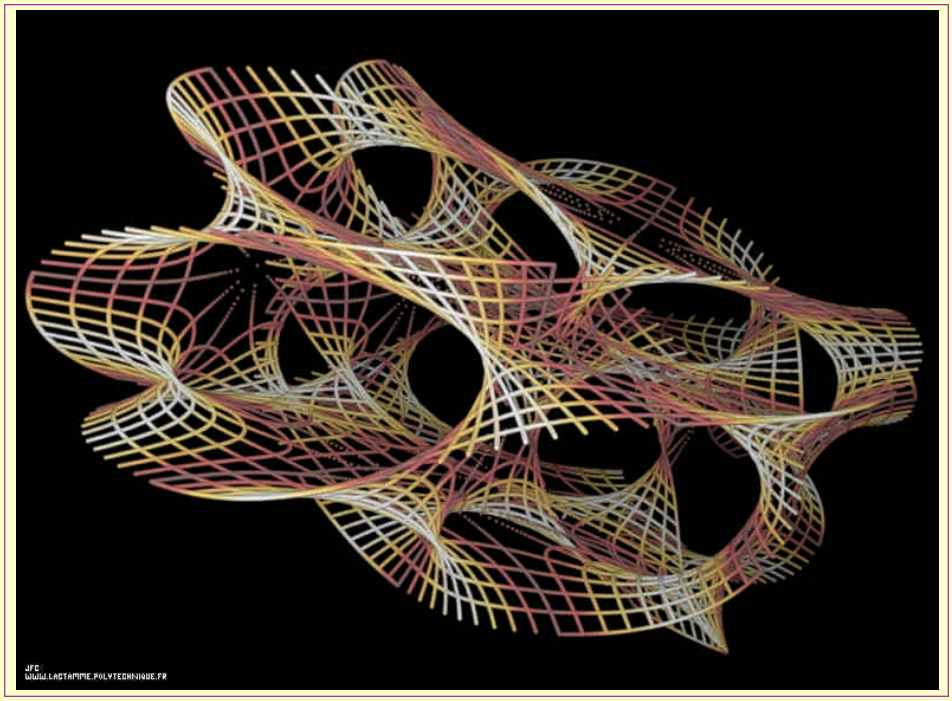
PRAGES



Guidelines for Gender Equality Programmes in Science

CAPACITIES

Presidenza del Consiglio dei Ministri
Dipartimento per le Pari Opportunità

prages

Practising Gender Equality in Science

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Author: Marina Cacace - ASDO
Via Pasubio, 2 - 00195 Roma (Italy)
info@asdo-info.org
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PRAGES Teams

Department for Equal Opportunities, Presidency of the Council of Ministers (Italy)
Michele Palma (team coordinator)
Serenella Martini
Marino Di Nardo
Irene Zancanaro

ASDO – Assembly of Women for Development and the Struggle against Social Exclusion (Italy)
Marina Cacace (team coordinator)
Giovanna Declich
Maresa Berliri
Marina Bruni
Martha Foschi
Dominika Kupczyk
Marysia McGilvray
Giovanna Murari
Andrea Peto

TETALAP – Hungarian Sciences and Technology Foundation (Hungary)
Katalin Kálai (team coordinator up to spring 2009)
Beata Szoboszlai (team coordinator from spring 2009)
Dóra Groó
Mária Palasik
Richard Gönczi

Department of Sociology and Social Research, University of Milan – Bicocca (Italy)
Francesca Zajczyk (team coordinator)
Francesca Crosta
Brunella Fiore
Sabrina Ortelli
Pietro Palvarini

Danish Centre for Studies in Research and Research Policy, Aarhus University (Denmark)
Evanthia Kalpazidou Schmidt (team coordinator)
Stine Thidemann Faber

Centre for Equality and Diversity at Work, Manchester Business School (United Kingdom)
Marilyn Davidson (team coordinator)
Sandra Fielden
Carrie Hunt
Jackie Kan
Helen Woolnough

Centre for Study and Research "Women and Gender Differences", University of Milan (Italy)
Daniela Falcinelli (team coordinator)
Bianca Beccalli
Antonio Chiesi
Claudia Sorlini
Elisa Rapetti
Sara Benjamin
Sveva Magaraggia

Center for Gender in Organizations, Simmons College School of Management (United States)
Patricia H. Deyton (team coordinator)
Alice Hogan
Kerri Kivolowitz
Kathleen Ryan

Department of Sociology, University of Cambridge (United Kingdom)
Jackie Scott (team coordinator)
Anna Bagnoli

Research School of Social Science, University of Queensland (Australia)
Gillian Whitehouse (team coordinator)
Carlie Rocco

European University Institute (Italy)
Giulia Calvi (team coordinator)
Valentina Fava

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Foreword

The European Union has been active in the field of women in science for 10 years now. Since the beginning, we have concentrated on collecting information on the situation of women in European science, and on funding measures that encourage and retain women in science and technology careers. We have had good results in these areas, but a lot has still to be done.

We are now moving away from an emphasis on 'fixing the women' to 'fixing the system', as expressed by the American scholar Londa Schiebinger. When we say 'fixing the women' we do not just mean measures on mentoring, role models, networking, etc, but also measures 'to fix the women so that they fit into the existing system'. There is a general consensus that the existing system is far from perfect and needs modernising, and we would very much like to contribute to this modernisation process.

On the one hand, after 10 years, it is discouraging to have to deal with the enduring lack of gender equality conditions in a social institution, such as science, which by nature should be grounded on the recognition of one's merit, competences and creativity, regardless of any other personal feature or orientation. This lack of gender equality clashes so much with the traditional view of science as a gender-neutral institution that it is still denied or, more often, underrated in its scale and consequences, both for women and for science itself.

On the other hand, thanks to the previous decade of activities, it is encouraging to see the high level of social mobilisation we have obtained to redress this state of affairs. The European Commission has contributed to this process in Europe, but a similar process has occurred in other non-European countries, where investments by governments and public institutions, and the engagement of women in this realm, have been increasing.

The main question now is to better understand what effects all these programmes and initiatives can actually produce, and how they can be effectively disseminated. Identifying successful programmes, and understanding how to make the most of

their achievements, was the main aim of PRAGES, the first project funded on gender in the Seventh Framework Programme. And these Guidelines, PRAGES' main product, are specifically geared to this objective.

The "Guidelines for Gender Equality Programmes in Science" are based on a complex work of collection and assessment of practices developed in Europe, North America and Australia, resulting in a database of gender equality programmes in science and technology that is available on the Web.

This overview will make it easier to capitalise on the theoretical and practical knowledge available on how to promote gender equality in science and technology. The Guidelines will thus be useful for universities, research centres and other stakeholders to implement a new institutional cultural change for a greater inclusiveness of women scientists, and the improvement of the working conditions of women (and men) on their premises.

These Guidelines will be also useful in achieving our ultimate objective: to make the differences and peculiarities of male and female researchers the main strength of the European Research Area, the source of creativity and innovativeness.

Jean-Michel BAER
Director for Science, Economy and Society
Directorate-General for Research
European Commission

Executive Summary

An enduring pattern

The difficulty women have in reaching leadership positions is so systematically widespread in all spheres of social life that it appears to be a deeply rooted pattern reproducing itself even in the most advanced societies. Public attention has largely focused on women's under-representation in politics, business or public administration, while the existence of gender bias in science and technology has long been underrated or even denied. This has, in all likelihood, contributed to the supposed gender-neutrality of science, in turn based on an assumption that considers science a rational activity which is thus hardly "polluted" by the social and cultural dynamics producing gender discrimination.

Unfortunately, science is no exception, and the data clearly show this. In Europe, North America and elsewhere, women tend to disappear as we progress from lower to higher levels of scientific careers. In EU-member states, women hold fewer than 20% of all higher academic positions (grade A), despite the fact that they account for over 55% of all university students and for nearly 60% of all graduates. Although increases in women's presence in highly qualified positions are regularly reported, their actual pace is slow (about a 2% increase in women's presence in grade A positions over 5 years).

Yet, women's participation in research is not the only issue at stake. It mirrors a broader and deeper lack of recognition of the gender dimension of science, affecting its contents, methods and priorities. This has increasingly negative impacts on research quality, research policies and on the use of scientific results in economic and social terms.

Policy efforts

Fortunately, the significance of these issues has been grasped by many institutions and players, both in Europe and in other parts of the world, leading to increasing commitment to gender equality in science.

Many national governments have developed various measures to increase women's participation in science and technology (S&T). Since the mid-1990s, the European Commission has greatly developed its actions in this regard, including an ever-broader array of different initiatives and measures. In this changed environment, many universities, research institutions, professional networks and women's associations have designed and developed projects focusing on gender equality in S&T.

Learning from experience

The need to capitalise on these experiences is now emerging, in view of enhancing the quality and impact of the actions developed. Around this need, a trans-national "community of practices" has begun to take shape, facilitating the production of new practical tools aimed at selecting and disseminating ideas and practices which have proven to be the most effective, reliable and sustainable.

These Guidelines are part of this common endeavour. They are the outcome of the project "Practising Gender Equality in Science" (PRAGES), whose main objective has been to take stock of programmes and initiatives found in specific institutional settings (such as universities, institutes, faculties and departments, but also networks, associations and S&T-related enterprises) aimed at promoting gender equality in S&T.

To achieve this objective, a necessarily complex path was followed. A preliminary survey of programmes implemented in Europe, North America and Australia was carried out and then over 1,100 representatives of institutions, organisations and networks which had promoted these programmes were contacted. First-hand and web-based information on a set of 125 programmes was collected. Finally, by adopting a benchmarking approach, a database was created providing a description and short assessment of 109 selected programmes.

The programmes constituted the most relevant information source on which to then develop the Guidelines themselves. Analysing them as a whole offered the chance to go beyond a merely descriptive dimension and to better understand their underlying intentions, objectives and operational schemes as well as to better record their overall impacts.

The strategic orientation of gender equality programmes

Viewed from this angle, gender equality programmes show a strong strategic orientation, on average. The vast majority of them seem to be grounded on a solid knowledge and great awareness of the pervasive mechanisms making science a male-dominated domain. Even when limited in scope, these programmes often manage to anchor their actions to a broader strategic framework and almost always tend to extend their range of action and to acquire a permanent feature over time.

This bird's eye view of the programmes, so to speak, led to three overall strategies providing the backbone of these Guidelines.

The first strategy consists of making science and technology (and, more concretely, research institutions) an enabling environment for women's progression and working life. Three main objectives stemming from the actions carried out by the programmes were singled out in this regard:

- promoting change in the culture and traditional behaviours of science- and technology-related work environments;
- supporting work-life balance for all;
- providing early-stage career-development.

The second strategy aims to include the gender dimension in the very process of research and innovation designing. Two main objectives were identified in this regard:

- overcoming stereotypes of women and science;
- influencing scientific contents and methods.

The third strategy consists of promoting women in scientific leadership positions. In this case, four objectives emerged from the analysis of the programmes:

- supporting women's leadership in research practice;
- supporting women's leadership in research management;
- supporting women's role in science communication;
- increasing women's presence and weight in managing innovation processes and in the related science-society relationships.

On the whole, the Guidelines contain 31 recommendations for implementing the three strategies, along with 61 lines of action. In turn, the lines of action are accompanied by 219 examples drawn from the experience of gender equality programmes. For each example, at least one web address is provided in order to allow direct access to relevant information sources.

The structure briefly described above is summarised in the summary charts 1-3 attached to this Executive Summary.

A cross-cutting look at equality programmes in S&T

In addition to this substantive view, the Guidelines also attempt to provide a cross-cutting analysis of the programmes in order to identify the practical solutions and orientations they developed, regardless of the strategies adopted and the objectives pursued.

Three domains are considered.

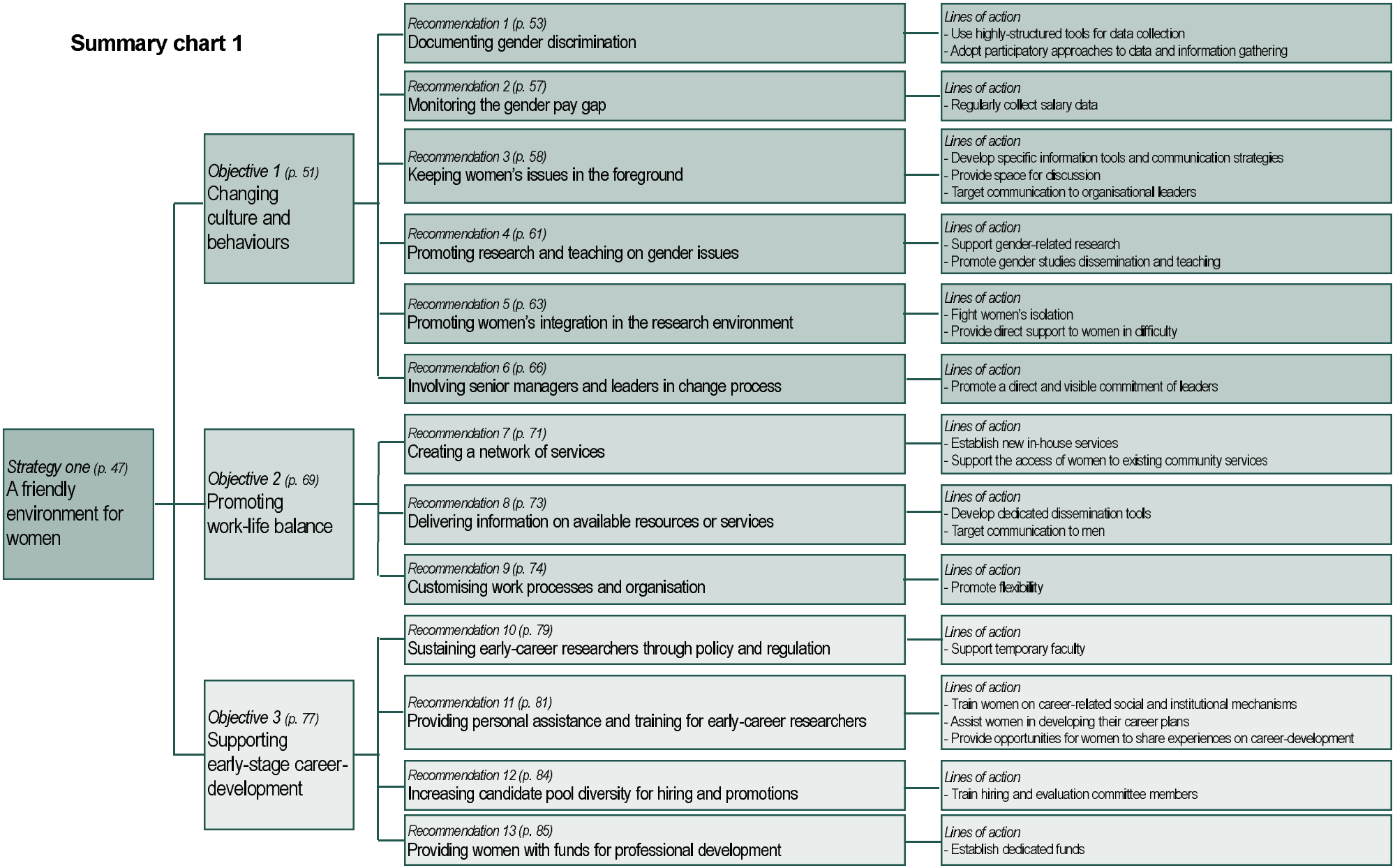
The first includes the tools used by the programmes to achieve their objectives. Needless to say, a tool can be applied to achieve different objectives and to implement different strategies, and even several strategies at the same time. A total of 31 tools have been singled out and are accompanied by 138 examples, each with a relevant web address.

The second domain concerns the action patterns, that is, the recurrent schemes of action which programme promoters use to assure acceptable quality levels to their programmes. A total of 30 action patterns have been identified and grouped into four main quality dimensions: relevance, effectiveness, efficiency and sustainability.

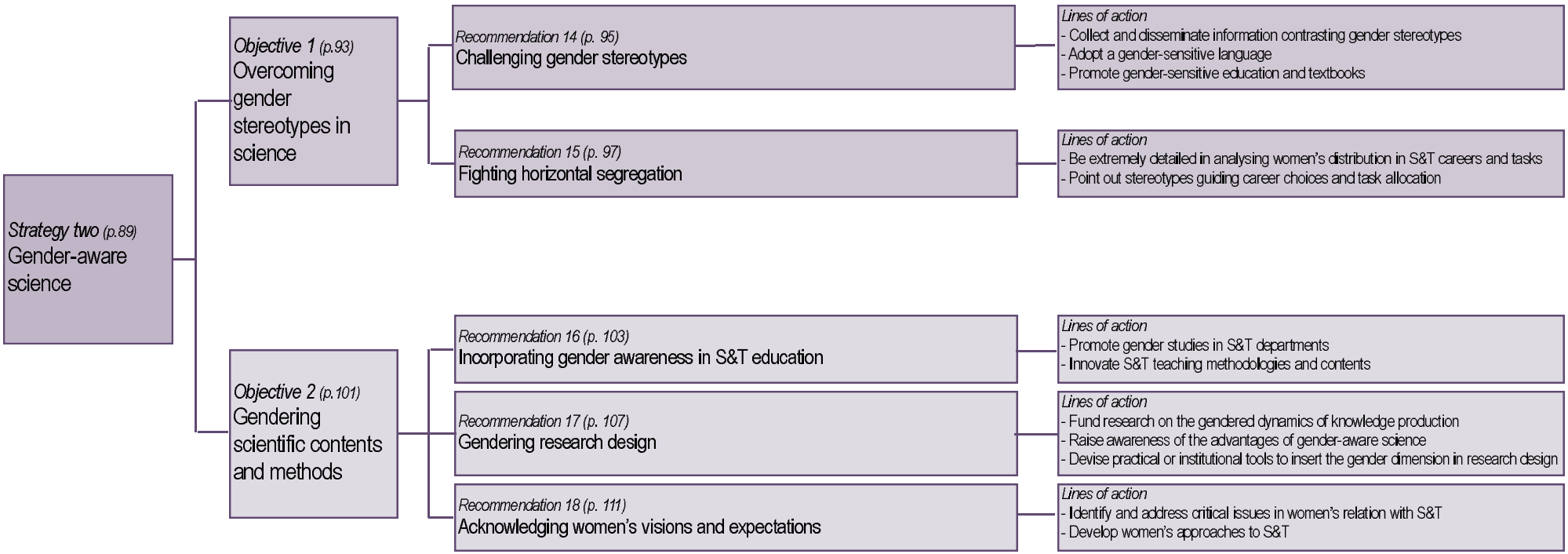
The third domain concerns some conclusions emerging from the entire analysis. These are presented in the form of 7 overall methodological suggestions.

The structure and contents of these three domains are summarised in the summary charts 4-6, attached to this Executive Summary.

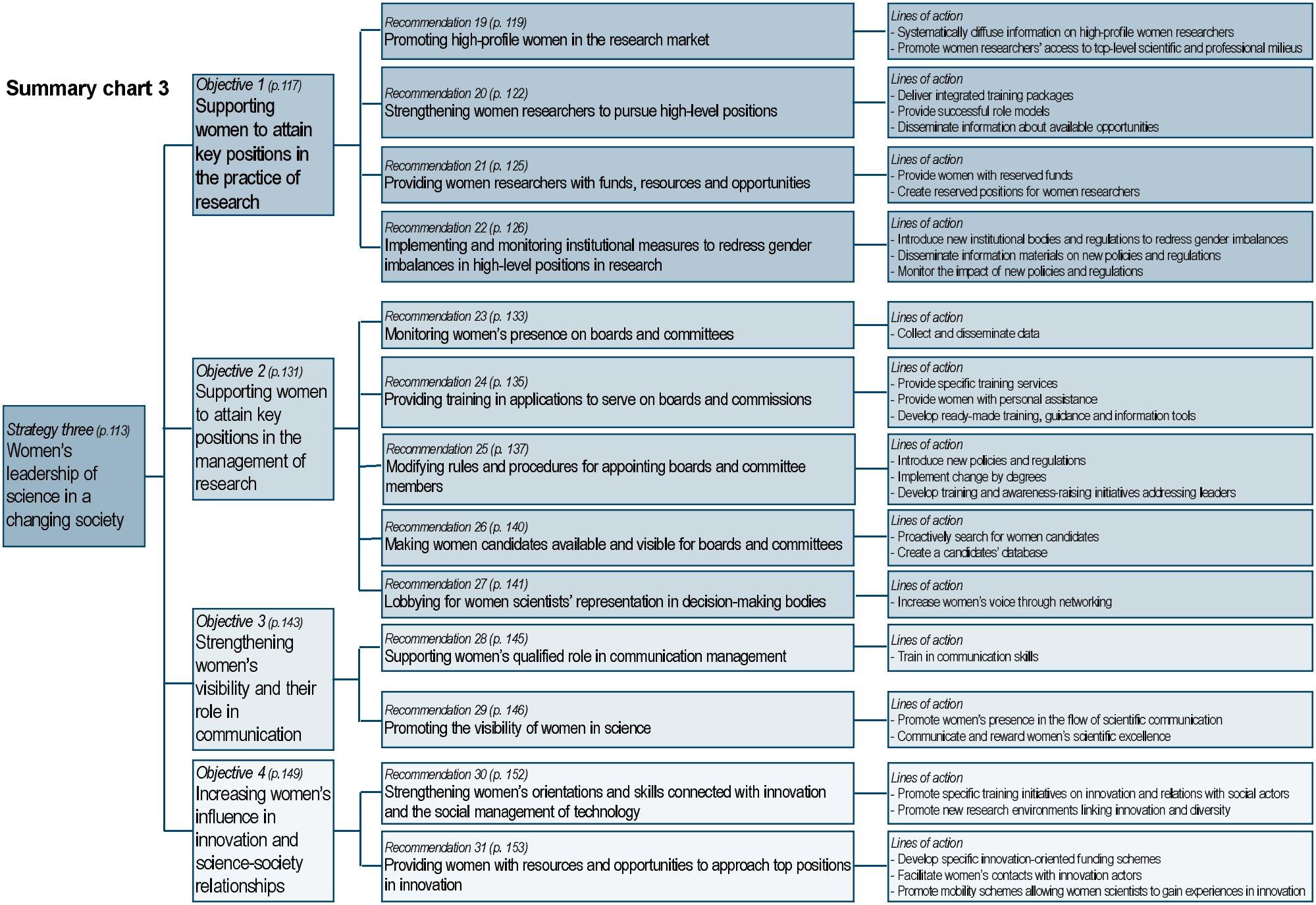
Summary chart 1



Summary chart 2



Summary chart 3



Summary chart 4

Tools (p.159)

1. Awards and recognitions
2. Best practices collection
3. Books and reports
4. Charters
5. Childcare services
6. Coaching
7. Committees
8. Consultations
9. Databases
10. Direct contact
11. Dissemination and guidance packages
12. Expressive and artistic tools
13. Grants, loans and subsidies
14. Information desks
15. Institutional arrangements
16. Lobbying
17. Media campaigns
18. Meetings
19. Mentoring
20. Monitoring and evaluation tools
21. Networks and networking
22. On-demand services
23. Organisational arrangements
24. Planning
25. Public communication tools
26. Regulations
27. Research and data collection
28. Social events
29. Training courses, lessons and seminars
30. Web-based discussion spaces
31. Websites

Summary chart 5

Action patterns (p.191)

Relevance (p. 194)

1. KNOWLEDGE – Generating knowledge about the problem
2. PARTICIPATION – Using participatory approaches in programme planning
3. DIVERSITY – Framing gender issues in the broader context of diversity issues
4. LESSONS LEARNED – Capitalising local past experiences and the experiences of others
5. SOCIAL CAPITAL – Using and enlarging the social capital of the programme
6. ORGANISATION LEADERS – Bringing organisation leaders to one's own side
7. ORGANISATIONAL CULTURE AND STRUCTURE – Aligning the programme to the organisation's culture and structure
8. SCOPE AND TARGET – Keeping a unitary approach while addressing a broad target
9. AWARENESS – Supporting all programmes with awareness-raising activities

Effectiveness (p. 197)

1. STAFF – Gearing the programme to a motivated, experienced, diversified and active core of people
2. VOLUNTARY ACTION – Promoting voluntary action in support of the programme
3. PROGRAMME LEADERSHIP – Ensuring continuity in programme leadership
4. PLANNING – Developing public, long-term and realistic action plans
5. MONITORING AND ASSESSMENT – Endowing programmes with effective monitoring and assessment systems
6. PARTNERSHIPS – Promoting inclusive partnerships involving key players
7. TRANSPARENCY AND TRANSFERABILITY – Making the programme transparent and transferable to external players
8. DIVERSIFICATION – Diversifying actions and tools

Efficiency (p. 199)

1. FUNDING MIX – Diversifying financing sources as far as possible

2. ADHERENCE TO PLANS – Keeping a flexible but close adherence to the established action plans

3. ACCOUNTING AND MANAGEMENT – Providing the programme with professional accounting and resource management systems

4. SCENARIOS – Timely developing scenarios for future resource needs and sources

5. COOPERATION – Enlarging cooperation networks to increase access to resources

6. STAFF SKILLS – Reinforcing staff skills in resource-raising and management

Sustainability (p. 201)

1. SUSTAINABILITY PLANNING – Planning sustainability from the very beginning

2. FUND-RAISING – Developing sustainability-oriented initiatives while the programme is still running

3. MEN'S INVOLVEMENT – Involving men in the promotion and implementation of the programme

4. PROGRAMME VISIBILITY – Making the programme as visible as possible

5. PARTNERS' COMMITMENT – Promoting a direct engagement of partners

6. ORGANISATIONAL FLEXIBILITY – Envisaging flexible organisational solutions

7. INSTITUTIONAL EMBEDDEDNESS – Shooting for progressive embeddedness of the programme in the organisation concerned

Summary chart 6

Methodological suggestions (p. 205)

1. Linking action to knowledge
2. Creating institutional space for gender issues
3. Looking for alliances and support
4. Adopting an integrated approach
5. Connecting gender and diversity issues to science development
6. Promoting a community of practices
7. Protecting programme vitality

Introduction

These guidelines are the final result of the 21-month project "**Practising Gender Equality in Science**" (**PRAGES**), which aimed to address women's under-representation in high-profile positions in scientific and technological research.

After a decade of efforts by European, national and local agencies – as well as universities and research institutions – and in the context of persistent dynamics of discrimination, the aim of the project has been that of **taking stock of the situation** by highlighting strategies and measures that have proven effective in accelerating the pace of progress, still unexpectedly slow despite women's growing inclusion in, and contribution to, scientific and technological disciplines and professional areas.

Issues at stake have from the beginning been identified, not only in women's indisputable right to fair evaluation and reward of scientific merit, in terms of career advancement and access to decision-making positions, but also – as is increasingly recognised – in the chance for scientific and technological research to become more firmly grounded in society and more relevant to evolving needs and expectations, in a time of profound change. Moreover, adding women's (and other under-represented groups') perspectives to the research process cannot but enhance creativity and innovation, while helping science to reconsider its by now questionable claims of ***neutrality*** and ***universality***.

From this point of view, the **link between diversity and excellence** clearly stands out, with all its implications in terms of scientific and technological progress and economic development. The need also emerges of avoiding simplistic approaches aimed at resolving problems by "fixing the women", to make them compatible with dominant approaches and cultures. Problems women face and report should, on the contrary, be considered as starting points to "fix" the scientific cultural and organisational environment on the basis of the diversity concept.

The project has been characterised by a set of general approaches. First, a **comparative approach** among the initiatives promoted in the different European countries and those implemented in Canada, Australia and the Unites States. Second, an **analytical approach**, highlighting the different sides of the "gender-and-science issue", in order to identify suitable strategies and tools to deal with them. Third, a **benchmarking approach**[1], to single out the most successful solutions and provide suggestions regarding their possible adaptation and transfer to different contexts.

[1] Benchmarking, which originated in the 1970s in the context of management studies and was developed especially in the 1990s, can be defined as "the process of identification, understanding and adaptation of practices, of one's own or of other organisations, in order to improve one's own performance" (Cook S., ***Practical benchmarking***, Kogan Page, London, 1995); at the same time, benchmarking represents a permanent process of learning and continuous improvement, and a process of standard-setting in relation to practices that can be identified (Benchmarking Centre, United Kingdom, 1997).

Measures collected and analysed, according to the general aim of the project, are those implemented at **organisational level** (universities, institutes, faculties, departments, but also networks, associations and S&T-related enterprises), that is, concrete initiatives located in specific institutional contexts. National or European policies have not been directly taken into account, even though some initiatives originate in or have links to such policies. This is not obviously implying that it is possible to redress widespread situations of inequality without broad supporting legislative and policy measures. The intention is, instead, to provide indications and examples of what can be accomplished **starting from the bottom-up**, including both simple one-issue programmes and large mainstreaming efforts, grounding general organisational change on the recognition of diversity.

To pursue its goals, the project has been designed as an integrated effort, organised into **four main steps**.

The **first step** was an **extensive networking activity** aimed at mapping the initiatives implemented in Europe, the United States, Australia and Canada to support women's progression in scientific and technological careers. A mailing list containing more than 1,100 programmes has thus been set up.

The **second step** entailed directly contacting all those on the mailing list and the **administering of semi-structured questionnaires** to the promoters of the programmes who have been willing to participate (125). A **database** was then designed to contain basic descriptive information on the 109 initiatives that – after the analysis of questionnaires and related documentation – were recognised as relevant to the project.

The **third step** focused on **quality evaluation**. In this phase, **successful solutions** were identified among the ones the programmes devised to manage the problems faced during implementation, be they social, cultural, organisational, financial, etc. The perspective here has been that of **benchmarking**, that is, finding best ideas and isolating enabling factors for other programmes to share. A **second version of the database** was then issued, containing this additional information.

The **fourth step** has finally been that of drafting these **guidelines**, trying to make the most of the experience of the programmes and to organise the knowledge derived from their analysis in an easily usable format.

The guidelines have undergone a broad **review process** which has involved, beyond the partners of the consortium, the members of the International Board of Advisors of the project, as well as 24 experts from Europe, Australia, Canada and the United States. In addition, four national seminars have been organised in the European countries participating in the project (Italy, the United Kingdom, Denmark and Hungary) in order to collect further comments and suggestions.

Supporting the itinerary briefly outlined above, a number of other dissemination and public communication activities were undertaken, equally crucial to the success of the project. Among them, the setting up of a dedicated **website**, the creation of a web-based **Observatory** focusing on seminars, conferences, publications and other events relevant to the women in science issue, and the issuing of an electronic **newsletter**.

The Guidelines are organised into five parts.

Part A, entitled "**Women and science: Problems and issues at stake**", firstly aims to provide a picture of women's position in S&T sectors, highlighting the **main risks** affecting their progression. Secondly, how the programmes tend to react and manage these risks is described, showing that three **main strategies** are devised, addressing the fundamental issues underlying the many obstacles women usually face.

Part B, entitled "**A friendly environment for women**", deals with the first strategy, using a wealth of examples to illustrate the efforts of the programmes in building an enabling environment for women's progression. Recommendations and lines of action that have been drawn by such experiences include three areas: promoting change in the **culture and traditional behaviours** of science- and technology-related work environments; supporting **work-life balance** for all; providing **early-stage career-development**.

Part C, entitled "**Gender-aware science**" addresses the second strategy, aimed at inserting the gender dimension in the very process of research and innovation design. Through concrete examples, two areas of recommendations are identified: overcoming **stereotypes** of women and science; influencing scientific **contents and methods**.

Part D, entitled "**Women's leadership of science in a changing society**", is concerned with the issue of scientific leadership in a broad sense, and highlights four areas of recommendations, again derived from the actions identified in the programmes: supporting women's leadership in the **practice** of research; supporting women's leadership in the **management** of research; supporting women's role in science **communication**; increasing women's presence and weight in managing **innovation** processes and the related **science-society relationships**.

Part E, entitled "**Programmes that work**", collects the practical indications coming from the promoters of the programmes, organising them into "Tools for action", "Action patterns" and some overall "Methodological suggestions". In this part, it was decided to increase the empirical grounding of the guidelines by including opinions and tips coming from those who actually run the programmes.

A **bibliography** and two **appendixes** complete the text. Appendix 1 contains a brief explanation of the **methodology** applied to identify, select and assess the programmes which form the basis of the guidelines. Appendix 2 lists the **programmes and their promoting organisations** (links to public documents related to each one are instead provided in the text after each example).

It must be stressed that, obviously, not all the programmes can be implemented in any legal, social, cultural or organisational context. To decide whether and how a given programme might be adopted and/or adapted in one's own situation, **the information on the guidelines can be supplemented with that contained in two other connected sources**:

- The **relevant webpages** of the programmes, directly provided in the guidelines, as they are indicated through specific links after each example;
- The **PRAGES database**, where information on structural and procedural enabling factors and obstacles of many different kind of programmes are contained, as well as quality and transferability assessments (the database is available at: http://www.reteparioppportunita.it/prages)[2].

[2] For obvious privacy reasons, information on the assessed programmes is provided in an anonymous form (see appendix 1: Methodological note). Search tools allow users to browse different categories of initiatives and types of information.

The project was carried out under the Seventh Framework Programme for Research and Technological Development, also benefiting from a grant from the Italian Ministry for the Economy and Finance. The activities were implemented by a consortium of eleven partners:

- Department for Equal Opportunities – Presidency of the Council of Ministers (Italy, project coordinator);
- ASDO – Assembly of Women for Development and the Struggle against Social Exclusion (Italy);
- TETALAP – Hungarian Science and Technology Foundation (Hungary);
- Department of Sociology and Social Research, University of Milan – Bicocca (Italy);
- Danish Centre for Studies in Research and Research Policies, Aarhus University (Denmark);
- Centre for Equality and Diversity at Work, Manchester Business School (United Kingdom);
- Centre for Study and Research "Women and Gender Differences", University of Milan (Italy);
- Center for Gender in Organizations, Simmons College School of Management (United States);
- Department of Sociology, University of Cambridge (United Kingdom);
- Research School of Social Sciences, University of Queensland (Australia);
- The European University Institute (Italy).

The guidelines are firstly **targeting** scientific leaderships and management as well as women's networks and associations within public and private universities and research institutions, in order to provide them with ideas and suggestions to start or enhance gender-equality initiatives in their organisations. At a more general level, the guidelines are also targeting public, private and non-profit institutions involved in research policy; public, private and non-profit institutions involved in equal opportunity policies; civil society organisations; business associations and trade unions; national and European scientific societies and networks; the media.

The text was drafted by Marina Cacace (ASDO).

Women and science: problems and issues at stake

Part A

Women and science:
problems and issues at stake

From figures to risks

Part A
Chapter One

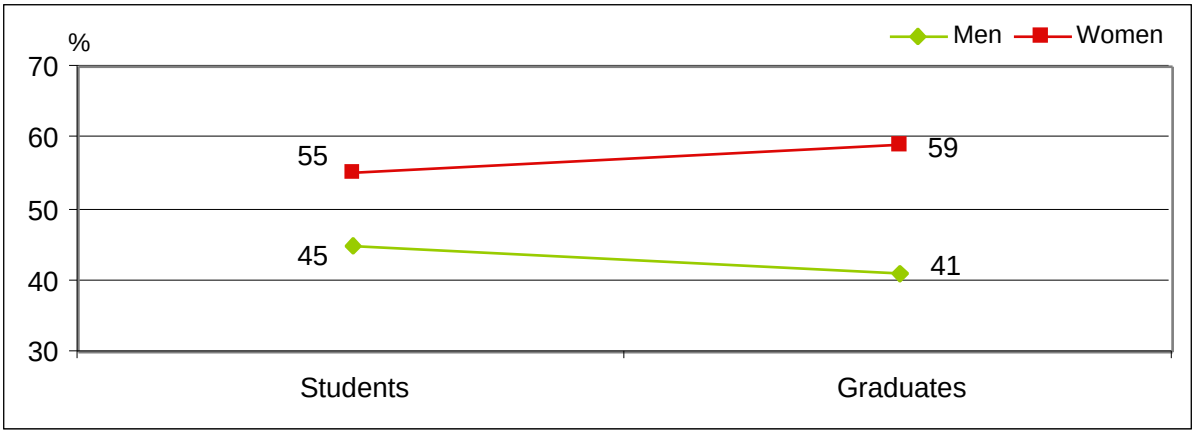
[1. Looking at the numbers]

Women's position in scientific and technological sectors, as it emerges from available data, is still far from being balanced and fair with respect to men's. As it happens in other fields, women's presence in S&T is affected by sharply contrasting dynamics, resulting in an **extremely slow pace of progress**, as it clearly appears looking at the numbers.

Some figures, suggest a **general trend towards growing inclusion and success of women in all sectors of science**. In some cases male numerical dominance even gets reversed. In EU27 countries, for instance, university students in 2006 were 55% female, with even higher rate for and women among graduates (59%), attesting to women's greater success in tertiary education (see graph 1). Progress has also been recorded in women's proportion among PhD graduates (which rose to 45% in 2006), and in traditionally male-dominated fields, such as the natural sciences, where the share of women's participation at PhD graduation level grew by an average of 6.3% per year between 2002 and 2006, compared with a 3.7% increase for men (European Commission, 2009).

Other figures, however, show the **strength and persistence of the exclusionary processes** slowing down and jeopardising women's advancement in scientific careers. In 2006, women accounted for only 19% of all "grade A" academic positions[1], with an increase of only 2 points in 5 years (17% in 2002 in EU-27 countries). In addition, data show the systematic disappearing of women as we progress from the bottom to the upper levels of the occupational ladder. In the classical pattern of vertical segregation, there is a lack of women in proportionate numbers in high-level positions. Graph 2 shows the most recent version of the famous "scissors diagram": what happens after graduation dramatically modifies the trend emerging in graph 1, above.

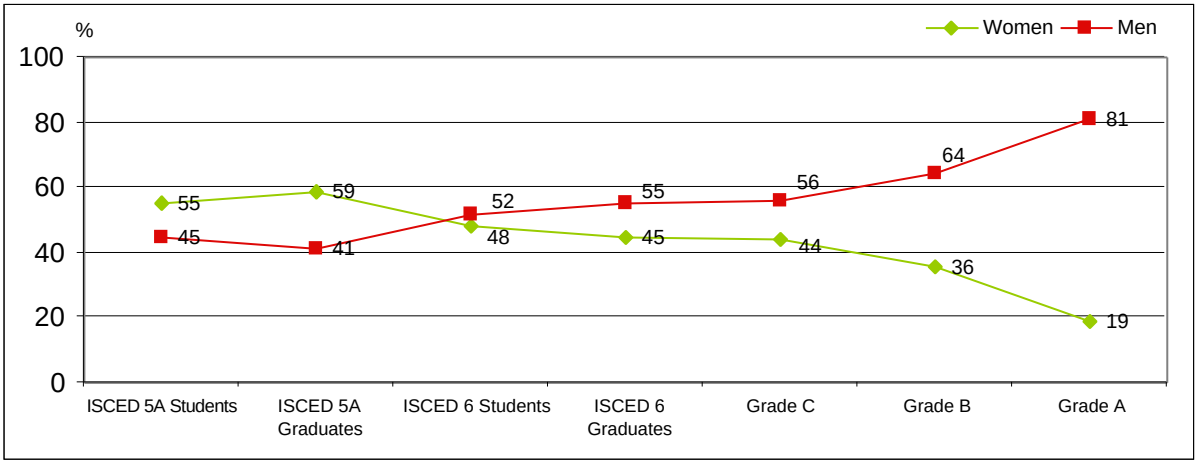
Graph 1 – Proportion of men and women among students and graduates, EU-27, 2006 (%)



Source: European Commission, 2009

[1] Defined as "the single highest grade/post at which research is normally conducted" (European Commission, 2009), corresponding in most cases to the position of "full professor".

Graph 2 – Proportion of men and women in a typical academic career, students and academic staff, EU-27, 2006 (%)



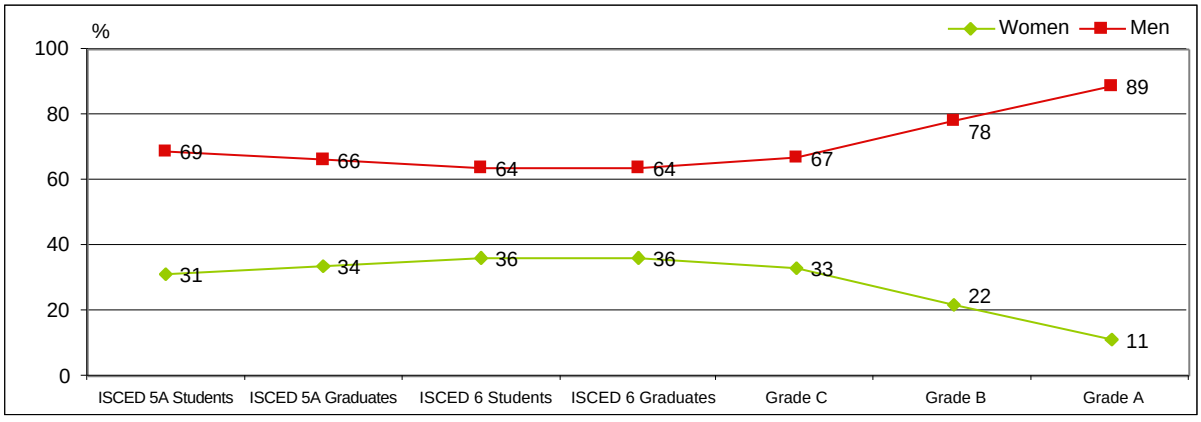
Source: European Commission, 2009

Women are even more under-represented in science and engineering careers (graph 3), where women account for only 31% of students. It is true that their presence is growing not only among graduates (34%), as is the case when considering all fields together, but also among PhD students and graduates (36%). But, at this point, the general pattern shows up again and the proportion of women drops in the subsequent hierarchical echelons, with a **comparable attrition rate** to all other study fields (European Commission, 2009).

To explain these patterns of vertical segregation, a "**generation effect**" hypothesis is often proposed, implying that women at grade A are proportionally represented considering the small proportion of women students when they entered the pipeline. A slight generation effect can indeed be documented considering that the youngest generations are better represented at the highest levels than older ones. At EU-27 level, for instance, women account for 23% of grade A academics among 33 to 44-year-olds, compared to 18% of the oldest age group (over 55 years). It must be noted, however, that differences are really slight, especially considering the increase in the proportion of women among students and graduates, and that they are not consistent across countries.

Data accurately comparing women's presence among students and grade A academics in the same age group could clarify this point, but they are currently lacking. An estimate can be made for Italy, a country where women's presence at grade A

Graph 3 – Proportion of men and women in a typical academic career in science and engineering, students and academic staff, EU-27, 2006 (%)



Source: European Commission, 2009

is in line with the EU-27 average (19%). Even though it is not obviously possible to generalise the Italian situation, it is interesting to note that in this country **women's continual increase among graduates has only partially been matched by their increase at the highest academic positions**. Women's presence among graduates has been checked by birth-year groups from 1935 to 1969. Results have been compared to women's presence among academic grade A staff for the same age groups. Table 1 shows very different progress rates: women in the birth-year group 1965-1969 were the first to achieve parity among graduates, but today they only represent 19.6% of full professors in universities. The fact that women's presence among grade A staff stops increasing and even decreases for younger generations probably means that it takes longer for women – at least in Italy – to reach the position of full professor, so that the generation effect looks particularly ineffective here.

Table 1 – Women's proportion among graduates and grade A academic staff by birth-year group (%)

Birth year groups	Women among graduates	Women among grade A academics
1935-1939	31.1	11.9
1940-1944	33.8	16.2
1945-1949	42.7	21.1
1950-1954	44.8	24.2
1955-1959	44.1	20.6
1960-1964	46.0	19.3
1965-1969	49.8	19.6

Source: ASDO estimate based on D'Aprile (1998); MUR (2008)

Vertical segregation, however, is not the only problem affecting women's careers, since it is connected to many others. There is in fact also plenty of evidence for horizontal segregation, that is, the concentration of women in some disciplines and in some sectors or tasks within a discipline; and of differences in salary, access to resources, publications, patenting, and even of complex phenomena such as the presence of gender stereotypes about women and science.

Women's low participation in key positions in science and technology can actually be represented through many different kinds of measurements, and this calls for a full understanding of the **multidimensional** nature of the problem.

Going in depth into the many layers this issue is made of, **three main areas of exclusion** emerge, which while overlapping with each other, are still separate in their basic meaning, and require some specific forms of intervention:

– The unfriendliness to women of some features of the S&T **environment**;
– The dominant understanding and practice of **science** which is gendered as masculine;
– The male-dominated dynamics of **leadership**.

In the following paragraphs, we will briefly review the three areas, presenting them also as **areas of risk**: risks for women of not concretely achieving equality, but also risks for society in the waste of women's talent, thus missing an opportunity to build **innovative and "socially robust" science** (Nowotny, Scott, & Gibbons, 2002), by adding women and the gender dimension to it.

[2. Three areas of risk]

Here below, the three risk areas will be briefly discussed, as well as some figures to provide concrete evidence of them.

2.1. Science as an unfriendly environment

A hidden structure of discrimination

Many of the factors making scientific and technological work settings unfriendly to women are common to any professional environment, even though the degree of male-domination of some specific discipline (such as engineering) is really impressive. The problem is that science is considered to be perfectly objective and meritocratic, so that the idea is that it can afford to disregard the gender dimension. The common belief of the **gender-blindness of science** is the basis of the informal and hardly visible nature of its segregating mechanisms, which often go unrecognised even by women themselves. This makes problems harder to address.

An objective appraisal of the data on women in science, however, clearly indicates that, even though overt discrimination is now virtually absent, **the most hidden and rooted structures of discrimination are still in place** and continue to produce very visible and quantifiable results. They show a peculiar vitality and a strong capacity to assume new forms over time, as significant transformations affect the research system and society at large (see the paragraph on "Women under-representation in a wider context" below).

It is as if a **cultural, social and psychological "matrix" of science as a male domain** is still continuously generating old and new discriminatory mechanisms able to adapt themselves to the changing external social conditions. As things stand, positive observable improvements in women's advancement – such as an increase in the number of women in scientific faculties or their larger presence in male-dominated working sectors – are not always indicators of a weakening of the influence of processes of discrimination.

Being hidden, these discriminating structures are not easily detected. They are embedded in the language, in the symbolic dimension, in quite automatic behavioural patterns, in common sense and in well-rooted widespread beliefs. As a whole, they contribute, not necessarily to directly activate discriminatory processes, but rather to create a **climate** or an **environment** conducive of discriminatory conditions for women. Below, some of the factors connected to what has been sometimes named a "**chilly climate**" for women in S&T departments are briefly discussed below.

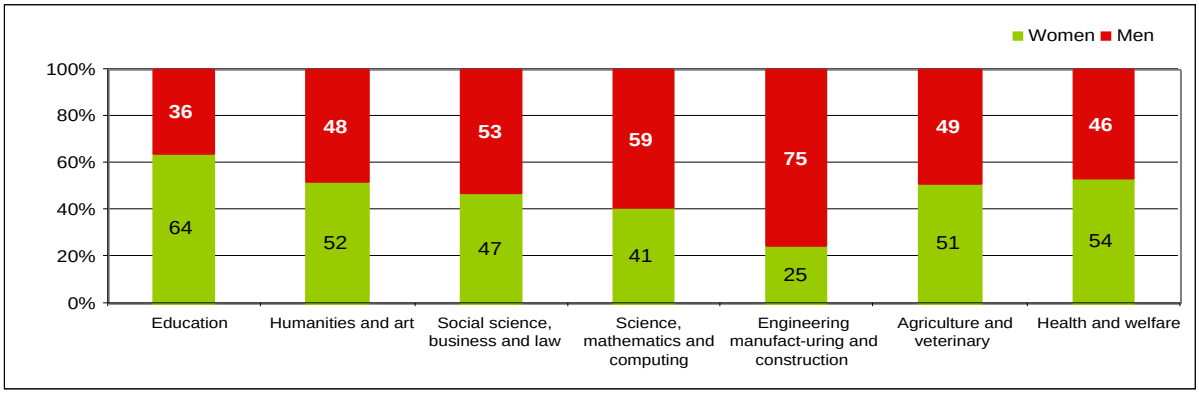
The leaky pipeline

Science and technology departments and faculties look unwelcoming to women **since the beginning of academic curricula**. Currently, fewer women than men choose to enter educational paths in the scientific and technological domains, as is shown in graph 4, dividing the academic degrees into large areas.

Narrowing the analysis to science- and technology-related fields of study, the gap between male and female participation increases (graph 5).

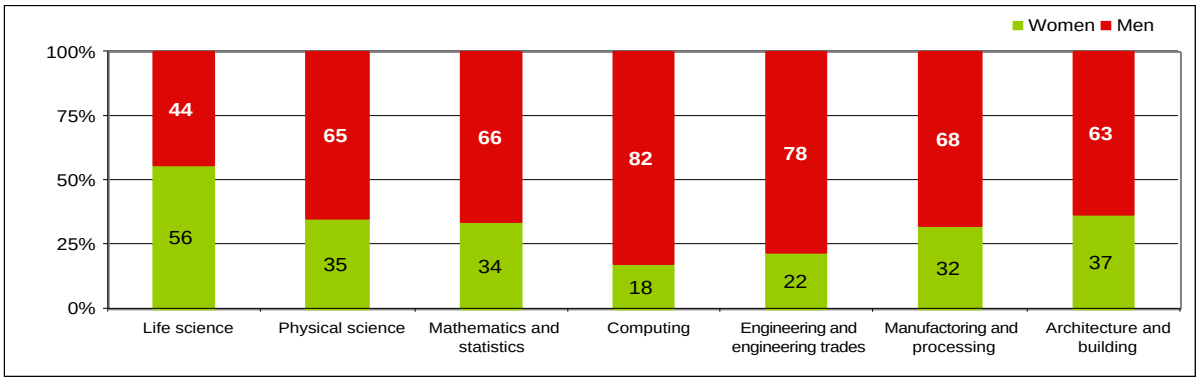
Figures are similar for non-European countries, even though S&T fields are not always grouped according to the same criteria. For example, in the United States women graduates and PhDs in mathematics and computer science account for 28%, while the relative figure is 22% in engineering and construction. In Canada these figures are respectively 29% and 25%; in Australia 26% and 24% (Observa, 2008).

Graph 4 – Female tertiary graduates and PhDs (ISCED 6) as percentage of total tertiary graduates and PhDs, EU-27, 2006 (%)



Source: European Commission, 2009

Graph 5 – Female tertiary graduates and PhDs (ISCED 6) as percentage of total tertiary graduates and PhDs by narrow field of study in natural science and engineering, EU-27, 2006 (%)



Source: European Commission, 2009

After years of policies encouraging women's enrolment in S&T, however, it has been demonstrated that the increase in the number of women students in graduate and PhD courses in scientific branches does not automatically translate into an increase in the number of women in senior positions (Fielding & Glover, 1999).

This is why many talk of a "**leaky pipeline**" (Jensen, 2005). The leaky pipeline, in fact, indicates a process of ongoing loss of young and adult women, at a higher rate than men at each educational level or career stage, from primary education to S&T decision-making, and increasingly at senior career levels (Etzkowitz, Kemelgor, Neuschatz, & Uzzi, 1994). There are many factors contributing to women's rarefaction: education, socio-cultural attitudes and prejudices, work-life balance issues, direct discrimination in male-dominated selection committees, indirect discrimination grounded in unconscious gender-biased selection criteria, self-censuring rooted in gender stereotypes (European Commission, 2009). In this situation, continuing to insist on the still important policies that encourage women's access to scientific branches of study is a sort of **Sisyphean task**, given the high drop-out rates (Etzkowitz & Gupta, 2006).

Drop-out rates are probably the best indicators of stress for women in S&T environments, and demonstrate the functioning of exclusionary mechanisms that tend to go unnoticed and unaddressed.

Critical mass, "hidden quotas" and informal networks

Fewer women in science and technology also mean a serious **lack of female role-models** for students and postgraduates, which

cannot but contribute to making the environment less welcoming to women. For instance, in natural sciences women were only 13.4% of the full professors (grade A) in the EU-27 countries in 2006, and only 7.2% in **engineering** (European Commission, 2009).

In university departments and public research institutions, it has been often argued that the feelings of isolation and other difficulties are due to the fact that a "**critical mass**" of women has not been reached. Even though women's equal or greater presence in specific fields does not automatically translate into their obtaining leadership positions, without such a "mass" it is harder to even lay the ground for change. A significant presence of women is, for instance, necessary to press for the introduction of gender studies programmes (indeed, virtually absent in scientific departments), and also to affirm styles that are alternative to the typical masculine models (Blickenstaff, 2005) and to question the masculine symbolic perception of science (Lagensen, 2007) in order to create a more comfortable environment for women (Gürer & Camp, 2002). Women's scarce presence on the staff of scientific faculties and departments is also considered a discouraging factor for female students, as has been demonstrated by several studies taking into account the gender composition and atmosphere in the **micro-environments** in which women students and researchers carry out their work every day (Sonnert, Fox, & Adkins, 2007).

In S&T as much as in other fields, however, the need for a critical mass seems to be at odds with the presence of **"hidden quotas"**. A German study shows, for example, that there exists a tacit limit to the accepted rate of women in research groups and this results in a "revolving door" effect. This means that if in a group there is already a 25% rate of women, the (informal) trend is that other women will gain access only when one of them quits her position (Allmendiger & Podsiadlowski, 2001).

Scarcity of women, especially with regard to senior positions, is often at the origin of the frequently reported problem of **women's marginality in research networks**, which are mainly based on informal relations (the so-called ***old boys networks***). This fact results in women's relative isolation or subordination. **Activities related to work-life balance needs** and **career breaks** because of maternity also undoubtedly have a role in reducing the time devoted by women to informal networking activities. The relative absence of women in relations among fellow researchers decreases the level of mutual exchange into departments and deprives women of basic instruments for successful advancement (Gupta, Kemelgor, Fuchs, & Etzkowitz, 2005).

Work-life issues

In the field of scientific and technological research, as everywhere else, gendered **social roles as family** caregivers obviously weigh heavily on women. Many studies highlight the difficulty of balancing professional scientific activity (that often also includes international mobility) with care responsibilities (European Commission, 2005; Gupta, Kemelgor, Fuchs, & Etzkowitz, 2005; Zimmer, 2003; Meulders, 2003; Stafford, 1996). This situation gives rise to **deep psychological and organisational conflicts** in women. Inner conflicts and their effects on women's scientific careers are particularly serious also considering the greater degree of **interdependency** between life domains and career experienced by women with respect to men (Nazio, 2009; Martin-Garcia, 2009; Matysiak & Vignoli, 2008).

As a consequence, women may feel forced to renounce maternity or postpone it for a long time, with all the risks entailed, or to slow down their research activity, often irreversibly compromising their own possibilities of attaining levels of excellence, if not even to give it up altogether. Often the solution is to lower one's own expectations and adapt to models of "reduced careers" that damage the potential of the researchers (Cacace & Mastropietro, 2003).

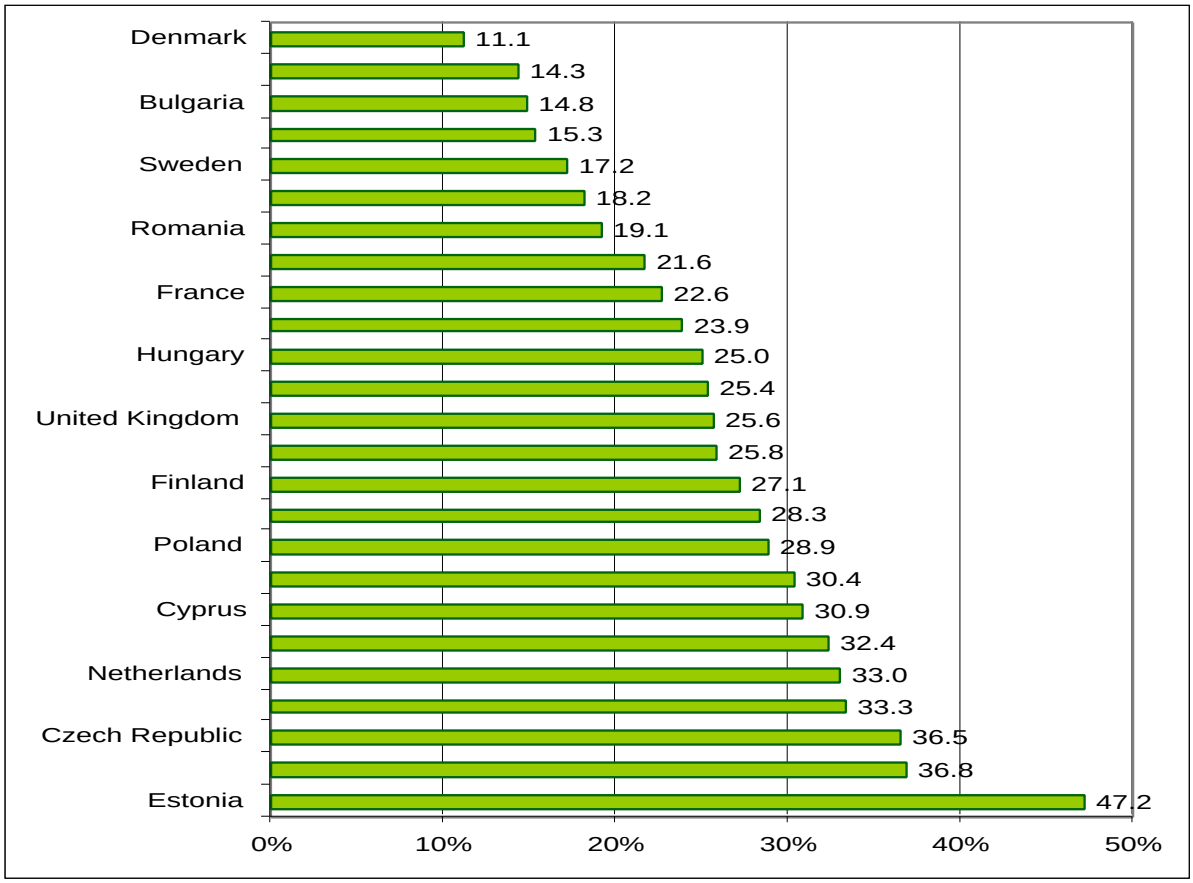
The **availability of accessible, affordable and good quality care services**, flexible enough to suit the particular needs of scientists must be considered an important ingredient in making the environment friendly to both women and men.

Access to resources and career development

The gender pay gap does not spare science- and technology-related professional sectors, as is documented by many studies, the most recent being the one carried out by the European Commission in 2006 in public and private commercial sectors in the EU-25 and associated countries. European women researchers[2] tend, on average, to earn 24% less than their male colleagues (European Commission, 2007), in line with the gap covering the entire economy, which stood at 25% in the EU-27 countries in 2006 (European Commission, 2009). Data referring to some of the countries included in the study is reported in graph 6.

Besides that, **accessing resources for research** is more difficult for women. As in the case of gender segregation, this is not an exclusively European phenomenon either. In the 60s Alice Rossi shocked U.S. public opinion and experts when she demonstrated that gender discrimination did occur even in a prestigious research institution like the Massachusetts Institute of Technology (Rossi, 1965). At the end of the nineties, other surveys conducted on and by women at MIT revealed that even women scientists who have exceptionally successful careers get systematically lower earnings compared with their male colleagues, and have access to fewer **resources for research**, such as

Graph 6 – The pay gap between men and women researchers in some European countries, 2006 (%)



Source: European Commission, 2007

[2] For the purpose of the study, "researchers" are defined according to the Frascati Manual (OECD, 1993): "a researcher is any person who devotes at least 50% of her/his time to carry out research activities".

laboratories and academic funds (Lawler, 2001; Ellemers, van de Heuvel, de Gilder, Maas, & Bonvini, 2004).

In addition, research on faculty structures in United States universities shows that, while there is an ever growing recourse to contingent faculty staff, **women are over-represented in non tenured and off the tenure-track positions** (Ivey, 2005). Also in the majority of European countries women are under-represented among part-time workers (Brookman, Haines, Koenig, McLean, & Westwick, 2004).

Evaluation of scientific merit

Unfair evaluation of scientific merit undoubtedly plays a role in determining this situation. In a famous study, Christine Wennerås and Agnes Wold have shown how in ***peer reviews*** conducted within the Swedish Medical Research Council (MRC), to select recipients of post-doctoral research grants, there were active forms of prejudice that led reviewers to give **inferior appraisals to women** than those given to male colleagues that had the same level of scientific productivity (Wennerås & Wold, 1997). Since then, many studies in different disciplinary fields have confirmed the weight of the gender variable in evaluation procedures that have been so far considered capable of guaranteeing fairness (Sheridan, 2006).

Two core processes appear involved in assigning lower competence to women (Foschi, 2000):

- **Biased evaluations**, occurring when there are no objective ways of evaluating a performance, and the performance is judged to be better if originated from men;
- **Double** (and sometimes even multiple) **standards for competence**, occurring when performance by a woman is objectively judged to be equal to that of a comparable man, but nevertheless different requirements for competence are applied to the two people.

Biased evaluation and double standards originate in what have been called "**gender schemas**", i.e., "a set of implicit, or non-conscious, hypotheses about sex differences which play a central role in

Integrating knowledge and action on assessment bias.
The experience of the ADVANCE Program in the United States

A hallmark of the U.S. National Science Foundation's ADVANCE Program to address the under-representation of women in academic science is the integration of scholarly knowledge about the impact of gender on key processes such as evaluation and perception of merit. Rigorous research studies have documented how men and women unconsciously hold assumptions, or schemas, that affect their judgment and interfere with objective evaluation of merit.

For example: A study of over 300 letters of recommendation for medical faculty found that letters for female applicants differed from those for males in the following ways: the letters were shorter, provided "minimal assurance" rather than solid recommendation, raised more doubts, portrayed women as students and teachers rather than as researchers and professionals, and were more likely to mention women's personal lives. This was true for both male and female letter writers (Trix & Psenka, 2003).

A study of postdoctoral fellowships awarded by the Medical Research Council of Sweden found that women applying for a postdoctoral fellowship had to be 2.5 times more productive to receive the same reviewer rating as the average male applicant. (Wennerås & Wold, 1997).

A study looking at the impact of motherhood found that evaluators rated mothers as less competent and committed to paid work than non-mothers. Mothers were less likely to be recommended for hire, promotion, and management, and were offered lower starting salaries than non-mothers. (Correll, Benard, & Paik, 2007).

Understanding the cognitive processes that affect evaluation can interrupt the automatic schemas that often result in women's contributions being undervalued. Extensive annotated bibliographies on this and other research as well as recommendations for integrating scholarly knowledge with action are available at many ADVANCE websites including the University of Wisconsin's WISELI office, the University of Michigan's ADVANCE Program, and Hunter College's Gender Equity Program.

shaping men and women's professional lives", affecting expectations about them, evaluation of their work, and their performance as professionals (Valian, 1998).

2.2. Science as gender-insensitive

Die-hard stereotypes

That science is not at all gender-blind, as some scientists like to think, is indirectly demonstrated by the persistence of **gender stereotypes identifying science and technology with masculinity**, to the symbolic exclusion of women (Faulkner, 2007; Wajcman, 2007 and 2000).

Table 2 – Women as news subjects, 2000 e 2005 (%)

	2000		2005	
	% Female	% Male	% Female	% Male
Homemaker, parent	81	19	75	25
Student	46	54	51	49
Child	n/a	n/a	44	56
Celebrity	45	55	42	58
Office, service worker	35	65	40	60
Resident, villager	n/a	n/a	39	61
Media professional	n/a	n/a	36	64
Royal, monarchy	n/a	n/a	33	67
Retired, pensioner	35	6	33	67
Health, social services	20	80	30	70
Academic, education	27	73	25	75
Activist, NGO	24	76	23	77
Trades, labour	15	85	23	77
Religious	9	91	21	79
Unemployed	33	67	19	81
Law	n/a	n/a	18	82
Government employee, public servant	12	88	17	83
Sports	9	91	16	84
Agriculture, fishing, mining	15	85	13	87
Politician, government official	10	90	12	88
Business	n/a	n/a	12	88
Science, technology	**12**	**88**	**10**	**90**
Criminal	7	93	9	91
Police, military, security	4	96	5	95
Total	**18**	**82**	**21**	**79**

Source: Gallagher, 2005

To confirm this point it is interesting to note, as shown in the Global Media Monitoring Project, that among scientists portrayed in the news (television, radio, print), women only made up 10% in 2005 (even less than in 2000, when they reached 12%), while they are over-represented among home-makers (81%), and are represented proportionally as students (51%), as can be seen in table 2, above.

The strongly masculine-gendered image of S&T is evident: **in the media, science and technology are represented as among the least feminised of all occupations** and social positions. Women are less frequently portrayed only as criminals or policewomen.

Moreover, the **different scientific disciplines exhibit different degrees of gendering in public perception**. A study carried out in Italy analyses the perception of the different disciplines by young people aged 16/19 (Observa, 2008). Results are shown below, in table 3.

Table 3 – The gender of some scientific disciplines according to young Italians (years 16 – 19) (%)

Discipline	Prevalently female%	Neither male nor female %	Prevalently male %
Foreign languages	59	40	1
Philosophy	42	40	18
Biology	36	55	9
Music	17	75	8
Economy	11	48	42
Medicine	9	65	16
Mathematics	9	61	30
Chemistry	8	52	40
Astronomy	7	62	31
Physics	5	41	54
Engineering	1	24	75

Source: Observa, 2008

The perception and internalisation of stereotypes appear to play an important role in producing low **self-esteem and dynamics of self-exclusion** among young women in reference to scientific careers. Choosing educational and career paths not aligned with the stereotyped gendering of fields generates

a feeling of "**gender inauthenticity**", to be listed among the reasons for the leaky pipeline phenomenon (Faulkner, 2007).

Stereotypes of women, and also **stereotyped images of science** and "**the scientist**" play a certain role in discouraging young women. Some widespread representations can be pointed out, reflecting features that are typically presented as an unchangeable and masculine model of doing science, as opposed to an equally stereotyped "feminine model" (Etzkowitz, Kemelgor, Neuschatz, & Uzzi, 1994; European Commission, 2000; Thielen, 2002; Equal Opportunity Commission, 2002):

- The idea that science is a perfectly rational activity, dominated by objective and purely logical procedures, and therefore not completely compatible with the assumed attitude of women as more oriented to the emotional, and preferring perspectives of analysis that privilege subjectivity (Keller, 1991; Wajcman, 1995);
- The idea that research is a very demanding activity that has to be performed on a full time basis and, for this reason, is incompatible with the activities, assumed to be as demanding, of family care.
- The idea that scientific and technological research is a sector where strong competition is required, and therefore researchers have to be very aggressive, as men would typically be.

Male knowledge

It is not only a matter of image. Feminist studies have also analysed the **influence of gender on our conceptions of knowledge**, bringing to light the costs of the exclusion of women and other under-represented groups from full participation in science (Harding, 1998 and 1986; Haraway, 1991).

It has been for instance demonstrated how political and social interests, as well as personal prejudices, have an impact on the production of scientific knowledge, deeply affecting research priorities, contents and methods (Longino, 1990). **Gendered assumptions** may in fact influence:

- How scientists decide upon the priorities of scientific research;
- Which questions are posed with respect to a given subject;
- Which explanatory and theoretical contexts are used;
- Which methods are applied;
- Which data are considered valid or not valid;
- How data are interpreted;
- How data are compared to those of other studies;
- Which conclusions are drawn from analyses of scientific data;
- Which suggestions are formulated for future studies.

So it may happen that, in a gender-unaware male-dominated environment, medical research only or mainly studies male subjects and later extends its results to women (in some cases with negative consequences for women's health); economic research only addresses typical male situations; technological innovation only considers male preferences or attitudes, and so on.

Being unaware of the gendered assumptions that are the basis of scientific and innovation processes, besides limiting science itself and its relevance to society, **constitutes one of the most serious, yet invisible impediments for women in science**. Women are led either to feel that they are not adequate as scientists, or that important issues are ignored or poorly addressed in research.

2.3. Scientific leadership: missing women

The under-representation of women

Despite their increased and ever more qualified participation in most S&T sectors, women are severely under-represented in apical and decision-making positions. We already presented in graph 2 the scissors

diagram showing women's decreasing presence if one goes up the academic career path. Here we go into more detail.

The following table, for instance, shows the dramatic contraction, in the 27 European Union countries, of women's participation in academic careers as a function of their prestige and status.

The EU-27 average is strikingly similar to data relating to USA, Canada and Australia, as shown in graph 7.

Women's presence among **research directors** is also limited. For example, in all the projects funded by the Directorate-General for Research of the European Commission under the 6th Framework Programme for Research and Technological Development (10,755 overall), only 17% had a woman as "scientific coordinator"[3], and only 16% had a woman as "scientist in charge", as reported by the Gender Equality Report (European Commission, 2008).

It is also interesting to analyse women's participation in the role of **head of university** in European countries, considering that women in this position represent in most cases an exception. Of the 29 European countries taken into consideration in a recent survey, there are 6 without even one woman as head of university, and only 4 where women's presence exceeds 25% (Sweden, Iceland, Norway and Finland). In the others, women's proportion remains below 10%, and yet among them we find socially advanced countries, a result suggesting that if the political context has an influence, this is not systematic and does not prevail on the widespread gender discrimination dynamics (European Commission, 2009).

Women's presence in high-level decision-making bodies is also marginal. Eurostat estimates that the European average presence of women in **national scientific boards** is around 22%, with significant variation by country.

Table 4 – Female participation among researchers, associate and full professors in EU-27, 2007 (%)

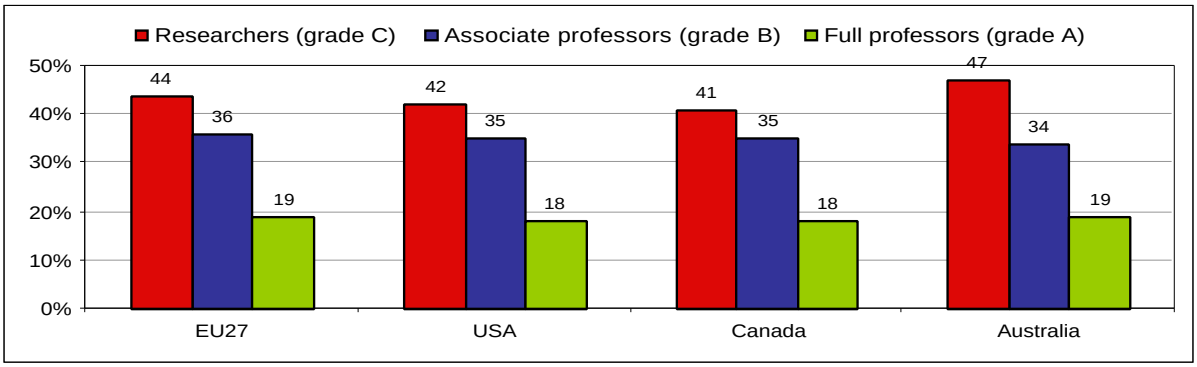
Country	Research-ers	Associate professors	Full professors
	(grade C)	(grade B)	(grade A)
Bulgaria	:	38	24
Romania	:	49	32
Estonia	57	37	17
Finland	56	49	23
Latvia	54	42	14
Lithuania	54	42	14
Iceland	53	32	19
Slovak Republic	50	35	20
Spain	48	36	18
United Kingdom	47	37	17
Ireland	47	40	10
Norway	46	34	18
Slovenia	46	30	17
Cypre	46	20	10
Hungary	45	32	19
Italy	45	34	19
Portugal	43	34	21
Poland	43	28	20
Sweden	42	47	18
Austria	40	19	14
Switzerland	38	24	22
Denmark	37	25	12
Israel	36	22	13
France	34	39	19
Germany	33	18	12
Greece	32	23	11
The Netherlands	32	18	11
Czech Republic	31	31	13
Luxemburg	31	29	9
Belgium	31	25	11
Malta	14	32	2
EU27	**44**	**36**	**19**

Source: European Commission, 2009

Women's position in crucial science and technology functions can be measured through

[3] The "scientific coordinator" coordinates the preparation of proposals and project implementation in the institution coordinating a consortium of partners. "Scientists in charge" are head researchers responsible for the preparation of proposals and project implementation within institutions that are part of a consortium without taking on the coordination of the consortium (European Commission, 2008).

Graph 7 – Female participation among researchers, associate and full professors in EU-27 countries, USA, Canada, Australia, 2007 (%)



Source: European Commission, 2009; American Association of University Professors, 2004; Canadian Association of University Professors, 2007; DEST, 2002

evaluating parameters such as **publications** and **patents**, which – beyond measuring productivity – also represent women's importance in scientific communication and technological innovation, and the extent of their inclusion in important scientific and industry-related networks.

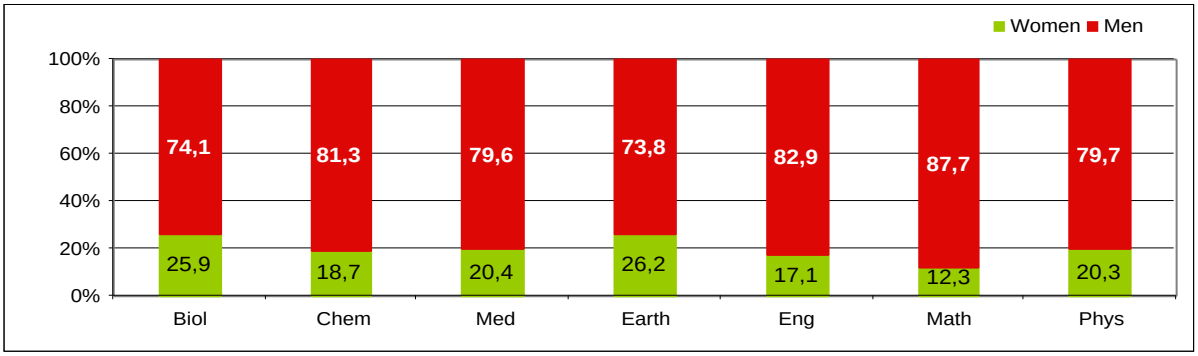
As for **publications**, the results of a study published by the Italian National Research Council (CNR) in 2002 are worth mentioning (Naldi & Vannini Parenti, 2002). This was an analysis of 10,000 articles published in 1995 in 95 journals specialised in different disciplines (Biology, Chemistry, Medicine, Earth sciences, Engineering, Mathematics, Physics), parametered according to the Science Citation Index (SCI) criteria. Publications were authored by 35,000 scholars from 6 European countries (United Kingdom, France, Germany, Italy, Spain and Sweden).

The proportion of articles authored by women, alone or together with other researchers, is shown in graph 8. It emerges that women tend to publish slightly less than men, when controlling for their presence as researchers in the different disciplinary fields, though the width of the gap is wider in some fields (biology and medicine, for instance) than in others (engineering, mathematics and physics).

A study by the European Commission (2004) links publication rates to academic rank. Following this view, the lower productivity of women can be explained by the fact that they are working at lower professional ranks than men. Within the same category, it seems that there is no significant difference by gender (Bordons, Morillo, Fernandez, & Gomez, 2003).

The same study reports the opinions of Schiebinger and Valian, according to whom

Graph 8 – Proportion of women and men among authors of scientific publications by disciplinary field in some European countries, 1995 (%)



Source: Naldi & Vannini Parenti, 2002

there is some evidence that women tend to publish **fewer papers, with each paper being more substantive**. On average, papers published by female scholars are cited more frequently than papers by more 'productive' male scientists (Schiebinger 1999; Valian, 1998; Sonnert & Holton, 1996; Long 1992; Zuckerman, 1987; Nilsson 1997; Feller, 2004). Palomba notices that differences are not so much in numbers of articles but in other aspects, such as type of publication, language or type of specialisation. However, no significant difference can be found in impact factor: data show that publications by women are as influential as those by men (Palomba, 2006).

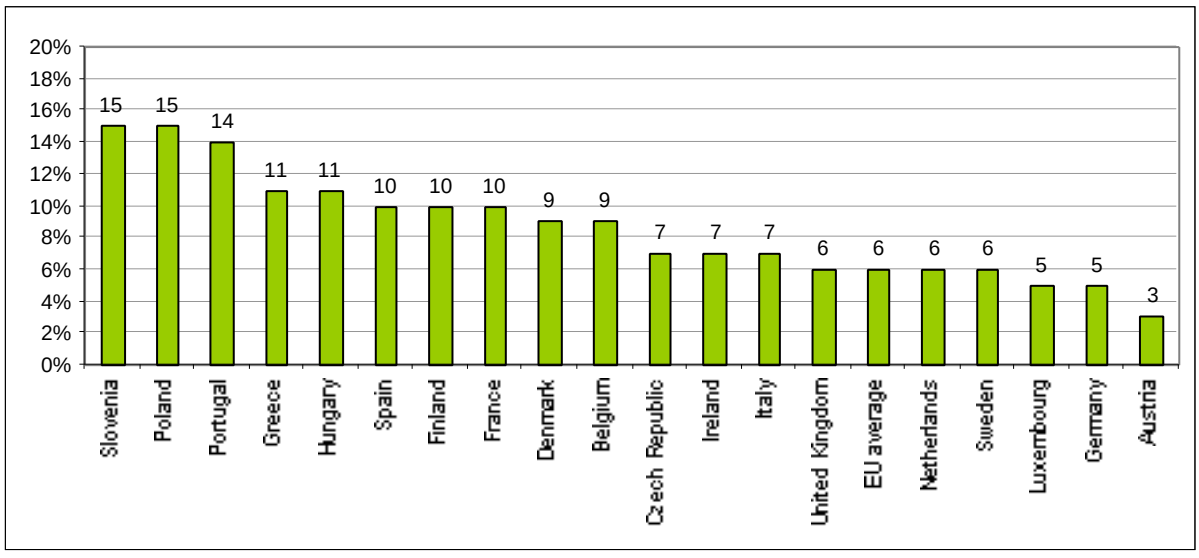
The situation of **patents** is even more unbalanced. The project "European Studies on Gender Aspects of Inventions", carried out in the framework of the EC 6th Framework Programme for Research and Technological Development, analysed women's presence among more than 300,000 inventors[4] who successfully applied for patents to the European Patent Office (EPO) in 2001, 2002 and 2003.

It emerged that **only 8% of patent-holding inventors** (head count) **are female at the European level**. A comparison of the geographical distribution of inventors with the proportion of female inventors by country revealed **that the proportion of female inventors is higher in countries where the overall patenting activity is lower, and lower were the total patenting activity is higher**. The most extreme example is Germany, from where as many as 47% of European patents originate, featuring only 5% of female inventors.

By considering not the number of inventors, but their contribution to EPO patents through a fractional count (each patent accounts for 1 and a fractional value is assigned to each contributor), then the women's rate amounts to 6% only, as shown in graph 9.

A closer look at the female contribution **within** technology sectors reveals a severe under-representation of women (see graph 10). According to the authors of the study, "specific gender patterns across technologies become apparent. These are indicated by the comparatively high contributions of female inventors in chemistry and health-related sectors, on the one hand, and the extremely low female contributions in transporting, physics and electricity, on the other. Given that most patents are obtained in the latter technology sectors, the under-representation

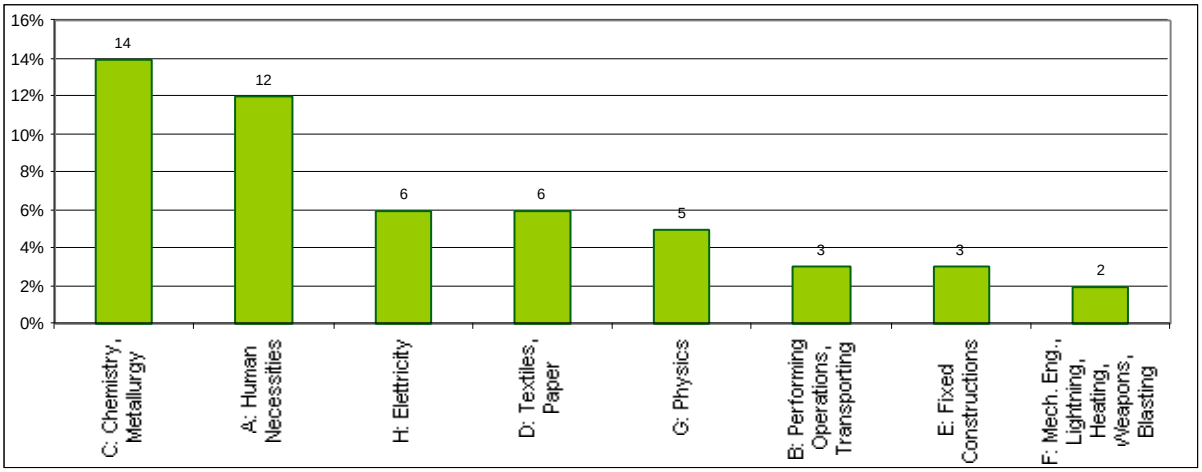
Graph 9 – Female contribution to EPO patents, average 2001-2003 (%)



Source: Busolt, Kugele, & Tinsel, 2009

[4] The sample includes the data of 360,844 who have a residential address in one of the European Union Member States.

Graph 10 – Female contribution in technology sectors, EU-27 inventors, 2001-2003 (%)



Source: Busolt, Kugele, & Tinsel, 2009

of women inventors within these sectors is worryingly low" (Busolt, Kugele, & Tinsel, 2009).

Similar data are also provided by an analysis made by the American NCWIT (National Center for Women & Information Technology) on **patents in the IT sector** licensed by women in **United States** and **Japan** in the period 1980-2005 (when the patent was licensed by a mixed group, for each gender the respective fraction was attributed). Five percent of US patents were licensed by women (5.7% if the shorter 2000-2005 period was considered). In the case of Japan, the figure was 3% (Observa, 2008).

Women's under-representation in a wider context

To better frame this set of data it is necessary to introduce a further piece of interpretation, linking the issue of women's leadership to the **profound changes science and technology are going through**, and the growing importance of some scientific professional roles and profiles.

Obviously, pure scientific merit has never been, even in the past, the only criterion used to select leadership. There are other variables that influence career dynamics (e.g. political affiliations, personal networks or seniority). Even more important, as the French sociologist Pierre Bourdieu pointed out, besides **scientific power** (related to scientific reputation, which manifests itself, e.g., in writing books and articles, citations, participation in seminars, conferences and workshops), scientific careers have always been determined by scientists' "**temporal power**" (Bourdieu, 2001). This is linked to abilities such as interacting with publishing houses, getting funds, managing research structures, interacting with industries and policy makers.

This is to say that leadership in the scientific domain has never been uniquely related to pure scientific talent, but also to other kinds of capacities recognised as embedded in the "profession of scientist".

However, **rapid and deep changes** in the last decades have affected the way in which science is produced, communicated and exploited and the overall relationship between science and society. These changes have in turn **altered the balance between "scientific" and "temporal power" roles**, conferring more importance to the latter, and in particular to activities such as communication and fund-raising.

As for the **emerging trends in S&T production**, they are so deep and rapid as to justify the idea of an overall shift from **"academic" to "post-academic" science**

(Ziman, 2000), marked by some structural changes, such as:

– The increasing weakening of disciplinary boundaries;
– The growing social and political pressure on research actors to immediately exploit research outputs economically;
– The ever less clear-cut distinction between science and technology;
– The strengthening of competitive mechanisms regulating the access to research funds;
– The growing orientation of policy makers to directly steer the research sector;
– The bureaucratisation of many aspects of scientific work.

On the same wavelength Nowotny, Scott and Gibbons maintain that it is necessary to acknowledge that contemporary **science is both invasive** towards society, **and invaded** by society, in the sense that its boundaries and roles are more and more intensely called into question. Therefore, these authors argue that we are witnessing the parallel processes of "**scientisation**" or "technicisation" **of society**, on the one hand, and "**socialisation of science**", on the other.

The ongoing erosion of the model prescribing separation between science and society gave rise, in the authors' view, to a mostly "contextualised" science which is characterised by phenomena such as the growing trend toward the **political and social governance of research priorities,** the **commercialisation of knowledge**, the **stress on the** economic, political and ethical **management of research results** (Nowotny, Scott & Gibbons, 2002).

Science-society relationships are thus profoundly changing. Scientific and technological research is increasingly politically, socially and economically significant and visible, while at the same time there is a rising mistrust towards science and technology in large sectors of society and political leaderships, and a widespread indifference towards the problems faced by scientists and research institutions.

This **scarce** "**social mobilisation**"(Bijker & d'Andrea, 2009; Quaranta, 2007) of scientific and technological research manifests itself in different ways, such as: low appeal of scientific studies to young people; decreasing social status of scientists; low investments on research, mainly by the private sector but, in some European countries, also by the State; a growing gap between science and culture; scarce attention devoted to research and innovation by large sectors of public administrations and political leaderships; diffused, sense of concern about science- and technology-related risks.

In this new context, **leadership dynamics inside S&T** cannot be but deeply altered in terms of new roles and new professional figures emerging, modification of hierarchies and career paths, changes in the relative values attributed to different skills and capacities, etc.

These transformations are occurring at varying paces, following more than one path and producing diversified effects depending on national contexts, institutional settings, disciplinary environments or previous experiences. Therefore, it is difficult to forecast their future development.

What is certain is that **dealing with the under-representation of women** in top positions in the S&T sector and failing **to take this changing picture** into account would be fruitless, if not counterproductive. It is therefore important to address all those areas where leadership can be expressed, and monitor women's presence.

Exhaustive data on women holding roles currently assuming growing importance, such as those related to **research management**, **communication** and **evaluation**, as well as in managing **relations with political, economic and social actors** are lacking, even though some clues come from the figures presented above. It is important to consider the issue also from the point of view of the **new opportunities that could arise for women** if access to these positions were

to be made more formal and transparent. Again, what is at stake is not only qualified women's right to leadership, but a more effective and balanced management of the relationships among science, innovation and society.

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Women and science:
problems and issues at stake

From risks to strategies

Part A
Chapter Two

[1. Finding solutions]

For some years programmes have been implemented that address the "women in science" issue. As was stressed at a recent European conference[5], when the European Commission started its activities in this field, there was very little political debate on the topic (Potocnik, 2009). Now a wealth of initiatives are underway, and a sufficient number have gained enough experience and produced outcomes to allow some general reflection. Further, all these programmes constitute an invaluable resource for new initiatives to borrow ideas and solutions based on concrete experience.

A thorough analysis of more than one hundred programmes in European countries, as well as in Australia, Canada and the United States, reveals the multidimensional character of the efforts to address problems faced by women in science and technology. **Most programmes**, in fact, identify and often simultaneously **target**, even if to different extents, **the three areas of risk** described in the previous chapter, and namely:

– The unfriendliness to women of some features of the S&T **environment**;
– The dominant understanding and practice of **science** which is gendered as masculine;
– The male-dominated dynamics of **leadership**.

In the programmes, moreover, and especially in the most successful ones, the **areas of risk are turned into strategic lines of action** which appear to be mutually reinforcing.

It is of course not always necessary, nor possible, to address in a single programme all the problems connected with the different areas of risk faced by women. What is really important, instead, is **having a clear perception of the many-sided nature of the issues** that are going to be addressed. Being unaware of the whole picture means in fact exposing the programme to the risk that issues left in the background interfere with the programme, limiting its impact, or indeed producing paradoxical effects.

Differences among the programmes, in terms of the **promoting agency** (universities, public or private research institutes and laboratories, but also public agencies, networks and associations), the **dimensions** and the **sector** (science, technology or other) account for the variety of the objective pursued and the tools utilised. Some of them can be transferred and adapted from one organisational and institutional context to another, while others are more tailored to a specific environment or situation.

It obviously happens, for instance, that **bigger programmes**, which can rely on adequate funding, more frequently succeed in devising specific tools addressing the many sides of the problem. Smaller ones, anyway, often promoted by **women's associations**, can at times compensate for paucity of funds with strong awareness and direct experience of the different levels of women's discrimination, sometimes producing innovative and inexpensive ideas in one risk area, that can be replicated elsewhere, as well as in larger programmes.

The results of the analysis of them all offer a rich menu, allowing one to choose which recipe could better fit one's situation and needs; or, to use another metaphor, represent the different keys that can be played to compose and perform one's own music.

[5] The European Commission organised in Prague, in May 2009, the Conference ***Changing Research Landscapes to Make the Most of Human Potential***, with the aim to take stock of its last ten years of activities in favour of women in science and diversity promotion in general. Conference materials are available at: http://ec.europa.eu/research/science-society/index.cfm?fuseaction=public.topic&id=1860

[2. Three strategies: an overview]

As mentioned, **many programmes succeed in turning the risk areas into strategic lines**.

Three strategies are briefly outlined that have been derived from the analysis of the varied practices of the programmes.

More operational indications are contained in parts B, C and D, providing specific recommendations for practically implementing initiatives pertaining to each strategy.

2.1. Strategy one: A friendly environment for women

Most programmes set the objective of creating an enabling environment for women in S&T academic and professional settings.

The "chilly climate" issue for women in science is actually a **question largely addressed by the promoters** of the programmes which represent the empirical basis of these guidelines. As a matter of fact, nearly 70% of the programmes had this as one of their main goals, and no one failed to consider the problem. To a certain extent, promoting a more favourable environment for women is viewed as the **preliminary and necessary condition** allowing the pursuit of more specific purposes.

Nevertheless, even though contents and profiles of such an objective are intuitively understandable, when one moves into the strategic and practical dimension, terms like "environment" or "climate" appear difficult to conceptualise and to translate into well-defined and measurable aims.

In this regard, the analysis of the experiences of the programmes can be helpful, since it allows for the identification of a **wide array of measures and tools** which, as a whole, make the objective of a friendly institutional, cultural and working environment for women in science much more concrete and practically pursuable.

Three specific objectives can been drawn out of such experiences, in relation to this first strategy.

A first group includes measures pertaining to the **modification of the cultural and behavioural patterns** within the research environment, by promoting awareness-raising initiatives addressing specific internal and external targets, promoting gender studies across university faculties and departments, and supporting women in coping with environmental stress factors.

The second objective concerns the **provision of services** facilitating work-life balance, by means of supporting access to internal and external services of various kind and the promotion of customised and flexible organisational practices.

The last group contains measures specifically aimed at **sustaining early-stage career-development** for young scientists, particularly addressing the barriers that women frequently meet in that early phase. These measures include contractual arrangements supporting temporary staff, career advice, mentoring and training for early-career researchers, provision of funds for professional development and training officers in charge of hiring and promotions.

2.2. Strategy two: Gender-aware science

The strategy of introducing the gender dimension in S&T representations and contents is also widely diffused among equality-oriented programmes. As a matter of fact, more than two thirds set this kind of objective. The fact that the remaining third do not address nor indirectly mention the issue indicates that **this is not a "basic" component** of programmes for women in

science, **but the result of a specific intentionality.**

As for this second strategy, **two sets of specific objectives** can be drawn out.

The first set encompasses actions and tools aimed at **challenging gender stereotypes** in science and technology. This is pursued, on the one hand, by addressing images and representations of women and science, especially through the collection of data documenting the groundlessness of stereotypes, the use of gender-sensitive language and textbooks, as well as awareness-raising initiatives. On the other hand, particular attention is devoted to fighting those mechanisms translating gender stereotypes into **horizontal segregation**, by attaching a gender to disciplines, topics or tasks. This is done especially by addressing training initiatives of various kinds to those responsible for career development support and task attribution.

The second set of objectives focuses on **gendering science and technology contents**, by questioning epistemological and theoretical assumptions, methodologies and priorities. Research and dissemination activities are usually undertaken in this regard, but also curricular reform of scientific disciplines to include relevant gender studies, institutional or organisational arrangements to increase the number of women research directors, and the dissemination of tools to support the process of gendering the **design** of research and innovation.

2.3. Strategy three: Women's leadership of science in a changing society

Supporting women's leadership is a strategy pursued as one of the main objectives by more than 60% of the programmes representing the empirical basis of these guidelines, and is anyway directly or indirectly addressed by 95% of them.

Beyond focusing on women's progression in the traditional academic path, some of them also target the **new positions and roles** that are assuming increasing importance in contemporary science (such as communication, fund-raising, relations with economic and social actors: see chapter one, paragraph 2.3.), which are, in some cases, interpreted as important **opportunities**, both for **women** to be adequately represented at leadership level, and for **science and technology** to incorporate new ideas and perspectives and to get closer to societal needs and expectations.

The many agencies (universities, research institutions, women's associations, etc.) who are promoting programmes and initiatives aimed at balancing women's representation in leadership positions in S&T seem to be largely aware of the relative flexibility and the inherent opportunities characterising the present development phase of research systems and the **new professional profiles** it is producing.

It is not by chance that **four distinct leadership areas** come to be addressed as **specific targets** by the programmes in the wider framework of this third strategy.

The first area is the **traditional academic career**, where measures encompass, among the others, support for mobility, delivery of specific training, mentoring, provision of dedicated funds for research, creation of reserved chairs, introduction of new institutional bodies or regulations to redress gender imbalances.

The second area focuses on **research management**, including tools such as direct support to access boards and committees, introduction of quota systems, creation of candidate' databases, lobbying.

The third leadership area addressed concerns **scientific communication**, grouping the tools aimed at strengthening women's visibility and role in the communication flow among scientists and to the general public.

The fourth area deals with leadership roles in managing the **relationships between science and technology**, on the one hand, **and social, political and economic actors**, on the other, with a specific focus on the management of the issues involved with technological innovation.

2.4. Objectives, recommendations and lines of action

Parts B, C and D of these guidelines present, for each strategy, the different **objectives**, the main **recommendations** and the more specific lines of **action**, illustrated by concrete **examples** drawn from the programmes that have been analysed in Europe, the United States, Australia and Canada (see the Introduction and the Methodological Note for details).

In particular, **part B** (***A friendly environment for women***), is organised around 3 general objectives, 13 recommendations, and 22 lines of action (with a total of 94 examples).

Part C (***Gender-aware science***) contains 2 general objectives, 5 recommendations, and 12 lines of action (with a total of 42 examples).

Part D (***Women's leadership of science in a changing society***) encompasses 4 general objectives, 13 recommendations, and 28 lines of action (with a total of 83 examples).

Strategy one

A friendly environment for women

Part B

Introduction

No longer strangers in science

As discussed in Part A, women are participating in significant and increasing numbers in most sectors of science and technology, and they are already a majority in some. The significance of the "leaky pipeline" phenomenon, however, demonstrates that full confidence and a sense of belonging have not been attained yet by all women.

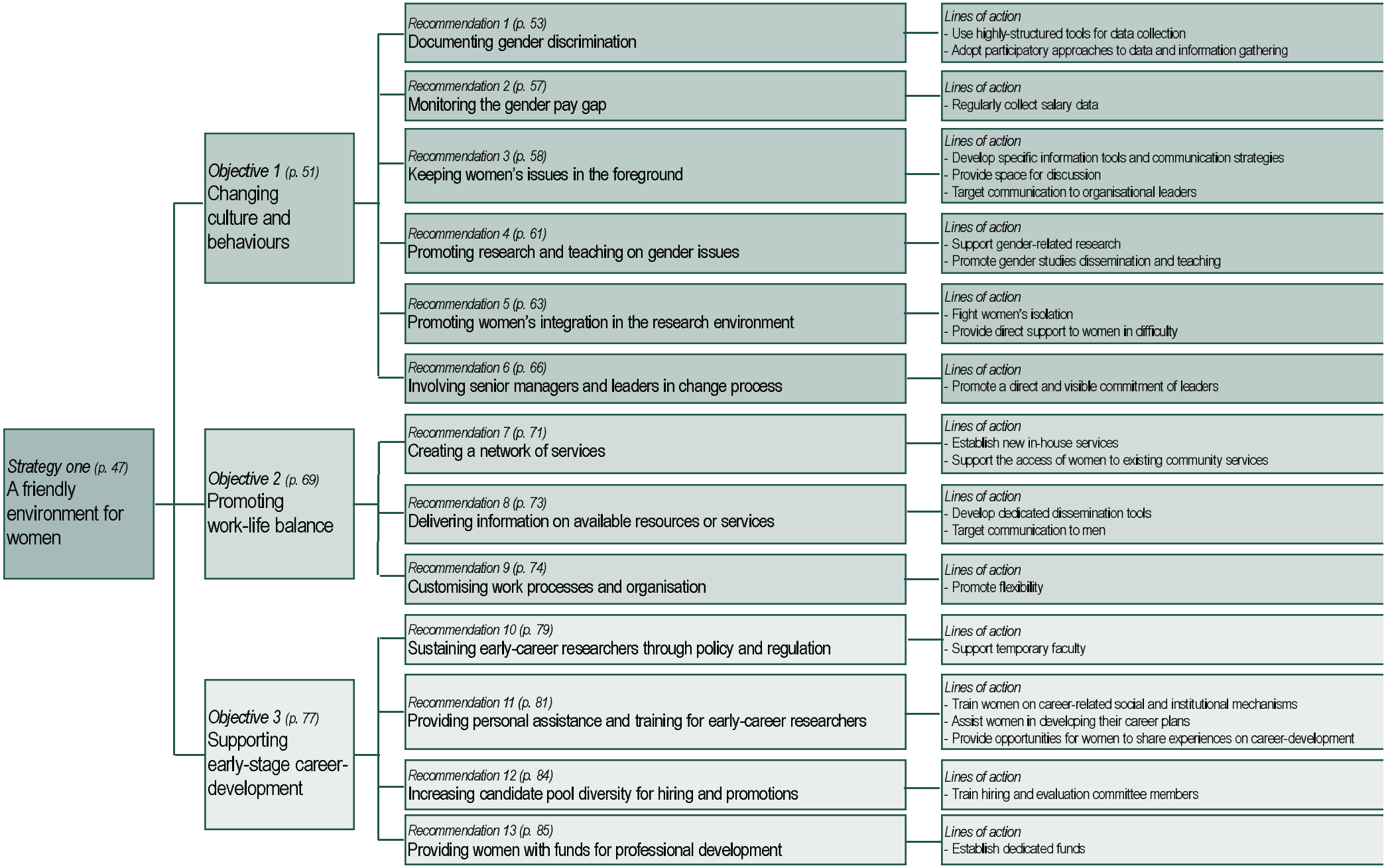
Many women – especially in some disciplinary areas and at some career level – still feel more like intruders in someone else's domain than like recognised scientists with full entitlements. In short, **women are not always feeling that they are "at home" in science and technology**.

Many factors contribute to the situation and can be addressed to some degrees by equality-oriented programmes. In this part of the guidelines, three sets of **recommendations** target three main objectives:

Objective 1 – Cultural and behavioural change (chapter three);

Objective 2 – Work-life balance (chapter four);

Objective 3 – Early-stage career support (chapter five).


Strategy one (p. 47)
A friendly environment for women
Objective 1 (p. 51)
Changing culture and behaviours
Recommendation 1 (p. 53)
Documenting gender discrimination
Lines of action
- Use highly-structured tools for data collection
- Adopt participatory approaches to data and information gathering
Recommendation 2 (p. 57)
Monitoring the gender pay gap
Lines of action
- Regularly collect salary data
Recommendation 3 (p. 58)
Keeping women's issues in the foreground
Lines of action
- Develop specific information tools and communication strategies
- Provide space for discussion
- Target communication to organisational leaders
Recommendation 4 (p. 61)
Promoting research and teaching on gender issues
Lines of action
- Support gender-related research
- Promote gender studies dissemination and teaching
Recommendation 5 (p. 63)
Promoting women's integration in the research environment
Lines of action
- Fight women's isolation
- Provide direct support to women in difficulty
Recommendation 6 (p. 66)
Involving senior managers and leaders in change process
Lines of action
- Promote a direct and visible commitment of leaders
Objective 2 (p. 69)
Promoting work-life balance
Recommendation 7 (p. 71)
Creating a network of services
Lines of action
- Establish new in-house services
- Support the access of women to existing community services
Recommendation 8 (p. 73)
Delivering information on available resources or services
Lines of action
- Develop dedicated dissemination tools
- Target communication to men
Recommendation 9 (p. 74)
Customising work processes and organisation
Lines of action
- Promote flexibility
Objective 3 (p. 77)
Supporting early-stage career-development
Recommendation 10 (p. 79)
Sustaining early-career researchers through policy and regulation
Lines of action
- Support temporary faculty
Recommendation 11 (p. 81)
Providing personal assistance and training for early-career researchers
Lines of action
- Train women on career-related social and institutional mechanisms
- Assist women in developing their career plans
- Provide opportunities for women to share experiences on career-development
Recommendation 12 (p. 84)
Increasing candidate pool diversity for hiring and promotions
Lines of action
- Train hiring and evaluation committee members
Recommendation 13 (p. 85)
Providing women with funds for professional development
Lines of action
- Establish dedicated funds

Strategy one

A friendly environment for women

Objective 1

Changing culture and behaviours

Part B

Chapter Three

[Rationale]

Today gender discrimination is rarely explicit. However, **the most hidden and deeply-rooted structures of discrimination** are still at work, and they show a peculiar vitality and a strong capacity to assume new forms, according to the overall transformations affecting societies and institutions. These structures, mostly out of awareness, are difficult to detect and manage. They are embedded in language, in the symbolic dimension, in quite automatic behavioural patterns, in common sense and in deeply-rooted widespread beliefs. As a whole, they contribute, not only to direct discriminatory processes, but also to a climate or an environment that is conducive to discrimination.

Science and technology are far from being immune from these subtly discriminating dynamics, which are targeted by many programmes aimed at easing cultural and behavioural change in research institutions. As experience shows, change may happen, but it requires programmes to last long enough to let it take root, to simultaneously manage a multiplicity of factors and levels, to overcome conflicts and to be able strongly to involve leaders as well as all the women in the organisation, from scientists to technicians to administrative personnel.

[Recommendations]

Overall, **six main recommendations** to promote changes in culture and behaviours have been singled out.

 # 1 – Documenting gender discrimination
 # 2 – Monitoring the gender pay gap
 # 3 – Keeping women's issues in the foreground
 # 4 – Promoting research and teaching on gender issues
 # 5 – Promoting women's integration in the research environment
 # 6 – Involving senior managers and leaders in change processes

Recommendation # 1
Documenting gender discrimination

Promoters of gender-oriented programmes, in the phase of project design, often face the problem of a scarcity or even a lack of knowledge and data on the factors that contribute to create an environment penalising women in their organisation. This exposes them to the risk of acting on the basis of abstract and unreliable assumptions, and consequently promoting ineffective action which does not match expectations and needs nor improve the working environment. Documenting gender discrimination is essential to counteract the widespread tendency of staff and managers (often including women too) to "deny" the very existence of the problem in their own organisation or to underestimate its dimensions and impacts.

LINES OF ACTION

Two main lines of action can be identified, as far as this recommendation is concerned:

– Use highly-structured tools for data collection;
– Adopt participatory approaches to data and information gathering.

Use highly-structured tools for data collection

The first line of action is using highly-structured tools for data collection, which has also the advantage of demonstrating the systemic character of the problem by using a method which is familiar to scientists. As shown by the following examples, different kinds of highly-structured tools can be used, ranging from systematic data collection to in-depth research programmes.

– An example of a **systematic collection of data and analyses** is that implemented in the framework of a programme carried out by the Institute of Sociology of the Czech Academy of Science. Data and information were collected regarding stereotypes that could be observed in scientific faculties and departments and the existing barriers disadvantaging women. The aim was to develop new processes that could support of women's integration in research and innovation. Being a national programme, data and analyses have been the subject of dissemination initiatives.
http://www.zenyaveda.cz/html/index.php?s1=1&s2=0&s3=0&s4=0&s5=0&s6=0&what=barriers&m=3&lng=13&user_url=&menu_id=1&m=1&typ=clanek&recid_cl=2225&menu_id=1

– With support from NSF Advance[1] the Women In Science and Engineering Leadership Institute (WISELI) at the University of Wisconsin-Madison, conducted **a web-based internal "climate survey"** at the departmental level, in order to provide department chairs with the necessary information to identify specific gender-related issues in their own departments. Relevant collected data have been discussed in a workshop involving all the chairs. Under the same programme, data about faculty members' salaries have been collected, in order to detect and document gender disparities.
http://wiseli.engr.wisc.edu/docs/EvalReport_Climate_2005.pdf

– The Canadian Association of Physicists is promoting **external critical assessments of the climate and environment for women in scientific departments** of universities, providing for external groups to conduct interviews with faculty, staff and students, thus focusing attention on issues and practices which usually go unnoticed, as they are taken for granted.
www.cap.ca/pic/archives/64.4(2008)/Oct08-offprint-Predoi-Cross.pdf

1. In the United States, the National Science Foundation ADVANCE Program for Institutional Transformation awards grants to university initiatives aimed at increasing the participation and advancement of women in academic science and engineering careers. In these guidelines, programmes promoted by American universities under this national scheme are indicated as "ADVANCE-IT" programmes. For more information: http://www.portal.advance.vt.edu/

– The University of Michigan/ADVANCE-IT programme promoted similar "internal climate assessment" exercises within departments, schools and colleges to systematically review issues which contribute to their particular climate for students, staff and/or faculty. A central team assists with the identification of external visitors who can provide assessments, or directly performs the assessments, also suggesting measures aimed at improving the climate. Under the same initiative, the programme staff has conducted a **campus-wide exit interview study** with faculty who left the university during a specified timeframe; in addition, faculty candidates have been interviewed who declined or accepted offers of tenure-track employment, at the university.
http://sitemaker.umich.edu/advance/faculty-climate

– Some gender-equality oriented programmes are, in fact, **action-research**, in that they base programme design on the results of preliminary research activity. For instance, a programme promoted by the Natural Sciences and Engineering Research Council of Canada (NSERC) in partnership with the University of Guelph, aimed at creating chairs for women in science and technology in different universities. It involved a specific research project on the organisational and social factors responsible for the under-representation of women in such disciplinary areas. The Sociology and Social Research Department of the University of Trento, in Italy, carried out a study in the preliminary phase of its programme on the occupational segregation of women focusing on three aspects: patterns of career structuring and assessment; use of flexible employment contracts; different work/life balance arrangements and their problems. The Australian Computer Society, in turn, financed a survey of its female members, in order to produce useful data to assess the needs of women within the association and in the broader workplace. The data, particularly focusing on needs and expectations with respect to flexible work arrangements, were used to improve the association's policies and practices.
http://www.nserc-crsng.gc.ca/Professors-Professeurs/CFS-PCP/CWSE-CFSG_eng.asp
http://www.unitn.it/gelso/ricerca.htm
http://www.acs.org.au/acswomen/index.cfm?action=show&conID=memberssurvey2008
https://www.acs.org.au/acswomen/docs/ACSWomenMembersSurveyThematicAnalysisReportAugust2008.pdf

– The Department of Chemistry of the University of York, in the framework of its application activities for the ATHENA SWAN Charter awards[2], has designed an **analytical list of indicators** (such as the female/male ratio of academic staff at each grade, of School/Faculty/Department heads, of academic staff job applica-

2. In the United Kingdom, the Athena SWAN (Scientific Women's Academic Network) Charter recognises and celebrates good employment practice for women working in science, engineering and technology (SET) in higher education and research. Any university or research institution which is committed to the advancement of the careers of women in SET in higher education and research can apply for membership. In these guidelines, programmes promoted by UK universities under this scheme are indicated as "ATHENA SWAN application" programmes (see also recommendation #23). For more information: http://www.athenaswan.org.uk/

tion and success rates, of academic staff promotion rates) against which gendered statistical data is periodically collected. Besides, monitoring tools have been devised on the main aspects pertaining to working conditions, career advancements, impact of career breaks and transition points. Results are analysed and discussed at different decision-making levels and used to launch new programmes or to enhance existing ones.
http://www.york.ac.uk/research/athena/athena_submission.html

Adopt participatory approaches to data and information gathering

Another line of action is based on participatory approaches to data and information gathering. Even though such approaches are often less structured than the ones presented in the previous section, they offer the opportunity to combine data collection process with awareness-raising initiatives involving key players (faculty women, university leaders, etc.)

– Different programmes use a variety of contexts (**networking**, **focus groups**, **events** and **debates**) to collect information about the critical factors generating a negative climate for women, often with the support of external experts. Usually these tools allow, on the one hand, women to single out and become aware of the main critical factors and, on the other hand, chairs and administrators to exchange experiences. Under a programme promoted by the Rice University, for instance, **department chair meetings** have been organised to discuss their departments' situation and involve them in the design of the initiatives.
http://cohesion.rice.edu/centersandinst/advance/emplibrary/ACF368F.doc

– The New Mexico State University/ADVANCE-IT programme, set up a **Proposal Committee** meeting regularly, involving representatives from the different stakeholders (managers, teachers, students, etc.) in the on-going identification of problems and in the planning of relevant new activities. **Beneficiary involvement** is the strategy also adopted by the Australian Macquarie University, inviting students and academics to sit on a committee **to collect information about existing needs and demands**.
http://www.advance.nmsu.edu/
http://www.iws.mq.edu.au/

– The Georgia Institute of Technology/ADVANCE-IT programme has used **participatory monitoring approaches** to detect positive and negative changes in personnel composition. Officers have been involved in a critical self-study led by a senior researcher to investigate bias in faculty development and tenure/promotion evaluation.
http://www.adept.gatech.edu
http://www.advance.gatech.edu
http://www. advance.gatech.edu/archive/promotion.html

Recommendation # 2

Monitoring the gender pay gap

In documenting gender discrimination, the gender pay gap deserves special attention.

Unlike other kinds of discrimination, a pay gap is not immediately visible since comparative information on salaries is usually not easily accessible (while, for example, information on the gender composition of the executive board are public). This entails that women's awareness levels about pay gaps are often very low. Moreover, mechanisms producing pay gaps are subtle and complex, reflecting the interactions of many variables which tend to escape observation.

Making the phenomenon visible and understanding its causes are thus important steps for drawing a full and reliable picture of discrimination dynamics as a whole.

LINES OF ACTION

Regularly collecting salary data

One line of action can be identified.

The most effective way of monitoring the gender pay gap is that of promoting in-depth studies and collecting statistical data on a regular basis about salaries, in order to fully record advancement and regression and to verify the impact of measures taken for ensuring gender equality conditions in the organisation.

– Under a NSF Advance programme conducted by the Women In Science and Engineering Leadership Institute (WISELI) at the University of Wisconsin-Madison, a set of gender pay equity studies has been carried out. Each faculty member's salary is evaluated for equity relative to career merit at the time of each major faculty review and evaluation: in the third year of the probationary period, at the time of promotion to associate professor or full professor, and at each five-year post-tenure review. In addition, salaries must be evaluated in response to a request from the faculty member. A specific **Provost's Office on Salary Equity Policy** has been created and specific guidelines for implementing faculty gender Pay Equity Review have been developed. Finally, a book containing the lists of salaries of all employees has been published.
http://wiseli.engr.wisc.edu/uwpgms/payequity.php

  In the framework of the University of Illinois at Chicago WISEST programme, **a salary equity study** has been carried out in order to determine the nature and source of variation among faculty salaries in science, technology, engineering and mathematics disciplines. The study considers demographic characteristics, education, experience and seniority, productivity in teaching and research, and the interaction of gender and race/ethnicity with these factors. Some productivity measures have been developed, including status (principal investigator, co-principal investigator), grant dollars generated, publications and teaching load.
http://www.uicwisest.org/images/stories/wisest_salary_equity_study_description.pdf

- The Gender Equity Project at the Massachusetts Institute of Technology carried out a systematic analysis on gender-related aspects in 2001, by interviewing all tenured women faculty and a matched pair of male faculty. The analysis included **data referring to the gender pay gap**, providing the basis for a set of recommendations for bridging it.
  http://web.mit.edu/faculty/reports/pdf/som.pdf

Recommendation # 3
Keeping women's issues in the foreground

Making the unfriendliness of the S&T environment for women visible and debated is one of the main objectives pursued by gender-oriented programmes. Relevant activities include awareness-raising initiatives, communication and information campaigns, as well as any other action intended to raise the question and keep it in the foreground.

LINES OF ACTION

Three lines of action can be mentioned:

– Develop specific information tools and communication strategies;
– Provide space for discussion;
– Target communication to organisational leaders.

Develop specific information tools and communication strategies

To make issues related to women's condition in S&T a subject of public discussion, within or outside the institutions concerned, many different information tools and communication strategies can be adopted. These include, for example, diffusion of **leaflets**, **brochures**, **information reports** and **books**, the organisation of **workshops, meetings** and **lectures** on women's issues, **web-based campaigns**, organisation of **receptions**, **dinners** and **galas**, establishment of **celebration days** and **awards** (for a more detailed description of these last tools, see part E). In order to specifically spread information about the programme and its activities (which also satisfies accountability and transparency needs), the simplest tool is the creation of a **programme website** or **portal**. **Periodical publications**, such as **bulletins**, **newsletters** and **magazines**, are also very common.

– Diversified communication tools have been used by the Italian University of Trento on the basis of the results of a programme intended to fight occupational segregation, including: **promotional campaigns** to encourage fathers to take parental leave; diffusion of a **series of thematic publications** containing the results of the programme; organisation of **public seminars and conferences**, both within and outside the university; management of a page devoted to women's occupational segregation on the university **web site**.
  http://www.unitn.it/gelso/campro.htm

– Under the ATHENA SWAN application programme at the Chemistry Dept. of the University of York, a set of initiatives has been carried out which were specifically intended to improve communication on women scientists' situation within the organisation. Rather than developing a new communication tool, however, special attention has been paid to **ensuring that women were adequately represented in institutional communication** at department and university levels (i.e., on the university web site, on newsletters, etc.). In this same perspective, the Kansas State University/ADVANCE-IT programme can be mentioned here for having promoted a set of actions intended to **review and modify the institutional web sites** (both at university and at departmental levels) in order to ensure acknowledgement of gender diversity.
http://www.york.ac.uk/research/athena/athena_submission.html
http://www.k-state.edu/advance/Initiatives/initiatives.html

– In the framework of an international programme co-ordinated by the Institute of Sociology of the Czech Academy of Sciences on the barriers contrasting women's advancement in S&T, a **monthly newsletter** distributed by e-mail is issued bringing information on activities in science and research, conferences, grants, and fellowships from a gender perspective.
http://www.cec-wys.org/html/index.php?s1=1&s2=3&s3=10&lng=13

– A very original way of arousing interest in gender issues has been successfully implemented at the University of Michigan. A theatre programme, offered by the university Center for Research on Learning and Teaching, performs **interactive sketches based on three typical activities in faculty life**: a faculty meeting discussion about a faculty hire; a faculty mentoring interaction; discussion of the evaluation of a faculty member for promotion and tenure. Promoters report that the impact, of a personal and concrete character, has been powerful in most cases, making people recognise and reflect upon their own behaviour and their department's practices.
http://sitemaker.umich.edu/advance/stride

Provide space for discussion

Since factors contributing to a "chilly climate" are difficult to detect and acknowledge, there are not many occasions to discuss them, either among peers or with the support of experts. It is therefore important to create spaces for discussion of common problems. Tools used for similar purposes include, among others, the organisation of workshops, the creation of spaces or opportunities allowing informal exchange, the setting of interactive portals and chat rooms. A few examples are provided below.

– A component of the WISELI programme, funded under the ADVANCE-IT scheme at the University of Wisconsin-Madison plans, among its communication and dissemination activities, a **series of seminars** in which scholars from various disciplines share their work on women in S&T with the programme promoting team, their colleagues, graduate students, postdocs, and all other

interested parties. The goal of these seminars is to **foster discussion** on the various issues confronting women and **present relevant programme results**.
http://wiseli.engr.wisc.edu/docs/EvalReport_FINALSummative_2007.pdf

– **Networks of women in different disciplinary areas** (physics, engineering, chemistry, biology, but also non S&T disciplines) and at different levels (institutional, local, national, regional, international) are often organised to respond to the need for peer-to-peer support, communication and learning. In some cases, the networks receive some form of institutional support and their activities are recognised by the university/ies the scientists come from, as in the case of the CIRSDe, an Italian Interdisciplinary Centre for Women's Research and Studies promoted by university teachers and researchers which has been acknowledged and is now eligible to receive financing from the university. The network organises **on-line courses in order to raise awareness about gender issues**, publishes a **quarterly review** on graduation dissertation and doctoral theses on gender issues, organises **conferences and meetings** and many other initiatives.
http://www.cirsde.unito.it/ATTIVITA--CIRSDe/default.aspx?linkid=5629&linkalias=&linkcid=5618&linkurl=2471&linkmid=12&linktype=2

– A **network for women scientists and engineers** has been promoted in the University of Michigan, composed of faculty members in science and engineering across the entire campus. The network meets several times each year to socialise, to talk about issues the members have in common, and to develop plans for the future. Many new programmes addressing women in S&T at the university, such as a mentoring initiative, have emerged from network discussions. The network actually represents an opportunity for women faculty in S&T to define collective goals.
http://www.umich.edu/~advproj/midtermreport.pdf

– A **combination of mentoring and networking schemes** is often applied to allow women to both enjoy the support of high-profile scientists and share their experiences with their peers. A Canadian network for women in technology, the Wired Women Society, for instance, organises career mentorship initiatives each year, where mentors and mentees meet at least once a month for a six-month period. The experience is completed by the mentees' participation in two **group mentorship training/orientation sessions** and two major **social networking events**. The mentoring programme of the University of Fribourg, in Switzerland, also combines one-to-one mentoring with networking meetings, targeting women researchers.
http://www.wiredwoman.com/mc/page.do?sitePageId=55433&orgId=wws
http://www.unifr.ch/f-mentoring/fr/prg/presentation1

Target communication to organisational leaders

Of crucial importance are **awareness-raising initiatives** specifically addressed at decision-makers and **leaders** about the "chilly climate" issue. Sometimes these initiatives are conceived, not as pure communication activities, but as action aimed at immediately triggering change processes in organisations.

– A good example is provided by the Rice University/ADVANCE-IT programme, in which a series of events was organised specifically targeting **department chairs**. The events took the form of **short-duration high-content meetings**, through which attendees were informed about the negative effects of gender stereotypes on university life, with special reference to evaluative judgements.
http://camp.rice.edu

– The University of Michigan implemented the Science and Technology Excellence Program (STEP) to engage senior faculty members, both male and female, in internal change processes related to gender and diversity, through a **programme of self-education and commitment to affect the internal climate** of their department. The central focus of the programme is a three-day workshop offered outside the regular term to three or four senior faculty, participating from a particular unit, who agree to engage in the programme as a team. Participants are asked to identify potential or tentative goals for their teams and themselves in advance. The workshop curriculum is focused on the process of facilitating organisational change, drawing on both academic theory and data, and includes discussion of obstacles to change and strategies to overcome such obstacles.
http://www.sitemaker.umich.edu/advance/step

– In the WISELI programme, promoted by the University of Wisconsin-Madison, and funded under the ADVANCE-IT scheme, a similar initiative has been promoted, where a set of "**internal climate workshops**" addressed to **department chairs** has been offered. The workshops had the form of a sort of **3-step itinerary**. The first session was devoted to "launching the question", through a presentation and discussion of issues such as the concept of climate and the benefits of a positive climate for women. In the second session, the results of a survey carried out at the departmental level on climate were presented and discussed. The third session was focused on how to present and discuss survey results in the departments and how to develop an effective action plan for enhancing the working environment for women.
http://wiseli.engr.wisc.edu/climate.php

Recommendation # 4

Promoting research and teaching on gender issues

To improve the internal cultural environment for women researchers an indirect tool is sometimes used, entailing the establishment of research programmes, courses or new research units devoted to gender studies. Though in principle there is no direct relation between an institutional effort on gender studies and the concrete situation of women in the organisation, experience shows that promoting gender studies can – if properly managed – have important impacts on the university climate.

LINES OF ACTION

Two main lines of action can be identified:

– Support gender-related research;

– Promote gender studies dissemination and teaching.

Support gender-related research

The establishment of a new research unit (institute, research centre, research group, etc.) specialising in gender issues can be, as mentioned, a strategy to gain space and acceptance for women's issues, endowing them with academic credibility. In other cases, the recognition effect comes from the existence of funds for gender studies from National governments. Some examples are provided below.

– In the University of Turin, an **inter-departmental research unit specialising in gender studies** has been created. Among its aims is the generation of new knowledge on the gender dynamics in the organisation. One of the initiatives taken by the unit has been a **research project on the language used by the university administration**, analysed from a gender perspective, aimed at favouring the adoption of a more gender-sensitive language in administrative communication.
http://www.cirsde.unito.it/ATTIVITA--CIRSDe/ARCHIVIO/default.aspx

– In the case of the UW-Madison ADVANCE-IT programme, the **establishment of a research unit** specialising in gender studies has been explicitly designed as a strategy to attach the label of research to actions in favour of gender equality, thus more easily gaining acceptance among scientists.
http://wiseli.engr.wisc.edu/links.php

– In Spain, the National Plan of the Ministry of Science and Innovation contemplates a **specific budget-line** to fund gender studies projects, which are to be selected each year.
http://www.plannacionalidi.es/plan-idi-public/

– The European **network of academic mentoring programmes** for women scientists EUMENT-NET, involving universities in Austria, Bulgaria, Germany and Switzerland, has been established with funds from the European Commission with the aim of fostering the exchange of knowledge and expertise on mentoring and supporting research studies and publications on science-policies related to gender.
http://www.eument-net.eu/default.aspx

– In Portugal, the national research funding agency (Fundação para a Ciência e a Tecnologia/FCT) of the Ministry of Science opens regular calls for research projects (every 2 years) on the thematic of gender equality following a protocol established in 1998 with the Commission for Citizenship and Gender Equality (CIG).
http://www.fct.mctes.pt/projectos/Protocolos/protocolos_CIDM/
http://alfa.fct.mctes.pt/apoios/projectos/concursos/pihm/index.phtml.pt

Promote gender studies dissemination and teaching

Training and dissemination opportunities in gender studies, in the form of curricular classes, introductory courses or informative sessions, can be useful to increase the awareness on women's situation in science and technology. This is the reason why some programmes combine direct action to promote change with information and/or training activities on gender studies.

– The Australian Macquarie University promotes a programme of **interdisciplinary research on women's studies**, bringing together research units from different universities and disciplines (including Anthropology, English, Critical and Cultural Studies, History, Law, Media, Human Geography, Philosophy, Politics and Sociology). Research results are used in postgraduate degrees, undergraduate teaching and other kinds of support for students and faculty members, including **conferences**, **work-in-progress seminars** and **research/ reading groups**.
http://www.iws.mq.edu.au/

– The Italian University of Turin regularly organises an **introductory on-line course on gender studies** aimed at raising awareness on gender issues among both students and faculty.
http://www.cirsde.unito.it/CORSO-ON-L/.

– The Czech Academy of Sciences accompanies direct actions supporting women scientists with dissemination activities on gender studies. With the purpose of raising awareness on critical women's issues in S&T, a **quarterly magazine on gender studies on science** has been created, disseminating research results.
http://www.zenyaveda.cz/html/index.php?s1=1&s2=3&s3=16&s4=3

Recommendation # 5
Promoting women's integration in the research environment

It is important to plan action aimed at providing women faculty and students with direct and personal support in their integration in the research environment. Support can be provided through specific services for newcomers, the creation of new opportunities for communicating, learning and interacting, and the provision of procedures to deal with discrimination, bullying and harassment cases.

LINES OF ACTION

Two main lines of action can be identified:

– Fight women's isolation;
– Provide direct support to women in difficulty**.**

Fight women's isolation

In some cases, programmes aim at "smoothing" the impact of the environment on women creating a sort of more protective and friendly "sub-environment". Also networking and mentoring schemes, or the organisation of special events can perform this function, even though at different levels, as in the examples that follow.

– The New Mexico State University/ADVANCE-IT programme organises each year a **welcome event for new faculty members** in Autumn and a **celebration of faculty members' achievements** in the Spring. The aim of these events is to help create moments of socialisation where everybody may feel accepted and recognised in the university environment.
http://www.advance.nmsu.edu/Documents/PDF/Retention_Report-Nov08.pdf

– To help undergraduate women students in their approach to S&T faculties, a **learning community**, offering **housing facilities**, has been established by the Center for Study of Women, Science and Technology (WST) at the Georgia Institute of Technology. Under the programme, **networking and mentoring initiatives** addressing personal and professional issues for women students entering scientific and technological fields are organised. These initiatives are focused on topics such as women's studies in the natural sciences, leadership opportunities offered under the programme, measuring individual success, and monitoring female self-esteem in a mostly male environment. Finally, women students are also encouraged to attend informal lunch discussions with various faculty and staff members, intended to inform them about campus resources, opportunities, professional development, as well as to establish student-faculty relationships.
http://www.wst.gatech.edu

– A study conducted by researchers from Colorado College, in the United States, identifies some factors that appear to be conducive to a **female-friendly departmental climate for students**, which also benefits male students. Among them: the availability of comfortable and properly furnished space for students to study and meet, the hiring of majors as tutors and lab assistants, the organisation of social and professional activities, the opportunity for students to be involved in outreach activities, useful to make them see themselves as role models, and the chance to establish relationships with female role models and with alumni, to provide relevant advice to students.
http://www.colorado.edu/facultyaffairs/leap/research/index.html

– **Networks and associations of women** in the different S&T disciplines and professional sectors (see also recommendation # 3) are also initiatives that provide women with a "friendly place" where they can share stories, doubts and experiences. For instance, the objective of a university-based Australian network of women students and professionals in science, technology and engineering is that of providing support for university female students and professionals in disciplinary areas where females are traditionally underrepresented. To this end, a university-wide network has been created in the Australian University of Southern Queensland in the framework of the GO-WEST Project (Go Women in Engineering, Science and Technology). The aim of the network is to **build cross-discipline links** and professional and personal expertise to **foster the success of academics and students** in the concerned disciplines. The network also provides a **virtual support**

structure of professionals and academics to **reduce existing isolation**; identifies and addresses **female students' concerns and priorities** that may influence retention and progression; links the network members to **industry initiatives**. Within the Pharmacy Guild of Australia, a "Women and Young Pharmacists committee" has been established, to increase their representation in the professional association, and to strengthen both under-represented groups by building a strategic alliance.
http://www.usq.edu.au/gowest
http://www.guild.org.au/content.asp?id=894

– In some instances, **"friendly places" to get in contact with science or technology** are provided to the general public, as in the case of the Italian "Associazione Orlando", a women's association providing a public and virtual space inside dedicated women's centres, allowing women to be informed and to learn about ICTs with gender-sensitive tools and methodologies (see also recommendation #18).
http://orlando.women.it/cms/index.php

Provide direct support to women in difficulty

A second line of action is that of directly assisting women with the aim of protecting them from the actual and potential segregating dynamics they are exposed to and assisting them when damage occurs.

– An example is provided by the "Universidonna" programme, funded by the European Social Fund and carried out in Italy by the University of Milan-Statale (Centre for Study and Research "Women and Gender Differences"), the Milan Polytechnic, the University of Milan-Bicocca, and Orientamento Lavoro onlus. The programme entailed the creation of a **help-desk** specifically addressed to women faculty and students experiencing harassment or other forms of discrimination. The service provides direct support to individual women and, at the same time, allows the promoters to collect "first-hand" information about the situation of women within the university and its evolution over time.
http://www.universidonna.org/du/index.php?option=com_content&task=blogsection&id=7&Itemid=35

– Another example is the ADVANCE-IT programme of the New Mexico State University. Under the programme, a set of actions has been designed and implemented to assist women faculty, female students and staff who feel at risk of not receiving adequate support within their departments. The tools used can be different on a case-by-case basis, and include **mentoring**, provision of **information** and **networking** actions.
http://www.advance.nmsu.edu/Initiatives/Mentoring/index.html

– An initiative aimed at preventing cases of **sexual harassment** has been activated at the UW-Madison, also in the framework of the ADVANCE-IT programme. It includes the offering of **informational sessions**, designing and publishing of **informational material** and the identification and training of a **contact person** in each school, college and division for preventing and managing cases of

sexual harassment. Moreover, a **cross-campus team of facilitators** has been created to sustain deans, administrative teams, academic departments and support units in such an effort.
http://wiseli.engr.wisc.edu/uwpgms/sexual-harassment.php

Recommendation # 6
Involving senior managers and leaders in change process

Proactive and motivated involvement of senior management (and not a mere loyal or token one) is of pivotal importance for triggering cultural transformations within an organisation. Such an involvement appears necessary for at least three different reasons. First, attacking profoundly rooted cultural gender biases depends on overall change of the organisation's culture; and that can be successfully achieved only with the strong commitment of senior management. Secondly, a proactive involvement of leaders has a symbolic effect which greatly facilitates the mobilisation of personnel at all levels. Finally, and more practically, only strong support by leaders makes it possible to develop successful initiatives aimed at creating a friendly climate for women, mobilise appropriate resources and prevent or settle possible conflicts.

LINES OF ACTION

Promote a direct and visible commitment of leaders

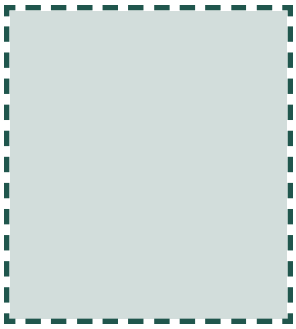
One main line of action has been isolated.

It is generally thought that programmes are most effective if leaders participate in them directly, performing visible roles. Some examples of direct participation are provided below. Commitment of leaders can also be made visible through media and institutional communication tools (websites, newsletters, etc.).

– The ADVANCE-IT programme carried out at the Rice University and aimed at improving the internal climate for women, succeeded in having the **President**, the **Provost** and the **vice-presidents** attending all its main events, with the specific purpose of demonstrating leadership's commitment and encouraging chairs and faculty administrators to take the programme seriously.
http://cohesion.rice.edu/centersandinst/advance/emplibrary/ACF368F.doc

– To facilitate leadership's commitment, the promoters of the NSERC (National Science and Engineering Research Council of Canada) Regional Chair for Women in Science and Engineering organised several meetings of the regional **Committee of deans** of engineering faculties, devoting them to the promotion of a friendly environment for women. This led to a direct discussion about equal opportunities in engineering and made the engagement of the Committee with these issues visible.
http://www.nserc-crsng.gc.ca/NSERC-CRSNG/Reports-Rapports/Index_eng.asp

– In New Mexico State University, the choice has instead been that of promoting a **weekly informal coffee meeting** with the participation of the deans, chairs, administrators and faculty staff for discussing issues concerning women faculty.
http://www.advance.nmsu.edu/Documents/PDF/Retention_Report-Nov08.pdf



– To **fully engage new full professors**, the future leaders of change processes, the University of Michigan organises one-day workshops each year, which the deans of the different schools and colleges encourage their faculty to attend. The University Provost, three deans and other University leaders discuss how the University addresses many issues, including diversity. In this way emerging leaders may be influenced by the current commitments of the current leaders.
http://www.sitemaker.umich.edu/advance/home

Strategy one

A friendly environment for women

Objective 2

Promoting work-life balance

Part B

Chapter Four

[Rationale]

A friendly environment, for both women and men, is one where work-life balance is pursued and made possible through adequate regulation, policy and services. To achieve this aim, not only are important cultural and behavioural changes needed, but also investment of sizeable **financial resources** and establishment of suitable **organisational arrangements**.

The inclusion of men in such policies has different important motivations: trying to include them among those entitled to a balanced life; making the measures acceptable under laws and regulations which forbid providing benefits to just one sex; helping women by encouraging men to take on responsibilities with respect to the provision of care; and reducing gender stereotypes.

[Recommendations]

Three main recommendations to sustain work-life balance can be identified:

 # 7 – Creating a network of services
 # 8 – Delivering information on available resources or services
 # 9 – Customising work processes and organisation

Recommendation # 7
Creating a network of services

The most direct way to favour work-life balance is creating an adequate network of services to reduce the burden of the family work that – most of the time – rests disproportionately on women's shoulders. The concept of "network" is to be stressed here. The most effective actions carried out by the examined programmes appear to be those based on a combination of different services and measures as far as possible managed in a co-ordinated way.

LINES OF ACTION

Establish new in-house services

Two main lines of action can be identified:

– Establish new in-house services;
– Support the access of women to existing community services.

Some programmes promote the creation of **new in-house services** aimed at favouring women. The most typical example is the establishment of childcare services by universities and research institutions. This can ensure that services provided are tailored to the needs of the users. The examples below all refer to North American universities, where campus childcare is widespread.

– In the Georgia Tech ADVANCE-IT programme, for instance, a set of **childcare centres**, located in different areas of the campus, has been created. The centres, available for faculty, students and staff, run a specific programme for nursing mothers, aimed at providing them with a private, sanitary, onsite location to continue the breast-feeding without adding stress to their life.
http://www.gatech.edu
http://www.advance.gatech.edu

– The University of Illinois at Chicago, under the ADVANCE-IT funded programme WISEST (Women in Science and Engineering System Transformation), created on-campus childcare centres, accredited by an association specialised in children's education and licensed by the local department of children and family services. The same university provides **adoption assistance** for eligible employees.
http://www.uic.edu/orgs/wisest/index.htm

– The UW-Madison has strengthened its campus childcare service providing support (in the form of subsidies) to single parents and low-income parents for **tuition**, expanding the hours the service is open, and providing **extra-support in case of need** on the occasion of conferences, etc. In the same university a different kind of service has also been organised, called "**time-stretcher**", enabling beneficiaries to hire individuals to run simple tasks that would take time away from activities important for their personal or professional development.
http://wiseli.engr.wisc.edu/docs/AnnReport_IT_2003.pdf

Support the access of women to existing community services

Besides or rather than creating new services, some programmes prefer to help women access **existing community services**. The prevalent form of support is that of providing **grants** and **soft-loans**. The support can cover different kinds of services, such as healthcare, children's education, childcare and relocation, and is usually extended to the employee's partner and dependants. A couple of examples are provided below.

– The German network LaKoG (Conference of Equal Opportunities Advocates at Universities of Applied Sciences in Baden-Württemberg) has promoted a programme for female scientists with children to **improve the compatibility of career and family during early career stages** (doctoral thesis, postdoctoral lecturer qualification) via financial support for two years. There is also a line of funding for women who plan their re-entry into a research career after parental leave.
http://www.lakog.uni-stuttgart.de/en/menue_links/startpage/index.html
http://www.lakog.uni-stuttgart.de/menue_links/foerderprogramme_fuer_frauen/schlieben_lange_programm_fuer_nachwuchswissenschaft_lerinnen_mit_kind/index.html/

– A **fund helping tenure-track faculty stay on track for their research after significant life-altering events** has been created in the framework of the ADVANCE-IT funded programme at the

University of Illinois at Chicago, as a vital component of an integrated institutional transformation effort. Such transitions may include, but are not limited to, childbirth, adoption, eldercare and family illness.
http://www.uic.edu/orgs/wisest/index.htm

Recommendation # 8
Delivering information on available resources or services

Another important issue to take into consideration in addressing work-life balance is the supply of **information** about one's rights, services and resources available and the procedures to follow for accessing them. Hence there is a need to develop procedures and tools specifically aimed at timely delivering appropriate and updated information on available work-life balance resources. Some examples are provided below.

LINES OF ACTION

Two main lines of action can be identified:
- Develop dedicated dissemination tools;
- Target communication to men.

Develop dedicated dissemination tools

Most dissemination tools are web-based, even though some programmes choose to establish special offices as one-stop shops offering advice for issues pertaining to work-life balance in general.

- A **work-life resources website** has been established by the Kansas State University under its ADVANCE-IT programme. The strategy pursued is that of creating a single source of information about any aspect related to resources pertaining to the balance between the professional dimension and other aspects of life. Therefore, the website provides information on in-house and community services of particular interest to women, on any measure and regulation in support of women and on other possible resources available in the area where the university is located. The website covers a broad range of sectors, such as healthcare, eldercare, childcare, services for disabled people, education services, relocation, employment services and recreation.
  http://www.k-state.edu/worklife/

- An "**Office of childcare and family resources**" has been established at the UW-Madison, with the aim of assisting women with questions and problems pertaining to work-life balance. In particular, the office can be contacted to ask for assistance and information on childcare, breastfeeding facilities, family and parent resources, parenting support and education needs. Much information is also directly provided on the office's website.
  http://www.occfr.wisc.edu/

- Another example of a web-based information tool is the Euraxess Portal, promoted by the European Commission in order to support

researchers' mobility all over Europe. The portal's section "Euraxess services" allows users to identify and contact a network of more than 200 centres located in 35 European countries, thought to assist mobile researchers, especially women, in every step of their move, starting in their home country and continuing until they have settled in a new one. Each centre provides customised assistance on topics such as: accommodation, day care and schooling; intellectual property rights; language courses; recognition of qualifications; salaries and taxation; social and cultural aspects; social security, pension rights and healthcare; visas and work permits. Euraxess centres also promote child nursery services and flexible working patterns.
http://ec.europa.eu/euraxess/index_en.cfm?l1=0&l2=2

Target communication to men

Some programmes choose to target information on existing work-life balance tools to men, in order to encourage them to make the most of such opportunities, thus at least partially relieving women.

– Not addressing a single organisation, but the general public, the Italian University of Trento, in the framework of an already mentioned project about women's vertical segregation in the labour market, has launched, in cooperation with trade unions and associations, a **media campaign** to promote work/life balance practices intended for men (particularly parental leave for fathers).
http://www.unitn.it/gelso/campro.htm

Recommendation # 9
Customising work processes and organisation

Besides providing services and information, it appears equally important to act on the professional environment through actions allowing, as far as possible, redesign work processes and organisation to help employees cope with critical junctures in family life (such as illness of dependants or childbirth).

LINES OF ACTION

The **main line of action** under this recommendation involves trying to make the professional environment as flexible as possible.

Promote flexibility

– Many universities develop more favourable **leave policies** than in national legislation, explicitly designed to support women and men in balancing family and work. Most of the schemes include both paid and unpaid leave for caring for ill family members, in case of birth and adoption and for significant responsibilities related to elder or dependent care. **Active support for parental leave policies for both sexes** is for instance a basic requirement of the Project JUNO, a UK code of practice intended to advance women in physics departments.
http://www.iop.org/activity/diversity/News/file_23103.pdf

– In the ADVANCE-IT programme at the UW-Madison, in order to safeguard both the right to take parental leave and the needs of students, some guidelines have been defined for providing guidance to department chairs about how to better **manage parental leave and part-time work**. These guidelines mainly concern replacement of the person on leave in teaching activities, student advice, non-classroom instructional activities, service assignments (such as committee work, assistance to the chair, etc.) or distance education.
http://www.ohr.wisc.edu/polproced/BalFamWrk_Apr08.pdf

– Periods of leave are particularly effective when associated with measures aimed at simultaneously **stopping the tenure-clock** for parental or other familial responsibilities, as it is often provided for in the ADVANCE-IT programmes funded through the American National Science Foundation.
http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5383

– It is also possible **actively to modify the assignment of duties** in situations of particular need for family reasons. In the ADVANCE-IT programme implemented at the Georgia Tech, these procedures allow faculty affected by health, pregnancy or caregiving responsibilities to apply for release from particular teaching or scholarly duties and to ask to stop the tenure clock.
http://www.advance.gatech.edu

– The establishment of **part-time arrangements** is also provided for in different research institutions in case of particular critical situations such as care of child, partner, or parent. In some cases **split appointments** are foreseen, where persons can split an appointment between them and a partner. In NSF funded ADVANCE-IT programmes, toolkits and other web tools have been devised to support managing such arrangements.
http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5383

– Resources to **counter "gender-neutrality" of S&T workplaces** and their internal practices have been developed by the Queensland Government's Office for Women, an Australian State public agency that has been involved with increasing women's qualified participation in science and technology through its ***Smart Women – Smart State Strategy***. Childcare, flexible working practices, and planning and managing career breaks have been identified as key issues that impact upon women's long term participation in S&T.
http://www.women.qld.gov.au/work-and-life/smart-state-strategy/

– ADVANCE-IT programmes, in the United States, also provide assistance to **dual-career couples**, in the form of **spouse relocation programmes** or directly foreseeing the possibility of **dual-career hiring**. Similarly, the Swiss Federal Institute of Technology in Zurich (ETH) created the **Dual Career Advice Office**, in order to assist in exploring career opportunities for partners of ETH faculty members, who have recently been recruited from abroad and

provides them with start-up aid. These measures are based on the recognition of the difficulties often faced by women when it comes to relocating their families to take advantage of professional opportunities.

http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5383
http://www.facultyaffairs.ethz.ch/dualcareer/index_EN

Strategy one

A friendly environment for women

Objective 3

Supporting early-stage career-development

Part B

Chapter Five

[Rationale]

One mark of a welcoming environment enabling women to progress, besides a positive cultural attitude and the existence of tools to balance work and family life, is the **availability of support in planning and implementing the first steps of one's own career path**. First steps are in fact crucial in designing a successful career.

Support may come in the form of adequate regulation, policy and practice to sustain young researchers, or in the provision of assistance, both as training and as the possibility to network and share experiences and solutions with peers and older faculties or researchers. It is also important to sensitise and train people in charge of hiring and promotions on the specific difficulties young women scientists may face and how to overcome unconscious gender bias.

[Recommendations]

Four main recommendations to support women's early-career phase can be pointed out:

 # 10 – Sustaining early-career researchers through policy and regulation
 # 11 – Providing personal assistance and training for early-career researchers
 # 12 – Increasing candidate pool diversity for hiring and promotions
 # 13 – Providing women with funds for professional development

Recommendation # 10
Sustaining early-career researchers through policy and regulation

One way of fixing the holes in the pipeline is providing policy and regulation to help those who are close to the end of a contract to stay, for instance on the grounds of temporary contractual arrangements bridging young researchers to their next assignment.

LINES OF ACTION

Support temporary faculty

One general line of action, encompassing a range of different activities, can be singled out.

Regulation in this area, useful for both male and female researchers, is particularly precious for women, who represent the majority among contingent or temporary faculty and personnel.

– The purpose of the “Safety Net Scheme for Research Staff”, promoted by the University of Western Australia, is to provide **bridging support to fund the salary of key personnel normally supported by external research grant income**, where an individual or group has failed to obtain continued funding for the position. The majority of these positions are held by women. Procedures are based on applications submitted by individuals and institutions to the Pro Vice-Chancellor for Research and Innovation for approval. Applications include information on: the key staff members to be funded; how a continuation of their position is of strategic importance to the group; how retaining the key staff member will continue to help the individual or group attract external research funding; whether other options might be available to retain the key staff member within the group; what external funding will be sought to support the salary of the key staff member within the next twelve months.
http://www.research.uwa.edu.au/welcome/research_services/research_grants/finding_funding/funding_opportunities/safety_net_scheme_

– Another programme promoted by the University of Western Australia has instead the objective of retaining women academic personnel by improving job security levels of grant-funded research staff members (the majority of which are again women). To pursue this objective, the university negotiated with trade unions the introduction of a new category of employment, i.e. “**Ongoing Contingent-Funded Research Contract**” employment. This category offers the possibility to grant-funded research staff who have been employed continuously for a period of a least six years or that will be employed on a grant to convert their contract into this new one, which ensures some of the rights which are recognised only to fixed term contract staff (related to e.g. severance payment, possibility to apply for loans, consultation on organisational change).
http://www.hr.uwa.edu.au/agreements/academic/academic_staff_agreement/schedules/ongoing_contingent_funded_research_contract

– One of the principles of the already mentioned ATHENA SWAN Charter maintains that the system of short-term contracts has particularly negative consequences for the retention and progression of women in science, and asks universities applying for recognition under the code to properly address such issue. The department of Chemistry of the University of York (UK) has appointed an **officer in charge of providing post-graduate students and post-doctoral researchers with advice on career and professional development** and opportunities, to address the negative impact of short-term contracts and to tackle obstacles in the transition from PhD into an academic career.
http://www.york.ac.uk/research/athena/chemistry%20gold/appendix%20G%20york.PDF

Recommendation # 11

Providing personal assistance and training for early-career researchers

Another way to address the unbalanced presence of women and men at different career stages is activating initiatives intended to increase the ability of women to manage their own career-development, overcoming the various gender-based barriers often limiting women's progression.

LINES OF ACTION

Three main lines of action can be identified:

– Train women on career-related social and institutional mechanisms;
– Assist women in developing their career plans;
– Provide opportunities for women to share experiences on career-development.

Train women on career-related social and institutional mechanisms

One of the most common ways to help women master their career is that of providing training activities, organised formally or informally. Some example may be helpful in understanding how this line of action has been implemented in practice.

– The programme Encouragement to Advance, implemented by the German Center of Excellence Women in Science (CEWS) was aimed at fighting vertical segregation by encouraging women researchers' applications to professorship chairs in six European countries, as well as the mobility of researchers. The programme provided training seminars to participants on **appointments procedures commonly used by the research institutions** of the participating countries. The seminars dealt with different relevant issues, such as how the appointment system actually works, how to conduct negotiations at universities' committees, how to prepare application documents, how to find support in career strategies.
http://www.cews.org/cews/prokoo.php

– The Department of Chemistry of the University of York, in the framework of its application for the ATHENA SWAN Charter awards, created the new position of the **training officer for graduates and research assistants**. This position has been designed to help women manage some of the obstacles they frequently meet in making the transition into a sustainable academic career. The same university also promoted a set of **career talks**, involving successful women from outside the department.
http://www.york.ac.uk/research/athena/chemistry%20gold/appendix%20G%20york.PDF

– Under the LEAP (Leadership Education for Advancement and Promotion) programme, funded under the ADVANCE-IT scheme at the University of Colorado-Boulder, a set of **workshops** has been organised with the aim of supporting women junior faculty, providing them with an understanding on **how the institution works** and **how to achieve success** at the institution. **Professional development**

workshops, matched with networking events and speaker events, are also offered to young researchers from different universities and research institutions by the Society for Canadian Women in Science and Technology (SCWIST). Particular attention is devoted to women scientists who have immigrated to Canada.
http://www.colorado.edu/facultyaffairs/leap
http://www.scwist.ca/index.php/main/news/category/Events/P24/

Assist women in developing their career plans

A way to help women to launch a successful career is supporting them in developing a career plan, in order to seize the existing opportunities and to be able to choose, rather than simply waiting to be chosen. Some examples can be provided.

– The many activities implemented at the Chemistry Department of the University of York, in view of its application to the ATHENA SWAN Charter awards, included a group of initiatives contributing to define a pro-active approach to career-development, encouraging women scientists to plan their own career and providing them with the relevant basic tools and capacities, mostly through the **direct assistance of the department's Principal Investigators** (PIs).
http://www.york.ac.uk/research/athena/chemistry%20gold/appendix%20G%20york.PDF

– A similar approach has been tested in the ADVANCE-IT programme of the Kansas State University. Also in this case, rather than resorting to experts, it is the **deans and department heads** who are asked to work with women faculty members at all ranks in order to help them in developing **long-term career plans**.
http://www.k-state.edu/advance/Initiatives/career_maps.html

– A **handbook on "Giving and Getting Career Advice**. A Guide for Junior and Senior Faculty" has been produced and widely disseminated by the University of Michigan. According to the promoters, career advice from people with information and experience can provide a crucial context for decision-making and career-development. The handbook provides examples of many different forms of career advice, all of which are valuable to junior faculty; and it provides guidelines to both those doing the mentoring and those receiving it. A **mentoring network** is also available, designed to provide information, encouragement and support to undergraduate and graduate students, postdocs and untenured faculty. Mentees are matched in one-on-one e-mentoring relationships with mentors, and the network provides the training, coaching and support for them to pursue an 8-month mentoring relationship.
http://www.umich.edu/~advproj/career%20advising.pdf

– Competitive awards offering **year-long support to pre-tenure female faculty** seeking to enhance their professional development are provided under the ADVANCE-IT Programme at Marshall University.
http://www.marshall.edu/mu-advance/Yr1Report-2007.pdf

– The strategy adopted at the University of Queensland through the **Promoting Women Fellowship programme** is that of strengthening women's research profile and leadership potential, in order to allow them to develop successful career plans. Women who have had career interruptions or other impediments due to equity-related circumstances are given additional consideration. The programme provides the most appropriate form of support to successful applicants such as assisting fellows to research, write and publish their papers in refereed academic journals, writing a book length publication, developing or consolidating a research project with international collaboration, or taking time off for a senior administrative responsibility.
http://www.uq.edu.au/equity/index.html?page=11462

– Rice University's ADVANCE-IT programme promotes "**Negotiating the Ideal Faculty Position Workshops**" to assist postdoctoral scholars and PhD students in decision-making points in their life, to encourage them to consider an academic career. The workshops provide them with an opportunity to learn from women faculty leaders across all science and engineering disciplines.
http://cohesion.rice.edu/centersandinst/advance/emplibrary/WEPANFinal011808.pdf

Provide opportunities for women to share experiences on career-development

Exchanging experience is another way for women to get information about how scientific careers work in practice and how to prevent the risk of being penalised by gender-related mechanisms.

– A large number of programmes adopt this line of action. The main tools that are being used are **networking** and **mentoring schemes**, often backed by **public events**. This is for instance the choice of Kansas State University, where a career advancement programme is conducted addressing women associate professors as mentees, while tenured women act as mentors. Each mentee can choose more than one mentor to receive advice on different critical topics, such as advancement into full professorships, or the undertaking of administrative responsibilities. **Specific funds** are available to mentees for different purposes, including attendance at short courses, attendance at meetings, travel to research sites or to be used as seed money for research.
http://www.k-state.edu/advance/Initiatives/CAP%20RFP%20Round%205.pdf

– A regional programme (called MuT - Mentoring und Training) carried out by the German network LaKoG (Conference of Equal Opportunities Advocates at Universities of Applied Sciences in Baden-Württemberg) applies the same scheme. It is based on a **combination of mentoring and training tools** directed to help women aiming at a full professorship to increase their skills and to make a more effective use of their career opportunities. The programme provides participants with the possibility to have supportive relationships with experienced researchers and to gain knowledge and experience in the academic field.
http://www.lakog.uni-stuttgart.de/menue_links/mut_mentoring_und_training/index.html

– The programme promoted by the Swiss University of Fribourg (Réseau Romand de Mentoring pour Femmes – RRM) uses **mentoring** as a tool for women scientists to increase their career opportunities. The individual mentorship scheme is supported by other initiatives, including network meetings, workshops and discussions on career-relevant topics.
http://www.unifr.ch/f-mentoring/fr/accueil

– The mentoring programme launched in Austria by the University of Vienna (Mentoring University of Vienna – MUV) applies **networking** and **mentoring** to accelerate women's career progression. According to promoters, by accessing formal and informal professional networks and thus sharing their experiences, women have the opportunity of gaining much experience in a short time-period and of seeing experiences of gender discrimination in a more objective and depersonalised perspective. The programme includes the resort to a broad range of **backing initiatives**, such as supervision of the mentoring group, seminar modules for mentees, demand-oriented training courses for mentors and mentees before the beginning of the mentoring relationships.
http://personalwesen.univie.ac.at/frauenfoerderung/mentoring/about-the-program/history/?L=2

Recommendation # 12
Increasing candidate pool diversity for hiring and promotions

Some programmes, rather than or besides providing support to women, try to promote diversity by including in the pool of candidates more women and under-represented minorities. To be more effective, these measures are sometimes supported by specific regulations in hiring and promotion and should be backed with a pro-active orientation of committee members to identify possible female candidates for posts.

LINES OF ACTION

Train hiring and evaluation committee members

One main line of action can be identified for this recommendation.

Providing training for the organisation's officers involved with hiring and promotions, such as members of hiring committees or department heads. This usually pursues two main objectives: increasing awareness of gender bias in hiring and promotion procedures, and introducing changes in such procedures in order to make them more equitable. Four cases can be mentioned.

– A first example is provided by the WISELI programme at the UW-Madison, where a **training workshop for hiring committee members** has been organised. The aim of the workshop was to transfer techniques and practices allowing committees to diversify applicant pools and candidates for interviews. The workshop, based on an active learning approach, combined brief presentations and active

discussions, favouring exchange of ideas and experiences. Topics discussed included: recruiting of a highly qualified pool of candidates; discussing diversity within search committee meetings; unconscious assumptions and their potential influence on evaluation of candidates; how to ensure fair and thorough review of candidates; how to implement an effective interview process.
http://wiseli.engr.wisc.edu/docs/AnnReport_WISELI_2007.pdf

– A second case is that of the Massachusetts Institute of Technology, where a subcommittee has been created, with the aim of producing **hiring and development guidelines** to ensure more diversity in the hiring process of junior faculty. The subcommittee is chaired by the head of the engineering gender equity effort. The guidelines were distributed by the provost to all department heads, who were asked to provide them to the search committees in their departments.
http://web.mit.edu/facfamily/

– A third example is provided by the ADVANCE-IT STRIDE programme carried out at the University of Michigan, where a specific **Committee on Strategies and Tactics for Recruiting to Improve Diversity and Excellence** has been established. The committee provides information and advice about practices to maximize the likelihood that diverse, well-qualified candidates for faculty positions will be identified, and, if selected for offers, recruited, retained and promoted. The committee leads workshops for faculty and administrators involved in hiring. It also works with departments by meeting with chairs, faculty search committees, and other department members involved with recruitment and retention.
http://sitemaker.umich.edu/advance/stride

– Lectures, seminars and meetings with an awareness-raising purpose are commonly foreseen as a supporting component of many integrated programmes on women in science. In the LEAP (Leadership Education for Advancement and Promotion) programme, for instance, implemented in the University of Colorado at Boulder under the national ADVANCE-IT scheme, **training of faculty search committee** is carried out to ensure that there is no bias in selecting candidates for hiring.
http://www.colorado.edu/facultyaffairs/leap/index.html#support

Recommendation # 13

Providing women with funds for professional development

Another way to support women's start in science and technology is that of providing them with additional funds and resources. This approach is widespread in academic institutions, often in combination with other measures (training, information services, etc.).

LINES OF ACTION

Establish dedicated funds

One line of action has been connected to this recommendation.

The way in which funds are allocated, managed and delivered can be different, as the following examples show.

– The New Mexico State University's ADVANCE-IT programme established a **mini-grant programme** (up to $500 per person) in support of the professional development of women faculty. The funds can be used for different aims, such as participating to workshops and professional seminars, participating in teaching-improvement activities or joining professional networks. Funds can also be used to access other initiatives supporting professional development promoted by the same university and aimed at supporting women faculty to improve their productivity, writing capacities, teaching effectiveness and managerial skills.
http://www.advance.nmsu.edu/Documents/PDF/ann-rpt-08.pdf

– Kansas State University's ADVANCE-IT programme launched a **differentiated group of initiatives centred around the delivery of grants**. One of them is aimed at encouraging tenure-track women faculty members to connect with leaders in their research area. Under another initiative, funds are provided for enhancing visits and exchange among researchers. Two other initiatives are intended to provide funds to support tenure-track and tenured women accessing professional development opportunities.
http://www.k-state.edu/advance/FundingOpportunities/funding_opportunities.html

– Another example is that of the Swedish VINNMER programme (Qualification for female researchers), carried out at national level by VINNOVA, the Swedish government agency that administers state funding for research and development. The programme provides universities and research institutions with grants to be allocated for **women's professional development** through the promotion of international collaboration, incentives to increase the mobility of women researchers, and the recruitment of women from a foreign environment.
http://www.vinnova.se/In-English/Activities/Strong-research-and-innovation-environments/VINNMER/

– Some universities established programmes specifically aimed at preventing the attrition of women who have already started a scientific career because of lack of support for **life course events**. In this regard, the experience of the UW-Madison WISELI programme, funded under the ADVANCE-IT scheme, is particularly useful. The programme supports women who are at **critical junctures** in their professional careers and whose research productivity is affected by personal life events, such as illness of a dependent or oneself, complications from childbirth or a combination of different major life events. The programme supports eligible women with **additional funds** in order to help them cope with their particular situation. A similar strategy has been adopted by CSIRO

(Australia's Commonwealth Scientific and Industrial Research Organisation), through a programme providing **grants to women returners**. It consists of the delivery of grants of up to AUS $ 35,000 each to support researchers to re-establish themselves and re-connect with research underway in their field. Several awards are offered each year.

http://wiseli.engr.wisc.edu/docs/AnnReport_IT_2007FINAL.pdf

http://www.csiro.au/files/files/pmvp.pdf

– The UK Resource Centre for women in science, engineering and technology developed a scheme targeting women who have had a career break, by offering **one-to-one support** and the opportunity to meet other returners. An **online course** was established, in cooperation with the Open University, and a guide, based on concrete cases of women returners, is made available online.

http://www.ukrc4setwomen.org/html/services-for-women/

– The University of Surrey Daphne Jackson Trust runs a fellowship programme addressed to women returners after a break of at least two years from a science/engineering/technology related career. The applicant is invited to develop **a research project to be hosted by a research institution and supervised by a senior researcher**. A re-training programme is also established which has to involve updating in a previously familiar field or initiation into a new field. The re-training programme is expected to take about 100 hours per year and it has to match the needs of the research project and enhance the fellow's future employability.

http://www.daphnejackson.org/main_menu/Fellowship/Scheme.php?session_key=

Strategy two

Gender-aware science

Part C

Introduction

Shaping the fabric of science

The image and representation of **science and technology**, and particularly of disciplines such as physics or engineering, **are strongly gendered as masculine**, and the increasing participation of women (see part A) does not automatically mean that this is going to change. Consequently, a male view is also dominant about who the users and beneficiaries of science and technology are and what impacts scientific and technological development have on people.

As discussed in chapter 1, science and technology image and representation also have remarkable effects on both women and men's perception of their attitudes and capabilities, and to influence career choices and decisions about the allocation of tasks and promotions. Addressing stereotypes and (mis)representations is not easy, since the dominant belief is that science has no gender, but is perfectly neutral and meritocratic.

Stereotyped and male-gendered representations, moreover, do not affect only the external image of science and technology (S&T). They also have an internal effect on S&T contents and methods.

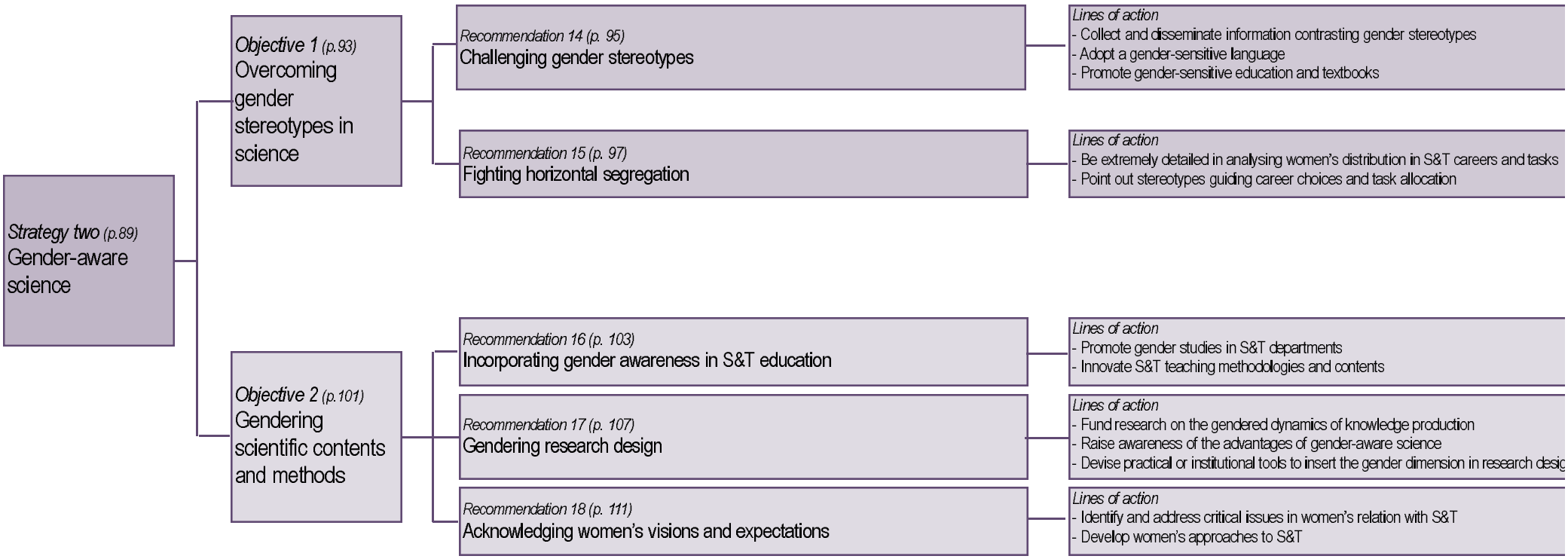
To understand how wide and deep this effect is, the European Commission has promoted a meta-analysis on gender and science research aimed at providing an exhaustive overview and analysis of all research projects carried out on this issue at European, national and regional levels, in the period 1980-2007. The final results of the project will likely offer new insights into dimensions, risks and features of male-dominated understandings of science and technology.

Countering gender blindness – and therefore "androcentrism" – in science also represents a prerequisite for scientific and technological research to attain **excellence**.

In this domain, **recommendations can be grouped into two areas**, corresponding to distinct **objectives**, targeting respectively:

Objective 1: Gender stereotypes in science (chapter six);

Objective 2: The gender dimension of science and technology contents and methods (chapter seven).


Strategy two (p.89)
Gender-aware science
Objective 1 (p.93)
Overcoming gender stereotypes in science
Recommendation 14 (p. 95)
Challenging gender stereotypes
Lines of action
- Collect and disseminate information contrasting gender stereotypes
- Adopt a gender-sensitive language
- Promote gender-sensitive education and textbooks
Recommendation 15 (p. 97)
Fighting horizontal segregation
Lines of action
- Be extremely detailed in analysing women's distribution in S&T careers and tasks
- Point out stereotypes guiding career choices and task allocation
Objective 2 (p.101)
Gendering scientific contents and methods
Recommendation 16 (p. 103)
Incorporating gender awareness in S&T education
Lines of action
- Promote gender studies in S&T departments
- Innovate S&T teaching methodologies and contents
Recommendation 17 (p. 107)
Gendering research design
Lines of action
- Fund research on the gendered dynamics of knowledge production
- Raise awareness of the advantages of gender-aware science
- Devise practical or institutional tools to insert the gender dimension in research desig
Recommendation 18 (p. 111)
Acknowledging women's visions and expectations
Lines of action
- Identify and address critical issues in women's relation with S&T
- Develop women's approaches to S&T

Strategy two

Gender-aware science

Objective 1

Overcoming gender stereotypes in science

Part C

Chapter Six

[Rationale]

Its image of neutrality and meritocracy notwithstanding, it is by now widely acknowledged that male-gendered assumptions are at the very core of the scientific processes, influencing research priorities, theoretical contexts and methods, data interpretation, educational approaches, etc.

Programmes aimed at introducing awareness of the gender perspective in science and technology may represent an antidote to some of the most serious impediments contributing to the "leaky pipeline" phenomenon affecting women in research. In particular, they help women overcome barriers connected with the sense of not being adequately acknowledged in a **masculine-gendered representation of scientific knowledge** and the **stereotypes concerning the cognitive skills of women and men**.

When gender stereotypes are challenged, space opens up for women to bring different approaches to epistemology, theory and methodology to the fore, as well as to legitimise different research agendas.

[Recommendations]

Two main recommendations have been drafted on the basis of the relevant programmes analysed:

 # 14 – Challenging gender stereotypes

 # 15 – Fighting horizontal segregation

Recommendation # 14
Challenging gender stereotypes

Gender stereotypes operate, often invisibly, affecting women's attitudes towards science. The perception and internalisation of stereotypes appear to have a very strong role in producing low self-esteem and dynamics of self-exclusion from scientific studies and high-level scientific careers. The stereotyped images of science and "the scientist", on the other hand, reflect features that are typically presented as unchangeable and refer to a taken-for-granted masculine model.

LINES OF ACTION

Three distinct lines of action can be identified under this recommendation:

– Collect and disseminate information contrasting gender stereotypes;
– Adopt a gender-sensitive language.
– The third line of action "Promote gender-sensitive education and textbooks" has the same content and is dealt with in recommendation #16, devoted to S&T educational issues.

Collect and disseminate information contrasting gender stereotypes

Debunking the myths perpetuating gender stereotypes is the main measure to deal with them. Concrete actions encompass conducting and disseminating studies showing their fallacy – which is particularly effective in a scientific environment – but also organising information campaigns in the traditional media and on the web, as in the examples provided below.

– A **report on women and science** in Italy, analysing women's attitude towards science and technological innovation, has been published and widely disseminated by Observa, an Italian non profit cultural association. The report helps to correctly interpret the differences in perceptions and attitudes that are usually recorded between women and men, and directly addresses prejudices and stereotypes regarding women's competencies and capacities in the different scientific tasks.
http://www.observa.it/pubblicazioni_view.aspx?ID=474&LAN=ITA

– A **media campaign oriented at displaying the varied life-worlds of women in innovation and science** has been supported, in the framework of a larger programme, by the Austrian Research Promotion Agency. In a video, female inventors, company founders, managers, pioneers and self-employed engineers, beside offering an insight into their workplace, presented their path, their career and their history, in an effort to do away with stereotypes and make room for new images of both women and science/technology.
http://www.w-fforte.at/en/wissenschafft-leben/

– Donestech, a Spanish association of women technologists, has collected and published on its web site almost 60 audio-visual interviews (12-30 minutes each, with excerpts of 5-20 seconds) with women working with ICTs, with the aim of **"mapping" the different technological practices of women**, their different motivations and the obstacles they met. This extremely rich material provides very lively evidence of the varied experience of women in technology, as well as documenting the hidden mechanisms and stereotypes affecting such experience.
http://www.donestech.net/ca/audiovisual

Adopt a gender-sensitive language

Activities related to this line of action include first of all those aimed at raising awareness about the importance of the issue, often undervalued; practical tools can also be devised to help solve practical problems, as in the second example.

– **Discussions about "language and gender"** have been organised by the UK women's network WiSET (Women in Science, Engineering and Technology) within the Faculty of Engineering and Physical Sciences of the University of Manchester, in the framework of a session on the role of gender in scientific settings. Seminars addressed both male and female students and staff.
http://www.wiset.eps.manchester.ac.uk/

– The Autonomous University of Barcelona has drafted and discussed, in the framework of its Action Plan for gender equality, a **Guide to non-sexist language.** This Guide provides rules and plenty of examples in a wide range of documents in terms of use, length and style. Different sections address grammatical problems and solutions in the use of the feminine or neutral forms, while a specific section is devoted to stereotypical expressions which may be patronising or demeaning, and how to avoid them.
http://selene.uab.es/observatori-igualtat/PDF_2008/Us_no_sexista_del_llenguatge.pdf

Recommendation # 15
Fighting horizontal segregation

Horizontal segregation, i.e., the prevalence of one of the two sexes in specific sectors and occupations, integrates with and reinforces vertical segregation dynamics, and translates into the tendency of female researchers to be concentrated in some disciplinary areas. Attaching a gender to certain disciplinary areas and branches of studies is a logical consequence of gender stereotypes. Moreover, subtle lines of gender segregation are traceable not only between disciplines, but also among different domains and tasks within the disciplines.

LINES OF ACTION

Two lines of action can be identified as concerns the contrast to horizontal segregation dynamics:

– Be extremely detailed in analysing women's distribution in S&T careers and tasks;
– Point out stereotypes guiding career choices and task allocation.

Be extremely detailed in analysing women's distribution in S&T careers and tasks

Collecting data is of critical importance to assess women's status and progress in S&T (see also recommendation #23). Horizontal segregation only becomes apparent when detailed data are analysed making it possible to distinguish between within sectors and tasks. Examples are presented below of programmes trying to devise meaningful analytical categories to have an appropriate picture of women's situation.

– Many integrated programmes implemented in universities and research institutes plan the **collection of systematic data** on women's status within the involved organisation as their first step, thus identifying measures against which to assess progress. In such collections, internal data are usually broken up into specific analytical categories, thus highlighting both vertical and horizontal segregation dynamics. At the U.S. National programme Advance, promoted by the National Science Foundation, such collection is mandatory to receive a grant, and it must include data on the distribution of science and engineering faculty by gender, level, and department. Such analytic data collection has also been undertak-

en in the integrated programmes promoted by the Universities of Barcelona and Chicago.
http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5383
http://www.portal.advance.vt.edu/
http://selene.uab.es/observatori-igualtat/Indice.html
http://www.uicwisest.org/

– The already mentioned report on women and science in Italy, edited by the Italian non profit cultural association Observa, contains a classified collection of data and information gathered from the most authoritative national and international sources. The data reported on women's presence are **organised by the different S&T disciplines, sectors and career levels** and are matched with results from qualitative analyses on women's **self-reported attitudes** towards scientific and technological areas and tasks.
http://www.observa.it/

– To adequately measure and monitor girls' and women's participation in S&T fields, the Queensland Government's ***Smart Women – Smart State*** Taskforce and Office for Women highlighted the importance of a **life-cycle analysis of women's participation in S&T** to provide an accurate picture of women's participation and actual progress. A life-cycle analysis assists with the identification of gendered career trajectories and consequent priority areas of intervention at each stage of a woman's education and career.
http://www.women.qld.gov.au/work-and-life/smart-state-strategy/documents/set-action-plan.pdf

Point out stereotypes guiding career choices and task allocation

Stereotypes easily translate into career decisions reinforcing horizontal segregation. Actions to counter this tendency generally share the aim of **making segregating mechanisms**, which are often unconscious, **evident**, even if through different kinds of actions, exemplified below.

– A central feature of the ADVANCE-IT programme of the University of Colorado at Boulder is devoted to **enhancing awareness of the tacit mechanisms guiding decisions** about the attribution of tasks and to **broaden the candidates pool**. This also led to a study on male and female career paths and choices, exploring which choices are being made and how "voluntary" they really are.
http://www.colorado.edu/facultyaffairs/leap/index.html

– To understand the mechanisms reinforcing the gender division of labour in the ICT sector, and pushing women into segregated jobs and tasks (such as documentation, relations with clients, networking, etc.), the Spanish association of women technologists Donestech has devised and administered **300 questionnaires to women working in the sector**. The questionnaires have been analysed and the results published on the association web site, intended as an empowerment tool for women.
http://www.donestech.net/ca/recerca_icd

– In the Leadership Development for Women (LDW) programme, run at the University of Western Australia for more than 15 years, and oriented at developing women's leadership skills and advancing their career, **workshops encourage participants to examine the gendered cultures of their workplace**, to question what gets rewarded and what does not, and the effects of stereotypes on women's careers.
http://www.osds.uwa.edu.au/programmes/ldw

– Seminars delivered by national experts on unconscious gender bias schemas are delivered as **standard training to search committees members** in the framework of the ADVANCE-IT programme implemented at the University of Illinois at Chicago.
http://www.uicwisest.org/leadership-seminars.html

– The University of Technology Sydney's Women in Engineering Program applied insights gained over time to identify **how a new role in a restructure was gendered as female**, with the consequence that it was avoided by senior women.
http://www.eng.uts.edu.au/EducationandOutreach/wie/index.htm

Strategy two

Gender-aware science

Objective 2

Gendering scientific contents and methods

Part C

Chapter Seven

[Rationale]

Influencing the epistemological, theoretical and methodological approaches of science and technology is maybe the most ambitious goal an equality-oriented programme can set for itself, dealing with the deepest level from which more evident forms of discrimination may originate.

Having to deal with the long-lasting belief in the objectivity of science, programmes are often engaged in what can be considered cultural battles, aimed at **dismantling the myth of gender-neutral science**. Programmes in this area tend to concentrate on activities such as awareness-raising, education, training and dissemination, as well as in action-research, that tries to find evidence for the claim of the male-gendered nature of science and provide a basis for concrete programmes aimed at legitimising women's approaches and points of view on scientific research and innovation.

Belief in the gender-blindness of science is, as mentioned, one of the strongest yet most invisible barriers to women progressing in substantial numbers in S&T sectors. Putting such belief to the test and showing its shortfalls represent the first steps in an awareness-raising strategy which is a precondition for change.

It is possible however to document efforts to introduce real change in research or innovation design or to establish new research centres based on innovative theoretical and methodological frameworks. When this is the case, the effort towards equality matches **the search for excellence**, both in scientific research and in technological development, finally taking into account women's visions, needs and expectations.

[Recommendations]

Three recommendations can be drawn from experiences in this area.

 # 16 – Incorporating gender awareness in S&T education
 # 17 – Gendering research design
 # 18 – Acknowledging women's visions and expectations

Recommendation # 16
Incorporating gender awareness in S&T education

Belief in the gender-blindness of science is, as mentioned, one of the strongest yet most invisible barriers to women progressing in substantial numbers in S&T sectors. Putting such belief to the test and showing its shortfalls represent the first steps in an awareness-raising strategy which is a precondition for change. Education plays a key role here.

Teaching contents and methodologies, indeed, directly affect the conception new generations of students will form of their disciplines. Programmes focusing on the educational level are thus crucial in fostering an image of science including both genders' perspectives, especially in those disciplines whose deep-rooted image appears more removed from gender issues, such as the natural sciences and engineering.

LINES OF ACTION

Two main lines of action can be isolated as far as this recommendation is concerned:

– Promote gender studies in S&T departments (for gender studies promotion in general see recommendation # 4);
– Innovate S&T teaching methodologies and contents.

Promote gender studies in S&T departments

Gender studies have obviously a much greater potential to affect the contents, methods and educational style of S&T disciplines if they are rooted in S&T departments, rather than only in social sciences and humanities departments, as it is often the case. That's why programmes aimed at strengthening the impact of gender studies strive to reinforce their cross-sectoriality.

– The Action Plan for Equality of the Barcelona University includes the active promotion of gender studies within faculties or departments. Over the years, gender-oriented courses (both under-graduate and graduate), research groups and institutes have increased. To assess the actual success of its gender studies policy, the university has conducted a **university-wide analysis** taking into account the number and type of academic disciplines involved, with a particular emphasis on S&T-related disciplines. Introducing gender studies in these sectors is in fact considered to be a key factor affecting the gender-biased mechanisms of knowledge production. Subjects taught and researched in the gender studies programmes have been divided into "gender-specific" (directly gender-related) and "gender-sensitive" (indirectly gender-related). Gender-specific programmes have only been promoted in the fields of Health Sciences, Arts and Humanities, and Social Sciences, while just a few gender-sensitive programmes were organised in the field of the Natural Sciences (no one in Engineering and Computer Sciences). Building on these results, new targets for gender studies in S&T disciplines have been identified and an **advanced monitoring system** has been set up, involving the periodic analysis of gender studies integration, both as regards gender-specific programmes and gender-sensitive ones.

  http://observatori-diagnostics.uab.es/Recursos/Documents_PDF/Informe_Perspectiva_Genere_Docencia_UAB.pdf

– Universidonna, a programme funded under the European Social Fund and carried out in Italy by the University of Milan-Statale (Centre "Women and Gender Differences"), the Milan Polytechnic, the University of Milan-Bicocca and Orientamento Lavoro onlus, has entailed reviewing the gender studies programmes and

research of the participating universities through the **systematic mapping of graduation and doctoral theses, courses syllabi and research projects**. Through the identification of the disciplines and subjects concerned, and the determination of the male/female ratio among the teachers, the research directors and the students involved at different academic stages, the programme has produced detailed information and insight on the dynamics leading to the marginalisation of gender studies and approaches, in a pattern of horizontal segregation, thus contributing to devise effective strategies to counteract such dynamics.
http://www.universidonna.org/du/index.php?option=com_content&task=blogsection&id=6&Itemid=29&phpMyAdmin=Kaqa7Yp479zJozjS8ne5t7sVR46

– The Arizona State University organised an undergraduate course fully devoted to (en)gendering science and technology. Its purpose was to **explore how science and technology contribute to and are shaped by gender ideals and images**. In this perspective, the course deepened, on the one hand, how the social construction of gender gets reinforced or challenged through the technological world and, on the other, how gender impacts on technological systems. The Bryn Mawr College offered a similar course on gender and science, dealing with the role of women in the scientific enterprise, the contemporary feminist critique of scientific practice, and what both suggest for science education.
http://www.jillfisher.net/papers/WST394.pdf
http://serendip.brynmawr.edu/sci_cult/courses/genderscience/

– The Association of African Universities and the Association for the Development of Education in Africa published a comprehensive **toolkit for mainstreaming gender in higher education in Africa**. The text is organised into 10 different modules. One of them is devoted to the inclusion of a gender perspective into research contents and methods as well as into the exploitation and dissemination of its results. The ultimate aim of the toolkit is that of institutionalising gender as a dimension of research. Other modules deal with the inclusion of gender into faculty programmes and university curricula.
http://www.aau.org/wghe/gender/toolkit/Tooltik-complete.pdf

Innovate S&T teaching methodologies and contents

To “strengthen the pipeline”, that is, to increase the number of girls and women in science education and careers, programmes are carried out that critically review and question traditional teaching methods and test new approaches, or elaborate new curricula and provide guidelines. Some examples are provided of these approaches.

– As a component of the ADVANCE-IT programme of the University of Colorado at Boulder, **best practices in teaching science in college physics** have been collected, as evidenced by research-based studies in science and science education, both in general and specifically **addressing women and girls**. Studies have been sorted by research design (e.g., quasi-experimental, survey, ethnographic), and an evaluation has been made of the quality of

the evidence. Finally, the results have been synthesised and disseminated via the programme web site. Some alternative instructional methods have been demonstrated to be more promising for teaching physics. Among these are various activities that allow students to be active class participants, procedures or devices that give instructors a rapid way to assess their students' understanding during class, in-class opportunities to discuss understandings and difficulties, and activities specially designed to be fun, challenging and relevant.
http://www.colorado.edu/facultyaffairs/leap/activities/activities_02.html

– A project carried out by a partnership of U.S. universities has been **analysing the teaching methods** of 9 undergraduate physics schools, comparing those with "high" to those with "typical" results as for the number of female majors. A set of recommendations has been devised on the basis of results, which are being disseminated on the web sites of many other universities. The main findings highlight the role of a **female-friendly pedagogy**, implying the need to build high expectations and identify meaningful goals, the creation of a confidence-building atmosphere, the recognition and encouragement of female leadership, especially in labs, and the fostering of a spirit of cooperation, through group work and participatory classes.
http://www.coloradocollege.edu/dept/pc/WhatWorks2004/web%20pages/Home.htm

– Four S&T faculties (Technical Chemistry, Informatics, Mechanical and Industrial Engineering, Electrical Engineering and Information Technology) of the Vienna University of Technology organised gender training for teachers engaged in a **special PhD programme for Women in Technology**, in order to effectively deliver gendered contents in advanced science education. To meet this aim, the programme matched the traditional teaching of technical contents with the involvement of the students in workshops on science and engineering for school girls, and their collaboration in measures promoting women within the university, such as seminars, workshops and special events.
http://www.tuwien.ac.at/services/service/gender_studies/women_in_technology/EN/

– **Communicating a broader concept of engineering** and linking it with everyday applications and the interests of women has been a strong theme of the communications and creative strategies for the University of Technology, Sydney's Women in Engineering Program. This inspired the production of resources for technology teaching, and development of a more inclusive curriculum to encompass the ways in which technologies are contested and socially shaped, and the research and inventions of women.
http://www.eng.uts.edu.au/EducationandOutreach/wie/index.htm

– A **guide to teach ICTs in a gender perspective** has been drafted by Donestech, a Spanish association engaged in promoting a better relation between women and technologies. The guide addresses issues such as: applying the gender perspective to ICTs; women, ICTs, and the knowledge society; main obstacles and facilitating factors in women's access to ICTs; methodology and work organisation to support and train women in their relationship with ICTs. A collection of relevant best practices is also included. Obstacles, facilitating factors and methodologies are organised according to the following categories: motivation, access, learning process, use, contents.
http://www.donestech.net/ca/guia_didactica

– The ATHENA Thematic Network project, supported by the European Commission, in its effort to consolidate Gender Studies education and research in Europe, is developing European degree programmes in this field. The debate on this issues – developed through a series of seminars, conferences and scientific works – also included the possibility to develop gender studies curricula and research able **to challenge the premises and epistemological foundations of scientific disciplines** and to allow a critical analysis of science in its orientation to perpetuate forms of discrimination and even of exclusion of women.
http://www.athena3.org/images/documents/gender%20studies%20tuning%20brochure-final%20draft%202009.pdf

Recommendation # 17
Gendering research design

A set of programmes are concerned with demonstrating and exploiting the benefits connected with explicitly introducing the gender dimension in research design and organisation. Analysing these programmes, what we might call a "content-focused" approach to gender difference in S&T emerges which, beyond equality arguments, aims at finding a remedy for the strongly male-dominated conception and praxis of science.

LINES OF ACTION

There are **three main lines of action** relevant to this:

– Fund research on the gendered dynamics of knowledge production;
– Raise awareness of the advantages of gender-aware science;
– Devise practical or institutional tools to insert the gender dimension in research design.

Fund research on the gendered dynamics of knowledge production

Even though it can be characterised as basic research, reflection on the epistemological salience of the gender dimension can provide useful and concrete indications for action and is often funded in the framework of equality-oriented policies.

– Helsinki University promotes an internal Equal Opportunities Action Plan whose motivations are rooted, among other things, in an "epistemological perspective", maintaining that a more diverse academic community produces more multifaceted research and asks different questions, so that equality produces better and more innovative science. On these grounds the action plan provides for the **annual funding of gender equality projects dealing with the gendered dynamics of knowledge production**, whose results inform the university's equality agenda, so that gender studies promotion is seen as part of gender equality promotion.
http://www.helsinki.fi/henkos/tasa-arvo/TaSu_EN.htm

– The Women in Science unit of the Czech Academy of Science has co-ordinated an **EC funded research programme** involving 5 other European partners (all university institutes) investigating **how epistemological frameworks are influenced by categories such as that of gender,** with the intent of providing a sound knowledge base sustaining equality policies. The project has in particular analysed selected scientific institutions in the partner countries to investigate and compare the ways in which interactions between regional and national contexts and histories, hegemonic discourses, institutional politics and practices affect the motivations, research interests, epistemological frameworks and career trajectories of women and men in science.
http://www.knowing.soc.cas.cz/?page=home

– A space for reflection available to scholars with different disciplinary backgrounds has been created through the editing of a **quarterly magazine** dedicated to the issue of gender and science and their interlinks, by the above mentioned Czech Academy of Science. The magazine starts from the observation that major theories in the last thirty years are built on specific contexts and aims at **documenting the importance of contexts for generating knowledge**. Since gender is one of the most important structuring variables of society, it cannot but have an impact on the structuring of science.
http://www.zenyaveda.cz/html/index.php?s1=1&s2=3&s3=16&s4=3

Raise awareness of the advantages of gender-aware science

Very different types of actions are grouped under this category, encompassing public communication programmes and media campaigns, drafting of handbooks, networking and lobbying activities.

– The Fraunhofer Gesellschaft, a German public research agency has launched a **research and public communication programme** (DiscoverGender) analysing and widely disseminating, through publications, conferences and the media, how taking gender and diversity aspects into account can lead to completely new ideas for products and new applications for technology. The message the project has widely communicated is that **women and men have different expectations about products**, and that **men primarily think of men when they develop a new product**. For

example, a “functional food” study which was carried out as part of the project showed that women are more interested than men in “smart packaging” that indicates whether the food is spoiled. Men, on the other hand, would be far more interested in an “intelligent refrigerator” which automatically re-orders food and gives nutritional tips. This message stressed that if companies took the use of gender-specific applications into consideration in the development of products and services, they could open up valuable opportunities for optimising outcomes. New ideas would help to establish new markets and – with the help of gender-sensitive usability methods – expand and develop existing ones.

http://www.fraunhofer.de/archiv/magazin04-08/fhg/Images/magazin-1-2007-62_tcm5-72815.pdf

– The Committee for Mainstreaming – Women in Science, a public-status Norwegian agency made up of universities and research institutes, which is in charge of promoting equality policies in the fields of science and technology, has launched a **communication campaign on the “E-Quality” of scientific research**, thus linking equal opportunities and the issue of quality of S&T outputs. According to the programme approach, research of high quality is dependent on the research community’s ability to ask the right questions and to assess the various answers. In this perspective, quality is best assured in an environment which accommodates different kinds of people with different experiences.

http://eng.kvinneriforskning.no/c63090/seksjon.html?tid=63091

– To offset the tendency to make women invisible, not only as producers but also as subjects of research, the Czech Academy of Science has launched an analysis of research based only on male situations or studying only male subjects. On the basis of the results, a **manual for researchers** has been drafted and disseminated to help them recognise how gender bias occurs in research, and to check for that in their research proposals.

http://www.cec-wys.org/html/index.php?s1=1&s2=10&s3=6&s4=3&s5=0&s6=0&m= 1&typ=clanky&recid_cl=1951

– To develop and promote the notion of women scientists and the role they can play in **enhancing competitiveness and innovation in Europe**, the Europe-wide network European Platform for Women in Science (EPWS) has joined two high-profile “Policy Forums” on the subject of innovation: the Science Business Policy Bridge and the European Policy Centre Innovation Taskforce, bringing together representatives from industry, academia, EU institutions, the media and interest groups. The intent is to give exposure to the concerns and needs of women in scientific and technological research not just at the political level, but also within business circles, the media, and beyond.

http://www.epws.org/index.php?option=com_content&task=view&id=325&Itemid=4668

Devise practical or institutional tools to insert the gender dimension in research design

The examples provided for this line of action range from relatively simple and inexpensive tools, to well-articulated institutional programmes, dependent on strong political support and adequate funding.

– The above-mentioned German public research agency Fraunhofer Gesellschaft has developed a questionnaire addressing engineers working in the field of technological development. The questionnaire is structured in the form of a **check-list finalised at verifying if gender aspects were included in product design**, thus adopting a tool engineers are familiar with. Examples are also provided about the negative impact on product development and success of not integrating gender.
http://www.genderchancen.de/EN/

– The Women's Network in Archaeology has been established in Germany based on the belief that gender is an important analytical category within each group, culture, social class and period of time. However, it is not adequately inserted into the picture in standard archaeology. Women and women's topics are rarely studied or they are interpreted in relation to a male backdrop. The network is thus intended as the **institutional tool which makes it possible to concretely re-think traditionally held methods and concepts** within archaeology and related fields, with the aim to redefine modern scholarship.
http://www.femarc.de/Netzwerk/text/naafweb1.html

– The Austrian Research Promotion Agency, in the framework of the "w-fFORTE – Laura Bassi **Centres of Expertise**" programme has established several centres of excellence, located at the interface with industry, to carry out applied basic research in the natural sciences, engineering and technology. At each centre, the position of research director is held by a woman and women must be adequately represented in the composition of research teams. The programme has the goal of fostering a creative and innovative look at research topics, with impetus for **a more gender-equal design of research projects**. To this end, in addition to traditional quality criteria, the following are valued and sought after: the creation of new links between **inter-disciplinary and trans-disciplinary approaches** to research as the prerequisite for research and innovation; career development that is commensurate with women's qualifications and potential, so to have **more women in senior positions**; **team-oriented and inter-cultural research**, in the belief that rigid hierarchies hinder creative science, while diversity leads to success; **transparent, project-oriented research management** that recognises development potential, consciously structures the transfer of knowledge, allows every member of the team to contribute to development and creates identification.
http://www.w-fforte.at/en/laura-bassi-centres.html

– In 2009, the European Commission published in the **Toolkit** "Gender in EU-funded Research", providing an overall introduction to gender in research, and concrete tools on **how to make research gender-sensitive** (including topics such as: The gender-sensitive research cycle; Participation of women and men in research; Gender in research content; Check-list for gender in research). Besides, examples are provided of gendered contents in different disciplines and on different topics, such as health, energy, nanosciences, environment, transport.
http://www.yellowwindow.be/genderinresearch/downloads/YW2009_GenderToolKit_Module1.pdf

Recommendation # 18
Acknowledging women's visions and expectations

Recognising and documenting the existence of different gender approaches to science and technology, without buying simplistic gender stereotypes, has the twofold objective of identifying subtle and often hard to detect barriers to women's full participation in S&T disciplines and at the same time finding the key to making the most of their potential, innovating the fields they contribute to.

LINES OF ACTION

In the same way, programmes in this area tend to be oriented by two distinct intents, translated into **two different lines of action**:

– Identify and address critical issues in women's relation with S&T;
– Develop women's approaches to S&T.

Identify and address critical issues in women's relation with S&T

This first line of action is focused on analysing women's relationship with male-gendered S&T and finding remedies for critical points in this relationship. The examples reported deal with information and communication technologies, where differences in approach have been more frequently analysed.

– For the Italian feminist association Associazione Orlando, the strongly male character of information and communication technologies is at the heart of the wide gap between women's visions and expectations and available hardware and software. The association has thus promoted a **web-based search-engine taking into account women's points of views, questions and languages**, also through the compilation of a specific thesaurus, and supports the creation of gender-sensitive software.
http://www.women.it/cms/

– The Spanish association Donestech has carried out a study on **women's projects and personal or collective practices** in relation with information and communication technologies. The study particularly focused on those women who develop electronic tools and software, to understand how they accessed technologies, how do they used them, and under what conditions they were able to

integrate a gender perspective in their work. From the experience of these women, the study has identified attitudes, representations and practices that discriminate against women in ICTs. The practical result of the initiatives has been the establishment of a **web-page** containing gender-sensitive tools and resources for women to use and work with ICTs.
http://www.donestech.net/

Develop women's approaches to S&T

This second line of action aims to connect gender differences to potential career paths in the framework of the contemporary modes of production of S&T.

– The recognition of the importance of the gender dimension in science has been matched – by the Italian training institute Trentino School o Management – with an emphasis on the new competencies needed in modern science. Training activities addressing graduate women have thus been aimed at **developing highly-qualified profiles** engaged in new S&T-related professions, characterised by the increasing **stress on science contextualisation** with respect to its social, political and economic environment, which is consistent with women's attitudes towards S&T as they emerge from many studies.
http://www.tsm.tn.it/documenti/formazione_manageriale/2005_fse_COMING_Orientamento_e_consulenza_alle_competenze_di_mediazione_scientifica.pdf

– The study of the occupational distribution of women in the ICT sector in three European countries, conducted in the framework of the European project "Women and job mobility: obstacles and solutions for women in Information and Communications Technologies (ICTs)" highlights the need for "soft skills" in the sector as a circumstance that is favourable for women, who more easily combine technical and soft skills. To make the most of this opportunity, the project has organised sensitisation activities addressed to human resources managers, local players, social partners and training institutions, also proposing the adoption of a **self-assessment tool for soft-skills**.
http://ict.womenmobility.org/carreras.php#

Strategy three

Women's leadership of science in a changing society

Part D

Introduction

More women in leadership positions in science and technology

Attaining gender balance in leadership positions represents one of the main objectives to be pursued for supporting women in S&T sectors. What is at stake is quite intuitive. An increased presence of women on the top is decisive in triggering an overall change in science, in both its practices and contents.

It is more difficult to understand **how this process can be supported in practice**, since the factors hampering women in reaching leadership positions are many, of different nature, usually interconnected and often so rooted in culture and social behaviours that they are very difficult to detect and remove.

It is also paramount to identify **which are the actual positions in science and technology where leadership is expressed**. As already pointed out (see part A), the rapid and profound changes that in the last decades have affected both the way in which science is produced, communicated and exploited, and the overall relationship between science and society, profoundly modified the structure of power in this sector. In the shift from “academic” to what has been called “post-academic” science, many leadership positions are increasingly connected to previously neglected aspects of the scientific process.

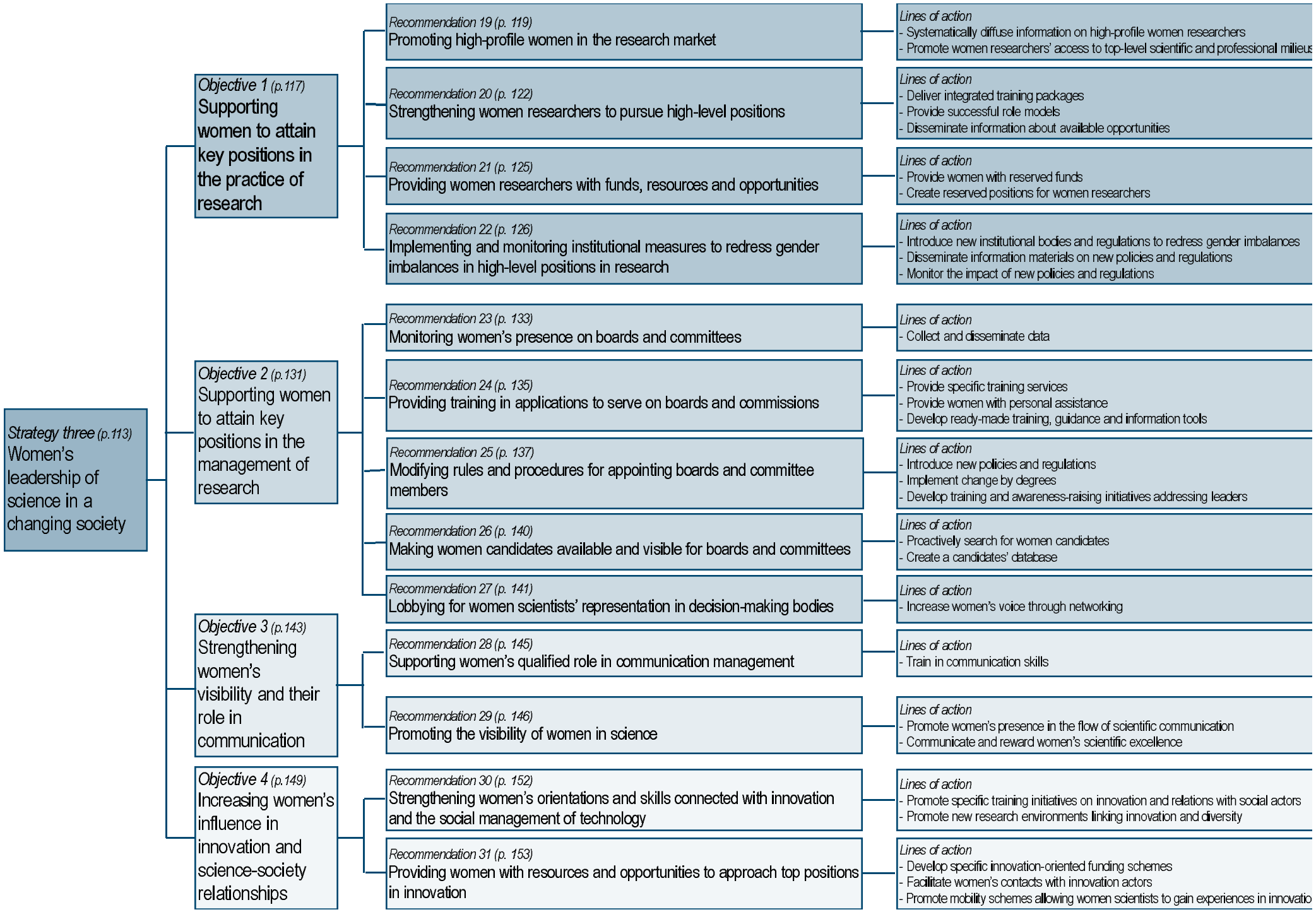
In this perspective **four sets of recommendations** are included in this part of the guidelines, having as their objective different leadership areas in post-academic science:

Objective 1 - The practice of research (chapter eight);

Objective 2 - The management of research (chapter nine);

Objective 3 - Scientific communication (chapter ten);

Objective 4 - Innovation and science-society relationships (chapter eleven).


Strategy three (p.113)
Women's leadership of science in a changing society
Objective 1 (p.117)
Supporting women to attain key positions in the practice of research
Recommendation 19 (p. 119)
Promoting high-profile women in the research market
Lines of action
- Systematically diffuse information on high-profile women researchers
- Promote women researchers' access to top-level scientific and professional milieus
Recommendation 20 (p. 122)
Strengthening women researchers to pursue high-level positions
Lines of action
- Deliver integrated training packages
- Provide successful role models
- Disseminate information about available opportunities
Recommendation 21 (p. 125)
Providing women researchers with funds, resources and opportunities
Lines of action
- Provide women with reserved funds
- Create reserved positions for women researchers
Recommendation 22 (p. 126)
Implementing and monitoring institutional measures to redress gender imbalances in high-level positions in research
Lines of action
- Introduce new institutional bodies and regulations to redress gender imbalances
- Disseminate information materials on new policies and regulations
- Monitor the impact of new policies and regulations
Objective 2 (p.131)
Supporting women to attain key positions in the management of research
Recommendation 23 (p. 133)
Monitoring women's presence on boards and committees
Lines of action
- Collect and disseminate data
Recommendation 24 (p. 135)
Providing training in applications to serve on boards and commissions
Lines of action
- Provide specific training services
- Provide women with personal assistance
- Develop ready-made training, guidance and information tools
Recommendation 25 (p. 137)
Modifying rules and procedures for appointing boards and committee members
Lines of action
- Introduce new policies and regulations
- Implement change by degrees
- Develop training and awareness-raising initiatives addressing leaders
Recommendation 26 (p. 140)
Making women candidates available and visible for boards and committees
Lines of action
- Proactively search for women candidates
- Create a candidates' database
Recommendation 27 (p. 141)
Lobbying for women scientists' representation in decision-making bodies
Lines of action
- Increase women's voice through networking
Objective 3 (p.143)
Strengthening women's visibility and their role in communication
Recommendation 28 (p. 145)
Supporting women's qualified role in communication management
Lines of action
- Train in communication skills
Recommendation 29 (p. 146)
Promoting the visibility of women in science
Lines of action
- Promote women's presence in the flow of scientific communication
- Communicate and reward women's scientific excellence
Objective 4 (p.149)
Increasing women's influence in innovation and science-society relationships
Recommendation 30 (p. 152)
Strengthening women's orientations and skills connected with innovation and the social management of technology
Lines of action
- Promote specific training initiatives on innovation and relations with social actors
- Promote new research environments linking innovation and diversity
Recommendation 31 (p. 153)
Providing women with resources and opportunities to approach top positions in innovation
Lines of action
- Develop specific innovation-oriented funding schemes
- Facilitate women's contacts with innovation actors
- Promote mobility schemes allowing women scientists to gain experiences in innovatio

Strategy three

Women's leadership of science
in a changing society

Objective 1

Supporting women to attain key positions in the practice of research

Part D
Chapter Eight

[Rationale]

Vertical segregation of women in the very practice of research is probably **the most basic question to be addressed** from the perspective of an overall gender balancing of science and technology. The history of science provides manifold examples of outstanding women scientists who have been marginalised by the scientific community, who made discoveries that have been attributed to their male colleagues, or simply who have seen their career blocked or diverted towards less valuable positions in order to give room to male scientists. All that is particularly disturbing since science is supposed to be the sector in which merit and personal capacities should receive the utmost recognition.

Therefore, it is completely comprehensible that promoting women to leadership positions in the concrete practice of research remains one of the main objectives pursued by programmes oriented at gender equality in scientific and technological sectors. This allowed the consolidation of a broad range of experience in this field, where many new approaches have been developed and tested.

Different paths approach the question from different complementary directions, such as the **distribution of resources**, the **modification of institutional and organisational mechanisms**, and the social and academic **recognition of scientific endeavours**.

[Recommendations]

Overall, **four main recommendations** to sustain women in the practice of research have been identified.

 # 19 – Promoting high-profile women in the research market
 # 20 – Strengthening women researchers to pursue high-level positions
 # 21 – Providing women researchers with funds, resources and opportunities
 # 22 – Implementing and monitoring institutional measures to redress gender inbalances in high-level positions in research

Recommendation # 19
Promoting high-profile women in the research market

One of the main factors usually mentioned among those hindering the access of women researchers to leadership positions is their lack of visibility within the research market, the community of university administrators, the private sector or their own disciplinary community. This recommendation, therefore, is aimed at redressing this imbalance through specific initiatives providing high-profile women legitimately aspiring to attain leadership positions in scientific practice with the space and opportunities to become more visible.

LINES OF ACTION

Two main lines of action can be identified:

– Systematically diffuse information on high-profile women researchers;

– Promote women researchers' access to top-level scientific and professional milieus.

Systematically diffuse information on high-profile women researchers

The first line of action is intended to systematically provide information on highly qualified women to be employed in top professional and scientific positions. The tool more frequently used to implement this line of action is that of **creating databases** on female researchers and experts.

Three examples, in this regard, can be provided.

– The Austrian Research Promotion Agency set up a database conceived as a service available to everyone who is looking for female scientists and experts, whether they be universities, technical colleges, research institutes, businesses, administrations and other private and public institutions. The database encompasses around **25 different areas of expertise** (from forensic medicine to climate protection) providing, for each expert, personal details and address, work experience, language skills, interests as expert, other qualifications and publications. Users are requested to fill out a form specifying their needs and the reasons why they are looking for an expert.
http://www.femtech.at/index.php?id=65&L=2

– The creation of a women scientists' database is often backed by complementary communication activities aimed at promoting the use of the database among potential employers. This is the case of an **interdisciplinary database** of women scientists from four central European countries established in the Czech Republic by the National Academy of Sciences. For each scientist the database provides personal details and information about current institutional affiliation, position, education, research experience, fellowships, papers, national and international projects. The database is part of a broader project including other information about activities such as the organisation of seminars, and the diffusion of information flyers. The launch of the database has been supported by **dissemination activities** aimed at raising awareness on gender inequality in research institutions.
http://www.cec-wys.org/html/index.php?s1=1&s2=7&s3=2&lng=13

– A database developed in Germany by the Center of Excellence Women in Science (CEWS) contains information on several thousand **German-speaking women scientists** of all academic fields, eligible not only for professorships and professional works, but also for other kinds of university positions, such as mentor, expert, panel member or referee. The database is conceived in a way to

easily bridge offer and supply by directly connecting women experts with their potential employers.

http://www.femconsult.de/

http://www.femconsult.de/femconsult/LuceneQuery?style=home

Promote women researchers' access to top-level scientific and professional milieus

It is considered particularly important to promote the direct contact of highly-qualified women scientists with top-ranking scientific and professional milieus. It is by now generally recognised that women have fewer opportunities to establish informal relations with potential employers or high-ranking scientists, and may experience more difficulties in accessing prestigious research centres and universities.

– Networking is a key strategy used to pursue this objective. One example is given by the Rural Women's Network, a government funded program in Australia within the New South Wales Department of Industry and Investment, which was established in 1992 to enhance communications, promote information exchange and provide a voice for rural women to government. This approach to networking continues to focus on strengthening relationships and developing project ideas that bridge identified gaps in the rural sector. A significant feature of the network is that it involved **key stakeholders** from the start. These included institutions, government and non government agencies and rural women themselves. This has resulted in a robust network which penetrates across diverse sectors of society, creating links between rural women, their prospective supporters, agencies and decision-makers.

  www.dpi.nsw.gov.au/rwn

– Another approach is that adopted by the "Prix Excellencia – Trophée de la Femme Ingenieur High-Tech", a programme by a non profit entity in France (Innovative Europe – Excellencia Awards Committee) and focused on the establishment of an **award for women engineers in the high-tech sector**. The promoters of the award, who also participate in the jury, are drawn from among the most prestigious schools and firms in the sector, and the winners – but also many candidates – are often offered the opportunity to start a career in one of them, or in connected entities. The award is thus a tool allowing brilliant women engineers to gain a prestigious audience for their ideas, and to directly establish personal contacts in a high-profile environment.

  http://www.innov-europe.eu/in/index.php?option=com_content&task=view&id=18&Itemid=35

Recommendation # 20

Strengthening women researchers to pursue high-level positions

To avoid the dynamics of self-exclusion, it is crucial to strengthen women scientists' orientation to and effectiveness in pursuing leadership positions. Ii is particularly important to create some form of "connection" between senior women scientists and those potentially interested in pursuing leadership positions in scientific and technological research, in order to facilitate the transfer of explicit and tacit knowledge and know-how, as well as to provide expert advice.

LINES OF ACTION

This recommendation can be implemented through at least **three different lines of action**, which can also be used in combination with each other:

– Deliver integrated training packages;
– Provide successful role models;
– Disseminate information about available opportunities.

Deliver integrated training packages

One approach to increase the orientation and effectiveness of women in pursuing leadership positions is based on the delivery of integrated training packages.

– Training can be usefully connected with **other initiatives**. For example, the Computer Research Association's Committee on the Status of Women in Computing Research (CRA-W) promoted a composite programme to increase the number of women in industrial and governmental labs. The programme strives to build a community of senior researchers and professors providing younger women with a broad set of training opportunities, including **mentoring**, **leadership training** and **advice services**. The programme revolves around the organisation of **workshops**, where senior scientists and women interested in pursuing top positions in their career tracks can meet. Among the issues addressed are how to be promoted as a full professor and how to reach the top of the technical ladder in the research labs.
  http://www.cra-w.org/CAPP-L-2008

– The connection of mentoring and training services with **networking** is also fruitful, as witnessed by the EU-funded TANDEMplusIDEA programme, conducted by a consortium of Imperial College London, TU Delft, ETH Zurich and, as coordinator, RWTH AACHEN Integration Team, which developed an International **mentoring scheme** to prepare qualified female scientists for a high-profile scientific career and professorship and provided **training services** on career development. The mentoring scheme is supported with **networking events**, allowing participants to meet and exchange experiences.
  http://www.idealeague.org/tandemplus

– The training package may be also delivered at a distance, using ICTs. In this regard, the “Tailored e-coaching” programme promoted by the Manchester Business School can be mentioned, even though it focused on women’s entrepreneurship. The programme is centred on the provision of structured **online coaching services** providing women with customised support. Coaches and coachees become part of a network, maintained mainly through the **programme website**, allowing them to access a set of resources (a coaching handbook, information, contacts, etc.). The success of this kind of programmes, however, heavily depends on the user-friendliness of the software adopted.
http://www.mbs.ac.uk/research/equalitydiversity/documents/Ecoaching2007ESFReport.pdf

– Training initiatives addressing women scientists can also be short in their duration and highly focused in their aims. It is interesting, in this regard, the case of a **four-day training seminar** organised by the German Centre for Excellence Women in Science (CEWS). Targeting women scientists, it is specifically intended to motivate and support them to **apply for professorships** in six European countries. To this end, the seminar provides the attendees with overall information on issues such as international appointment procedures or how to conduct negotiations at universities, strategic networking in science, and research funding at the European level. The training package also includes individual career-planning support to female senior researchers.
http://www.cews.org/cews/en/bertra.php?cid=420&aid=73&lid=en

Provide successful role models

Many of the programmes addressing leadership issues for women scientist provide, among other benefits, the chance to meet successful researchers who can act as role models. In some programmes this aim is made explicit and women who attained top positions in science and technology are involved in order **to balance the dominant cultural view connecting leadership with male roles**.

– Role modelling is often associated with training. In the case of the American Computer Research Association's Committee on the Status of Women in Computing Research (CRA-W), a complex training programme for women interested in leadership positions in scientific research is based on the **involvement of senior women scientists**, both directly in leadership training and in other kind of support activities.
http://www.cra-w.org/capp

– Meetings and seminars on leadership can also be the occasion for role modelling. A good example is provided by a **leadership conference** co-organised by the Canadian University of Guelph and other American universities on the under-representation of women in high-level scientific positions. The conference was also aimed at providing **diverse leadership role models**, in order to encourage attendees **develop their personal leadership vision**.
http://www.weli.eng.iastate.edu/Conferences/Syracuse2004/Flyer.pdf

Disseminate information about available opportunities

Another line of action revolves around the dissemination of appropriate information specifically targeting women about existing opportunities and is based on the observation that female scientists' access to opportunities is structurally more limited than that of their male colleagues. The notion of "opportunity" is used here to refer to a broad range of factors and situations, such as participation in conferences, accessing useful information for career advancement, accessing publications, presenting one's work to qualified audiences, contacting relevant institutions, working for a period in other institutions or accessing training courses. One of the reasons behind women's lower participation in leadership may lie in their being less involved in informal networks, where such information very effectively circulates.

– In the framework of its application to the ATHENA SWAN charter awards, the Chemistry Department of the University of York launched some actions specifically intended to increase women's **access to existing opportunities**. Among them are the development of a web site detailing courses, opportunities and information useful for female faculty; advertising among women the availability of training opportunities; advertising among women researchers (especially those returning after a career break), new funding opportunities, etc.
  http://www.york.ac.uk/research/athena/charter.htm

– The Czech Academy of Sciences regularly publishes a **newsletter** providing information on activities in science and research, conferences, grants and fellowships from a gender perspective. Under the same programme, a **website** has also been created providing information about study opportunities, grants, fellowships and links to other websites giving information on specialised literature.
  http://www.zenyaveda.cz/html/index.php?&lng=13

– In the case of a dissemination campaign organised by the Autonomous University of Barcelona, information delivered was extremely specific and regarded **available post-doctoral grants**, with the aim of encouraging women faculty to apply.
  http://selene.uab.es/observatori-igualtat/Angles/Plans_Accio_Index.html

– In other cases, information campaigns are promoted that address the whole issue of women's access to top positions in research to a mixed-sex audience. It is the case of the programme aimed at improving new full professors' capacity to "Lead Excellence", organised by the University of Michigan, as a component of its ADVANCE-IT programme. The tools used in this programme deserve a special attention. In addition to a traditional workshop format, where issues are introduced through brief lectures by senior researchers and University leaders, there are **theatre sketches** that reproduce typical academic situations, immediately recognisable and amusing, in order to prompt discussion on leadership issues.
  http://sitemaker.umich.edu/advance/stride

Recommendation # 21

Providing women researchers with funds, resources and opportunities

This recommendation sees the lack of research funds and other research-related material resources (such as equipment and lab space) as one of the main factors hindering gender-balanced access to top positions in scientific career tracks.

LINES OF ACTION

This recommendation can be implemented through **two different lines of action**:

– Provide women with reserved funds;

– Create reserved positions for women researchers.

Provide women with reserved funds

Establishing grants restricted to women is a practice that may balance the distorting factors hampering the access of women to research funds. Internal regulations or national laws, however, can limit or forbid such practice. In these cases, funds are established that, even though available to both male and female researchers, address problems often experienced by women.

– One relevant case is represented by the **independent funds for female researchers** delivered by the Slovenian Science Foundation. The aim is to favour women's hiring by science- or technology-oriented companies, or the further advancement of those already working in such companies. In this way, both parties benefit from cooperation: the women from the chance to broaden their career opportunities, and the companies from access to new expertise. The funds (up to € 5,000) are provided on the basis of a specific plan of career-advancement proposed by the candidate.
http://www.szf.si/?lang=slo

– The New Mexico State University ADVANCE-IT programme provides funds for **professional development** (such as the improvement of teaching or managerial skills). Even though these activities can be helpful for women, funds are not limited to them.
http://www.advance.nmsu.edu/Resources/MiniGrants/index.html

Create reserved positions for women researchers

One possible way to promote the access of women to career opportunities in the scientific domain is that of creating new positions reserved to them. As for reserved funds, it may not always be possible to implement such programmes, since internal policy or national law may prohibit positive actions of this kind.

– Reserved positions can be established to broaden **research opportunities for women**. One valuable example is that of VINNOVA, the Swedish government agency that administers state funding for research and development, promoting **inter-university projects headed by women scientists** as a mandatory requirement, in order to partially balance the number of state-fund-

ed projects headed by male scientists. Following this same philosophy, the programme covers **mobility costs** of female researchers to other institutions and enterprises, both in the country and abroad.

http://www.vinnova.se/In-English/Activities/Strong-research-and-innovation-environments/VINNMER

– The same approach is adopted by some universities in the United Stated to increase the opportunities for women to access high-profile **teaching positions**. The NSF-funded ACES programme at the Cleveland-based Case Western Reserve University created 3 new endowed chairs for women faculty in the field of science and engineering. Overall, the number of women faculty holding endowed chairs in these faculties increased from 8 to 15 in the period 2003-2008. In order to make the creation of new chairs possible, specific fundraising activities have been carried out. It is to notice that the creation of reserved chairs for women is strongly facilitated in the US university system, where sponsored chairs are relatively widespread.

http://www.advance.vt.edu/Advance_2008_PI_Mtg/Case_Western_ADVANCE_2008.pdf

Recommendation # 22

Implementing and monitoring institutional measures to redress gender inbalances in high-level positions in research

A big effort is made by many programmes supporting women in science and technology to identify and modify those factors which hinder the equal access of women to senior positions in the scientific careers. Although being of different nature (legal, social, relational, cultural, etc.), these factors basically concern the way in which research institutes work and are organised. Addressing institutional and organisational mechanisms penalising female scientists often triggers broader change processes within the institution.

LINES OF ACTION

Due to the variety of factors involved, this general recommendation generates different kinds of actions. Overall, **three main lines of actions** can be singled out, to be applied in combination with each other:

– Introduce new institutional bodies and regulations to redress gender imbalances;
– Disseminate information materials on new policies and regulations;
– Monitor the impact of new policies and regulations.

Introduce new institutional bodies and regulations to redress gender imbalances

To redress gender imbalance, some programmes choose to create new specialised institutional bodies. This may be part of a broader action in support of women, but it usually includes measures to specifically address the problem of the limited presence of women in high-level research roles. In other cases, new policy and regulation are introduced, some of which particularly effective, as in the case (extremely rare, actually) of quotas.

– The forms assumed by the new body and the task assigned to it can be different. One possibility is that of creating a **committee**, like in the case of the Spanish CSIC (Consejo Superior de Investigaciones Científicas), in charge of developing diagnoses and analyses of the constraints to women's career and suggesting policy measures. This action is framed within a broader **plan** intended to introduce new procedures and better standards in the daily life of the organisation.
http://www.csic.es/mujerCiencia.do

– Similarly, at the University of Michigan a **committee** composed of distinguished senior faculty (both men and women) has been established in order to improve diversity within the university personnel. The committee is engaged with developing new strategies and tools for increasing the likelihood that diverse well-qualified candidates for faculty positions would be identified, selected, retained and promoted up to top-level positions. The committee also organises peer education workshops for their colleagues in order to disseminate new tools and diversity procedures. These workshops are mandated for members of faculty search committees.
http://sitemaker.umich.edu/advance/home

– The choice made by the WISELI (Women In Science and Engineering Leadership Institute) programme, at the University of Wisconsin-Madison, has been different. Rather than an institutional body, a **new research institute** specialising on women, science and leadership has been created. On the basis of the research activities carried out, the institute promoted, among other things, a **working group** including representatives from the Academic Staff Council and administration, aimed at identifying and modifying administrative, financial, and attitudinal barriers hindering or slowing down the access of women to top positions. Moreover, the institute develops and disseminates new leadership development approaches and tools addressed to mid-career and senior women.
http://wiseli.engr.wisc.edu/

– Simple but potentially powerful institutional policy and regulation to be introduced are those aimed at **increasing the accountability of research institutions** with respect to women's advancement. For example, the Spanish CSIC (Consejo Superior de Investigaciones Científicas) introduced a new regulation establishing that all the institutes and research centres produce an **annual report** in which, for all career levels and career paths, data on the

gender composition of personnel are given. The annual report is also intended to provide information on the measures adopted to promoting women and their impact.
http://www.csic.es/mujerCienciaInformes.do

– **Quotas** represent a controversial but certainly effective measure to redress gender imbalances, also as regards high-level individual positions. The Academy of Finland has for instance introduced, in its Equality Plan, the provision according to which if the percentage of one underrepresented gender falls below 40 per cent for a position, even if two applicants are equally qualified or only slightly differ in their level of qualification, the representative of the underrepresented gender shall be selected.
http://www.aka.fi/en-gb/A/Science-in-society/The-research-career/Equality/

Disseminate information materials on new policies and regulations

The second line of action is intended to increase the awareness levels of the barriers preventing women from accessing high-level positions in research, presenting the measures and the materials that can be used to overcome them. Obviously, the tools to be used can vary widely.

– The web provides the opportunity to increase awareness and disseminate new procedures and good practices. A good example is a **web-based package** developed by the Georgia Institute of Technology, addressing both female faculty and university leaders on gender bias in the promotion mechanisms. The package is aimed at increasing the capacities of identifying forms of bias in evaluation processes, to increase their fairness and objectivity. The package consists of a downloadable application that contains **case studies and related materials and tests** appropriate for group discussion or individual use by candidates, members of committees, and other faculty. Another interesting example is provided by the website of the University of Michigan.
http://www.adept.gatech.edu
http://www.sitemaker.umich.edu/advance/home

– Often, **workshops** and **meetings** are organised to improve officers and faculty members' awareness of the difficulties women experience in trying to access top positions in science. This is the case of **one-day workshops** organised by the Autonomous University of Barcelona in the framework of a broader programme aimed at removing the obstacles to professional promotion of women within the academic staff. The workshops involve concerned university executives and officers, and are intended to identify the mechanisms penalising women in their scientific career paths, with special reference to top positions. The workshops are expected to produce guidelines and to suggest new measures to be put into place within the organisation.
http://selene.uab.es/observatori-igualtat/Angles/Action_plan_2008_2012.pdf

– Some programmes include the issue of women's advancement in top scientific positions in broader communication initiatives, using

different tools such as **newsletters**, **web-based information** and **networking**. A meaningful case is that of the European Platform for Women in Science (EPWS), which promotes a large sensitisation action among universities and research institutions, aimed at promoting **Europe-wide monitoring mechanisms** on women's career advancement, in the framework of a larger monitoring activity on women's condition in science and technology.

http://www.epws.org

Monitor the impact of new policies and regulations

One need widely perceived in university settings is that of creating new and more effective tools and procedures in order to evaluate implemented policies and measures by monitoring the advancement of women.

– In many cases, this aim is pursued by conducting a **research** or a **data gathering process** intended to draw a picture of women's situation in all positions, including top scientific roles. This activity is generally performed at the beginning and at the end of the new programme, even though some permanent measure foresees annual activity reports providing information about changes in the figures of women in leadership positions.

http://selene.uab.es/observatori-igualtat/PDF_2008/Informe_Perspectiva_Genere_Docencia_UAB.pdf

http://www.equality.gov.mt/filebank/Research%20Findings%20-%20UNESCO.pdf

http://www.universidonna.org/du/files/osservatorio/report_final_v1-ballarino.pdf

http://cohesion.rice.edu/CentersandInst/Advance/emplibrary/Fastlane%20Climate%20Survey.pdf

– Monitoring is sometimes carried out as a **specific institutional task**. This is the choice made in the Autonomous University of Barcelona "Observatory for Equality" programme, which promoted the appointment of a **person in charge of monitoring** the impacts of equality policies for each of the governing teams of research centres and departments. The appointed officers are viewed as members of a central "**monitoring network**" acting at university level.

http://selene.uab.es/observatori-igualtat/Angles/Action_plan_2008_2012.pdf

– Monitoring actions can be also developed through **informal initiatives**. For example, in the framework of the Georgia Tech ADVANCE-IT programme, informal **periodical conferences and workshops** involving women faculty, provosts, deans and school chairs are organised to review and refine goals and progress of women's advancement in their career tracks.

http://www.advance.gatech.edu/archive/misc/sum%20of%20accom%20site%20visit.pdf

Strategy three

Women's leadership of science
in a changing society

Objective 2

Supporting women to attain key positions in the management of research

Part D
Chapter Nine

[Rationale]

The second objective of a strategy aimed at enhancing female leadership in science and technology is quite obviously that of **putting more women**, not just in individual high-level research positions (see chapter eight), but also **in decision-making bodies** and in **key managerial positions** connected to science and technology, at all levels (departmental, university, national, European, etc.).

Pursuing this objective is actually a difficult endeavour, since the dominance of men in governing bodies is still widespread and constantly recreated by habits, rules, procedures, cognitive representations, cultural orientations and languages.

The question is not new, and of course it does not concern only science and technology. There is a large and well-established stock of scientific literature on this argument. What is perhaps new in the last two decades or so is that a **wealth of experience and know-how** developed on how to cope with the vast array of obstacles met by women in entering committees, boards and managerial positions in the sector of science and technology.

An important part of this experience and know-how has been produced by the many programmes aimed at bringing women into S&T decision-making structures, devising even sophisticated, original and composite tools attacking the problem from multiple sides, in order to offset the different factors (such as those related to political dynamics, cultural bias, and organisational mechanisms) contributing to discriminating against women.

[Recommendations]

Overall, **five main recommendations** can be identified.

 # 23 – Monitoring women's presence on boards and committees
 # 24 – Providing training in applications to serve on boards and commissions
 # 25 – Modifying rules and procedures for appointing boards and committee members
 # 26 – Making women candidates available and visible for boards and committees
 # 27 – Lobbying for women scientists' representation in decision-making bodies

Recommendation # 23
Monitoring women's presence on boards and committees

Reaching a gender-balanced composition of decision-making bodies first requires a good understanding of the obstacles preventing women from accessing them. Since each work environment and institutional setting is characterised by a peculiar mix of obstacles (both in quantitative and in qualitative terms), mapping them is an indispensable **preliminary step** for launching new programmes and actions. The very act of mapping obstacles usually has an impact on the existing situation (e.g. awareness raising effects, putting the question on the agenda, reinforcing the authority of programme promoters, etc.).

LINES OF ACTION

Collect and disseminate data

One line of action can be highlighted.

Some programmes entail conducting more or less systematic research and data collection to identify the factors hampering women in their access to high-ranking decision-making and managerial positions. Tools and strategies can vary a great deal.

– Nearly all the programmes carried out under the US National Science Foundation-funded ADVANCE programme (see also recommendation # 15) include research activities, data gathering and other kinds of actions for identifying, among other things, factors hampering women's access to governing boards and committees. One interesting approach is that used by the UW-Madison, which published a **brochure** summarising some existing social psychology, cognitive psychology, and social science literature on the effects of unconscious biases and assumptions, and how these tendencies might affect selection processes. This brochure has been discussed at workshops involving search committee members and has been used as a basis for **collecting further first-hand information and data**.
http://wiseli.engr.wisc.edu/docs/AnnReport_WISELI_2004.pdf

– The ADVANCE-IT programme at Georgia Tech launched a **critical self-study** on issues related to women in leadership positions. The study addressed a broad set of needs, such as understanding the foundations of gender bias in the university, identifying obstacles to women's access to top positions and boards, proposing strategies for advancement of women and creating a base-line data toward assessment of change.
http://www.advance.gatech.edu/archive/promotion.html

– More structured research has often been used. In activating its already mentioned Observatory for Equality, the Autonomous University of Barcelona launched an **exploratory study** to detect subjective and objective obstacles preventing the inclusion of women in decision-making bodies. A **report** containing the study results was published on the web, and has been used as the basis for the design of new measures. The study represented the first step in the creation of a **permanent monitoring service** on women's condition in the university (Observatory for Equality). It was also used as a tool for changing the orientations and attitudes of university leaders towards gender equality, and overcoming the resistance from some of them.
http://selene.uab.es/observatori-igualtat/Documents%20pdf/Sexisme%20a%20la%20UAB.pdf

– The programme promoted by the Chemistry Department of the University of York produces data on the gender composition of committees and disseminates it through the university website, in order to **increase transparency in candidates' selection**.
http://www.york.ac.uk/research/athena/chemistry%20gold/appendix%20G%20york.PDF

Recommendation # 24

Providing training in applications to serve on boards and commissions

Besides removing external obstacles limiting women's access to decision-making bodies, it is also important to support women's decision to apply for boards and committees and provide specific training to that end. Skills required are mainly unconnected with science and technology, rather involving communication, lobbying, self-presentation, use and management of one's own relationships (social capital), and the exercise of leadership roles.

LINES OF ACTION

At least, **three main lines of action** can be mentioned:

- Provide specific training services;
- Provide women with personal assistance;
- Develop ready-made training, guidance and information tools.

Provide specific training services

Training programmes addressing women eligible for decision-making bodies in S&T sector are characterised by their integrated character, as in the examples that follow.

- A mix of formal and informal training tools is the main feature of a programme developed by the Canadian Association of Women Executives and Entrepreneurs (CAWEE), addressing women aspiring to get on board in the business and non-profit sectors. The programme is based on a diversified set of **learning tools** (such as workshops, conferences and forums) and networking activities (such as breakfast panels or lunches). The initiatives are intended to empower women in terms of professional development as well as personal motivation. All the initiatives are linked to one another through continuous contact among beneficiaries and with a large group of experts, professionals and consultants, offering their help on a voluntary basis.
  http://www.cawee.net/events.html

- A similar **multi-component training programme** has been implemented by the Australian industrial association Women in Technology (WiT), focused on women's advancement in the high-tech industry. The initiative, called "Board Readiness Programme", included **mentoring, networking and training** to prepare women in accessing the board of high-tech enterprises. The aim was to transfer technical information on the boards (functions, role of the board director, etc.) and to develop skills for being an effective board member (e.g. on financial management). It also provided trainees with specific customised support allowing them to enhance their motivations and to develop their own strategies to access a board for the first time. The programme is also aimed at promoting recognition of the importance of technology skills at board level.
  http://www.wit.org.au/default.asp?PageID=10&n=Board+Readiness28TM29

Provide women with personal assistance

A second line of action revolves around the provision of personal assistance to support women in attaining decision-making roles. Three examples, all coming from Australia, are provided below.

– This approach has been recorded for example, in the case of the Sydney University of Technology's Women in Engineering Program by personalised advice aimed at **encouraging and helping women applicants for nomination** to a peak university board.
http://www.eng.uts.edu.au/EducationandOutreach/wie/UTSStaff.htm

– Another similar programme ("Women on Boards/WOB") is promoted by the National Foundation for Australian Women, specialised in supporting women to access boards in the private and non profit sectors. Even though not focused on university settings, the association developed different strategies and tools which may be usefully transferred within the S&T sector. Particularly relevant is the provision of **customised services** to women, including assistance with **drafting an effective curriculum vitae** and in devising personal **winning strategies** to put their aspirations to become board members into practice.
http://www.womenonboards.org.au/professional-development/index.htm

– **Customised services** to access boards are also provided by the already mentioned Australian industrial association Women in Technology (WiT), addressed to high-qualified women in technological companies and research institutions. The programme includes action supporting women in setting up their own executive profiles, highlighting their competencies, raising their visibility through conference participation, publications and presence in the media, dealing with patenting and intellectual property issues.
http://www.wit.org.au/default.asp?PageID=10&n=Board+Readiness28TM29

Develop ready-made training, guidance and information tools

Another possible approach to follow is to develop ready-made training and information packages addressed to women interested in getting on university or industry boards, as well as in achieving top managerial positions.

– Australian organisations seem to be particularly active in this area. A good example is provided by the above mentioned National Foundation for Australian Women, which - under its Women on Boards/WOB programme - develops and disseminates various **ready-made packages** such as: an **online case study series** on women successfully accessing boards; **periodic standardised information services** on board vacancies; a set of **practical publications** on how to develop strategies to access boards in the different sectors; a **guide** to useful organisations to be contacted for women aspiring to become a board member or to reach high-level managerial positions. The CATA Women in Technology produced similar tools, like toolkits or **guidelines** for helping women to attain top positions, while the Australian Computer Society conducted

seminars, workshops, conference presentations and engaged in **public policy to assist women to attain top positions**.

http://www.womenonboards.org.au/boardroom/onboard.htm

http://www.womenonboards.org.au/boardroom/cs/index.htm

http://www.catawit.ca/fourPillars/

http://acs.org.au/acswomen/index.cfm?action=show&conID=2006111414224 71815

Recommendation # 25

Modifying rules and procedures in appointing boards and committee members

This recommendation is based on the recognition that criteria, procedures and institutional mechanisms adopted in selecting board members tend to be gender biased and therefore need to be constantly revised. The ways in which modifications are introduced, facilitated or encouraged vary, according to national cultural, legal and organisational traditions and settings.

LINES OF ACTION

Overall, **three main lines of action** aimed at implementing this recommendation can be identified:

– Introduce new policies and regulations;
– Implement change by degrees;
– Develop training and awareness-raising initiatives addressing leaders.

Introduce new policies and regulations

Introducing new rules to promote women on boards and committees is the most direct way for enhancing gender-balance in decision-making bodies. Needless to say, it entails the committed engagement of government authorities or university leadership, and generally has to be backed by national laws providing for positive action, on the example of the law adopted by the Norwegian Parliament imposing that the boards of all publicly traded and public limited companies must have at least 40 percent female representation

– An example of this approach is represented by the **system of quotas** introduced by the Greek government (Ministry of Development) through a framework law, also concerning scientific committees. Besides the law, a programme has been launched, carried out by the National Centre for Social Research, aimed at **monitoring the full enforcement of the law**. The programme produces data about the actual gender composition of the committees and provides suggestions about measures to be taken for bridging the gender gap.

http://www.ekke.gr/english/index.html#

Implement change by degrees

The development of plans aimed at progressively introducing measures able to ensure equal representation of women and men in deci-

sion-making bodies is probably the most common approach. The pathways followed to attain this result vary according to the institutional setting and the features of the organisations. However, they all tend to build consensus and include direct involvement of administrators, leaders and stakeholders on the planning process.

– The establishment of a **working group** is the choice made by the Academy of Finland in order to develop a general plan for increasing the level of gender equality within the institution. A plan (rather then compelling regulation) has been preferred in order to directly engage top managers in assuming specific responsibilities, not only in its definition, but also in its enforcement, including for those concerning the composition of Committees and Councils.
http://www.aka.fi/en-gb/A/Science-in-society/The-research-career/Equality/Equality-Working-Group/

– A similar choice has been taken by the Spanish CSIC (Consejo Superior de Investigaciones Científicas), which created an **inner committee** in charge of monitoring advancements and withdrawals, as well as identifying and promoting the application of **new measures**. The gradual introduction of the planned changes is accompanied by specific initiatives aimed at both overcoming cultural and organisational resistances, and balancing the previous lack of regulations and consolidated practices on the matter.
http://www.csic.es/mujerCienciaEnlaces.do

– The already mentioned **Observatory for Equality**, established by the Autonomous University of Barcelona has, among its tasks, the advancement of proposals to reach a balanced presence of women in university committees. The procedures adopted provide for **consultation** with university top managers and leaders, trade unions and other stakeholders in order to create consensus around new proposals, countervailing inner oppositions.
http://selene.uab.es/observatori-igualtat/

Develop training and awareness-raising initiatives addressing leaders

More or less structured training and awareness-raising initiatives targeting the organisation's leaders can also be used in support of women's access to top decision-making and managerial positions.

– Training components and awareness-raising components are frequently combined together. The ADVANCE-IT programme at the Georgia Institute of Technology has a **formal training scheme** for committee members in charge of appointments and promotions; it is intended to increase the number of women in decision-making and managerial positions. The scheme has been designed to facilitate board members in **growing capacity in independently detecting and removing discriminatory procedures** in selecting directors and new board members. This approach appears to be particularly effective for coping with informal discriminatory practices, cultural bias and the lack of adequate internal regulations.
http://www.adept.gatech.edu/

– A Committee of distinguished faculty members in S&T disciplines has been established in the University of Michigan, that offers **annual faculty recruitment workshops** for members of faculty search committees, in the form of **peer education workshops for their colleagues**. The committee provides information and advice about practices that will maximise the likelihood that diverse, well-qualified candidates for faculty positions will be identified, and, if selected, recruited, retained, and promoted within the university. Tools and guidelines have also been developed and published on the web site of the programme.
http://www.sitemaker.umich.edu/advance/stride

– In the same university, an **annual series of training sessions for department chairs** are also planned on a range of diversity-related topics. The aim is to increase chairs' knowledge about issues facing women and minority faculty, and, in particular, to circulate information about best recruitment practices and evaluation bias in faculty reviews and promotion. In addition, **new chairs are offered one year of "executive coaching"** by coaches who are particularly schooled in issues of diversity.
http://www.sitemaker.umich.edu/advance/home

– The ATHENA SWAN Charter initiative may be usefully mentioned in this regard. It does not directly address committee members, but universities or university departments as a whole. The programme solicits the voluntary commitment of research institutions to a set of principles (summarised in a Charter) for ensuring equal representation and conditions for women in university departments. One of the principle concerns a balanced presence of men and women in decision-making bodies. The programme is based on the **free compliance of university managers and administrators** to these principles and on their engagement in translating them into facts through the development and implementation of plans of action, which are open to external evaluation. Top quality experiences are publicly awarded.
http://www.athenaswan.org.uk/html/athena-swan.

– A similar approach is adopted by the TOTAL E-QUALITY Deutschland e.V., a non profit association supported by the German Ministry of Education and Research. The association established the **Total E-Quality Award**, to be recognised to universities and scientific institutions whose management and institutional policies are designed to achieve equal opportunities. Institutions apply for this Award by filling out a self-assessment checklist focused on gender equality. On behalf of the Ministry for Education and Research, the Center of Excellence Women in Science (CEWS) advises universities and scientific research institutions who wish to apply for the award.
http://cews.org/total-e-quality/index-e.html
http://www.total-e-quality.de/index.php?id=1de&L=1

Recommendation # 26

Making women candidates available and visible for boards and committees

Another approach to improve women's presence in decision-making bodies and top managerial positions is that of making women candidates more visible. The core idea is that women, for different reasons, run a greater risk of being marginalised in university and inter-university communication networks, so that they are overlooked by managers and committee members in the selection of candidates to board membership and managerial positions.

LINES OF ACTION

In order to enforce this recommendation, **two lines of action** can be singled out:

– Proactively search for women candidates;
– Create a candidates' database.

Proactively search for women candidates

One possible way to implement this recommendation is that of proactively searching for eligible women, so as to widen the pool of available candidates.

– In this regard, the programme carried out at the Chemistry Department of the York University, is worth mentioning. The programme undertook specific action aimed at identifying and contact female independent research fellows as candidates for board positions. This action was associated with forms of support and encouragement of candidates such as those outlined in recommendation # 24.
http://www.york.ac.uk/research/athena/chemistry%20submission/Appendix%20E%20York%20Chem%20submission%20report.pdf

Create a candidates' database

Databases are also used to make women candidates more visible to decision-making bodies and in selection for managerial positions.

– One of the most advanced experiences in this field does not pertain to universities or research institutions. We are referring to the **database** developed by the National Foundation for Australian Women, collecting information about women interested in filling board positions in private business. The database includes a narrative presentation of the candidate and information about education, working experiences and aspirations. Moreover, a database containing information about **board vacancies** was also set up, as well as a personalised **early-alert system** providing timely information to prospect women candidates about new vacancies.
– http://www.womenonboards.org.au/

– Different women experts' databases also offer information on **women interested in accessing university boards and committees**. This is the case of a database of German-speaking women experts, promoting women's biographical profiles fitting different high-ranking positions related to science and technology. The database, developed by the Centre of Excellence Women in

Science (CEWS), also comprises profiles of women with qualifications and experience that make them suitable for senior decision-making and managerial positions.
http://www.femconsult.de/femconsult/LuceneQuery?style=home

Recommendation # 27

Lobbying for women scientists' representation in decision-making bodies

Lobbying remains an important instrument for the promotion of women's presence in decision making bodies and managerial positions. The kinds of activities can vary a lot according to the institutional setting, the national context and the dimension and scope of the lobbying action, including sensitisation activities, promotion of debates and exchange, policy proposal, monitoring action on decision-making process, and information initiatives. All these actions are aimed at creating political pressure on leaders (at the European level, national level or at the level of a single institution/university) to promote women's advancement in their scientific careers and equal representation of women in governing bodies.

LINES OF ACTION

Increase women's voice through networking

One line of action can be mentioned here.

The organisational tool which is the most frequently adopted in lobbying is that of **networking**.

– The most significant, but not the only, example of network performing lobbying actions is that of the European Platform for Women in Science (EPWS), specifically aimed at increasing the representation of the interests, needs, concerns and aspirations of women scientists in the research policy debate at the European level. The network connects different national women's networks, and promotes a large array of initiatives, including meetings, events and informal discussions. Through these initiatives, proposals of measures, policies and regulations are advanced to top European and national political levels.
http://www.epws.org

Strategy three

Women's leadership of science
in a changing society

Objective 3

Strengthening women's visibility and their role in communication

Part D
Chapter Ten

[Rationale]

Science communication is one of the sectors most affected by the **profound transformations** in S&T production and science-society relationships (see part A).

Up to the relatively recent past (more or less, up to the 80s), communicating research findings out of the close circle of peers was viewed as a minor and un-necessary aspect of the research process. **New forms of science and technology production** - even though uneven – deeply changed this picture. Engagement in scientific communication is now of strategic benefit for scientific institutions in accessing funds, attracting students and high-qualified professors, influencing policy-making processes, and in cooperating with relevant societal and institutional actors (enterprises, local authorities, consumers' associations, civil society organisations, etc.) that are increasingly involved with research and with the social and economic exploitation of scientific results.

In this framework, the **women-communication nexus** is destined to become increasingly significant and may well facilitate a more gender-balanced distribution of power and roles in science and technology.

[Recommendations]

Overall, **two main recommendations** to support women's leadership in scientific communication can be drawn from the analysed programmes.

 # 28 – Supporting women's qualified role in communication management
 # 29 – Promoting the visibility of women in science

Recommendation # 28
Supporting women's qualified role in communication management

This recommendation specifically aims at promoting women's role in communication dynamics.

LINES OF ACTION

Train in communication skills

One main line of action has been singled out.

Training initiatives in communication skills are sometimes provided to integrate women's professional and leadership portfolio.

– **Formal training** is often used to this end. A relevant example is provided by a **training course**, promoted by the Italian Trentino

School of Management, designed to support a group of graduate women in developing capacities related to scientific communication and science dissemination. The programme is not only intended to promote **women in filling relevant positions in scientific communication**, but also to develop **new professions** on the boundaries between science and society.

http://www.tsm.tn.it/documenti/formazione_manageriale/2005_fse_COMING_Orientamento_e_consulenza_alle_competenze_di_mediazione_scientifica.pdf

– Equally important is helping women scientists **to master communication in their work environment**. In this regard, it is worth mentioning the mentoring programme promoted by an inter-university network based in Switzerland (Réseau romand de mentoring pour femmes/RRM). Under the programme, some of the network meetings have been devoted to trigger **learning processes on communication** for women scientists, through the support of external experts. This component of the programme is informed by a critical approach, based on the recognition that, also as concerns communication, men and women have unequal access to resources.

http://www.unifr.ch/f-mentoring/fr/prg/presentation1

– A leadership course has been launched by the Western Sydney Regional Organisation of Councils (WSROC), an Australian network of local authorities. Even though it does not pertain to science and technology, this experience is relevant since it includes **training sessions** specifically aimed at helping young women improve their own communication skills to fulfil their aspirations in becoming leaders at community level. Training subjects include: public speaking, presenting, networking and communicating through the media. Sessions are supported with practical experiences, such as attending or speaking at conferences or helping to organise events.

http://www.wsroc.com.au/page.aspx?pid=216&vid=7

Recommendation # 29
Promoting the visibility of women in science

This recommendation is aimed at putting women in the forefront of scientific communication, both inside the scientific community and in relation to other spheres of society. Thus, it aims to bridge the visibility gap suffered by female scientists with respect to their male colleagues, which often entails the lack of recognition of their merits and their successes in scientific work.

LINES OF ACTION

Two lines of action can be identified:

– Promote women's presence in the flow of scientific communication;

– Communicate and reward women's scientific excellence.

Promote women's presence in the flow of scientific communication

The first line of action is geared to enhancing existing communication channels and tools, removing biases and factors that limit women's access to communication flows.

– One way to implement this approach is to promote a critical review of the communication tools and strategies developed by research institutions. For example, under the ATHENA SWAN application programme of the Chemistry Department of the University of York, a **critical analysis of the communication tools** used by the departments was carried out, with special reference to the **departmental web-sites**. Special attention was also given to ensuring the publication of information on women researchers' achievements in scientific activities in the university magazine. The objective is to reach gender balance in institutional communication as well as to make women scientists' achievements and scientific responsibilities more visible. Under the same programme, the need to provide more space to female researchers in **departmental and university publications** has been addressed, and a set of **guidelines** has been issued addressing seminar organisers, in order to ensure a greater number of women among external lecturers, conference speakers and visiting professors.
http://www.york.ac.uk/research/athena/chemistry%20gold/appendix%20G%20york.PDF

– Another strategy to increase women's visibility is improving their effectiveness in **communicating the results of their own research**. In many university curricula this aspect is barely acknowledged. The Vienna University of Technology organised PhD courses for women that include initiatives aimed at **promoting women students' participation** as speakers at high-level international conferences and at encouraging and assisting them to submit their work to peer-reviewed journals.
http://www.tuwien.ac.at/services/service/gender_studies/women_in_technology/EN/

– Similarly, under the ADVANCE-IT programme launched in Kansas State University, **college and departmental websites** have been studied and revised in order to ensure a full acknowledgement of diversity, related to gender and ethnicity.
http://www.k-state.edu/advance/Initiatives/initiatives.html

– Many programmes providing mentoring, training or coaching are supported by networking initiatives which are also conceived as opportunities for women to communicate their work. A good example is provided by the WiE (Women In Engineering) programme of the University of Technology of Sydney, using network meetings to allow women scientists **to present their work** to other researchers and the media.
http://www.eng.uts.edu.au/EducationandOutreach/wie/index.htm

Communicate and reward women's scientific excellence

Different tools can be used to reinforce public recognition of women scientists.

– One relevant experience is an **award** created in France for **women engineers** working in research centres or private labs (the "Prix Excellencia – Trophée de la Femme Ingenieur High-Tech", promoted by Innovative Europe/ Excellencia Awards Committee (see also recommendation # 19). Selection procedures involve the major schools of engineering in France as well as many of the most important high-tech industries. This allows a large group of candidates engaged both in fundamental and applied research (actually, two specific awards have been established) to inform a highly qualified audience about their works and projects.
http://www.innov-europe.eu/in/index.php?option=com_content&task=view&id=18&Itemid=35

– Similar approaches are applied by public agencies and private associations in charge of promoting scientific research in many parts of the world, including China, India, Japan, as well as in Arab and African countries. A **women scientist award**, for example, is awarded annually by Natural Resources Canada, a Canadian public agency supporting national research on natural resources. The award is given both to prominent women researchers and to young women scientists.
http://www.nrcan-rncan.gc.ca/com/elements/issues/29/science-eng.php

– The Austrian programme FemTech, promoted by the Federal Ministry for Transport, Innovation and Technology is engaged in promoting women scientists through the establishment and maintenance of a women experts' database. Each month, on the programme website, a comprehensive portrait of the "**Female expert of the Month**" is provided, with the aim, both to recognise the role played by the selected experts in their professional life, and to promote a role model in the field of science and technology for young women.
http://www.femtech.at/index.php?id=118&L=2

– **Books** focused on women scientists are also frequently undertaken. One example is the publication of the Spanish Fundación Esteve turning around the biographies of twelve top-rank female scientists in the 20th Century biomedicine. The publication is not merely a collection of the findings that made these women part of the history of medicine – seven of them were Nobel prize winners – but also an account of the obstacles they had to overcome to pursue their career and gain professional acknowledgement. The book **"**Women in science – Compelling stories of the heroines of science", published by the European Commission, aims to show that, despite the **invisibility of women in the historical narrative of mainstream science**, science has never been exclusively a man's world. Throughout the centuries, many women managed to overcome their marginalisation and to excel in their chosen field.
http://www.esteve.org/aw/Home/Secciones_Web/Publicacions/Cuadernos/~bvk/mujeres_biomedicina/
http://ec.europa.eu/research/science-society/index.cfm?fuseaction=public.topic&id=2020

Strategy three

Women's leadership of science
in a changing society

Objective 4

Increasing women's influence in innovation and science-society relationships

Part D
Chapter Eleven

[Rationale]

In the “post-academic context” (see Part A), technological innovation and science-society relationships are of **pivotal importance** for the future of scientific and technological research and for society as well, given the ever closer connections between them.

As for **innovation**, scientists are increasingly asked to aim their research activities towards economically exploitable outputs. This means that the potential application fields of a given research programme must be identified in the early stages of the programme itself. This requires high levels of cooperation between a large set of players (research groups, enterprises, professionals, suppliers, financial institutions, etc.).

Nowadays, the **relationships between science, technology and society** are becoming more and more important and intricate. While in the past such relationships were rare and highly structured, today they are much more frequent and less regulated, involving many players and revolving around issues of an ethical, political, organisational, cultural and social nature. On this basis, technological innovation risks being ignored, misunderstood or even refused while, on the other hand, if effective channels of communication and dialogue are not kept open, social actors risk that their expectations and needs are not taken into adequate consideration by technological actors.

All this suggests that career tracks and leadership positions relating to innovation are likely destined to become ever more significant in the future, given their powerful impact on society.

In this context, promoting **women’s leadership in this area** represents another key aspect in the struggle for gender equality in science and technology. Such action is also important in order to meet the urgent need of developing new and more effective strategies to link science, economic systems and society. This requires a wide range of skills and capacities, which can only be provided with the full engagement of women scientists and professionals.

[Recommendations]

Two main recommendations can be singled out.

 # 30 – Strengthening women’s orientations and skills connected with innovation and the social management of technology

 # 31 – Providing women with resources and opportunities to approach top positions in innovation

Recommendation # 30

Strengthening women's orientations and skills connected with innovation and the social management of technology

This recommendation is intended to enhance women's attitudes and leadership skills in relation to innovation and science-society relationships.

LINES OF ACTION

Two main lines of action can be singled out:

– Promote specific training initiatives on innovation and relations with social actors;
– Promote new research environments linking innovation and diversity.

Promote specific training initiatives on innovation and relations with social actors

One possible approach is providing women with access to specific **training initiatives** on innovation, backing them with other support action.

A wide range of actions can be taken to implement this recommendation.

– Training can be carried out by employing a **large array of tools** at the same time. A significant case is that provided by the Anita Borg Institute for Women and Technology, which organises **different kinds of training initiatives** for women in technology and innovation, including short training courses on leadership in innovation and technology-related sectors, learning and sensitisation events and mentoring opportunities.
http://anitaborg.org/initiatives/techleaders/

– **Social innovation** can also be included in the development of training programmes. The training and networking programme elaborated by the above-mentioned Anita Borg Institute for Women in Technology is useful in this regard, because it provides tools and knowledge to women and men who seek to enhance the positive **social impact of technology**. Training activities are mainly carried out through **workshops** that bring together elite networks of women from industry, academia, and government.
http://www.anitaborg.org/initiatives/techleaders/

– Combining different kinds of tools is also the choice made by a Canadian network specifically aimed at boosting women's participation and advancement in high-growth technology sectors (CATA Women in Technology). The programme comprises both **ready-made professional development packages** and **mentoring schemes** for facilitating women in accessing leadership positions in high-tech industries and labs.
http://www.catawit.ca/fourPillars/

Promote new research environments linking innovation and diversity

A second line of action is aimed at modifying research environments in order to make them more open to innovation and diversity. The main motivation here is not promoting women to leadership positions in already structured work contexts, but creating new research and innovation contexts where strong female leadership creates favourable conditions for more diversity in innovation.

– The most advanced example of this kind of approach is the publicly-funded "w-fFORTE – Laura Bassi **Centres of Expertise**" programme, promoted by the Austrian Research Promotion Agency, which established **new innovation-oriented research centres** (see also recommendation # 17). The core strategy is that of pursuing innovation through diversity, emphasising trans-disciplinarity, advanced forms of knowledge transfer, public-private partnership, cultural and gender diversity of the work environment and project-oriented management. All the research centres (six in all) are led by women and their research teams have a gender balanced composition. The programme is conceived as a "learning initiative", to be subjected to transparent evaluation procedures, the results of which should provide important information on how to better link innovation and gender equality.
http://www.w-fforte.at/index.php?id=220&L=1

– Another example is given by an Italian programme, promoted by the Trentino School of Management, aimed at reinforcing the linkage between science and society by strengthening women's involvement in the **cultural mediation of science and technology**. The programme is intended to develop, by means of training courses addressed to women graduates in S&T sectors, new high-profile professional roles dealing with scientific dissemination specifically targeting a range of social actors, to manage, improve and guide the interaction between scientific research and society.
http://www.tsm.tn.it/documenti/formazione_manageriale/2005_fse_COMING_Orientamento_e_consulenza_alle_competenze_di_mediazione_scientifica.pdf

Recommendation # 31
Providing women with resources and opportunities to approach top positions in innovation

This recommendation is based on the fact that women's access to resources and opportunities to reach senior positions in innovation is particularly limited. Hence the need to balance this situation by making specific resources and opportunities available to women in support of their career advancement.

LINES OF ACTION

Three lines of action have been identified:
– Develop specific innovation-oriented funding schemes;
– Facilitate women's contacts with innovation actors;
– Promote mobility schemes allowing women scientists to gain experiences in innovation.

Develop specific innovation-oriented funding schemes

The first line of action is establishing new funding schemes facilitating the access of women scientists to experiences in the field of innovation.

– An example of this kind of approach is the **specific funds**, reserved for female researchers, which the Slovenian Science Foundation established for activating **new innovation projects** or for being incorporated in **technological/developmental activities** of commercial companies. Besides supporting women access to top-level careers in innovation, the scheme is also designed to favour the intensification of university-industry relationships (see also recommendation # 21).
http://www.szf.si/?lang=slo

Facilitate women's contacts with innovation actors

Creating opportunities for women to connect with top-level innovation actors is another possible approach to support women's career in this sector.

– Various tools can be used. For example, an Australian programme (Women on Boards/WOB, promoted by the National Foundation for Australian Women), a Canadian programme (Canadian Association of Women Executives and Entrepreneurs), and a British programme (Tailored e-coaching, promoted by the Manchester Business School) use **networking** to facilitate contacts between high profile women and technological enterprises' top management, while other programmes tend to establish contacts through the organisation of **meetings** and **conferences** involving university and industry, as in the case of the Anita Borg Institute for Women in Technology. Some women experts' **databases** (such as the above-mentioned FemConsult, developed by the German Centre for Excellence Women in Science/CEWS) are also designed to create access to top positions in private industries.
http://www.womenonboards.org.au/
http://www.cawee.net/about.html
http://www.mbs.ac.uk/research/equalitydiversity/documents/Ecoaching2007ESFReport.pdf
http://www.femconsult.de/femconsult/LuceneQuery?style=home

– It is also worth mentioning another programme promoted by the Anita Borg Institute for Women in Technology, the Grace Hopper Celebration for Women in Computing. The programme focuses on a **four-day annual conference**, designed to present the work of a high number of women scientists specialised in computing and related technological fields. A call for participation is issued for technical women to submit panels, workshops and posters. The conference is addressed to industrial, academic and government communities.
http://gracehopper.org/2009/

Promote mobility schemes allowing women scientists to gain experiences in innovation

A third line of action to help women researchers reach high-level positions in innovation is the expansion of mobility schemes to provide women scientists with work experience in entrepreneurial settings.

– One example of developing **mobility schemes** allowing women scientists to run high-profile projects within private enterprises has been undertaken in a programme promoted by VINNOVA, the Swedish government agency that administers state funding for research and development. In this way, beneficiaries are able to develop their own curriculum vitae in order to access senior positions in innovation-related sectors, both in private enterprises and in universities.

  http://www.vinnova.se/In-English/Activities/Strong-research-and-innovation-environments/VINNMER/International-qualification---call-for-proposals/

Programmes that work

Part E

Programmes that work

A map of tools to support women in science and technology

Part E
Chapter Twelve

The previous parts of the guidelines have been devoted to three main strategies to promote women in science and technology, aimed respectively at creating a female-friendly environment for women (Part B), building a gender-aware science (Part C), and facilitating women's access to leadership positions (Part D). As a whole, 31 recommendations, 62 **lines of actions** and 219 **examples** of action have been provided.

However, there is another "level" deserving specific attention, cross-cutting and, to a certain extent, underlying the others: that of **tools for action**.

The relevance of the tools for action – most of them very well known – can be intuitively appreciated by considering how much the success of a programme depends on the appropriateness and effective use of the tools chosen to implement it.

The previous chapters, presenting cases and experiences, mentioned a broad array of tools for action. This chapter aims to provide a more systematic presentation of these tools.

For each tool (or consistent group of tools), a concise card will be presented, organised into two sections:

– Section One ("Description") provides a short description of each tool and its expected results;
– Section Two ("Application domains") gives some information about the use made of each tool in developing actions in support of women promotion in science and technology as well as the strategies they refer to (promoting a women-friendly work environment; building a gender-aware science; supporting a gender-fair access to leadership positions).

In addition, a set of examples drawn from gender equality programmes is provided for each tool.

The tools or groups of tools, presented in alphabetical order, are as follows:

1. Awards and recognitions
2. Best practices collection
3. Books and reports
4. Charters
5. Childcare services
6. Coaching
7. Committees
8. Consultations
9. Databases
10. Direct contact
11. Dissemination and guidance packages
12. Expressive and artistic tools
13. Grants, loans and subsidies
14. Information desks
15. Institutional arrangements
16. Lobbying
17. Media campaigns
18. Meetings
19. Mentoring
20. Monitoring and evaluation tools
21. Networks and networking
22. On-demand services
23. Organisational arrangements
24. Planning
25. Public communication tools
26. Regulations
27. Research and data collection
28. Social events
29. Training courses, lessons and seminars
30. Web-based discussion spaces
31. Websites

The tools are to be understood as "bricks" of various sizes, which can be combined together to shape largely different programmes, in terms of aims, approaches and dimensions. Therefore, the following descriptions are illustrative, but incomplete, examples of possible uses of the different tools for action.

[1. Awards and recognitions]

Description

The delivery of awards and other forms of recognition (such as a mention in a magazine or in a website) to women or institutions is a way to acknowledge their excellence in specific fields. Awards are often associated with benefits (such as subscriptions to international journals and associations) and/or money.

Application domains

When assigned to senior women scientists, awards are used to promote a larger presence of women in **leadership positions** by increasing their social visibility in the academic environment or private industry (some awards concern women scientists engaged in innovation and working in the high-tech industry sector). Awards can also promote a more balanced **work environment** for women, by offering female role models for younger women interested in, or involved with, scientific careers. When assigned to institutions – often in the context of the establishment of ***charters*** (see below) – awards are mainly aimed at spurring institutional transformations**,** by devising strategies to support women in science and technology.

Examples of practices

The “Prix Excellencia – Trophée de la Femme Ingenieur High-Tech”, promoted by a French non profit entity (Innovative Europe – Excellencia Awards Committee)
http://www.innov-europe.eu/in/index.php?option=com_content&task=view&id=18&Itemid=35

The women scientist award annually delivered by Natural Resources Canada
http://www.nrcan-rncan.gc.ca/com/elements/issues/29/science-eng.php

The portraits of the “Female expert of the Month” included in the website of the programme FemTech promoted by the Austrian Federal Ministry for Transport, Innovation and Technology
http://www.femtech.at/index.php?id=118&L=2

The L’Oréal-UNESCO For Women in Science Prize
http://unesdoc.unesco.org/images/0015/001583/158383e.pdf

The Grace Hopper Celebration for Women in Computing, promoted by the Anita Borg Institute for Women in Technology
http://gracehopper.org/2009/

The celebration of women faculty members’ achievements organised each year at the New Mexico State University
http://www.advance.nmsu.edu/Documents/PDF/Retention_Report-Nov08.pdf

[2. Best practices collection]

Description

The term “best practice” refers to any experience displaying techniques, methods or approaches which are considered to be particularly effective at delivering a specific outcome and, therefore, deserving to be disseminated to other organisational contexts.

Application domains

Identifying, sharing, adapting and applying best practices are recurrent activities in programmes focusing on gender equality in science and technology. Best practices can refer to all three of the strategies previously highlighted; that is, the creation of a **women-friendly work environment**, the building of a **gender-sensitive science** and the **promotion of women to leadership positions**. Selection and adaptation of best practices have been recorded, for example, for devising actions aimed at retaining women in scientific careers, for activating institutional change processes in universities and for enhancing the ways in which scientific disciplines are taught at university. Often, the exchange of best practices is carried out through ***networking*** activities (see below).

Examples of practices

The collection made at the University of Colorado at Boulder of best practices in teaching science in college physics
http://www.colorado.edu/facultyaffairs/leap/activities/activities_02.html

The use of best practices carried out at Rice University
http://cohesion.rice.edu/centersandinst/advance/about.cfm

[3. Books and reports]

Description

Publishing books and reports is one of the most recognised tools for transferring complex knowledge and ideas in as complete and comprehensive a way as possible. In academic settings, books and reports tend to be structured as scientific products in order to acquire more visibility and influence, while outside academia they aim at a broader audience and are thus characterised by a less academic style and format.

Application domains

As final products of ***research tool*** application (see below), books and reports are largely used, in the academic setting, to document the enduring existence of a female-unfriendly work **envi-**

ronment in the science and technology sector. Furthermore, books and reports are used to launch and deepen a debate on the **gendered nature of science**, as well as issues of an epistemological and theoretical nature. Non-scientific books and book-like publications are sometimes produced to influence cultural orientations which are dominant in the **work environment**, proposing and disseminating a different image of women scientists.

Examples of practices

The report on women, science and technology in Italy published and disseminated by Observa
http://www.observa.it/pubblicazioni_view.aspx?ID=474&LAN=ITA

The annual report prepared by the Spanish Consejo Superior de Investigaciones Científicas (CSIC) providing data on the gender composition of personnel and information on the measures adopted to promote women and their impact
http://www.csic.es/mujerCienciaInformes.do

The book devoted to outstanding women scientists published by the Spanish Fundación Esteve
http://www.esteve.org/aw/Home/Secciones_Web/Publicacions/Cuadernos/~bvk/mujeres_biomedicina/

The book **"**Women in science – Compelling stories of the heroines of science", published by the European Commission
http://ec.europa.eu/research/science-society/index.cfm?fuseaction=public.topic&id=2020

The report of the Professional Equality Commission between men and women at the French Ecole des Hautes Etudes en Sciences Sociales (EHESS)
http://www.ehess.fr/fileadmin/Egalite_pro_hf/rapport_egalite_professionnelle.pdf

The research and evaluation reports produced by the Women in Science and Engineering Leadership Institute (WISELI) at the University of Wisconsin at Madison
http://wiseli.engr.wisc.edu/pubtype.php

The survey report on faculty perceptions, needs and experiences, carried out in the framework of the ADVANCE Programme at the Georgia Institute of Technology
http://advance.gatech.edu/archive/ADVSURV_NSFREPORT.pdf

[4. Charters]

Description

The heading "charters" groups together those documents establishing principles, practices or reference standards which institutions are asked to voluntary adhere to. Unlike the ***dissemination and guidance packages*** (see below), charters typically have a political nature rather than a technical one, since the commitment process is designed as a public engagement which also entails public recognition of it (see the heading ***awards and recognitions*** above). The term "charters" may refer not to a simple document, but to a coordinated set of actions including, for example, the process of drafting the document, its dissemination among the interested institutions, the creation of commissions or similar structures with the authority to assess the application degree of the principles, practices and standards established in the charter by the institutions aspiring to adhere to it, or the development of forms of public recognition of the adhering institutions.

Application domains

Charters are mainly used as an incentive to activate processes of institutional transformation within research bodies and universities. They tend to promote an integrated approach since they aim to deal with all aspects of women's condition in science and technology, including **work environment**, the **gendered nature of science and technology** and **women's career advancement**. The best known programme adopting this approach is the British ATHENA SWAN Charter programme, involving different universities, which provides for different forms of recognition, according to the level of commitment of the institutions concerned.

Examples of practices

The code of practice intended to advance women in physics departments promoted in UK in the framework of the Project JUNO
http://www.iop.org/activity/diversity/News/file_23103.pdf

The ATHENA SWAN Charter initiative in UK
http://www.athenaswan.org.uk/html/athena-swan

The European Charter for Researchers (containing recommendations of good practice for researchers and employers and/or funders) and the Code of Conduct for the Recruitment of Researchers (which outlines principles for hiring and appointing researchers) issued by the European Commission
http://ec.europa.eu/eracareers/pdf/am509774CEE_EN_E4.pdf

The Total E-Quality Award, promoted by TOTAL E-QUALITY Deutschland e.V. and supported by Centre for Excellence Women in Science (CEWS)
http://cews.org/total-e-quality/index-e.htm

[5. Childcare services]

Description

We refer here to childcare services established by the organisation in which women work or study, financially supported by it and located within or close to the organisation's offices (for example, on the university campus).

Application domains

Childcare services are one of the most relevant means to make the **work environment** friendlier to women. Their establishment in research institutions and universities is not such a rare event. In addition, lactation utilities and spaces are often made available.

Examples of practices

The childcare centres and the facilities for nursing moms, created at the Georgia Institute of Technology
http://advance.gatech.edu

The on-campus childcare centres, licensed by the local department of children and family services, established at the University of Illinois at Chicago
http://www.uic.edu/orgs/wisest/index.htm

[6. Coaching]

Description

Coaching is a method of training and directing individuals or groups, supporting them in acquiring new skills or achieving some specific goals. Coaching usually includes a large set of tools, such as workshops, supervised practical activities or training sessions. Coaching tends to be focused on personal development, both in the professional domain and in other spheres of life, and is therefore aimed at facilitating those who are coached in identifying, developing, enlarging and using their own potential, skills and knowledge.

Application domains

Programmes in support of women in science and technology tend to use coaching as a tool for preparing women scientists to attain **leadership positions**. Various specific objectives can be pursued through coaching, such as: supporting women to develop their own career plan; encouraging women to apply for high-ranking positions; supporting mentors involved with ***mentoring***-based leadership programmes (see below); helping women to reinforce their orientation to innovation and entrepreneurial skills. Web-based e-coaching methods can also be used.

Examples of practices

The “Tailored e-coaching” programme promoted by the Manchester Business School
http://www.mbs.ac.uk/research/equalitydiversity/documents/Ecoaching2007ESFReport.pdf

The coaching scheme provided at the University of Michigan by coaches trained in diversity issues
http://www.sitemaker.umich.edu/advance/home

The annual career coaching workshop held at the Georgia Institute of Technology
http://advance.gatech.edu/initiatives.html

[7. Committees]

Description

Committees (or similar structures under different names, such as “commission”, “task-force” or “working group”) are usually established in organisations to perform one or more specific tasks as quickly as possible, on behalf of a superior body to which they report. The nature of the tasks can vary, including both strategic functions (such as designing action plans or devising measures) and organisational functions (such as coordinating activities or assessing programmes).

Application domains

The institution of committees is sometimes used to trigger overall institutional transformations within the organisation. Different universities interested in starting or enhancing their gender policies have created committees with different names (committee on women, commission on the status of women, women and science committee), performing, at least at the beginning, various tasks such as monitoring women's status in the institution, improving women's recognition, or attaining gender balance in decision-making bodies. Committees can be either top-down formal institutional bodies, endowed with the authority to allocate resources or to introduce new ***regulations*** (see below) or more informal structures, adopting participatory approaches. Committees can also be one-issue bodies, created to pursue specific tasks. The most significant examples of this second kind of committees pertain to the advancement of women in **leadership positions**.

Examples of practices

The committee established by the Spanish Consejo Superior de Investigaciones Científicas (CSIC), in charge of developing diagnoses and analyses of the constraints to women's career and suggesting policy measures
http://www.csic.es/mujerCiencia.do

The specific committee established at the University of Michigan in order to improve diversity within the university personnel
http://sitemaker.umich.edu/advance/home

The Women and Young Pharmacists committee, created within the Pharmacy Guild of Australia to increase their representation in the professional association
http://www.guild.org.au/content.asp?id=894

The subcommittee created at the Massachusetts Institute of Technology for producing hiring and development guidelines
http://web.mit.edu/facfamily/

[8. Consultations]

Description

The term "consultation" refers here to sets of actions aimed at collecting inputs (opinions, suggestions, points of views) by the different players involved in a process of change such as designing new measures, taking new decisions or building a consensus around new measures and policies to be devised. Consultations can be formal and structured or highly informal.

Application domains

Forms of consultation have been recorded for introducing new procedures in universities in order to guarantee a balanced presence of women in **leadership positions** (with special reference to the composition of decision-making boards), involving different players (top-managers, trade union representatives and other stakeholders). In some universities, informal consultations are used in order to favour exchanges among the players concerned as regards solutions and strategies for improving gender equality within the institution.

Examples of practices

The internal climate workshops on organisational change organised at the University of Michigan
http://www.sitemaker.umich.edu/advance/step

The consultation with university top managers and leaders, trade unions and other stakeholders in order to raise consensus around new proposals for promoting a balanced presence of women at the Autonomous University of Barcelona
http://selene.uab.es/observatori-igualtat/

The department chairs meetings organised at Rice University to discuss their departments' situation and involve them in the design of the initiatives
http:/cohesion.rice.edu/centersandinst/advance/emplibrary/ACF368F.doc

[9. Databases]

Description

Databases are another tool sometimes used by programmes in support of women in science and technology. They usually contain structured data and information on women scientists and experts and are made available in either an open or a restricted way on the web.

Application domains

Databases are almost exclusively used as a way to help women reach **leadership positions**. There are both general databases, which include records on women aspiring to, and qualified for, different science-related positions in a large array of disciplinary sectors (such as professor, lecturer, mentor, administrator, etc.), and specialised databases pertaining to women candidates to decision-making boards. Some databases are designed to provide women with information on vacancies in university positions and other career opportunities (such as funding opportunities or training opportunities).

Examples of practices

The database of female scientists and experts, encompassing around 25 different areas of expertise, developed by the Austrian Research Promotion Agency
http://www.femtech.at/index.php?id=65&L=2

The interdisciplinary database of women scientists from four central European countries established in the Czech Republic by the National Academy of Sciences
http://www.cec-wys.org/html/index.php?s1=1&s2=7&s3=2&lng=13

The database developed in Germany by the Center for Excellence Women in Science (CEWS) contains information on several thousands of German-speaking women scientists
http://www.femconsult.de/femconsult/LuceneQuery?style=home

The database developed by the National Foundation for Australian Women (NFAW) in the framework of the Women on Boards programme, bearing information of women interested in filling board positions in private business
http://www.womenonboards.org.au/

[10. Direct contact]

Description

Direct contact refers to face-to-face and personal interaction between those promoting a programme or action supporting women and other individuals performing different roles, such as potential beneficiaries, experts or representatives of funding agencies. Since contacts of this kind are extremely widespread, they are not usually viewed as a "tool for action". However, they often play a key role for the success of a programme. Moreover, the establishment of direct contacts is an objective explicitly pursued through different tools such as ***networking***, ***mentoring***, and some specific types of ***meetings*** (see below).

Application domains

Direct contact has been recorded as a specific tool for promoting the advancement of women in **leadership positions**. In particular, direct contacts have been used in some programmes in order to proactively search for women with competences and skills making them potential candidates for leadership positions and to encourage them to apply for these posts. Direct contact has also been used to encourage women scientists to publish their works in eminent international journals and to contribute to internal and university publications.

Examples of practices

The personalised action provided at the Sydney University of Technology aimed at encouraging and helping women to apply for becoming a member of one of the university boards
http://www.eng.uts.edu.au/EducationandOutreach/wie/UTSStaff.htm

The personal contacts with female independent research fellows to propose as candidates for board positions promoted at the Chemistry Department of the York University
http://www.york.ac.uk/research/athena/chemistry%20submission/Appendix%20E%20York%20Chem%20submission%20report.pdf

[11. Dissemination and guidance packages]

Description

The term "dissemination and guidance packages" is used here to refer to the many kinds of products (mostly documents and books) aimed at documenting knowledge, know-how, experiences and information, such as guidelines, reference books, source books, handbooks or toolkits, so that they can be directly used by individuals and institutions without resorting to further support (such as mentors, trainers or information desks). These products are almost always downloadable from the web.

Application domains

Different kinds of packages can be developed in support of **women's leadership**, such as hiring and promotion guidelines; guidelines for seminar organisers to ensure a gender-balanced procedure in selecting external lecturers, conference speakers and visiting professors; training and information packages and toolkits addressed to women aspiring to leadership positions; manuals helping women to devise strategies for accessing university boards; case studies on women who successfully attained top positions; guidelines on how to search and contact women qualified to access decision-making boards; manuals on professional development. Similar packages have been produced in order to build a **gender-aware science**, such as: guides to non-sexist language; tool-kits addressed to search committee members in order to facilitate a full integration of gender studies in universities and departments; manuals for male faculties on how gender bias occurs in research; guides for teaching ICT in a gender perspective. As regards promoting a fair **work environment**, it is worth mentioning, for example, the development of guidelines to ensure gender pay equality.

Examples of practices

The hiring and development guidelines developed at the Massachusetts Institute of Technology to ensure diversity in the hiring process of junior faculty
http://web.mit.edu/facfamily/

The guide to non-sexist language developed by the Autonomous University of Barcelona
http://selene.uab.es/observatori-igualtat/PDF_2008/Us_no_sexista_del_llenguatge.pdf

The guide to teach ICTs in a gender perspective drafted by the Spanish association Donestech
http://www.donestech.net/ca/guia_didactica

The new curriculum resources on teaching technologies to female students developed at the Sydney University of Technology
http://www.eng.uts.edu.au/EducationandOutreach/wie/index.htm

The manual for researchers on gender bias in science drafted by the Czech Academy of Science
http://www.cec-wys.org/html/index.php?s1=1&s2=10&s3=6&s4=3&s5=0&s6=0&m=1&typ=clanky&recid_cl=1951

The check-list addressed to engineers finalised at verifying if gender aspects were included in product design, elaborated by Fraunhofer Gesellschaft
http://www.genderchancen.de/EN/

The toolkit "Gender in EU-funded Research", providing an overall introduction to gender in S&T and concrete tools on how to make research gender-sensitive, published by the European Commission
http://www.yellowwindow.be/genderinresearch/downloads/YW2009_GenderToolKit_Module1.pdf

The web-based package developed by the Georgia Institute of Technology, addressing both female faculty and university leaders on gender bias in the promotion mechanisms
http://www.adept.gatech.edu

The guidelines for helping women to attain top positions developed by the Canadian Advanced Technology Alliance (CATA) Women in Technology programme
http://www.catawit.ca/fourPillars/

The guidelines issued at the University of York addressing seminars'organisers, in order to ensure a greater number of women among external lecturers, conference speakers and visiting professors
http://www.york.ac.uk/research/athena/chemistry%20gold/appendix%20G%20york.PDF

[12. Expressive and artistic tools]

Description

This heading groups together information and dissemination tools mainly of an expressive and artistic nature, such as documentaries, videos, exhibitions or theatrical performances.

Application domains

Use of these kinds of tools is quite rare. Some examples are: videos about women scientists, inventors, company managers and engineers aimed to show the stereotyped nature of many assumptions on women, science and technology; videos and dissemination documentaries produced on best practices in institutional transformation of research institutions; theatre sketches used in order to highlight the obstacles women face in their careers.

Examples of practices

The interactive theatrical sketches applied for promoting a debate on gender discriminating practices and behaviours carried out at the University of Michigan
http://sitemaker.umich.edu/advance/stride

The audio-visual interviews (12-30 minutes each, with excerpts of 5-20 seconds) with women working with ICTs, carried out by the Spanish association Donestech
http://www.donestech.net/ca/audiovisual

[13. Grants, loans and subsidies]

Description

This heading includes all funds directly delivered for any purpose through an application process to individuals or institutions (also in the form of loans or subsidies).

Application domains

The delivery of funds to support women in science and technology is a common practice, applied to pursue a wide range of objectives. Funds are mostly delivered to support women's **advancement to high-level positions**. For example, they can be used: to retain women in scientific careers or to help them get "back on track" after significant life events; to help women get professional opportunities such as attending international conferences or travelling to research sites; to provide women scientists with seed funds for starting new research projects; to participate in courses or training seminars (for example, to improve one's productivity as well as writing, teaching and managerial skills); to pay subscriptions to scientific jour-

nals; to pay membership fees of scientific networks and associations; to support women researchers' employment in private companies; to sustain the mobility of female scientists to other institutions or enterprises; to start new innovation projects. Fund delivery is also a way to improve women's **working environment**. For example, some research institutions provide women with specific grants, loans or subsidies to facilitate their access to community services (such as childcare services, elderly services, healthcare services), for them and their dependents. As regards promoting a **gender-aware science**, funds are mainly used to finance research programmes on gender and science.

Examples of practices

The two-year financial support provided by the German network LaKoG to female scientists with children to improve the compatibility of career and family during early career stages
http://www.lakog.uni-stuttgart.de/en/menue_links/startpage/index.html

The funds helping tenure-track faculty stay on track for their research after significant life-altering events (such as childbirth, adoption, eldercare, or family illness) provided at the University of Illinois at Chicago
http://www.uic.edu/orgs/wisest/index.htm

The mini-grant programme created at the New Mexico State University in support to professional development of women faculty
http://www.advance.nmsu.edu/Documents/PDF/ann-rpt-08.pdf

The grants provided to universities and research institution by the Swedish VINNOVA for women's professional development
http://www.vinnova.se/In-English/Activities/Strong-research-and-innovation-environments/VINNMER/

The additional fund scheme established at the University of Wisconsin at Madison to support women who are at critical junctures in their professional careers and whose research productivity is affected by personal life events
http://wiseli.engr.wisc.edu/docs/AnnReport_IT_2007FINAL.pdf

The grants provided by the Australia's Commonwealth Scientific and Industrial Research Organisation (CSIRO) to each to support women researchers to re-establish themselves and re-connect with research underway in their field
http://www.csiro.au/files/files/pmvp.pdf

The independent funds for female researchers delivered by the Slovenian Science Foundation
http://www.szf.si/?lang=slo

[14. Information desks]

Description

Information desks are sometimes used in the framework of programmes aimed at promoting women in the science and technology sector. These services (with dedicated spaces and personnel) provide information on a specific set of issues, give answers to users' questions and sometimes provide them with direct assistance.

Application domains

Information desks are usually linked to the need for **enhancing the work environment for women**. Most of them are connected with other services. For example, in some universities information desks are attached to ***childcare services*** (see above). In some cases, they have been conceived as an autonomous one-stop shop coordinating women's access to all services and opportunities (such as family services, parenting support, education needs, etc.). Sometimes, this function is performed through dedicated ***websites*** (see below).

Examples of practices

The work-life resources website established at the Kansas State University
http://www.k-state.edu/worklife/

The office established at the University of Wisconsin at Madison with the aim of informing and assisting women on the opportunities available issues such as childcare facilities, family and parent resources and parenting support
http://www.occfr.wisc.edu

[15. Institutional arrangements]

Description

This heading refers to the creation of new "institutions" or positions of any kind, including new centres, institutes, departments, chairs, professorships or units, designed to be permanent in character. ***Committees*** are dealt with under a specific heading (see above).

Application domains

The creation of new institutional bodies or positions is a widespread practice for sustaining women, with special reference to programmes geared to accelerating their **advancement to leadership positions**. Among institutional arrangements, the following can be usefully recalled here: the institution of the position of training officer for graduates and research assistants, to be charged with addressing some of the obstacles women face in their careers; the creation of new professorships addressed to women in science and engineering; the creation of a new position within research centres and departments for a person charged with monitoring equality policies; the creation of new research institutes, units and professorships specialised in women and science. One of the most common institutional arrangements promoted in order to facilitate a **gender-aware science** is that of establishing research centres, departments, permanent research groups, Ph.D. programmes or chairs specialised in gender studies. Centres of expertise or competence centres addressed to women and led by women have also been created. Finally, different kinds of programmes addressing women's issues in science and technology may be made permanent by providing them with an annual budget and a permanent dedicated staff, thereby introducing new institutional features in the organisation.

Examples of practices

The establishment at the University of York of an officer in charge of providing post-graduate students and post-doctoral researchers with advice in order to help them tackling obstacles in the transition from PhD into an academic career
http://www.york.ac.uk/research/athena/chemistry%20gold/appendix%20G%20york.PDF

The creation of the women-led Laura Bassi Centres of Expertise by the Austrian Research Promotion Agency
http://www.w-fforte.at/en/laura-bassi-centres.html

The establishment of a new research institute specialised on women, science and leadership, created at the University of Wisconsin-Madison
http://wiseli.engr.wisc.edu/docs/AnnReport_IT_2007FINAL.pdf

The creation of the "Observatory for Equality" at the Autonomous University of Barcelona
http://selene.uab.es/observatori-igualtat/Angles/Action_plan_2008_2012.pdf

[16. Lobbying]

Description

Rather than being a tool, lobbying can be viewed as a way to combine different tools in order to influence the decision-making process in favour of specific groups such as women in science and technology.

Application domains

The most significant examples of the use of lobbying are provided by some networks or committees engaged in promoting more effective policies on women in science and technology, at national or European level and within professional and scientific societies and at university level. The main tools used are production of policy statements, involvement of decision-makers in public debates, promotion of ***media campaigns*** (see below), development of recommendations and ***monitoring*** (see below) of devised policies.

Examples of practices

As already pointed out, the most appropriate example is that of the European Platform for Women in Science, with special reference to the two policy forums "Science Business Policy Bridge" and the "European Policy Centre Innovation Taskforce"
http://www.epws.org/index.php?option=com_content&task=view&id=325&Itemid=4668

[17. Media campaigns]

Description

Media campaigns are specifically geared to disseminating information to the general public through such things as television, newspapers, magazines and web-based media.

Application domains

Media campaigns are rarely used for the promotion of women in science and technology. This is probably due to the fact that most programmes focus on promoting changes inside their own organisation or at least in universities and research institutions. Therefore, involving the public at large is usually not their primary objective. This tool is, however, more commonly used for promoting awareness on the **gendered nature of science**, an issue directly concerning different targets outside university and research settings. Media campaigns, for example, can be created to show the varied life-worlds of women in innovation and science or how gender and diversity can lead to new ideas for products and new applications for technology.

Examples of practices

The campaign to promote work/life balance practices intended for men (particularly parental leaves for fathers) promoted in Italy by the University of Trento
http://www.unitn.it/gelso/campro.htm

The media campaign promoted by the Austrian Research Promotion Agency oriented at displaying the varied life-worlds of women in innovation and science
http://www.w-fforte.at/en/wissenschafft-leben/

The communication campaign “E-Quality”, launched by Norwegian Committee for Mainstreaming – Women in Science for promoting equality policies in the field of science and technology
http://eng.kvinneriforskning.no/c63090/seksjon.html?tid=63091

[18. Meetings]

Description

The word ***meeting*** can be applied to an extremely broad range of situations in which people meet. Here, the term is used specifically to refer to meetings where participants are invited to discuss specific topics and exchange opinions and experiences. Therefore, working meetings envisaging decision-making, developing actions, devising measures and assessing or evaluating programmes are not included. These kinds of meetings are contemplated under other headings, such as ***committees***, ***consultations***, ***institutional arrangements***, ***organisational arrangements***, ***policy promotions*** or ***transfer of best practices*** (all tools for action entailing the organisation of meetings).

Application domains

Needless to say, organising meetings is a daily practice for programmes aimed at supporting women in science and technology. As regards programmes striving for a more balanced **work environment** for women, meetings are organised for various reasons, such as: collecting data and opinions on women's conditions in the university setting and critical factors generating a negative climate for them; raising women's awareness on factors hampering them in their life within the institution; awareness-raising of department chairs on these very issues; promoting a discussion on sexual harassment in university settings. Using meetings as a tool for action has also been recorded in programmes aimed at supporting **women's careers**. Again, they can pursue very different goals such as: discussing the promotion and tenure process in the university; promoting an exchange on career development convening women faculty and other successful women scientists; debating the organisation's policies for promoting women in high-ranking academic positions, with the direct involvement of senior university staff; raising women scientists' awareness on the relevance of scientific communication. Meetings can also be organised for discussing the **gendered nature of science**, as in the case of meetings aimed at encouraging women scientists to examine the gendered cultures of their workplace or at deepening women students' understanding of the relationships between gender and technology.

Examples of practices

The meetings with the department chairs on the negative effects of gender stereotypes on university life at Rice University
http://cohesion.rice.edu/centersandinst/advance/emplibrary/ACF368F.doc

The weekly informal coffee meeting with deans, chairs, administrators and faculty staff for discussing issues concerning women faculty at the New Mexico State University
http://www.advance.nmsu.edu/Documents/PDF/Retention_Report-Nov08.pdf

The one-day workshops organised by the Autonomous University of Barcelona in the framework of a broader programme aimed at removing the obstacles to professional promotion of women within the academic staff
http:// selene.uab.es/observatori-igualtat/Angles/Action_plan_2008_2012.pdf

[19. Mentoring]

Description

Mentoring refers to a relationship in which a more experienced person (the mentor) helps a less experienced one (the mentee). Mentoring is increasingly used in human resources development and is largely applied in the promotion of women in different organisational settings (such as public administration, enterprises and service providers).

Application domains

Mentoring is also widely used in universities and research institutions. A number of programmes aimed at helping women faculty to attain **leadership positions** apply mentoring,

usually by coupling young women researchers as mentees and highly qualified female scientists as mentors. Mentoring schemes usually focus on the transfer of capacities and skills necessary for attaining full professorship and top scientific positions, but also for supporting women to reach qualified innovation-related positions in university and industry (for example, allowing mentees to access the mentor's social capital). Mentoring is also important in creating a better **working environment** for women, and especially a welcoming climate for new faculty members. It may allow younger women researchers to identify the factors penalising women in their own workplace and assist women who feel they are not adequately assisted within their department. Often mentoring is associated with other tools such as ***networking***, ***training courses*** or ***social events*** (see below).

Examples of practices

The mentoring programme of the University of Fribourg, in Switzerland
http://www.unifr.ch/f-mentoring/fr/prg/presentation1

The European network of academic mentoring programmes for women scientists EUMENT-NET
http://www.euement-net.eu/default.aspx

The mentoring scheme for career advancement developed at the Kansas State University
http://www.k-state.edu/advance/Initiatives/CAP%20RFP%20Round%205.pdf

The mentoring initiative carried out at the University of Vienna to accelerate women's career progression
http://www.personalwesen.univie.ac.at/gender-equality/mentoring/about-the-program/?L=2

The international mentoring scheme developed by the TANDEMplusIDEA programme, aimed at preparing qualified female scientists for a high-profile scientific career and professorship
http://www.idealeague.org/tandemplus/programme/programme/mentoring

[20. Monitoring and evaluation tools]

Description

Monitoring and evaluation refer here to any action aimed at providing information on the state of a given programme, policy or process. Monitoring is characterised by continuity of the assessment action for a given period, while evaluation is a discrete action, carried out once or several times, in usually pre-established development phases of the project, policy or process.

Application domains

Monitoring and evaluation tools are often used in promoting women in science and technology. They are largely employed to support women's access to **leadership positions**. Monitoring and evaluation tools are largely used with regard to policies geared to favouring women's career advancement in research institutions or universities. Evaluation exercises are also carried out for narrower objectives, such as critically reviewing institutional communication tools in order to ensure equal opportunities between women and men in gaining scientific visibility. Evaluation and monitoring activities are also promoted to assess **working environment**, including the salary gap between women and men or the climate for women in uni-

versity departments, and the construction of a **gender-aware science**, such as the degree of integration of gender studies in scientific and technical disciplines or the inclusion of gender aspects in research project design. Tools used include data gathering, evaluation meetings, application of checklists and standardised measurement tools or indicators.

Examples of practices

Examples on the use of monitoring and evaluation tools:

The participatory monitoring approaches to detect positive and negative changes in personnel composition at the Georgia Institute of Technology
http://www.advance.gatech.edu/archive/promotion.html

The review of the institutional web sites (both at university and at departmental levels) in order to ensure acknowledgement of gender diversity at the Kansas State University
http://www.k-state.edu/advance/Initiatives/initiatives.html

The critical assessments of the climate and environment for women in scientific departments of universities carried out by external assessment staffs promoted by the Canadian Association of Physicists
http://www.cap.ca/

The Europe-wide monitoring mechanisms on women's career advancement developed by the European Platform for Women in Science (EPWS)
http://www.epws.org

Examples of self-assessment exercises of women equality programmes:

The final report of the Women in Science and Engineering Leadership Institute (WISELI) at the University of Wisconsin
http://wiseli.engr.wisc.edu/docs/AnnReport_IT_2007FINAL.pdf

The Gold Progress Record Form prepared by University of York Department of Chemistry in the framework of the British Athena Swann programme
http://www.york.ac.uk/research/athena/chemistry%20gold/appendix%20G%20york.PDF

The Programme evaluation toolkit developed by the American ADVANCE-IT Programme
http://www.advance.nmsu.edu/Documents/PDF/toolkit2.pdf

[21. Networks and networking]

Description

Network refers to the establishment of more or less formal groups or associations, the membership of which is usually made up of people working in different units or institutions. Networking refers to a more or less continuous development of contacts or information-exchange among people included in an informal network. Networks and networking are often grounded in daily web-based communication, mixed with occasional or periodic face-to-face interaction (such as ***meetings*** or ***social events***).

Application domains

Networks and networking are used extensively in programmes promoting women in science and technology. Moreover, a considerable number of programmes are designed and implemented by

networks or have creating a network as their main goal. Networking is broadly applied (often in association with ***mentoring***) as a tool for encouraging women to attain **high-ranking positions**. It can be used for different purposes, such as: to help women consider their own career views and experience from a more objective angle; to prepare women to access decision-making boards, both in university and in the private sector; to facilitate contacts between highly qualified women and company top managers. Networking can also be used in order to improve the **work environment**, such as: to collect information on critical factors penalising women; to help young women to access new professional networks; to raise the awareness of women and managers on gender inequality; to provide informal support to women in difficulty or at risk because of the lack of adequate assistance by their organisation. The building of a **gender-aware science** can also benefit from networking, mainly as a way to aggregate those scientists interested in developing new gendered views of scientific work. Finally, networking can also be an effective tool to facilitate overall institutional transformation. On the one hand, networks and networking are relevant in many ***lobbying*** activities (see above) in support of women, both at national and European level; and, on the other hand, networks play a key role in enlarging the number of organisations positively oriented to change and in sustaining them in keeping this orientation in the time.

Examples of practices

The university-wide network created at the Australian University of Southern Queensland in the framework of the GO-WEST Project
http://www.usq.edu.au/gowest

The Women's Network in Archaeology established in Germany
http://www.femarc.de/Netzwerk/text/naafweb1.html

The Rural Women's Network promoted in Australia by the New South Wales Dept. of Primary Industries
http://www.dpi.nsw.gov.au/rwn

The network meetings carried out by the Swiss Réseau romand de mentoring pour femmes/RRM
http://www.unifr.ch/f-mentoring/fr/prg/presentation1

The networking activities carried out by the Canadian Association of Women Executives and Entrepreneurs (CAWEE)
http://www.cawee.net/about.html

[22. On-demand services]

Description

This heading groups together all services designed to be activated on user demand. The accent here is mainly on the customised nature of the services provided, requiring service providers to adapt to the specific needs of users.

Application domains

Creating on-demand services in support of women is one of the possible tools for rendering **work environments** friendlier for women. Among the services, one can mention: assistance services to women faculty in facing problems in their work environment; informal support to

junior women faculty to facilitate their integration in the new work contexts; services designed to encourage young female researchers to develop their own long-term career plan; services for women with specific family needs or aspirations (care of dependents, child adoption, etc.). On-demand services are also a way to help women **climb the career ladder**. For example, it is worth mentioning: customised support services to women interested in applying for scholarships and funds for research; advice services provided to women in order to increase their orientation to reach high-level positions; personalised advice to encourage and help women to apply for access to decision-making committees.

Examples of practices

The help-desk specifically addressed to women faculty and students experiencing harassment or other forms of discrimination, organised at three universities and a non-for-profit organisation in Milan
http://www.universidonna.org/du/index.php?option=com_content&task=blogsection&id=7&Itemid=35

The office established at the University of Wisconsin at Madison with the aim of assisting women with questions and problems pertaining to work-life balance (childcare, breastfeeding facilities, family and parent resources, parenting support and education needs)
http://www.occfr.wisc.edu

The assistance provided by the National Foundation for Australian Women (NFAW) through the Women on Boards programme to draft an effective curriculum vitae and to devise personal strategies to become board members in private enterprises
http://www.womenonboards.org.au/professional-development/index.htm

The customised services to access boards provided to women by the Australian industrial association Women in Technology (WiT)
http://www.wit.org.au/default.asp?PageID=10&n=Board+Readiness28TM29

The Sexual Harassment and Mobbing Counselling Office at the University of Vienna
http://personalwesen.univie.ac.at/gender-equality/counselling-office-sexual-harassment-and-mobbing/?L=2

[23. Organisational arrangements]

Description

Change in women's condition in science and technology is often pursued by developing new organisational arrangements, such as the adoption of new procedures and practices, the creation of new functions and tasks, the modification of organisational forms, and so forth. Unlike with ***institutional arrangements*** (see above), organisational ones do not require the establishment of new permanent units, bodies or positions; nor do they need new ***regulations*** (see below). Sometimes, regulations and institutional arrangements follow the adoption of new organisational solutions. Therefore, organisational arrangements – at least as they are meant here – are narrower in scope, more fluid and modifiable and based on decisions that can be taken at all levels of the organisation. Often, new organisational arrangements emerge spontaneously, and are not established through any formal decision.

Application domains

Modifying organisational procedures or forms can be a useful tool for gender balancing the **work environment**. Good examples can be: the introduction of new hiring practices; the use

of experts as facilitators for assisting deans, administrative teams or academic departments to cope with specific problems (such as sexual harassment); the introduction of new departmental procedures for managing cases of parental leave and temporary part-time work due to family reasons; the establishment of part-time arrangements to help women in balancing work and life; the testing of new gender-fair procedures for assigning duties. Organisational arrangements can also support the advancement of women to **leadership positions**, through, for example, the adoption of new mobility schemes or the modification of the ways in which promotion committees work and are organised.

Examples of practices

The procedures introduced for better managing parental leaves and temporary part-time work in the ADVANCE-IT programmes funded through the American National Science Foundation
http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5383

The procedures for actively modifying the assignments of duties of women in situations of particular need for family reasons at the Georgia Institute of Technology
http://www.advance.gatech.edu

[24. Planning]

Description

All organisations need to engage in planning to implement new functions, policies or programmes. In this sense, planning cannot be considered as a specific tool for promoting women in science and technology. However, experience shows how planning (i.e. defining strategies and objectives, identifying actions and means, allocating human and financial resources, etc.), over and beyond its practical effects, is a necessary political and symbolic step in order to shift from a fragmented, short-term, occasional and often generic support of women to a more long-term commitment aimed at really increasing gender equality in science and technology.

Application domains

Universities and research institutions sometimes develop **general gender equality action plans**; very often, action plans are devised to face **specific problems**, such as to improve the climate for women in the university, to remove obstacles hindering women's careers, to promote job mobility for women or introduce national legislation on gender equality in the organisation. Not rarely, action plans are developed through participatory procedures which involve stakeholders and decision-makers. Some gender-oriented university networks use the adoption of an action plan as the main indicator of the real engagement of university leaders in modifying the conditions of women in their institution. Finally, some national governments have also devised an action plan in support of women working in science and technology-related sectors. The strategy adopted by many programmes, in their first phases, includes three main steps: identifying the problems to be addressed, often resorting to ***research tools*** (see below); awareness-raising of key players, women and stakeholders on the need to find solutions; developing an action plan or, rather, urging decision-makers to develop adequate action plans to implement the envisaged solutions.

Examples of practices

The Equal Opportunities Action Plan established at the Helsinki University
http://www.helsinki.fi/henkos/tasa-arvo/TaSu_EN.htm

The Gender Equality Plan established at the Academy of Finland
http://www.aka.fi/en-gb/A/Science-in-society/The-research-career/Equality/Equality-Working-Group/

The Plan of Action intended to increase the presence of women in top positions and to reinforce their visibility developed at the University of York
http://www.york.ac.uk/research/athena/chemistry%20gold/appendix%20G%20york.PDF

The Plan of Action for the equality between women and men developed at the Autonomous University of Barcelona
http://webs2002.uab.es/observatori-igualtat/Angles/Documents_PDF/Pla%20d'igualtat%20aprovat%20en%20CG%204-05-06.pdf

[25. Public communication tools]

Description

This heading includes all tools geared to publicising programmes, actions and events and to disseminating information to a large audience, such as brochures, newsletters, bulletins, leaflets and flyers, both on paper and online.

Application domains

Dissemination and publicising tools may be employed by any kind of programme in support of women's promotion in science and technology. These tools can be used as awareness-raising means for promoting changes in the **working environment** (for example, to disseminate data and information on factors penalising women in the organisation) and – in support of women's advancement to **leadership positions** – to spread information on opportunities and resources (such as grants, courses, vacancies and research projects). These tools are sometimes also applied for awareness-raising initiatives on the **gendered nature of science**. An important role is played by dissemination and publicising tools in fund-raising.

Examples of practices

The monthly electronic newsletter bringing information on activities in science and research, conferences, grants, and fellowships from a gender perspective issued by the Institute of Sociology of the Czech Academy of Sciences
http://www.cec-wys.org/html/index.php?s1=1&s2=3&s3=10&lng=13

The publication of information about women researchers' successes in scientific activities in the Magazine of the University of York
http://www.york.ac.uk/research/athena/chemistry%20gold/appendix%20G%20york.PDF

The brochure prepared at the University of Wisconsin at Madison on the effects of unconscious biases and assumptions on personnel selection process
http://wiseli.engr.wisc.edu/docs/AnnReport_WISELI_2004.pdf

[26. Regulations]

Description

It is quite obvious that one of the most direct ways to modify the status of women in science and technology is by changing the rules (e.g. national laws, regulations, contracts and any other kind of normative element) governing how organisations and institutions work. Regulations are often applied to establish on paper a process of change developed by using other tools (for example, new ***funds***, ***planning*** activities or new ***institutional arrangements***), but it is more important here to focus on regulations introduced at the beginning of the process, i.e., as a tool for activating change and finding a direct solution to a given problem.

Application domains

The use of rules as a "change trigger" can concern any aspect of the condition of women in science and technology sectors, but it is particularly helpful for improving the **working environment** and supporting women's access to **leadership positions**. Some examples are: the introduction of new rules postponing the age limit for applying to post-doctoral research projects, in order to protect women's parenting needs; the definition of new regulations aimed at providing continuity in the salary of contingent faculty through bridging support; the establishment of a new category of contracts recognising a set of benefits and rights to researchers whose salary is covered by contingent funds; the introduction of new recruitment regulations favouring, under certain conditions, the underrepresented gender; the introduction of quota systems in the gender composition of scientific committees.

Examples of practices

The "Ongoing Contingent-Funded Research Contract" established at the University of Western Australia for retaining women academic personnel by improving job security levels of grant-funded research staff members
http://www.hr.uwa.edu.au/agreements/academic/academic_staff_agreement/schedules/ongoing_contingent_funded_research_contract

The institution of quotas at the Academy of Finland
http://www.aka.fi/en-gb/A/Science-in-society/The-research-career/Equality/

The application in S&T sectors of the quota system introduced by the law in Greece
http://www.ekke.gr/english/index.html#

The introduction of new measures for supporting women researchers at the Spanish Consejo Superior de Investigaciones Científicas (CSIC)
http://www.csic.es/mujerCienciaEnlaces.do

[27. Research and data collection]

Description

This heading includes all tools geared to generating or organising knowledge, regardless of the approaches and methodologies used, such as surveys, administrative data collection, organisation of statistical data, focus groups, informal interviews, and the like.

Application domains

Having up-to-date knowledge on the social, cultural, organisational and psychological dynamics that contribute to women's condition in science and technology is often critical. Research tools are thus widely used in programmes in support of women. Particularly common are research activities deepening the relation between **gender and science**, on issues such as: women's status in research organisations; women's attitudes towards scientific and technological areas and tasks; stereotypes of women in different scientific disciplines; mechanisms guiding the attribution of tasks in research practice; factors reinforcing the gender division of labour in scientific and technological sectors (such as in ICT); influence of gender in the choice of teaching methods; relationships between gender and technology; women's projects and personal or collective practices in relation to ICT. Research tools are also used to generate new knowledge on **gender and leadership**, for example: on bias in faculty tenure and promotion evaluation; on factors influencing the assignment of institutional resources (such as funds, spaces, human resources) to women and men in university settings; on objective and subjective obstacles preventing women's full inclusion in decision-making bodies. Moreover, research activities can be aimed at better understanding the **environment** women work in, by dealing with such themes as the existing barriers preventing women from being fully integrated in science and technology, the factors influencing the departmental or university "climate" or the influence and effects of gendered language used by university administrations.

Examples of practices

The web-based climate survey carried out by the Women in Science and Engineering Leadership Institute (WISELI) at the University of Wisconsin at Madison
http://wiseli.engr.wisc.edu/initiatives/climate/workshops_deptchairs.html#Wkshp

The campus-wide exit interview study made at the University of Michigan
http://sitemaker.umich.edu/advance/climate_assessments

The research project on the organisational and social factors responsible for the under-representation of women in S&T disciplinary areas at the Canadian University of Guelph
http://www.nserc-crsng.gc.ca/Professors-Professeurs/CFS-PCP/CWSE-CFSG_eng.asp

The research project on the language used by the university administration, analysed from a gender perspective, carried out by the Italian Centro Interdisciplinare di Ricerche e Studi delle Donne (CIRSDe) at the University of Turin
http://www.cirsde.unito.it/ATTIVITA--CIRSDe/ARCHIVIO/default.aspx

The collection of systematic data on women's status within the university carried out at the University of Chicago
http://www.uicwisest.org/

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./. Examples of practices

The data collection initiative for monitoring women's participation in S&T fields made by the Queensland Government Office for Women
http://www.women.qld.gov.au/work-and-life/smart-state-strategy/documents/set-action-plan.pdf

The study on professional equality between women and men carried out at the French Ecole des Hautes Etudes en Sciences Sociales (EHESS)
http://www.ehess.fr/fileadmin/Egalite_pro_hf/rapport_egalite_professionnelle.pdf

The survey carried out by the Spanish association Donestech on women in the ICT sector
http://www.donestech.net/ca/recerca_icd

[28. Social events]

Description

This heading includes all initiatives geared to producing a significant impact on the public they are addressed to. Events can be of various kinds: conferences, galas, dinners and receptions. Social events are often organised as components of ***networking*** activities (see above).

Application domains

Events can be used for pursuing a broad range of objectives. For example, to make the **work environment** friendlier to women, to increase women scientists' visibility (such as by organising a celebration day for women scientists) and to improve the working climate (such as by organising a welcome event for new women faculty members). Social events may also be useful in supporting women's careers up to **leadership positions**. Examples of this kind are: an annual forum for attracting women students to scientific careers; a biannual workshop on the promotion and tenure process in the university; conferences involving universities and industries to promote women scientists in innovation programmes or public lectures given by high-profile women. Events have also been used as part of a communication programme on the relationships between **gender and science**. Events are often one of the main ways people raise funds.

Examples of practices

The welcome event for new faculty members and a celebration of faculty members' achievements organised at the New Mexico State University
http://www.advance.nmsu.edu/Documents/PDF/Retention_Report-Nov08.pdf

The leadership conference co-organised by the Canadian University of Guelph and other American universities on the under-representation of women in high-level scientific positions
http://www.weli.eng.iastate.edu/Conferences/Syracuse2004/Flyer.pdf

The four-day annual conference, designed to present the works of a high number of women scientists specialised in computing and related technological fields promoted by the Anita Borg Institute for Women in Technology
http://gracehopper.org/2009/

./.

./. Examples of practices

The “Extraordinary Woman of the Year Gala” organised each year by the Canadian Association of Women Executives and Entrepreneurs (CAWEE) to honour women in business
www.cawee.net/cawee_extra.html

The gala dinners, the events and the golf tournament organised by the Canadian Advanced Technology Alliance (CATA) Women in Technology programme
http://www.catawit.ca/fourPillars/

[29. Training courses, lessons and seminars]

Description

This heading groups together different types of training initiatives (such as structured courses, training seminars or single lessons). They are all characterised by the common aim of transferring knowledge, skills, and competences and by a relatively clear distinction (also in emotional terms) made between teacher and learner – something that is less stressed in other training-oriented tools such as ***mentoring*** or ***coaching*** (see above).

Application domains

Training courses are widely used and for a variety of objectives. They are often aimed at supporting women to attain **leadership positions**, focusing on different issues, such as scientific communication and science dissemination, appointment procedures adopted in research institutions, skills and knowledge needed to attain full professorship positions, policies devised by the organisation with regard to leadership selection, leadership-related skills (such as public speaking, policy designing and management) or innovation-related skills. Rather than being specifically aimed at women, courses can also be addressed to university tenure and promotion committee members, in order to encourage fairer procedures in committees. Courses are also organised to address the **gendered nature of science and scientific settings.** Examples include courses on language and gender, on the implications of gender bias in assessing scientific research projects or on gender studies. Institutional transformations can also be supported by training courses addressed to department heads, high-ranking officers and administrators, on issues pertaining to **working environment**, such as how to change laboratory management, how to change the recruitment process in order to make it more gender-sensitive or how to enhance the climate for women scientists at university or department level. Web-based e-training tools can also be used.

Examples of practices

The on-line courses aimed at raising awareness about gender issues promoted by the Italian Centro Interdisciplinare di Ricerche e Studi delle Donne (CIRSDe) at the University of Turin
http://www.cirsde.unito.it/ATTIVITA--CIRSDe/default.aspx?linkid=5629&linkalias=&linkcid=5618&linkurl=2471&linkmid=12&linktype =2

The training workshop for hiring committee members organised by the Women in Science and Engineering Leadership Institute (WISELI) at the University of Wisconsin at Madison
http://wiseli.engr.wisc.edu/docs/AnnReport_WISELI_2007.pdf

The training activities promoted by the German Centre for Excellence Women in Science (CEWS), addressed to women researchers for helping them in handling the appointment procedures adopted in research institutions
http://www.cews.org/cews/prokoo.php

The set of workshops organised at the University of Colorado-Boulder with the aim of providing women junior faculty with an understanding on how the institution works and how to achieve success at the institution
http://www.colorado.edu/facultyaffairs/leap

The lessons on “language and gender” organised by the UK women’s network Women in Science, Engineering and Technology (WiSET) at the Manchester University
http://www.wiset.eps.manchester.ac.uk/

The gender training for teachers engaged in a special PhD programme for Women in Technology, in order to effectively deliver gendered contents in advanced science education, organised at the Vienna University of Technology
http://www.tuwien.ac.at/services/service/gender_studies/women_in_technology/EN/

The training activities addressing graduate women developed by the Italian Trentino School of Management, aimed at developing highly-qualified profiles engaged in new S&T-related professions
http://www.tsm.tn.it/documenti/formazione_manageriale/2005_fse_COMING_Orientamento_e_consulenza_alle_competenze_di_mediazione_scientifica.pdf

The four-day training seminar organised each year by the German Center for Excellence Women in Science (CEWS), targeting women scientists from six European countries and specifically intended to motivate and support them to apply for professorships
http://www.cews.org/cews/en/bertra.php?cid=420&aid=73&lid=en

The “Board Readiness Programme”, implemented by the Australian industrial association Women in Technology (WiT), aimed at preparing women in accessing the board of high-tech enterprises
http://www.wit.org.au/default.asp?PageID=10&n=Board+Readiness28TM29

The training scheme for committee members in charge of appointments and promotions, implemented at the Georgia Institute of Technology
http://www.adept.gatech.edu/

The peer education workshops for faculty committee members carried out at the University of Michigan
http://www.sitemaker.umich.edu/advance/stride

The short training courses on leadership in innovation and technology-related sectors organised by the Anita Borg Institute for Women and Technology
http://anitaborg.org/initiatives/techleaders/

[30. Web-based discussion spaces]

Description

This heading includes all forms of "virtual" places allowing synchronous or asynchronous debate, discussion and exchange (such as chat rooms, discussion forums, newsgroups and online conferences).

Application domains

Web-based discussion spaces are largely used in connection with ***networking*** activities (see above). Indeed, many networks develop mostly through this kind of tool. Virtual discussion spaces can be used for pursuing different objectives, such as awareness-raising on the unfriendly **working environment** for women, involving university managers with a direct debate with faculty members on women-related issues, collecting information on the obstacles women face in their daily working life, or supporting ***mentoring***, ***coaching*** and ***training*** programmes.

Examples of practices

The Association for Women in Science (AWIS), which organises a web-based forum and exchange on the main social networks (Facebook, Linkedin, MySciNet)
www.awis.org

The NSF-funded ADVANCE-IT programme, which established a listserve allowing to share best practices, web sites and programs as well as to discuss issues related to women and science
www.portal.advance.vt.edu

The German Center of Excellence Women and Science (CEWS), which provides a communication platform (Encouwosci) for discussion and exchange
http://www.cews.org/encouwomsci/

The Women in Science, Engineering and Technology programme (WiSET), carried out at the University of Manchester, which created the WiSET Forum, providing the opportunity to post messages and questions and to chat online
http://epsforum.web.its.manchester.ac.uk/

The Anita Borg Institute, which connects its community through the web (Twitter, Linkedin, Facebook and YouTube) and a blog
http://anitaborg.org/community/connect/

[31. Websites]

Description

This heading refers to all kinds of websites, webpages, platforms and portals maintained by institutions, programme promoters or any other actor in order to promote gender equality in science and technology sectors.

Application domains

Websites are increasingly powerful tools with regard to gender equality promotion in science and technology. Almost all the programmes focusing on women in science and technology maintain their own website. The use of websites for improving the **working environment** is widespread. In this regard, it is worth mentioning such examples as the use of websites to promote exchanges on women's issues, to launch information and awareness-raising campaigns, to provide women with well-organised and easily accessible information on the available resources supporting work-life balance, to keep women informed on legislation and rights pertaining to gender equality, or to allow younger scientists to access information on training opportunities and scholarships. Websites are also frequently used in order to support women in pursuing **high-ranking positions** and particularly to provide qualified women scientists with information on vacancies in high-level positions and opportunities for professional development. Websites are also used to promote research and scientific debate on the **gendered nature of science** because they allow easy access to research results and scientific literature related to this issue.

Examples of practices

Almost all programmes develop their own website. In addition, some programmes produced particular kinds of website such as, for example:

The web-based search-engine developed by the Italian feminist association Associazione Orlando, which takes into account women's points of views, questions and languages, also through the compilation of a specific thesaurus, and supports the creation of gender-sensitive software
http://www.women.it/cms/

The web-page containing gender-sensitive tools and resources for women to use and work with ICTs produced by the Spanish association Donestech
http://www.donestech.net/

The a website created by the Czech Academy of Sciences providing information about study opportunities, grants, fellowships and links to other websites giving information on specialised literature
http://www.zenyaveda.cz/html/index.php?&lng=13

The Euraxess Portal, promoted by the European Commission in order to support researchers' mobility all over Europe
http://ec.europa.eu/euraxess/index_en.cfm?l1=0&l2=2

Programmes that work

Action patterns

Part E
Chapter Thirteen

So far, the guidelines have been mainly focused on the contents of the programmes carried out in support of women in science and technology, identifying strategies, recommendations, lines of action and tools.

However, in addition to the substantive aspects and partially mingled with them, the question of the **quality** of the programmes is also important. Indeed, even the cleverest and most original programme, when badly planned and managed, is destined to fail or at least to produce impacts far below the expectations.

As is well known, quality is a concept broadly applied in management practices, and many methods to measure quality encompassing all the aspects of the organisation's life have been developed in industry and service sectors. However, in the case of gender-oriented programmes, an unselective use of these methods appears to be useless or even dangerous, since they tend not to suit the features (such as size, duration, aims and contents) of these programmes.

However, maintaining control over the programme's quality is necessary. It is not by chance that many women-oriented programmes develop their own quality criteria tailored to the programme, in part derived from those applied elsewhere and appropriately adapted and in part developed by the same coordinators.

This part aims to discuss this issue in order to better understand how **to make programmes that work**. The previous sections provided suggestions and directions not conceived in a vacuum, but drawn out of practical experiences.

The aim is not to deal with programme quality in general terms or in an exhaustive way. To meet this need, a vast number of handbooks on project quality management are available.

Rather, the interest is limited to the specific quality-related issues of those programmes geared to **enhancing the condition, status and weight of women** in science and technology, which are characterised by peculiar needs, dynamics and weaknesses.

We have singled out a set of recurrent **action patterns**. Obviously, these patterns cannot offer a "systematic" approach to quality-related issues. However, they can provide a picture of the main questions to be faced in running this kind of programmes and of the possible approaches to finding a solution.

The action patterns have been operationally grouped into the main four quality dimensions traditionally used in project management, and namely:

– relevance;
– effectiveness;
– efficiency;
– sustainability.

A short description is provided for each action pattern.

[1. Relevance]

Relevance refers to the potential capacity of a programme to actually solve the problems it is intended to solve. In this sense, relevance can be viewed as a relation between objectives pursued and problems faced.

There may be different reasons why a programme might not be (fully) relevant, such as: the objectives pursued are **not pertinent** with the problems; they may be relevant, but the solutions envisaged are **not applicable** (for example, for legal, cultural or organisational reasons); the objectives pursued are relevant and the solutions applicable, but both are **limited in scope and size** with respect to the scale and features of the problems to be dealt with.

Although relevance often concerns how a programme is designed (so that it can be assessed even before the programme starts), experience shows that relevance can increase or decrease throughout the programme's life. This is because programmes are rarely designed once and for all; more often than not, they are subjected to changes deeply altering their original structure and objectives, for better or worse.

By examining the solutions and behaviours adopted by programmes to remain consistent with their objectives and to maintain or increase their relevance, **9 action patterns** have been identified. A short description is provided for each of them.

1. KNOWLEDGE – Generating knowledge about the problem

A widespread action pattern related to relevance is that of supporting the programme with actions aimed at generating knowledge on the situation the programme has to cope with and the needs it is intended to address. This overall orientation is implemented in practice by resorting to different research tools and methodologies, such as surveys, focus groups, statistics collection, consultations and informal interviews. Usually, these activities are carried out in the first phases of the programme and their outputs are used for establishing the programme's objectives and activities. However, many programmes carry out extensive reviews of the situation on a regular basis in order to maintain an adequate degree of relevance throughout the programme's life.

2. PARTICIPATION – Using participatory approaches in programme planning

Another action pattern aimed at increasing the programme's relevance is the adoption of participatory approaches, mainly in the planning phase. This allows the beneficiaries, partners and organisation leaders of the programme to express their orientations, points of view, needs and feedback. The assumption is that fostering participation and promoting a critical and open discussion helps the programme to stick closer to reality. Different tools are applied, including meetings, social events and informal consultations.

3. DIVERSITY – Framing gender issues in the broader context of diversity issues

On the basis of the experiences analysed, programme relevance tends to increase when gender issues are dealt with in connection to the broader question of diversity management and promotion. Linking gender issues to other topics, such as ethnicity or age-based diversity, broadens the number and type of stakeholders, coordinates different actions with similar purposes within a unique framework, and reduces resistance, which often emerges against the launch of "special programmes" for specific groups. However, the need to preserve the specificity of gender issues has also been stressed (not least because they concern not a minority, but the majority of people), and to avoid having one set of issues overwhelm the others.

4. LESSONS LEARNED – Capitalising local past experiences and the experiences of others

One way to increase a programme's relevance is not to start from scratch, but to capitalise on past experiences in the same organisation. Indeed many programme promoters underlined this aspect, stressing the positive role played, as a facilitating factor, by the existence of a tradition in gender equality policies and programmes in their own organisation. When this tradition does not exist, programme coordinators can capitalise on the increasingly significant experience matured in other universities and research institutions on these issues. Moreover, this action pattern encourages programme promoters to recognise their own experience as part of a history of actions and engagement on gender equality in science and technology, and thus to see themselves as part of a transnational community. Collecting, adapting and transferring best-practices is certainly one of the most frequent ways in which this action pattern comes about.

5. SOCIAL CAPITAL – Using and enlarging the social capital of the programme

Besides any other possible use, social capital (that is, the networks of social connections anyone is involved in) can be a powerful means for increasing the relevance of the programme. Keeping the organisation's formal and informal networks (especially women's networks) involved with the programme allows it to continuously access information, data and feedback which are necessary to keep it in tune with its environment. Similarly, being part of external national and international networks helps programmes to keep up to date on new ideas, approaches and tools.

6. ORGANISATION LEADERS – Bringing organisation leaders to one's own side

There is also an institutional dimension of relevance to be taken into account. A programme that does not succeed in involving the organisation leaders or that does not pursue this objective runs the risk of not being relevant at all. That is why many promoters devote an important part of their effort to looking for involvement in the programme of leadership and management. Tools and strategies for attaining this result can greatly differ, depending on the institu-

tional context, national traditions and previous local experiences (see chapter twelve, in this regard).

7. ORGANISATIONAL CULTURE AND STRUCTURE – Aligning the programme to the organisation's culture and structure

Institutional relevance also largely depends on linking a programme's aims, plans and actions to the organisation's structure and culture. This action pattern can be identified in many programmes. For example, a programme carried out in an engineering faculty used language and tools compatible with the engineering culture and engineers' habit of mind (for instance, using a checklist to insert the gender dimension in project-designing). Another programme carried out in a university where faculties enjoyed a large degree of autonomy had a highly decentralised structure in order to adapt to that specific decentralised organisational environment. In another case, the programme strategy consisted of creating a research institution on women studies, thereby giving the programme the stamp of research which is of the highest value in an academic setting. Not taking the organisational context into consideration could make the programme a "foreign body" in the organisation or make it perceived as such.

8. SCOPE AND TARGET – Keeping a unitary approach while addressing a broad target

The experience of the analysed programmes seems to suggest that relevance tends to decrease when the target of the programme is too narrow (for example, by including women scientists and excluding women administrators, or including women faculty and excluding women students), or when they focus on too specific an issue (for example, work-life balance only or women's career advancement only), given their strong interconnection. The action pattern emerging from many programmes is that of keeping an open mind on the whole range of issues affecting women in the organisation, even when, for practical reasons, it is only possible to address some of them.

9. AWARENESS – Supporting all programmes with awareness-raising activities

Programme experience shows that, in many organisational contexts, women's discrimination is not fully perceived and its existence is sometimes explicitly denied, by both women and men. Under these conditions, actions aimed at promoting gender equality in science and technology are quite likely to be viewed as irrelevant or, worse, ideological. To prevent this risk, some programmes promote broad awareness-raising activities to encourage a "demand" for gender equality. Acting otherwise, programme relevance is likely destined to remain extremely low.

[2. Effectiveness]

The term effectiveness usually refers to the managers' capacity **to succeed in achieving the established objectives**. In this sense, effectiveness can be defined as the relationship between objectives and results.

In a broader sense, effectiveness is meant as the capacity "to do the right thing", and to prevent failure. Needless to say, there are no recipes for preventing failures, nor ways to distinguish between what is right and what is wrong before taking any decision. However, what seems to be important is keeping some control over the programme in order to, at least, reduce the risk of failure by taking the "right path".

As for effectiveness**, 8 action patterns** often adopted by equality-oriented programmes in support of women in science and technology have been identified.

1. STAFF – Gearing the programme to a motivated, experienced, diversified and active core of people

Staff ability to run the programme is obviously the main requirement in making a programme effective. This is the reason why programme coordinators usually attach great importance to the staff building process. According to the promoters of the analysed programmes, staff should consist of motivated, active people (showing a personal commitment to gender issues), with a diversified cultural and disciplinary background (including men) and possibly with experience in running programmes related to gender equality. Moreover, core staff should include a limited number of people, to make the decision-making process easier and quicker. These steps lower the risk of bureaucratisation, lack of spirit of initiative, and the use of narrow-minded approaches.

2. VOLUNTARY ACTION – Promoting voluntary action in support of the programme

Another action pattern aimed at favouring programme effectiveness is relying on volunteers. This choice is not only based on financial considerations (since voluntary action often plays an important role in making programmes economically sustainable). Involving volunteers helps a programme to remain vital and responsive, to avoid bureaucratisation, to reach and involve different groups of women and to create a widespread sense of ownership which is particularly important when the programme has to cope with critical transitions (such as changes in the organisation's leadership, in the programme staff, or in the financing structure).

3. PROGRAMME LEADERSHIP – Ensuring continuity in programme leadership

As for all enterprises, one of the main risks programmes face is the lack of continuity in leadership. Indeed, programmes characterised by frequent changes in leadership are more likely to show low effectiveness. However, continuity does not mean freezing the organisation's leaders (which creates other kinds of risks); rather, properly handling leadership turnover allows the programme to capitalise on past experience, prevent conflicts and transfer tasks.

4. PLANNING – Developing public, long-term and realistic action plans

Obviously planning is a necessary step in increasing a programme's level of effectiveness. The vast majority of programmes base their activities on planning, developing overall and specific action plans. However, bad planning remains one of the major risks for programmes. Sometimes, plans are unrealistic (see also what has already been pointed out about relevance), grounded on unproven assumptions, focused on short-term objectives and not open to public discussion and exchange. Moreover, action plans should be able to combine a strategic approach and concreteness, allowing the programme to keep a hands-on approach and to devise appropriate coping strategies without losing sight of the pursued aims; this is never an easy task. Therefore, resorting to professional support for the planning process is sometimes necessary.

5. MONITORING AND ASSESSMENT – Endowing programmes with effective monitoring and assessment systems

Naturally, effectiveness is also connected to the ability of the programme coordinators to follow its development step by step, to identify the impacts it produces and to record the reactions it prompts. Developing monitoring and assessment systems is thus indispensable, even in the case of short-term small-scale initiatives. Different monitoring and evaluation tools can be applied, from the most structured to the most informal ones (see chapter twelve for more information in this regard).

6. PARTNERSHIPS – Promoting inclusive partnerships involving key players

The effectiveness of programmes is sometimes limited by their isolation with respect to other relevant players. Doing things on one's own can, be a very attractive option for programme leaders, since it allows them, for example, to run the programme according to their own views and orientations and to avoid heavy negotiations and trade-offs. Yet, in the long-run, this is a losing strategy. Indeed, any programme needs to involve the key players, who can give added value to the programme (in terms of political weight, visibility, quality, recognition, and so on). This is the reason why different programmes attach great importance to the creation of well-established partnerships, both within the organisation (university, research institute, department, etc.) and externally. This may entail more complex forms of decision-making process-

es (such as the creation of enlarged steering committees or enlarged consultations). Obviously, the type, size, scope and tools of partnerships can greatly vary.

7. TRANSPARENCY AND TRANSFERABILITY – Making the programme transparent and transferable to external players

Transparency is, or should be, a principle that any kind of organisation and project is asked to comply with. This is even more important in the case of programmes aimed at protecting rights, as the gender equality programmes actually are. Lack of transparency can be a serious factor limiting the programme's effectiveness, since it generates distrust in the programme and contributes to a hostile environment around it. Moreover, transparency is a requirement to access funds and institutional resources. Similar considerations can be made about transferability. Usually, the transfer of best practices is viewed as a process producing an advantage to the recipient but having no effect on those who generated them. However, any attempt to identify and share one's own successful practices produces positive effects on programme effectiveness, in terms of self-reflexivity, institutional learning and visibility. This is the reason why many programmes are strongly committed to the development of transparent and transferable procedures and practices, by adopting different kinds of tools, such as annual reports, handbooks, toolkits, brochures, websites and periodic public meetings.

8. DIVERSIFICATION – Diversifying actions and tools

An action pattern often adopted by programme coordinators is diversifying the actions and tools in order to meet the different needs of the programme or to achieve its various aims. This action pattern often emerges as a reaction to positive developments of the programme. For example, programmes initially focused on mentoring, later started diversifying their action tools in order to back mentors and mentees with networking, support training or advice. Often, programmes show a creative approach, both in starting new actions and in developing new tools.

[3. Efficiency]

By "efficiency" here is meant the productive **access** to, and **use** of, resources of any kind (technical resources, human resources, funds, spaces, etc.).

This definition is deliberately broader than the one usually applied, where efficiency tends to simply refer to the capacity of doing things in the most economical way. Indeed, among the main questions challenging programmes there is not only that of reducing costs, but also that of ensuring stability, continuity and high-quality levels to programmes, which often have only access to uncertain and limited resources.

As regards efficiency, **6 action patterns** have been singled out.

1. FUNDING MIX – Diversifying financing sources as far as possible

Diversifying financing sources is one of the main action patterns adopted by programmes to face uncertainties in resource availability. Attracting different sources allows programme coordinators, for example, to limit the damage produced by the withdrawal of a donor, to coordinate the timing of different funds, ensuring cash flow continuity, and to increase the possibility of accessing long-term financing. The funding mix approach, developed by many programmes, often requires the support of professional fund-raisers.

2. ADHERENCE TO PLANS – Keeping a flexible but close adherence to the established action plans

Action plans, when well made, should be the main tool supporting programme leaders to master resource flows. We note, however, that the degree of adherence to the established action plans is frequently low. To avoid this, various programmes have developed specific procedures to maintain close control over the implementation of action plans through periodic meetings or other kinds of monitoring tools. This does not mean turning a blind eye to the implementation of plans. Indeed, action plans can and sometimes must be modified. However, action plans that are forgotten or continuously changed cannot be helpful at all for dealing with resource-related problems.

3. ACCOUNTING AND MANAGEMENT – Providing the programme with professional accounting and resource management systems

A very widespread action pattern is that of providing programmes with professional accounting and management systems. For those programmes that are fully supported by an organisation (such as a university or a private company), the issue often does not even arise, since accounting and (more rarely) resource management services are directly provided by the organisation's line structures. In other cases, even when small programmes are concerned, resorting to professional advisors and experts is sometimes necessary. It must be noted that poor accounting and management is recorded as one of the main obstacles programmes face in running their activities.

4. SCENARIOS – Timely developing scenarios for future resource needs and sources

Forecasting future resource needs is not always easy. However, it is a necessary exercise in order to avoid critical situations. Developing scenarios for future resource needs and sources, on the basis of the action plans, is thus a useful exercise, even when they cannot be fully detailed. Scenarios can help programme promoters to prevent a temporary lack of funds, to timely look for alternative sources or to establish priorities.

5. COOPERATION – Enlarging cooperation networks to increase access to resources

Access to funds and resources can be increased through the enlargement of cooperation networks involving other programmes and players. Indeed, partners can sometimes access sources that are not directly accessible to programme promoters. Moreover, partners can make their social capital available, thereby further increasing the opportunities to access resources. Finally, partners can also support the programmes in specific situations (for example, by providing short–term loans or goods in kind, when necessary).

6. STAFF SKILLS – Reinforcing staff skills in resource-raising and management

Increasing staff skills in resource-raising and management is another action pattern that helps ensure higher levels of efficiency. Some programmes strive to achieve this objective through specific training in fund-raising, accounting and resource management. Other programmes tend to capitalise on their own experience by selecting those practices and procedures that have been more effective in the past.

[4. Sustainability]

Sustainability refers to the capacity of a programme to **endure over time**, extending its effects beyond its actual duration. The best option is, of course, that of acquiring a permanent status, but good sustainability is also achieved when a programme succeeds in reaching a **duration consistent with its initial objectives and scope**.

The overall picture provided by the analysed programmes offers, from the point of view of sustainability, a large array of situations. Many programmes, not attached to one specific research organisation, start their activities with short-term funds (typically the case of EU-funded projects) and then strive to collect new funds and to redefine their institutional features in order to survive and develop after the exhaustion of the initial grants. In other cases, programmes are based on short-term funds, but are attached to a research organisation (typically the case for the ADVANCE-funded programmes in the United States), and then strive to be institutionalised after their completion. In still other cases, universities or research organisations directly manage the programme as an institutional initiative, ensuring its sustainability from the outset. However, even in these cases, serious sustainability-related problems can arise, since the institutional support is not always adequate to allow the further development of the programme, and it sometimes weakens over time.

With respect to sustainability, **7 main action patterns** can be identified.

1. SUSTAINABILITY PLANNING – Planning sustainability from the very beginning

Developing the main structures of sustainability (stable funding, institutional set-up, staffing, equipment, space, etc.) needs time. A recurrent problem met by short-term funded programmes is the difficulty of timely coping with sustainability-related questions. This is due to various reasons including lack of time and experience or not recognizing the problem as such. An action pattern adopted by many programmes in this regard is that of including sustainability in the planning process at the outset of the programme as one of its primary objectives.

2. FUND-RAISING – Developing sustainability-oriented initiatives while the programme is still running

Sustainability is strongly linked to the capacity of the programme to raise funds to be used when the initial funds are exhausted. A frequent approach is to carry out appropriate sustainability-oriented fund-raising initiatives, with dedicated staff and adequate expertise, while the programme is still running and is far from completion. To do that, it is advisable to include these initiatives in the initial budget of the programme.

3. MEN'S INVOLVEMENT – Involving men in the promotion and implementation of the programme

Involving men from the beginning in the promotion and implementation of the programme increases its future sustainability. This is probably due to various reasons, even though no specific analysis has been carried out in this regard by the promoters. The most common argument is that involving men at an early stage facilitates awareness-raising in the organisation's (prevalently male) managers. Moreover, men's involvement should avoid the programmes from being perceived as "special programmes for women", which seems to reduce their chances of success over time (for example, various universities do not include the promotion of programmes addressed to specific groups in their routine policies).

4. PROGRAMME VISIBILITY – Making the programme as visible as possible

Another action pattern that promotes sustainability is amplifying the visibility of the programme as much as possible, while it is running. To achieve sustainability, programmes have to prove to be useful, effective and capable of significant results for the benefit of women and men, in order to attract the interest of sponsors, institutions and key players. A recorded action pattern is thus that of developing a marketing-style consensus-building action that favours the continuation of the programme in the long run. This action can be carried out by resorting to different tools, such as brochures, dissemination initiatives, reports and media campaigns (see chapter twelve).

5. PARTNERS' COMMITMENT – Promoting a direct engagement of partners

As we saw above, creating a stable network of partners is particularly important to increasing a programme's effectiveness (#7) and efficiency (#5). However, partners can also play a significant role in a programme's sustainability in different ways: facilitating access to possible sponsors; urging institutions and key players to mobilise for the programme's survival; sustaining and amplifying the programme's sustainability-oriented initiatives. Again, this commitment should be requested from the outset of the programme, as part of the partnership agreements, and not in its final phases.

6. ORGANISATIONAL FLEXIBILITY – Envisaging flexible organisational solutions

While it is often difficult to raise new funds to ensure the survival of the entire programme, it should be easier to ensure the survival of some of its specific actions and components. A common action pattern is thus that of envisaging flexible organisational solutions, such as that of "de-structuring" the programme into different components and raising dedicated funds for each of them, by differentiating the sources of financing.

7. INSTITUTIONAL EMBEDDEDNESS – Shooting for progressive embeddedness of the programme in the organisation concerned

In the case of short-term funded programmes, the most common action pattern to achieve sustainability is that of striving for the institutional embeddedness of the programme in the larger organisation. However, this process does not occur automatically – it has to be built in throughout the programme implementation phase, with appropriate strategies, investments and tools. This entails, for example, the launching of specific awareness-raising actions addressed to the organisation's managers and key players, carrying out of feasibility studies on how the process can be practically undertaken (taking into account the different aspects of the organisation, such as its policies, regulations, institutional constraints and budget structure), or the early activation of a negotiation process.

Programmes that work

Some conclusions: Methodological suggestions

Part E
Chapter Fourteen

The action patterns presented in the last section, if taken as a whole, appear to be the expression of some deeper general trends underlying the behaviours and choices of the promoters of equality-oriented programmes in science and technology sectors. These trends seem to mainly refer to **a set of key questions**.

This section will briefly dwell upon these trends, by considering them as overall **methodological orientations** stemming from the most consolidated and updated experiences carried out in this field.

[1. Linking action to knowledge]

An important part of the effort made by programmes is that of systematically **linking action to knowledge**.

This trend is found, for example, in widespread programmes carrying out research activities, in the great attention devoted to knowledge capitalisation and dissemination, or in the peculiar meaning that programme coordinators usually ascribe to monitoring and evaluation of processes, understood as more similar to a scientific endeavour than to a managerial activity.

This trend can be partially explained by considering that most programmes are promoted and managed by scientists and researchers. It is, therefore, quite logical that they tend to apply their professional habits and capacities in carrying out the programmes, as witnessed by the large number of scientific-style reports, handbooks and documents produced under the programmes.

However, linking action to knowledge seems all the more necessary to deal with gender segregation trends in scientific settings, which appear to be fragmented, hidden and difficult to document and interpret.

[2. Creating institutional space for gender issues]

Another widespread trend is that of creating institutional places where gender issues can be appropriately recognised and treated.

This trend can be found in different phenomena, such as in the high “institutional productivity” (in terms of committees, commissions and work groups) usually shown by the programmes or the high attention given to the institutional embeddedness of programme activities. To understand this trend, it is enough to recall that stating the existence of a “gender issue” has long been difficult to accept by research institutions. The finding that science (that is, the most objective form of knowledge) and universities (that is, the most meritocratic organisations) are gender-biased remains difficult to accept for many research institution leaders. Recognising

institutional places where gender issues could be dealt with, therefore, should mean, for many of them, bringing openly into question the neutrality and objectivity of science.

Whatever the reason, it is a fact that in many universities and research organisations (perhaps the majority), gender issues are still waiting to be institutionally recognised; and this is a preliminary problem that needs to be addressed quickly.

[3. Looking for alliances and support]

Looking for alliances and support can be identified as the third methodological direction deriving from the analysis of the main trends in women-support actions in science and technology. As shown in the previous section, creating partnerships is a widespread orientation favouring programme relevance, effectiveness, efficiency and sustainability. Moreover, most of the programmes are characterised by broad intense activities of networking, dissemination and involvement of key players, both inside and outside the organisations they belong to.

This trend now involves a large array of subjects; primarily women scientists, but also other players such as women's associations, scientific societies, university administrators, civil society organisations, private enterprises and professional networks.

This orientation seems to be chiefly aimed at countervailing the strong tendency recorded in the research environment to view gender-related issues as a "specialised question", directly involving only women scientists and their employers. Creating partnership allows making it a real "public question" by broadening the circle of players who feel committed about it.

[4. Adopting an integrated approach]

As pointed out earlier (in Part A), the analysis of the programme actions led to formulating three main strategies: creating a gender-balanced working environment; building a science aware of its gendered nature; promoting women to high-ranking positions.

The vast majority of programmes show the propensity to adopt an **integrated approach**, i.e. the propensity not to focus on a single strategy, but to follow more than one strategy at a time, and even the three strategies together in an interconnected way. This propensity is also witnessed by the tendency of the programmes initially focused on one strategy to progressively broaden the scope of their action, incorporating new objectives and activities pertaining to the other strategies.

These operational orientations find their justification in the holistic nature of the issue of gender in science and technology, which increasingly appears to be a unique fabric of closely interconnected phenomena and, consequently, a unique arena of policies and players. This makes it difficult for a programme to focus on and achieve valuable results in a given strategic domain without, at least, taking into consideration, if not directly acting on, the other domains.

[5. Connecting gender and diversity issues to science development]

A fifth important trend is the growing orientation of programme coordinators to perceive gender issues in connection with diversity issues, and both in connection with the **overall development of science**.

Indeed, by examining the theoretical background of the most advanced experiences, what appears to be at stake with the lack of equality is not only the protection of the rights of women and minorities, but the very possibility of scientific and technological research to fully actualise its potential. Any inequality is a burden for science, especially now that scientific and technological research is exposed to profound change processes affecting the way in which it is produced, managed and politically driven. Inequality favours the brain-drain and a waste of resources, reduces the capacity to socially contextualise research activities, increases organisational conflicts, feeds the dissemination of distorted and stereotypical representations of scientific work and reduces the capacity of science to "speak" to society and of society to speak back to science. In this perspective, gender and diversity issues are to be seen, not as a specific, although important, question to solve, but as one privileged "gate" to access and interpret the entire spectrum of problems science is called upon to address today.

[6. Promoting a community of practices]

The development and dissemination of programmes entirely focused on gender and science is a very recent phenomenon, only really starting up in the 1990s. Therefore, even if the pioneering phase has probably ended, the movement is not yet in its maturity stage.

However, it is worth noticing **how rapidly this movement is growing**. An increasing number of programmes are developing new approaches and tools; best practices are increasingly disseminated, thanks in part to the production and dissemination of handbooks, toolkits and guidelines, and to the progressive consolidation of national and international networks involving research institutions, associations and individuals.

A true transnational "community of practices" focused on gender issues in science and technology is emerging. This is a process that each programme is called upon to support, primarily by participating in and promoting national and international networks and initiatives, but also by proactively fostering an orientation to share and exchange ideas, knowledge and experience.

[7. Protecting programme vitality]

The aforesaid issues bring us to the last methodological direction, which can be summarised as **protecting programme vitality**.

Experience seems to show that the most successful programmes are those that remain open to novelty and are capable of grasping new needs and demands, including new targets, broadening their scope, serving new aims, developing new actions, reacting quickly to unexpected events or taking advantage of change processes.

Protecting programme vitality is, however, a process requiring work aimed at, for example, avoiding conflicts, preventing programme bureaucratisation, preserving organisational flexibility, ensuring the mobilisation of volunteers, and stimulating the creativity and passionate engagement of all those concerned. Hence, it is important not to underestimate these risks and to foster the developmental capacities of the programme in every possible way.

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Annex 1
Methodological note

This note briefly summarises the main methodological approaches adopted in the PRAGES project, particularly as regards the construction of the database of programmes and the evaluation and benchmarking procedures.

The guidelines and database, representing the main outputs of the project, are closely connected with one another. Indeed, the information contained in the database constitutes the fundamental empirical basis of the guidelines, providing most of the examples used in order to first identify and then exemplify recommendations and lines of action.

Therefore, to fully understand the guidelines, a discussion of the general methodological approaches is needed, as well as of the specific criteria followed in identifying, collecting, assessing and benchmarking the programmes and in building the database.

A complete outline of the methodology and results of the activities leading to the construction of the database can be found in the ***Synthesis document of best practices database***, available on the programme webpage: http://www.reteparioppportunita.it/prages.

This methodological note consists of 9 sections:

1. General methodological approaches
2. Preliminary mailing list
3. Database setup
4. Assessment and benchmarking
5. Transferability issues
6. The online database
7. From database to guidelines
8. Confidentiality issues
9. A sample record from the database

1. General methodological approaches

A set of basic approaches must firstly be highlighted.

1.1. General strategic framework for selecting the programmes

An analytical framework was devised (see part A of the guidelines) in order to identify and select the programmes to be included in the database. On the basis of this framework, gender equality oriented initiatives in science and technology (S&T) were grouped under three main strategies, respectively addressing three critical areas for women in science:

– The unfriendliness to women of some features of the S&T environment;
– The dominant understanding and practice of science which is gendered as masculine;
– The male-dominated dynamics of leadership.

1.2. The knowledge management perspective and benchmarking methodology

Since the objective is the coordination of existing knowledge on gender equality programmes, the basic perspective was that of knowledge management, defined here as "a process of formalisation of, and access to, knowledge and collective expertise which creates new capabilities, improves performances and encourages social and organisational innovation".

Within this perspective, the methodological tool of benchmarking was chosen, allowing for the identification and dissemination of effective social technologies. Benchmarking can be defined as "a permanent process of learning and continuous quality improvement through the identification, understanding and adaptation of practices of other organisations".

Three kinds of information are structurally necessary to the benchmarking process, and namely:

– Information on the elements of excellence to be found in the programme (***benchmarks***);
– Information on the factors that enabled the programme to acquire the quality of excellence (enablers);
– Information on the programme's potential transferability to other settings (social, institutional, national).

The benchmarking variant adopted here is the "cross-sectorial" (or "generic") one. Cross-sectorial benchmarking involves analysing practices which are common to different sectors, comparing processes between varied economic or social areas, both public and private. This type of benchmarking focuses on excellent work processes rather than on the practices of a particular industry or organisation, acknowledging the fact that some functions or processes are the same regardless of dissimilarities of the sectors. Cross-sectorial benchmarking was chosen because it can reveal the very best practices by widening the scope of observation.

1.3. Focus on micro-policies

Units of analysis for the database were identified in initiatives developed at the individual organisation or network level, while public policies (both at the local, national or European level) were only indirectly considered in those cases where an initiative originated in, or had links to, such policies.

1.4. Diversity of schemes and promoters

The adoption of a cross-sectorial benchmarking approach (see section 1.2 above) led to the inclusion of programmes and schemes coming from different kinds of promoters (public and private research institutions and universities, networks and associations, public agencies and private enterprises) in the field of science and technology and – to a lesser extent – in other disciplinary fields and even in other sectors, particularly management (up to 10% of the programmes). This option was preferred in that it allowed an enrichment of the portfolio of actions to be developed in S&T environments. Issues of transferability (see section 5 below) were thus carefully taken into consideration.

1.5. Qualitative methodology

Programmes contained in the database do not constitute a representative sample, and their analysis does not thus provide information on gender equality oriented programmes in general. The database includes a qualitative panel of programmes – selected, analysed and assessed in depth through the procedures described below.

2. Preliminary mailing list

An extensive mailing list was created in the first part of the project in order to identify programmes supporting women's qualified presence in science and technology. All entries were later contacted to complete an electronic questionnaire (see section 3.1 below).

2.1. Sampling technique

To construct the preliminary mailing list of programme promoters, a snowball sampling technique was used by reviewing the websites of the most significant actors in the selected countries (see section 2.2 below) in order to pinpoint further contacts. New contacts were then reviewed, proceeding in an iterative manner until the material became saturated, i.e., once no further new contacts in the websites were found, and it was possible to be reasonably sure that most of the main institutions operating in a given country had been collected. This sampling technique was adopted because it is particularly recommended for populations that are not well delimited or enumerated, as is the case with the institutions involved in the project issues. In order to avoid a common drawback of this sampling technique, i.e. failing to pinpoint smaller groups or institutions, the snowball chain was started from not one but several different national associations/organisations or international networks. The networks of contacts of the project partners were also used in order to complete the search.

2.2. Criteria for inclusion in the mailing list

In line with the cross-sectorial benchmarking approach (see section 1.2 above), the following criteria were adopted.

Geographical areas
The mailing list primarily includes contacts from European countries and three other OECD countries, and namely Australia, Canada and the United States, since one of the specific features of the project proposal was a comparative study of these areas. The numerous Western institutions working at an international level in and with developing countries were not included.

Disciplinary fields
Following the programme design, most of the entries relate to science and technology fields. A broad approach to the term "science" was adopted, referring both to hard and soft science, in accordance with the definition adopted by the European Commission, which includes all scientific disciplines that generate knowledge. The decision was made to give more weight to hard sciences, as previous research had shown this to be the less welcoming field for female professionals. A smaller percentage of programmes implemented in the business sectors were also considered, both science- and technology-related and unrelated ones.

Types of promoting institution
According to the inclusive approach adopted, programmes were considered which had been implemented by public, private and non-profit institutions.

2.3. Mailing list entries: some results

In total, the mailing list contains 1,112 entries, from the countries and geographical areas indicated in the table below. Approximately 43% of the contacts gathered in the mailing list are institutions based in non-European countries (see table 1).

Table 1 – Mailing list entries by geographical area (%)

Geographical area	%
Europe	55
North America	33
Oceania	10
Other	2
TOT	**100**

Source: PRAGES, 2008

As shown in table 2, almost 40% of the institutions collected in the mailing list operate in the field of "Natural Sciences, Engineering and/or Architecture". Many institutions (accounting for 28% of the entries) are engaged in different disciplinary fields, (codified as "various fields" in the table). Among them are institutions that promote gender equality in all fields (for example, national public institutions), while others are organisations that work in "more than one field" but ***not*** in all fields. The Law/Social Sciences field (17%) is composed primarily of women's or gender research centres working on the situation of women in the labour market or in political institutions, or by organisations that promote equal opportunities. Medical Science fields are the least represented disciplines in the mailing list (3%), while institutions operating in areas different from Scientific and Technology, indicated here as Management/cross sectorial benchmarking, account for 9% of the records.

Table 2 – Mailing list entries by disciplinary field (%)

Disciplinary field	%
Natural sciences, engineering, architecture	37
Various fields	28
Law, social sciences	17
Management/cross-sectorial benchmarking	9
Education, humanities	5
Medical sciences	3
Missing	1
TOT	**100**

Source: PRAGES, 2008

As for the type of promoter institutions (see table 3), four main categories were identified. The first is non-profit organisations, a grouping that includes networks, projects and associations, as well as various types of private non-profit groups (usually NGOs or foundations involved in gender equality projects). This type of actor accounts for 55% of the contacts. Universities, the second type of institution, also have a major presence in the mailing list. They account for 23% of the entries and include the following types of actors: university research centres and university-based networks, projects or associations. Public agencies represent the third type of institution. This category includes public agencies as well as public research institutes, and accounts for 13% of the mailing list entries. The fourth and last group consists of private for-profit institutions, organizations, private companies and private research institutes; this category accounts for fewer than 10% of the entries.

Table 3 – Mailing list entries by type of promoting institution (%)

Type of promoting institution	%
Non-profit	55
Universities	23
Public	13
Private for-profit	9
TOT	**100**

Source: PRAGES, 2008

More analytical data on the mailing list are available on the website of the PRAGES project, at: http://www.reteparioppportunita.it/prages.

3. Database setup

3.1. Questionnaire and documentation grid

All the entries in the mailing list were contacted and the persons previously identified as responsible for programme implementation were sent an electronic questionnaire of 63 questions, divided into three sections:

– General information on the organisation in which the initiative was carried out (analysis of the context);
– Information related to the initiative (analytical description, evaluation and benchmarking);
– Information on the broader impact of the initiative (interpretation of its meaning with respect to the major determinants of the problem).

Documentation, both internal and published on the Internet, was also collected on those programmes a questionnaire had been filled out for. The documents were analysed according to a standardised procedure based on an electronic grid reproducing the same items on the questionnaire.

3.2. Criteria for inclusion in the database

Beyond satisfying the criteria already established for inclusion in the preliminary mailing list, programmes were included in the database when, from the analysis of the questionnaire and the grid, they displayed both:

– an explicit aim of producing an impact on at least one of the three areas identified in the general framework (see section 1.1 above); and
– ***prima facie*** existence of consistent measures towards that aim.

Considering that most initiatives for the promotion of women in positions of leadership in the fields of science and technology are relatively recent, no limit was established for the starting date of the programmes, including recent and ongoing ones (see section 3.3 below, table 7).

Finally, a sufficient level of information had to be available on the initiative, both from the questionnaire and from documentation.

3.3. Database composition: some results

A total of 125 programme promoters returned the questionnaire filled out, with a return rate of just over 10%. Of these, 109 satisfied the criteria for inclusion (see previous section) and were included in the database.

As for geographic distribution (see tables 4 and 5), over half the programmes (57 out of 109) are in Europe, under a quarter (29 programmes) in North America (including 18 in the US and 11 in Canada) and slightly fewer (23 programmes) in Australia. As regards Europe, 17 EU member states are represented in the database (especially the United Kingdom, Spain, Germany and Italy). Switzerland and Norway also feature in the database. Finally, there are three European programmes that cannot be ascribed to a specific country. Among the countries involved in these European programmes, the presence of two countries (Ireland and Bulgaria) not already represented in the database must be noted.

Table 4 – Programmes by country (figures)

Country	n.
Australia	23
United States	18
Canada	11
Germany	8
Italy	7
Spain	7
United Kingdom	7
Denmark	4
France	4
Austria	3
European programmes	3
Finland	2
Norway	2
Slovenia	2
Belgium	1
Czech Republic	1
Estonia	1
Greece	1
Malta	1
The Netherlands	1
Sweden	1
Switzerland	1
TOT	**109**

Source: PRAGES, 2009

Table 5 shows the geographical areas.

Table 5 – Programmes by geographical area (figures)

Geographical area	n.
Europe	57
North America	29
Oceania	23
TOT	**109**

Source: PRAGES, 2009

Most programmes (96) in the database were implemented in science and technology and a minority (13) in other sectors.

As regards the type of promoting institution, a different classification was used with respect to the one employed for the mailing list (see section 3.3 above). In 44 cases out of 109, the programme promoter is a university (public or private), in 40 cases an association, in 13 cases a public body, in 7 a public or private research institute and in 4 a private company. Finally, one programme was promoted by a private law training institute established by public entities.

Combining these elements (sector and nature of the promoter), three institutional settings were defined:

– Programmes implemented in science and technology sectors by public and private universities and research institutes (S&T-URI);
– Programmes implemented in science and technology sectors by other actors, such as associations, networks, private companies, public bodies (S&T-Oth);
– Programmes implemented in other sectors (OTH-S).

Programmes in science and technology sectors are almost equally divided (49 vs. 47) between those implemented by universities and research institutes (S&T-URI) and those implemented by other actors (S&T-Oth), while those in other sectors are, as anticipated, 13 (Oth-S), as shown in table 6.

Table 6 – Programmes by institutional sector (figures)

Sector	n.
S&T sectors – universities and research institutions (public and private)	49
S&T sectors – other promoters	47
Non S&T sectors (cross-sectorial bench-marking)	13
TOT	**109**

Source: PRAGES, 2009

As regards the starting date of the programmes, 3 out of 4 programmes were activated after 2000 (see table 7).

Table 7 – Programmes by starting year (figures)

Starting year	n.
Before 2000	25
2000/2004	33
2005/2007	38
2008/2009	13
TOT	**109**

Source: PRAGES, 2009

More analytic information regarding the programmes in the database are available on the website of the PRAGES project, at: http://www.reteparioppportunita.it/prages.

4. Assessment and benchmarking

As outlined above (see section 1.2), the first step of the benchmarking procedure is an assessment of the selected units of analysis (the programmes, in this case), in order to identify excellent performances, or benchmarks. The following sections (4.1 and 4.2) will outline the methodology used in assessing programme quality and impact. Section 4.3. deals with the identification and marking of benchmarks based on assessment.

4.1. Quality assessment procedures

As already said, quality was assessed according to four dimensions:

– Relevance;
– Effectiveness;
– Efficiency;
– Sustainability.

Analytical Quality Indices (range 0-10) were produced for each of the four dimensions. Finally, a Synthetic Quality Index (with the same 0-10 range) was assigned on the basis of the results achieved by the programmes in each dimension. For both Synthetic and Analytical Quality Indices, a five-point scale system was then applied, and performance in the different dimensions was identified as Poor, Limited, Medium, Good or Excellent[1].

[1] 0-2 = Poor; 2.1-4 = Limited; 4.1-6 = Medium; 6.1-8 = Good; 8.1-10 = Excellent

A medium Synthetic Quality Index was considered the necessary minimum for inclusion in the database.

Relevance
Relevance was defined with reference to two parameters: a) provision of activities geared to increasing promoters' knowledge of the reality and needs of national, local and institutional research settings in which the programme would operate; b) programme capacity of adaptation to its specific setting.

Answers to questions and items contained in the questionnaire and in the grid pertaining to relevance were evaluated, a Relevance Index calculated (0-10) and a label (poor, limited, medium, good or excellent) assigned on the basis of the scale system results.

Effectiveness
Effectiveness was defined according to two parameters: a) self-reported achievement of the identified objectives; b) self-reported performance of the activities envisaged.

Answers to questions and items contained in the questionnaire and in the grid pertaining to effectiveness were evaluated, an Effectiveness Index calculated (0-20/2) and a label (poor, limited, medium, good or excellent) assigned on the basis of the scale system results.

Efficiency
Efficiency was defined according to four parameters: a) extension of the activities during implementation (increase or decrease in planned activities, increase or decrease in beneficiaries, extension of the programme over time, etc.); b) availability of resources to the extent envisaged; c) financial reporting capacity; d) managerial capacity.

Answers to questions and items contained in the questionnaire and in the grid pertaining to efficiency were evaluated, an Efficiency Index calculated (0-10) and a label (poor, limited, medium, good or excellent) assigned on the basis of the scale system results.

Sustainability
Sustainability was defined according to two main parameters and two subsidiary ones. Main dimensions: a) institutionalisation of the initiative (adoption of the programme, including financial aspects, by the sponsoring institution); b) degree of men's involvement in promoting the project. Subsidiary dimensions: c) diversification of the financing sources; d) identification of further economic resources.

Answers to questions and items contained in the questionnaire and in the grid pertaining to sustainability were evaluated, a Sustainability Index calculated (0-10) and a label (poor, limited, medium, good or excellent) assigned on the basis of the scale system results.

4.2. Impact assessment procedures

Impact was assessed with respect to the general framework outlined above (see section 1.1), with respect to three critical areas:

– The unfriendliness to women of some features of the S&T environment;
– The dominant understanding and practice of science which is gendered as masculine;
– The male-dominated dynamics of leadership.

Impact assessment involved two main dimensions: "objective impact" and "subjective impact".

Objective impact
On the basis of their achieved results, programmes were given an Objective Impact Analytical Index for each area, which represented a basis for calculating an Objective Impact Synthetic Index. Here, too, a five-point scale system was applied and impacts were labelled as Poor, Limited, Medium, Good or Excellent.

Given that many programmes are quite recent (see table 7 above), and also considering the difficulty of measuring the impact of some initiatives, especially those which are more cultural in character, an operational concept of impact was agreed upon in line with project aims. According to this, an objec-

tive impact was acknowledged on one or more of the three strategic areas when a plausible connection emerged between:

– an explicit and grounded orientation towards achieving an impact in that area; and
– the implementation of consistent measures.

The adopted notion of impact is therefore hybrid: it takes into account both orientation and concrete action and identifies "conditions for impact" more precisely.

Subjective impact

"Subjective impact" was conventionally defined as the degree of consensus achieved by the programme (consensus among promoters and from beneficiaries and men involved in different capacities). In determining consensus, the number of external groups in favour or – on the contrary – against the programme, and the degree of public recognition obtained was also considered. A synthetic index was also assigned for subjective impact (consensus).

4.3. Identification of benchmarks

Combining the outputs of both quality and impact analyses, a benchmarking procedure was fine-tuned to achieve two different goals.

The first was to single out best practices, and namely those with a high quality level and a high impact level, identifying a group of programmes that could be described as "of excellence". These were identified as "golden benchmarks".

At the same time, a second type of benchmark was awarded, the "silver benchmark", to programmes which, regardless of their level of quality (none could, in any case, be below the "medium" level – see section 4.1 above), exhibited a high level of impact on one or more of the strategic areas identified in the general framework (see section 1.1 above).

Whereas golden benchmarks are designed to identify excellence in both quality and impact, silver benchmarks indicate that a programme (both of excellence or not) recorded an impact (as defined above) on one of the three areas.

To receive a golden benchmark, programmes had to have the following characteristics:

– An excellent overall quality level (Synthetic Quality Index of 8.1 or higher);
– An excellent or good impact level in at least one area of impact (Analytical Objective Impact Index of 6.1 or higher).

To receive a silver benchmark, programmes had to have the following characteristics:

– An "excellent" or "good" impact level in at least one type of impact (Analytical Objective Impact Index of 6.1 or higher);
– A quality level that was "medium" or higher (Synthetic Quality Index of 4.1 or higher).

As a result, all the programmes that received a golden benchmark necessarily also received at least one silver benchmark.

The use of two different selection criteria based on the parameters of quality and impact is justified by the fact that (as already mentioned) no programme of the 109 in the database had an overall level of quality that was below "medium. The same, however, cannot be said for the impact of the programmes, since, in fact, some programmes had "limited" or "poor" impact levels.

4.3. Assessment and benchmarking: some results

Quality level

In general, programme quality was medium to high (table 8). More than one third of the programmes displayed excellent quality (42 in 107), and almost half reached a high quality level in any case. No accepted programme fell below the medium quality level ("poor" or "limited").

Table 8 – Programmes by quality level (figures)

Quality level	n.
Poor	0
Limited	0
Medium	16
Good	51
Excellent	42
TOT	**109**

Source: PRAGES, 2009

Impact level

Although programmes are, on average, of a high level of quality, the overall picture is more problematic in terms of impact, though still positive, as can be seen from the distribution of the 109 programmes (table 9).

It can clearly be seen that only 9 programmes out of 109 have an excellent impact level (compared to the 42 programmes that reached the same level in terms of quality), while 45 have a "good" impact level (compared to 51 programmes that reached the same level in terms of quality). In addition, while no programme fell below the medium level in terms of quality ("limited" and "poor" categories), more than 1 programme out of 10 (15 in all) fell below this level as regards impact.

Table 9 – Programmes by impact level (figures)

Impact level	n.
Poor	1
Limited	14
Medium	45
Good	40
Excellent	9
TOT	**109**

Source: PRAGES, 2009

Benchmarks

Overall, 110 silver benchmarks were awarded to a total of 71 programmes (65.1% of total), 42 of which, of course, within the golden benchmark group and 29 outside this group.

The 42 "programmes of excellence" received a total of 72 silver benchmarks (an average of 1.7 benchmarks per programme), while those not in this group received 38 silver benchmarks (an average of 1.3 benchmarks per programme).

Taking both groups into account, a total of 44 silver benchmarks were awarded for impact on S&T environment, 26 for impact on the gendering of science and technology, 44 for impact on leadership.

Programmes identified as benchmarks with respect to their impact on one or more strategic areas (see section 1.1 above) were included in the guidelines as examples of possible actions to be implemented to promote change in that area.

More analytic data regarding the assessment of quality and impact of the programmes recorded in the database, as well as about benchmarks awarded are available on the website of the PRAGES project, at: http://www.reteparioppportunita.it/prages.

5. Transferability issues

After assessing quality and impact, a transferability assessment was performed to complete the benchmarking procedure. The database contains information on the transferability of programmes awarded a golden or, at least, silver benchmark.

The aim was to provide information on factors that may hinder or, conversely, promote the replication of a programme in other settings (national, institutional, etc). By nature this type of analysis does not produce general indications, since individual programmes can be judged as more or less transferable depending on those willing to adopt them. In this sense, it is not possible (nor would it make sense) to provide aggregate data on the transferability of the programmes.

A brief presentation of the dimensions considered in the analysis is provided below.

Information disclosure
This dimension assesses the aptitude of promoters to provide detailed information about the programme, its aims and implementation methods, as well as information on obstacles found, facilitating factors or possible forms of replication. Account was taken of the transparency level of the promoters' website and the quality and quantity of online resources provided, as well as the thoroughness with which promoters completed the semi-structured questionnaire sent during the database building phase (see section 3.1 above).

Occurred replication
This dimension focuses on whether the programme had already been transferred to another context, either through planning or spontaneously, on the assumption that a programme that has been replicated has already shown some aptitude for replicability. Indications are provided on the setting where the programme was adopted, to better assess this aptitude. It also indicated whether a programme was itself a replication of a scheme implemented elsewhere.

Enablers: structural factors
This dimension focuses on structural factors (for example, social and cultural settings, the institutional and regulatory environment, resource availability, etc.) which facilitated the implementation of the programme or made it possible. This is an important aspect for those interested in transferring the programme, since it enables them to assess in advance whether these structural factors exist in the environment the programme will be transferred to (for example, it would be difficult to transfer a programme that depended on a specific legislative incentive to a setting where there is no such legislation).

Enablers: process factors
This dimension concerns process factors which are important or necessary to acknowledge for successful transfers, such as the existence of a motivated leadership, administrative support from the promoter, the presence of monitoring mechanisms, the inclusion of men besides women in the implementation of the programme, and specific institutional, organisational, communicative, managerial and relational measures or solutions which proved effective.

Obstacles
This dimension considers the obstacles that delayed or complicated the implementation of the programme. Of course, the obstacles are of different types, relating to both structure and process.

Tips from the promoters
Finally, in analysing transferability, suggestions were also taken into account (when available), made by the promoters to facilitate the transfer of the programme (this was part of the questionnaire).

6. The online database

The following pages go through the typical layout of the PRAGES database record.

6.1. Structure

Every record is divided into several parts. Field names are indicated in brackets.

Programme identity
This part provides information to identify the programme. Being an anonymous database (for reasons of confidentiality, information on the promoter and the official title of the programme is omitted), a descriptive title has been provided ("programme"); there is information on "promoter type" (e.g. public university, network, etc); whether the programme concerns scientific and technological research or other sectors ("type").

Description of the programme
In this part a brief description is given of the programme, including information on the "target groups", the geographical area ("region") where it was implemented, the setting, or "scope" (single organisation, national, etc.), "duration" (start-up year, end year or planned end year; whether it is a permanent project); presence of "partner organisations".

This is followed by a more or less detailed "narrative description" of the programme.

Information is then provided on:

– The "focus" of the programme, which includes three possible entries ("providing direct support to individual women; transforming institutional processes to address critical points in women's career paths; promoting systems change - mainstreaming the gender dimension);
– "Fields of activity" (including a list of 25 items);
– "Economic resources" used and funding sources;
– "Dissemination" tools.

Programme quality profile
The third part includes a narrative analysis of the "quality" of the programme, based on the four parameters of relevance, effectiveness, efficiency and sustainability (see section 4.1 above), to justify the assignment of a specific value to the programme (poor; limited; medium; good; excellent).

Programme impact profile
The fourth part contains a narrative analysis of the "impact" of the programme on the three major strategic areas taken into consideration, divided into objective impact (environment, gendering, leadership; see section 1.1 above) and subjective impact ("consensus"). It explains why a specific value (no impact, poor; limited; medium; good; and excellent) was assigned to a programme both as regards objective and subjective impact (see section 4.2 above).

Benchmarks
At the top of the screen, specific symbols indicate whether the programme has been awarded a benchmark (golden or silver).

Transferability assessment
The last part gives a "transferability assessment" for programmes awarded a golden benchmark and for those awarded at least one silver benchmark, organised according to the dimensions already described above (information disclosure; occurred replication, enablers: structural factors; enablers: process factors; obstacles; tips from the promoters).

6.2. Database use

With the "search" tool available on the front page of the database, programmes can be browsed according to:

– Programme;
– Promoter;
– Region;
– Keywords.

The database is available at: http://www.reteparioppportunita.it/prages.

7. From database to guidelines

The information stored in the database was extensively used in drafting the guidelines. In particular, all the 71 programmes (see section 4.3) which received a golden or silver benchmark in recognition of the impact achieved on at least one of the three strategic areas mentioned in section 1.1 were included. These programmes are used to exemplify possible measures and projects pertaining to the area(s) to which they were impactful (see parts B, C and D of the guidelines). Each programme is mentioned more than once when impacts have been recorded on more than one area, or when more actions have been implemented simultaneously. Only a small percentage of the examples are drawn from sources external to the database (19 out of 219). Among these, one Africam programme is included.

Moreover, all 109 programmes included in the database were used in order to identify the tools for actions, action patterns and methodological suggestions contained in part E.

In addition, all the programmes constituted an invaluable source of information to identify the strategies, objectives, recommendations and lines of actions forming the structure of the guidelines.

There are, however, substantial differences in the approaches adopted by the database and the guidelines in processing the information on the programmes.

Firstly, the database provides in-depth information on individual programmes, whereas the guidelines provide short bits of information on a great variety of measures.

Secondly, the guidelines display a strong proactive approach, whereas the database has a marked evaluative connotation, even though it is itself a tool fostering action.

Their use is thus different: the guidelines are what can be called a menu of actions for prospective promoters of gender equality oriented programmes to choose; the database shows how the different measures can actually be implemented in different contexts.

8. Confidentiality issues

As already mentioned, while programmes are listed in the guidelines under their official name and with the indication of their promoters, this information is missing in the database, where details leading to the identification of the included programmes have been omitted.

The reason lies in the different sources of information used for the two objects. Information included in the guidelines is drawn from public sources, mostly documents published on the internet by the programmes themselves and classified as public documentation during the evaluation phase (see section 4). The database, instead, relies very much on the information contained in the questionnaires, which is protected for privacy reasons.

9. A sample record from the database

The next pages show a sample record.

Good Practices database

PRAGES
Practising Gender Equality in Science
(G.A. No. 217754)

Institutional transformation programme for promoting women's leadership in S&T departments (3)

Promoter	PUBLIC UNIVERSITY
Target group(s)	Women in science and engineering departments
Region	North America
Scope	Single organisation
Duration	Starting year: 2002 Duration: permanent
Partner(s)	
Economic resources	The budget was initially about US $500,000 a year, while now is approximately US $350,000 a year Economic resources now come from: - self-financing by the organization - university/research institute funds - national funds (new grant) - private funds
Programme type	S&T

Golden benchmark

Programme of excellence

Silver benchmarks

Impacts on two areas

Narrative Description

Hide  Back

The PROGRAMME AIM is promoting outstanding women staff to faculty positions as well as fostering participation and advancement of women in academic science and engineering by transforming the faculty environment.

Under the programme, a centre (that is a centralised, visible administrative structure) has been established within the university, with a mission to address a number of impediments to women's academic advancement. The centre has the nature of a research institute. This feature differentiated it from all purely programmatic organisations operating in other university settings.

The centre intends to bring the issues of women scientists and engineers from obscurity to visibility and to provide an effective and legitimate means of:

- networking women faculty across departments decreasing their isolation;

- advocating for and mentoring women faculty;

- linking women postdoctoral fellows in predominantly male environments with a variety of women faculty.

The centre organises 5 different kinds of initiatives:

RESOURCES: initiatives aimed at providing women with more resources (Gender Pay Equity Studies; analysing patterns of assigning institutional resources).

WORKPLACE INTERACTIONS: initiatives aimed at improving the interactions in the workplace (climate workshops for Department chairs; sexual harassment information sessions, university Provost's climate initiative; workshops on laboratory management; training for hiring committees).

LIFE-CAREER INTERFACE: initiatives aimed at helping women in life/work conciliation (dual career couples; tenure-clock extensions; campus child care; split appointments; time-stretcher services; life cycle professorships; parental leave; domestic partner benefits).

DEVELOPMENT, LEADERSHIP, VISIBILITY: initiatives aimed at supporting women in career development and in attaining leadership positions (women faculty mentoring programme; celebrating women in Science and Engineering Grant Programme; Seminar Series; endowed professorships for women; leadership development and/or tenure-line conversion of non-tenure line women; leadership development/mentoring for senior women; developing networks, promoting communication, increasing visibility of women; Cluster Hire Initiative).

OVERARCHING ACTIVITIES: (Committee on Women in the University; leadership programs and national workshops; documentary video; research and evaluation; workshops, grant programs, data collection, research and evaluation projects).

Each activity is in continual evolution, being submitted to an evaluation and upgrading cycle. Data from evaluation exercises are analysed and findings are continually used to improve the activities. Faculty administration co-operate with the centre in this process, having a stake in structure and content of the activities carried out.

Focus

- [x] Providing direct support to individual women
- [x] Transforming institutional processes to address critical points in women's career paths
- [x] Promoting systemic change (mainstreaming the gender dimension)

Fields of activity

[x] Networking	[x] Empowerment schemes	[ ] Definition of targets regarding gender balance in research groups
[ ] Mentoring	[x] Dissemination of information material	[ ] Definition of targets regarding gender balance in decision-making positions
[x] Support in periods of absence for family needs	[x] Revision of internal policies regarding staff appointments	[ ] Targeted funding practices to improve women's access to research funding
[ ] Schemes for women-returners	[x] Revision of internal policies regarding promotions	[ ] Introduction of chairs and positions reserved for women
[ ] Care services	[x] Gender-sensitive practices for the attribution of tasks	[ ] Introduction of awards reserved for women
[x] Support to career-development	[x] Gender-sensitive practices for assessment	[ ] ntroduction of single sex degree and specialization courses
[ ] Support to mobility	[x] Monitoring appointments, promotions or attribution of tasks	[ ] Revision of teaching curricula and texts
[x] Training courses	[ ] Institution of quotas	[ ] Mainstreaming actions

Other(s)

Dissemination

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[ ] Newsletters and internal bulletins	[x] Website	[x] Publications in scientific journals
[x] Articles in newspapers or magazines	[x] Radio or television interviews	[x] Internal initiatives and seminars
[x] Local initiatives and seminars	[x] National initiatives and seminars	[ ] International initiatives and seminars

Other(s)

Assessment

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Quality profile EXCELLENT

This programme shows an excellent quality level, both aggregate and in its single dimensions.

RELEVANCE: EXCELLENT
Outstanding performance has been secured putting in place all the tools available to keep the project relevant. Thus, an extensive review of the situation of women at all levels within participating departments has been carried out and it is being updated continually. Moreover, new objectives have been defined during the course of the programme, with the insertion of ethnicity as another crucial category of diversity to be taken into account, leading to the consideration of new categories of beneficiaries. Beneficiaries' involvement and feedback have been solicited regularly, initially by convening town hall meetings, and later through the Leadership Team of the project, and through the on-going evaluation of programme activities.

EFFECTIVENESS: EXCELLENT
Effectiveness is equally high. Actually, the programme has been assessed by promoters to have reached most of its objectives and implemented all the planned activities and many new ones, combining theoretical approaches to gender issues with noteworthy concreteness.

EFFICIENCY: GOOD
As for efficiency, no problems have been recorded in relation to the acquisition of funds and its timing, nor as concerns accounting and management, while the programme succeeded both in implementing more activities by efficiently using the initial grant, and launching new initiatives through the collection of additional economic resources by public agencies and private sponsors.

SUSTAINABILITY: EXCELLENT
Strong sustainability has been achieved, since the programme has been able to survive the expiration of the initial five-year grants, collecting resources to an amount only slightly below the annual budget previously available. The impact of the programme on retention and advancement of women faculty has attracted funding for key elements such as small grants programmes for addressing unforeseen, temporary interruptions in research programmes. The presence of men to a percentage as high as 50%, among the promoters of the programme, has undoubtedly been a factor improving its overall sustainability. Actually, the inclusion of men was an eligibility criterion to access the national grant.

Impact profile GOOD

The programme has achieved many significant impacts.

CREATING AN ENABLING ENVIRONMENT FOR WOMEN'S CAREERS: GOOD
Under the programme, many new organisational approaches have been institutionalised, and customary behaviours have been significantly changed, in relation to hiring, assessing and promotion of faculty staff. Internal evaluation recorded significant increases in new female faculty hires in participating departments compared to non participating ones. Over 70% of involved chairs reported improvements in departmental climate. Besides, the programme has had a wide echo and its effects have thus been able to be replicated in different colleges and universities. The programme, which has moreover triggered the setting up of an association devoted to gender issues within the university, is being continuously presented and disseminated, also through visits to other campuses and the performance of workshops targeting administrators and members of hiring committees. Only in 2005, the programme materials and procedures have been introduced to over 20 campuses.

PROMOTING WOMEN IN KEY ROLES IN S&T AND SCIENCE-SOCIETY RELATIONSHIP: GOOD
Impacts connected to the promotion of women's presence in key decision-making positions reached a good level, with a particular emphasis on increasing internal and external visibility of women researchers' accomplishments and promoting their presence in high-profile positions in research management. The programme also favours women's presence in scientific communication, the study of women's patenting behaviour and the support to their scientific and technological start-ups.

GENDERING S&T CONTENTS, METHODS AND REPRESENTATIONS: MEDIUM
The impact of the programme on this area has been somehow more limited, but important. This effort included widespread dissemination of accessible summaries of the scholarly literature on bias and stereotyping, which served to alert both men and women to the ways in which the purportedly objective processes of science are subject to evaluation bias and gender schemas. The programme, moreover, obtained positive outcomes in terms of fighting horizontal segregation and contrasting unconscious biases and assumptions guiding the attribution of tasks. As a consequence, women faculty members have in some cases been offered more diverse assignments.

CONSENSUS: GOOD
Consensus to this programme has been very high. Satisfaction has been expressed to a significant degree by promoters and beneficiaries, including participating men, and the programme enjoyed a convinced support from the institutional leadership of the university and the involved departments. No groups are reported opposing the initiative and the new climate and procedures it brought about, while recognition came from many relevant actors, both at the academic and the political levels, as well as nationally, among peer institutios.

Transferability

INFORMATION DISCLOSURE: HIGH
Programme transferability is remarkably enhanced by a strong attitude toward information sharing and dissemination. Not only institutional set-up, activities and procedures are described in detail on the website and the many booklets produced, but a reflective attitude is identifiable that leads to analyse strengths and weaknesses and to provide tips to support the dissemination of the programme and its parts.

ALREADY REPLICATED? YES
The programme is itself an application of a broader scheme, implemented in several universities at the national level. Internal transfers to previously not participating departments at the same university have also happened.

ENABLERS/structural factors
- Cultural and social context. A long record of gender equity programmes at the university, with many initiatives (e.g. women faculty mentoring programme, tenure clock extension, gender pay equity studies) already in place for many years.

- Normative and institutional context. A strong faculty governance tradition, which was favourable to a faculty-led programme such as this one.

- Financial resources availability. Ability to access a large grant from the National Science Foundation lasting five years, thus giving the programme time to take roots and find additional resources. Campus administrators contributing to the programme efforts with direct funds.

ENABLERS/process factors
- Leadership's attitude. The provost and many deans supporting the programme, which made it easier to reach the faculty in their units. One dean even mandating attendance at one of the workshops.

- Campus administrators support. Campus administrators helping identify private funding sources to continue major programmes after the initial grant expiration.

- Early men's inclusion. Almost all programme initiatives including men from the very beginning. Men served on design teams for workshops and participated in them; men are recipients of grants as well as women; as a consequence, the programme didn't generate a backlash or a great deal of resentment for being a "special" programme for women.

- Creation of a research institute. All activities being grounded on the results produced by a research institute created to serve as the centre base of the programme. This gave the programme the stamp of "research" and differentiated it from purely programmatic initiatives. Delivering only research-based interventions, and generating original research from the programme has been crucial in reaching faculty who most of all value research.

- Continual evaluation. Each programme being continually evaluated, enhanced and upgraded. Evaluations are not just filed in a drawer, but the data are analysed and findings continually used to improve the activities. Faculty saw that their opinions mattered and actually have been willing to get involved.

- Programme leadership effectiveness. Tightening up leadership of the programme to a few core people, with participative tools in place to collect opinions and feedback from all relevant stakeholders, but the ability to swiftly take decisions and identify priorities.

OBSTACLES
- Normative and institutional context. State laws prohibiting to pay for parental leave or domestic partner benefits, even from private gift funds.

- Internal regulations. Financial rules making it impossible to give faculty grant money to take children or caregivers on a research or conference trip.

TIPS FROM THE PROMOTERS
- Track race and ethnicity issues from the beginning as well as gender issues. Working on these issues together can help create a larger change and stronger networks among different equity groups. At the same time, the "gender" component of diversity can sometimes get lost, so it's important to remain focused on gender even while expanding your diversity message.

- Ten tips for academic leaders to accelerate the advance of women in science and engineering: 1) learn about outstanding women on your campus; 2) learn from the local experts about gender issues; 3) review campus data on equity; 4) study work/life issues; 5) make gender issues visible; 6) increase the visibility of outstanding women scientists; 7) support committees and task forces; 8) ask hard questions and take tough stands; 9) embed gender equity in campus process; 10) be receptive when presented with gender issues

To contact the promoter of this programme, fill in the following fields.

Your email address: YOUR EMAIL ADDRESS

Your request: YOUR REQUEST

Mail to programme promoter

Annex 2

List of programmes

Gender equality programmes analysed in the framework of PRAGES
(in alphabetical order by country)

Country	**Promoter**	**Programme**
Australia	Australian Computer Society (ACS)	Survey of all female members
Australia	Commonwealth Scientific and Industrial Research Organisation (CSIRO)	Payne Scott Award
Australia	Foundation for Australian Agricultural Women	Ambassadors on Boards
Australia	Inspiring Women Pty Ltd	Inspiring Women Pty Ltd
Australia	Macquarie University	Interdisciplinary Women's Studies, Gender and Sexuality Program
Australia	Monash University	Future Academics Workshop
Australia	National Foundation of Australian Women (NFAW)	Women on Boards (WOB)
Australia	Office for Women's Policy (Victoria)	Victorian Women’s Register
Australia	Pharmacy Guild of Australia	Women and Young Pharmacists Committee (WYPC)
Australia	Queensland Government Office for Women	Smart Women - Smart State Strategy
Australia	Rural Women's Network, NSW Department of Primary Industries (RWN)	Rural Women's Network
Australia	ThoughtWare	Million $ Babes

Country	Promoter	Programme
Australia	ThoughtWare	Doing IT Around The World
Australia	ThoughtWare	Screen Goddess - IT Calendar 2006-2007
Australia	University of New South Wales	Lucy Mentoring Program
Australia	University of Queensland	Promoting Women Fellowships
Australia	University of Southern Queensland	Go Women in Engineering, Science and Technology (Go WEST) project
Australia	University of Technology of Sydney	Women in Engineering Program
Australia	University of Western Australia	Safety Net Scheme for Research Staff
Australia	University of Western Australia	Leadership Development for Women Programme (LDW)
Australia	University of Western Australia	Ongoing Contingent-Funded Research Contract Employment
Australia	Western Sydney Regional Organisation of Councils (WSROC)	Young Women's Leadership Program
Australia	Women in Technology (WiT)	WiT Board Readiness Program
Austria	Austrian Research Promotion Agency (Österreichische Forschungsförderungs-gesellschaft mbH – FFG)	w-fFORTE – Laura Bassi Centres of Expertise
Austria	University of Vienna, Center for Gender Equality (Universität Wien Abteilung Frauenförderung und Gleichstellung)	Mentoring University of Vienna(MUV)

Country	Promoter	Programme
Austria	Vienna University of Technology (Technische Universität Wien), Center for Promoting Women and Gender Studies	Women in Technology (WIT)
Belgium	Institute for the equality for women and men (Institut pour l'Egalité des Femmes et des Hommes – IEFH)	Cycle of seminars "Gender main-streaming, a new challenge for the federal government and its administrations"
Canada	Association of Professional Engineers and Geoscientists in BC (APEGBC)	Division for Advancement of Women in Engineering and Geoscience (DAWEG)
Canada	Canadian Association of Physicists (CAP)	External critical assessment of the climate and environment for women in physics departments
Canada	Canadian Association of Women Executives and Entrepreneurs (CAWEE)	Canadian Association of Women Executives and Entrepreneurs (CAWEE)
Canada	Canadian Engineering Memorial Foundation (CEMF)	CEMF Scholarship Program.
Canada	CATA Women in Technology Forum (CATAWIT)	CATA Women in Technology Forum (CATAWIT)
Canada	Ontario Society of Professional Engineers	Semi-Annual Conferences
Canada	Society for Canadian Women in Science and Technology (SCWIST)	Society for Canadian Women in Science and Technology (SCWIST)
Canada	University of Guelph	NSERC Regional Chair for Women in Science and Engineering
Canada	University of Toronto, Women in Science and Engineering (WISE)	University of Toronto, Women in Science and Engineering (WISE)
Canada	Wired Woman Society	Wired Woman Mentorship Program
Canada	Women's Executive Network (WXN)	Women's Executive Network (WXN)

Country	Promoter	Programme
Czech Republic National Contact Centre - Women and Science	Institute of Sociology, Academy of Sciences (Sociologicky ústav Akademie ved Ceské Republiky)	National Contact Centre - Women and Science
Denmark	Network for Women in Physics (Netværk for Kvinder i Fysik – KIF)	Network for Women in Physics
Denmark	University of Aarhus (Aarhus Universitet)	Task force for gender equality
Denmark	University of Southern Denmark (Syddansk Universitet)	Network for Women in Philosophy (Netværk for Kvinder i de Filosofiske Fag)
Denmark	University of Southern Denmark (Syddansk Universitet)	Employing a Gender Equality Consultant
Estonia	Innovative Women in the North (Qvinnliga uppfinnare i Norden – QUIN	Innovative Women in the North (Qvinnliga uppfinnare i Norden – QUIN
European Programme	Association of Organisations of Mediterranean Businesswomen (AFAEMME)	Women and job mobility: obsta-cles and solutions for women in Information and Communications Technologies (ICTs)
European Programme	European Network of Academic Mentoring Programmes for Women Scientists (EUMENT-NET)	Building a Europen Network of Academic Mentoring Programmes for Women Scientists
European Programme	European Platform of Women Scientists (EPWS)	European Platform of Women Scientists (EPWS)
Finland	Academy of Finland (Suomen Akatemia)	Equality Plan of the Academy of Finland
Finland	University of Helsinki (Helsingin Yliopiston)	Equality Plan
France	Ecole des Hautes Etudes en Sciences Sociales (EHESS)	Professional Equality Commission between men and women

Country	Promoter	Programme
France	Equal opportunities for women and men in engineering studies and careers in Europe (ECEPIE)	Equal opportunities for women and men in engineering studies and careers in Europe (ECEPIE)
France	Innov.Europe	Prix Excellencia - Trophée de la Femme ingenieur High-Tech
France	Women & Science (Femmes & Sciences)	Femmes & Sciences
Germany	Center of Excellence Woman and Science (CEWS)	Encouragement to Advance - Training Seminars for Women Scientists (ENCOUWOMSCI)
Germany	Center of Excellence Women and Science (CEWS)	University ranking on the basis of gender equality indicators
Germany	Center of Excellence Women and Science (CEWS)	Encouragement to Advance – Career Strategies for Women in Science (Anstoß zum Aufstieg - Karrierestrategien für Frauen in der Wissenschaft)
Germany	Center of Excellence Women and Science (CEWS)	FemConsult - Database of Women Scientists
Germany	Conference of Equal Opportunities Officers at universities and academic institutions in Baden-Württemberg (Landeskonferenz der Gleichstellungsbeauftragten an den wissenschaftlichen Hochschulen Baden-Württembergs) (LaKoG)	Conference of Equal Opportunities Officers at universities and academic institutions in Baden-Württemberg (Landeskonferenz der Gleichstellungsbeauftragten an den wissenschaftlichen Hochschulen Baden-Württembergs – LaKoG)
Germany	Fraunhofer-Gesellschaft	DiscoverGender
Germany	RWTH Aachen University (Rheinisch-Westfaelische Technische Hochschule Aachen), Integration Team	TANDEMplusIDEA
Germany	Women's Network in Archaeology (Netzwerk Archäologisch Arbeitender Frauen e. V)	Women's Network in Archaeology (Netzwerk Archäologisch Arbeitender Frauen e. V)

Country	Promoter	Programme
Greece	National Centre for Social Research (EKKE)	Studies for establishing and assessing a quota system in the composition of scientific committees
Italy	Italian Association of Women Inventors and Innovators (Associazione Italiana Donne Inventrici e Innovatrici – ITWIIN)	Italian Women Innovators and Inventors Network (ITWIIN)
Italy	Observa – Science in Society	Women and Science 2008. Italy and the International context
Italy	Orlando Association (Associazione Orlando)	Women Server
Italy	Trentino School of Management (TSM)	Women and Science: scientific education and career in technical and scientific professions, articulated in two programmes (ESC)
Italy	Universities of Milan-Statale and Milan-Bicocca, The Milan Polytechnic, and Orientamento Lavoro onlus (Università di Milano Statale e di Milano Bicocca, Politecnico di Milano e Orientamento Lavoro onlus)	Universidonna
Italy	University of Trento (Università di Trento)	Equal GELSO (Genere Lavoro e Segregazione Occupazionale)
Italy	University of Turin, Interdisciplinary Centre for Women's Research and Studies (Centro Interdisciplinare di Ricerche e Studi delle Donne – CIRSDe)	Interdisciplinary Centre for Women's Research and Studies (CIRSDe)
Malta	National Commission for the Promotion of Equality (NCPE)	UNESCO project on gender gap in S&T in Malta
Netherlands	University of Twente (Universiteit Twente)	Recruiting and promoting more women into scientific and managerial top positions
Norway	Committee for Mainstreaming – Women in Science (Komité for integreringstiltak – Kvinner i forskning)	Gender Mainstreaming for Women in Science
Norway	Federation of European Biochemical Societies (FEBS)	FEBS Working Group on Women in Science

Country	Promoter	Programme
Slovenia	Slovenian Research Agency (Javna agencija za raziskovalno dejavnost Republike Slovenije) (ARRS)	Young Researchers
Slovenia	Slovenian Science Foundation (Slovenska Znanstvena Fundacija – SZF)	Fund for Slovenian Female Researchers
Spain	Autonomous University of Barcelona (Universitat Autonoma de Barcelona)	UAB Observatory for equality
Spain	Donestech	Donestech
Spain	Esteve Foundation (Fundació Dr. Antoni Esteve)	Book: “Doce mujeres en la biomedicina del siglo XX” (Twelve women in biomedicine in XXth century)
Spain	Murcia's Women's Institute (Instituto de la Mujer de la Región de Murcia)	Proyecto ADELANTATE
Spain	Spanish National Research Council (Consejo Superior de Investigaciones Científicas) CSIC	Women and Science Committee
Spain	University of Cantabria (Universidad de Cantabria)	Equal Opportunity Commission
Spain	Women’s Institute (Instituto de la Mujer)	Funds for research in gender studies
Sweden	Swedish Governmental Agency for Innovation Systems (Verket För Innovationssystem – VINNOVA)	VINNMER – Qualification for female researchers
Switzerland	University of Fribourg	Réseau Romand de Mentoring pour femmes [RRM]
United Kingdom	British Association of Women Entrepreneurs	British Association of Women Entrepreneurs
United Kingdom	Manchester Business School	Tailored e-coaching Programme (TEC)
United Kingdom	UK Resource Centre for Women in Science, Engineering and Technology (UKRC) Equality Challenge Unit	Athena SWAN (Scientific Women's Academic Network) Charter

Country	Promoter	Programme
United Kingdom	University of Leicester	Athena Swan Bronze Award
United Kingdom	University of Manchester	WiSET (Women in Science, Engineering and Technology)
United Kingdom	University of Warwick	Institute of Physics – Project JUNO
United Kingdom	University of York	Athena Swan Gold Award, Department of Chemistry, University of York
United States	Anita Borg Institute for Women and Technology	Grace Hopper Celebration for Women in Computing
United States	Computer Research Association's Committee on the Status of Women in Computing Research (CRA-W)	Cohort of Advanced Professionals Program (CAPP)
United States	Georgia Institute of Technology (Gatech)	Georgia Tech-NSF ADVANCE Program
United States	Georgia Institute of Technology Center for Study of Women, Science and Technology (WST)	WST Learning Community (WST Lrn C)
United States	Kansas State University	NSF ADVANCE-IT Program at Kansas State University
United States	Marshall University	NSF ADVANCE-IT Program at Marshall University
United States	Massachusetts Institute of Technology (MIT)	Gender Equity Project
United States	New Mexico State University	ADVANCE Program at New Mexico State University
United States	Northwestern Society of Women Engineers	Mentoring Program
United States	Rice University	Rice University NSF ADVANCE Program
United States	Smith College	Center for Women in Mathematics at Smith College

Country	Promoter	Programme
United States	University of Colorado at Boulder	Leadership Education for Advancement and Promotion (LEAP)
United States	University of Illinois at Chicago (UIC)	Women in Science & Engineering System Transformation (WISEST)
United States	University of Michigan	ADVANCE Programs at the University of Michigan and related initiatives
United States	University of Washington	ADVANCE Center for Institutional Change
United States	University of Wisconsin at Madison	Women in Science & Engineering Leadership Institute (WISELI)
United States	Virginia Polytechnic Institute and State University (Virginia Tech)	NSF ADVANCE-IT Program at Virginia Tech
United States	Women Engineering Leadership Institute (WELI)	Women Engineering Leadership Institute (WELI)

Other programmes and initiatives cited in the Guidelines

(in alphabetical order by country)

Country	Promoter	Programme
African Programme	Association of African Universities and Association for the Development of Education in Africa	Toolkit for mainstreaming gender in higher education
Austria	Federal Ministry for Transport, Innovation and Technology	FemTech
Canada	Natural Resources Canada	Women Scientist Award
European Programme	ATHENA Thematic Network	ATHENA Thematic Network
European Programme	European Commission	Euraxess Portal
European Programme	European Commission	Toolkit “Gender in EU-funded Research”
European Programme	European Commission	Book: “Women in science – Compelling stories of the heroines of science”
European Programme	European Commission	European Charter for Researchers
Germany	TOTAL E-QUALITY Deutschland	Total E-Quality Award
International Programme	UNESCO and L’Oréal Group	Women in Science Prize
Portugal	Science and Technology Foundation (Fundação para a Ciência e a Tecnologia - FCT)	Funds for research projects on gender equality
Switzerland	Swiss Federal Institute of Technology in Zurich (Eidgenössische Technische Hochschule Zürich - ETH)	Dual Career Advice Office
United Kingdom	ATHENA SWAN Charter	ATHENA SWAN Charter
United Kingdom	University of Surrey, Daphne Jackson Trust	Fellowship Programme
United States	Arizona State University	Undergraduate course on gendering science and technology
United States	Association for Women in Science (AWIS)	Website Forum
United States	Bryn Mawr College	Course on gender and science
United States	Case Western Reserve University	ACES programme
United States	National Science Foundation	ADVANCE-IT
United States	University of Wisconsin at Madison	Office of Child Care and Family Resources (OCCFR)

PRAGES

The image on the cover shows a tridimensional representation of a quadridimensional Calabi-Yau manifold, applied in superstring theory.
Photograph courtesy of Jean-Francois Colonna (CMAP/Ecole Polytechnique. www.lactamme.polytechnique.fr)