# Gendered organisational cultures in German academic engineering

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**ABSTRACT**
This paper will describe and analyse how female professors manage formal and informal norms and values of their departments and organizations. State of the art includes different gender theories and research. With a qualitative methodological design (especially interviews and focus discussion groups), case studies were conducted in companies, political institutions, governmental research organizations and universities. From a gender perspective, the following aspects were analysed: gender stereotypes and gendered leadership expectations, transparent and strategic communication, expectations of output, commitment and availability, gender awareness, and integration in gendered networking and networks. The results focus on academic engineering cultures in investigated research institutes and one technical university.
**Keywords:** career, gender stereotypes, academic organizations, gender awareness, gendered networks.

## *Culturas organizativas de género en la ingeniería académica alemana*

**RESUMEN**
Este artículo describirá y analizará cómo las profesoras manejan las normas y valores formales e informales de sus departamentos y organizaciones. El estado del arte incluye diferentes teorías e investigación de género. Con un diseño metodológico cualitativo (especialmente entrevistas y grupos de discusión), se realizaron estudios de caso en empresas, instituciones políticas, organizaciones gubernamentales de investigación y universidades. Desde una perspectiva de género, se analizaron los siguientes aspectos: estereotipos de género y expectativas de liderazgo de género, comunicación transparente y estratégica, expectativas de producción, compromiso y disponibilidad, conciencia de género e integración en redes y redes de género. Los resultados se

centran en las culturas de la ingeniería académica en los institutos de investigación estudiados y en una universidad técnica.
**Palabras clave:** carrera, estereotipos de género, organizaciones académicas, concienciación de género, redes de género.

## INTRODUCTION

Academic engineering is characterized by horizontal and vertical gender segregation. Several European Commission Reports (for example ETAN, WIR, ENWISE) reflect this situation (European Commission 2000; 2003; 2004; 2006). Gender inequality persists in SET throughout the European Union. Only 32% of scientists and engineers are women (EC, 2013: 5). While female PhD graduates now equal or outnumber men, in engineering they are still significantly underrepresented (26%). Although "positive trends can be observed such as the considerable growth in the proportion of female scientists and engineers… horizontal gender segregation across different economic sectors and fields of science persist" (EC, 2013: 14). In terms of career progression, in science and engineering, the attrition of women increases at post-PhD level and "improvement over time is small and slow" (EC, 2013: 89). It is, therefore, not surprising that in the fields of engineering only 7.9% of women hold full professorships (EC, 2013: 6). In Germany, the natural sciences and engineering remain bastions of male domination (EC, 2013: 62).

Organizational cultures together with gender stereotypes and excluding networks determine the career of women even when being in top management positions. Gendered organizations (Acker, 1990) with gendered norms and values are even more determent in male domains (Kanter, 1977). In these organizations women as minority are discriminated structurally and gender stereotypes hinder their career even if they perform excellent. In engineering gender stereotypes come together with dualistic gendered technique stereotypes (Wajcman, 1996) and help to define women as "somebody else" who does not fit. These barriers will be even more effective in informal organizational cultures.

Engineering as part of the scientific-cultural system is not gender neutral. Career criteria and measures to make a successful career are supported by male networks and formal and as well as informal networking. In these nontransparent processes, gatekeepers play a very important role.

Taking her cue from Bourdieu's concept of science as social process, Beate Krais (2010) investigated gender as a social dimension which biased outcome in terms of women's under-representation in German higher education and especially in top positions. The German 'co-optation principle' for obtaining a first professorship - which stems from the organization of higher education - has more negative effects on women (Krais, 2010) precisely because they cannot necessarily rely upon the help of their mentors as much as men do. A gendered competitive style in the natural sciences disadvantages female scientists too. Women are not recognised within the scientific community as much as men because they have been defined as outsiders, as 'somebody

strange'; having children is another barrier for women in academia. Especially during their early careers women experience disproportionate disadvantages because of conflicts between careers in research and family demands. "Many studies show that the family-or-science dilemma is not only gendered, but exacerbated by institutional constraints and implicit academic norms, values and expectations that take the traditional male life-course as the norm" (EC, 2012: 17). Most career theories proposed by Weber, Giddens, Kohli and Sennett are based on male employment concepts and don't integrate the private sphere (Schiffbänker, 2009).

Women's poorer networking resources together with "an accumulative logic of 'non-occurrences' and slight exclusionary practices that progressively disadvantage women's careers … cause a sensation of isolation, difficulty in assuming the risks inherent to the scientific career and low professional self-esteem" (EC, 2012: 18). Gender biases in the production of knowledge because research unmasks "power relations, gate-keeping practices and informal networks as a source of tacit knowledge, support and recognition" (EC, 2012: 18). There is also a bias in formal assessment procedures that leads to unequal access to research funding or academic positions. "The definition and assessment of scientific excellence (the recognition of merit) is not independent of gender relations in academia and society at large" (EC, 2012: 18). Women's slight disadvantages during the early stages of their scholarly careers might turn into wide differences in subsequent career outcomes due to cumulative (dis)advantages (see also Faulkner, 2005).

This paper will describe and analyse how female professors manage formal and informal norms and values of academic departments and organizations. The background of this paper is the German research project 'Women on Top: the Impact of Women in Leadership Positions in Engineering, Science and Environmental Organizations'.[1]

Based on state of the art and some remarks about the qualitative methodology objectives include first how gender stereotypes define gendered leadership expectations; how cooperation and competition are gendered; the question if communication is gendered; how conflicts are managed, if there are gender differences in expectations of output, commitment and availability; the importance of gender awareness as a women furthering characteristic of organizational culture; if and in which ways women are integrated or not integrated in men's networking and networks; how women fit in and are part of career mentoring; in which ways women's networks can help for academic engineering careers.

[1] The project was conducted from April 2009 to March 2012 and was financed by the Ministry of Education and Research (BMBF) and the European Social Funds (ESF). It combines the expertise of two institutions, the University of Wuppertal with Felizitas Sagebiel as the scientific leader, and the Wuppertal Institute for Climate, Environment and Energy with Uta von Winterfeld as leader. This paper will focus on the results of research in four case studies analysed at the University of Wuppertal. I wish to thank Ulla Hendrix and Christine T. Schrettenbrunner for their contribution to this research.

From all investigated organizations only data from one technical university and seven institutes of an important relevant governmental research organization will be included. Political and economic organizations which were studied too are not discussed in this paper. The data has been gathered from male and female engineering professors in in interviews and focus discussion groups; not include were participant observations as ethnographical research would rely on.

## 1. SOME SELECTED THEORETICAL AND RESEARCH REFERENCES

The conceptual framework consists of theoretical perspectives taken from gender in science and academia research, gender-based organization studies and feminist technology studies as well as critical men's studies. These research fields are overlapping partly even though they will be described here separately.

- **Gender in science and academic research**

Science research seldom has taken in account social factors, especially gender has been neglected (Krais, 2000; 2010). Beaufaÿs and Krais (2005) with reference to Bourdieu (1997) have differentiated formal and informal dimensions and their effects on (in)visiblity of women. Research on gender in science show similar results in UK (Bagilhole & Goode, 2001; Morley 1999), Finland (Husu, 2005) and Germany (Metz-Göckel 1999; Sagebiel 2010b). In academia female engineers are highly visible as women because of their low numbers, but, invisible as engineers (Faulkner 2005). This invisibility results from gender-based ideology of meritocracy, which ignores the informal support system that exists among men (Bagilhole & Goode, 2001). Gender in academia[2] could be seen as a special research field of organizational studies focused on universities as institutions and organizations of higher education.

- **"Gendered organization" and organizational cultures**

In Germany women and gender studies in engineering focused long time on women as individuals (Janshen & Rudolph 1987) and practical projects working with the deficit perspective tried to analyse female student's supposed lack of skills and self-confidence. In contrast, organization research by Kanter (1977) analysing the structural characteristics of male domains like engineering gave the necessary basis for studies about marginalizing effects on women. Similar results can be found for example in the following studies from Germany (Erlemann 2002; Haffner, Könekamp & Krais 2006), UK (Bagilhole 2005; Carter & Kirkup1990) and Australia (Robert & Ayre 2002).

Gender-based organization studies focuses on the formal and informal ways in which organizations are gendered (Acker, 1990). Engineering and management in engineering are perceived as being 'archetypical' men's careers (Evetts, 1998: 283).

[2] There is a large amount of research on gender and higher education in Germany. For an overview, see: Lind (2006), Matthies & Zimmermann (2010) and Kamphans (2014).

Wajcman argues on basis of her research in management as a man's field, women have to adapt (Wajcman, 1998). Gender expectations are in conflict with managerial responsibilities: "if the woman is an efficient, competent manager, she is likely to be judged as "unfeminine", but if she demonstrates the supposedly female qualities of care and sensitivity she is likely to be assessed either as an inappropriate and inefficient manager (Kanter, 1977; Marshall, 1984) or as a good female manager" (Evetts, 1997: 229).

The homo-social culture of leading management is a barrier for the recruitment of women to top positions. The informal management culture is characterized by 'male bonding' and communitarianism which is characterized by rituals of strong hierarchies, self-verifying of equality, and prohibition of fraternization. After Matthies et al. (2001) the masculine organizational culture which define the ideal manager together with myths of equality and stereotype gender roles hinder career chances of women.

Networks in general management (Burt, 1998; Funken et al., 2011) and in engineering research are gendered (Sagebiel, 2010). Homo-social men's networks demonstrate their exclusiveness through selective processes for new members, restriction of information, secrets and strict separation of members and non-members (Rastetter 1998). They function with their norms of all-time-availability, informal structural information channels, hierarchies and mechanism of exclusion (Doppler 2005; Rastetter, 1998). More women scientists in leading positions mean more direct competition with men at the same level. The fear of this threat from women strengthens informal activities within men's networks which exclude women (Miller, 2002; Ohlendiek, 2003). Equal opportunity and diversity programmes can be easily undermined by vested informal men's networks (Sagebiel, 2007:155). Women's networks are mostly formal and have less inner organizational power and therefore they often cannot compensate women's less integration in men's networks (Sagebiel 2010; Sagebiel & Dahmen 2008).

- **Feminist studies of technology**

Gender stereotypes (Sagebiel & Vázquez Cupeiro 2010; Vázquez 2013) together with gendered stereotypes of technology (Wajcman, 1996) play an important role for reproduction of gender segregation. Gender stereotypes in connection to technique stereotypes stem from universal dualistic thinking (Faulkner, 2000; Wajcman, 1996). They influence the polarisation of soft and hard technology, concrete and abstract approaches, body and ghost. After Wendy Faulker (2000) engineering is gendered in three aspects: 1) through gendered division of labor resulting in gendered working styles; 2) through symbolic, visual and cultural connection between masculinity and technique and 3) through gendered professional identities of engineers and experiences. Wajman (1996) argues that the female identity construction would be in conflict and the male identity construction would be in harmony with technology; because of ideological construction of male as higher valued and of female as less valued in engineering the outcome is the reproduction of hierarchy between the men and women. This stereotyping results in a fragile self-confidence of female engineers (Erb 1996; Håpnes und Rasmussen 1991).

Gender and technique stereotypes have been applied to reinforce the exclusion of women as outsiders based on their perceived 'otherness'. Studies on international gender-based differences in engineering have resulted in similar conclusions. The processes deployed to reproduce or reinforce male domination by seemingly informal strategies, such as storytelling, fraternization, fun and sports, as originally outlined in Australian research (McLean et al., 1996), have been confirmed by the ethnographer Wendy Faulkner in the UK (Faulkner, 2000) and in Europe (Sagebiel & Dahmen, 2006).

Defined gender differences (gender stereotypes) (Wajcman, 1996; Knight & Kerfoot, 2004) and men's networks have consistently been deployed to manipulate and weaken women's chances for a successful career and work. Even top academic women meet gender stereotypes embedded in a binary system. In a male domain like engineering the coping strategies of women are: "acting like one of the boys, accepting gender discrimination, achieving a reputation, and seeing more advantages than disadvantages" (Powell et al., 2009: 425). Knights & Kerfoot (2004: 432) found that there are only two coping strategies available for women leaders to overcome this binary thinking combined with the devaluation of women as the weaker: that they play the game or else that there exists a culture of acceptance of different truths.

- **Critical men's studies**

Critical men's studies propose Connell's concept of hegemonic masculinity (Connell, 1999) which can be taken for analyses of gendered careers in higher education. Polarized gender stereotypes help to reproduce the hegemonic masculine ideal, particularly in leadership positions, and helps to reproduce the traditional masculine values and norms of organizational culture (Höyng & Lange, 2004; Sagebiel, 2007: 150). To get the patriarchal dividend (Connell 1999), belonging to the male gender is enough.

Men learn basic skills for management from their youth onward in their 'serious competitive matches'. "This masculinity has a competitive structure learned in homo-social fields which young boys train in risky competitive plays" (Meuser 2006: 164, translated by the author). To strengthen network connections, one has to learn to demonstrate one's attractiveness as well as value the qualifications of the partners for cooperation and competition.

The question if by modernizing management that will change the traditional organizational culture to a more women friendly new 'masculinities' will develop in engineering is an empirical one. After Lange (1998) it is not very probably that the higher value of soft skills which are traditionally defined as female will value women higher.

## 2. QUALITATIVE METHODOLOGY OF EMPIRICAL STUDY

A qualitative methodology was applied to investigate how women engineers on top manage to change organizational culture, to consider the role of networks and

networking for successful change, and to analyse gendered promoters and barriers so as to determine whether there is a gendered understanding of technology.

For this paper two case studies[3] were investigated in one technical university in the north-eastern part of Germany and seven institutes of a governmental research organization spread across different regions of Germany. Both organizations should (at least theoretically) employ representative numbers of women engineers in leadership positions. This pre-condition was particularly necessary for selecting research institutes, because many of them in fact had either no or very few women engineers to ask participate in focus groups. For the selection of interviewees in both cases the equal opportunity officer helped. Both female and male leaders in engineering and the natural sciences, in higher education and governmental research organizations, have been investigated.

The methodological instruments were focus discussion groups, guided interviews and website analysis. In each selected organization, three guided expert interviews were carried out with women in leadership positions and two interviews were done with men in leadership positions. Two further guided interviews were performed with key personnel from human resources and equal opportunity offices. In each organization investigated, two gender-separated focus discussion groups with women and men in leadership positions were carried out. In the technical university and the governmental research institutes, in total 22 participants took part in four focus discussion groups. The interviews lasted between one and a half and two hours, and were audio taped, transcribed and analysed by themes. The focus discussion groups lasted two hours and were audio typed and analysed according to the six themes included (gendered leadership, change potential in leadership positions, promoters and barriers, use of networks, gender sensitivity, and power and change potential). The data were collected between 2010 and 2011.

Limitations of the qualitative approach focusing on case studies is a lack of generalization; limitation of the interview methods is that these methods cannot produce nonreactive data.

## 3. RESULTS: GENDER IN ACADEMIC ORGANIZATIONAL CULTURES

The results about organisational cultures presented and discussed in this paper focus on gender stereotypes and gendered leadership expectations, transparent and strategic communication**,** expectations of output, commitment and availability, gender awareness as a characteristic of organizational culture, and integration in gendered networking and networks.

[3] Eight case studies in total were carried out in companies, governmental research organizations, political institutions and universities in Germany. Different types of organizations were chosen to ascertain whether there are different barriers and promoters for leadership positions (Sagebiel 2013a).

### *3.1. GENDER STEREOTYPES AND GENDERED LEADERSHIP EXPECTATIONS*

Several studies on management styles found numerous gender stereotypes regarding leadership (Wajcman, 1998: 63). If women leaders manage in a 'feminine' way which differs from men's management styles in similar positions, is this a reflexion of gender stereotypes or can evidence of this difference be found in the interviews? Do women professors experience the prejudice that they are not suitable for leadership roles with the consequence having to fight for acceptance?

The results show two different aspects of female and male leadership in engineering, first male continuity versus female discontinuity and second male acceptance from the beginning versus necessary fight for female acceptance.

Even though one woman focused on being 'the best' showing a competitive attitude normally expected from leading men she had to invest more energy at the start. A male colleague started his leadership position in continuity with his predecessor, leading in the same way like his former chiefs and supervisors "who were effective scientific managers" and from whom he learnt the principle of hierarchy and delegation with which one can manage a bigger unit, "because I experienced how much more you can do if you are ready to separate a bit from scientific daily duties ready to have some perspective on everyday scholarly obligations".

In comparison for the female professor, the delegation of project acquisition to the researchers is an innovation which has to be re-enforced, all the while overcoming resistance to the changes. The male professor follows the structure already in place. But, in order to achieve the same results, the woman has to be more assertive and put in more energy. Tested at the beginning Female professors speak about being tested in the beginning as to whether she could be dominated by men; to quote one of them:

> "Their being able to perceive me objectively as a fellow scholar has only now begun. At the initial stage, I had to work hard to assert myself… because I was invisible. And there have been situations which have been beyond the pale… they would not have dared with a man."

In order to be accepted, women had to do more than a man would have had to do in order to be accepted in their leadership positions as the following example of a male professor shows who did not have to fight for acceptance:

> "I felt accepted, not liked… but at least properly accepted. This was not so simple with me because I had been… here before. This meant that I already knew people from several years before for whom I was now the boss, but this situation worked out very well, although it was not originally clear how it would work out."

In universities power games are inherent like to assert 'Claims to power'. Reflecting upon existing gender stereotypes[4] and feminist discussions it is interesting how female professors think about and handle power. The majority of the female professors interviewed, don't tell that they feel ambivalence about having power. Instead they want power to influence and shape organizational structures and cultures, to change work details, and, to set their own agenda as professors. Even though this can reflect a gender prejudice against male colleagues it can also reflect experiences in the engineering workplace culture, characteristic of dominant pattern of hegemonic masculinity (Connell, 1999).

- **Cooperation and competition**

Management of cooperation and competition is a genuine male play which leading women adapt more or less successfully, but often without fun. Cooperation between men starts often informal, similar to networking, and competition is biased by men's networks and bonding often with informal exclusion of women. Etzkowitz, Kemelgor and Uzzi (2000: 115) speak about the 'Kula ring' of successful scientific relationships between cooperation, networking and scientific output.

One male professor in a governmental research institute refers to the interdependent relationship between cooperation and competition for acquisition of projects: "Competition is a condition for cooperation: one can only cooperate with people with whom one has overlapping topics".

In this view competition has a positive effect on efficiency of research which female professors see it the same when they talk about competition for projects as normal. Management of competition is not an easy job for women. All interviewees tell that competition and recognition are intertwined and recognition could only be attained after fighting with a competitor. Female professors adapt to this situation differently. One of them because of negative experience with competition and less support, expects negative critics all the time while another female interviewee practices an active way of handling competing situations because otherwise she argues, she would expect to be not recognized. The third interviewee in the technical university definitely prefers open instead of hidden competition, and she views competition as a sport with rules. The only problem she perceives is that women are expected to be always kind and charming. Her strategy is to be kind, but at the same time consequently oriented towards her issue, which is non-charming in the end.

In summary female professors expel two patterns of adaptation in the university: One is to play the male power game with a male sportive attitude which neglects female stereotypes. The second pattern is not to play the male power game and to avoid being attacked all the time. In this manner the woman in leadership position becomes a victim adopting a possibly expected stereotyped behavior.

[4] A comprehensive overview of studies on gender stereotypes in technology under a socialization perspective is given by Susana Vázquez-Cupeiro (2013).

### *3.2 TRANSPARENT AND STRATEGIC COMMUNICATION*

Communication as element of organizational cultures is at the same time a factor of handling power. Women engineers during their career to power positions in the academe tell about their experienced discrimination as exclusion from information and by this way from participation of power. For them, to create transparent information structures should serve to inform their employees as well as to get information for themselves.

In this way a female professor talks about her management, focusing on communication:

> "I have weekly leaders' meetings, where the most important things are talked about and not as a taking-note-of-decision activity, but… I would like to get opinions, therefore really an exchange... On the other hand, I delegate some things concretely and say, that is your responsibility, your tasks. First, I trust that it is done by them themselves and independently up to a certain degree, and if there are problems, they have to refer it back up to me."

Another female leader of a research institute installed regular formal meetings with her team leaders to combine transparent information and control:

> "Principally we have once a month a meeting with team leaders for two hours with a clear structure, for which information will be given before and which will be consolidated by myself and principally the meeting is very focused and structured. And between these four weeks we have often times consultations, we sit together or phone. Well, I do many things by phone."

Besides focus on more communication in academia there exists also a contrary information strategy, namely to withhold information. For example in processes of project acquisition retention of own ideas will be chosen when competing people could use this information for their own purposes.

While female professors tend to have regular formal communication exchange one male interviewee talks about an informal meeting for information exchange. He installed this informal meeting after regular work time, combined with coffee, cake and beer, and offers at the same time possibilities for networking:

> "And, it is possible that some new scientific staff will be introduced or projects will be presented, that somebody tells something about the infrastructure or anything else…but, it is well accepted. Coffee, cake, drinks, some beers will be served, because it is Friday afternoon"

Interestingly no female interviewees talked about a similar practice.

- **Conflict management**

A special case of communication is conflict management. Female engineering professors who came from industry use systematic active methods while male professors using hierarchy and delegation leave solution of conflicts to other

subordinated staff. One female professor uses modern management methods and underpinned her approach economically: she invests time for communication as 'relational work' (Fletcher 1999) to avoid later costs of conflicts. As strategies for conflict solution she takes team building and internal networking. Regular exchange with employees as feedback instrument should avoid conflicts. A male colleague uses delegation of responsibility who intervenes in conflicts only as mediator and justifies his approach as pedagogic.

The question is: what functions does this change of communication structure and culture by female professors have? Is it to change the culture to a more participatory model, and in so doing, does it help to get agreement from employees with a strategy like 'relational work' (Fletcher, 1999)? Or does the structure follow the aim of compensating a lack of information due to a lack of network integration? If, in this way, a woman follows a different communication style in comparison with men, the reason could be that she operates in a different situation with less social capital in terms of network possibilities in a male domain like engineering. This situation means that the style of a woman cannot be evaluated without taking into account her situation within a gendered organizational environment.

### *3.3. EXPECTATIONS OF OUTPUT, COMMITMENT AND AVAILABILITY*[5]

In the natural sciences and engineering, 'output' means high performance which, in practice, means extensive publications and successfully securing research grants and (particularly for engineers) patents. Frequently, the quantification of high output has not been analysed thoroughly. Those factors favouring success, such as mentoring and networks, have been neglected by focusing only on the final output, especially in academia (Bagilhole & Goode, 2001; Morley, 1999). Nearly all the interviewees considered a high output as the unquestioned norm.

Many women professors refer to their deep professional commitment with virtually no separation between professional and private/family life. Besides speaking of a pattern of intensive work on special occasions, leading women in the governmental research institutes also noted that they had to work these long hours all the time:

> "One has two jobs, two full-time jobs. One has a full professorship… and to lead a small- to medium-sized enterprise, this is the research institute... That means between 70 and 80 hours, otherwise it is not possible… that means from morning to evening and night, if one is travelling, weekends that is clear, one has only very little time."

Another woman states, self-confidently:

[5] For more detail regarding outcome in connection with efficiency, see also Part 2 in Hendrix and Sagebiel (2013).

> "I am always available. I can be reached on my cell phone or, of course, by e-mail… And I think few people really understand this. Many preferred the situation where my predecessor was not always available, which gave them a week-long calm. And with me they always get a rapid response… which causes a problem for many employees. They go off on holiday and leave their cell phones and laptops at home. Tough luck, when a project is working out badly and they don't have the slightest clue."

These quotes show that female professors as leading persons see themselves as total dedicated to, what they think, is a necessary professional commitment, inclusive being available at all times. One can object that this result reflects a particular work-ethic, which in fact suggests that the answers given by interviewees do not tell the whole truth but, instead, reflect the existing organizational working culture in the institutes.

Output orientation has been combined with a change of expectations to employees/researchers. Whereas in the past more engineering employees working in research institutes used to have open-ended, full-time employment contracts employees in universities used to have fixed contracts, often partly employed. Wwhat is similar is that both groups of employees were expected to finish a dissertation during the course of their employment. One interviewed young female professor had a so-called 'fixed-term' on 'non-tenured' junior professorship, which means that she herself must acquire skills to be appointed to a tenured professorship, which in turn puts her under additional pressure to convince her doctoral students to work harder as well:

> "I expect that everyone, even if she/he is not paid full time, will work full time… and what I tell employees at the beginning is that 40 hours is not enough… I say this because I know that otherwise it will be very difficult for them to get their PhD on time."

Most interviewees in academia think that traditional rules governing working hours do not apply to academic organizations. However, this attitude does not mean that working hours (in this case overtime) in academia can be compared to those in industry. The fact that expectations to work overtime cannot be explained as a gender-based rejection of traditional working hours (i.e., nine-to-five-work) can be seen in the following two quotations, the first from a man and the second from a woman, both in leadership positions:

> "I expect that the people will focus their life on it. That doesn't mean that they have to be here for 20 hours, but if I have the feeling that someone shows up at nine in the morning and leaves at five in the afternoon – and not because he has finished his work at five, but because it is five – this would lead to a conflict with me."

> "And the mentality of 'I do research and leave for home at five o'clock', turns out to be is a strategy that is not really successful… some employees don't like the new situation…"

These quotations reveal an ambivalence about expected overtime as well as about flexible working arrangements. Monitoring staff presence ultimately entails giving up the idea that researchers can, in principle, work anywhere and everywhere. At the same time, the traditional 'nine-to-five' work schedule can be seen as a metaphor for conducting intense research under time constraints.

Bourdieu (according to Krais, 2010) construed academia as a special masculine field where total dedication is the traditional work ethos, based on traditionally separate spheres of private and working life with a gendered division of labour. Generally in research in the natural sciences and engineering, even having a family does not mean regular working hours because one is expected to continue working at home and to organize one's own work/life balance:

> "I expect from researchers that they will sometimes work at night because they are enthusiastic about their research. But this does not mean that they cannot take care of their children. We have fathers and mothers who leave at pre-determined times."

While here the staff members have the responsibility for organizing output-oriented work, in the next example a female professor differentiated between her own commitment and what she expected from her staff:

> "I don't expect that one is permanently at the workplace and always available – an employer also has a duty to care about their holidays and recreation… and often I have to remind people that it is Sunday and they don't have to reply to my e-mails immediately."

These different statements underscore that, whether this culture of long working hours depends on subjective or ideological factors rather than objective ones, the answers here nevertheless suggest that this structure has neither been questioned nor changed by most of the female interviewees. Gendered organizational studies and feminist studies have criticized this long hours rule as an exemplar of traditional hegemonic masculinity workplace culture. Critical labour studies have analysed this change in the division of responsibility for outcome between superiors and employees as a fundamental change in society's labour environment. It has been criticized as erasing the boundaries between work and privacy as a residual sphere. Equal opportunity policies applied in society in general - and in labour organizations in particular - have based their practices on these assumptions in order to influence the formal rules governing working hours and the scheduling of official meetings; yet these formal policies are largely ineffective in changing the informal spheres of scientific engineering working culture.

### *3.4. GENDER AWARENESS AS A CHARACTERISTIC OF ORGANIZATIONAL CULTURE*

Gender awareness is not inherent in an organizational culture, it is a result of processes in which one thinks about gender and how it is interconnected with society,

institutions and organizations and, it affords individual and organizational learning processes. In the empirical project gender awareness should indicate the amount of gender equality in organizational cultures. From research results two main aspects will be presented: organizational influence of equal opportunity and coping strategies of female professors between making gender issues explicit and leaving them hidden.

In engineering still traditional masculinity define organizational cultures because men who live dominant masculinity are still in powerful management positions and determine the work culture (Höyng/Puchert, 1998). Gender awareness in a positive way as to make organization more women friendly is not an element of this formal culture and the same is true for informal masculine work culture.

Interviewed equal opportunity officers evaluated gender equality in both investigated academic organizations. In the governmental research organization only a few institutes have female leaders and equal opportunity office has been installed under external pressure and against the resistance of men working there. After the interviewed equal opportunity officer the small number of women is a result of women's lack of double qualification, because for a career as leader of a research institute ones need an industrial and an academic career in university. In her experience women as institute leaders seldom support female junior staff and show distance to equal opportunity work.

The interviewed equal opportunity officer in the technical university talked about two career hindrances for women in science and engineering, the low gender reflexion in engineering and science cultures and the cooptation[6] practice which results in homo-sociality and not diversity. She characterizes gender discrimination in assessment procedures in the following ways:

> "…we as women's officer were assaulted we would not look after quality but after gender. In reality the opposite was true. Men looked after gender and took this as opportunity to state a qualitative difference that means the main difference in qualification has been gender."

Gender equality is very well included in the guidelines of the technical university, but the equal opportunity officer thinks that in fact implementation of equality should not change too much in the organization; therefore, she believes informal equal opportunity work is more effective. Gender awareness in an academic organization measures possibilities for gender equal decisions. Female professors perceive their exceptional situation in science and engineering as high visibility. And, even though they had experienced discrimination they don't act all in favor for women.

Only one from three interviewees focuses explicit on other women's career support. Another female professor tells that today she is more relaxed in discriminating situations and tries to support careers of scientific junior staff, male and female, but talks about the resistance of women who don't want to overtake responsibility, "they have no interest in leading functions".

[6] Krais (2010) analyzed this practice as a general hindrance for women in academia.

Only one female professor in the technical university, based on her feminist belief, supports explicitly female engineers in their career. In her mind gender is a horizontal mainstream issue of engineering as a discipline and it is not a subjective niche issue. She wants to sensitize students for gender awareness and to establish gender competence as a qualification:

> "…this issue gender-mainstreaming … From my point of view professors and scientific staff have understood this, who did not understand it at all are the students. When we talk about this issue during lessons and seminars …there is always a murmuring, the young men are worse than the old ones! When I am there I tell them that they will not laugh in the future, because they will realize how important gender will be for themselves. When they don't know about this issue they will not step in a career in research, industry and university…".

One male professor wants to prefer women as institute leader, because he thinks they are on more stress resistant because of their minority experiences, but he perceives a pressure to justify those decisions to male colleagues and employees. One other example is one male professor in chemistry in the technical university. He talks about his learning process of gender awareness through the equal opportunity officer; as a consequence he supports female employees with family duties during their qualification phase he thinks at the same time that postdoc female chemists could not go further in their academic career because they would not be strong enough.

### *3.5 INTEGRATION IN GENDERED NETWORKING AND NETWORKS*

In Germany, qualifying for a professorship entails various complicated selection processes. However, while in practice these are necessary, they are not enough. A female professor has precisely described the critical points in the course of a search process where networks and networking come into play:

> "…During a search a lot works via selection processes. But, then again, who will be asked to serve as the outside evaluator of the list of finalists? How will the list of finalists for a professorship be constructed in the first place?... We always want to think that these processes are fair, but this is far from true… I would be naive to think that this is the case… that they don't function via collusive behaviour... Yes, and when you look at who is ranked first, and if you piece together the story of the search afterwards, then you will quickly identify the connections which caused the result…"

Networks' influence is largely hidden but it is enormous, virtually replacing objective criteria such as qualifications and performance, and so bias the selection of professors as the best qualified people.

In order to achieve - at least on paper - success in an academic career, the importance of networking cannot be stressed enough. During the course of an academic career, there should be an equal focus on enhancing performance and on cultivating networks, as sensitivity to networking is a very important precondition especially for leadership positions (Sagebiel, 2010, 2013).

The processes described above are not limited to engineering but can be found in all professorial searches, and apply to both women and men. Nevertheless, gender stereotypes are still applied to women who are candidates for professorial positions. As a male professor in a focus group (who observed the entire procedure as a member of a search committee) remarked: a search committee with a male majority would regard the slightest uncertainty in the presentation of a woman scientist/engineer not as evidence of critical self-reflection but as a sign of weakness. He suggested that the intervention of an equal opportunity officer who would articulate the issues involved could remedy this inequity.

### 3.5.1. Fitting into men's networks? Barriers against women

For female professors in engineering who hold leadership roles, cooperation with men is an everyday job, yet becoming integrated into men's networks is a different issue altogether. In particular, the homo-social culture of men's networks represents a barrier for the recruitment of women (Sagebiel, 2007), so it is little wonder that our study shows that women's participation in men's networks is limited. Women are no longer formally excluded from most networks, but their integration is seen as a question of 'fitting into' male-defined institutions (Schrettenbrunner, Sagebiel & Hendrix 2012). In the homo-social culture of men's networks, described above, women cannot fit because - not being men - they cannot be trusted. Since trust seems to be a prerequisite for choosing network partners (see Vaske & Schweer, 2013), women are automatically discriminated in this process.

An example of discrimination because of 'non-fitting' is one young female professor (36) who described an important conference where she was the only woman representing her discipline. Other women present were either wives or journalists. She summarized up her experience by noting that men liked to sit next to her, but would not take her seriously on a professional level, as a professional peer; that is, she was not perceived as being qualified for networking or cooperating on research projects. From the perspective of dualistic gender and technique stereotypes, this interviewee was seen as an attractive woman, but not as real engineering colleague, not as a peer. This informal discrimination of a woman is what Gail M. McGuire (2002: 316) also found in her research: "Women may have been perceived by network members as poor or risky investments because of cultural beliefs that ranked them below that of a white man according to status characteristics theory."

Several interviewees also described their perceptions that somehow men's networks did not fit for them either. Space, time, media and activities separate them from networking with men (separate restrooms, meeting at unpredictable times, phoning, drinking at night, doing extreme sports). They immediately perceived the unspoken barriers, but they also did not want to try to be part of a network where they would feel excluded or which they would not want to join in the first place:

> "I believe that many great deals are still [made] on a male level… while drinking beer at the bar – I don't do that, I don't drink… even with my partners in Japan… this is what my male colleagues do. And I am very convinced – this

> may be strange – that I simply meet a barrier… I believe that this being together from man to man would open some additional doors."

The quotation shows that this woman is keenly aware of these informal discriminatory processes and feels a barrier to men's networks because of drinking rituals. Even if she were to join such networks, she could expect to profit less from information sharing and cooperation with male colleagues. Her feeling of less 'belonging' (Faulkner, 2005) separates herself from networking men. Being aware of informal discrimination, however, spurs her on to find a way to react to the situation in an individual way, but it does not change the culture of men's networking and discrimination because there is no general awareness arising among participating men.

So, the female professor could not advise her female scientific junior staff the same way like the male professor in the following quote:

> "The most important thing that I try to teach my doctoral students is this: Be there until the end of the evening, and stay in the right hotel, in the right bar – all of this will help. And the number of male colleagues is disproportionally higher than the number of female ones… My wife always says that I don't have to drink, and I say, I know, but, if I don't drink in Russia, then I don't get the project, it is really that simple."

Besides gender issues in networking the quote tells about important cultural differences masculine networking. If it is true what one male respondent in a focus discussion group told there exist barriers for cooperation between women and men because the latter would not miss those opportunities:

> "My theory is that men are often in top positions because they are active in different networks and have more connections… Most of the decisions are informally made over a beer, and become formal afterwards… and one cannot underestimate the importance of this beer culture where men function in a more skilful and more integrated manner than women."

Against these excluding working cultures which use fitting as selection criteria nothing seems to be effective against, on either a consciousness-raising or an ethical level. Even equal opportunity politics seem helpless against these informal gendered career barriers (see section 4.4).

### 3.5.2. Gendered mentoring for networking as career promotion

For obtaining a professorship in engineering networking as a precondition is an acquired, learnt skill. From men's studies, we know that men learn basic skills like cooperating and competing at the same time from adolescence on (see section 2). In the field of the natural sciences and engineering, junior members of the network are traditionally introduced by (male) seniors (mentors):

> "I was just a beginning graduate student… then he took me to France for a week with him… Well, you have to get to know the people… He didn't have to go there himself, but he also couldn't have sent me there alone because I

> would have been a little helpless, but like that, it matched quite well... because with networks one has to start at some time, because, after all, networks just don't drop down from the sky, and so one must start at some point and at some time..”

While this male professor was able to learn thanks to the help of his major professor how to network in practice, a female interviewee presented a contrasting story:

> “...As for conference visits or something similar – nothing has yet been set up. I did not go inside very much, was never introduced and when, subsequently, I had travel monies, I practised networking more intensively and noticed myself how important it is… I had been left very much alone and had to discover how necessary networking was by myself.”

In her recollection, she felt like an outsider within the engineering community, being left alone in her career planning yet realizing the importance of networking while not knowing how to do it practically. Working in a male domain, one would expect that women would have needed more mentoring in making a career in academe, but in fact they received less. Moreover, as Vaske and Schweer (2013) show, on the basis of their review of the pertinent literature, women in particular need strategic protégées. However, because they cannot rely on established powerful networks, women need continuing mentoring even when they find themselves in leading positions.

The comparison of these two cases demonstrates a gendered difference in career promotion based on inclusion and exclusion. In the recollection of the male interviewee, this common conference together with his boss was a decisive career step which the female interviewee missed. She learnt networking not at the beginning of her career but at a much later stage, and she now tries to help her employees in beginning to network as early as possible.

### 3.5.3. The potential of women’s networks in SET

Women’s networks in engineering exist and promote women in making academic careers. There are formal women’s engineering networks, mostly as sections of a large, general (but also more or less male) network. In Germany, for instance, the VDI (The Association of German Engineers) has one such women’s section. In addition, several women’s engineering networks exist, such as the DIB (The German Association of Women Engineers). The power and influence of these women’s networks over academic careers is probably not extensive at the moment because of the low number of leading women in the field of engineering who could potentially promote other women’s careers. Moreover, the internal influence in academic organizations which is most important for career advancement is probably even less extensive. Nevertheless,

these formal women's networks function for information exchange and solidarity. The interviewees did not speak about internal women's networks in academia.[7]

As far as direct cooperation among women is concerned, one interviewee spoke of her appreciation of connecting women with each other as a less complicated option:

> "I think that sometimes women engineers handle problems more impartially. In the case of technical ones as well, I can handle them more personally and collegially"

This cooperation among women is not easy in practice because the lower proportion of women in the engineering sector means that most of them are working in isolation from one another. Another possibility is to use an external women's network, without a specific engineering focus, about which one female professor talks about the network 'Generation CEO', which as an external network affords emotional and intellectual support, but cannot directly advance a career in any particular organization. Interestingly, this elite women's network was founded by a man and is financially supported by private industry. This gesture can be interpreted as the male-dominated industry itself weakening the power of informal men's networking in order to advance women to leadership positions.

## 4. SOME CONCLUSIONS ABOUT ACADEMIC ORGANIZATIONAL CULTURES FROM A GENDER PERSPECTIVE

In our reflections on academic leadership and careers from a gender perspective, three important conclusions arise:

First, gendered disadvantages for women in the natural sciences and engineering have often been summarized as a 'cumulative process of discriminating events' during the course of life (EC, 2012), a phenomenon which many studies have confirmed (Faulkner, 2005, 2009). Analysing the 'discontinuity' examples of women professors in our study, the results can also be interpreted as 'cumulative processes of reduction of hindrances' against successful academic leadership. Working as a minority in a male field and looking to their own professional careers, women engineers in leading academic positions are sensitive to gender issues, most of them having experienced discrimination in different forms. However, these women did not dwell on these negative events, and instead emphasized their own aims and scientific questions. What is the difference in insight using the different perspectives? The latter focuses on activities which are - or can be - successful. Nevertheless, many of these women engineers are aware that this approach meant that they had to struggle for success in a way in which they believe their male colleagues did not have to do.

[7] Only in the investigated large company has a women engineers' network been established by two leading women engineers, a move which received the company's acceptance and support. This network experienced a very critical reaction from male engineers in this company (see Schrettenbrunner, Sagebiel & Hendrix, 2012).

Second, the case of the female traffic planner shows the enormous energy which she had to apply in order to realize her conceptual and organizational goals. Following a gender-based approach in engineering research was an exceptional innovation for which she had to fight for recognition, not only in the academic promotion committees but also within the scientific community. Adapting to an established agenda in a scientific field is much easier, whereas an innovative approach often promises little success, and traditional research suffers barely any discrimination compared to research with a gender approach. In addition to the extra effort required here she was confronted with the challenge to change the organizational culture after she was appointed a professor. She had stayed at the institute for a long time beforehand and now had to work with people who had been her former collaborators. Instead of using a hierarchical structure from the beginning to solve possible problems, and given her experience in private industry, she decided that an assessment centre in the department institute should clarify the situation for team building and future cooperation. Such an approach had never been taken before in this institution. Her model of change, which bypassed traditional structural elements and old networks, was exceptional.

Third, the 'continuity' example from a male professor could teach a gender lesson about networking. Receiving and giving information is connected to networking, and being a part of the relevant networks is a prerequisite for a leadership position. In their careers, women have to learn how to network; in order to realize this objective, there is an urgent need for mentoring for understanding and learning networking. Men's networks still exist and integration in or working with them almost seems to be more important than performance in making successfully career and research in the natural sciences and engineering.

In our example, the man has been able to rely on pre-existing networks in the scientific field as well as in the research institute; that he tends to experience continuity in his career progression in getting his position, including the evidence of successfully networking in the selection committees. This male professor could start or continue his research without any time lag or hindrances, supported by formal and informal networks. Hopefully, these male strategies will work efficiently and will be translated into many publications, projects and patents. In comparison with a female professor in a 'discontinuity' situation, it is obvious that this male professor has a numerical advantage. Hitherto, the presence of informal male-bonding groups or 'rope teams' within leading management circles has not been taken in account.

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