"You're not smart enough for it. You can't do it anyway." - Experiences and Coping Strategies of Female System Administrators

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ABSTRACT

The profession of system administration is currently very male-dominated. This is also reflected in research on system administrators which largely relies on male-dominated samples as well. We conducted and analyzed 8 interviews with female system administrators working in Germany and investigated the experiences they encounter in their professional and private environments. Our findings show that female system administrators make negative as well as positive gender-specific experiences. To deal with the negative experiences the female system administrators have developed certain coping strategies. These include adapting to their male-dominated environment in terms of language and dress choices, confronting misbehaving colleagues or clients and even exploiting existing gender stereotypes to their advantage. Furthermore, our results highlight the huge impact that both professional and personal environment can have on female system administrators.

CCS CONCEPTS

• **Social and professional topics** → **Gender**; **Women**.

KEYWORDS

system administration, sysadmin, gender, qualitative interviews

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1 INTRODUCTION

System administrators are highly relevant to our society. Most of the time they work invisibly to the end user to maintain the infrastructure on which our modern-day life is built. However, as the German Federal Employment Agency [15]) reports, in Germany, the IT sector is very male-dominated. Nevertheless, in the last few years, more and more women are striving for a career in this technical field [15].

In research on system administration, gender issues are usually not investigated, and the number of female participants in studies is very low. In the 2011 LISA salary study [17], for example, only 7.1% of 1173 participants are women. Thus, Dietrich et al. [3] investigate how security misconfigurations happen in system administration. They conduct interviews with six male sysadmins and do not report gender of 221 participants in the questionnaire developed on the basis of the interviews. Krombholz et al. [13] state in their qualitative study on mental models of HTTPS: "Sadly, we were unable to recruit female or non-binary [system] administrators" [13, p. 4]. In online surveys on how system administrators manage software updates, Li et al. [14] and Tiefenau et al. [16] report 6 out of 102 and 1 out of 67 female participants, respectively.[1] In addition, the early research by Barrett et al. [2], Haber [5], and Haber and Kandogan [6, 8] about the working environment of system administrators does not provide information about the gender distribution in their sample. However, the use of pronouns and the mention of system administrators with pseudonyms Christine and Jeanette indicate at least two female participants [2, 6].

In this paper we address the relation between questions of gender and system administration. Furthermore, we look especially at the perspective of female system administrators. Therefore, this research is guided by the question: *Do female system administrators make gender-specific experiences?*

We conducted and analyzed 8 qualitative interviews. Our results show that female system administrators not only make gender-specific experiences, but also develop strategies to cope with them. Our research also highlights the impact of the professional as well as the private environment of female system administrators.

2 BACKGROUND AND RELATED WORK

As a framing for this work, we use the definition of system administrators (sysadmins) given by Barrett et al. [2]. They describe sysadmins "as those who use their technical, social, and organizational skills to architect, configure, administer, and maintain computer systems, including operating systems, networks, security systems, infrastructure, databases, web servers, and applications." [2] The available field studies by Haber and Kandogan [8], Haber and Bailey [7], as well as Barrett et al. [1], extensively document the everyday

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[1] In the study by Tiefenau et al. [16], three participants identify as "other" and five do not disclose their gender.

work of sysadmins. Furthermore, Barrett et al. [2] point out that sysadmins spend a lot of time communicating via various forms of media and with different people (e.g., colleagues or customers). Haber [5] states that sysadmins must process and structure a large amount of information. Since, in addition to monitoring systems, they also frequently expand or configure these systems, they are almost constantly multitasking.

Hyde [11] provides a good overview of existing research theories and findings regarding gender. As a foundation for this work, we use her understanding of gender as a social identity that is self-perceived by a person, rather than a physiological state (often referred to as "sex"). This should not be understood as binary but rather as much more diverse and may change over a person's life. Furthermore, Hyde [11] presents the Gender-Similarities Hypothesis [10], which states that genders are similar in many ways and different in a few areas. Gildemeister and Robert [4] also deal with the influence of gender in their book (currently only available in German). In this context, they emphasize the tremendous relevance of family, society, and culture in the discussion of gender differences. In addition, they explain that the experienced socialization of gender also affects communication, perception, emotion, and the choice of a profession.

The experiences of female sysadmins have not yet been studied in depth. However, the experiences of female computer scientists have been analyzed by Gildemeister and Robert [4] based on Heintz et al. [9]'s study of female computer scientists that was conducted over 25 years ago. They emphasize the importance of impression management [4, p. 235f.]. In this context, computer scientists consciously try to present themselves as competent to be recognized for their work. In addition, the authors point out that female computer scientists develop strategies to counter their male colleagues and deal with negative gender stereotypes.

Based on the literature, we identified key themes corresponding to the research question which provides a theoretical frame for this study. The key themes selected are work processes, teamwork, task distribution, communication, perception, emotion and motivation, career choice and promotion as well as private life.

Independently and concurrently to our research, Kaur et al. [12] investigated experiences of marginalized genders in system administration. While they conducted text-based online focus groups, we chose individual qualitative interviews as our methodology. Content-wise they focus on the work environment of sysadmins, while we also look at career choice, interplay of work and private life as well as the role of emotions in work contexts. A more in-depth comparison of the two studies is given in the discussion (Section 5).

3 METHOD

For this exploratory study, we conducted 8 qualitative interviews. These were based on an interview guide we developed according to our focus areas (Section 2). The guide was further evaluated and refined in a series of 3 test interviews with two female and one male system administrator. Data collected in the test interviews was not coded or included in further analysis. All interviews were conducted in German (the native language of the interviewer and the participants).[2]

Recruitment and Ethics. For recruitment, we chose a snowball method: we distributed the call for study among scientific and private contacts and asked for forwarding to possible matching contacts. In the call, we pointed out that we were particularly interested in female sysadmins.

The research plan was preliminarily checked by the data protection office of our university. All interviews were conducted using video conferencing systems of participants' choice and we obtained informed consent from the interviewees in advance. Participants were compensated for their time with a €20 Amazon gift card. During the following transcription phase, we removed identifying features, such as company names or location, to protect the anonymity of the participants.

Analysis. The interviews were coded using the program MaxQDA[3]. The majority of data analysis was done by the first author. Parts of the transcripts were coded independently by all team members, and differences were discussed afterward, resulting in a consensual code system.[4]

In the first phase of analysis, detailed descriptions of the private background and the topics addressed by each participant were drafted. In the second step, dominant codes common to the participants were evaluated and selected for in-depth analysis depending on their relevance to the research question. In the detailed analysis of the selected topics, the perspectives of the various participants were compared with each other and supported with appropriate quotations. Finally, the results of the analysis were compiled and documented in the form of a written report.

Sample. Our analyzed sample contains 8 sysadmins, who identify as female. An overview of their demographic data is provided in Table 1. Instead of abbreviations, we have chosen to use alphabetical pseudonyms in this work. The participants are between 25 and 52 years old. Elena is currently still in apprenticeship and has the least experience with 3 years, whereas Bettina, Christina, and Gabriele reported 25 years of experience. The frameworks in which they pursue their profession are diverse. For example, while Daniela works as a freelancer, Annika and Gabriela have a special thematic orientation toward IT security. In addition, some of the participants work part-time. 7 of the 8 participants have either completed vocational training in system administration or an academic degree in computer science. Gabriela, on the other hand, previously studied social science and has no education dedicated to IT. As seen in Table 1, the participants' workplaces also differ in company size and department size, as well as the number of female colleagues. Fiona is the only one who works in a female-dominated team. The duration of the participants' employment at the same company also differs significantly. For example, Hannah only started a new job one and a half months ago, while Bettina has been with her company for 25 years already.

[2] A translation of the final interview guide can be found in Supplementary Material.
[3] https://www.maxqda.com/
[4] A condensed version of the codebook is included in Supplementary Material.

Table 1: Demographic data of the participants. The given names are pseudonyms. All participants describe themselves as female.

Pseudonym	Age	Marital Status	Experience	At the same Company	Company Size	Team Size	Female Colleagues	Annual Salary
Annika	31	single	9 years	1 year	8	5	0	60.000 €
Bettina	52	single	25 years	25 years	≈ 70	10	0	69.000 €
Christina	44	married (3 kids)	25 years	10 years	≈ 160	6	1	65.000 €
Daniela	50	widowed (kids)	20 years	-	-	-	-	80.000 €
Elena	37	single	3 years	1,5 years	≈ 1000	25	4	6.300 €
Fiona	28	married	6 years	6 years	≈ 19.000	4	2	55.000 €
Gabriele	52	single	25 years	3,5 years	≈ 120.000	35	7	85.000 €
Hannah	25	single	4 years	1,5 months	≈ 800	30	5	38.400 €

4 RESULTS

In this study, we observe that female sysadmins make gender-specific experiences. In the following, we first look at the participants' reasons for choosing system administration as a career and the experiences they made during this decision-making phase. We then look at disrespect, underestimation, and admiration before examining how female sysadmins cope with negative gender-specific experiences. Afterward, we explore emotion in more detail before concluding with the impact of practicing systems administration on the participants' private lives.

4.1 Path to System Administration

The participants state that they entered system administration because of their interest and affinity for technology. Apart from their fondness for the variety of specializations and tasks, they also appreciate the financial security and future perspectives offered by their profession. In particular, the participants note that as the importance of computers increases, sysadmins will always be needed. Furthermore, Annika points out that she wanted a job in which she could be flexible in terms of location.

During the career choice process, the participants were confronted with their families' concerns regarding the desired career in system administration. The interviewees report that doubts expressed by their family and environment slowed them down or hindered them. Elena puts it as follows:

> *"But it always held me back that others kept telling me: You're not smart enough for it. You can't do it anyway." – Elena*

In this context, the participants refer primarily to system administration being generally perceived as a male profession. Annika, Bettina, and Elena state that their families questioned their career decisions especially because of this prevalent image.

4.2 Between Contempt and Appreciation

The interviewed female sysadmins do not only make gender-specific experiences in their choice of profession, but also in their everyday work when dealing with colleagues and customers. Almost all participants report issues of credibility based on their gender. Annika states:

> *"And sometimes it's as if you can do whatever you want as a woman, and you're just not taken seriously." – Annika*

As part of their duties, Annika and Bettina are responsible for answering a helpline. Both report that customers have asked them to get connected to a (male) technician or the technical department. Annika used to get annoyed by such calls but is resigned about them now. Bettina mentions that such requests only come from customers who do not know her yet. In addition, she reports being frequently contacted in e-mails with a male form of address.

Underestimation and lack of credibility also play a role in interaction with colleagues or external sysadmins. Daniela and Elena note that fixing a bug can be delayed if a female colleague's opinion or even solution is not taken seriously. Elena points out:

> *"Well, I've come across it over and over again, that women are less trusted. [...] I don't think many male colleagues or men in the IT field are even aware of that." – Elena*

Daniela is the only one who mentions the word "discrimination" in the context of being a female sysadmin. As a freelancer, she experienced companies preferring less qualified men to a woman for advising them. A manager justified this preference by claiming that a woman walking around the office would distract the men too much from their work. She realized that:

> *"Women have to know more and achieve more to get to the same positions as men in the middle level, and in the upper level they don't have a chance at all." – Daniela*

The participants also report lewd or misogynistic comments from colleagues. Elena believes that many people are not even aware of their sexist language. She finds it difficult to combat this unconscious sexism, since she also has experienced not being taken seriously, when addressing it. It is not only the use of language that results in gender-specific experiences for female sysadmins. Annika, for example, experienced harassment. Christina and Daniela further report that in the past they have earned less money for their work compared to male colleagues.

Although female sysadmins encounter underestimation, contempt, and discrimination on an everyday basis, they also experience appreciation for their work. Elena and Fiona explain that

knowledge and competence are appreciated regardless of gender. Daniela notes that when attending the college and in her first years on the job, she was "famous" because of her gender and therefore received a top-notch job offer. Annika states that being a woman sometimes means being better supported, as companies see a need for more, especially female, IT staff.

As Elena describes, appreciation and disregard can also overlap with each other. For example, she experienced a situation in which her colleagues complimented her work but combined this with a sexualized and misogynistic comment. Despite the indirectly expressed praise, she felt extremely uncomfortable in this situation.

4.3 Coping Strategies

The interviewed female sysadmins have learned different strategies and behaviors to deal with their work environment and the negative gender-specific experiences they encounter. These coping strategies include adapting to the male-dominated field of work, working flawlessly to be perceived as competent, confronting colleagues with gender stereotypes or even using gender stereotypes to their advantage.

4.3.1 Adaptation. The participants adapt to their work environment in many ways. They describe, for example, that they have adopted a more confident appearance even when they do not feel confident. Gabriele reports that this way, colleagues are less likely to contradict her and more likely to follow instructions. Annika, Christina, and Daniela also mention controlling emotional expressions or hiding them as an adaptation strategy. The female sysadmins state that they have adapted their style of communication and clothing. For example, Annika tries to express herself very precisely and more harshly. Furthermore, she prefers to wear hoodies to work rather than blouses, because she has noticed that her clothing has both an influence on others and on her own self-confidence. Hannah also notes that she clearly stands out when she wears dresses to company events in summer. The female sysadmins point out that they must achieve more and work flawlessly to be perceived as competent. Annika describes this as follows:

> *"If I make a mistake now, I'll just be pigeonholed more quickly, that I'm not a technician." – Annika*

4.3.2 Confrontation. In addition, the participants also use confrontation to deal with prejudice or negative gender-specific experiences. Bettina reports, for example, that she reacts to incorrect addresses in e-mails by replying with an incorrect address herself and pointing out that at her company women are also "allowed" to work in technology. Gabriele explains that when she encounters prejudices (also irrespective of gender), she tries to mirror her counterpart's attitude, address the stereotypes, or at least shows her irritation. She finds this approach useful and effective. Elena has also tried to draw colleagues' attention to inappropriate behavior, but experienced that her objections were not taken seriously.

4.3.3 Exploiting Gender Stereotypes. Gabriele takes a distinctly different approach by using an exaggeratedly female profile picture for work accounts. She uses "a blonde chick picture" of a young woman, which does not correspond to her own appearance, to achieve her goals more easily. She has noticed that men are significantly more motivated and helpful when they see this profile picture instead of a different, or no photograph. She is aware that the men would not react in such a way to her own appearance. She is open about using this image to get her way "with all the narrow-minded guys." In this way, she uses existing gender stereotypes to her advantage.

4.4 Emotion

The interviewees also made different statements about the importance of emotion in their everyday work. Gabriele and Hannah indicate that emotions are of little importance, while the other participants attribute significant importance to emotion in everyday work. The participants also differ in the way they express their emotions. While Fiona can share her emotions with her team, Daniela states:

> *"In my day-to-day job? I'm not allowed to have emotions." – Daniela*

Gabriela addresses the emotions of others when she appeals to her opponent's fear of failure in an attempt to give urgency to her request (usually the elimination of security vulnerabilities).

The interviewees report especially fear and insecurity. For example, they encounter fear when they notice gaps in their knowledge. Hannah is also afraid of becoming obsolete if her company moves infrastructure to the cloud. Although Elena was afraid of sexual harassment in the past, she no longer feels this way, due to her good working environment and colleagues she trusts. Furthermore, the female sysadmins describe stress as another influence on their work. Fiona notes that stress can increase her productivity as it has an encouraging effect on her. However, depending on the amount of stress, it can also have a negative impact on her performance. The participants also emphasize that empathy is an essential skill, particularly for sysadmins who are in contact with customers. Both Annika and Daniela state that they regularly need empathy to understand how to help their clients.

4.5 Influence on Private Life

The participants combine their profession with their private life in diverse ways. Hannah's transition between work and free time is seamless, as she also deals with technology privately. On the other hand, Daniela separates these areas very strictly. Furthermore, Bettina has found that her work as a sysadmin has an impact on her dating. Due to her superior knowledge of technology, men cannot flirt with her by helping with computer issues.

To achieve better compatibility of work and private life, female sysadmins use the opportunity to work part-time. The participants working part-time stated that they were doing so because of further training, health reasons, or to be able to care for their children. Additionally, the participants emphasize the advantages of working from home. For example, Fiona has noticed that she can save a lot of time and do household tasks in parallel with her work.

Two participants face the particular challenge of balancing work and raising children. Christina notes:

> *"My first thought is that, luckily, although I have three children, I'm not unemployed." – Christina*

She highlights that the balance is only possible because of working from home. Furthermore, she points out that maintenance work in the evening is beneficial, as it allows her to be with her children

in the afternoon. In contrast, Daniela focused on her career and therefore decided to employ nannies to help raise her children.

5 DISCUSSION

In this discussion, we first highlight key findings and compare our results with the findings from related work. Second, we discuss the limitations of this study.

5.1 Key Findings

Female sysadmins make gender-specific experiences, which includes contempt and underestimation. This finding is consistent with those of Kaur et al. [12]. Although Gildemeister and Robert [4] (in analyzing Heintz et al. [9]'s study) concentrate on female computer scientists rather than female sysadmins, they note a similar influence of gender in professional life.

The professional, as well as the personal environment, have a significant impact on female sysadmins. Like Kaur et al. [12], we find that female sysadmins are not only underestimated, but also structurally disadvantaged and even overlooked in their jobs. We also conclude from our data that the interviewees make these experiences due to the environment and the interactions therein. In addition to the findings of Kaur et al. [12], we identify the importance of the private environment for the sysadmins. This might be due to the influence of the participants' families on their career choice, but also in the way they balance their professional and private lives.

Female sysadmins use various coping strategies to deal with negative gender-specific experiences. Kaur et al. [12] elaborate on various strategies, noting that female sysadmins accept or avoid such experiences, support other marginalized groups, or disrupt the current state by, e.g., confronting colleagues. We also find that participants adapt to their environment by adjusting their appearance, dress, or even their use of language to fit the male-dominated environment, but also confront misbehaving colleagues. Additionally, we find that they are sometimes able to use gender stereotypes to their advantage. Gildemeister and Robert [4] also mention adaptation strategies in their work, but point out that this often harms females, as they are no longer perceived as authentic.

Female sysadmins do emotional work by not only being empathetic, but controlling their expression of emotion in contact with colleagues and clients. Kaur et al. [12] note that empathy is used as a tool by sysadmins. As we asked in detail about emotions, we further find that female sysadmins experience fear and uncertainty in both their professional and personal lives. In addition, our data show that interviewees not only control the expression of their emotions but also appeal to the emotions of others. Kaur et al. [12], additionally, highlight the aspect that sysadmins provide care work for machines by maintaining and for users by providing support.

5.2 Limitations

This study has some limitations due to the method chosen and the sample studied. As we chose a qualitative method (i.e., interviews), we cannot provide information about the frequency of occurrence of the phenomena we observed. However, this exploratory work has established a foundation for further qualitative and quantitative work. Data saturation is not reached with the current sample size of 8 participants. Therefore, we will continue to evaluate further five interviews which have been conducted but not analyzed yet, and we will conduct further interviews, if deemed necessary. Since only female sysadmins are considered here, male and non-binary perspectives on this topic are missing. Furthermore, all participants are from Germany. As we assume at least some influence of cultural background, an international comparison would be interesting.

6 CONCLUSION AND FUTURE WORK

This work provides an exploration of the relation between questions of gender and system administration. Our findings show that female sysadmins make both negative and positive gender-specific experiences. To cope with the negative experiences, the female sysadmins have developed various strategies, e.g., by adapting to their environment with language and dress choices. Furthermore, consistent with Kaur et al. [12] we find that the professional environment frames the respective experiences. In addition, we highlight the importance of private environments, as they not only have a major influence on career choice but in turn also are noticeably influenced by working as a sysadmin.

However, more research is needed to provide a in-depth evaluation of the topic. We, therefore, already conducted five further interviews with female sysadmins and will evaluate these in the coming months. In addition, we plan to interview other genders and include their perspectives. Based on these results, also more specific quantitative studies are conceivable. Since our findings emphasize that female sysadmins face negative gender-specific experiences, such as underestimation or contempt, future research should also address the question of how this situation can and should be changed and improved.

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