

Frauke Prott (Fuhrmann) & Margit Scholl

# Does a Career in Information Security Appeal to Women?

An empirical analysis of job ads, supplemented by job descriptions and narratives

Security 

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1. Introduction, project research & research questions
2. Literature review
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  - Language & images
  - IT stereotypes
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Information security (IS) is a future-oriented field that is still developing and is rich with opportunity.

IS provides a career for women with considerable prospects, as there are no firmly established structures and procedures.

However, IS is a male dominated job area— increasing diversity in the field would have the beneficial effect of including different perspectives and experience [17].

Women are thus in a position to step in and claim their place in this process

However, worldwide the proportion of women in IS is very low. Increasing the number of women would help address the anticipated labor shortage and integrate diverse perspectives and experience.

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IS is often not part of the school curriculum, and so typically there is no opportunity for pupils to get a sense of the kind of work involved.

In a standardized, anonymous survey we conducted with 194 8th-grade pupils: 61 percent of them indicated that IS topics are not taught in school.

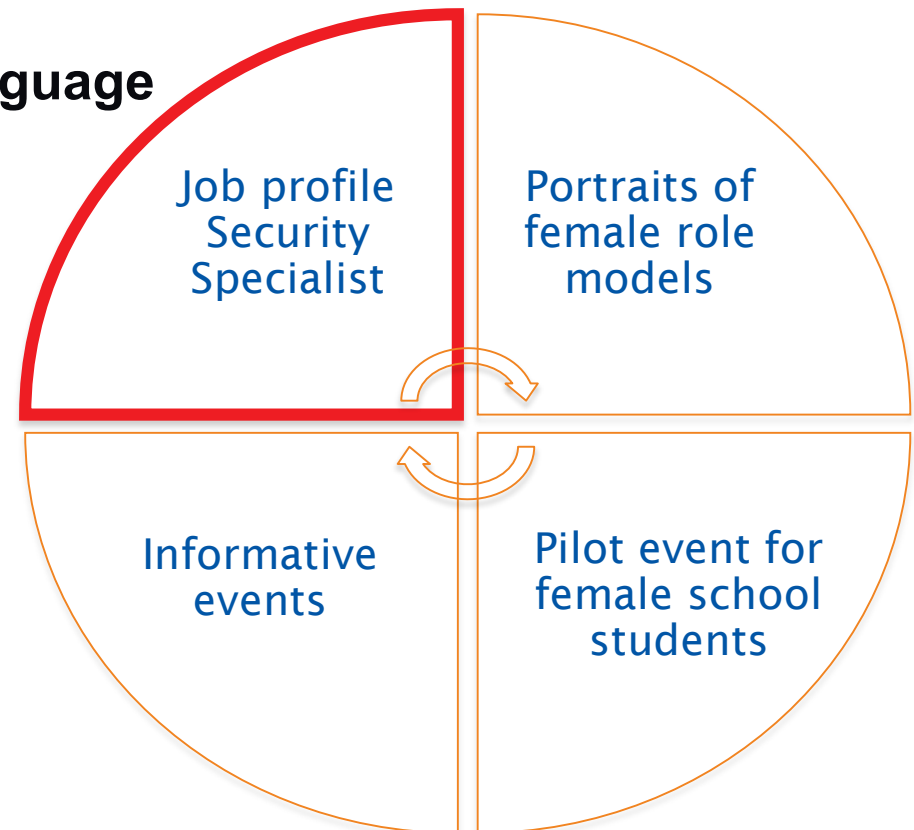
**Lack of information about the specific jobs available in IS and how diverse and exciting they can be [16]** makes it hard for pupils in school and young women to be aware of IS as a career path for themselves.



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In preparation for the development of a gender-sensitive job profile in IS, we **analyzed existing ads** in the field with regard to **gender-sensitive images and language** as well as the **preferences** of women (and men) for certain **job characteristics and skill sets.**

The analysis was complemented by insights derived from **job descriptions and interviews** with female and male experts working in IS.



The process was guided by the following **research questions**.

**RQ1:** How appealing are existing job ads to women based on criteria derived from previous research findings?

**RQ2:** Do existing job descriptions found on web-based career-guidance platforms show the diversity of the field?

**RQ3:** In what respect do the narratives of people working in the field of IS complement the required attributes and skills mentioned in the job ads?

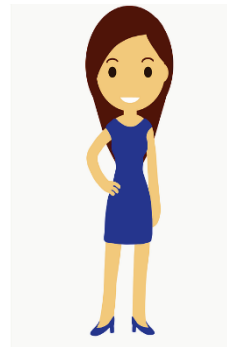
The answers provide an indication of how we should formulate and design the job profile and what information we should present and mention in the job profile we are developing.

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## 2. Literature Review: Interest/Preferences

Research indicates that job ads in computer sciences are often presented in a way that does not attract women or give them a sense of belonging to the field [11].

For both women and men, the following **five job characteristics** were investigated [17]:



work-family balance,  
salary and benefits,  
career advancement,  
challenging tasks,  
mentoring for women



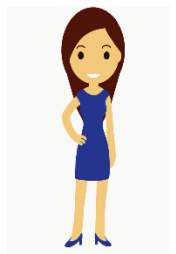
They had a significant, positive effect on the intention to apply. However, for both women and men **work-family balance** is the most important issue, while special programs for females are the least appealing attribute.

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## 2. Literature Review: Interest/Preferences

In order to understand why women leave jobs in the technology industry twice as often as men, [10] conducted interviews with women who did **not** drop out of technological jobs to identify key factors that motivate women to stay.

These factors include a **close-knit, cohesive team, projects and tasks that matter for the people themselves** (e.g., learning, stimulation) or for others but need not necessarily be socially relevant, and **nonjudgmental flexibility to balance work and private/family responsibilities**.



**Women are interested in group work, communication, practical problem-solving** [16], and **creative tasks** [14] and want to **interact with people** [05]. Furthermore, they are interested in the **interfaces** the position has with other people, departments, and organizations [02].

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The **language and images** in a job ad or description can affect the extent to which women experience a feeling of belonging and a sense of fit in an occupational field. Thus, it is **important to show both women and men**, so that both sexes have the impression that they fit in the field [07, 09].

**Gender-sensitive language** is also expected to be a productive area [16]. In Germany, where our research is conducted, this means using not only gender-specific pronouns (she/he), but also paying attention to terms denoting individuals.

In the German language the ending of such a term can differ for males and females—for example,

employee = Mitarbeiter (male) and Mitarbeiter**in** (female),

students = Studenten (male) and Student**innen** (female)

**Gender-neutral in German: Beschäftigte or Studierende.**

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Based on **gender stereotypes**—“generalizations about the attributes of men and women” [08]—the attributes typically ascribed to **females** are **communal** attributes, while for **males** they are **agentic**.

[09] lists **typical agentic attributes (decisive, motivated to lead, career-oriented, competitive, assertive)**

and **communal attributes (communicative, cooperative, team-building, diplomatic, motivating)** used in job ads.

## 2. Literature Review: IT Stereotypes

Besides the pictures used in job ads, the image of information technology (IT) and computer scientists is worth examining.

Several studies suggest that women and girls still consider **IT to be theoretical and boring and that it is all about coding.**

Furthermore, computer scientists are seen as male “geeks,” sitting in front of their computers all day without any social contact [01, 14, 16].

“Security” sets out to depict the reality of the occupational field:

**diverse,  
creative,  
communicative, and  
meaningful [16].**



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Based on the literature review in section two, **we defined twenty-one criteria for the analysis of existing job ads** in order to answer **the first research question**: the degree to which these ads appeal to women.

- The first thing we analyzed were the **pictures**.
- The next criterion was the use of **gender-sensitive language**.  
As we were analyzing job ads in German, this included the use of gender-specific terms to denote people.
- Based on the preferences of women and men, **employee benefits** (e.g., career advancement and promotion opportunities) and **job attributes** were the next two categories analyzed.
- We also checked the **skill requirements** to identify tasks women (and men) are interested in (e.g., communicative and language skills).
- Finally, we looked at whether typical **agentic or communal stereotypes** are mentioned.

### 3. Methodological Procedure

The criteria were coded in binary form to indicate whether the factor was “present” or “not present” in the job ad.

Three people (2 females, 1 male) analyzed **fifty-seven** randomly selected job ads.

The task profiles of the positions described were only analyzed to the extent that they served us as indications for the criteria we were examining.

However, in order to gain insight into the diversity of the field of IS it would be worth analyzing these tasks in more detail.

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In addition, we conducted searches on **twenty German-speaking web-based career portals** for descriptions of occupations in the field of IS to determine, in response to the **second research question**, whether the diversity of IS is depicted in the job descriptions.

To date of the paper, we have also conducted **eight semi-structured interviews** with male and female experts working in different areas of IS.

The aim of these interviews is to identify different professional activities in the field of IS and their main and typical tasks. We also explore which skills and attributes are required for these tasks in an attempt to identify similarities and differences between the various professional activities.

The template for these interviews is based on the **critical incident technique** and complements the **third research question**.

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The analysis of the job ads reveals that most of them use **images** that include both women and men, as is recommended.

However, we did not quantify the degree to which men and women are equally presented:

in most cases, the proportion was equal, but there were also examples with more men than women or with a man in the foreground and a woman in the background.

Category	Criteria	Present in x of 57 job ads (%)
Images	only men	6 (10.53%)
	only women	7 (12.28%)
	men and women	24 (42.11%)
	image without people or no image	20 (35.09%)

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With regard to **gender-sensitive language**, we determined that almost 70 percent of the ads use male terms or mainly male terms to denote individuals.

<b>Gender-sensitive language</b>	male terms to denote individuals	39 (68.42%)
	male and female terms or neutral terms to denote individuals	12 (21.05%)

One company explicitly encouraged women to apply for the position.

Six companies highlighted the fact that they are an equal-opportunity employer and would be pleased to receive applications irrespective of any specific group identification (e.g., sex, nationality).



With regard to **employee benefits**, it is striking that no job ad cited special programs for females.

The majority of the ads analyzed address the issues of salary and benefits, as well as career advancement and opportunities for promotion. Only 44 percent of the job ads refer to work/family balance.

<b>Employee benefits</b>	special programs for women	0 (0%)
	work/family balance	25 (43.86%)
	salary and benefits	32 (56.14%)
	career advancement and promotion opportunities	33 (57.89%)

Also [17] shows: Over 55 percent of the employers miss the opportunity to attract both women and men by talking about the measures they have introduced to promote work-family balance.

The degree to which a task is challenging is highly subjective and depends on a person's skills and abilities.

We marked job ads which stated that the **position includes challenging tasks** or **sole responsibility** for a particular area. Less than half of the ads we analyzed (46 percent) mentioned something along these lines.

The finding that almost 90 percent of the ads indicate who the prospective employee will **work together** with **counteracts** the stereotypical image of an IT/IS specialist working alone in front of his(/her) computer.

Job/Company description	
challenging tasks	26 (45.61%)
interface to other departments/institutions	50 (87.72%)

We looked at if the job ads explicitly mentioned any **special impact** the job might have on their

- own organization (e.g., contributing to the company's success),
- clients (e.g., successful customer projects), or
- society (e.g., improving people's lives, creating a safe future).

As research states that women (and men) attach importance to the **impact of their work**, employers are encouraged **to highlight the meaningfulness of the jobs** more precisely.

<b>Job/Company description</b>	impact of the job	22 (38.60%)
	working in a team	26 (45.61%)

Only 39 percent of those included in our analysis did that.

**Working in a close-knit, cohesive team is important for women.**

Based on this, we checked to see if job ads contain information about the position being part of a team.

Less than half (46 percent) are currently doing this.

Required skills	
creativity	10 (17.54%)
teamwork	26 (45.61%)
communicative skills	36 (63.13%)
language skills (German, English)	42 (73.68%)
problem solving	8 (14.04%)

Our results underline the internationality of the field IS, as a large majority (74 percent) of the employers require **very good language skills** in German *and* English as well **as communicative skills** (63 percent), which in turn **contradicts** the stereotypical image of computer scientists, too.

## **Creativity and problem-solving skills are seldom mentioned.**

However, according to the interviews we conducted with experts working in the field, these skills are extremely important.

Although, a third of the job ads include **agentic words** such as assertive, these words are only sporadically used. We counted at most two typically agentic terms in the same ad.

Conversely, we only find a few communal attributes listed as required characteristics.

<b>Agentic attributes</b>	e.g., assertive, analytical thinking	18 (31.58%)
<b>Communal attributes</b>	e.g., friendly, cooperative	5 (8.77%)

With regard to our **first research question**, the majority of the job ads we analyzed include gender-sensitive visual language, salary and benefits, information about career advancement and promotion opportunities, the interfaces of the position, and communicative and language skills.

However, existing job ads can **improve**

- their use of **gender-sensitive language** and
- their presentation of **work-family balance, challenging tasks, the impact of the job**, and
- how it relates to the **team**, as well as
- the emphasis given to the required **skills of creativity, teamworking, and problem solving**.

We conclude that existing job ads in IS in Germany do address women but can still increase their attractiveness in this respect.

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## 4. Results: Second RQ

In answering the **second research question**, it is interesting to record that 14 (70 percent) of the web-based career-guidance portals we researched provide no information about the career field.

The six career-guidance platforms that provide information about the broader jobs like IT security officer and about specialized areas such as cryptology show the **diversity** of the field, because they describe a variety of tasks.

This reveals the importance of developing and disseminating a **job profile** for the field of IS.

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**All eight interviewees** stated that “creativity is extremely important in the field of information security.” It became apparent that **creativity** is needed to achieve several different goals.

Another important skill that was **mentioned in all the interviews** is the **ability to communicate**.

Communicative competencies cover the ability

- to **understand** other people,
- **empathize** with them, and
- make complex IS issues **comprehensible**.

Furthermore, **for all those interviewed, communicative activities constitute a major part of their profession**. The interviews offer us a deeper and more vivid insight into the required skills and abilities than ads.

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Our analysis showed that typical agentic or communal words are **very seldom used** in the job ads we analyzed. Thus, from this point of view both women and men might feel attracted to the job ads.

However, based on research findings regarding the use of gender-sensitive language and the preferences for certain job attributes, the organizations **can improve in order to appeal more to both women and men.**

Although there are not many terms denoting people in the job ads, the title of the position and the way employees are mentioned in **most cases reflect male terminology.**

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In contrast to the interviews conducted with experts working in the field, both the **job ads and the job descriptions fail to highlight the importance of creativity in IS.**

However, in order to increase the proportion of women in computer science and information security, making job descriptions and ads appealing to women can only be the beginning.

As statistics show that women also suffer from a **gender pay gap** in computer science and leave their IT jobs much more often than men, it is important to overcome these inequalities in order to retain women in their IT positions or inspire them for IS.

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## Was ist Informationssicherheit?

### Informationssicherheit

#### IT-Sicherheit



Wie schütze ich mein Smartphone vor Schadsoftware?

#### Datensicherheit



Wie schütze ich Kundendaten eines Unternehmens?

#### Datenschutz



Wie schütze ich meine personenbezogenen Daten?

## Wo werden Informationssicherheits-Fachkräfte gebraucht?

### Finanzwirtschaft



### Elektrotechnik



### Lebensmittelindustrie



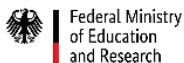
### Automobilindustrie



### Gesundheitswesen



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Margit Schöll und Frauke Prött (Hrsg.)

Weibliche Rollenvorbilder gibt es in der Informatik seit Anbeginn. So gilt Ada Lovelace, Mathematikerin im 19. Jahrhundert, als erste Programmiererin. Auch heute gestalten Frauen die Informatik entscheidend mit – so auch im Bereich der Informationssicherheit.

In diesem Buch erzählen 29 Frauen von ihrem beruflichen und privaten Leben. Sie gewähren Einblick, wieso sie sich für ihren Beruf/ihr Studium entschieden haben, was sie an ihrem Beruf/ihrer Studium begeistert, welchen schönen Momente, aber auch Herausforderungen sie erleben. Begeben Sie sich auf eine inspirierende Lesereise durch das vielseitige und zukunftssträchtige Berufsfeld der Informationssicherheit.

Security: Das Leben von Informationssicherheits-Spezialistinnen



„Jeder Tag sieht anders aus.“

Aus dem Leben von  
Informationssicherheits-  
Spezialistinnen

Ein Projekt der Technischen Hochschule Wildau:  
Gendersensible Studien- und Berufsorientierung für den Beruf Security Spezialistin (Security)

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## Studentin im Bereich Sicherheitsmanagement

An einem hellen Wintertag treffen wir Jenny in der Bibliothek der TH Wildau. Hier an der Hochschule im berufs begleitenden Bachelor-Wahlpflichtfach „Informationssicherheitsbewusstsein für den Berufseinstieg“ wurde ihr Interesse für das Thema Informationssicherheit geweckt. Heute studiert sie an einer anderen Hochschule den interdisziplinären berufs begleitenden Masterstudiengang „Sicherheitsmanagement“.

### Worum besteht deine berufliche Tätigkeit?

Ich bin derzeit Referentin für den Gesamtbetriebsrat eines großen Unternehmens. Der Schwerpunkt meiner beruflichen Tätigkeit liegt in der Beratung der Gremien innerhalb des Unternehmens in Bezug auf Sicherheit. Es sind aber verschiedene Sicherheitsaspekte; einmal die operative Sicherheit – wir schützen in erster Linie Menschen, unsere Kundinnen und Kunden – das ist der Hauptschwerpunkt unseres Unternehmens; aber auch Informationssicherheit und Datenschutz ist ein großer und wichtiger Bereich.

### Neben deiner beruflichen Tätigkeit studierst du.

Genau. Ich studiere derzeit Sicherheitsmanagement. Es ist ein interdisziplinärer Masterstudiengang. Das heißt, der Studiengang ist aufgestellt in Bezug auf Wirtschaft, aber auch rechtliche und politische Themen werden dort abgehandelt. Schwerpunkt ist Risikomanagement. Das heißt, wir erkennen Risiken und Gefahren und wir erstellen Sicherheitskonzepte, indem Schwachstellen eruiert und Maßnahmen getroffen werden.

### Was gefällt dir besonders an deinem Studium?

Dass es interdisziplinär aufgestellt ist. Also man lernt ganz viele, verschiedene Dinge: sei es Psychologie oder Kommunikation, was ganz wichtig ist, aber auch Teamarbeit ist ein wichtiger Punkt. Dass man nicht alles alleine schaffen kann, das ist klar. Und man lernt ganz viele Kommilitoninnen und Kommilitonen kennen, die das gleiche Ziel haben, aber aus unterschiedlichen Behörden und Unternehmen kommen. Da vernetzt man sich sehr gut. Das finde ich eigentlich am besten. Und ja, dass man da viel lernt und viel mitnimmt.

### Welches Ziel verfolgst du mit deinem Studium?

Mein Hauptziel ist es, irgendwann eine Führungsfunktion im Unternehmen einzunehmen und natürlich das lebenslange Lernen. Ich will immer noch etwas dazulernen, ich will immer Wissenstaput bekommen. Das ist mir besonders wichtig.

### Welcher der interdisziplinären Bereiche deines Studiums interessiert dich am meisten?

Der Bereich Kommunikation. Der ist mir derzeit sehr sehr wichtig. Wie man im Team zusammenarbeiten kann. Und ich finde es ganz toll, dass man verschiedene Dinge lernt, mit denen man sich vorher selten beschäftigt hat. Also mit solchen Fällen, wie kann ich das Unternehmen so sicher machen, dass keine Informationen abhanden kommen. Spionage zum Beispiel ist für mich ein neues Themenfeld, was mir derzeit am meisten Spaß macht.

### Wie können wir uns die Vermittlung dieser Inhalte in deinem Studium vorstellen?

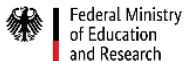
Das ist unterschiedlich. In den meisten Fällen erhalten wir erst einmal theoretischen Input, wie es generell gemacht wird in verschiedenen Unternehmen. Zudem wird auf die Erfahrung von allen gepocht. Also jeder darf etwas dazu beitragen, indem man erzählt, so und so läuft es bei uns oder so und so müsste es laufen.

Wir haben aber auch Planspiele, das heißt, da wird dann ein fiktives Unternehmen erstellt und innerhalb dessen müssen wir dann zusammen als Team die Aufgaben lösen. Es befähigt, dass man die Soft Skills dafür erlangt, selbstsicherer wird und im Team gut zusammenarbeitet. Und das ist das Spannende an diesem Studiengang. Man weiß nie, was für ein Ergebnis letzten Endes herauskommt und es gibt auch keine Musterlösung. Man arbeitet auf einem anderen Level, wie es vielleicht wäre, wenn man alleine arbeiten würde. In den seltensten Fällen würde man alleine zum gleichen Ergebnis kommen.



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**Suchst Du nach Abwechslung in Deinem Alltag?**

Dann hol Dir Anregung bei Jenny, Studentin im Bereich Sicherheitsmanagement.

**Studien:** Herabgeleitete Masterstudiengang „Sicherheitsmanagement“

**Detail der Studien:** Es ist ein angewandter Studiengang mit Themen aus Wirtschaft, Recht und Politik. Schwerpunkt bilden die Risikoprüfung sowie hinsichtlich Sicherheit von Personen, Daten und Informationen.

**Die andere Freude an Studien macht:** Die unmittelbare Ausrichtung der Studiengänge. Man lernt viele, verschiedene Dinge – sei es in Psychologie oder Kommunikation über die Bezug auf IT, sondern. Und man lernt viele K. (Kommunikation) und K. (Kommunikation) aus unterschiedlichen Blickwinkeln und Themen heraus kennen.

**Die Umsetzung der Studien:** Es ist mir ganz wichtig, wenn Leute kommunizieren und sich gut zu verstehen. Ich finde es schön, dass ich alle Schichten verstehen kann, die mich umgeben, wie Sicherheit. Kann man machen, aber auch Wirtschaft und Politik. Für die Gesundheit, die meisten oder generell ist es auch sehr wichtig, weil es bei der heutigen Vernetzung sicher noch Schwächen gibt, die wir gleichzeitig gar nicht sehen.

**Interessensgebiete der Studien:** In Bezug auf Management habe ich viel das gelernt. Man muss verstehen, alle (berufliche Tätigkeiten, Studium, Beruf) irgendwie unter einen Hut zu bekommen. Aber es geht.

**Interesse der Informationswissenschaften:** Es ist für mich die gleiche Richtung/Wahlmöglichkeit. Informationswissenschaften sind mir am liebsten die Richtung, die ich am liebsten mag. Ich würde gerne mehr über das Thema Informationswissenschaften wissen. Ich würde gerne mehr über das Thema wissen. Ich würde gerne mehr über das Thema wissen. Ich würde gerne mehr über das Thema wissen.

**Beachtung der Studierenden:** Nebenher, das Thema arbeiten. Möglich sein.

Die Projektseite: Suchleiste, Mitarbeiterin im Bereich Post-Quantum-Kryptographie

## Posters

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of Applied Sciences*

**Thank you for your attention!**

**Q & C ?**

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**Project website:**

<http://security.wildau.biz/en.html>

**Security**The logo for 'Security' features the word in a bold, black, sans-serif font. The letter 'i' is replaced by a stylized orange female symbol (a circle with a vertical line and a horizontal line).

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