Gender all around! A practical and holistic approach towards recruiting and retaining women in the field of IT

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ABSTRACT

Is a women-only degree program an effective way to provide a path for women into attractive carriers in the field of IT? This paper presents different ways, how the University of Applied Sciences HTW Berlin attempts to recruit, support and retain women for STEM (Science, Technology, Engineering and Mathematics). The focus is on the mono-educative degree program 'Informatik und Wirtschaft' (computer science and business administration) and its gender-oriented curriculum. The degree program is one part of a three-phase-support-model to attract women for STEM in general. This support-model and the linkage with the degree program will be explained. Finally we present as one first indication of success, the diversity of the reached student group.

Author Keywords

Degree program; Bachelor; Gender; IT; Mono-educative; Curriculum; Mentoring Program; Change; Women in technical fields, Women in STEM

ACM Classification Keywords

K.3.2 Computer and Information Science Education

INTRODUCTION

The HTW Berlin (Germany) was rewarded with the 'Digital Impact Organisation of the Year' prize from the European Commission at the ICT 2013 - Europe's biggest digital technology event in Vilnius, Lithuania [3]. The reason for this honour is the implementation of an innovative women-only Bachelor degree program, 'Informatik und Wirtschaft' (computer science and business administration). This program is not only mono-educative, the curriculum and the framing conditions differ from other mainstream degree programs. It is especially adapted to the needs and require-

ments of women and is linked to the expectations of the industry and potential employees to create win-win situations. The HTW Berlin also implemented a 'three-phase-support-model' to recruit and retain more women in STEM (Science, Technology, Engineering and Mathematics). The three phases include the complete student-life cycle: Recruitment, support during studies and transfer to the industry [2]. In this paper, we present the activities of the HTW Berlin and discuss how they support women in the field of IT.

THE DEGREE PROGRAM 'COMPUTER SCIENCE AND BUSINESS ADMINISTRATION'

HTW Berlin is a well-known University of Applied Sciences and has a long history in engineering education. In the field of IT, the HTW Berlin offers a range of 12 different bachelor and master degree programs. The HTW Berlin established the bachelor degree program 'Informatik und Wirtschaft' in 2009. This is a mono-educative degree program which aims to encourage young women to study computer science. The decision to create a mono-educative program was inspired by the successful women's colleges in America. Furthermore the support of a partner program in Bremen was obtained [10].

In order to address the target group, the following three core values are used to promote this program to women:

1. "Wir fangen bei Null an!" (we start at zero) – Women sometimes underestimate their knowledge and show less self-confidence with respect to IT. We address this and claim that embarking on the 'Informatik und Wirtschaft' program does not require prior IT-knowledge.

2. "Mütter willkommen." (mothers welcome) - we guarantee a timetable that makes it possible to take care of children. We hereby claim that an IT-study and family life do not conflict.

3. "Fragen erwünscht." (questions welcome) - IT is often perceived as difficult because of the technical vocabulary and the numerous abbreviations. We encourage our students to ask, as soon and as often as necessary.

All three slogans are especially relevant in the context of a mono-educative course that is exclusively for women. Furthermore, applicants of other countries are especially

addressed through informations in Arabic, Turkish, Russian and English. The program enrols 40 students (out of around 100 applicants) every year and celebrated its first graduating class in 2012.

Framing conditions
To transfer the core-values into practice, it was decided to set up a flexible program that would offer women who often need to care for others, a good option for organizing their studies without sacrificing the rigour necessary for a computer science lectures. Besides that, all lectures take place between 9am and 4pm, with the flexibility being built in by investing in the option of e-learning and by offering at least one of the modules, usually a social skills module, as a block course in the long German semester breaks. This evens out the time investment necessary for studying.

Gender aspects in the curricular
It has been shown, that women are attracted to so-called hyphenated programs (e.g. life-science), which combine interdisciplinary fields [6, 8]. This can be attributed to the assumption that women interests are wider spread and more holistic. The program takes this into account by combining computer science with economics. This way the students do not only learn about IT-techniques and -methods but also learn the special language and typical tasks of an important application area.

Another important aspect is that many courses (like the following) in this program are taught by female professors. They are important role models, encouraging students to trust their own capabilities [11].

Practice improvement through projects
It has also been shown, that women can be especially attracted to programs which are applied and build bridges towards practical work [8, 9]. The program sets a high value on hands-on projects. During the course of the program, students will twice have the opportunity to work on real projects with external industrial partners. Every year, 10-12 companies are asked to be stakeholders in the projects. The projects represent the wide range of possible working areas within the IT-sector. In the third and fifth semester, the students are put together in mixed project teams. It is a speciality that already the third semester students are participating in these external projects. As this is relatively early in the degree program, key courses, such as 'project management' and 'software engineering', are held at the same time, allowing the knowledge to be applied directly. Still it is a challenge. The lack of experience is often compensated by a higher motivation caused by the 'real' project setting. Furthermore obstacles or even to some extend failure - are valuable and can be used to improve the second project phase two semesters later. It shows that the attitude of the fifth semester students within the projects is much more offensive and target-oriented due to the further experience [5]. That is also why the project teams are mixed (fifth and third semester students). The students can profit and learn from each other.

The profit for both sides – companies and students – is obvious: The companies are brought into contact and obtain first impressions of a group of future IT graduates. Additionally, these students gain first-hand experience and can familiarize themselves with the working conditions and requirements of these companies and are therefore valuable potential new employees. The students are given the possibility to work on real projects, improving their professional skills – both technically and socially. An additional advantage for the students is that they can find a potential company for an internship in the fourth semester or respectively a company for their bachelor thesis in the sixth semester.

The Hackathon: Getting into programming
The Hackathon [5] is part of the programs 'distributed systems' course and takes two facts into account: The program is dedicated to women without any further knowledge in programming (see above). Nevertheless programming knowledge is crucial for later work. The Hackathon is a block course of nine consecutive days. This provides the opportunity to take the necessary time to examine and analyse unexpected problems with installations, implementation and communication of software components. The students are grouped into teams of four to six and work on an application in the field of grid or cloud computing. The software development is agile and oriented at SCRUM. The course is coordinated with the software Redmine. The project work itself is mostly organised by the students themselves, who find the relevant information from internet sources, documentation, tutorial or forums. The first challenge that has to be taken, is predominantly the configuration of one´s own computer system. The problems concern e.g. the installation or administration of the application server, compatibility of different versions of software, or path names. Even if some students were frustrated by these problems, one important competence is gained: the deep knowledge of one´s own computer system and, later, on database systems [5]. This empowers the students to develop enhanced problem solving strategies based on the better understanding of the systems architecture.

SUPPORTING WOMEN FROM THE OUTSET TO BUSINESS: THE 'THREE-PHASE-SUPPORT-MODEL'
A main target of the HTW Berlin is to increase the number of women in STEM [2]. For this, the HTW Berlin developed a 'three-phase-support-model' which includes recruiting and retaining women to study, as well as helping them into job market and supporting them in their professional life.

Recruitment
Several activities target young women to get into IT and technical fields in general. First of all there is the 'Mädchen machen Technik' - 'Girls doing technology' - a summer school for pupils from the age of 15 and older. It was first

inaugurated in 1999 as a girls-only activity and includes experiments and lectures in technical fields in the autumn school holiday [2]. Every year, 65 to 80 girls participate. Second there is the 'Jump in MINT' ('Jump in STEM') program, a mentoring program for female pupils. The girls who participate build partnerships with a female mentor – a female student or a woman working in a technical field – and visit several technical companies. This is also the first linkage to the degree program 'Informatik und Wirtschaft' mentioned above, as some of the students are also mentors in this program.

Retaining
Since 2012, another mentoring program called 'ProfIT', aiming exclusively at women in IT has been implemented. The mentees are from all forms of IT degree programs at the HTW Berlin. They profit from the exchange with a female mentor from the IT field as well as a program which contains inputs via short lessons, workshops, and networking meetings. The mentees have to be in the fifth semester at least. This can also lead to internships or even the writing of the Bachelor respectively Master thesis in the companies of the mentor.

Depending on their own experience, the mentors profit in different ways as the evaluation of the first cycle showed. All mentors have at least three years working experience, but the majority has more. The young mentors gain leadership experience, while the experienced mentors learn what young women nowadays expect from their future company and what they can offer. This is a great advantage not only for the mentor, but also for the company itself. All mentors are provided with further trainings in e.g. consulting competence and coaching lessons. The evaluation of the first cycle has also shown that all mentors were very satisfied. They profited from the exchange with the mentee and the new network, new perspectives on the own person and on the working field. The trainings for the mentors are financed by the project 'MINTPORT[1]' which is cooperation with the Beuth University of Applied Science. This program also offers a free organisational consultation on gender diversity. This consultation is carried out by an external professional consultant, who analyses the company's structure and accompanies the company through a change process. This has a mutual effect: the company is assisted on how to keep and support valuable workforce in their company. Secondly, women profit from better working conditions and from a more permeable 'glass ceiling' [1]. As the drop-out rate in technical fields for women is still very

high [4], this is another important step to ensure that the very few, well educated women will stay in the business.

RESULTS: INCREASING DIVERSITY
It is now five years since the mono-educative course 'Informatik und Wirtschaft' was brought into life. Since then, around 40 students have registered for the program each year. This has led to an increase in the number of women studying computer science at the HTW Berlin. A measurable indication of the actual boost in female IT-students is the steady numbers of female students in other IT programs at our University, which did not diminish during the last three years. In fact, the opposite has happened: the number of women in other IT programs increased (e.g. co-educative Business computing the percentage of women increased about 5% from 2009 to 2011) [2]. One speculation about this effect is that the promotion of the women-only program or just the knowledge that such an offer exists, has encouraged women to study IT at the HTW Berlin.

The assumption is furthermore that without our program, a high percentage of our students would not have studied computer science at all. This can be concluded from the unusual mixture of woman reached by the program. We get a lot of women who would not have started a computer science course in a normal setting. This is a result of a questionnaire handed out at the beginning of the program. Some students say that they did not dare to study computer science as they thought they would not have met the same requirements as their male classmates (who, they suppose, spent most of their time working or playing with a computer). The course also attracts older students (age 30-45), who have a pragmatic interest in tapping into good job opportunities. They aim to achieve a further qualification, but do not want to sustain their position among young male 'nerds'. Other statistics show that the proportion of mothers and women with a migration background are significantly higher compared to statistics including all students in Germany [7] (in the latest semester 17 % of the students are mothers (compared to 5-6% of all students) and 34 % have a migration background (compared to 23% of all students[2])). It also shows that the program is chosen quite often by students that either already have other qualifications or do not have a German Abitur or equivalent qualification, but have vocational training and at least three years of work experience. The diverse mixture of women within our program confirms that this strategy works and should therefore be continued. The exact evaluation of these phenomena and the deduction of possible consequences for a better designation of the target group is the topic of a current doctoral thesis.

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[1]   The project is financed by the Bundesinitiative „Gleichstellung von Frauen in der Wirtschaft" (www.bundesinitiative-gleichstellen.de). The Program was developed by the Bundesministerium für Arbeit und Soziales together with the Bundesvereinigung der Deutschen Arbeitgeberverbände (BDA) and the Deutschen Gewerkschaftsbund (DGB). The program is financed by the Bundesministerium für Arbeit und Soziales (BMAS) and the Europäischen Sozialfonds (ESF).

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[2] This can only be interpreted as a tendency, as the measuring of ‚migration background‘ was different in the two statistics.

The curriculum - and in particular the projects and the Hackathon which are applied and time flexible - shows that it is possible to combine high education goals of an IT degree program with the interests and the lifestyle, such as time management, of young women and mothers. This only acquires the will, the creativity and the flexibility of the professors to find solutions for the target group. In case of the projects this is a win-win situation for both sides - the students and the companies. Additionally, a practical approach is what women are especially interested in. So this should be a good example for further gender sensitive curricula.

Long-term, the women-only degree program alone is not sustainable. First of all, new students are needed. Activities, such as 'Girls doing technology' are just one step in the right direction. With the mentoring program 'Jump in MINT', the students of 'Informatik und Wirtschaft' act as mentors and can promote the advantages of their degree program directly.

Even as the overall number of female IT students in Germany is on the increase, further steps to keep these women in the business are necessary. With the mentoring program 'ProfIT' and 'MINTPORT', the HTW Berlin is taking first steps. The program supports women at career entry level, a crucial phase with a high drop-out rate [4], to make sure that they remain in the IT sector. MINTPORT is even taking one step more by offering gendersensitive organisational consultation. As both programs are quite new, there are no general results (e.g. effect on the drop-out rate) about the effects of these programs. What can be said is, that the mentees were very satisfied with their learning curve, that some of the mentees completed internships or Bachelor thesis in the companies of their mentors and that they all definitely profit in one way or another in their personal development.

Overall, it can be concluded that a mono-educative degree program is successful if the curriculum is structured according to the needs and expectations of the target group and differs from the mainstream degree program. Additionally a supporting program is important to make the degree program sustainable. This combination aims to support women through the complete student-life cycle. It shows that the degree program encouraged women to study computing who never thought they would ever study computing. The three-phase-support-model tries to keep them in the business. It is one holistic and so far successful approach to recruit and retain women in the field of IT. How the program can be improved, what we can learn from the program or how the concept could be transferred to other programs should be discussed and further discovered.

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