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Effective Reskilling of Foreign-Born People at Universities - The Software Development Academy

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ABSTRACT Contribution: An intensive three-month educational program can be used for rapid integration of foreign-born people into the IT industry. A novel method for integrating industrial needs with the practical parts of a bachelor's Computer Science program. Background: The program was motivated by (1) the societal need to increase the meaningful integration of immigrants into the workforce, and (2) the demand for IT specialists in the IT labor market. Intended outcomes: An effective intensive software developer program with a high level of industrial integration and a working matching model for employment. Application design: The program consists of three different phases; recruitment of participants, training and job matching. The training is divided into six modules using five different teaching methods. An evaluation model, based on passive and active data, is implemented with fast learning loops for teachers and participants. Findings: The program has been run seven times with 263 unemployed participants of different nationalities. On average 82.6 percent of the participants found employment in the IT industry within 5 months of the course ending. Female participants are in the majority and are more successful in securing employment. The findings suggest that it was possible to rapidly prototype and deliver an advanced reskilling program within a university setting and use it as a positive method to support newcomers find meaningful work that has a direct benefit for the local IT industry, as well as for the wider society.

INDEX TERMS Accelerated learning, career development, computer-aided instruction, computer science education, curricula development, lifelong learning.

I. THE IT SKILLS SHORTAGE AND THE POTENTIAL IN FOREIGN-BORN PEOPLE

The need to retrain the workforce has never been greater. The "half-life" of knowledge [1] and thus skills due to technological developments, rising retirement age due to increased life expectancy [2], and the influx of foreign-born people are all factors that pose radically new challenges for how to think about and organize education in general, so that it can better adapt to new realities whilst providing sustainable support for lifelong learning in society.

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In addition, general purpose technologies, like digitalization, change not only which knowledge skills are attractive in the labor market but also how skills can be learned. In order to move with the technological developments, the education sector also needs to best utilize technology to further its impacts. Technology also forces change upon organizations and companies as new skills become both possible and sought-after. Accordingly, there is a need to rethink the whole system of education and lifelong learning so as to develop new approaches to, and strategies and methods for, validating or updating skills.

This paper reports experiences from establishing and running an innovative reskilling pilot program in software

development for foreign-born people with academic or professional backgrounds from various fields.

A. THE IT SKILLS SHORTAGE

In 2017, the Swedish IT & Telecom Industries association (IT&Telekomföretagarna, now techSverige), which represents employers in the IT sector, published a report that underlined the skills shortage in the sector. A 70,000 jobs deficit was predicted by 2022 if measures, such as educational initiatives, were not taken [3]. Furthermore, Statistics Sweden (SCB, the Central Bureau for National Statistics) forecasted an increasing demand for IT-educated people up until 2035 as more and more sectors are looking for employees with IT skills. Additionally, the number of graduates from IT educational programs was slightly lower than demand, and a large part of the workforce in 2017 were over 45 years old [4].

B. FOREIGN-BORN, WELL EDUCATED, UNDEREMPLOYED

Foreign-born people in Sweden are a diverse group, with educational levels ranging from elementary school to university degrees. Of the individuals who gained residence permits between 2014 and 2017, about 33 percent have post-high school education longer than three years and an additional 21 percent have some post high school education, under three years [5]. Generally, foreign-born people in Sweden are more frequently unemployed, for several reasons. As one example, the employment rate varies with the reason for migration [5]. To illustrate, in the group 'asylum seekers with three years of higher education' who arrived between 2006 and 2017, around half had employment when investigated in 2018. On the other hand, people with the same educational level, but who immigrated for work, were employed at the same level as natives of the same educational level [6]. Furthermore, the current economic situation, contacts with currently employed people (a network of contacts) and the local labor market impact the likelihood of being employed [5]. Lastly, of the foreign-born people who immigrated between 2006 and 2017, around 55 percent were employed in jobs that matched their education, compared to natives who were 80 percent employed in jobs that matched their education [6].

C. INITIATIVES TO FAST TRACK FOREIGN-BORN PEOPLE TO JOBS

A number of initiatives to merge skills shortages on the labor market and unemployment amongst foreign-born people exist. Jobbsprånget(literally, 'the job leap') is an organization run by The Royal Swedish Academy of Engineering Sciences (IVA), and aims to fast track newly immigrated people into jobs via internships. The internships, aimed at engineers, economists, architects and scientists, are intended to give the participants a chance to show their potential to employers as well as reduce the time it would normally take to find a job [7]. IVA reported that around 7 out of 10 interns received job offers as a result of the internship [8]. In 2017, the government assigned a number of universities, employer organizations and companies with the task of designing and running fast track programs for newly immigrated academics and other professional groups such as painters, chefs and truck drivers [9]. The academic programs in the fast track program were mainly targeted at academics in social sciences [10], [11].

D. OTHER INITIATIVES FOR RESKILLING

Reskilling, the practice of retraining people to take on jobs in new sectors as old ones become obsolete due to technological development, has been suggested as a solution for skills shortages [12]. A number of market driven alternatives to university education have been created in recent years in Sweden. Recruitment, and other, companies hire or take in people interested in reskilling for new, in-demand IT jobs. A model is to offer no-cost coding bootcamps, and in return the recruit will work as a consultant for a given time [13]. Other companies have the participant pay a course fee [14].

Migration Policy Institute reports from an overview of 16 different coding boot camps for refugees in Europe show that there were many arguments for coding skills being a potential route to job market entrance; local language skills are not needed to do the job, attractive salaries and higher status than other possible careers, employers accept employees with the right skills rather than with the right formal qualifications, IT skills are also seen as transferable when moving to another country [15].

A related project in Sweden is MatchIT, which was in operation over the years 2018 to 2021. MatchIT developed a method for matching high competence among foreign-born newly arrived academics with the shortage in the labor force in Sweden. Getting participants into qualified work was combined with intensive training in programming at university level with language studies, business activities and internships. The participants were not selected on grades, but through tests and interviews [16].

E. THE CREATION OF SDA

When large numbers of asylum seekers arrived in Sweden in the fall of 2015, academics at KTH Royal Institute of Technology (KTH) initiated discussions about the role of higher education in contributing to a rapid transition into the workplace [17]. Learning from other studies (for instance [18]), SDA focused on removing challenges for entry into the job market. Two staff members from KTH contacted a CEO from a just launched recruitment company focusing on finding work for high potential foreign-born people who had recently immigrated to Sweden. In April 2016 they set up a joint venture and applied for funds to develop and test a model for rapid training of foreign-born people. Consequently, in spring 2017, the Software Development Academy (SDA), was established.

The aim of the SDA project was to design and pilot a short education program in which foreign-born people would be trained to become more employable in the rapidly expanding Swedish IT sector, where the demand for more personnel was high. To explore the possibilities of a high-ranked

university contributing to a rapid transition into work for individuals currently unemployed, a 14-week intensive training course in software development for participants from diverse educational and cultural backgrounds was developed and piloted. Studying successfully at an advanced level at an accelerated pace likely requires motivation. Because of the work-intensive nature of the rapid training program, the assumption was that SDA participants needed to be highly motivated and have some sort of higher level educational training, and that for people with these prerequisites it would be possible to conduct an intensive training program of approximately 500 hours of programming education and practice in only 14 weeks.

In the creation of SDA, it was concluded that there might be many foreign-born people that were currently unemployed or had jobs not fitting their educational level. In addition, the discussion in society about solutions to rapidly transition newly-arrived foreign-born people into work meant a strong argument for the swift development of such a program. Therefore it was important to get started quickly and produce initial results. To summarize, the SDA project intended to investigate whether it was possible to create and run an IT reskilling program within a university setting with the intention of successfully transferring previously unemployed people with academic or professional backgrounds into jobs.

The SDA project has also worked as a test bench for innovative pedagogical methods over the years [19], such as reduced learning time [20], reduced teaching time [23], and adaptive course development [21]. This paper presents the approach towards skills development in SDA in order to meet current and future needs, and argues that skills development programs such as SDA should be designed by universities in collaboration with multiple partners. The aim of this paper is thus to report on the design and execution of an intensive and relatively short IT course based on a different pedagogical focus provided to highly motivated individuals.

The rest of the paper is structured as follows. In Section 2, the program is described in detail followed by Section 3, which contains a walk-through of participant results. In Section 4 the findings are discussed in relation to the aim, and lastly, Section 5 presents conclusions and ideas for further research.

II. THE SOFTWARE DEVELOPMENT ACADEMY

This section describes the detailed setup of the pilot program, the curriculum and its pedagogical approach. The admission process and job matching phase are briefly reported on.

A. OUTLINE OF THE PROGRAM

The SDA program consists of three different phases; recruitment of participants, training of participants and job matching (see Fig. 1). This paper focuses on the training, and hence the other two are only briefly described. To ensure that the education was relevant for the needs of the job market, four employers from the local IT industry were involved in the program design, ensuring that the contents of the education fit their needs, and thereby increasing the chances of employment directly after the training course. The education element of the project was arranged and implemented by teachers from the ordinary undergraduate and graduate programs in Computer Science. In parallel with the IT training, job matching was conducted by the recruitment company which also provided the candidates with training in soft skills and Swedish workplace culture.

B. ADMISSION

Recruitment to the program took place through a process that both KTH and the recruitment partner were involved in designing. KTH's role was to define the prerequisites (level of result in the different application tests) for the participants in order to cope with the program and to design the method of measuring abilities related to knowledge acquisition around coding. The role of the recruitment partner was to attract candidates, introduce elements to evaluate the motivation of the candidates and make a selection based on the agreed criteria. Staff from KTH assisted with expert support in computer science and coding when an in-depth assessment of any candidate was required.

The selection process was based on recruiting, applications, online tests, interviews and resume assessment. Recruitment took place in various social media channels that attract newcomers and foreign-born people in Sweden such as Facebook groups, LinkedIn and Instagram channels, and also included some well-known websites that newcomers usually read (i.e. the Swedish Public Employment Service (Arbetsförmedlingen)).

Four online tests were carried out; logic, mathematical ability, problem solving and English. Based on the test results, applicants were then selected for interviews by telephone for an initial screening. Candidates with the most relevant profiles were invited to a second, physical, interview. From a cohort of 250-380 applications for each instance of SDA, about 30-40 participants were admitted to an instance of the SDA.

C. TRAINING

1) BALANCING INDUSTRY DESIRES WITH ACADEMIC CAPABILITY

The design for the training emerged from a process of engaging both industrial and academic partners. In terms of industrial input, companies in the local area were contacted in order to discover their requirements and expectations of the skills that a junior developer should possess. In contrast, academic inputs provided information on the necessary foundations required to educate junior developers from a pedagogical perspective. Despite the potential for tension between the desires of industry and the capacities of academics, a sequential module-based plan for a three month education program emerged. Over successive iterations of the academy, this has been refined and stabilized into its current form, as shown in Figure 2.

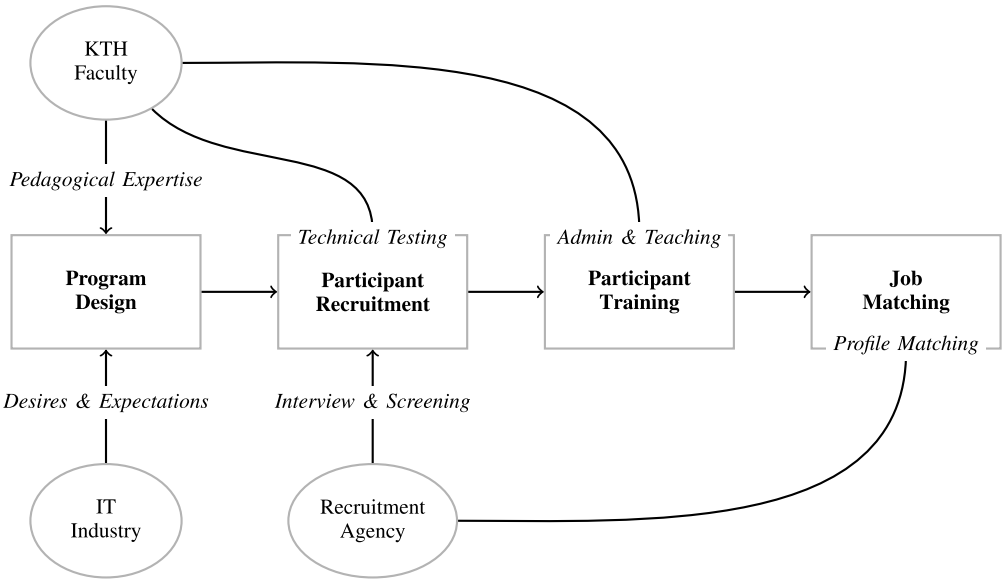

FIGURE 1. High level overview of the major stages of the SDA program and the inputs of the project partners at each of the stages.

2) MODULE DESCRIPTIONS: CONTENT/ DURATION/EVALUATION

Each of the modules is designed around a set of learning objectives that contribute towards the basic skills required of a junior software developer. The following briefly describes the essence of each module along with the methods of assessment and evaluation.

a: PROGRAMMING FOUNDATIONS

This module introduces programming and problem solving through an object oriented programming language (Java). By the end of this module, the participant should be able to utilize basic object orientation, make appropriate use of fundamental programming concepts, read and generate documentation and improve program structure using inheritance and polymorphism. Assessments are done on a weekly basis, both teacher-constructed online quizzes, and via novel online quizzes that students generate themselves - in a single instance participants generated 230 multiple choice questions and 50 percent of the students answered 100 or more questions [22].

b: SOFTWARE ENGINEERING

The module focuses on the project management area of knowledge, investigating project methodologies in a challenge driven approach, including modeling languages and practical practices. The participants are expected to learn about theoretical concepts outside of the classroom setting in a flipped classroom framework and are given the opportunity to apply these concepts in class via a unified group project, in addition to using focused theme workshops which allow the participants to practice certain software engineering skills in an innovative learning environment. Assessments are done on a weekly basis via online quizzes as well as the group project.

c: INDIVIDUAL PROJECT

The aim of the module is to provide participants with the opportunity to apply knowledge and skills accumulated over a duration of five weeks to an individual project, participants are provided with a specific development assignment which focuses on applying design and development skills in a self-regulated environment. Participants are assessed twice using a grading checklist by mentors who are assigned to each participant. The first review is done midpoint of the project to allow the participants to reflect on their progress, and then again at the end of the project.

d: ENTERPRISE TECHNOLOGIES

The aim of the module is to cultivate independent learning and transmission of knowledge. Rather than have all participants learn one ET, groups will research and develop different ETs and train the rest of the class, which leads to covering a broad range of important frameworks that are used within modern software engineering and development of industry projects. This is a self-regulated learning environment done in the form of organized workshops over a period of one week and is assessed in the form of peer reviews. For more details, see [23].

e: ADVANCED

The aim of this advanced module is to introduce technologies for front-end development. By the end of this module, the participant should be able to develop and design modern Android applications for smartphones, use the Android development tools and libraries and understand how the Android

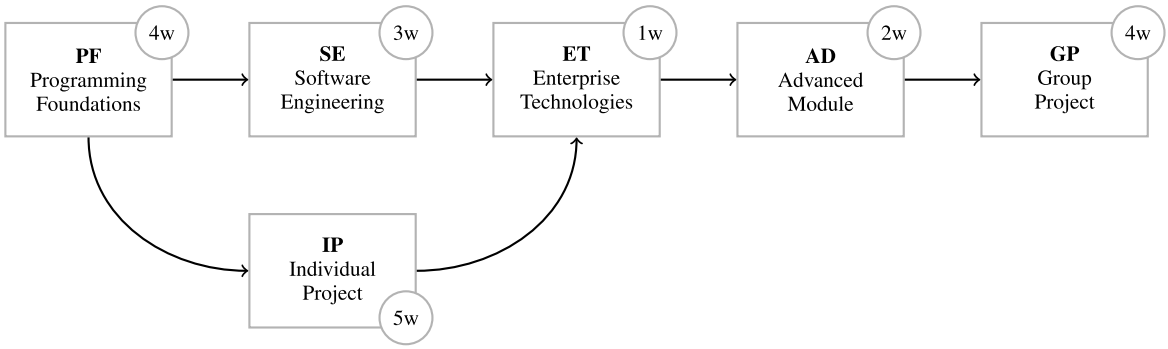

FIGURE 2. The SDA is organised into six modules. The individual project (IP) runs in parallel with both programming foundations (PF) and software engineering (SE). Numbers in the white ovals indicate the normal duration of each module in terms of calendar weeks.

application ecosystem works. Lately, the content has been adjusted for other front-end technologies. The module ends with a group project where a small web application is developed based on a template using Spring/React.

f: GROUP PROJECT

During this module the learning objective is to allow participants to practice agile software development methods in a team project, applying Scrum as a development framework. Participants are organized in teams working on a larger application over a four-week period. Groups are assessed based on code quality via an in-depth code review. Furthermore, the groups are instructed to use GitHub which is assessed through a review of the group's source repository.

3) LEARNING METHODS AND ENVIRONMENT

As each module covers different topics, the teaching methods vary accordingly (see Table 1). As a result, the teachers involved report that the education is more stimulating than ordinary teaching, as the participants are exposed to different ways of engaging with the material, ranging from the traditional lecture and lab-based work, to more self-regulated group and individual projects, as well as workshop-based sessions where the participants themselves may take responsibility for developing and delivering the content to other participants (e.g. Enterprise Technologies module, see [23]).

Furthermore, modules are delivered in an intensive, block-based format so that participants can focus their efforts and learn rapidly. In contrast to traditional university delivery, where a module like Programming Foundations would be delivered over three months with a single lecture, lab session and task per week, within the SDA a single day is used for the equivalent weekly content. This compression of material creates the need to ensure that participants are constantly engaged in their education. The solution chosen to maximize the chances of this happening was to (1) create a single dedicated space for the learning to take place, and (2) create the requirement that participants treat this as a job and be present from 9am to 5pm. Early experiments in arranging the learning space included a traditional rank and file classroom, however as the SDA has evolved and better spaces secured, a more organic cluster-based seating plan has emerged, with multiple displays mounted on walls to ensure participants' experience of the teaching was relaxed and comfortable throughout the day.

4) A DATA DRIVEN AGILE APPROACH TO EDUCATION

A challenge created by compressing education is that if a participant falls behind, they may struggle to catch up and ultimately disengage from the academy. Whilst academics can deliver the content at an intensive pace, a need emerged to actively monitor participant progress. The solution was an agile approach to education, whereby each week presented the opportunity to capture data about the participant experience, confidence and knowledge. The participants completed three different surveys every Friday and the results were presented at a full team meeting the same day. Other data sources included input from the teaching assistants, spontaneous oral feedback collected from the participants during the week and traceable results from the particular labs and exercises that week. Teachers could then discuss and reflect upon this data, and plan remedial action to adapt the education accordingly. This model is described as the experience, confidence and knowledge (ECK) evaluation model, see Figure 3 [24]. A direct outcome of this agile process is that participants can communicate issues and immediately observe the results of this process. As participants already spend the working day in the lab, it was possible to arrange additional interactions with a teacher to review challenging topics, with the only cost being the teacher time involved. This approach is also module-neutral, and runs as an ongoing theme throughout the academy, offering participants a means of recourse, as well as providing insights for teachers to analyze and adapt to.

D. MATCHING

During the training, participants were given the opportunity to meet a recruitment consultant to be trained in interview skills and to gain a better understanding of their profile, strengths, development areas, the type of company they wished to work for and where they would like to work in Sweden. After the

TABLE 1. Summary of the teaching methods that are employed as the primary means of teaching in the different modules of the academy.

	Programming Foundations (PF)	Software Engineering (SE)	Individual Project (IP)	Enterprise Technologies (ET)	Advanced Development (AD)	Group Project (GP)
Lectures	✓	✓			✓	
Labs	✓				✓	
Workshop-based		✓		✓		
Project-based		✓	✓			✓
Self-regulated			✓	✓	✓	✓

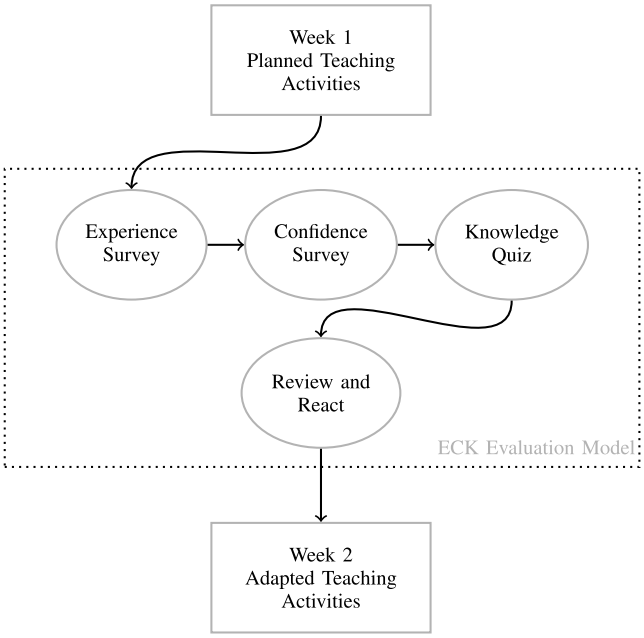

FIGURE 3. ECK Evaluation Model: Each week teaching activities are planned and delivered. At the end of the week a participant evaluation is performed that targets the experience, confidence and knowledge of the participants. Based on the findings, changes are made for the following week to ensure the pace and participant progress align [24].

SDA course was completed, the participants were able to get help from the recruitment partner to find employment as consultants. For successful matching, a salary at the level of junior software developer was paid. Participants could also find jobs themselves or use other recruitment support.

III. FINDINGS

A. PROGRAM RESULT

Seven iterations of SDA have started as of spring 2020. Of these, the latter two, rounds 6 and 7, have parallel instances in Stockholm and in Lund, both in Sweden. Data on the different iterations are presented below in two different parts. The first part describes the composition of the participant group (number, gender etc.) and the second describes the outcome in employment (how many, which, time, etc.).

1) PARTICIPANT DATA AND GENDER

SDA1-7 accepted 263 participants. SDA7 lasted until June 2020. Since job result data are measured five months after completion, only iterations up to and including SDA6 will be reported here. The pandemic starting February 2020 might affect the setup of the program and its result, which is why a separate report on iteration SDA7 and forwards is suitable. SDA1-6 had 215 participants where 26 left the program, giving a 12.9 percent dropout rate. An average of 30.7 people started each iteration.

More women than men attend the program (54.8 percent). More men dropped out (13.4 percent compared to 11.0 percent for women). There is a positive trend in accepted women with an average rate of 43.5 percent women in SDA1-3 and 60.8 percent in SDA4-6 (four iterations). 89.0 percent of the females complete the program and 86.6 percent of the males.

2) JOB MATCHING RESULTS

The participants' previous experience in job hunting in Sweden varies between individuals. However, the common understanding is that it hasn't been successful. Quoting a partner of the company that handles the selection process:

> The average amount of time the participants were in Sweden before starting SDA is three years. [. . .] The next question [is] how many jobs do you think you have applied for - you get a number of different answers but it is always more than 100 jobs. A person may have applied for as many as 1,500 jobs. I would say the average is quite high [. . .] something like 300 jobs.

Results from the job matching are time dependent in Sweden. The normal course iterations end in late December and May respectively. The recruitment window is practically closed during the Christmas holidays in late December early January and the summer vacation in late June to early August. In order to get a fairer judgment of the job matching success rate, it is measured five months after the ending of the iteration. The total number of job-matched participants continues to increase even after this five-month period. For instance, 14.5 percent got a job between 7-18 months after the training ended.

A *job* in this setting means accepting a full-time IT-related job offer. That is, reaching the intention of the program. No discrimination is made regarding whether the job was obtained via the recruitment company or by the participant directly.

Counting participants in SDA1-6, on average 82.6 percent of them got an IT job within 5 months following the end of their SDA-iteration. The female participants are a little more successful in landing a job, 83.3 percent do so within 5 months while the men's figure is 81.7 percent. The average time for getting a job, among those getting it within the 5 month period, is 1.2 months. The median within the same time frame is 1.0 months.

IV. DISCUSSION

In this paper we report on a reskilling project that intended to investigate whether it was possible to create and run an IT reskilling program within a university setting with the intention to successfully transfer previously unemployed people with academic or professional backgrounds into jobs.

The majority of the SDA participants, although the data is shallow, have academic backgrounds but have had difficulties getting jobs for a variety of reason. The findings suggest that language barriers, discrimination in application processes and few networks of contacts (i.e. knowledge of the Swedish work culture) could partly explain the unemployment in the group of SDA participants. These findings are supported by the literature, where [18] identifies several barriers for Syrian refugees when entering the Swedish job market. Validation processes for educational qualifications and lengthy administrative procedures are two significant obstacles.

SDA was designed as a reskilling program similar to the ones that operate on the regular market [13]; [14], but was targeted at unemployed foreign-born academics. Before admission to SDA, the participants were unemployed for the majority of time since arriving in Sweden. This approach, reskilling to work in a new job, for tackling unemployment in this specific target group is unique. We argue that the program is a success, but due to the lack of possibilities to compare our results with other programs, for example not even the Swedish Public Employment Service publish data on e.g. cost per employment in their programs, we must describe this as a case study. Our best argument for the program being a success is the post-course employment rate of 82.6 percent. We are aware that the employed participants were all employed in a sector with a substantial deficiency of employees [3] and might therefore not be faced with as much competition from other job seekers. However, this is also the goal of our reskilling, and we should also note that these course participants were not randomly chosen, but selected from the pool of long-term unemployed migrants with a demotivating long history of applying for hundreds of positions without even being called for an interview.

The high number of participants in jobs after the coding school is in line with [25] who reported that different coding schools vary in "intensity, duration, and delivery" The result, however, showed a unified positive outcome in getting jobs for the participants. A local Swedish initiative, MatchIT, has also reported results showing that the method works. The round of MatchIT that gave the best results was MatchIT in Lund (Sweden), which resulted in 50 percent of the participants finding relevant and qualified work (follow-up is done six months after the end of the effort) [16].

By its nature, a reskilling program of 500 hours and 14 weeks offers a limited amount of learning. It could be argued that participation in the program only helped the participants to their first job and that they might suffer later in their careers due to a lack of deeper and broader IT-skills. However, in the IT sector proof of actual skills is just as important as diplomas. Due to the rapid development of new technologies within IT, on-the-job training and self-learning are necessary even for those with a Master's degree. A similar initiative in Germany reported the following findings "English language skills are often sufficient for newcomers to get by, but German skills are still helpful, Degrees are not the only path to a tech career, but they still carry weight, Interpersonal and intercultural skills are important for workplace success, Demonstrating the ability and drive to keep learning is vital for professional success" [15]. A short program is not a replacement for a university diploma, but since the participants in many cases already had a diploma, just not in IT, it is fair to assume that the abstract and analytical skills following a (longer) university education were already in place. This suggests that the value of partaking in a reskilling program could be greater for people who already have degrees.

Lastly, a surprising figure is the average female participation in SDA of 52 percent, compared to computer science programs in Sweden [26], Norway [27] and the US [28] where female participation is less than 25 percent. This is partly due to the selection process, but also due to the fact that computer science is not connoted as a male occupation in many non-Western cultures [29]. For a longer discussion on computer science and gender, see [30].

What are the key points for the successful outcome of the program? Despite not having that question in focus, nor the data to provide an full answer, possible reasons can be discussed. The extensive admission process where tests and interviews ensure that candidates have the necessary prerequisites for managing the training are accepted can be a contributing factor. The skilled teachers and the freedom given for designing, and quickly re-designing the program is also a positive contribution. The collaboration with industry partners providing both insights in desired curriculum and helping out with the matching process at the end of the program is another possible key for success. It could also be as simple as the brand name as the regular student admission is arguably the most competitive in Sweden among engineering programs and computer science as KTH is in general ranked among the top 50 in the world [31] and an education from KTH is valued highly by employers, even though this one is only three months.

A. RECOMMENDATIONS BASED ON TEACHING TEAM'S EVALUATIONS

Collected experiences from teaching team evaluations, run after each SDA-instance, highlight actions interpreted as

successful for the implementation of SDA. Recurring themes derived from the evaluations have been:

- When admitting to the program, evaluate future potential, not historical achievements. The admission process focuses on the participant's potential, not previous achievements. Although these could be argued to be interconnected, the focus on tests leads to a program that accept candidates with few traces of relevant previous experience, but highly motivated and with feasible prerequisites for being successful in the training.
- The close contact to industry implies relevance in the chosen curricula. It also deepens the understanding of how companies reason in different matters, for instance when it comes to long lasting theoretical skills versus instant employability by focusing on current trends and tools.
- The work model, where all teachers evaluate and contribute during the whole program to all different modules regardless of whether they are responsible for it or not, has been interpreted as positive.
- The value of the created pedagogical lab environment where teachers' creativity can be set free, somewhat independent from the university's original structures, is recognized as high. Even if the data presented in this paper only covers the creation of the current program, the break-down can form the basis for preliminary studies by other actors who are considering starting a similar type of education.

V. CONCLUSION AND FURTHER WORK

Three results stand out in the experiment. *Firstly*, it is possible in a university environment to create a successful educational program for reskilling. *Secondly*, it is interesting that the current program has succeeded in getting previously long-term unemployed people into work by participating in the program. Although it is not clear or clarified which part of the program has the most impact, the whole is shown to be effective. *Thirdly*, it is interesting that an IT program has succeeded in attracting a higher proportion of women than men. This result is in stark contrast to previous data on gender distribution in IT programs in higher education.

One question to investigate further is which part, or parts, of the program create the good outcome (admissions, implementation, curriculum and cooperation with the business community are candidates). The need for IT-trained staff remains significant. As the program works for unemployed new arrivals, it would be interesting to investigate whether it would also work for people who are currently employed, but in a sector that is facing rapid changes and where new skills are needed fast. The possibility of scaling up the program while maintaining quality, through a larger portion of online education and with more automated methods, is also worth investigating and studying. Finally, the question of the high proportion of women among the participants is worth investigating.

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