

WOMEN WAVEMAKERS

Practical Strategies for Recruiting and Retaining
Women in Coding Bootcamps



WORLD BANK GROUP

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Abbreviations

AGI	Adolescent Girls Initiative
CIRR	Council on Integrity Results Reporting
CSS	Cascading Style Sheets
FCI	Finance, Competitiveness and Innovation Global Practice
FLFP	female labor force participation
FT	full-time
HTML	HyperText Markup Language
ICT	information and communication technology
IFC	International Finance Corporation
ILO	International Labour Organization
PT	part-time
STEM	science, technology, engineering and mathematics
WBG	World Bank Group

All dollar amounts are U.S. dollars unless otherwise indicated.

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Executive Summary

Coding bootcamps, a type of rapid tech skills training program, have recently emerged as a promising approach to equipping individuals with the skills needed to thrive in digital economies. But despite the potential of these training programs to prepare graduates to compete in a changing global labor market, women often participate at significantly lower rates. When women do enroll, they tend to have higher dropout rates than men.

The World Bank Group (WBG) Gender Strategy (2016-2023) identifies occupational sex segregation as a key constraint to women's economic opportunity, along with the lack of care services, limited mobility, and legal and regulatory restrictions. Because coding bootcamps may offer one way to bring more women into the digital economy, the WBG sought to gather insights from bootcamp providers across the world to better understand strategies for recruiting and retaining women.

Insights from this report aim to inform the work of WBG teams that are increasingly using coding bootcamps as a tool to address youth unemployment, as part of an approach to reducing poverty and increasing shared prosperity. The findings may also be useful for WBG teams working on other kinds of skills training programs, including technical and vocational training as well as entrepreneurship accelerators. External policymakers focused on skills development might also find these insights helpful, along with bootcamp providers working to increase women's participation in their programs.

The Case for Women's Participation in Coding Bootcamps

The term "coding bootcamp" specifically refers to a "ready-to-work" model. These are intensive short programs (usually 3-6 months) designed to provide participants with programming skills—and in many cases socioemotional skills—to prepare them for entry-level tech employment opportunities.¹

Coding bootcamps are becoming increasingly relevant as global demand for tech skills continues to grow globally. In the United States, employment in computer and information technology related occupations is expected to grow at a rate of 13 percent between 2016 and 2026—faster than all other occupations.² In the Middle East and North Africa, the enterprise application software industry grew by seven percent in 2017.³ And, Thailand's software industry has experienced extraordinary growth—estimated at 160 percent since 2013.⁴

Underlying the importance of equipping tomorrow's workers with relevant tech skills, the WBG's *World Development Report 2016: Digital Dividends* finds that digital technology is "skill-biased", meaning that it is most likely to benefit those with tech proficiency and higher-order cognitive and socioemotional skills.⁵ The *World Development Report 2019: The Changing Nature of Work* also notes that technology is shifting the types of skills needed for work, with increased demand for advanced cognitive skills, socio-emotional skills and a mix of skills that facilitate greater adaptability.⁶

Research indicates that across 30 emerging economies, men are 2.7-times more likely to work in the ICT sector than women, and 7.6-times more likely to work in ICT occupations.⁷ And the benefits of new employment opportunities—especially jobs that utilize advanced tech skills like coding—have not been equally shared among men and women: Among 80 economies, women make up 40 percent or more of the workforce in information and communication jobs in only 12.⁸ Notably, the gender gap in information and communication careers is significant even in countries with a relatively high female labor force participation (FLFP) such as Sweden, Norway, and Switzerland. (Each has a FLFP rate higher than 60 percent, but women make up 29 percent of the information and communication jobs in each of these countries) (see figure 1).⁹ As a result of occupational sex segregation, many women find themselves working in lower paying sectors like health, education and other social sectors. Those who do work in male-dominated fields such as STEM are likely to

be overrepresented in STEM education and health-related jobs, whereas men are more likely to work in technology and engineering, management and business-related roles.

While increasing women's economic participation holds value in of it itself, there is also a business case. Businesses, communities and economies are unable to maximize their full potential without the full participation of women. Emerging research has established the link between women's employment and positive business outcomes, such as increased productivity, retention and firm performance.¹⁰ More women in the workforce add value at all levels: as employees, managers and leaders. Research by McKinsey found that among companies that invested in attracting, retaining and developing female talent, 64 percent reported an increase in employee productivity and retention and 57 percent reported an increase in their ability to attract talent.¹¹ Teams with gender diversity are often more innovative: A study of 4277 companies in Spain found that companies with more women were more likely to introduce innovations in the market over a two-year period.¹² At the leadership level, the benefits of women's representation are also evident. Firms with more women in leadership roles often demonstrate better firm performance, especially during periods of economic volatility, greater ability to minimize high-risk transactions and better serve markets dominated by women. A study of 215 Fortune 500 firms found that companies with higher levels of female representation outperformed industry revenue averages by 46 percent.¹³ Companies with diverse boards often tend to generate a higher return on equity than those without.¹⁴



Key Insights

The insights in this report draw on the experiences of 25 coding bootcamps and 7 digital skills programs in 22 countries that were identified using a desk review as well as through networks and technology-focused communities. The goal is to share ideas from practitioners around the world that are working to address these challenges. Rather than setting out a prescriptive pathway, the report provides a menu of options that providers and policymakers can test in their respective markets.

01

Approaches to Recruitment

- 1. Marketing messages can counteract stereotypes about coders and the culture of bootcamps.** Providers are cautious about reinforcing male and “nerdy” stereotypes around coding and computer science. When trying to recruit women, bootcamps often utilize messages that counteract traditional stereotypes and emphasize coding as a creative, collaborative skill that can help solve real-world problems.
- 2. Featuring female role models can help disrupt the notion of what a stereotypical coder looks like.** Providers profile local women in technology, as well as past and current students, especially role models who can communicate the fact that they can have both successful personal and professional lives. However, when it comes to recruitment in particular, male role models could help too if they do not reinforce the traditional stereotype.
- 3. Marketing impact can be maximized through creative approaches that leverage women's networks to encourage female applicants.** Providers are utilizing local and international groups like Google Women Tech Makers, TechWomen, Technovation or other women in technology groups to help identify potential trainees.
- 4. In settings where social norms are restrictive, providers can build family and community support early on.** Bootcamps faced with the additional complexities created by restrictive social norms attempted to navigate these by engaging women's families and communities: Programs often invite family members and influential community members to visit the bootcamp site and get to know instructors as a way of building trust.
- 5. Some providers focus on ensuring students hit the ground running, by setting clear expectations and helping beginners get up to speed through preparatory, self-guided training.** Bootcamps are providing resources and opportunities for beginners to upskill before programs, to increase accessibility.
- 6. Some providers try to reduce constraints around upfront tuition to ensure that bootcamps are more inclusive.** While this approach is likely to be good practice for both male and female participants, providers suggest that this is a critical consideration to increase the participation of women. Many programs focused on getting more women into their programs offer scholarships or give trainees the option of deferring tuition payments until they acquire a job.

02

Strategies for Inclusive Program Design

- 1. Program design can be used to alleviate upfront constraints and boost program accessibility.** Constraints include challenges around ensuring high-quality, safe and affordable care, and transportation. Some providers connect trainees to information about reliable public or private care services. Similarly, some programs subsidize travel costs for students and others are exploring on-site access to computers outside hours of instruction.
- 2. Tackling the “confidence gap” is critical.** Bootcamps are addressing challenges around self-efficacy by leveraging role models, developing structured mentorship programs (with multiple mentors, where possible), and testing peer-learning models for effectiveness in this area. Some programs also engage counselors to provide support.

3. **Socioemotional and life skills can be incorporated into bootcamp programs to better prepare trainees for the labor market.** Programs are integrating socioemotional skills that can help individuals effectively manage emotions, deal with conflict, maintain positive relationships and communicate proficiently. Some bootcamps also include a focus on life skills, especially for socially and economically marginalized young women.
4. **Some programs focus on minimizing women's risk of and exposure to sexual harassment.** A few programs seek to prevent and respond to risks around sexual harassment. Bootcamps can consider integrating a holistic approach that includes anti-sexual harassment policies, a complaints procedure, defined consequences, training and awareness-raising as well as monitoring and evaluation.
5. **Bootcamps can build a sense of community to improve retention.** Programs are exploring the extension of opening hours to create spaces for women to build inter-personal connections and establish online communities.

03

Creating Linkages to the Labor Market

1. **Modules on professional development can be included in curricula.** Programs are helping prepare trainees for the local and international labor market. These modules often include insights about the job-seeking process, cover letter and résumé writing, and interview practice. Providers can also consider including information to prepare women for risks they can face online, such as cyber violence.
2. **Providers can help women to build professional networks and showcase their new skills to potential employers.** Female students might not yet be connected to local tech communities. Furthermore, if these spaces are male-dominated, women might have a harder time breaking into "old boys' clubs" on their own. Therefore, providers host events for local women in technology, job fairs, and other career-related events to create networks and opportunities for graduates.
3. **Bootcamps can create structured linkages to internship and employment opportunities.** Support mechanisms range from a "light-touch" approach like an online job matching platform, to more structured internship and job placement programs.
4. **Support is often important even after job placement.** Providers establish mechanisms for alumnae to receive support after job placement: social media can be a cost-effective approach. Some programs also continue to provide training for graduates.

Introduction

This report provides practical insights for coding bootcamps to recruit and retain women. It complements work from the Decoding Bootcamps, a World Bank Group (WBG) initiative that aims to understand the effectiveness of bootcamps as a tool for tackling youth unemployment, especially in emerging market contexts.

Bootcamps are emerging as an approach to preparing people for the digital economy. According to the WBG's *World Development Report 2016: Digital Dividends*, digital technology is "skill-biased", meaning that it is most likely to benefit those with advanced skills, particularly those with information and communication technology (ICT) skills and higher-order cognitive and socioemotional skills.¹⁵ The *World Development Report 2019: The Changing Nature of Work* also notes that technology is shifting the types of skills needed for work, with increased demand for advanced cognitive skills, socio-emotional skills and a mix of skills that facilitate greater adaptability.¹⁶

Despite the potential of these digital skills programs to equip graduates to compete in the global digital economy, the Decoding Bootcamps initiative has shown that women often participate at significantly lower rates and when women enroll, they tend to have higher dropout rates than men.

This reflects the occupational sex segregation that limits women's employment options in the tech sector and across global labor markets more generally. Tackling this issue is a key objective of the WBG's Gender Strategy (2016-2023).

In 30 emerging economies, men are 2.7-times more likely to work in the ICT sector than women, and 7.6-times more likely to work in ICT occupations.¹⁷ Therefore, targeting women and considering ways that programs might better meet their needs can support the closing of gender gaps in economic opportunity.

The insights in this report draw on interviews with 25 coding bootcamps and 7 digital skills programs in 22 countries that were identified using a desk review as well as networks and technology-focused communities. The goal is to share ideas from practitioners around the world that are working to address these challenges. Rather than setting out a prescriptive pathway, the report provides a menu of options that providers and policymakers can test in their respective markets.

Insights from this report aim to inform the work of WBG teams that are increasingly using coding bootcamps as a tool to address youth unemployment. The goal is to fill a knowledge gap of potential ways that coding bootcamps can shift design features to make their programs more inclusive. While these insights are not at the stage of being proven solutions, the ambition is to provide a menu of options to test, adapt and refine. The hope is that these insights lay the groundwork for rigorous evaluation of the implementation of these strategies to advance knowledge in this area, especially in emerging markets. The findings may be applied beyond bootcamps to other WBG initiatives such as skills training programs, including technical and vocational training, as well as entrepreneurship accelerators.

The Decoding Bootcamps Initiative

Women Wavemakers: Practical Strategies for Recruiting and Retaining Women in Coding Bootcamps builds on three previous reports from the WBG's Decoding Bootcamps initiative.

The first report, [*Coding Bootcamps: Building Future-Proof Skills through Rapid Skills Training*](#), provides an overview of the origins, categories and main principles of coding bootcamps, with a focus on emerging economies. It also outlines the main challenges and criticisms, and provides examples of policy interventions. Six deep-dive case studies of coding bootcamps are included.¹⁸

The second report, [*Coding bootcamps for youth employment: evidence from Colombia, Lebanon, and Kenya*](#), captures findings from one of the first rigorous evaluations of coding bootcamps. Drawing on a randomized controlled trial in Medellin and qualitative results from Beirut and Nairobi, the report includes findings on employment, business creation and education. It highlights the importance of better targeting women due to their underrepresentation in these training programs. Findings from Colombia show that bootcamp participants did not report higher job satisfaction, job benefits, employment, high quality jobs, or business creation, meaning that participants' general job outcomes were not improved by bootcamp participation. There are several possible reasons for these results: It is probable that program implementation and curriculum, or treatment group identification design could have led to different outcomes than expected. The report also highlights many challenges that accompany the rigorous evaluation of coding bootcamps, especially in emerging markets.¹⁹

Lessons for future impact evaluations cover five areas: i) study design; ii) integrity of treatment and control groups; iii) delivering the intervention (including ensuring consistency across cohorts); iv) impact and results reporting; and v) scalability.²⁰

CODING BOOTCAMPS

Building Future-Proof Skills
through Rapid Skills Training



The third report in the series is intended to be a [*toolkit for practitioners*](#) and policymakers aiming to develop a bootcamp. It outlines what is needed, in terms of human capacity, financial, organizational, and communication resources, to plan, implement, monitor, and evaluate a coding bootcamp in an emerging market. It also discusses approaches designed to ensure sustainability and ownership within a local technology innovation ecosystem. Policy recommendations include: i) strengthening data collection efforts to enable evaluation of the impact of bootcamps; ii) linking bootcamps to formal education; iii) boosting access to these programs by providing funding for groups who are disproportionately excluded; and iv) leveraging public-private partnerships and networks to ensure skills are linked to labor market demands, graduates are connected to mentors, and relationships are built with potential employers.²¹

Chapter 1: Coding Bootcamps: An Overview



What are Coding Bootcamps?

Coding bootcamps, a type of rapid tech skills training program, have recently emerged as an approach to equipping individuals with the tech skills needed to effectively cope with a changing global labor market.

As “skills accelerators”, bootcamps attempt to respond to the “skills bias” of digital technologies which are most likely to benefit those with advanced tech skills and higher-order cognitive and socioemotional skills.²²

These “skills accelerators” typically have three key features: i) intensive rapid-skills training; ii) an experiential learning approach; and iii) dynamic, adaptive curricula structured around industry needs.

Many also include training in socioemotional skills like teamwork, effective communication, and adaptability, with the goal of preparing well-rounded coders for the labor market.

The two main categories of programs are: i) “ready-to-work” programs; and ii) educational programs designed to serve as an introduction to tech skills.

The term “coding bootcamp” specifically refers to the “ready-to-work” model: it is an intensive short program (usually 3-6 months) designed to provide participants with programming skills to prepare them for entry-level tech employment opportunities (see table 1).²³

Table 1: Models of Newly Emerging Tech Skills Training²⁴

Category	Bootcamp Model	Description
Professional Tech Skills <i>Preparation for entry-level tech jobs</i>	Pre-Bootcamp Model	Part-time online or in-person program providing basic digital and tech skills to prepare students for the “ready-to-work” model. The pre-bootcamp model varies in form and length and can be limited to basic digital skills or expanded to also provide basic socioemotional or life skills.
	Ready-to-Work Model (coding bootcamps)	Intensive three-to-six months full or part-time rapid skills training program that prepares people to qualify for employment shortly after the training ends.
	“Bootcamp Plus” Model	Extended training approach which includes an intense coding bootcamp and continues with practical or “on-the-job” training to equip students with a higher level of tech and socioemotional skills. In the most advanced stages, this model includes on-the-job training for two-to-four years.
Educational <i>Introduction to tech skills to potential workers or students</i>	Mini Bootcamp Model	Very short-term training programs ranging in length from two days to one month. They are typically designed to spark interest in learning the basics of programming, to recruit or identify talent, for professionals to update their skills, and for outreach and community building.
	Early Educational Model	These are efforts to trigger interest in programming at an early age. This model includes workshops, hackathons, and online platforms as well as more encompassing efforts such as schools integrating coding skills into their curriculum. Although not focused on employability in the short term, the early education model is an important trend to monitor.

Design Features & Approaches

Coding bootcamps tend to pursue a “glocalization” approach in curricula design: they create “in-house” study programs by mixing internationally recognized tech education products (for example, proprietary and free online courses, video tutorials, Massive Open Online Courses) with a curriculum responding to the needs of the local tech ecosystem and reflecting local cultural characteristics.²⁵

Players from the local tech scene—small private firms, multinational corporations, industry associations—are typically encouraged to participate in curriculum development. There are several avenues for this, including providing inputs to the content, designing projects for students or delivering talks during training.²⁶

Bootcamp providers typically select programming languages by monitoring publicly available online sources (for example, data from national statistical and labor agencies) and private market intelligence data to identify in-demand languages. Providers also engage stakeholders in the local tech sector and overseas outsourcing companies to deepen their understanding of the demand for certain skills. The frequency of curriculum reviews and adaptations varies, but typically there are more frequent changes than in traditional curricula in academia.²⁷

With respect to business models, in the USA and Canada, coding bootcamps are typically for-profit entities. The average fee charged is \$11,451, with tuition ranging from \$5,000 up to \$20,000 for a 13-week bootcamp. Providers justify high fees by noting a strong track record of placement of graduates in paid employment and the high salaries that graduates receive. Student loans are often used to cover the fees.²⁸

Rather than charging upfront tuition, some programs take a fixed percentage of graduates' post-

bootcamp salary within the first year of employment. Others use a model where partner employers are charged a fee for access to the talent pool, rather than charging tuition to students. In some ecosystems, bootcamps also partner with government to provide subsidized training to target groups, including low-income communities.²⁹

While data outside high-income markets is limited, available information indicates that programs in emerging markets span a range of business models, including social enterprises and nonprofits, in addition to for-profit programs. Both nonprofit entities and social enterprises typically receive donor support. With critical objectives around social inclusion, youth empowerment, skills training and linkages to the labor market, donor-supported programs can serve as important mediators of supply and demand in the labor market; however, they may suffer from problems surrounding longer-term sustainability.³⁰ This is an important area for further research.



Photo credit: World Bank Group, 2017. Coding bootcamps: building future-proof skills through rapid skills training. Washington, D.C.: World Bank Group.
<http://documents.worldbank.org/curated/en/795011502799283894/Coding-bootcamps-building-future-proof-skills-through-rapid-skills-training>

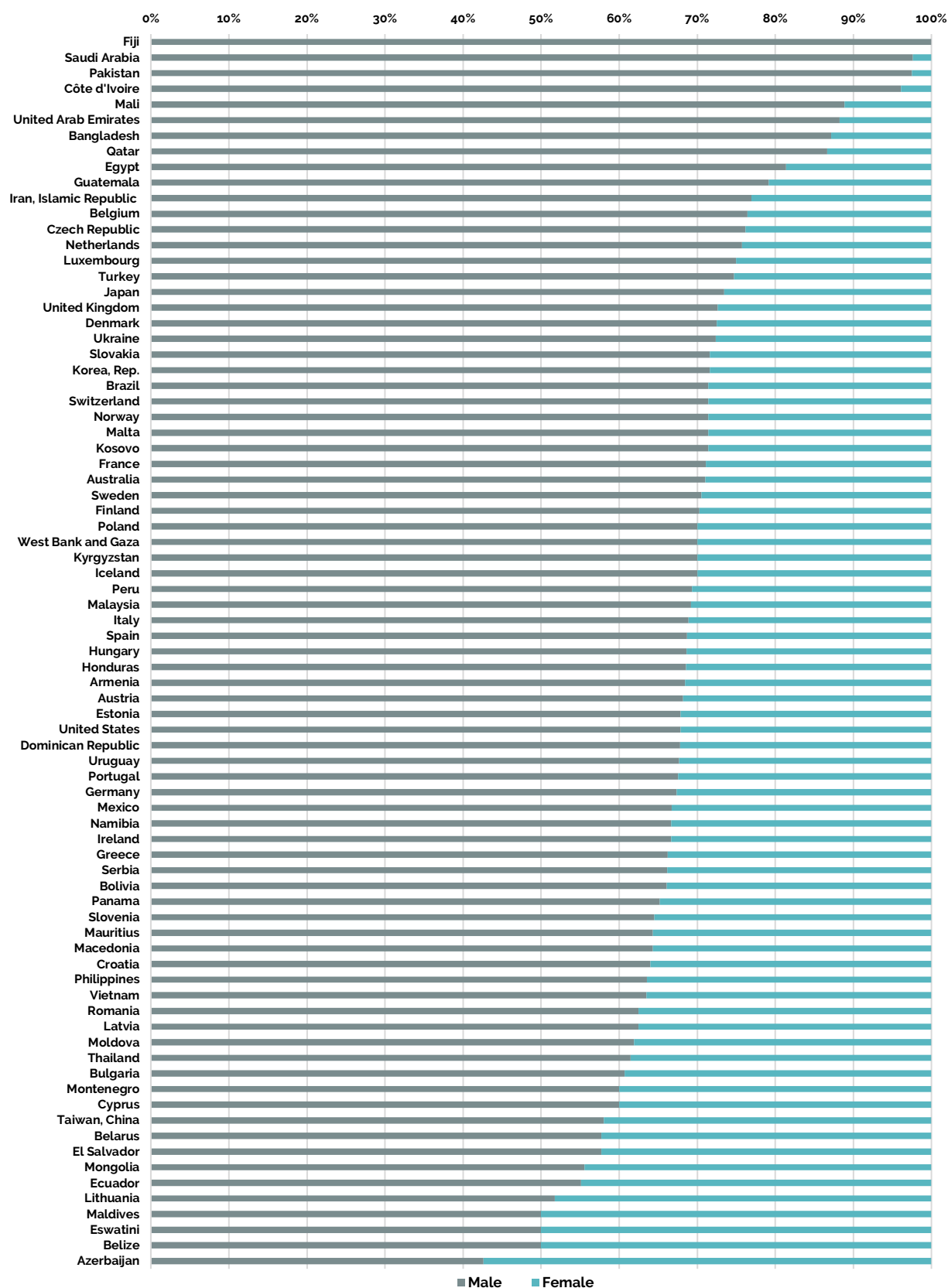
Chapter 2: Bringing a Gender Equality Lens to Coding Bootcamps

The emergence of digital technologies is disrupting global labor markets and changing the nature of work. As the digital economy continues to grow, people with expertise in technology will be in higher demand.³¹ In the United States, employment in computer and information technology related occupations is expected to grow at a rate of 13 percent between 2016 and 2026—faster than all other occupations.³² Other labor markets around the world are also experiencing strong growth. For example, in the Middle East and North Africa, the enterprise application software industry grew by seven percent in 2017.³³ Thailand's software industry has experienced estimated growth of 160 percent since 2013.³⁴



But this growth has not been equally shared between men and women. While global ICT labor market trends are difficult to establish due to the lack of a standard definition of an “ICT occupation”, available data from the International Labour Organization (ILO) indicates large gaps between men and women across many economies.³⁵ Among 80 economies, women make up 40 percent or more of the workforce in information and communication jobs in only 12.³⁶ Notably, the gender gap in information and communication careers is significant even in countries with a relatively high female labor force participation (FLFP) such as Sweden, Norway, and Switzerland. (Each has a FLFP rate higher than 60 percent, but women make up 29 percent of the information and communication jobs in each of these countries) (see figure 1).³⁷

Figure 1: Workers in Information & Communications Job by Sex (ILO, 2016)



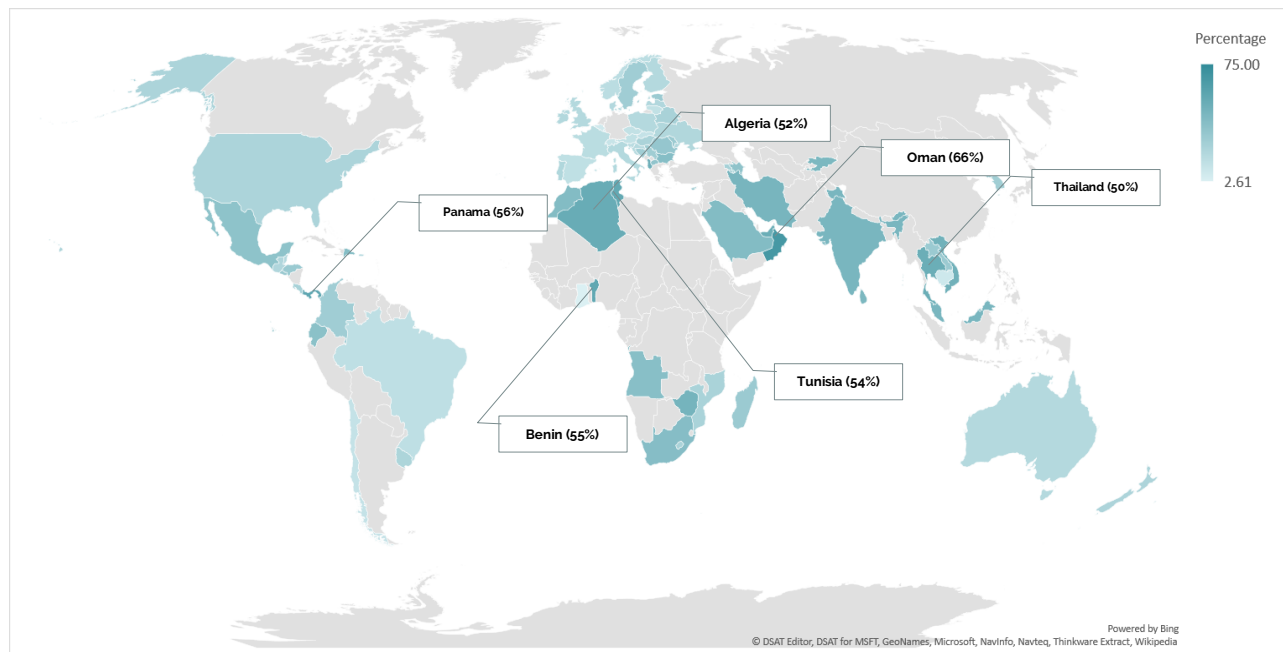
Available data also indicate that women and girls are underrepresented in ICT education.³⁸ With respect to graduation rates at the tertiary level, Oman is among the highest with 66 percent, along with Panama (56 percent), Benin (55 percent), Tunisia (54 percent), Algeria (52 percent) and Thailand (50 percent). Ghana and Cambodia are among the lowest with 3 percent and 8 percent, respectively (see figure 2).

In the USA, women account for just 18 percent of students in computer science degrees, and this figure has remained stagnant over the past decade.³⁹ Interestingly, 30 years ago, women in the USA were more likely to complete a technology-related degree than they are today. In 1984, the number of women earning degrees in computer science peaked at 37.2 percent.⁴⁰ Various studies attribute the post-1984 decline to a range of factors, including the marketing of personal computers toward men, the limited portrayal of women in technology in the media, and the lack of female role models in technology.⁴¹ A lack of exposure to computer classes prior to college may also be a contributing factor, along with limited social encouragement for girls from parents and other influential figures, including teachers and peers.⁴²

Research also highlights a gender-equality paradox in science, technology, engineering and mathematics (STEM) education: Countries with higher levels of gender equality (measured using the World Economic Forum's Global Gender Gap Index) have fewer women among STEM graduates than in less "gender-equal" countries. One explanation relates to the idea of relative strengths: Girls' best subject was reading and boys' best subject was science, meaning that even when girls outperformed boys in science, they often scored even higher in reading, therefore opening up alternative career pathways.⁴³ At the same time, boys expressed more interest and self-efficacy in science. Another explanation relates to the economic value of a STEM career as a pathway to a more secure future for women in less "gender-equal" countries. Essentially, a well-paying career in STEM often serves as an investment in a more secure future, especially in countries that have larger gender gaps across a range of domains, including economic opportunity, education, health, and political participation.⁴⁴

Although a tertiary-level education is not needed to pursue a tech career in programming, these data help illustrate the gaps.

Figure 2: Global Female Graduation Rates in ICT Tertiary Education (2015) (%)⁴⁵



The Business Case for Women in Technology

Despite educational gains for women in STEM, this has not translated into more women entering and staying in these roles, particularly in technical and leadership positions. Furthermore, women continue to face a range of barriers to their meaningful participation in the workforce. These include discrimination, harassment, lack of childcare and paid leave, and limited career development opportunities. Legal, social and cultural barriers also compound this challenge. As a result, women's economic opportunity continues to stagnate in terms of employment, asset ownership, income and skills.⁴⁶

Increasing women's participation in the labor force is of value in and of itself. Moreover, businesses, communities and economies are unable to maximize their full potential without the full participation of women. Emerging research has established the link between women's employment and positive business outcomes, such as increased productivity, retention and firm performance.⁴⁷

The business case exists for women's employment at all levels: as employees, managers and leaders. There are a host of business benefits associated with investing in women employees. These include value creation, particularly as it relates to building human capital, upgrading skills and driving productivity and quality. Another area relates to growth and resilience of firms, including through innovation and social cohesion as well as reducing vulnerability to external disruptions.⁴⁸ Research by McKinsey found that among companies that invested in attracting, retaining and developing female talent, 64 percent reported an increase in employee productivity and retention and 57 percent reported an increase in their ability to attract talent. Corporate policies focused on

women's employment and advancement can also help enhance a company's reputation and build goodwill as companies enter new markets.⁴⁹ Teams with gender diversity are often more innovative: A study of 4,277 companies in Spain found that companies with more women were more likely to introduce innovations in the market over a two-year period.⁵⁰

As managers, women play an important role in the operational performance of businesses. They also provide a pipeline of future talent at the leadership level and serve as role models for other women. However, if companies do not invest in developing and retaining female talent at this level, they often get stuck or exit the company. At higher levels of management, female representation contributes to better firm performance by motivating women at the middle-management level and improving the conduct of managers throughout the firm. The Center for Talent Innovation found that companies that leverage diversity among their workers and at the leadership-level are 45 percent more likely to have grown their market share and 70 percent more likely to have captured a new market in the previous 12 months.⁵¹

At the leadership level, the benefits of women's representation are also evident. Firms with more women in leadership roles often demonstrate better firm performance, especially during periods of economic volatility, greater ability to minimize high-risk transactions and better serve markets dominated by women. A study of 215 Fortune 500 firms found that companies with higher levels of female representation outperformed industry revenue averages by 46 percent.⁵² Companies with diverse boards often tend to generate a higher return on equity than those without.⁵³

Chapter 3: Characteristics of Participating Bootcamps

The insights in this report draw on the experiences of 25 coding bootcamps and 7 digital skills programs in 22 countries (see table 2).

These programs were identified using a desk review as well as networks and technology-focused communities. While countless digital literacy programs exist, most were outside the scope of this activity. Overall, 71 programs were identified in 28 countries. Next, interviews were conducted with a subset of these bootcamps. Twelve women-only and 13 co-ed bootcamps were interviewed (One bootcamp, She Skills (now SkillsFirst) from Pakistan, shifted its model from women-only to co-ed, during the course of writing this report) (see table 3).⁵⁴

Table 2: Participating Coding Bootcamps

Emerging or Middle-Income Economies		High-Income Economies	
Ace Hacker	Bangalore, India	23 Code Street	London, United Kingdom (with a program in India)
AkiraChix	Nairobi, Kenya	Ada Developers Academy	Seattle, Washington, United States
Andela	Lagos, Nigeria; Nairobi, Kenya; Kampala, Uganda	AdaLab	Madrid, Spain
Awele Academy's S(H)e Hacks Africa	Lagos, Nigeria	Grace Hopper Program at Fullstack Academy	New York, New York, United States
Code Astra	Hyderabad, India	Hackbright Academy	San Francisco, California, United States
Code to Inspire	Herat, Afghanistan	Israel Tech Challenge	Tel Aviv, Israel
Cymetria's NivelPRO	Bogota, Colombia	MotherCoders	San Francisco, California, United States
Hacktiv8	Jakarta, Indonesia	V School	Salt Lake City, Utah, United States (with programs in Beirut, Lebanon and Cape Coast, Ghana)
Jaaga	Bangalore, India	We Can Code IT	Columbus and Cleveland, Ohio, United States
Laboratoria	Santiago, Chile; Lima and Arequipa, Peru; Mexico City, Mexico		
Moringa School	Nairobi, Kenya		
Plataforma 5	Buenos Aires, Argentina		
SkillsFirst	Islamabad, Pakistan		
The Hacking School	Hyderabad, India		
WeThinkCode	Johannesburg, South Africa		
Women EdTech	Cotonou, Benin		

Note: Due to the dynamic nature of these programs, the information captured above is subject to change.

The following digital skills programs were interviewed: i) [Apps & Girls Foundation](#) (Tanzania); ii) [Django Girls Mombasa](#) (Kenya); iii) [Django Girls Nairobi](#) (Kenya); iv) [Girls in Tech](#) (Cameroon); v) [Girls in Tech](#) (Kenya); vi) [Pwani Teknowgalz](#) (Kenya) and vii) [Girls Develop IT](#) (USA).

Table 3: Typology & Target Demographic

Type of Bootcamp	Name	Target demographic	Length of instruction (full-time or part-time)
Ready-to-Work programs <i>Intensive three-six months full or part-time rapid skills training program that prepares people to qualify for employment shortly after the training ends.</i>	Ada Developers Academy	All-female; open to non-binary people ⁵⁵	27 weeks (FT)
	AdaLab	All-female	4 months + 6 months internship (FT)
	AkiraChix	All-female	1 year (FT)
	Code to Inspire	All-female	2 years (after-school program; 15-25 years)
	Grace Hopper Full Stack Academy	All-female	17 weeks (4-week part-time portion and remote Foundations training followed by 13-week full-time on-site training) (FT)
	Hackbright Academy	All-female	12 weeks FT (new 24-week PT program recently launched)
	Ace Hacker	Co-ed	15 weeks (FT)
	Code Astra	Co-ed	4 months (FT)
	Hacktiv8	Co-ed	12 weeks (FT)
	Israel Tech Challenge	Co-ed	3 months (FT) + two-month internship
	Jaaga	Co-ed	6 weeks (FT) and 11 weeks (PT).
	Moringa School	Co-ed	15 weeks (FT)
	Plataforma 5	Co-ed	12 weeks (FT)
	The Hacking School	Co-ed	13 weeks (FT)
	V School	Co-ed	12 weeks (FT)
	We Can Code IT	Co-ed (with a special emphasis on inclusion and diversity in tech)	14 weeks (FT) or 16-week hybrid program (online and face-to-face)
Bootcamp Plus Model <i>Extended training approach which includes an intense coding bootcamp and continues with practical or "on-the-job" training to equip students with a higher level of tech and socioemotional skills. In the most advanced stages, this model includes on-the-job training for two to four years.</i>	Laboratoria	All-female	6 months + 18 months continuing education (FT)
	Andela	Co-ed	6 months (Fellows continue training for 4 years while working for local and international companies) (FT)
	WeThinkCode	Co-ed	4-week bootcamp, then 2-year course (FT), including two 4-month internships with corporate partners.
Pre-Bootcamp <i>Part-time online or in-person program providing basic digital and tech skills to prepare students for the "Ready-to-Work" model. The Pre-bootcamp Model varies in form and length and can be limited to basic digital skills or expanded to also provide basic or life skills.</i>	23 Code Street	All-female, non-binary	12 weeks (PT)
	MotherCoders	All-female; non-binary	8 weeks (PT)
	She Skills (now SkillsFirst)	All-female*	4 weeks (PT) with blended online portions)
	Women EdTech	All-female	8 weeks (FT)
	Awele Academy's (S)He Hacks Africa	Co-ed	4 weeks (FT)
	Cymetria's NivelPRO	Co-ed	8 weeks (PT)
<i>Notes: i) Due to the dynamic nature of these programs, the information captured above is subject to change; ii) The seven digital skills programs fall under the educational model, using a combination of short workshops or courses as well as tech clubs and meetups to introduce tech skills and generate interest. *The insights presented here for She Skills reflect the design features of their all-female program. However, during the finalization of this report, the bootcamp shifted its model to a co-ed program.</i>			

In addition to the typologies listed, one emerging trend identified is that some providers are meeting a new demand for upskilling or 're-skilling'. For example, MotherCoders focuses on helping mothers upskill and re-enter the labor market in mid- or senior-level roles. And 23 Code Street focuses on instilling 'tech language' and coding skills in non-tech sector, mid-level executives so they can more effectively manage their tech teams.

Curricula and Program Design

Bootcamps offer opportunities for trainees to pursue web or mobile development. The most commonly taught languages across bootcamps are HTML (HyperText Markup Language), CSS (Cascading Style Sheets), JavaScript, followed by Python.

HTML, CSS and JavaScript are considered foundational "front-end languages"; these help manage the visual elements of a website.⁵⁶ HTML is used to create the basic structure of the content while CSS manages how these elements look—for example, controlling colors. JavaScript supports the interactivity on a webpage and helps make websites more user-friendly.

Many curricula also include Python and Django. Python is considered a "back-end language". This refers to the elements that an end user does not directly interact with, and includes databases and servers.⁵⁷ Python can be used for web development, machine learning and data science among other functions.⁵⁸ Django is an open source framework written in Python (A web framework refers to a set of

components that helps developers build websites faster: rather than starting from scratch, developers can build on ready-made components that manage elements like user authentication, among others).⁵⁹

Business Models

The bootcamps interviewed operate under both for-profit and non-profit models. Some are social enterprises (generally speaking, businesses with primarily social objectives, whose surpluses are principally reinvested).

Some programs offer tuition deferment until trainees obtain a job. To participate in Grace Hopper's Full Stack Academy for-profit program, for example, trainees pay a 15 percent deposit with the remainder of the tuition paid in nine monthly installments once trainees get a job. If graduates do not find work within one year of graduation, their deposit is refunded. The program thus shares the risk and reward of graduates' career outcomes. AdaLab (non-profit/social enterprise) similarly allows trainees to pay tuition upon graduation, and if trainees do not find work, they do not have to pay the fees. Laboratoria (non-profit social venture) collects tuition once graduates get a job.

Many bootcamps have a tuition-free model, covering costs through various partnerships, including corporate sponsors (often with potential employers) and international donors. Such programs include Ada Developers, WeThinkCode, AkiraChix and Code to Inspire, among others.

Box 1: A Note on Costs

Costs of employment-focused bootcamps vary extensively, from **tuition-free models** (e.g. AkiraChix (Kenya), WeThinkCode (South Africa), Code to Inspire (Afghanistan), Ada Developers Academy (USA)); **tuition-deferred models** (e.g. Grace Hopper Full Stack Academy (which charges \$19,610)) and more traditional **fee-based models**: Awele Academy's (S)He Hacks Africa (Nigeria) charges tuition of \$100 but offers women trainees full or partial scholarships when they receive grants; The Hacking School's (India) tuition is \$1,250 for Indian nationals and \$5,000 for non-Indians. Moringa School (Kenya) charges \$1,600 for its intensive, 'Core' program, but offers a \$200 discount to trainees that have taken the shorter, 'Prep' course. The fee for non-Kenyan students is \$3,200. 23 Code Street (United Kingdom) charges about \$2,300. In Indonesia, Hacktiv8's fees range from \$2,500 to \$2,800, with a ten-percent discount for women. Plataforma 5 (Argentina) charges students \$3,900; We Can Code IT (USA) charges \$12,000; Hackbright Academy (USA) charges \$17,000.

Course Report, a third-party resource on bootcamps founded in 2013, maintains a [list of coding bootcamp scholarship for women](https://www.coursereport.com/blog/bootcamp-scholarships-for-women-a-comprehensive-list). These range from automatic discounts for women applicants, to scholarships that range from several hundred dollars to 70 percent of tuition.

Source: Authors' analysis; <https://www.coursereport.com/blog/bootcamp-scholarships-for-women-a-comprehensive-list>

Chapter 4: Approaches to Recruitment

Challenges

Previous WBG research has shown that men are more likely to participate in coding bootcamps than women. To counteract this challenge, programs focused exclusively on women have emerged. At the same time, co-ed programs have begun to implement measures designed to increase women's participation rates.

Recruiting more women in coding bootcamps raises a set of complex issues related to the role of stereotypes, understanding what works to increase women's interest in computer science (and STEM, more broadly), as well as nuances around framing messages.

While US-centric, the stereotype of a computer programmer is salient. Coding is typically associated with the male "geek" who is seen as anti-social and independent with strong "computer ability".⁶⁰ Other research related to computer science shows that those in the field are thought of as technologically-oriented and socially awkward.⁶¹ Common associations linked to the field more broadly relate to it "requiring brilliance"⁶² and being characterized by isolation as well as a lack of communal goals like helping others and working together.⁶³



When this computer science stereotype is strong, girls tend to feel a lower sense of fit and therefore belonging. This in turn decreases their interest in enrolling in computer science courses.⁶⁴ In one experiment, researchers created two classrooms for girls 14-17 years. The first included a set of stereotypical male images, including Star Wars/Star Trek items, electronics, software, tech magazines, computer parts, video games, computer books, and science fiction books. The second was designed to be "non-stereotypical" and included nature pictures, art pictures, water bottles, pens, a coffeemaker, lamps, general magazines, and plants. Girls reported higher rates of interest in enrolling in computer science when the environment did not reinforce traditional stereotypes.⁶⁵

Highlighting role models is one strategy that can start to shift the stereotypes around computer science. With respect to attraction and recruitment specifically, role models can give a real-world understanding while sharing their experiences in the field. They can also help others to envision a future in computing.⁶⁶ In male-dominated fields, exposure to female role models also helps increase a sense of belonging and interest.⁶⁷ Many studies validate the importance of female role models for women. Role models demonstrate the kind of success that women can strive toward and show that overcoming barriers due to gender norms and stereotypes is possible. Furthermore, female role models can counteract the potential harm of "stereotype threat"—that is, a situation in which an individual worries about being judged negatively due to regressive stereotypes about her identity group.⁶⁸ When young women encounter female role models such as a female professor in STEM, they are more likely to identify with science, implicitly associate science with women more than men, and aspire to careers in STEM fields.⁶⁹ Sharing details about the professional achievements of female role models as well as information on how many are able to balance care responsibilities with work demands can also

encourage younger women to pursue study or careers in STEM fields.⁷⁰

Framing STEM as potentially communal, collaborative and creative can also help increase women's interest. Studies highlight that communal goals are valued by people in general, but especially by women.⁷¹ As a result, when STEM careers are perceived as less communal and collaborative, women's interest declines.⁷² A study on girls aged 11-18 in the US also showed that interest in design and creativity acted as a significant predictor for interest in computer science, so promoting the creative dimensions of STEM may help attract girls to these fields of study more broadly.⁷³ Other studies have also noted that women who enroll in computer science programs cite an opportunity to be creative among the reasons for their interest.⁷⁴

Strategies

The strategies bootcamps are employing are largely aligned with the existing evidence on women and girls in computer science and STEM, more broadly. Many providers are using marketing messages that actively shift the stereotype of a typical coder. Programs are depicting and leveraging female role models in their local tech ecosystems, framing coding as a collaborative activity linked to social impact, and actively and creatively working to recruit women by tapping into women's networks. Bootcamp providers are also working to build family and community support, especially in contexts with more restrictive gender and social norms, helping beginners get up to speed and finding ways to reduce constraints around upfront tuition to make programs more accessible.

Bootcamp providers are utilizing the following strategies:

1. Using marketing messages to counteract stereotypes about coders and the culture of bootcamps
 2. Featuring female role models to help disrupt the notion of what a stereotypical coder looks like
 3. Maximizing marketing impact through creative approaches and tapping into women's networks to encourage female applicants
 4. Building family and community support early on, especially in settings where social norms are restrictive
 5. Setting clear expectations beforehand and helping beginners get up to speed
 6. Considering ways to reduce constraints around upfront tuition to ensure that bootcamps are more inclusive
-

1. Using marketing messages to counteract stereotypes about coders and the culture of bootcamps

Attraction, marketing and recruitment strategies are crucial when encouraging women to enter coding bootcamps. The types of messages, ways in which messages are presented, and design choices in marketing materials can signal culture, shape interest and influence a sense of belonging.

Of course, many women will pursue a program regardless of whether they identify with the people pictured in marketing materials, but globally interviews with bootcamps validate the importance of thinking strategically about these dimensions.

Imagery that is overly combative, competitive or hyper-individualistic can discourage women from applying. Instead of inviting applicants to become "coding ninjas" or "warriors," marketing materials can emphasize the capacity of code to promote empowerment, increase incomes, and solve challenges in one's community (see figure 3).

Programs can also challenge perceptions about the competitive and individualistic culture of bootcamps by depicting coding as creative, collaborative and community-oriented. In Kenya, AkiraChix makes an effort in its marketing material to show that coding can be fun and social. It includes photos of parties and informal get-togethers throughout the course and afterwards.⁷³ Code Street in the United Kingdom found that it attracted women by marketing the program with an emphasis on a family-oriented approach and tight-knit, supportive cohorts. In the United States, MotherCoders, a program focused on helping women with children gain skills to thrive in the digital economy, emphasizes that trainees will join a community of peers who support them and have the resources to enable their success.

Many programs also try to change perceptions around barriers to entry through signaling that coding is accessible and can often be learned without prior experience. WeThinkCode, a South African program, explicitly indicates on its application that coding is open to everyone,

regardless of background: “No previous education or coding experience required. If you are between 17 and 35 years old, simply complete our online application to find out if you have the potential to become a world-class software engineer.” With programs in Nigeria, Kenya and Uganda, Andela uses open-source learning resources to help interested applicants get up to speed. The module begins with the basics that serve as an introduction to computer science.⁷⁵

Furthermore, some providers are re-framing coding as a way to make an impactful change and develop solutions, and as an opportunity to create a new future. For example, WeThinkCode markets coding as a “super-power to create what you can imagine”. This subverts the idea that coding is simply a way to make money, and presents it also as a way to develop solutions that can improve people’s lives. One of MotherCoders key target markets is the group of “entrepreneur moms”; it focuses on upskilling these women with tech skills to develop solutions and implement their start-up ideas.

Figure 3: Counteracting stereotypes through marketing messages



2. Featuring female role models to help disrupt the notion of what a stereotypical coder looks like

Communication efforts during recruitment can help disrupt the perception of coding as an isolated and masculine activity.

To counteract this view, bootcamps can leverage the “role model effect” by showcasing female coders,

including current or past students, and illustrating that they can have successful personal and professional lives. Other forms of role models, such as female coding instructors or public figures who have broken barriers in STEM could be effective.

Bootcamps that target women or those that have been trying to increase the share of women in their cohorts have started to use female role models to attract female students (see figure 4).

Figure 4: Programs are using female role models to recruit female students



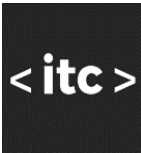
CODE TO INSPIRE leverages its female mentors as a way to overcome stereotypes and demonstrate how learning to code can empower women.



ADALAB tells the stories of women who broke barriers in the STEM field in the past (such as Ada Lovelace) during recruitment.



23 CODE STREET shares the journeys of women who came in the program as beginners, but are now instructors and mentors.



ISRAEL TECH CHALLENGE has a predominantly female program staff. The head of the program, deputy and marketing leads are women. Their application screening team is all female and half of their instructors are women.

Box 2: Women Coders: Spotlight 1



"It all began with the first computer I saw. The curiosity was enough to blow up the moon. I wondered, "How? How is this working?" That's how my love for technology was born. Before WTC (WeThinkCode) I was at Wits University studying Film and TV. The urge to solve problems in code was still there. I took the leap and today I am a WeThinkCoder. I am a young lady from the West Rand aiming to be a software engineer. I aim to be a tech entrepreneur by the end of my WTC career."

-Phumudzo Nevhutala, Coder, WeThinkCode

Some bootcamps also pay attention to other forms of representation in marketing materials. US-based programs attempt to tackle other dimensions of diversity, to reach women of color as well as the LGBTQI community. Ada Developers Academy—a Seattle-based program—notes that its mission is to diversify tech by providing women and non-binary people with the skills, experience, and community support to become professional software developers who contribute to changing the world with software. MotherCoders, a program focused on helping women with children enter the tech industry,

also highlights the importance of materials that ensure mothers and pregnant women see themselves represented in tech and feel included. It makes a particular effort to challenge the traditional bootcamp environment which may not accommodate care responsibilities or lifestyles. While targeting mothers, it openly welcomes everyone who is transgender,⁷⁶ cisgender⁷⁷ and those who were assigned female gender at birth but do not identify with the gender binary. In the United Kingdom, 23 Code Street explicitly includes in their mission and marketing materials that inclusivity and

accessibility are at the heart of everything it does. It emphasizes the importance of inclusion in tech of those that identify as women and non-binary people from all backgrounds.

3. Maximizing marketing impact through creative approaches and tapping into women's networks to encourage female applicants

Often, coding bootcamps operate as start-ups that lack specific budgets to conduct targeted marketing campaigns that could help expand their reach to potential women applicants. While dedicated resources are preferable, in their absence programs can still use creative approaches to magnify efforts. Examples of these include maximizing exposure through public relations coverage, media articles, and speaking at conferences geared toward inclusion in tech. 23 Code Street has found that public relations and media coverage has helped it achieve low-cost coverage of their program. It approached journalists who profiled the bootcamp. WeThinkCode did not have a marketing budget during its first two years of operation. However, the team behind this bootcamp leveraged personal networks to access public relations opportunities such as talk shows and media spots. They also focused on in-person outreach via events and roadshows at schools.

Another approach is to form outreach partnerships with local organizations, including those focused on increasing the share of women who participate in the local tech industry. Often, coding bootcamps lack networks that connect them to potential women applicants, making these kinds of partnerships especially helpful. For instance, Jaaga, a Bangalore-based co-ed program, reached out to creative industries outside of tech that included a larger pool of women in professions, such as design and art. It marketed coding as a way for creatives to build their portfolios and attain the technical skills needed to implement and enhance their creative visions.

Programs can also complement digital marketing with face-to-face recruitment methods. In Kenya, Moringa School has also started to use face-to-face recruitment techniques to enroll women, such as events at universities and churches hosted by current female students or mentors. Next, Moringa used techniques including leveraging "influencers" during recruitment (other women in the tech ecosystem) and hosting hackathons (potentially women-only) to boost women's exposure to coding. The marketing team at Andela also found offline channels to be effective, especially advertisements at malls and universities. They also partnered with Google's Women Techmakers and AkiraChix to get the word out.

Box 3: Women Coders: Spotlight 2



"I am a Lesotho born lady, mother of two who now lives in South Africa. I studied Bsc. Biology and Chemistry at the National University of Lesotho(NUL) and could not complete my studies. Came to SA and studied Mine Survey(certificat) and did not get far with it, and became a stay at home mom after all those years of studying. I then heard about MOOV(Massive Open Online Varsity) and went to study web development, that when I found out about WeThinkCode_ and coding. At first, I did not know what coding is, so I had to go and do my research and became interested, decided to write online tests and passed, came to bootcamp and that's when I develop the passion for coding. Being part of the revolution, the future and the ability to test and push one's boundaries is what I love about technology and wish to be the best female coder there is."

- Senaki Sekese, Coder, WeThinkCode

4. Building family and community support early on, especially in settings where social norms are restrictive

In many contexts, particularly those with restrictive gender and social norms, building family and community support are critical enabling factors to women's enrollment.

Challenges around women's mobility and decision-making emerged as a prominent theme in countries with more restrictive gender norms. In some contexts, women required permission from spouses or male family members to participate in bootcamps. Expectations around marriage and the ways in which these norms may conflict with economic and educational activities also posed a challenge for some programs that wanted to enroll and support women. In these cases, the concern about a woman's high earning potential after the bootcamp was perceived as a negative outcome, which might affect her "marriage potential" and take time away from care and domestic responsibilities.

Bootcamps faced with these additional complexities attempted to navigate them by engaging women's families. Where safety was the main concern, programs often invited family members and influential community members to visit the bootcamp site and get to know instructors as a way of building trust. In Afghanistan, Code to Inspire occasionally hosts open houses, where students' families can visit the space, see the projects that students are working on, and speak with instructors. Students report feeling more supported after their families see their learning environment and observe their progress themselves. Ace Hacker includes family members in their outreach efforts. It also provides women-only accommodations that are walking distance from classes, along with 24-hour women-only security guards and a live-in "house mother".

5. Setting clear expectations beforehand and helping beginners get up to speed

While this may seem obvious—and is best practice for male or female clients across any kind of program—providers stress the importance of setting clear expectations about the demanding nature of many bootcamps.

For instance, at AdaLab, attrition rates were linked to a mismatch in expectations about time and commitment. Learning from this, it now makes a concerted effort to set expectations early on. AkiraChix uses a "welcome handbook"—also serving as a code of conduct—to outline course expectations, processes for maintaining quality, and resources for additional support.

Providing resources and opportunities for beginners to upskill before joining a bootcamp can increase program accessibility. Some programs incorporate a preparatory period prior to coursework. The Grace Hopper Program at Full Stack Academy asks beginners to get up to speed with a two-week prep program prior to the core courses. They also host a regular coding night for beginners to build a community of women that are exploring and just starting in the industry. Awele Academy's (S)He Hacks Africa provides a three-day prep course for participants to ensure that everyone begins at the same starting point.

6. Considering ways to reduce constraints around upfront tuition to ensure that bootcamps are more inclusive

To alleviate constraints around what is often the prohibitive costs of many bootcamps, some programs have started to explore creative ways of increasing access for low-income/income diverse applicants. While this approach is likely to be good practice for both male and female participants, providers suggest that this is a critical consideration to increase the participation of women.

Many programs focused on getting more women into their programs offer scholarships or give trainees the option of deferring their tuition payments until they acquire a job. However, these programs are often tremendously competitive: Laboratoria, boasts an acceptance rate of 9 percent.⁷⁸ Trainees pay for the program after graduation and only if they get a job. At Andela, which is harder to get into than Harvard College, fellows do not pay tuition during their 6-month training period. Fellows then transition to working for local and international companies, where they receive a salary and have the option of on-site accommodations. The Grace Hopper Program provides deferred tuition payment for students until they have been hired. This has helped alleviate the

upfront investment by women and also reassures them that the program will support them when transitioning to the labor market. Hacktiv8 provides a tuition deferment option and offers a money-back guarantee if trainees do not find a job within four months. MotherCoders offers a subsidized tuition model including childcare options facilitated by donor contributions. It is important to note that many of these programs often receive donor support and have challenges around sustainability.

Beyond recruitment strategies that aim to shift perceptions around coding and center on women's networks, programs emphasize the importance of building the pipeline of talent from early on. In fact,

girls' interest in mathematics and science tends to decline during adolescence.⁷⁹

AkiraChix offers a co-ed Kids Tech Camp focused on game development and arts for children ages 5-11. It also hosts a bootcamp for high schoolers aged 12-17 that teaches Python. In Lagos, Awele Academy's (S)He Hacks Africa runs programs for girls in secondary school (11-17 years) designed to give them information about the range of career opportunities in technology and start to build their confidence. WeThinkCode partners with local organizations focused on girls in tech in order to spark their interest in the field and introduces alumnae as example role models of women in tech.

Box 4: Technovation: Working to Build the Pipeline of Women in Technology⁸⁰



Technovation is the world's largest technology entrepreneurship program for girls aged 10-18. It runs across 100+ countries, supported by the United Nations Educational, Scientific and Cultural Organization, Peace Corps and UN Women. Through Technovation, girls work with women mentors, identify a community problem that could be addressed with technology, develop a mobile app, and launch a start-up.

Developed in 2010 in response to the decrease in the number of women entering the field of computer science over the past 30 years, Technovation enables girls to learn how to create technological solutions to problems around them.

Over the past eight years, about 18,000 girls have developed mobile apps and start-ups to solve diverse challenges, including food waste, nutrition, and women's safety issues. After participating in the program, 78 percent of students reported being more interested in computer science, 70 percent were more interested in entrepreneurship, and 67 percent were more interested in business leadership. Furthermore, 58 percent of alumnae enroll subsequently in computer science courses. As just 26 percent of alumnae in college major in computer science subjects. This is 65-times the US national rate of 0.4 percent of female college students majoring in computer science.

Each summer, the top-12 finalist Technovation teams are flown to San Francisco to celebrate their accomplishments, tour technology companies, network, and share their ideas. In 2017, Technovation hosted girls from Kazakhstan, India, Kenya, Cambodia and the USA. Their apps included:

- Cambodia Identity Product aims to share information about traditional, handmade Cambodia products, such as kroma. Its goal is to reduce rural poverty and preserve Cambodian culture by better connecting artisans to potential customers.
- iCut tackles female genital mutilation in Kenya by providing a platform to report cases and support survivors.
- 4Refugee helps connect refugees in the USA to jobs, transportation and food. It supports their integration in host communities by placing them with local families for US holidays such as Thanksgiving.



Insights for Implementation

Role Models During Recruitment: Does Gender Matter?

To enhance the effectiveness of strategies to recruit more women, bootcamp providers can build on empirical findings showing that both female and male role models can be effective specifically for recruitment (as opposed to retention), provided they do not reinforce traditional stereotypes about computer science.⁸¹

During recruitment, a perception of relatability could be more important than the sex of the recruiter.⁸² This suggests that men could be used as role models, provided they do not reinforce traditional stereotypes about computer science. However, it is important to note that this study is largely based on US experience and therefore there are limits in knowledge regarding its global applicability.

Researchers can work to fill this evidence gap to provide a better understanding of what works around the world for a wider cross-section of women and girls, taking an intersectional approach that covers multiple races, ethnicities, income-levels, and other dimensions.

Chapter 4 Summary

RECRUITMENT: Ideas from Providers

1. **Use marketing messages to counteract stereotypes about coders and the culture of bootcamps.** Some providers are cautious about reinforcing the male and "nerdy" stereotype around coding and computer science. Instead, when trying to recruit women, bootcamps often utilize messages that counteract traditional stereotypes and emphasize coding as a creative, collaborative skill that can help solve real-world problems.
2. **Feature female role models to help disrupt the notion of what a stereotypical coder looks like.** Providers are profiling local women in technology, as well as past and current students, especially role models who can communicate the fact that they can have both successful personal and professional lives. However, when it comes to recruitment, male role models could help too once they do not reinforce the traditional stereotype.
3. **Maximize marketing impact through creative approaches and leverage into women's networks to encourage female applicants.** Programs are leveraging local and international groups like Google Women Tech Makers, TechWomen, Technovation or other women in technology groups to help identify potential trainees.
4. **Build family and community support early on, especially in settings where social norms are restrictive.** Bootcamps faced with these additional complexities attempted to navigate them by engaging women's families and communities: Programs often invited family members and influential community members to visit the bootcamp site and get to know instructors as a way of building trust.
5. **Set clear expectations beforehand and helping beginners get up to speed through preparatory, self-guiding training.** Bootcamps are providing resources and opportunities for beginners to upskill beforehand to increase program accessibility.
6. **Consider ways to reduce constraints around upfront tuition to ensure that bootcamps are more inclusive.** While this approach is likely to be good practice for both male and female participants, providers suggest that this is a critical consideration to increase the participation of women. Many programs focused on getting more women into their programs offer scholarships or give trainees the option of deferring their tuition payments until they acquire a job.

Chapter 5: Strategies for Inclusive Program Design

Challenges

A range of constraints can limit women's participation and retention in coding bootcamps. These can include constraints related to care, a lack of safe transport or time. Traditionally, women often bear the responsibility of caring for children, the sick or the elderly. The care needs of others can limit women's ability to engage in economic activities and skills-building programs, like intensive coding bootcamps. Almost one in 10 of the world's population (679 million) are under five years old and in need of care. Yet, childcare remains scarce, especially for children under three years old.⁸³

While focused on employers, the IFC's *Tackling Childcare, the Business Case for Employer-Supported Childcare* report holds important findings on the business case for childcare. These kinds of services are linked to a range of benefits, including more inclusive recruitment, retention, productivity gains, workforce diversity and access to markets. For example, in the tech sector, Akamai (US-based) and Mindtree (India) found that offering childcare enabled them to recruit and retain highly qualified software engineers. Childcare also helped reduce employee turnover by one third at Nalt Enterprise (a textile producer in Vietnam) and by 15 percent at Martur (a car component producer in Turkey).⁸⁴

Safe, accessible and affordable transportation could affect women's retention in coding bootcamps. Women are more willing to use transportation services that are clean and comfortable. Moreover, safety is a critical factor, along with efficient routes that can help women manage their household responsibilities, where relevant.⁸⁵

A limited sense of self-efficacy could also play a role in whether or not a woman persists in a coding bootcamp. This also emerges as a recurrent theme when trying to address the underrepresentation of women and girls in STEM, more broadly. Self-efficacy refers to an individual's judgment of his or her abilities to accomplish a specific task. It also not

the skills *per se* that one possesses, but rather one's view of what one can do with the skills she or he has.⁸⁶ While women and girls possess equal abilities—data overwhelming shows that gender differences in mathematics and science performance have converged or closed⁸⁷—they tend to underestimate their capabilities.⁸⁸ This is due in part to internalized perceptions about their math and science competence.⁸⁹ For instance, in engineering, researchers found men to have higher measures of self-efficacy than women.⁹⁰ A study among tertiary-level students in the United States on mathematics found that, after controlling for student preparedness, career intentions, instruction and institution, women were 1.5 times more likely to switch out of calculus—a prerequisite for a STEM career—than men.⁹¹ However, in some cases, challenges around women's attrition in STEM has been linked to low sense of professional role confidence (individuals' confidence in their ability to successfully fulfil the roles, competencies and identity features of a profession), rather than a negative sense of self-efficacy in mathematics.⁹² Other factors often influence a sense of self-efficacy, such as a sense of belonging. A study focused on women's representation in mathematics found that a feeling of membership and acceptance in this field acts a critical driver of the gender gap.⁹³

As in recruitment, female role models can play a key role *during* programs, to reduce stereotype threat and boost self-efficacy. While both female and male role models may be effective during recruitment, *female role models* are especially critical during courses and training programs. Research suggests that this difference is due to the stronger roles of regressive stereotypes with respect to women in STEM that might emerge during the program.⁹⁴ Negative stereotypes may reduce feelings of belonging and limit women and girls' expectations of success.⁹⁵ Exposure to female role models in these instances can limit the impact of stereotype threat, protect their performance and improve implicit

associations with STEM.⁹⁶ In engineering, increased exposure to female engineers who shared information about their personal and professional lives, helped change misconceptions about women in the field.⁹⁷

Another approach to reducing attrition and increasing self-efficacy is mentoring. Mentoring can be defined as “a developmental relationship between a more experienced person (i.e., the mentor) and a less experienced person (i.e., the protégé), where the mentor’s aim is to support the protégé’s professional development and socialization into the profession.” Mentoring relationships can be formed through formal programs or informally.⁹⁸ Research specific to tertiary-level mentoring programs characterizes mentoring as having several functions, including psychosocial support (i.e., counseling, guidance, and encouragement) and instrumental support, like skills development.⁹⁹ Mentoring can also include a dimension of role modelling where mentors serve as a source of inspiration as well as knowledge around what is needed to succeed.¹⁰⁰

While sex-disaggregated evidence on mentoring is limited, the research that does exist highlights the importance of having not one but several mentors, for women in particular, who then provide linkages to broader networks. In addition to female role models, having female mentors is especially important for women in STEM.¹⁰¹ A 2017 study showed that a formal mentoring programs (participants were invited to a weekend workshop, had access to an online peer support community, and were connected to female mentors in science, such as faculty, postdoctoral researchers, graduate students or professional scientists) had beneficial effects on interest, intentions to continue in the field as well as identification with science. Mentees were also more likely to have multiple mentors as opposed to just one.¹⁰² The WBG has also found that in some male-dominated professions, male mentorship is especially effective. The Africa Gender Innovation Lab (GIL) has explored “crossovers”—that is, women crossing over into male-dominated sectors, such as metalworking. The GIL finds that, in Ethiopia and Uganda, crossing over is more profitable for women, helping close gaps between males and females, due in part, to the role of information as well as male mentorship.¹⁰³

Sexual harassment has also emerged as a critical challenge that programs can take steps to prevent, identify, address, mitigate and monitor.¹⁰⁴ Sexual harassment is defined as “unwelcome sexual advances, requests for sexual favors, and other verbal or physical conduct of a sexual nature...”¹⁰⁵ Although targeted to companies, the IFC’s *She Works: Putting Gender-Smart Commitments into Practice in the Workplace* holds valuable lessons that bootcamps could integrate into their programs. Sexual harassment can decrease motivation and morale, compromise teamwork and increase stress.¹⁰⁶ To minimize these risks, *She Works* recommends: i) developing a clearly defined and strongly worded anti-sexual harassment policy; ii) developing a complaints procedure that is fair (provides both the complainant and the respondent an opportunity to present their version of events), confidential, transparent, accessible and efficient; iii) defining consequences and remediation, including a requirement to attend sexual harassment training, mediation, or disciplinary action; iv) training and awareness-raising for staff at all levels to recognize, prevent, manage and mitigate harassment; and v) monitoring and evaluate policies, measures and mechanisms to ensure continued effectiveness.¹⁰⁷

Strategies

Thoughtful design can help women stay in the program and thrive. Providers can mitigate the constraints that reduce the participation and retention of women in rapid tech skills training programs, like care and transportation. Among the programs interviewed, women-only programs are more likely to address these issues. Other approaches used by women-only programs aim to encourage a sense of self-efficacy through leveraging role models and mentors, using collaborative, create, peer-learning to build confidence and engaging a counselor to provide support. Women-only programs are also starting to explore ways to prevent and respond to sexual harassment in the broader tech community. Many co-ed programs have made an effort to create an inclusive culture and have made explicit efforts to recruit and retain women, with positive results. Community-building activities are also being used to prevent attrition by both types of programs.

Bootcamp providers are utilizing the following strategies:

1. Considering ways to alleviate other forms of constraints, including challenges around quality, safe and affordable care and transportation services
 2. Tackling the “confidence gap”
 3. Incorporating socioemotional and life skills
 4. Minimizing women's risk of and exposure to sexual harassment
 5. Using bootcamps to build community to improve retention
-

1. Considering ways to alleviate other forms of constraints, including challenges around quality, safe and affordable care and transportation services

a. Taking care needs into account when designing programs

Depending on the age group and profile of potential female trainees, care responsibilities may emerge as a constraint for some. Bootcamp providers can take childcare needs into account in different ways, including through identifying nearby public facilities or by providing on-site crèches. Laboratoria realized it lacked the resources to provide childcare services to mothers. Instead, it connected mothers with government-provided childcare services in Chile.

Students reported feeling more comfortable knowing they could fulfill family responsibilities while attending the bootcamp. MotherCoders provides on-site childcare throughout its program. In addition, tuition—which is already subsidized by donor contributions—is subsidized further to pay for on-site childcare. (The six-week program costs \$4,000, or \$4,500 with on-site childcare) (see box 5). Lunch is included in each class session so mothers can maximize time in the classroom. The per student cost for delivering the program is \$8,377. MotherCoders depends on a community of donors to meet the funding gap. WeThinkCode recognizes that many of the women in its program have childcare demands. It is exploring offering potential daycare options close to its campus in collaboration with other organizations and businesses co-located in the Cape Town waterfront area.

Box 5: MotherCoders¹⁰⁸

MotherCoders in San Francisco is a 9-week, part-time technology program for women with tertiary degrees and work experience. It includes on-site childcare, as well as community events and workshops. The program views mothers as an under-utilized talent pool that can update their technical skills to participate in the innovation economy.

Using a combination of reading materials, online and in-class coding exercises, and classroom workshops and lectures, MotherCoders teaches participants basic skills in web and user experience design, enabling them to build a simple website using HTML, CSS, and JavaScript.

The program prioritizes frontend development as a way to demystify the coding process and help trainees gain confidence in their own ability to succeed. One-third of graduates go on to learn more advanced programming languages. The program also provides an overview of the technology industry, and works to build peer and industry networks.

Depending on the childcare site, the program provides care for children ages 3-36 months, 5-14 years, or youths aged 14-years and up. The childcare is based on the needs of each cohort of participants. MotherCoders charges students \$4,500 with childcare or \$4,000 without. The actual cost to the organization is \$8,377 per participant, but donor support fills the gap.

Box 6: Spotlight on Graduates from MotherCoders¹⁰⁹



Prisca Ekkens

Class of Fall 2014

Visual Designer, Health Fidelity

Technical Skills: HTML/CSS, Bootstrap, Swift, User Experience/User Interface

Prior to MotherCoders, Prisca was a visual designer working full-time in the biotech industry. After falling in love with code, Prisca went on to complete CodePath's iOS bootcamp while still working full-time. Her combination of design and programming skills helped her fully transition into UX design at a health-tech start-up.



Johanna Silva Waki

Class of Spring 2014

Regional Director, EMILY's List

Prior to MotherCoders, Johanna was the principal of a PR & Communications consultancy. After getting a confidence boost from developing marketable tech skills, she went after her dream job, where her responsibilities include using her UX skills to help political candidates build better websites—a must-have in today's competitive media landscape.



Margaret Lee

Class of Summer 2016

Founder, Stealth Mobile App

Technical Skills: HTML/CSS, JavaScript, Swift

Prior to MotherCoders, Margaret had worked as a marketing director in the gaming industry before pausing her career for motherhood. Since completing our program, Margaret's gone on to build a prototype of a mobile app aimed at parents.

b. Subsidizing travel costs for low-income students on a case-by-case basis

Bootcamps are realizing that travel costs can also act as a constraint to students' participation and retention. Considering ways to minimize transportation costs are likely to be good practice for boosting inclusion overall, but may be especially important for low-income women with limited access to or control over financial resources.

Cymetria was unable to provide financial support to subsidize travel costs, and several women dropped out of its bootcamp because they did not have enough money to travel to the location each day.

Ada Developers Academy and Laboratoria (Chile) both subsidize transport: Ada provides public transportation passes to low-income students on a need-basis, while Laboratoria provides students in

Santiago a charge card that can be used on local transit services.

WeThinkCode also provides a daily transport stipend, after realizing that one of the biggest barriers for women was the cost of transportation to campus. It also provides a subsidized accommodation option.

c. Taking different approaches to program flexibility

Some bootcamps argue that making programs flexible would be a disservice to students who need to be prepared for highly competitive and demanding jobs in the local or international tech sector. However, others see flexibility as central to their ability to attract and retain women. Providers that have started to offer training beyond the traditional full-time model (for example, part time, evening or weekend classes, or self-paced online courses) report higher numbers of women

participants and better retention. However, the longer-term impacts are not yet known.

MotherCoders provides classes on weekends and weekdays—the latter are aligned with the times children are at school to accommodate mothers' schedules. We Can Code IT allows students flexible start and end times as needed. This has allowed trainees to take care of dependents and complete assignments remotely. We Can Code IT has a hybrid program that combines online and face-to-face training. Trainees receive access to 20-25 hours' worth of foundational material and also work on team assignments in-person for two weeks per month. 23 Code Street offers part-time programs two nights a week for beginners. Ace Hacker will begin offering a revised schedule to better accommodate women: Instead of 12-hour days, it will have 8-hour days ending at 6:00pm, to allow time for women to safely return home. Plataforma 5 plans to provide part-time programs, which have been in demand. And Jaaga previously provided a year-long coding bootcamp held at remote farm, but has now started to offer city locations that are more accessible for women. It is also exploring restructuring its program to provide part-time, evening and self-paced programs that better fit the needs of women.

d. Providing students with access to computers and access to the bootcamp site outside hours of instruction

Providing students with laptops could make bootcamps more inclusive for both women and men. Andela provides fellows with laptops when they enter the program. While this approach is expensive and may not be feasible for all programs, other approaches like providing flexible hours of access to the bootcamp site if programs use desktops could help low-income students who may not have access to computers or the internet at home to complete coursework. This could facilitate peer-learning and encourage collective problem-solving. 23 Code Street provides after-hour access so students and alums can utilize meeting rooms, technology and resources. Laboratoria, SkillsFirst and Code to Inspire have received requests from students and are currently exploring sustainable ways to provide more access to students.

2. Tackling the “confidence gap”

Bootcamp providers report that female students often drop out due to a lack of confidence despite objective metrics demonstrating high performance. While there is no silver bullet, programs have been trying a range of strategies to tackle this issue. These include drawing on female role models during the bootcamp and providing validation by showcasing their trainees' skills and achievements. Programs have also found that providing access to counselors and hiring female instructors are particularly effective.

a. Drawing on role models—again.

Female role models (i.e. instructors, professional mentors, or women leaders in the local tech ecosystem) can combat regressive stereotypes about women's capacity to acquire skills and thrive. While this approach relies on sufficient women in the tech ecosystem, in instances where this is not the case, some programs have invited women leaders across other industries to mentor and speak with students.

In various bootcamps, incorporating female mentors emerged as the main strategy for not only helping women to build their confidence, but also to connect them to women's networks and provide professional development support. Women's networks can connect trainees to job opportunities, share first-hand experiences of their experience working in tech, and also fight stereotype threat. AdaLab has 50 mentors who serve as role models and help female students understand that there is space and opportunity in the technology sector for them. Other programs—usually all-female—including Code to Inspire and AkiraChix use this approach as well. Hackbright Academy has a structured mentorship program, with each student assigned up to three mentors (both male and female). Mentors meet mentees once per week for one hour. They also provide informational interviews, as well as access to their networks. Other programs incorporate learning and leadership events where students can meet local women in tech and get a first-hand understanding of their experience in the industry. WeThinkCode hosts regular breakfast networking session with women in tech which facilitates connections and organically develop mentorship relationships.

b. Using peer-learning models with mechanisms for frequent feedback, to build women's sense of self-efficacy

Studies have shown that collaborative, creative and hands-on learning works best when teaching girls STEM subjects.¹¹⁰ In general, active learning—aiming to engage students through activities, promoting higher-order thinking and group work—has also been shown to improve scores in science, engineering, and mathematics.¹¹¹

Collaborative work is a key characteristic of rapid skills training programs; however, all-female programs suggest that working in groups has also been effective in boosting the confidence of their female students.



Each day at AdaLab, students have two hours of instruction followed by group work. Groups are changed every three weeks, and there are individual and group assignments. Over three months, students reported feeling more confident after working with their peers to complete projects. Laboratoria has adopted the *Agile* approach to help students work more effectively in teams, improve their communication skills and reflect on their learning progress as a group (see box 7). Group work can also build women's networks and build a tight-knit community that can provide a sense of support for students.

23 Code Street creates a focus on developing cohorts that are like a “family support” system within the program. To build relationships, it hosts lectures over meals and in familiar social settings, allowing women themselves to develop a support network. In addition, the staff reach out to each student to help them reach their individual goals. AkiraChix conducts student group mentorship around key challenges and challenges affecting women, which often

overlap with challenges faced by other women in the program (see box 8 for more on AkiraChix).

Bootcamps also try to incorporate frequent feedback mechanisms for assignments. Providers report that social reinforcement and constructive feedback from peers and instructors boosts self-confidence. Project critiques create an opportunity for female students to give and receive constructive feedback, increasing self-confidence. In addition to dedicating one day per week to socioemotional skills training, AdaLab incorporates socioemotional skills training into its assignments. There are mandatory presentations at the end of every three-week project, which are evaluated based on structure, delivery, time management, and audience connection. Presentations intrinsically build teamwork and communication skills, and allow students to provide each other with feedback. Laboratoria is developing a learning management system (LMS) so that students can practice more at home. The LMS will also allow students to measure their progress and complete practice exercises. These features are inspired by Khan Academy tutorials and videos.

c. Engaging counselors to provide psychological support

Counselors can help students manage stress that might impact their course performance. Laboratoria has two psychologists to tackle issues around self-efficacy and provide mental health support for students who are dealing with stress or personal issues (such as intimate partner violence). WeThinkCode has developed a partnership with an organization that provides mental health support for their students. This has enabled students to manage work demands along with other pressures in their personal lives. In addition, WeThinkCode's Talent Manager has a psychology background and is able to provide on-the-spot support. Hacktiv8 provides a counselor for students, both male and female, it has improved students' confidence.

Programs also try to set a dedicated time for students to express difficulties with coursework. Providers report that low self-confidence manifests itself through a reluctance to speak in class, including asking or answering questions. Having a dedicated time during class for women to speak to and in front of their peers intrinsically builds self-confidence, helps women relate to each other and sharpens public-speaking skills. In addition to

Laboratoria, We Can Code IT also has “stand-ups” at the beginning and end of each day, where students check-in with each other and expresses challenges they have experienced with coursework. This helps cohorts build trust and become closer with each other.

Implicit biases among instructors in ways that perpetuate misconceptions about women’s abilities in STEM may also play a role in decreasing women’s self-confidence. This is a critical area for further research.

3. Incorporating socioemotional and life skills

Socioemotional skills refer to social, emotional, behavioral, attitudinal and personality traits that enable individuals to effectively manage their emotions, deal with conflict, and maintain positive relationships among a host of other factors.¹¹² The term is often used interchangeably with soft skills and non-cognitive skills. Life skills often include a focus on personal agency and development (e.g., decision-making, self-awareness, self-esteem building and conflict resolution) along with cognitive and interpersonal skills (see box 9).¹¹³

Socioemotional skills have been positive linked to educational and labor market outcomes.¹¹⁴ Coding bootcamps already incorporate a focus on these skills as a part of their programs. Many focus on collaboration, teamwork and communication skills to complement technical coding skills and provide trainees with a well-rounded set of competencies for the labor market.¹¹⁵

The World Bank Group’s Adolescent Girls Initiative (AGI) highlights the role socioemotional skills might play in helping adolescent girls transition from school to productive employment. The AGI incorporated a focus on “life skills”, specifically: i) decision-making (e.g. critical and creative thinking, and problem solving); ii) community living (e.g. effective communication, resisting peer pressure, building healthy relationships, and conflict resolution); iii) personal awareness and management (self-awareness, self-esteem, managing emotions, assertiveness, stress management, and sexual and

reproductive health behaviors and attitudes). In Nepal and Lao PDR, the program had positive outcomes, with young women reporting greater economic power, agency, and job acquisition.¹¹⁶

Lessons from the AGI help make the case for the importance of socioemotional and life skills for young women, especially those who might be experiencing higher levels of vulnerability. AkiraChix, which targets young women from low-income backgrounds takes the life skills approach in its curriculum. Due to the needs of the young women entering the program, it also openly addresses issues around safe sex, drugs and alcohol. Programs like Andela, Moringa and 23 Code Street, among others, place a strong emphasis on providing socioemotional skills for developers. The Grace Hopper Program provides regular discussions on “imposter syndrome”—the internal experience of phoniness or lack of intelligence despite outstanding academic and professional achievements proving otherwise.¹¹⁷ The program openly addresses the frequency of these thoughts and provides tactics on how they can be controlled.

4. Minimizing women’s risk of and exposure to sexual harassment

Women experience increased risk of and exposure to sexual harassment. This has multiple implications for female students’ performance during coding bootcamps, including lowering self-confidence, inhibiting women’s ability to safely travel to/from the program site, and attend networking and other technology events.

Some of the coding bootcamps describes sexual harassment of women as prevalent. Many of the places for girls and women (particularly low-income girls and women) to access computers are at cyber cafes. These are usually male-dominated, and many girls and women feel unsafe because of the risk of harassment. Ace Hacker therefore provides accommodation arrangements specific to the needs of women participants. This includes women-only dorms, walkable to coding classes, 24-hour women-only security guards, and a live-in “house mother” around-the-clock.

Box 7: Agile at Laboratoria¹¹⁸



RUNNING SPRINTS, NOT MARATHONS



Following the Agile approach, Laboratoria runs “learning sprints” that allow for shorter feedback loops. A Learning Sprint is a time-bound effort (usually 2 to 3 weeks) in which students commit to achieving certain learning outcomes. Each Sprint starts with a Sprint Planning Meeting, where students plan ahead and identify the amount of effort to complete the goals. Each Sprint ends with a Sprint Retrospective, in which students reflect on the work carried out, identify lessons learned and determine areas for improvement.

LEARNING SQUADS



A Learning Squad—a group of 6-to-8 students—is formed to complete the Learning Sprint. The goal is to promote teamwork and collaboration. Learning Sprints have both individual and team goals to encourage a focus on not only their own learning but also their teammate's advancement. Every Squad has a coach. Following the Agile principle of “close, daily cooperation between business people and developers”, the Squad meets daily with its coach to perform a Daily Standup where students reflect on what they have accomplished, what they hope to accomplish, as well as potential obstacles. At the end of each Sprint, a new Squad is formed, which helps to build new working relationships.

GAMIFYING EDUCATION



Instead of having a traditional grading system, Laboratoria has a points-and-reward system. Students start at zero points and earn points as they go. Students are awarded points for effort, performance (like solving problem sets), and outstanding behavior (like teamwork and communication). They have also built in incentives to foster collaboration, with prizes awarded for both individual and group achievements.

Box 8: AkiraChix: Developing the Workforce of Women in Technology in Kenya



AkiraChix targets bright and promising young women from low income areas for twelve months of intensive training in programming, graphic design and entrepreneurship. Since 2010, 61 young women have undertaken the intensive diploma course in Information Technology and Entrepreneurship. AkiraChix places a strong emphasis on personalized interventions and holistic support. The program conducts monthly trainer meetings to enable the early identification of students that need extra help, and creates interventions for trainers to support them. AkiraChix also hosts overnight weekend camps for women to discuss life challenges, because the program has found that personal situations greatly affect students' class performance. The camp aims to provide students with a relaxed and safe environment to build relationships with each other.

Box 9: Defining Socioemotional Skills¹⁹

A WBG book, *Taking Stock of Programs to Develop Socioemotional Skills: A Systematic Review of Program Evidence*, outlines the varying, and often overlapping, definitions that refer to the broad concept of socioemotional skills:

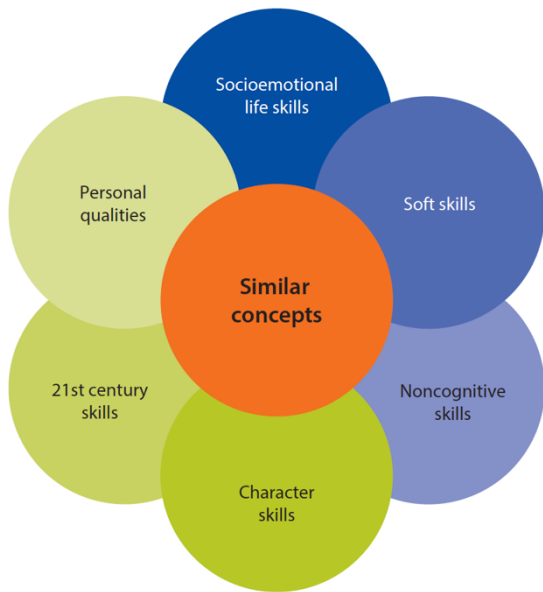
"Socioemotional skills", often found in psychological literature, describe the social, emotional, behavioral, attitudinal and personality traits that enable individuals manage their emotions, deal with conflict, set and achieve positive goals and solve interpersonal problems.

Similarly **"soft skills"**, typically found in business management literature, refer to skills that enable harmonious interpersonal interactions, like teamwork, creative thinking, leadership, listening skills and problem-solving.

"Non-cognitive skills" is a term often used by economists and refers to skills that are not captured by cognitive tests.

"21st century skills" also refer to a broader set of skills that encompass creativity, problem-solving and collaboration, but also learning and innovation skills; information, media and technology skills; as well as flexibility, adaptability and cross-cultural skills among others.

"Life skills" refer to three broad categories of skills: (a) cognitive skills for analyzing and using information; (b) personal skills for developing personal agency and managing oneself; and (c) interpersonal skills for communicating and interacting effectively with others (These skills are linked to health, peace education, human rights, citizenship education, and other social issues.)



AkiraChix discusses with students and alumni topics including harassment and inappropriate behaviors in the work environment. It aims to help women identify ways to advocate for themselves.

Some bootcamp program staff described the difficulties of working as women within the technology industry. When attending community events, some men use these as an opportunity to make sexual advances. To overcome this, providers have hosted their own tech workshops and hackathons, where they invited women working in technology, along with trusted male colleagues. Some coding bootcamps host hackathons for girls and women only. Because hackathons last overnight, female students and their family members felt safer knowing students were being trained by women.

To this end, programs can host professional visits from local companies on-site, which allows female students to network with industry professionals in a trusted environment. Providers can also allow female students to utilize program sites for meetings and interviews. Women may feel more comfortable meeting strangers in a trusted environment. Family members may also feel more comfortable (and be more supportive) knowing that meetings are hosted by the bootcamp.

Of course, the burden of preventing sexual harassment should not fall squarely on those who are more likely to experience it. Co-ed bootcamps could use their programs to provide training on what

constitutes sexual harassment and appropriate workplace conduct.

5. Using bootcamps to build community to improve retention

Researchers focused on increasing the participation of women in computer science also highlight the importance of peer support and networks to promote retention.¹²⁰

Code to Inspire encourages “free time,” where women can relax with each other at the program site before and after classes. Students responded positively, reporting that it creates a comfortable environment, reduce stress, and build friendships. SkillsFirst provides students with at least one hour of free time after every class. Students use this time in a variety of ways, from creating study groups to discussing challenges (such as depression, anxiety, domestic violence and divorce).

Some providers also create groups on social media platforms for cohorts to contact each other. Every cohort at We Can Code IT has its own email and social media groups. At Laboratoria, each team works with its team leader to decide how best to communicate. Teams have used Slack, WhatsApp groups and G-Chat. SkillsFirst markets its core expertise as community-building. Administrators use a social media group to create and manage conversations: they share motivational quotes and discussion prompts, as well as articles that may interest students. By ensuring there is always activity, it helps students remain engaged.



Insights for Implementation

Single Sex or Co-ed Program?

While single-sex, all-female programs are more likely to include features designed to reduce women's attrition, they run the risk of attracting the stigma that can surround single sex programs. In other fields, researchers cite the "you're only here because you're a girl" phenomenon.

For example, female physics professors who were awarded grants targeted to women experienced a loss of self-efficacy and felt that they were taken less seriously because they received the "women's award" versus the "normal" one.

A challenge around "sub-typing" also emerges. When women in computer science are identified as "female computer scientists" or "female coders" versus "computer scientists" or "coders", this implies that they differ from the norm and reinforces the stereotype that the "typical" computer scientist is male.

Research into public policy efforts to scale up women in computer science suggests that universal initiatives should be given preference over selective ones. This means, for example, the promotion of a mentorship program for everyone in a computer science program, rather than one just for participating women.¹²¹

Some studies find that such programs can still provide appropriate support for women and underrepresented groups in computer science, while ensuring others benefit as well.¹²² This may hold lessons for co-ed programs, which could implement retention efforts related to role models and mentoring across the board, rather than for women only. However, it is important to note that the studies reviewed here largely excludes experiences from emerging economies.

Ultimately, bootcamp providers are best-placed to develop strategies that are relevant for their own ecosystems. Whether single-sex or co-ed, programs can provide appropriate additional support to trainees (with role models, mentors and similar tools) through upfront consideration of possible constraints and potential benefits.

Could Online Mentoring Help?

Online mentoring could help overcome challenges including geographical distance, the concentration of mentors in specific locations, and scheduling constraints, among others.

In Germany, 800 high school girls were matched with a mentor. Mentors and mentees agreed to exchange emails once a week and the students had access to an online portal with discussion boards and STEM-focused news, as well as office hours with experts. The study showed that online mentoring was positively associated with outcomes that included increased self-efficacy and intention to pursue a STEM career.¹²³

However, experiences and lessons from other sectors, such as the IFC's women's entrepreneurship programs find that while online mentoring has a wider reach, such platforms also have higher rates of attrition. A mixed approach seems the most promising, with online-offline approaches facilitating the matching of mentors and mentees, and in-person interactions building trust and accountability.¹²⁴

Chapter 5 Summary

RETENTION: Ideas from Providers

- 1. Consider ways to alleviate constraints upfront in program design to boost program accessibility.** These might include challenges around quality, safe and affordable care and transportation services. Some providers are also connecting trainees to information about reliable public or private care services. MotherCoders, a US-based program, provides on-site care services with the support of donor funding. Programs can also consider subsidizing travel costs for students and providing on-site access to computers outside hours of instruction.
- 2. Tackle the “confidence gap”.** Bootcamps are working to address challenges around self-efficacy by leveraging role models, developing structured mentorship programs (with multiple mentors, where possible), and testing peer-learning models for effectiveness in this area. Some programs also engage counselors to provide support.
- 3. Incorporate socioemotional and life skills.** Programs are integrating socioemotional skills that can help individuals effectively manage emotions, deal with conflict, maintain positive relationships and communicate proficiently. Some bootcamps also include a focus on life skills as well, especially for socially and economically marginalized young women.
- 4. Minimize women’s risk of and exposure to sexual harassment.** A few programs seek to prevent and respond to risks around sexual harassment. Programs can consider integrating a holistic approach, including anti-sexual harassment policies, a complaints procedure, defined consequences, training and awareness-raising as well as monitoring and evaluation.
- 5. Use bootcamps to build community to improve retention.** Programs are exploring the extension of opening hours to create space for women to build inter-personal connections and establishing online communities.

Chapter 6: Creating Linkages to the Labor Market

Challenges

Despite some progress, women's economic opportunity has stagnated across multiple domains. The gender gap in labor force participation in developing countries narrowed between 1990 and 2017 but female labor force participation is still only 47 percent globally versus 75 percent for men.¹²⁵ Women tend to work more hours on average than men; however, they spend a share of this time on unpaid work, such as care, chores and household enterprises.¹²⁶ Moreover, women earn 10-30 percent less than men, due in part to occupational sex segregation.¹²⁷ In addition, women's economic opportunity is often constrained by skills gaps, lack of care services, limited mobility as well as legal and regulatory restrictions. In the Middle East and North Africa and South Asia regions, men are four times more likely than women to have full-time jobs.¹²⁸

Occupational sex segregation tends to keep women in lower paying sectors, like health, education and other social sectors. When they do work in male-dominated fields, such as STEM, they are likely to be overrepresented in STEM education and health-related jobs, whereas men are more likely to work in technology and engineering, management, and business-related roles.

Addressing these constraints requires innovative approaches, including new strategies for connecting women to economic opportunities. Arguably ready-to-work bootcamps, particularly those that develop strong relationships with potential employers and include job placement support, help address some of these constraints to women's economic opportunity as well as youth unemployment.

At the global level, the tech sector accounts for a larger share of jobs in advanced economies than low

or middle-income countries. In the latter, the WBG estimates that the tech sector accounts for only 1 percent of the workforce.¹²⁹ A closer look at the ecosystems in which many bootcamp providers operate show that they act as demand aggregators, crowdsourcing demands from multiple companies in the ecosystem (from start-ups to medium and large tech companies) and conducting "in-house training" for local tech-related small and medium enterprises, multinational corporations, and start-ups. As mentioned previously, coding bootcamps often develop their curricula based on local demand and adapt dynamically to the needs of their local industries. Through continued dialogue with hiring companies, relationships with hiring managers, and analysis of demands and trends they aim to match their supply of skills and talent to data-driven demand. Furthermore, some programs have developed a regional or global approach enabling them to connect local talent with international demand.¹³⁰ These approaches are promising; however, it is important that bootcamp providers work to ensure that their programs are not supply-driven and respond to existing demand for skills in their ecosystems of interest.

Strategies

Bootcamps have been working to include professional development modules in their curricula, helping trainees to build professional networks and creating opportunities for them to showcase their skills to potential employers. Some have used their corporate partnerships to create internship and job opportunities. Many also conduct follow-ups with graduates once they have started their jobs and emphasize the importance of continued support even after graduation.

Bootcamp providers are utilizing the following strategies:

1. Including modules on professional development in bootcamp curricula
 2. Building professional networks and showcasing students' skills to potential employers
 3. Creating structured linkages to internship and employment opportunities
 4. Establishing mechanisms for alumnae to receive support after job placement: social media could be a cost-effective approach
-

1. Including modules on professional development in bootcamp curricula

Several bootcamps, such as AdaLab, Andela and Hackbright Academy among others, include a focus on professional development skills to prepare trainees for the labor market. Programs provide resume and cover letter support, and also help students to build their online portfolios. Mock interviews and professional coaches are a part of career development for some programs, including Grace Hopper Full Stack Academy and Ace Hacker. At Plataforma 5 trainees spend their last four weeks working on a real-world project to apply the skills they have learned. Over a three-week period, Moringa School combines their real-world group project with professional development training as well. Some programs also bring in speakers who work in the industry to share their experiences. AkiraChix provides mock interviews and trains students on writing professional email correspondence. We Can Code IT provides 1:1 weekly sessions with an experienced developer as well as career counseling with a student success coach. The latter emphasizes that rejection is normal and that persistence is what aids success. These are likely good practices for both male and female participants. However, due to the underrepresentation of women in these jobs, they may be especially helpful in closing the gap between men and women in tech employment.

Programs like SkillsFirst, Ada Developers Academy and AkiraChix include specific modules designed to prepare women for risks they may face in the workplace or online, with courses on workplace and

online harassment (see box 10). Broader diversity and inclusion modules also share information about issues like implicit bias, imposter syndrome and microaggressions.¹³¹

2. Building professional networks and showcasing students' skills to potential employers

Female students might not yet be connected to local tech communities. Furthermore, if these spaces are male-dominated, women might have a harder time breaking into "old boys' clubs" on their own. Some graduates report a sense of isolation after completing the program. In response, providers work to maintain networks and communities through local women in technology groups. These events are also used as a way to expose trainees to professional opportunities. AdaLab encourages students to attend meetups, hackathons and other events held by the wider developer community. Programs like Awele Academy's (S)He Hacks Africa, the Grace Hopper Program at Full Stack Academy, Hacktiv8 and Ace Hacker hosts career days or demo weeks and use these events as an opportunity to trainees to meet with hiring companies. MotherCoders uses their demo days as a way to connect trainees with potential mentors as well.

Laboratoria hosts "Talent Fest," a 36-hour Hackathon that teams students with local and international companies. The goal of Talent Fest is to help companies to observe how students code, communicate and work as a team.¹³² Such events connect women to potential employers but also provide an opportunity for external validation, which could boost self-efficacy (see boxes 11 and 12).

Box 10: Cyber Violence/Technology-Based Gender-Based Violence¹³³

As more women and girls use the internet for a variety of uses, including skills development and income generation, the risk of cyber violence is important to consider. This includes hate speech, online stalking, identity theft, and hacking.

The United Nations Broadband Commission for Digital Development Working Group on Broadband and Gender has highlighted that online crimes are not only an issue for high-income economies, but follow the spread of the internet, and take multiple forms.

For example, it has been reported that instant messaging applications have been used for harassment in India and Malaysia. According to the Commission's report on cyber violence, women are 27-times more likely to be abused online than men, and online harassers are more likely to be men. Recommendations include: i) preventative measures through public sensitization, training and community development; ii) the promotion of safeguards and equality on the internet for women and girls; and iii) establishing and enforcing sanctions through laws, regulations and governance mechanisms.

The International Center for Research on Women, in partnership with the World Bank Group's Development Marketplace for Innovation on Gender-Based Violence, is currently developing a comprehensive definition of "technology-based gender-based violence", as well as standard approaches to measuring this form of violence that will be tested in Uganda and India. According to the preliminary definition: *"Technology-based gender-based violence is an action by one or more people that harms others based on their sexual or gender identity, or by enforcing harmful gender norms. This action is carried out using the internet and/or mobile technology and includes stalking, bullying, sexual harassment, defamation, hate speech and exploitation."* Tactics include doxing (revealing someone's personal information), hacking, and gender trolling (using graphic insults to demean women as sexual objects).

Take Back The Tech! is a collaborative project launched by the Association for Progressive Communications to highlight the issue of tech-related violence against women. Resources include [guidance](#) on ways to keep devices secure, protect against spying, keep hackers away from one's internet connection, and keep online conversations private. Security-in-a-box provides a range of digital security tools and tactics for staying safe online: <https://www.takebackthetech.net/be-safe/safety-toolkit>.

Box 11: Laboratoria's Talent Fest¹³⁴

Laboratoria's Talent Fest aims to provide tech companies with a better, faster and cheaper way to identify female talent.

Based on research with 52 companies in Latin America, Laboratoria discovered that firms typically spend between one and three months to recruit a candidate. At least three staff members are usually involved in the process.

Currently, there is a significant demand for professionals in this sector, and women are especially underrepresented. A global survey conducted by Stack Overflow of more than 55,000 developers, programmers and engineers found only six percent were women.

Forty Laboratoria students from Peru, Mexico and Chile wanting work as frontend developers participated in Talent Fest, a 36-hour hackathon with 10 employers.

The participating employers were: Lyft, BCP, Scotiabank, Tekton Labs, GMD, Ministerio de la Producción del Perú, Urbaner, ThoughtWorks, Globant, Everis

Each company was assigned a team of three or four students, who were presented with real-life challenges during a ten-minute overview from each firm. Companies had access to historical data on students' performance. Laboratoria also provided a live evaluation tool so the companies could assess the students' real-time performance, capturing both technical and socioemotional skills.

During three 20-minute breaks, companies conducted short interviews with the candidates.

Each company also pitched themselves to the teams, providing information on company culture, structure and hiring process.

Box 12: Feedback from Participating Firms on Laboratoria's Talent Fest



A talent fest has never been part of a recruitment process before, and helped us to get to know them better than in a regular interview”.

- *Maria del Pilar Gamarra, Tekton Labs*



“We identified a lot of developers with really powerful technical skills ...and we as Thought Works are interested in hiring them”.

- *Claudio Bustamante, ThoughtWorks*

3. Creating structured linkages to internship and employment opportunities

Employment outcomes are a critical metric in assessing a program's success. While, creating exposure to technology is valuable, arguably what happens after the program is more important. However, very few of these programs subscribe to the Council on Integrity Results Reporting (CIRR)—a standardized system for measuring and report student outcomes. The standards aim to provide students with more accurate and transparent data before enrolling in, and often paying high fees for, a coding bootcamp. CIRR standards include guidance on reporting factors, like how many students graduated on time, the number of students that accepted a full-time job *in the field* and *outside the field* for which they trained, the number that secured part-time jobs, the number of students the programs themselves hired, and the salaries of graduates who started jobs within their field of study.¹³⁵

Among the bootcamps interviewed only two subscribe to the CIRR standards—Hacktiv8 and Grace Hopper's Full Stack Academy. Hacktiv8 reports a graduation rate of 65.5 percent and Grace Hopper's rate stands at 91 percent. Other programs report a rate ranging from 73 percent (AdaLab) and 75 percent (Laboratoria), to 95 (Women EdTech) and 97 percent (MotherCoders). However, it is important to note that these figures could not be validated (see figure 5).

The kinds of support mechanisms range from a “light-touch” approach to more structured internship and job placement programs. Cymetria uses an online platform to match students with potential employers. It reports 30 percent of students find jobs through the platform in less than 3 months. Many programs facilitate professional exposure by connecting trainees to internship opportunities. For example, Ada Developers Academy connects graduates to paid internship opportunities at sponsoring companies, like Expedia, Amazon and Zillow, among others. AdaLab also facilitates student internships and graduates conduct 3-week projects with hiring companies. The program has established partnerships with over 35 companies. Awele Academy's (S)He Hacks Africa and Women EdTech also offer internship placement. At 23 Code Street, all students are invited to participate in an internship with partners after the bootcamp. SkillsFirst also provides internship opportunities and connects graduates with online jobs.

Upon graduation from “ready-to-work” programs, trainees should have the skills to work as entry-level/junior developers.¹³⁶ Bootcamps develop relationships with potential employers to facilitate access to these kinds of job opportunities. Programs like Hacktiv8, Jaaga and Plataforma 5 among others, establish corporate partnerships as a way to tap into opportunities for their trainees. We Can Code IT reports partnerships with hundreds of potential employers. Moringa School maintains relationships with over 40 hiring partners in Kenya who are encouraged to provide students with job (or

internship) opportunities. Moringa also works to connect students to online outsourcing projects for US and European clients.¹³⁷ WeThinkCode provides a clear path to employment with corporate sponsors. During the program, trainees intern with companies and then commit to working there for one year. As a part of Andela's four-year fellowship, fellows receive a small salary upon entering the program and train for six months. They also receive meals, a laptop and have access to subsidized housing. After this period, the fellows receive a higher salary after they begin working as developers on projects with clients, where clients are charged a fee per worker and Andela passes a portion of this onto their fellows. Fellows make an annual salary of around \$US30,000 or higher during this period.¹³⁸ With its distributed workforce, Andela connects corporate clients with talent in African markets.

4. Establishing mechanisms for alumnae to receive support after job placement: social media could be a cost-effective approach

Establishing ways for cohorts to receive continued support and stay in touch might be especially helpful for women who might find themselves working in male-dominated environments, or where staff members are of a different social or economic demographic. These networks and communities could help graduates cope with feelings of isolation or imposter syndrome.

AdaLab provides face-to-face and online training once per week for graduates for up to four months after the program. Each AdaLab graduate is also assigned a mentor from their hiring company. Members of Awele Academy's team conduct

quarterly site visits at employers' offices to track progress. Ace Hacker follows up with their graduates once per month with office visits, weekend meetups, email and phone support. Hacktiv8 follows up with graduates for up to six months. Jaaga follows up quarterly via email, in-person meetups and instant messaging groups.




Some programs use online methods to connect alumni with each other using social media groups or messaging apps. These include Women EdTech, Awele Academy's (S)He Hacks Africa, AdaLab and Cymetria. In addition to a Facebook group, 23 Code Street, uses a newsletter to keep graduates updated on new opportunities.

Alumni are also leveraged as mentors, instructors and role models for current cohorts. At the Grace Hopper Program at Full Stack Academy, alumnae have the opportunity to become instructors or mentors for their "Foundations" course. They are also invited to speak at alumnae panels and link new graduates to curated job opportunities via private forums. At MotherCoders, alumnae serve as mentors, workshop leaders, guest speakers. They often serve on the board and support fundraising efforts. Laboratoria has established an alumnae network as well as a system where "ambassadors" serve as the main point of contact between graduates and the bootcamp. They organize workshops and weekend trainings and connect graduates with mentors. Ambassadors receive a stipend for their efforts as well as discounts for other learning opportunities. Hacktiv8 alumni provide remote mentorship, present at "skill-share sessions" and attend networking events. Similarly, at Plataforma 5 alumni are invited as speakers for in-house projects and some are hired as teachers.

Figure 5: Snapshot of Validated Employment Outcomes

Employment Outcomes: CIRR Participating Bootcamps		
	Graduation Rate	Job Placement Rate
	91%	87.5% within 6 months of graduation; Median annual salary of \$83,500
	65.5%	88% job placement rate or started a new venture within 90 days; \$9,250 average annualized starting salary
Self-Reported, Non-Validated Employment Outcomes		
	73%	89% job placement within 2 months post-graduation; Average salary upon graduation is about \$18,500
	80%	50% job placement rate within 4 months of graduation
	90%	92% job placement from the Demo Week; 300% is the avg. jump in salary from before to after graduation
	90%	90% job placement post-graduation
	90%	30% job placement post-graduation within 3 months of graduation
	90%	87% job placement within 3 months of graduation
	85%	90% job placement within 6 months of graduation
	75%	80% job placement rate within 4 months of graduation. 3 times salary increase from pre-program salaries
	97%	29% now work in tech; 21% have launched their own entrepreneurial ventures; 18% have received promotions. Together, these women have raised their average salary by 64% (based on 2017 alumni survey)
	90%	80% job placement or launched their own venture within first 3 months of graduation
Women-Ed Tech	95%	50% job placement rate within 3 months of graduation. 100% average salary increase from before to after graduation
Note: Andela and WeThinkCode have not yet graduated their 4-year or 2-year cohorts, respectively.		

Box 13: Coding and Entrepreneurship

Several bootcamp providers have positioned coding as a tool to support entrepreneurial solutions. Some have included a structured support program to assist trainees in prototyping their ideas, connecting to relevant networks and launching a business after the bootcamp.		
		
In South Africa, WeThinkCode positions coding as a tool to develop solutions and create a new future, whether via entrepreneurship or through careers that address social challenges.	In the USA, MotherCoders specifically serves "entrepreneur moms" and helps women to establish or grow their start-ups through building foundational tech skills.	In India, AceHacker has a "Launcher Program" designed to help teams advance their start-up ideas. Winners of Ace Hackathons are offered tuition-free entrepreneurial training in exchange for equity. They then pitch to investors during Demo week.



Insights for Implementation

A Focus for Policymakers: Strengthening Labor Market Outcomes

Helping women to build career-oriented skills and links to the labor market is especially critical to women's economic opportunity. However, ensuring that programs connect graduates to job opportunities can be challenging, especially given that there are diverse business models and tuition structures.

The WBG's AGI provides promising lessons on ways partnerships can be structured, especially as bootcamps are increasingly being used as a policy tool to address youth unemployment and increase the share of women in advanced tech jobs in emerging markets.

The AGI used a dual approach. First, results-based payment approaches were used to ensure that training programs assumed greater responsibility for employment outcomes. Rather than delivering training as an output, programs were tasked with achieving job placements.

For example, in Liberia, ten percent of the total contract value was withheld until six months after the training ended. Providers then received a share of the withheld amount proportional to the number of graduates employed (i.e. if 90 percent received jobs, providers received 90 percent of the withheld amount). In Nepal, during contract negotiations with training providers, an "outcome price" (the payment received for one gainfully employed graduate) was calculated. This price was the cost of delivering the training plus an incentive covering monitoring and job placement costs. The outcome price was paid in three installments, linked to results. For example, 40 percent could be paid at training completion, 25 percent with employment verification at three months, and 35 percent with income verification at six months.

Second, to avoid "cream skimming" (providers selecting the most employable candidates), providers were given a greater incentive to train more disadvantaged groups. Using pre-established criteria, the highest incentive was awarded for training and placing the most disadvantaged students, with incentives reducing for less-prioritized groups.

A key recommendation from the [AGI](#) is to carefully define incentives: if the incentives are too low, they will not be effective, and if they are too high, this may lead to exclusive targeting of the most disadvantaged groups, which could result in lower employment rates.¹³⁹

Chapter 6 Summary

EMPLOYMENT: Ideas from Providers

- 1. Include modules on professional development in bootcamp curricula.** Programs are helping prepare trainees for the local and international labor market. These modules often include standard insights on the job process, cover letter and resume writing, as well as interview practice. Providers can also consider including information to help prepare women for risks they may face online, like cyber violence.
- 2. Help women to build professional networks and showcase new skills to potential employers.** Female trainees might not yet be connected to local tech communities. Furthermore, if these spaces are male-dominated, women might have a harder time breaking into “old boys’ clubs” on their own. Providers are hosting events for local women in technology, job fairs, and other career-related events to create networks and opportunities for graduates.
- 3. Create structured linkages to internship and employment opportunities.** The kinds of support mechanisms range from a “light-touch” approach, like an online job matching platform, to more structured internship and job placement programs.
- 4. Establish mechanisms for alumnae to receive support after job placement: social media can be a cost-effective approach.** Some programs also continue to provide training support for their graduates. For example, AdaLab provides face-to-face and online training once per week for trainees up to four months after graduation.

- ¹Meng, Victoria. 2013. "The Ultimate Guide to Coding Bootcamps: The Most Selective Bootcamps." SkilledUp. in World Bank. 2017. Coding Bootcamps : Building Future-Proof Skills through Rapid Skills Training. World Bank, Washington, DC. © World Bank. <https://openknowledge.worldbank.org/handle/10986/28218> License: CC BY 3.0 IGO.
- ²Computer and Information Technology Occupations: These include professions like computer and information research scientists; computer network architects; computer programmers; computer support specialists; computer systems analysts; database administrators; information security analysts; network and computer systems administrators; software developers; and web developers ://www.bls.gov/ooh/computer-and-information-technology/home.htm
- ³ World Bank Group. 2018. World Development Report 2019 Concept Note: The Changing Nature of Work. World Bank, Washington, DC. © World Bank. <http://pubdocs.worldbank.org/en/816281518818814423/2019-WDR-Concept-Note.pdf>
- ⁴ Ibid.
- ⁵ Technical skills, including ICT skills: Those abilities needed to carry out one's job, such as a plumber's ability to repair a water leakage, a factory worker's knowledge of how to operate a machine, or a bank employee's financial software knowledge. ICT skills, a subset of technical skills, are those that are needed for the effective application of ICT systems and devices. These range from an ICT specialist's ability to develop, operate, and maintain ICT systems, to a basic ICT user's competence using mainstream tools needed in their working life (such as e-mail, Excel, Outlook, PowerPoint, Word).
- Nonroutine, higher-order cognitive skills: The ability to understand complex ideas, deal with complex information processing, adapt effectively to the work environment, learn from experience, and engage in various forms of reasoning, to overcome obstacles using critical thought. More specifically, these include skills such as unstructured problem solving, and critical thinking, learning, and reasoning.
- Nonroutine interpersonal, socioemotional skills: Socioemotional skills (also called soft or noncognitive skills) encompass a broad range of malleable skills, behaviors, attitudes, and personality traits that enable individuals to navigate interpersonal and social situations effectively. These include grit or the perseverance to finish a job or achieve a long-term goal, working in teams, punctuality, organization, commitment, creativity, and honesty: World Bank Group. 2016. World Development Report 2016: Digital Dividends. Washington, DC: World Bank. © World Bank. <https://openknowledge.worldbank.org/handle/10986/23347> License: CC BY 3.0 IGO." URI
- ⁶ World Bank Group. 2018. World Development Report 2019: The Changing Nature of Work. World Bank, Washington, DC. © World Bank. <http://www.worldbank.org/en/publication/wdr2019>
- ⁷ World Bank Group. 2016. World Development Report 2016: Digital Dividends. Washington, DC: World Bank. © World Bank. <https://openknowledge.worldbank.org/handle/10986/23347> License: CC BY 3.0 IGO.
- ⁸ ILOStat (2016): Azerbaijan (M: 43%, F: 57%); Belize (M: 50%, F: 50%); Eswatini (M: 50%, F: 50%); Maldives (M: 50%, F: 50%); Lithuania (M: 52%, F: 48%); Ecuador (M: 55%, F: 45%); Mongolia (M: 56%, F: 44%); El Salvador (M: 58%, F: 42%); Belarus (M: 58%, F: 42%); Taiwan (M: 58%, F: 42%); Cyprus (M: 60%, F: 40%); Montenegro (M: 60%, F: 40%).
- ⁹ WBG Gender Data Portal: <http://datatopics.worldbank.org/gender/>
- ¹⁰ Center for Talent Innovation. (2014). Athena Factor 2.0: Accelerating Female Talent in Science, Engineering & Technology. <http://www.talentinnovation.org/assets/Athena-2-ExecSummFINAL-CTI.pdf>; IFC. (2013); International Finance Corporation. 2013. Investing in Women's Employment: Good for Business, Good for Development. Washington, DC. © World Bank. <https://openknowledge.worldbank.org/handle/10986/16257> License: CC BY 3.0 IGO; Noland, M. et al. (2016). Is Gender Diversity Profitable? Evidence from a Global Survey. EY & Peterson Institute for International Economics. <http://www.iie.com/publications/wp/wp16-3.pdf> in IFC 2016.
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- ¹² Rock D. and Grant H. 2016. *Why Diverse Teams Are Smarter*. Harvard Business Review: <https://hbr.org/2016/11/why-diverse-teams-are-smarter>
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- ¹⁴ International Finance Corporation. 2017. Investing in Women: New Evidence for the Business Case. Washington, DC. © International Finance Corporation. <https://openknowledge.worldbank.org/handle/10986/28973> License: CC BY-NC-ND 3.0 IGO
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- ¹⁹ World Bank. 2018. Coding Bootcamps for Youth Employment : Evidence from Colombia, Lebanon, and Kenya. World Bank, Washington, DC. © World Bank. <https://openknowledge.worldbank.org/handle/10986/29742> License: CC BY-NC-ND 3.0 IGO.
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- ²¹ World Bank. 2018. Coding bootcamps: guide for practitioners (English). Washington, D.C.: World Bank Group. <http://documents.worldbank.org/curated/en/175631522135001611/Coding-bootcamps-guide-for-practitioners>
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- ²⁴ World Bank. 2017. Coding Bootcamps : Building Future-Proof Skills through Rapid Skills Training. World Bank, Washington, DC. © World Bank. <https://openknowledge.worldbank.org/handle/10986/28218> License: CC BY 3.0 IGO.
- ²⁵ Meng 2013 in World Bank. 2017. Coding Bootcamps : Building Future-Proof Skills through Rapid Skills Training. World Bank, Washington, DC. © World Bank. <https://openknowledge.worldbank.org/handle/10986/28218> License: CC BY 3.0 IGO.

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- ³⁰ Ibid.
- ³¹ World Bank Group. 2018. World Development Report Concept Note 2019: The Changing Nature of Work. World Bank, Washington, DC. © World Bank. <http://pubdocs.worldbank.org/en/816281518818814423/2019-WDR-Concept-Note.pdf>
- ³² Computer and Information Technology Occupations: These include professions like computer and information research scientists; computer network architects; computer programmers; computer support specialists; computer systems analysts; database administrators; information security analysts; network and computer systems administrators; software developers; and web developers [:/www.bls.gov/ooh/computer-and-information-technology/home.htm](http://www.bls.gov/ooh/computer-and-information-technology/home.htm)
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- ³⁴ Ibid.
- ³⁵ According to the International Labour Organization (ILO) "information and communications technology professionals conduct research, plan, design, write, test, provide advice and improve information technology systems, hardware, software and related concepts for specific applications; develop associated documentation including principles, policies and procedures; and design, develop, control, maintain and support databases and other information systems to ensure optimal performance and data integrity and security." Eurostat uses the following definition of ICT specialists for the purpose of its data collection: "workers who have the ability to develop, operate and maintain ICT systems, and for whom ICT constitute the main part of their job". And, the United Nations Conference on Trade and Development notes: "The production (goods and services) of a candidate industry must primarily be intended to fulfill or enable the function of information processing and communication by electronic means, including transmission and display". ILO 2014 in United Nations Conference on Trade and Development (UNCTAD) 2015. Global Assessment of Sex-Disaggregated ICT Employment Statistics. Data availability and challenges on measurement and compilation. http://unctad.org/en/PublicationsLibrary/tn_unctad_ict4d04_en.pdf
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- ³⁷ WBG Gender Data Portal: <http://datatopics.worldbank.org/gender/>
- ³⁸ UNESCO uses the "proportion of learners (by sex) enrolled at the post-secondary non-tertiary and tertiary level in ICT-related fields" indicator. Available data show that only 8 per cent of least developed countries (LDCs) and 11 per cent of all African countries held data on this indicator, with 20 per cent and less reporting from countries in Asia, Latin America and the Caribbean, and Oceania. Even among developed economies, only 40 per cent supplied this data.
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