FACTORS AFFECTING WOMEN ENGAGING IN TECH CAREERS IN CAMBODIA

Rapid Design Research

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DISCLAIMER: The authors’ views expressed in this publication do not necessarily reflect the views of the United States Agency for International Development or the United States government.

The data collected for this research is meant for rapid user-focused design research and is not meant to be rigorous or statistically sound data to represent all women nor the tech ecosystem in Cambodia.
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<td>CSO</td>
<td>Civil Society Organization</td>
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<td>FGD</td>
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<td>ICT</td>
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<td>PNC</td>
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<td>STEM</td>
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EXECUTIVE SUMMARY

The global tech workforce shortage is not limited to high income nations. The severe underrepresentation of women is also felt across emerging economies, like Cambodia, where women only account for 8.5% of students in information-technology-related post-secondary programs. While the same barriers affect women in the tech industries across nations, additional pressures, institutional and cultural constraints prevent young women from pursuing career advancing opportunities in the tech ecosystem in Cambodia.

Development Innovations (DI) is a six-year USAID-funded project that helps civil society organizations, technology companies, social enterprises and young innovators to design and use information and communications technology (ICT) solutions and employ innovative processes to tackle Cambodia’s development challenges. In its sixth year, which will run from 2018 - 2019, DI will lead activities to focus on gaps observed in the innovation and tech ecosystem. This includes the observed gap in the pipeline of girls and women moving towards tech careers. Addressing the topic of gender is not new to the work of DI, which also runs Technovation; an important global program that builds girls' skills and knowledge in tech and entrepreneurship.

Identifying and analyzing the barriers that women face in engaging in and developing a career in tech is important for the economic and social development of Cambodia, and for women around the world. This document comprises rapid user research which DI conducted in late 2017, combining mapping, qualitative and quantitative research methodologies to learn about how it could better support girls and women in the tech ecosystem for the project’s sixth year. This study is not intended to be rigorous research across all women in tech. Instead, DI’s research team reached out to its partners, beneficiaries, and intended target populations to gain insights on how DI could help support more Cambodian women in the tech sector.

Qualitative data was collected through a series of in depth interviews with stakeholders, comprised of Cambodian male and female tech leaders, civil society organizations and young women currently enrolled in tech studies, as well as focus group discussions with school age girls involved in the Technovation program. All described the importance of developing an interest for science, technology, engineering and mathematics (STEM) at an early age. The education sector remains an underdeveloped and under-resourced when it comes to cultivating a pool of eager and well-resourced post-secondary female students. As a result, girls remain a minority within tech-related post-secondary classrooms; in computer science and engineering programs. While civil society organizations that target the underprivileged are seen as critical in identifying and supporting talented and motivated young women, interventions like support to the ICT curriculum and outreach to female students remain limited to older high school level. To address this, educational institutions and civil society need to improve tech awareness at the primary and high school levels, and family levels to expand opportunities for school age girls. At the school level, this may take the form of applied approaches to teaching, such as time working in a school’s laboratory. At the family level, CSOs need to raise the awareness of parents to the gainful employment opportunities offered by careers in the tech ecosystem.

Key informant interviews also revealed that there has been some recent improvement on how society perceives the role of girls and women. Female tech leaders and older students...
discussed the lack of support they received from their families and communities as they developed their careers, as well as the persistent stereotype that careers in the tech industry were only for men. Likewise, they described a lack of “emotional support” as a result of the lack of women in the sector, as well as the lack of women role models. Supporting and ensuring higher quality mentorship, networking and leadership building opportunities are recommended as better ways to ensure that older students and graduates are able to grow their careers. For example, business incubators and developer competitions are observed as useful gateways for women to further engage in tech opportunities in a meaningful way.

The youngest focus group participants were more positive and perceived fewer barriers in reaching their career goals beyond their own persistence and hard work. To maintain this optimism, support their learning and career objectives, school age girls need to continue to see themselves reflected in the media. Utilizing social media channels to promote Cambodian female tech role models is a powerful way to ensure young girls stay on track with their ambitions.

BACKGROUND

The global tech workforce encompasses all of the professions involved in the business, innovation, production and management of information and communication technology (commonly known as ICT or IT). With the observed global tech workforce shortage, there is also a severe underrepresentation of women. A study performed by the Information Systems Audit and Control Association (ISACA), an international organization for IT professionals, posited that this workforce shortage was the result of the lack of female representation. According to ISACA, women only hold a quarter of tech jobs, and less than 21% of executives in tech are women. Of 500 individuals surveyed, the biggest barriers affecting the professional proliferation of women in tech were a lack of female mentors and female role models, limited networking opportunities, gender bias in the work place and unequal growth opportunities and pay compared to men of the same skill level. These experiences, compounded by the perception of tech as a male-dominated field, a lack of work/life balance, and few structures within educational institutions to encourage girls to pursue tech careers (ISACA, 2017). This shortage is self-perpetuating as it discourages other younger women from entering the field.

These issues are not limited to wealthier countries with well-developed tech industries. In Cambodia, women only account for 8.5% of 16,415 students in IT-related post-secondary programs for the same reasons affecting women around the world (ESCAP, 2017 and Touch, 2017). From the beginning of the career-building stages of the life course, skills training offerings are gender-biased, with few women entering STEM or IT fields (USAID Cambodia, 2016). Social pressure from their families that prevent young women from pursuing educational or career advancing opportunities often prevails as there are few and far between institutional structures to counter those messages.

Young women who do complete post-secondary education in related fields remain in lower paid and low-skilled work sectors. Less than 40% of managers in electronics firms operating in Cambodia are female despite hiring proportionately more women in its assembly units (RTI International, 2015). The Royal Government of Cambodia, through its Ministry of Education, Youth and Sport identified the advancement of women into more management and leadership
positions as a priority (USAID Cambodia, 2016). Institutions and programs, like WECREATE, The Asia Foundation and SHE Investments already exist to support women in entrepreneurship, but institutional supports for women in tech are less known. Meanwhile, a shortage in the tech workforce in Cambodia is being reported by companies who attribute this deficit to shortcomings by educational institutions from developing multi-skilled graduates who possess work experience and the soft-skills needed to truly develop businesses.

Development Innovations (DI) is a six-year USAID-funded project that helps civil society organizations, technology companies, social enterprises and young innovators to design and use information and communications technology (ICT) solutions and employ innovative processes to tackle Cambodia’s development challenges. During this time, DI has supported a variety of activities to promote women in tech and helped improve inclusive access to tech opportunities and entrepreneurship. The project has hosted Technovation, an important global program that builds girls’ skills and knowledge in tech and entrepreneurship, for five consecutive years starting from 2014. In 2017, a final team of young Cambodian girls was selected to attend the Global Pitch event in San Francisco. DI also provides grant and technical support to SHE Investments, a local social enterprise, which seeks to support female-lead businesses. DI’s own key partners and supporters include women leaders in the tech industry in Cambodia.

RATIONALE

In its sixth year, which will run through 2019, DI will lead activities to focus on addressing gaps observed in the innovation and tech ecosystem. This includes the observed gap in the pipeline of informed, educated and goal-oriented girls and women towards tech careers.

To explore these gaps further, DI conducted a series of focus group discussions with representatives from different sectors to learn about ICT usage trends and needs among target groups in the final quarter of 2017. These groups included CSOs, youth communities and start-ups and young entrepreneurs. The topic of gender was introduced to the focus groups in order to learn about the structural and cultural barriers experienced by women in accessing the tech space in Cambodia. These FGDs revealed that the topic of gender resonates across the different areas and activities that DI engages. Young entrepreneurs and start-ups commented on a steady flow of opportunities for girls and women to participate and learn about tech and entrepreneurship, but these beneficiaries did not commit themselves to take the opportunities or move beyond them. Family pressure and its impact on the professional mobility of young women in tech was a trend discussed by FGD participants from leadership positions in the sector. Also discussed was the perception that women were not good or skilled for the engineering and tech sector. These key informants also described the perception among their industries that gender balanced teams were more successful.

In addition to trends within the sector, USAID’s own mission seeks to promote women within the tech workforce. The Gender Equality and Female Empowerment Policy (2012) indicates a vision to harness tech and innovation to reduce gender gaps, and empower women and girls and to ultimately change discriminatory social norms and stereotypes. USAID’s own Country Development Cooperation Strategy (2014-2018) for Cambodia notes the low rates of
women’s labour force participation as technical and professional workers and plans to support the private sector as “champion of women’s economic inclusion.”

JUSTIFICATION AND GOAL

The intersection of gender and technology is not new to Development Innovations. In 2014, Development Innovations held a workshop entitled “Why We Need More Women in Technology”. Entirely in Khmer, female tech leader Heang Oumuoy shared her experiences as a young woman in the Cambodian tech ecosystem. That same year, Development Innovations also hosted a session called “Why the World Needs More Women in Technology” with Sok Sikieng, a long-time member of the Cambodian Women in ICT Group, an informal collective of Cambodian women working in ICT. In 2014, Development Innovations launched Technovation in Cambodia, aimed directly at girls aged 10-18 years.

In its sixth year, Development Innovations is interested in engaging more with girls and women in tech. Finding out about barriers that women face in engaging in and developing a career in tech is important for the development of Cambodia, and for women around the world. A small study, framed as user research, that combines both qualitative and quantitative research methodologies, as well as innovative ways to reach out and acquire information from young people is key for DI to strategize how best to support women in tech.

This study is not intended to describe nor generalize across the experiences of all Cambodian women. Nor is this study intended to be a rigorous, randomized and controlled, or peer reviewed study.

SPECIFIC OBJECTIVES

- To learn about the socio-cultural factors that promote, demotivate, or prevent young women from engaging and furthering themselves in careers in tech
- To learn about the structural factors that promote, demotivate or prevent young women from engaging and furthering themselves in careers in tech
- To learn about what young women want to be made available to them to develop careers in tech
- Produce a learning product that helps DI design its activities to be more responsive to women in tech

THEORETICAL FRAMEWORK

Tech Education and Career Terminology

An education or career in tech encompasses a wide breadth of employment opportunities.
For this study, an education that moves towards a career in technology includes the following:

- Primary and secondary education focused in, or with extra-curricular opportunities in, science, technology, engineering or mathematics
- Post-secondary education (in a university, college, vocational training institution) in: engineering, computer science, computer programming, coding, design, telecommunications.

A career in technology includes but is not limited to:

- ICT design
- Computer programmer
- Computer (systems) engineer
- Software engineer
- Coding
- Web developer
- Information Analyst
- Database administrator
- Games or App developer
- Network Engineer
- IT Manager

The Career Building Stages of the Life Course

This term refers to the age range from which young people begin ideating their career prospects until the point in their career development at which “persist or quit” decisions are made.

Technovation, which is supported in Cambodia by Development Innovations, sets the lower limits of its age of participation to girls who are 10 years old. For the purposes of this inquiry, it is assumed that children begin to think about career prospects, particularly for careers in tech or STEM-related fields, beginning at the age of 10.

The ‘fight or flight’ decision is typically made in the late twenties and early thirties at which point young people may choose to stay in the career path they have chosen to further develop themselves in, or remain within one career level, or in some cases to leave that career entirely to pursue other interests which for women may include family planning. In Cambodia, fertility is closely associated with education (UNFPA Cambodia, 2015). Among Cambodian women who have completed secondary or possess post-secondary education, the average age to have their first child is 23.7 years (CDHS, 2014). Cambodian women living in urban areas, and assumed to possess more education, are more likely to have their first child at 25-29 years of age. The exit of women from the labour force upon arrival of their first child is also a noted occurrence. The upper age limit for young women developing careers in tech is therefore set at 30 years.
**Structural and Socio-cultural Factors**

Structural and socio-cultural factors are not mutually exclusive forces which impact the individuals’ experiences and decisions through their life course. For the purposes of this study, these factors are separated only to provide direction for recommendations and interventions which result from this report.

Structural factors that affect women’s engagement in careers in tech are defined as the institutional practices and regulations that impact a young woman’s engagement in a STEM education field, or their ability to find training opportunities, internships or work-study opportunities during their post-secondary education. In their careers, these structural factors may take the form in maternity leave policies, salaries and the way in which men and women are supported within corporate structures.

Socio-cultural factors that affect gender and career development are shaped by the ideologies and values that inform the community support systems that young women are exposed to through the career building stage of their life course. These may include religion, family and community values that shape the experiences and decisions a young person makes.

**METHODOLOGY**

To build a well-rounded base of information to inform Development Innovations about its users, multiple research methods were undertaken. Quantitative information was gained through a Google Survey shared with the larger base of Development Innovations’ audience. A stakeholder mapping was employed to gain an understanding of the multiple players and layers of responses to gender and tech careers in Cambodia. Qualitative methodologies in the form of key informant interviews, who were identified through snowball sampling, and focus group discussions with young girls involved with the Technovation program, were used to learn about the experiences and insights of young women and key players in the Cambodian tech ecosystem itself.

**Google Survey for Young Women Studying in Technological Fields**

Though it is not statistically robust, social media has become a rapid way for brands, businesses and organizations to collect a large quantity of information on a key demographic. By utilizing DI’s own Facebook page, this study shared a Google survey directed at young women currently studying in tech fields.
This Google survey seeks to learn about what young women perceive about their prospective careers in tech, and the services and supports they wish to see to help them to develop these careers and their perceived access to opportunities that will develop their careers. This section of the study is not intended to be a rigorous survey of all women in tech.

Mapping of Tech-Related Programs for Girls and Women in Cambodia

In order to design an effective program that supports women’s engagement in tech careers, it will be necessary to ascertain and map the pre-existing ecosystem that supports women, tech education and careers or both in concert. This will entail the descriptive mapping of related activities and potential partners, including:

- CSOs that support technology
- Co-working spaces with programs that support women and tech entrepreneurship
- Existing incubators that support women in tech entrepreneurship
- Donors and other non-governmental entities that are interested in supporting women in tech careers

Key Informants Interviews

Guided interviews were conducted to gain information about the current state of women in the tech field. These ranged from first person experiences from women leaders and entrepreneurs in the sector, to civil society organizations and researchers working on the topic of gender. Stakeholders from post-secondary educational institutions and a male stakeholder in the tech ecosystem were also interviewed. Interviews were designed to learn about the tech career building experiences of these women, the structural and socio-cultural elements affecting their career choices, and their forecast for the next generation of young women in tech, as well as what they think is missing from currently available resources. The four types of key informants are described below. Sampling was conducted by snowball methodology and based on their availability over a two-week period in February 2018. Eight individuals, with the following descriptors, sat for one to two-hour interviews for this study:

- **Gender-Oriented Civil Society** - Civil society organizations or researchers with missions to support and learn about women in Cambodia possess a wealth of information related to gender and labour force participation. Four women working in this sector were interviewed.
- **Female Leaders in the Tech Field** - Women who are either professors teaching tech-related courses at post-secondary institutions in Cambodia or corporate leaders in the tech field in Cambodia. They will possess information and opinions on what changes are necessary and feasible in the tech industry and education sectors to make be more inclusive for women. One woman was interviewed based on these qualities.
• **Women-Led Tech Start-Ups** - Women who are leading start-ups are key informants about the current environment and feasible opportunities and improvements that can be made in the near future. One such young woman was interviewed for this study.

• **Male Leaders in Tech** - Men are predominantly the main decision makers in the tech industry. The objective of interviewing these key informants will be to learn what sector wide changes need to happen to improve women’s access to and growth in their tech careers in Cambodia. Two men were interviewed for this study. Both are involved in post-secondary studies, and one interviewee possesses in depth knowledge of the private sector in Cambodia.

**Focus Group Discussions and Small Group Interviews**

These focus groups guided two groups of young women, at different stages in their education, in discussion about their experiences, expectations and goals as they pursue careers in tech.

**Young Women STEM Education and Pursuing Careers in Tech**

Two groups of young girls, selected based on availability, who are participating in the Technovation program were guided by a trained facilitator in a one-hour long focus group discussion. The groups were divided by age: Group 1 was composed of younger girls in primary school (age 10-12) and Group 2 was composed of older girls in high school (age 15-18).

All of the Group 1 participants attend private schools while all of the Group 2 participants attend public high schools.

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<th>Selection Criteria for FGD Group 2 Invitees</th>
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<tr>
<td>Location</td>
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Both focus groups were structured/designed to learn about:

• Their interest in STEM education or careers in tech
• Their awareness of career opportunities in tech in Cambodia
• Their perception of career opportunities in tech
• Their personal goals and how they intend to achieve them
• Different social and cultural elements in their lives that are affecting their experiences
• How they think their experiences can be improved
• What services they would like available to help them on their journey towards meeting their career goals.

Senior Female Post-Secondary Students in Tech-Related Programs

A larger focus group of young women enrolled in post-secondary tech programs was not possible due to their availability. Instead, two small group interviews were conducted with a total of five young women enrolled in tech-related programs at post-secondary educational institutions. These five young women were selected through snowball sampling, in which recruitment is performed through subjects’ acquaintances.

The objectives of this focus group are to learn about:

• Their awareness of career opportunities in tech
• How they intend to achieve their career opportunities in tech
• Goals that young women enter post-secondary education
• How their experiences affect how those goals as they make their way through a post-secondary tech-related program
• Different social and cultural elements in their lives that are affecting their experiences
• What services or help they would be interested in to help them achieve their career goals
• How the experience of “being a girl in tech” can be improved

RESULTS AND ANALYSIS

Quantitative Data on Cambodian Women in Tech

41 women responded to the Google survey that was shared on DI’s Facebook page and newsletter subscribers. Nearly all (90.2%) were studying or had completed a tech-related program and similarly, 92% were employed in a tech-related job. Most of the respondents were between the ages of 18-29 (see Figure 1).
Interestingly, while family (parents and older siblings) were reported as major influences in selecting program study, schools were reported more frequently (Figure 2). 63% reported they had role models for their career who were women. The role models they cited ranged from individuals like Sheryl Sandberg, who is the Chief Operating Officer of Facebook and a major leader in the women in tech movement, to local business leaders, tech professionals they knew and government officials.

The most frequently reported career choices among respondents was tech entrepreneur, closely followed by leadership in a tech company, and computer or software engineering (Figure 3).
Figure 2. Sources of Interest for Program of Study

Figure 3. Young Women’s Career Objectives
Mapping of Tech-Related Programs for Girls and Women in Cambodia

Programs that Target the Underserved

*Passerelles Numerique* is a non-profit organization, based in France and operating in Cambodia, the Philippines and Vientam with the mission to enable underprivileged young people to build their employability through education in the digital industry. Graduates are able to eventually lift their families from poverty through gainful employment in the digital ecosystem.

Since 2005, Passerelles Numerique Cambodia (PNC) has offered six month and two year IT training programs in System and Network Administration, and Web Programming across the country. A rigorous four-step process, with input from partner NGOs, is used to select talented and motivated underprivileged youth across the country from local high schools, and a special effort is made to ensure that at least 50% of its participants are young women.

In addition to tech education, PNC students are also prepared with the life skills they need to grow their careers. Material, emotional and financial support are also provided. After the two-year training, students are given a PNC certificate and Associate’s Degree diploma.

Since 2005, 1389 students have graduated from PNC programs, and 90% of 2-year program graduates are able to find a job within 2 months of graduation that earns them double the national minimum salary ($243).

*Digital Divide Data (DDD)* is a social business that delivers high-quality, competitively priced business process outsourcing solutions to clients worldwide. Using a social model called “impact sourcing”, DDD works with underserved populations to access professional opportunities and earn lasting higher income.

In Cambodia, DDD’s innovative work/study program enables young women and men from very poor families to gain the work experience in the tech sector that will give them access to higher incomes. Recruitment of disadvantaged high school graduates, aged 17-24, including young women and men, with specific outreach to youth with disabilities.

Programs that Target Girls

*Technovation Cambodia* is a program, operated by Development Innovations and globally run by Iridiscent, that guides and mentors young women between the ages of 10-18 to develop an application prototype, business plan and video pitch in 12 weeks. Working in teams of 3-5 that are supported by one dedicated technical coach and one business mentor who are Cambodian educators and female professionals, participants create an app to address a social problem. The program culminates in a national pitch in which three teams are selected by judges as the winners, but all teams that have submitted their project still have same opportunity to be judged for global pitch at the world wide annual event in Silicon Valley.
**Project Girl Code** is a non-profit organization teaching digital literacy and IT training to girls and young women who are vulnerable to trafficking, slavery and forced marriage. Like Passerelles Numerique, Project Girl Code works with partner NGOs to pre-select young women who are victims of or vulnerable to exploitation. As a Cisco Networking Academy, Project Girl Code hopes to use this tech training as a gateway to opportunities in a growing industry previously unreachable to its beneficiaries.

**UNESCO’s International Bureau of Education** is partnering with the Malaysian Government to promote gender-responsive science, technology, engineering and mathematics (STEM) education in Cambodia. In Malaysia, women attain 57% of science degrees and 50% of computer science degrees – bringing expertise and successful experience in promoting the participation of girls and women in STEM. The project aims to mainstream gender in educational policies, plans, STEM curricula and teaching, and has already produced a Resource Pack for Gender Responsive STEM Education as practical guidance and a training tool.

Over the past few years, civil society programs focused on bringing STEM education for girls are now proliferating. **STEM Sisters**, an initiative of the STEM Education Organization of Cambodia, plans to put a spotlight on female Cambodian STEM professionals, to increase their visibility in society and normalize female careers in STEM.

**Programs that Support Women in Tech**

In 2014, Google announced the launch of a series of global **Women Techmakers** events. Organized by the Google Developers Group of Phnom Penh, the Women Techmakers event is an annual forum seeking to gather developers interested in Google technology while also hosting activities, like hackathons and panels to engage young women in tech. In 2017, panel discussions included a discussion with five distinguished female developers on how they overcame their obstacles in the tech ecosystem and achieved success as women. The free-of-charge event at the National Institute for Posts, Telecoms and ICT (NIPTICT) attracted about 300 attendees in 2017.

2018 marked the first **Cambodian Women in Tech Awards** organized by the Ministry of Posts and Telecommunications on March to reward women who are actively contributing to the development of the ICT sector in Cambodia. The awards recognize the increasing role of women in the tech sector, which highlights how ICT can help enhance the economic, political and social empowerment of women while also serving as a program that incentivizes and motivates more women to enter the tech ecosystem. The awards require nominees to have proven work and success in entrepreneurship, engineering and community building.

Cambodian women in the tech ecosystem are also eligible to participate in regional opportunities like the **Women Techmakers Scholars Program for Women in the Asia Pacific**. The scholarship aims to create gender equality in the field of computer science by seeking out active leaders and role models in the field. A cash award is given to winners, who are selected on the basis of academic performance that demonstrated leadership and strength of
candidate’s impact on the community of women in tech. Previous winners have included Sok Sikieng and Sok Pichleap (unrelated).

**Programs that Support Female Entrepreneurship**

While no program exists that exclusively supports female tech entrepreneurship, a number of initiatives do support women’s entrepreneurship. *SHE Investments*, also a Development Innovations granteee, is a social enterprise that supports female entrepreneurs to scale their businesses and create social and economic impact for communities. *SHE Investments*’ incubator and accelerator programs, which are run by Cambodian women in the Khmer language, have previously included women lead tech businesses.

At the regional level, the *Female Foundry Accelerator* seeks to educate, mentor and give access to funding to leading female-led startups that leverage technology to propel economic sustainability. Female founded tech enabled business ventures in South Asia and Southeast Asia are eligible to apply for this opportunity to access high level mentors and networks through its parent organization, Dentsu Aegis, an international media and communications company.

**Perceptions of Women in Tech in Cambodia**

“It doesn’t matter what gender you are, as long as you have power,”

— Female Technovation Participant, age 10-12

The youngest group of focus group participants did not see gender as a restraint. These young girls, aged 10-11 years, reported that their parents shared similar views. “My mom always wanted me to work for Google, remarked one focus group participant.

As the age of the focus groups increased, this view shifted. The high schoolers, aged 15-18, had a more “realistic” view of the constraints they would face. Likewise, they reported their parents were less aware of the tech field and its opportunities, and therefore, less supportive.

The university students all described their uniqueness given their minority status in the classroom. All, aged 20-22, described receiving messages from their peers and families that “tech is only for men.”

The key informants all agreed that long held career stereotypes were a major barrier to girls being exposed to careers in tech. Beyond the general stereotype that “math and science are for boys”, key informants described that families and girls themselves saw that coding was “very complicated.” There was also a lack of general awareness of what could be done with tech related skills and the career opportunities presented.

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“Girls need to know more about IT to break the stereotypes about the subject,”
– Female Tech Start Up Entrepreneur

The gender imbalance of the tech workforce in its current state perpetuates the stereotype that it is men’s work. “People started telling me that IT was only for men,” remarked a senior university student studying computer science. The image of a person who works in tech is likewise stereotyped as “just sitting in front of computers, no life,” described the female tech start-up entrepreneur who was interviewed as a key informant. A high achieving university student added, “A lack of information on what majors are available is a factor preventing women from moving forward.” This is compounded that schools “only focus on theory, no application,” which further perpetuates girls’, and their parents, narrow perception of the field. One tech education sector key informant further described that while “20% of our enrollees are female, but 80% chose food science after the foundation year, and only 3% chose IT.”

Socio-Cultural Factors

“My parents are proud their daughter is a girl in tech,”
– Senior University Student

Like the quantitative findings, focus group participants, across the age groups, named their family as major influences, or role models in their life. Parental support seemed to increase as girls were younger. The university students reported a mix in the support their parents offered, while high school aged girls described parents who encourage them to work hard and pursue their goals, regardless of their gender. The youngest girls, aged 10-12, were mostly likely to name their parents as their most powerful role models. All were exposed to technology by their parents, who also controlled their contact with these devices, “until school work was completed.”

Parents also have a role in supporting or dispelling gender stereotypes. One senior university student described parents who corrected other family members who believed a career in tech was “only for men.” A key informant described that a supportive family was key in helping women to keep rising up in her field, even after marriage. Another university student described her parents wishing for her a more stable career with public sector.

Siblings, particularly older brothers, serve as a more powerful force for career development, as described by the young women who participated in focus groups. This idea, consistent with the quantitative findings, was further agreed upon by a key informant who is a female tech leader. Often times, these older siblings were described by the focus group participants as the first in their family to have studied a tech-related program or possessed to social capital to know that studying tech would lead to a “good career” with “opportunities. These older siblings, and other older male figures like uncles, were often seen by the focus group participants as setting a precedent in education achievement, thereby opening up a new career...
path. One senior-year university student described having a family largely composed of men who all worked in the IT industry. As a result, she knew “from age 15, [she] wanted to work in IT.”

“There is no emotional support for girls in rural areas who want a different future,”
– Key Informant, Civil Society

Rural Cambodia remains underdeveloped compared to its urban counterparts. Families who depend on subsistence farming, or other family-dependent businesses “prefer kids to help with the family work.” Girls are especially expected to remain close to home to help with house work and families often cannot afford to send their children to school, described key stakeholders. One key informant described that many of the young women currently enrolled in universities were the first generation in their family to ever attend post-secondary studies. As a result, they faced pressure for them to find a job that would allow them to “give back” to the family.

Tech awareness is also limited in rural Cambodia. Girls who do participate in programs implemented by public sector or civil society to teach about technology or promote science, technology, engineering and mathematics in schools find it hard to convince their families about the opportunities these areas bring. “I struggle to communicate with my family about what I am working on,” remarked a key informant who was a female tech start up entrepreneur. Another university student described, “Some friends criticized me because they don’t understand why I am in this field.”

“I still want to study, but it depends on my husband.”
– Female university student

Of the university students, one had just gotten married, and the others saw it looming in the distance. They were all aware of the potential difficulties that marriage would bring to their studies and career development, with one university student observing peers who “struggled” after having children while still studying. Another described pushing back against parents who wished for her to get married, “but I did not agree to this because I thought it would be very difficult for me.”

For those that do get married, negotiation and or compromise of domestic work is important for women in tech to be able to continue working and achieve their professional goals. Key informants described men as being open and happy to help. However, “the woman needs to initiate the conversation about sharing of household duties”

Nevertheless, one key informant described that “things are changing, improving.” As a post-secondary institution educator, he described female students being more active than men, taking charge in teams and being “aggressive.”

One key informant also discussed the culture of girls being both undervalued by the community around them, while also implicitly also undervaluing themselves. “Girls tend to have lower self-esteem because parents and culture have put the label on girls that they can’t
be like boys.” The female tech start-up entrepreneur elaborated, “I am not being taken seriously when talking to men or customers as a female entrepreneur.”

“Women don’t have the right mentors whom they can relate to personally,”
– Key Informant, Civil Society

The youngest group of girls who participated in the focus group all correlated their male mentors as being “technical” in nature. Their female mentors were all involved in the “business” aspect of Technovation, and guided them through activities like prototyping and branding, but also “pushing me to get more work done,” said one girl.

Many of the female key informants described a lack of female role models or mentors whom young women could look to for advice as they developed their careers. “The challenge is that I cannot find a mentor to help me. I have to do a lot of study and research myself because there is no one to help,” described one university student. “All IT teachers were guys, no role model for IT female students to look up to,” said one key informant of her own experience studying in a tech program.

One female key informant pointed out the importance of “age gaps,” between the mentor and mentee, which shouldn’t be “too big.” Mentor and mentee relationships, which vary across individuals, may be more successful when both are closer in likeness to each other.

Individuals also respond to different types of support systems as they develop their careers. For the female tech entrepreneur who was spoken to, she enjoyed “exposure to entrepreneurship environments, like events,” was inspired by “experienced people,” and sought out a “very strong support system and to network with the right people.”

Furthermore, one key informant described that “most tech role models are men,” however, the “emotional support” that is provided by female role models is more important and preferable.

For the high school and university students, Facebook was an important space where role models could be identified. Two students described using the social media platform to follow two different female Cambodian tech leaders’ journey and success stories, while also being able to communicate with them.

Structural Factors

“We need to start getting their attention at an early age, like primary school.”
– Key Informant, Post-Secondary Education

Exposure to technology, mostly through the use of computers, was mixed across the young women who participated in focus groups; even for those aged 10-11, who were all enrolled in private schools. These girls explained that afterschool or extra-curricular activities related to tech were not common. At their private schools, computer labs were only used for once-
weekly classes. “We have a computer class for studying Microsoft Word— not coding or programming,” remarked a 10-11 year old. One participant, in this group, described not even having a computer class. The older girls in high school described that computer programs were only available for the senior students.

“She doesn’t just teach the curriculum, she keeps pushing students to explore outside of it.”
– Focus Group Participant, age 15-18

Focus group participants, including those aged 10-12 years, perceived teachers as powerful role models. One university student added, “Schools should motivate and push girls to move forward—don’t discourage.”

Key informants all believed that it is “very important to start talking to them at a young age,” and that “there is a lack of exposure [to tech] in high school. Students do not know what IT or computer science are, nor how they are applied in the real world”. In terms of curriculum, “high schools should incorporate practical applications of the theory. There is only theory in what we study, and studying for tests,” remarked one high achieving university student. This is made worse by the observation that “teachers are not qualified,” “poor education standards,” and that “technology cannot be accessed in rural areas.” These suggestions applied for all young people. “Gender isn’t a factor for young children, age 8-10. It’s more about the family’s economic status,” specified one civil society key informant.

To address this issue, key informants suggested increasing English language learning, which is very important “because it is the language of tech.” Additionally—“new schools that focus on STEM education of males and females at all levels” could help support greater interest in tech careers for all young people.

“I don’t have any female friends”
– Female University Student

All three university students described there being very few girls in tech programs at their schools. While there was no pressure nor safety issues, all described a lonely existence and an awareness of their minority status. One university student wanted to see scholarships or financial assistance for girls to study in tech, as she explained that “access to finance is very limited for girls.” This was agreed upon by all key informants. “A discount for tuition fee based on gender would attract more female engineers,” concurred one education-sector key informant. He added that there were “no female professors currently working full time in technical subjects,” at his institution. This was unplanned, “there were no women to employ to start with.” A female tech leader further remarked that “there are no women’s only universities that provide STEM education.”

To support women, one educational institution was “providing cheaper tuition for girls, providing girls-only dormitories and employing female students to design advertisements.” One advertisement read: “Women are more sensitive to humanity.”
While some described seamless socializing with their male counterparts, some described less awareness of events or opportunities as a result of fewer socializing opportunities with others students. However, all of the university students reported to receive preferential or priority status by their professors.

**Personal Grit**

“I am responsible for everything myself. I pay my own tuition and support myself. They do not know much of what I am doing, but are proud.”

— Female University Student

The notion and power of personal grit and “self-study,” was a common topic discussed across focus groups and key informants. Even the youngest group of girls noted their own personal resolve to study, learn and access resources in order to reaching their personal goals. Families were important to them as well, but “at home, I want more encouragement,” remarked one 10-11 year old. Two university students summarized that while being “self-driven and confident” were important, a supportive family and access to mentors and role models were also key for them to develop their careers.

One female tech key informant described that female students usually solve problems on their own because “there was no one else to talk to.” The female tech entrepreneur added: “school was challenging because it was hard to make girlfriends, no one to share my internal struggles with.” The university students agreed with these descriptions, adding that this minority status lead to feelings of “loneliness,” feeling “discouraged,” and thoughts of dropping out.

*“There were only 3-5 women working at [my tech company]”*

— Female Tech Entrepreneur

Their minority status as young women enrolled in post-secondary tech programs is perpetuated as they transition into the work force. The experience of the university students described a range of interactions with potential employers who were not interested in increasing the number of women on their teams, including one who said “I don’t need female employees.” Another university student described the app developer sector not being “welcoming to women.” She described one company’s preference for women to work in administrative, supportive or design roles rather than technical developer positions. A key informant in the tech sector shared a similar observation: “local IT companies want to get more women on board, but not in the program developers group: usually they are in admin and finance.”

All of the students expressed a desire for tech companies to “want women to be more fairly treated.” Echoing one management-sector key informant, one university student surmised that international companies, “like my experience at Cisco,” were good examples. The management-sector key informant added that international companies often preferred female
candidates, as they are able to “pick up language skills, soft skills and communication,” when compared to their male counterparts.

To help young women entering the tech workforce, the university students discussed workshops specifically dedicated for women, featuring “women in tech to share their experience, and information” that would “help to guide women in their studies and career development,” as being important. Workshops and networking events like this would address the current situation of “limited access for women to key networks in the supply chain,” added one key informant.

One key informant added that there had been “lots of progress for female student involvement in the tech sector as a result of private sector-supported competition.” These competitions not only provided a “space for innovation,” but also for employment.

“Women excel in tech companies when there are safety nets for them.”
– Key Informant, Civil Society

The same civil society key informant added that “there are a lot of opportunities for women, but like other women around the world, they face the internal challenge to balance their life and career.” Key informants were also asked about the qualities or experienced that helped themselves or other female tech leaders to get ahead in the sector. The description of a successful woman in tech by key informants included the following traits:

- Marriage later in life
- Passionate about supporting others
- Access to the right support networks
- Exposure opportunities to professional environment abroad, etc. to expand horizon beyond Cambodia

Female tech key informants added that tech workplaces tended to be safe spaces for women, with no reports of harassment and that “men tend to help women.” However, key informants were able to describe factors that prevented women from moving forward in their careers. For some, this included a lack of policies that supported women who have children. “Having job security for women who have babies is important…maternal policies should provide support on how to get women back to work after giving birth,” described one female tech leader.

Younger key informants further elaborated on issues affecting women at the beginnings of their tech careers. These included a confidence deficit when working with men. “Women are not willing to lead men – they don’t have the commitment or confidence,” described the female tech entrepreneur. While a high achieving university student remarked, “Men treat me well, but I am still not comfortable to join the team.”

“Civil society needs to work with parents to promote ICT education,”
– Key Informant, Education Sector

When asked about what civil society, and particularly Development Innovations, should do next for women in tech in Cambodia, many key informants expressed the need for the
messages go beyond students. “70% of students at [my institution] were encouraged to choose their subject by their parents or relatives,” described one education-sector key informant. One civil society key informant added that civil society needed to “build an ecosystem that champions parents and mentors.”

Another civil society key informant added that Development Innovations itself needed to “go to other provinces outside of Phnom Penh.” The female tech entrepreneur added on the importance of civil society’s engagement with rural communities as the gateway to interest in tech, “I had no influences on my career growing up until I was first introduced to computers by [an NGO].”

“Now what? They came, they engaged, but nothing was really started.”
– Key Informant, Civil Society

Technovation was a major factor listed by young girls aged 10-12, as the catalyst of their interest in tech as a career; whether it was discovering an unknown talent in coding or interest in business through a mentor. “When I first met [my mentor], she inspired me to be interested in technology and introduced me to Technovation.”

Despite the success of these competition and incubation activities, key informants from both civil society and the private sector expressed the same thoughts about their true impact. “Getting successful teams to further their ideas in the field is important,” a private sector key informant remarked. More sustainable and long-term solutions to guide successful start-ups or business development competition winners was needed.

RECOMMENDATIONS

Produce Media Campaigns that Promote Female Tech Leaders

When young women can see themselves reflected in images they see on social media channels, they gain the confidence that they too are able to move toward a similar future. This will help to dispel the myth that “IT is only for men,” remarked by one senior university student.

In particular, highlighting successful tech leaders who come from rural upbringings can be used to promote education and career opportunities for young women from similar backgrounds.

Improve Tech Awareness by Targeting Parents and Elders, Especially in Rural Areas

Parents’ awareness of the opportunities borne by a career in tech are similarly divided by geography and socioeconomic status, as well as long held beliefs about gender roles. They also remain a major force in what programs their daughters choose in their post-secondary education, as well as financial, psychosocial and other forms of support, like child care, as they rise in their careers. By raising their awareness of the myriad possibilities open to their
daughters as Cambodia modernizes and joins the global tech economy, they are more likely to be supportive pillars to the next generation.

Social media, primarily Facebook, and other media like televised dramas are powerful and transformative forces in Cambodia that may serve as efficient outlets to initiate the change in these beliefs, promote gainful employment to a new generation of young women, and to support them as their move forward in their endeavours.

Civil society organizations, like Passerelles Numerique and Digital Divide Data, are already leading the charge in improving access to technology for rural and underserved populations, and have been an important pathway for young women to envision this future beyond one dictated by their families.

**Address Supply Quality by Working with Educators**

The supply of a female tech workforce is a multi-level task. In addition to working with the parents, the educators of young women are also complicit in how young women envision their goals. The young women who participated in this study’s focus group discussions remarked about the power of a teacher who goes beyond the curriculum. However, research has shown that while teachers are convinced about the usefulness of ICT in the classroom, they do not possess the capacity, support or infrastructure to implement these methods and philosophies in the classroom (Seng et al, 2014).

According to UNESCO, science laboratories in Cambodian schools were found to have a positive impact on student participation and helped to overcome preconceived beliefs about girls’ low abilities in science. By moving beyond the tradition of didactic ways of teaching and into more applied education in STEM fields, researchers were able to show a positive correlation between availability of science labs and girls’ and boys’ achievement in science. By supporting educators to transition from didactic forms of education, even at the primary school levels, to practical and applied ways of transferring knowledge to students, more young women will be able to envision futures outside the traditional realms of finance and administration.

**Improve Demand for Tech Training by Creating Opportunities for Young Women**

Demand-side strategies are the activities that universities can implement to increase the number of female students enrolled in tech programs that are typically male dominant. Initiatives like scholarships, reduced tuition, women-only dormitories can easily help school-age girls, especially those from rural areas, to envision a track towards their careers.

Likewise, job fairs dedicated to women in tech, and supporting employers to implement on-the-job training opportunities specifically allocated for young female students or graduates will also help young women to transition from study to career growth.

Initiatives like business development incubators or innovation competitions that involve tech have been popular in the past years for young women interested in tech careers and tech
entrepreneurship. These programs are important gateways of engagement for all of its participants, regardless of gender, towards further opportunities in tech.

**Support Opportunities for Meaningful Mentorship, Networking and Leadership**

Role models may be admired from a distance, but high quality and meaningful mentorship that leads to new opportunities happens face to face, or perhaps in the case of newer generations, across screens. By creating opportunities that match mentors not only on the basis of gender, but also age and background, young women may find not only the advice they need to move forward, but also the psychosocial support.

As individuals respond differently to support mechanisms, supporting a range of positive learning and support opportunities to young women as they move through school and develop their careers will be important. Women-only networking opportunities for young female tech entrepreneurs with older women investors may be a stepping stone for interacting with the tech investors.

Leadership training directed to women can ensure that more women are in management and executive roles, especially in local tech businesses. This kind of training may also empower women in tech to ask for higher wages and more responsibility from their employers, and lead teams primarily composed of men. Some may even become entrepreneurs and grow their own businesses. Furthermore, leadership training provides women with the confidence to initiate conversations with their partners on topics like equal share of domestic work.

**Support the Tech Ecosystem to Hire More Women, Retain Them and Advance Them Professionally**

The low supply of female tech workers is cited by employers for their unequal presence workforce. Furthermore, high achieving young women in tech envision a career beyond local tech companies and pursue further study and work outside of Cambodia.

Employers looking to break the gender divide in their workplaces need to actively seek out women trained in tech. Like the university administrators interviewed for this study, employers may want to promote their workplaces as gender equal, provide for women-only internship placements to students, mentoring or career growth opportunities for pre-existing female technical staff, and other supply side initiatives.

Cultural norms related to marriage and childbearing affect the female tech workforce across borders and cultures. Many tech companies have not had to implement policies like maternity leave due to the gender imbalance of the workforce. To maintain women in the tech workforce after major life changes like childbirth, employers need to have policies in place that not only support women to get back to work, and their continued professional advancement. When these “safety nets” are in place, it is more likely that women will feel comfortable to continue toward career goals.
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