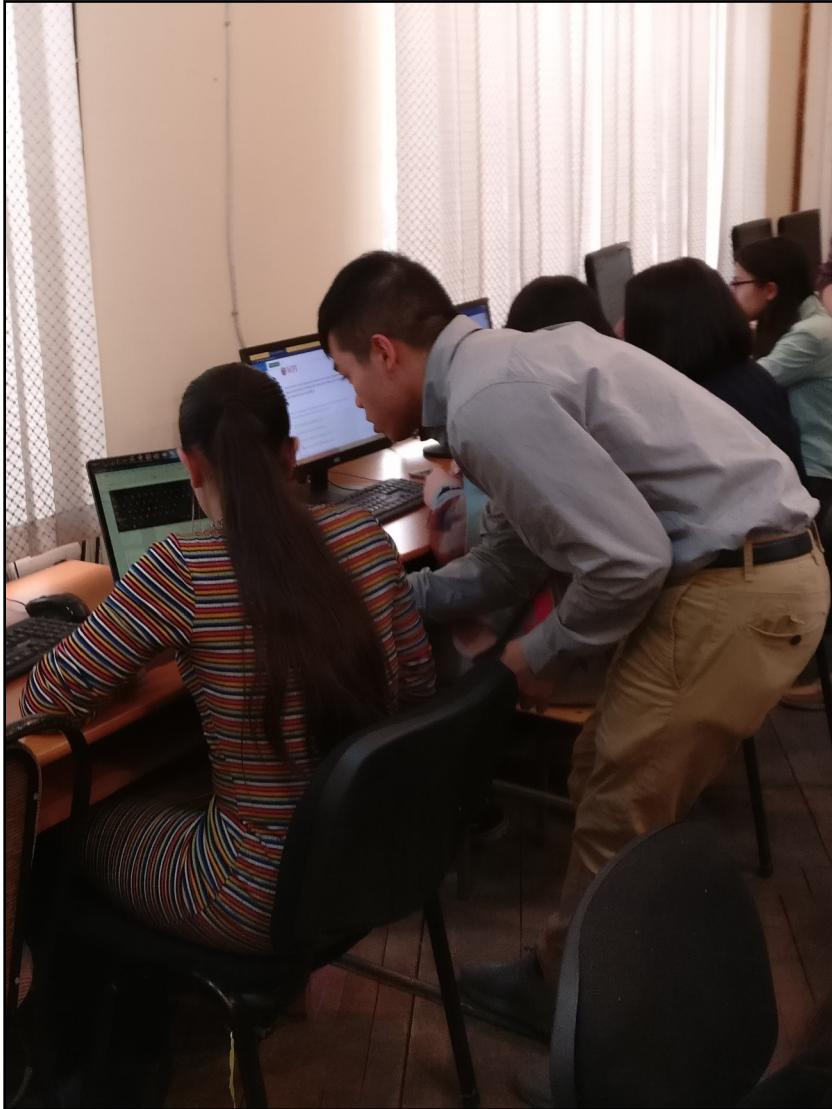# Extending the Impact of Technovation on Armenian School Girls

Abstract

The Technovation Challenge is an international app building competition for girls aged 10-18 designed to increase the number of female tech entrepreneurs. The program has experienced great success since its introduction to Armenia in 2017. Our project identified opportunities to motivate and support the girls to continue developing their personal, professional, and technical skills post-competition. We distributed a survey to past participants and conducted interviews with key stakeholders to identify opportunities and best practices. From this information, we provided eight implementation plans to the Regional Ambassador to provide guidance on organizational growth and program improvement. Together, these recommendations create an ecosystem for the program to flourish in Armenia.

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Lack of Women in ICT: The Disparity in Armenia

Women are underrepresented in engineering and related fields all around the world. According to UNESCO, in Israel, Japan, and the Republic of Korea fewer than 11% of computer scientists are women, and only 19% of engineers in Canada, Germany, and the United States are women.[1] While some developing countries are increasing the participation of women in engineering and computer science, there are still prevalent gaps. This global engineering and computer science gender gap persists within Armenia. Accounting for 6% of the country's GDP, only 30% of employees in the information and communications technology (ICT) industry are women.[2] While this may seem high when compared to other countries, most of these women occupy low level positions. Only a reported 1.3% of leaders in the Armenian ICT industry women.[3] The ICT sector has been growing approximately 26.3% each year since 2010, creating many new high-paying jobs and providing an opportunity for women to get economically involved and socially empowered. This growth is depicted in Figure 1.
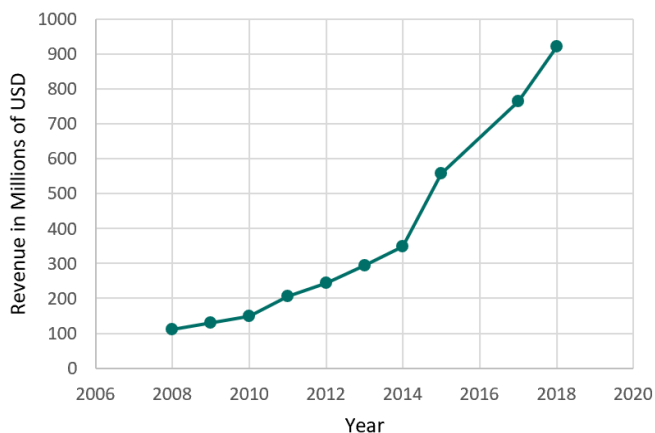
Figure 1: Revenue of ICT Sector in Armenia 2008-2018.[2]

One organization focused on integrating women into the ICT sector of Armenia is the Women and Information Society (W&IS), founded by Narine Abazian. One of the key programs W&IS organizes is the Armenian branch of the Technovation challenge, an international software development competition that educates and aims to inspire young girls to become future leaders in technology.[4] Technovation consists of a 12-week curriculum that requires participants to build a mobile phone application, create a business plan, and present a pitch to help them develop their leadership, entrepreneurship, and technical skills.

Technovation Armenia had been successful in recruiting participants, but there was a lack of data tracking and follow-up investigation of the girls after the conclusion of the program. Even with this limited data collection, the administrators felt that they had struggled to create their desired momentum for participants to continue their personal involvement in ICT, business leadership, and entrepreneurship. While research showed there were gender biases in education, the workplace, and at home in Armenia, it was unknown to what extent gender biases impacted the young girls' choice not to continue their involvement in ICT. This knowledge gap was an important barrier preventing programs like Technovation from improving their ability to encourage girls to pursue ICT careers.

This project sought to identify opportunities to further motivate the Technovation girls to continue the development of their personal, professional and technical skills, and design implementable recommendations to exploit these opportunities. In order to do this, the team focused on the following objectives:

- Identify to what extent the Technovation competition affects the motivation, confidence, and interests of the participants.

- Identify the factors discouraging the girls from continuing personal and professional development in computer science, entrepreneurship, and leadership.

- Identify other programs focused on developing skills for underrepresented groups and compile a list of strategies utilized by these programs that encourage or motivate girls to persist in pursuing technical careers.

- Synthesize implementable recommendations based on best practices that will address identified opportunities to motivate the Technovation girls.

To investigate the motivational, logistical, and societal issues limiting continuation, our team interviewed and surveyed Technovation participants, administrators, mentors, and representatives from other organizations similar to Technovation. We then matched existing solutions with issues identified in Technovation Armenia. We synthesized these challenges and the best practices to create implementable recommendations to expand continuation. These recommendations were then validated with follow-up interviews with participants recruited from the survey and other stakeholders. Our recommendations for Technovation Armenia will improve its impact on young girls along with their involvement in ICT, business, and leadership.

The Need for Technovation and its Activity in Armenia

The demand for technically proficient employees has increased dramatically around the world as each country wishes to compete in the global economy. However, as the technology sector has continued to grow, there is a global disparity of participation between genders. UNESCO has reported that this problem is getting worse, with the graduation rate of female computer scientists dropping in Australia, the Republic of Korea, and the USA.[1] The lack of women graduating with computer science degrees has led to a struggle in filling computer-related jobs. The National Center for Women & Information Technology estimates that at the current rate of

American students graduating with bachelor's degrees in computer science, only 17% of these jobs will be filled by 2026 in the US.[5] Globally, this presents a big opportunity to involve and empower women in the growing ICT industry.

To bolster female engagement in the technical industry, Technovation was introduced as a global competition for girls and young women. Founded in 2009, the program is now run by the engineering education non-profit Iridescent and has served over 23,000 girls from over 100 different countries. Technovation was specifically designed to close the gender gap in computing, business, leadership, and entrepreneurship. It is one of several after-school programs designed to broaden underrepresented groups' participation in and access to computer science. The annual program targets girls aged 10-18 and aims to provide the necessary skills for the participants to emerge as tech leaders. Technovation includes online modules pertaining to coding, business, marketing and pitching. Please refer to Figure 2 for the curriculum road map. Upon the completion of the 12-week program, the girls submit a mobile application along with a business pitch. Regional and semi-final judging are done online. The global finalists are flown to Silicon Valley to compete in the World Pitch Summit.

Since 2010, past participants have won startup and app-building competitions such as the Verizon App Challenge and the Columbia Startup Challenge. Past participants have also spoken at public events including TEDx Women, IBM India Onward, and the Google Science Fair. Additionally, past participants have gone on to attend hackathons and coding workshops. Lastly, some participants received design, development, and engineering internships with prominent technology companies, higher education institutions, and government agencies. A five-year look back survey in the U.S. showed that after participating in Technovation, participants were generally more interested in computer science, entrepreneurship, and business leadership. It also found 26% of alumnae went on to major in CS, while 58% of alumnae enroll in subsequent CS courses.[5]

ICT Gender Gap in Armenia

In Armenia's ICT industry, the majority of women in the industry fill the roles of general employees, while the majority of managerial positions are held by men. This gap reflects traditional gender roles in Armenian society. Women in Armenia are equal to men in the eye of the law; the government established political equality between women and men with the "law of the Republic of Armenia on ensuring women and men equal rights and equal opportunities," signed by the Armenian President in 2013, and passed The Gender Policy Strategic Action Plan for 2011-2015. However, strong gender biases ingrained in society persist and cultural opinions have not changed to reflect the laws' ideals. From a social perspective, Armenia exhibits characteristics of a patriarchal society; men are expected to be the breadwinners of the household while women are expected to do the housekeeping and childrearing. A report from the National Academy of Sciences of Armenia indicates that this prevalent characteristic in Armenian society is a fundamental reason for the challenges faced by women in the country.[6] The majority of respondents from a survey agreed that women are too emotional to be leaders in their communities. A report from the Small and Medium Entrepreneurship Development National Center revealed that this belief leads to a scarcity of women in decision making.[7]

Gender inequalities in the Armenian education system are not immediately obvious. UNESCO reports that the literacy rate of the total population has been
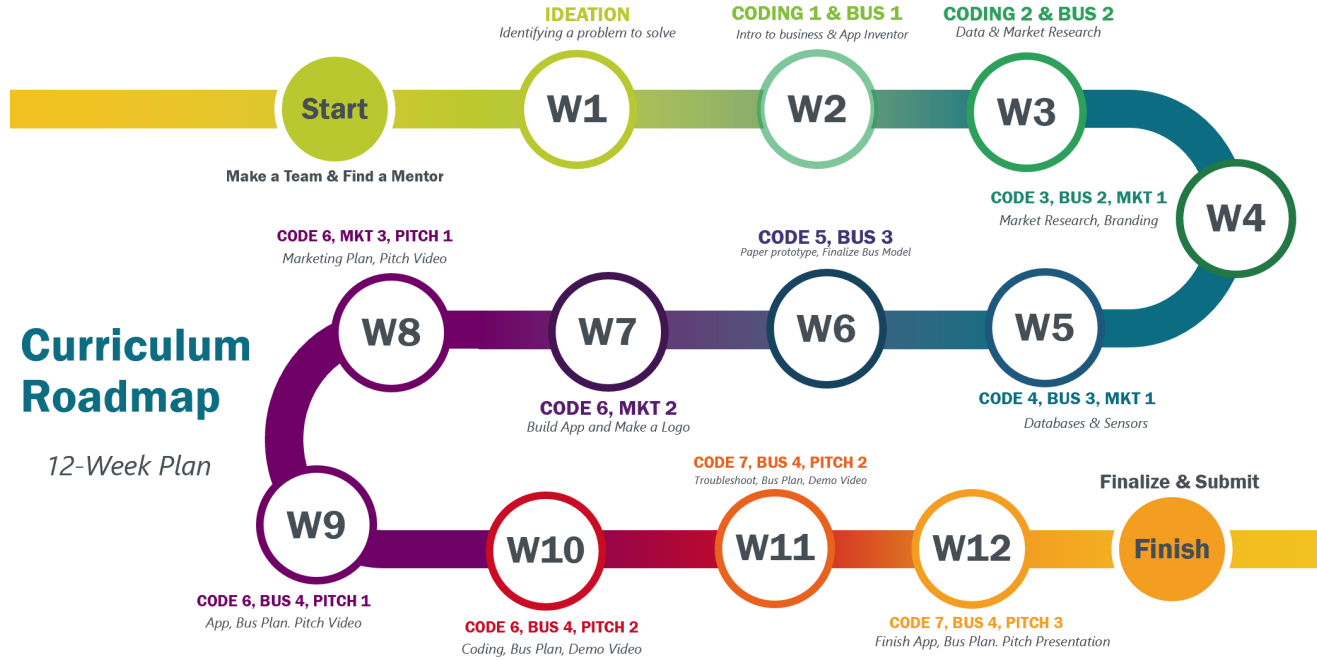

Figure 2: Technovation 2018 Curriculum Roadmap. [4]

above 99% since the 1960s, and today more than 85% of teenagers finish high school. UNESCO also claims only 46% of eligible boys attend tertiary school as compared to 58% of all eligible girls.[1] Multiple international tests have determined there is no tangible difference between girls' and boys' performance at school.[8] As shown in Figure 3, the most notable gender inequality within the Armenian school system is indicated by what girls decide to study. The World Bank reports, in general, girls choose fields such as teaching, health, art, and personal services. On the other hand, men pick a wider variety of fields, but mainly involve construction, transportation, machine building, and computer engineering.[8][9] Unfortunately, this gender-based predisposition leads to more inequality as women progress past college, as women's selection of majors and the expectation that women will fill traditional family roles lead to higher unemployment.[8]

Through engaging women in the ICT sector, Armenia can better address the gender parity issue. The Council of Foreign Relations, an independent, nonpartisan membership organization, identifies three important reasons to engage women in the ICT sector: to enhance gender equality, to empower women for the benefit of their children and community, and to bridge the gender gap in ICT.[9] Echoing a similar effect, a report on the governmental strategic action plan for Gender Policy for 2011-2015 in Armenia stated that opportunities in ICT created by this plan could be used to empower Armenian women both socially and economically.[4] In other words, "not recognizing that girls and women are underrepresented in ICT development policy and management, limits the resources of our [Armenian] society".[4] However, there is an overall lack of information regarding the involvement of Armenian women in ICT.[4] Due to the lack of relevant data, it is difficult to assess the current situation regarding women in ICT.

Technovation Armenia

To involve more women in the ICT sector in Armenia, Narine Abazian introduced Technovation to the region in 2017. As the president of the Women and Information Society (W&IS), she "aims to empower women and girls in Armenia through information and communication technologies, integrating them in the information society in Armenia".[10] By bringing Technovation to Armenia, she hoped to "develop the information and communications technology (ICT) industry, address the demand of more skilled specialists including women and girls in the ICT sector, and aid underserved women and girls to become innovators and leaders utilizing ICT".[10] Another reason for initiating Technovation was to provide young Armenian women with more opportunities to grow their skills and knowledge in technology and entrepreneurship.[10] Since its inception in Armenia, the program has increased its number of participants. In its inaugural year, 44 teams of one to five Armenian school girls participated in Technovation. In 2018, this number increased to 90 teams. Figure 4 shows the growth from 2017 to 2018 by marz or province. For 2019, the size remained about the same with a total of 407 students and 90 teams. Ms. Abazian hopes to continue enhancing the success of teams in the international competition and extending the participants' interest in ICT after the competition.

Though the program has been met with success in terms of participation, it faces challenges and limitations regarding post-program continuation. Within the two years of Technovation Armenia, three teams have gone on to win other competitions and receive additional funding to continue development of the applications created through Technovation. However, while the 12-week program is well defined, Technovation does not provide any additional resources or guidance for continuation beyond the conclusion of the competition. Ms. Abazian notes that a big challenge after the competition is thinking of ways for teams to acquire additional useful skills to grow their experience and confidence through technology.[10] Additionally, while the competition has experienced success already with these three teams, information about the progress of teams and what the participants do after the competition is limited. Technovation Armenia saves contact information for the participants in a simple database. Due to the lack of data collection, the extent to which Technovation has affected the majority of participants is unknown, limiting their ability to evaluate the program's success.

Importance of Post-Program Contact

Programs like Technovation are opportunities for points of contact, or "touch points," for girls to engage in ICT education outside of the traditional classroom environment. Touch points are characterized as contact beyond a singular program and usually include participation in additional enrichment programs.[11] A few studies were conducted to measure the effectiveness of STEM outreach programs to

■ STEM   ■ Non-STEM

| Men | 12,791 | 24,515 |
| Women | 5,442 | 35,999 |

Figure 3: Armenian Men and Women Graduating in STEM in 2017. [9]

encourage more female engagement in STEM education and fields. Though these studies did not explicitly focus on education in ICT, they demonstrated the importance of continuation and follow-up programs. One study focused on a specific program hosted on a college campus. The study conducted on the alumnae of a STEM program revealed a positive effect of post-program contact on selection of STEM majors in post-secondary schooling. The study demonstrated that alumnae of these programs were more likely to enroll themselves in a STEM degree as the level of contact with STEM after the program increased. As stated in the report, "additional opportunities for STEM touch points can impact a girl's decision to enter a STEM field in college".[12] A report from the Women's Foundation of Colorado has shown that multiple touch points can "improve girls' STEM skills, inspire them, motivate them, and create a sense of belonging that girls may not otherwise experience on their own".[13] These studies suggest that repeated contact is a key characteristic for successfully encouraging girls to follow a STEM path. Technovation might struggle to have its desired impact in Armenia if it does not ensure that its participants get repeated contact even after they complete the prescribed 12-week program.

Figure 4: Technovation Armenia Growth by Marz from 2017 to 2018. [10]

Obtaining Information from Key Stakeholders

The goal of our project was to identify opportunities for the Technovation girls to further their personal, professional, and technical skills in ICT and business after completing Technovation and provide recommendations to strengthen Technovation's impact. To achieve this goal, we explored root causes and barriers affecting the Technovation girls' outlook of professional opportunities and their ability to achieve their personal goals in ICT and entrepreneurship. In parallel, we also investigated similar organizations and their approaches to solve similar problems. Figure 5 shows an overview of the two research paths and how we integrated and synthesized the data to create recommendations.

Technovation Armenia Participant Research

To start the study, we investigated the impact of Technovation Armenia on current and past participants. Our initial approach utilizing a survey returned only 9 usable responses which was insufficient for drawing meaningful conclusions. Therefore, we turned to interviews in order to uncover participants' motivations for participating as well as to learn more about their experiences during the program.

We interviewed 9 Technovation girls, 3 mentors, 1 administrator, and 2 judges utilizing questions similar to the survey. These questions focused on why participants did or did not continue after the Technovation program. For the other interviewees, we focused on opinions of what would help the program have a lasting impact on the girls. To recruit the interviewees, Ms. Abazian sent out a mass email to each key group: past participants, mentors, and judges requesting they contact us to schedule interviews. Details on the questions utilized in the survey and interviews can be found in the supplemental file.
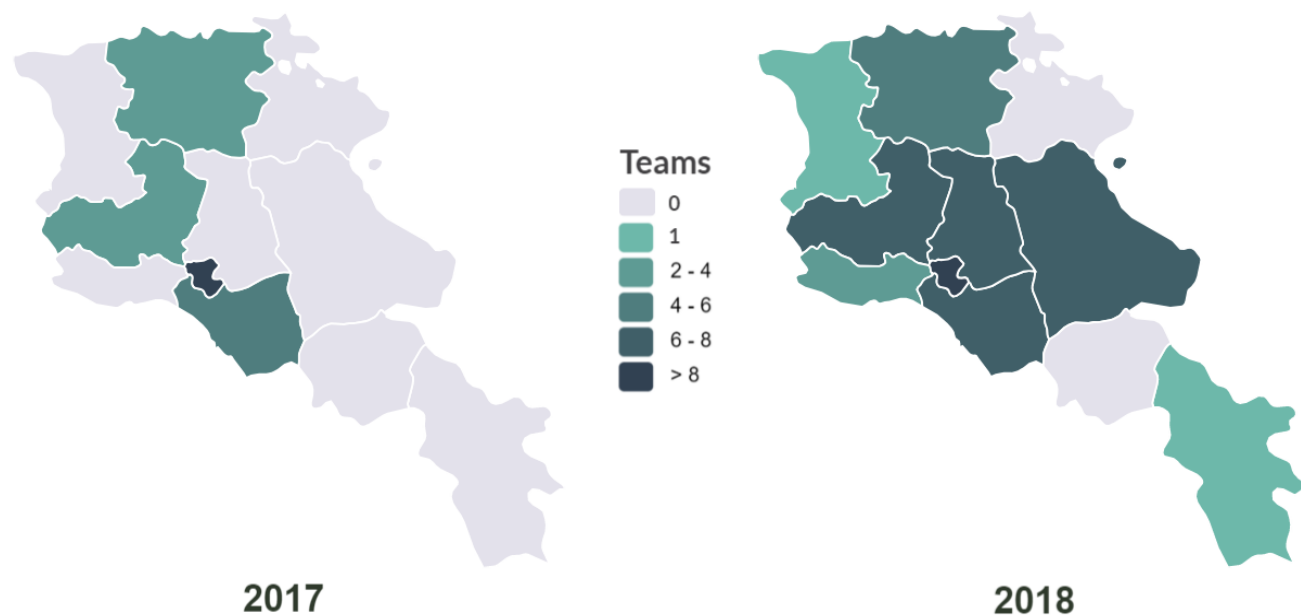
Together, the survey and interviews yielded both quantitative and qualitative data. For quantitative data, we reported counts of specific opinions or thoughts. Qualitative data were analyzed with inductive and deductive content analysis. Content analysis was an appropriate approach because this project required laying a foundation in an underdeveloped research space.[13] While we approached the content analysis with an inductive mindset, our background research allowed us to form some initial hypotheses to make the analysis more efficient. One hypothesis we kept in mind was when the girls go through the competition and do not win, they may become discouraged from continuing in ICT.[14] We also considered the implication of gender-related issues including the stereotype that girls should not pursue ICT careers. Inductive analysis led us to the creation of additional hypotheses which we later explored.

Identifying Opportunities in Other Programs and Branches of Technovation

In addition to researching Technovation in Armenia, we also investigated external organizations to learn more about best practices and methods utilized in promoting continued engagement. We investigated organizations focused on trying to get women and/or minorities into STEM. In practice, the criteria we used to select organization were relatively broad, covering anything from summer programs to after-school programs involving technology both in and out of Armenia. We identified 50 programs that focus on increasing the participation of underrepresented demographics in STEM fields. We interviewed six program administrators to identify best practices and potential solutions to the issues extracted from our research on Technovation Armenia. We also contacted 140 Technovation Regional Ambassadors from other countries and interviewed seven to gain insight on their challenges and how they addressed their continuation

issues. We used our findings to build our recommendations by matching their approaches with the situation we identified in Technovation Armenia.

Our Investigation Identified Eight Key Findings

Utilizing these eight key findings, we identified ten opportunities for improvement within the program. Next, we synthesized recommendations for each opportunity based on our best practice research and validated our recommendations through conversations with key informants and stakeholders. The recommendations are presented in approximate descending order of impact, as discussed in more detail in a later section.
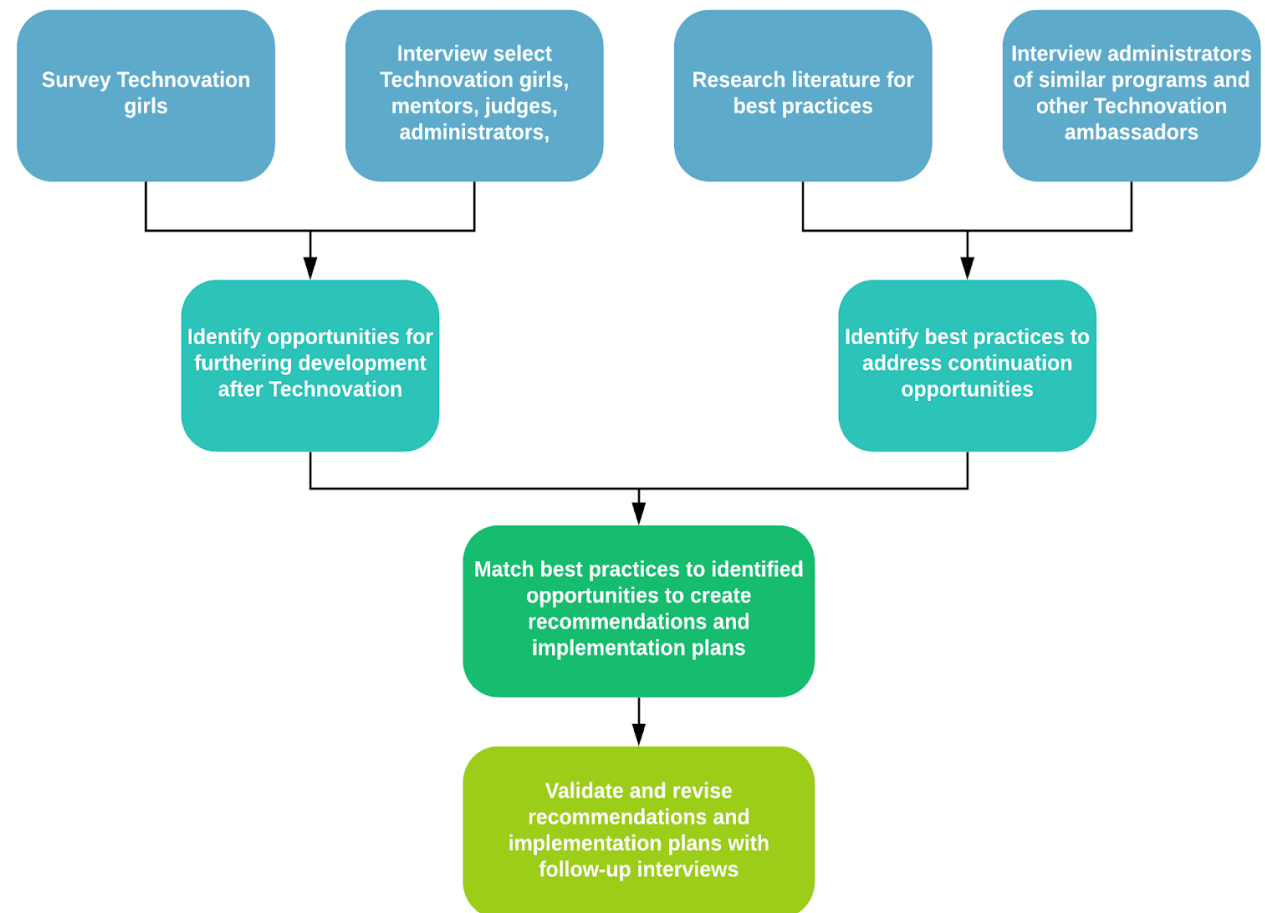

Figure 5: Methods Block Diagram

Technovation Provides an Opportunity to Fill an Unmet Need in Armenia's Tech Education

Technovation's immense growth in Armenia demonstrates that it is filling a gap in the Armenian school system. Past participants stated that they joined the program to learn about and gain experience in programming, business, and group work. Two of the past participants also mentioned that they had joined the competition to figure out if they would like to pursue programming in the future. Six mentioned that they joined to work in a team or on a project that had the ability to have a big impact on others. A general consensus was that Technovation presented a great opportunity related to programming, business, and extensive group work, which are not typically offered in schools. Due to the limitations of the educational system, there is a prevalence of tutoring and additional after-school programs. A primary example of this is TUMO, an after-school program during which students learn various STEM subjects at the TUMO Center. Since 2011, TUMO has grown to over 10,000 students in Yerevan alone. The founders are looking to further expand this number by adding additional locations.

Another example, such as the Seaside Startup Summit, an intense, one-week program for tech startups to work closely with tech professionals and mentors, has also grown to over 1,000 participants attending each year. Overall, Armenia sees the need to develop resources to grow in the ICT sector outside of the formal education system. From our interviews, it was clear that Technovation helped the participants determine what they wanted to study later on in college. Technovation Armenia has the potential to continue being an important part of Armenia's tech education as long as it continues to grow sustainably.

The Sudden Growth of Technovation in Armenia has Led the Program to Experience Typical Struggles of Successful, Rapidly Growing Organizations

Due to the unique opportunity the program provides in the Armenian region, Technovation has experienced rapid growth over its three years of existence. Similar to any other organization, as the number of participants increase, the workload on current administrators also increases. Without the administrators' significant efforts in the first years of the program, Technovation would not have achieved such growth. However, through observations and speaking with our sponsor, the regional ambassador, we came to the realization that the program has outgrown its administration. Currently, the same three administrative members from 2017 serve as the core team handling all 400 current participants, with our sponsor being the only one working full time. She has
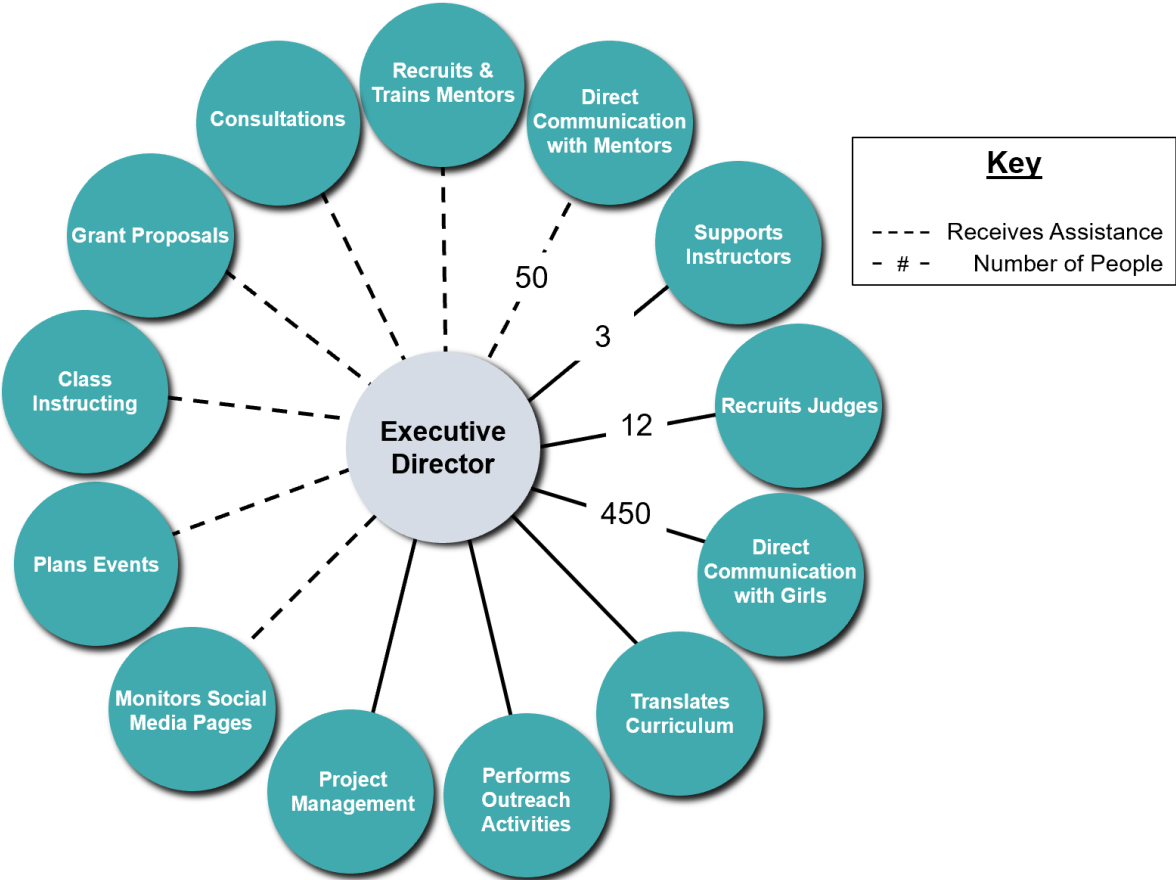

Figure 6: Current Regional Ambassador Tasks.

found herself involved in every part of the operation and has no time to focus on growing the impact of the program. In other Technovation branches that have experienced similar participation rates, many ambassadors have split up the area by adding smaller regional ambassadors. This is most notable in the US where many states are split into multiple regions to make the competition more manageable. Figure 6 is a web of the tasks the regional ambassador is currently responsible for.

Technovation needs to mature as an organization and expand its core team if it wants to continue growing in a sustainable fashion. Common practices to manage scaling include developing new funding plans, formalizing the structure of the organization [15], and developing formal processes to better manage the program. This is shown in the capability maturity model, Figure 7.
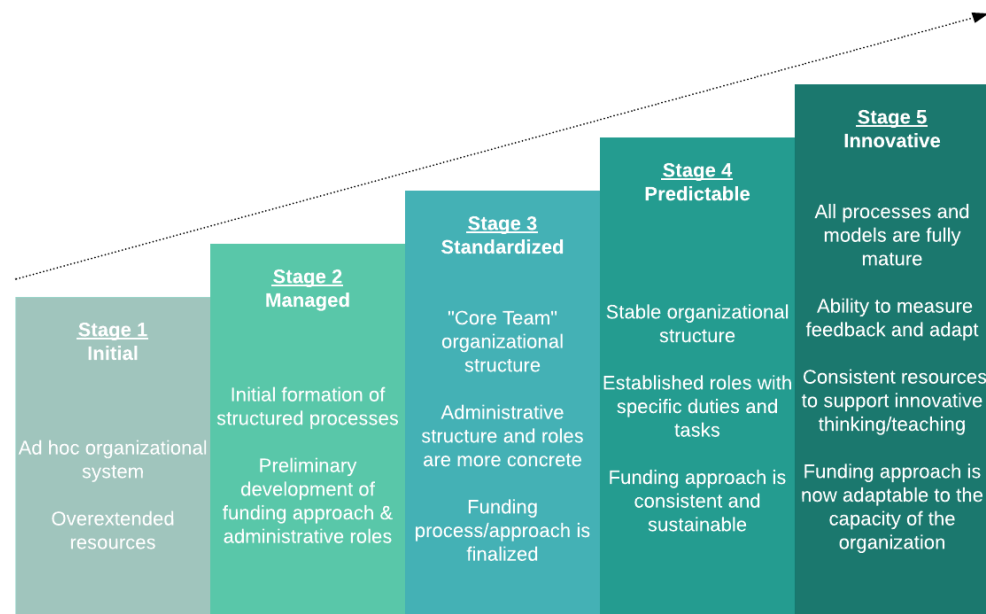
To help alleviate the workload on the current administrators, our team recommends a four-pronged approach that will allow the administrators to shift their current responsibilities to focus on the growth and impact of the program.

First, **we recommend that the current administrators formulate an improved funding strategy which will allow the program to grow**. To help the administrators acquire necessary resources including volunteers, professional support, mentorship, and monetary support, the team produced a resource prospectus for the administrators to use as a pitch to potential investors, donors, volunteer organizations and anyone else who wants to learn more about Technovation Armenia. The administrators can use this prospectus to create connections with additional organizations for funding and other needed resources.

Second, **we recommend that the administrators of Technovation Armenia transform the current informal organizational structure to a functional organizational structure.** This structure will focus on a core team along with the opportunity to create an extended team through the use of volunteers. These volunteers could be responsible for tasks such as monitoring Technovation Armenia social media pages, classroom assistance, event planning, and other activities. Having volunteers will allow top administrators to shift from monitoring all the current activities to a more defined managerial role of overseeing the program as a whole. Figure 8 shows the recommended structure for the organization.

Third, **we recommend that the executive director of Technovation Armenia utilize multiple regional ambassadors to help manage the size of the**
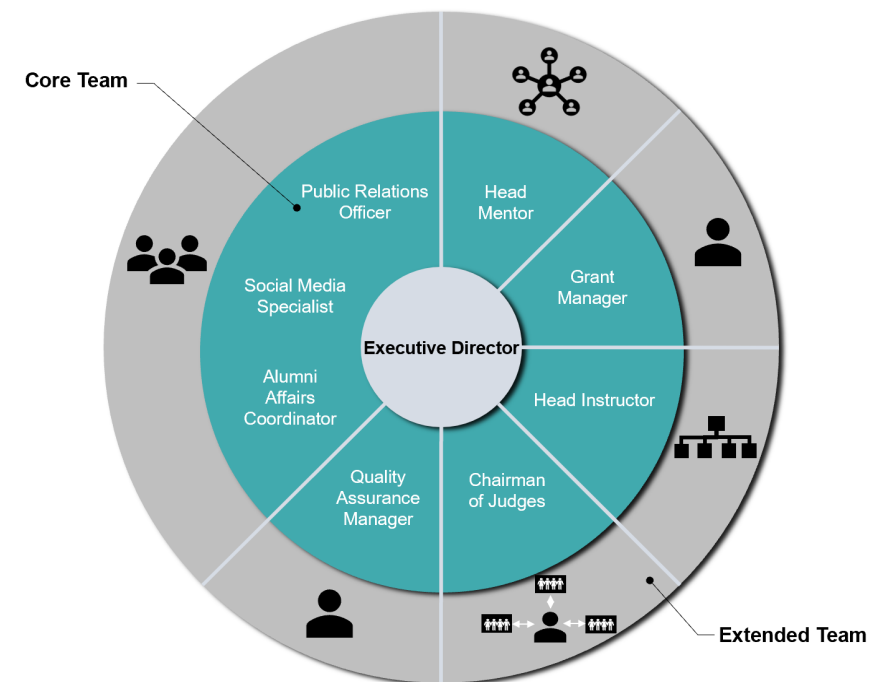

Figure 7: Technovation Armenia Maturity Model, adapted from [16].
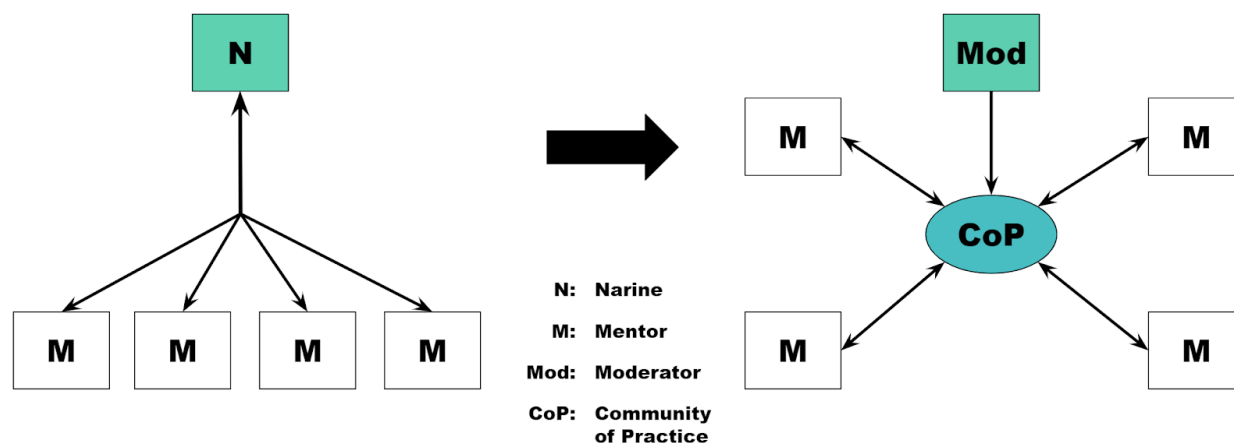

Figure 8: Recommended Organizational Structure.

Figure 9: The Effect of Implementing the Mentor CoP.

N: Narine
M: Mentor
Mod: Moderator
CoP: Community of Practice

competition. Since Technovation Armenia is one of the largest Technovation branches we interacted with, and there are examples of other branches with multiple. ambassadors to subdivide the region, incorporating regional ambassadors under Ms. Abazian is a logical next step. Adding sub-ambassadors will help alleviate the workload on Ms. Abazian and will help Technovation expand throughout Armenia.

Fourth, **we recommend the creation of a "Mentor Community of Practice"** (CoP). Due to the geographic distribution and number of mentors, the CoP needs to be organized on a virtual platform such as Slack. The CoP would be used to help the mentors share knowledge and ask questions amongst each other. It would also serve as a centralized location for questions directed at administrators where everyone can see the responses, which will help the administrators shift away from devoting attention to individual mentors to helping them as a whole. The CoP will also be beneficial because it only requires a single moderator to properly manage the virtual channel. The reduced time spent on mentor help will allow administrators to focus their energy on more managerial tasks. Figure 9 shows the change in focus away from Ms. Abazian after the CoP is put in place.

Successful Teams have Collaborated with Professionals During the Competition

During the ideation and development of the business plan some teams leverage personal network connections with professionals other than their mentors to help produce a more successful project. Even though Technovation Armenia provides professional panels through which the participants can network, each team has varying degrees of access to professionals. It is extremely important for the girls to interact with professionals who serve as role models. Three past participants we interviewed who continued to develop their applications mentioned professional assistance as an important part of their continuation. Numerous studies have found that role models influence the college course selection and career choices of female students.[17, 18, 19, 20, 21] Working with professionals can inspire the girls to learn more about IT and entrepreneurship. This is also particularly important as an educator indicated that the current secondary school curriculum does not relate well to real world careers. By providing opportunities for girls to work directly

with professionals, the girls are not only able to gain practical feedback on their applications and business plans, but they are also able to learn more about the profession. Other Technovation branches have tried to involve more professionals into the program by recruiting tech professionals to be mentors, or by organizing field trips to companies and organizations for the girls to learn more about how to apply coding to real careers.

We recommend Technovation Armenia involve more technical and entrepreneurial professionals into the program utilizing a structured process. Involving these professionals during the ideation phase (week 1) would allow the participants to optimize their time by validating their project before investing too much effort. To implement a structured format for engaging professions with the teams, we recommend utilizing a system where each team would submit a form with their idea to a professional for feedback. This would allow the teams to build a personal relationship with a professional which could lead to a mentorship opportunity. Figure 10 shows how this process would work. To help recruit the pool of professionals, the implementation plan includes guides for the administrators and a list of potential partners.

Many of the Participants Rely Solely on Their Mentors to Learn About Continuation Opportunities

Many past participants have indicated that their mentors inform their team of additional opportunities or programs in which the girls can participate, fostering the idea of post-program continuation. However, it is evident not all mentors share the same knowledge or are aware of the same opportunities for the girls. The Technovation Armenia administrators indicated that they plan to utilize a Facebook group to inform the participants of

opportunities that the administrators have come across, but there is no concrete system currently used to generate or disseminate this information.

It is important for the girls to know about and have access to the resources available to them, so they are able to continue their development after the end of the program. A notable path of continuation for successful Technovation teams has been the Seaside Startup Summit, but some of the past participants we interviewed did not even know it existed. One administrator of the Technovation Armenia program noted the importance of self-efficacy, where the girls themselves must be able to internalize the impact of technology, be aware of its implications, and know how to incorporate technology in their endeavors. Our literature review in the previous section has identified the importance of touch points and continual engagement in impacting the girls' outlook on tech-related careers.[11, 12, 13] To further encourage the girls, it would be beneficial to utilize a tool that informs all Technovation participants about the available opportunities.

Our investigation of other regional ambassadors connected us with one ambassador who utilizes both a Facebook page and a blogging website that consolidates and shares links and information for programs and other opportunities for the girls to explore. For this ambassador, it is important that she has one location with all of the material translated to the native language to make the information easily accessible to the girls.

We recommend Technovation Armenia utilize a centralized resource pool to connect the participants with other programs and opportunities. In doing so, Technovation Armenia will provide resources to build participants' knowledge of opportunities to further their development. Building an active Facebook group would be advantageous in the short term and a website or blogging site should be considered for investigation as a long term implementation. The Facebook page will include resources based on four categories, shown in Figure 11. To assist Technovation Armenia, the implementation plan includes a preliminary list of resources for each category and a framework in which key positions were identified for platform and content management.
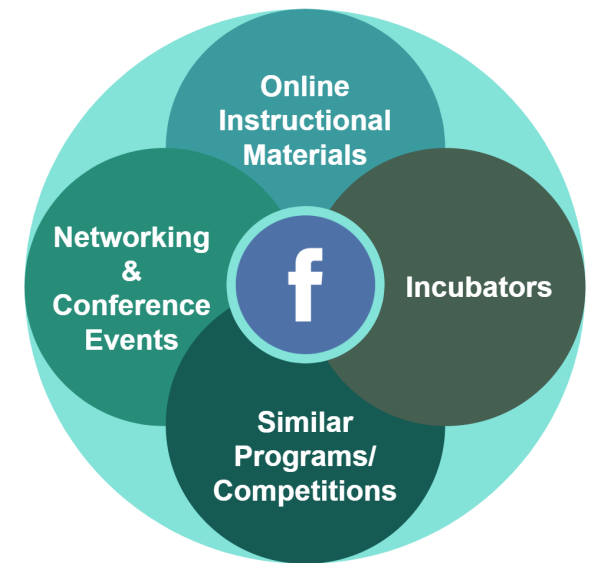
Figure 11: Facebook Group Resource Pool.

Technovation Armenia's Weekly Classes Utilize a Traditional Lecture Format that Lacks Engagement

Technovation Armenia has done an impressive job providing the mentors and participants with translated teaching content for the four Technovation modules: coding, business, marketing, and pitching. Most participants mentioned having the materials in Armenian was vital in their ability to learn the skills needed to complete the competition. Technovation Armenia also offers weekly classes in Yerevan to help teach the material. These classes are recorded and distributed to all the teams that can't attend. Both the administrators and three Yerevan State University students help teach the classes, but they are taught in a traditional lecture format where all the students sit in chairs and watch lessons that are projected on a screen.
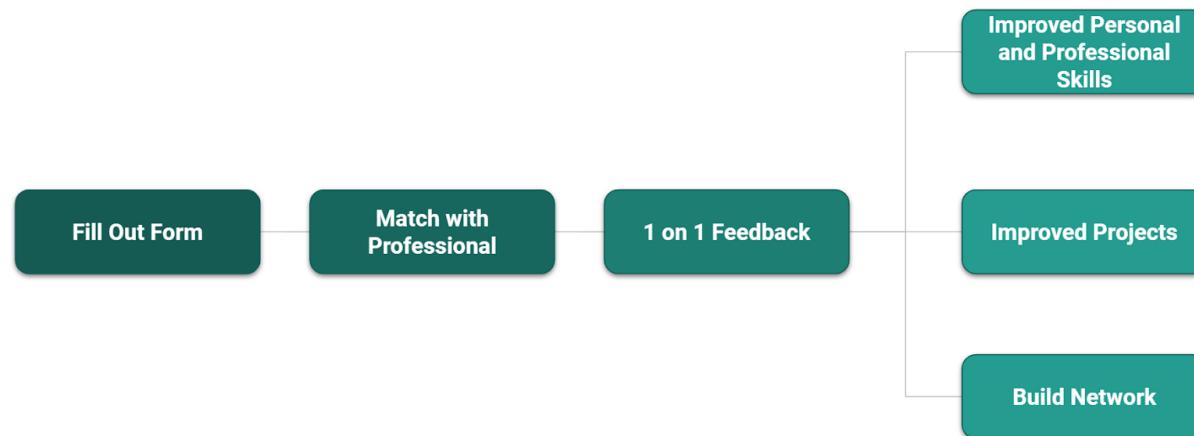
Figure 10: Potential Ideation Feedback Process.

Figure 12 shows a picture of the weekly classes. Most notably, the girls do not have computers with which to follow along and the instructors stay stationary at the front of the class, rarely interacting with the students.

Active learning improves both student performance and retention, especially in STEM subjects.[22] The New Jersey Center for Teaching and Learning (NJCTL) has been using these strategies to not only train educators, but to deliver tangible improvements to students' performance. While some specialists maintain that lectures can still be an important part of education [23], active learning has become the new standard in education and provides a great opportunity to make learning science and technology more accessible to all students. An example of active learning in Armenia is seen at TUMO's center where students first engage in self-learning and then participate in workshops with an instructor and with other students in close proximity to encourage a collaborative environment. Technovation Armenia has already exhibited some preliminary characteristics of active learning where girls do individual learning before the classes are taught. Figure 13 shows the 4 key characteristics needed for an active learning classroom.

To take the educational impact of Technovation to the next level, **we recommend that Technovation Armenia run a pilot program to incorporate active learning into its weekly classes in 2020**. **Additionally, we recommend active learning webinars be used to make the weekly classes more accessible to the participants from outside Yerevan.** To run the pilot program, the administrators should work with the next group of WPI students in 2020 to help them pilot an active learning environment both in the classroom and via the webinars. For this group of students, it is imperative to have native Armenian speakers to help translate and teach the classes since the weekly classes are taught in Armenian, therefore we further recommend that the team partner with students from AUA.

Many Participants are Unable to Take Advantage of Networking Opportunities

The importance of networking has been shown through various research over the years. One study found that all of its participants believed they would have benefited from learning and developing their networking skills earlier in their careers. [25] The importance of networking was also expressed by administrators of startups who emphasized the impact of their networks on their organizational success.

Technovation currently provides limited guidance when it comes to networking. During an interview with a Technovation Armenia judge, he stated he had made himself available to all the teams, but only two actually took advantage of this opportunity. Similarly, the administrators within the Technovation Armenia program have done substantial work starting their professional network, but struggle to find the resources the program needs to grow.

We recommend Technovation Armenia provide networking workshops for everyone involved in the program. Since the curriculum provided already fills an unmet need for business education in Armenia, there is an opportunity to expand this education to include networking skills. To

Figure 12: Current Setup During Programming Classes.

incorporate a networking workshop, Technovation Armenia should plan a workshop during the competition that is open to all personnel involved in the program. To help the administrators begin planning the workshop, our team provided a list of professionals to contact who could potentially run the workshop. Additionally, to help the administrators grow their network, we have compiled a list and begun initial contact with people from other relevant programs, investors, incubators, accelerators, and industry professionals. While our team initiated some of the relationships, they will need to be maintained by the administrators utilizing the skills taught in the workshop.

The Current Technovation Armenia Alumni Community is Underutilized by Past Participants

Creating a platform that enables alumni to communicate encourages a peer mentorship environment. Mentors, especially peer mentors, are very important for promoting continued professional growth. Numerous studies have shown the positive benefits of peer education and peer mentorship. The positive benefits are evident in a number of areas such as social and emotional development [26], academic accomplishment [27], and participant retention rates [28]. The Technovation Armenia administrators have already identified the importance of an alumni community to enhance the post-Technovation experience. As such, they have already taken the first steps by creating a Facebook group specifically for Technovation Armenia alumni. Although the Facebook group has been created, the past participants have yet to be invited to join.

We recommend that Technovation Armenia expand and improve their alumni Facebook page to cultivate their alumni community. Expanding their Facebook group to involve more members provides more opportunities to foster significant peer and professional relationships while also encouraging the continuation and development of the participants. To assist the administrators in implementing this improvement, the team built the new Facebook group to include all alumni and other important stakeholders. In addition, to increase the engagement of the alumni on the page, example posts and strategies were provided to help guide the alumni moderator to upkeep the Facebook group. The posting strategy provided promotes constant interaction through a wide array of posts differing in terms of significance, audience, interaction, and engagement. A more active alumni community provides an additional channel of information such as programs, conferences, workshops, job and career opportunities, colleague updates, as well as an opportunity to make professional connections, collaborate on projects, and form long-lasting partnerships. To help with creating networking opportunities, entrepreneurs and ICT professionals will also be included in the group.

The Current Program Evaluation Process is Informal and Limited in Scope

At the end of the regional pitching competition, participants are given the opportunity to provide informal feedback on their Technovation
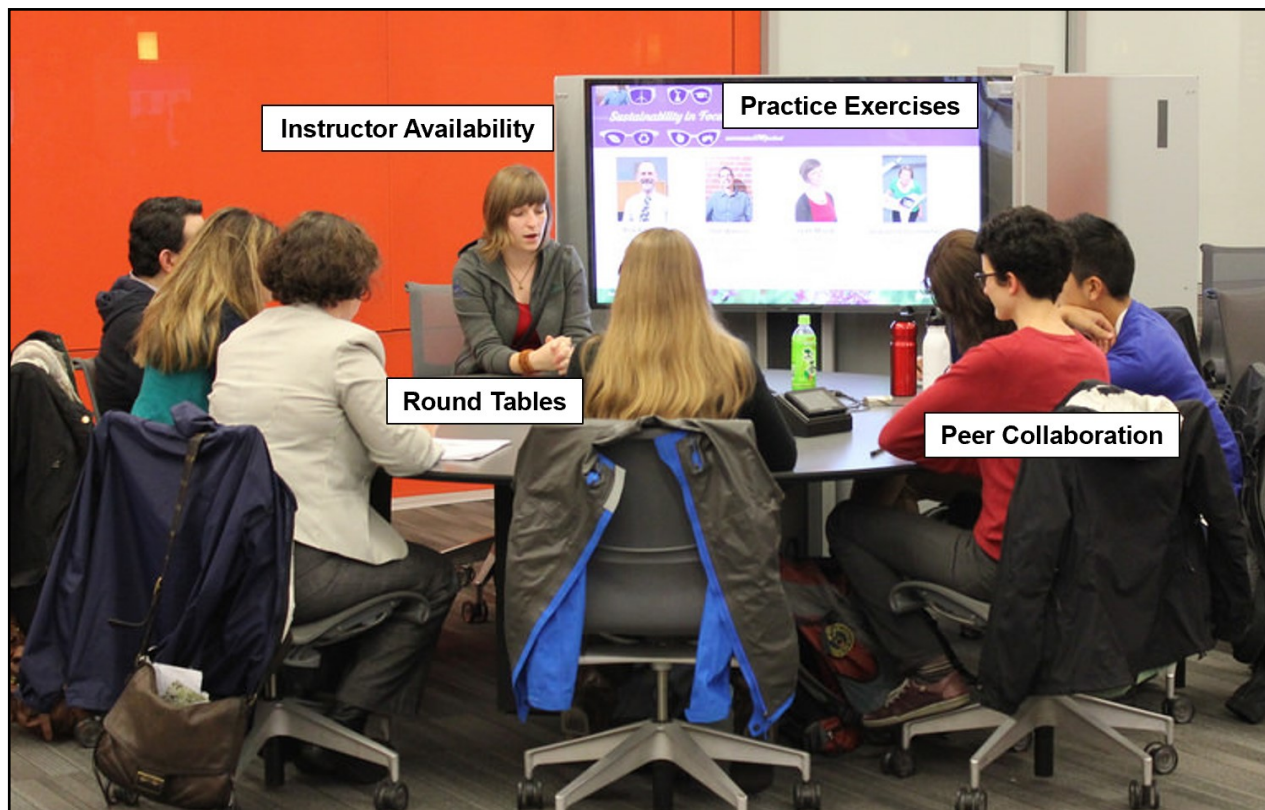

Figure 13: Components of an Active Learning Classroom [24].

Instructor Availability

Practice Exercises

Round Tables

Peer Collaboration

experience regarding the impact of the program and the work they have done. However, there is no formal process for recording the feedback and developing plans for revising the program itself. Other entities related to Technovation have been using a pre- and post-competition survey setup. For example, some of the global Technovation branches utilize pre- and post-program surveys to better capture the effect of Technovation on their participants. Iridescent also conducts their own yearly evaluations by sending pre- and post-Technovation surveys to the participants and mentors of all international branches of the competition.

To address the opportunity to better their program evaluation and improvement process, **we recommend that Technovation Armenia utilize a multi-survey approach**. This approach would provide a structured format for obtaining feedback on the program's performance, which can be utilized by the administrators to improve future iterations of Technovation Armenia. This approach would also provide data regarding the effect of the program on participants, mentors, and judges, which will be useful in getting more funding and support in the future. Figure 14 shows the timeline for distribution of each survey. To alleviate the overhead of creating many new surveys for the different demographics, Technovation Armenia can leverage the responses from the pre- and post-Technovation survey already being conducted yearly by Iridescent.

Impact Analysis of Implementations

To help present and prioritize the recommendations to be implemented, we performed a cost-impact analysis as shown in Figure 15. The vertical axis depicts the cost, which is based on the hours of paid staff time for each activity over a period of 5 years. The horizontal axis depicts the impact, in which each activity was arranged relative to each other based on their anticipated impact on continuation after
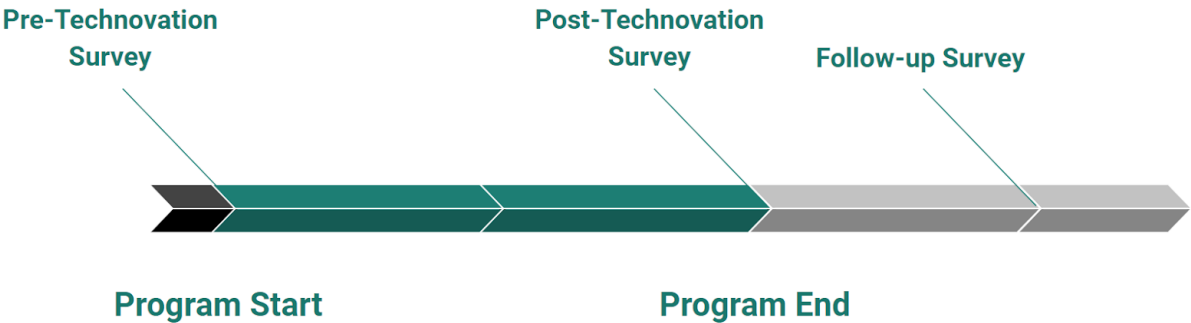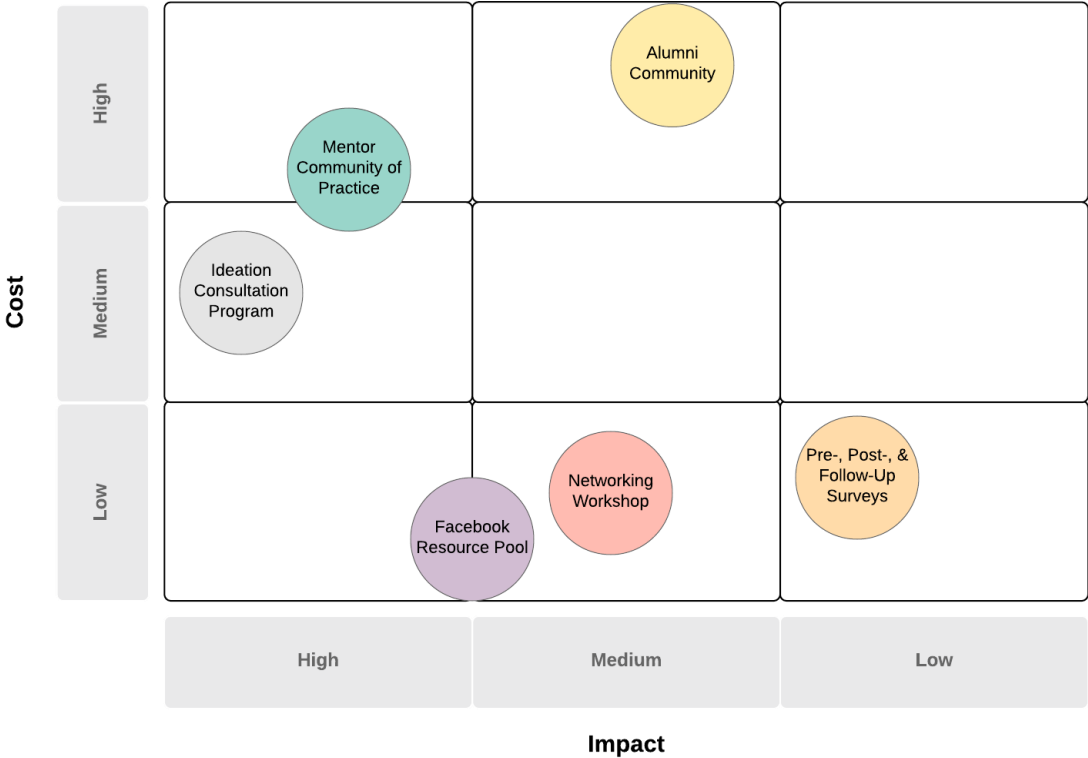

Figure 14: Survey Distribution Timeline

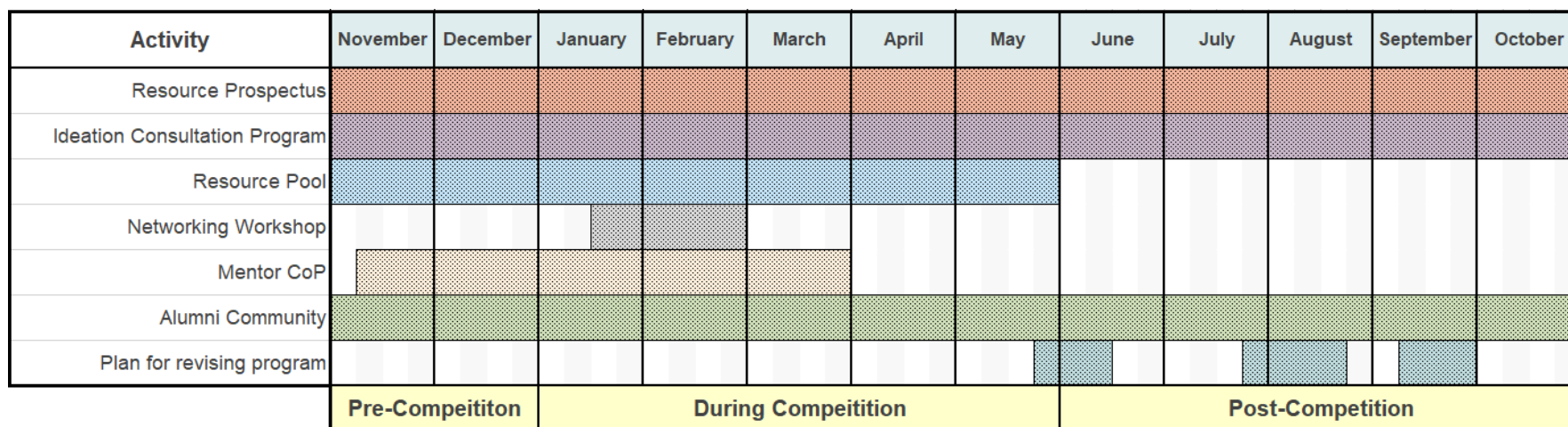Figure 15: Cost-Impact Analysis Chart of Each Activity After 5 Years.

Activity	November	December	January	February	March	April	May	June	July	August	September	October
Resource Prospectus	■	■	■	■	■	■	■	■	■	■	■	■
Ideation Consultation Program	■	■	■	■	■	■	■	■	■	■	■	■
Resource Pool	■	■	■	■	■	■	■					
Networking Workshop			■	■	■							
Mentor CoP	■	■	■	■	■							
Alumni Community	■	■	■	■	■	■	■	■	■	■	■	■
Plan for revising program								■		■	■	
	Pre-Compeititon		**During Compeitition**					**Post-Competition**				

Figure 16: Gantt Chart of Implementations on Yearly Basis.

5 years. The "best-value" implementations are in the lower left corner where they are both high in impact and low in cost. In our case, we've identified the Ideation Consultation Program, the Facebook Resource Pool, and the Networking Workshop as the recommendations with the highest value.

Each implementation plan requires various degrees of involvement during different times of the year. Figure 16 shows a Gantt chart of all of the implementation plans and the times of operation for one year, with respect to Technovation's timeline. For all information pertaining to the implementations plans, please refer to the respective sections in the Implementation Guide.

> "*I would have been interested in receiving a prize… not money really, just something to keep me interested…maybe advice or something? I would have liked to go to a professional workshop to learn more about creating my own business.*"   -Past Participant

Implementing our Recommendations will Create an Ecosystem that Extends the Impact of Technovation Armenia

In developing our recommendations for Technovation Armenia, we observed that many aspects of the recommendations overlap with one another. Each recommendation complements another recommendation, further building upon and enhancing the overall impact of Technovation Armenia. As such, our recommendations, when combined, create an ideal "Technovation Ecosystem," shown in Figure 17. Our team recommends implementing these recommendations together to create the necessary environment in which Technovation Armenia can flourish and have the desired impact on school girls in Armenia.

Figure 17: Technovation Ecosystem.

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