COMPETITIVE ASSESSMENT

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Overview

The field of Quantum Computing has continued to grow and increase in popularity in the last decade, this has led to an increasing gender gap between men, who have historically dominated STEM fields, and women. On account of this disproportionate gap, the creation of many groups and organizations that strive for greater inclusivity and diversity has been needed. As Quantum Computing continues to expand its horizons and feasibility as an emerging technology, new perspectives and minds are needed to continue the research and development that will have equitable impact for all.

Taking this into consideration, this competitive assessment takes a look at organizations within the following categories:

Education Focused   **Community Support Focused**
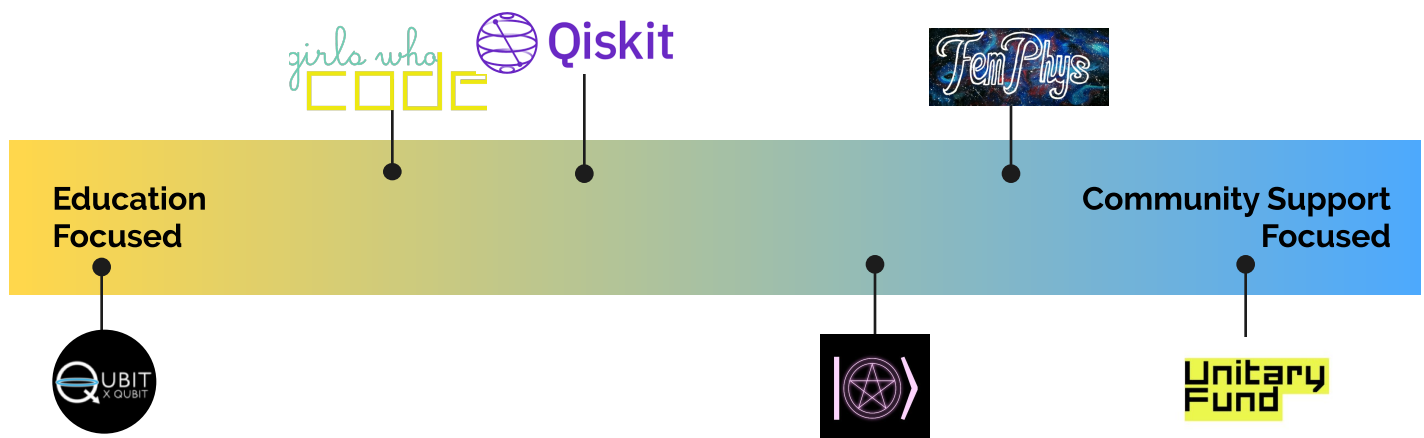
Education

This means that the product or organization is more focused on teaching a skill, typically to novices such as students. They tend to focus on bringing new members.

Community Support

This means that the product or organization is more focused on supporting existing members or experts in quantum computing. They tend to focus on community strengthening.

Competitors

Girls Who Code

Who: Girls Who Code is a non-profit aiming to close the gender gap in tech. GWC teaches computing skills to girls through their various educational programs and supports their alumni as they pursue careers in technology.

Why: Not only does GWC aim to teach girls how to code, it also aims to empower girls and prepare them for successful future careers in the tech industry.

QubitxQubit

Who: QubitxQubit is an initiative created by The Coding School to prepare the future quantum workforce. QubitxQubit offers summer camps and workshops to introduce and teach quantum computing to middle school and high school students.

Why: QubitxQubit emphasizes diversity and inclusion in their mission to train the future quantum workforce.

Qiskit

Who: Qiskit is IBM's open source quantum computing programming language, which is free to the public to use. There is a community built around the language, which includes textbooks, educational content, representatives, and events.

Why: Qiskit is a highly accessible way for people to start learning about and using (to a certain extent) quantum computing. The language is available to anyone with a computer and is actively supported by IBM.

Competitors

Unitary Fund

Who: The Unitary Fund is an independent organisation that aims to get more people involved in quantum computing/research without needing to be part of a major company or academia. It provides $4000 grants freely to fund independent research projects and also connects them through Discord and Slack.

Why: By providing financial support to independent researchers, the Unitary Fund helps those with interest but no financial backing pursue projects and add to the larger body of research.

WIQCA

Who: WIQCA is a women and non-binary support group whose goal is to make the Quantum Computing more inclusive and welcoming. It also emphasizes growing people's skills and abilities in Quantum Computing.

Why: As a group that strives for inclusivity, WIQCA functions as both a support and educational group for women. It provides several educational and networking opportunities for those who want to get involved/are involved in Quantum Computing.

FemPhys

Who: FemPhys is a university based group at the University of Waterloo (a leading academic institution in Quantum applications). It aims to facilitate education, sharing of experiences, and networking of women and non-binary people in physics and related fields.

Why: FemPhys emphasizes making the community as welcoming and supportive as possible through different educational talks focusing ethics and issues in the field and networking events. As well, it provides a safe space for women and other minorities in the community to connect and collaborate.

Criteria for Evaluation

Demographics

Target Demographic, Amount of users

Demographics refers to the target audience for these organizations' programs and services and how many people engage with their programs and services.

Accessibility

Platforms available, how to join, cost of joining, languages available

Accessibility refers to how people would access these programs. This includes the platforms that the information and/or services are provided on, the method and cost of access, and the languages available.

Presentation

Tone used, Selling Points, Imagery used, Self promotion

Presentation is how the organization/group presents itself to its potential audience. What it does to engage and bring in new and current people it has already attracted with what it provides.

Career

Services, Networking spaces, Networking Events, Mentorship

Career encompasses what services that these organizations offer to further the career advancement or help with job placement of women in the field of Quantum Computing and its related fields.

Education

Educational events, Technical skill building activities, Certification, Learning materials

Education encompasses the educational opportunities and events organized that help women learn more about the field. As well, to help build skills and gain certifications which may lead towards career/academic advancement or placement.

Girls Who Code ANALYSIS

Demographics	**Target Demographic**	K-12 girls, college-aged women, educators and parents
	Amount of Users	450,000 girls and women
Accessibility	**Platforms Available**	(pre-pandemic) In-person programs/classes, (during pandemic) virtual programs
	Method to Join	Apply for summer program, join/start a local club, join/start a local college loops program
	Cost to Join	Free (also provides needs-based stipend)
Presentation	**Tone Used**	Informative, empowering, more informal language targeted toward younger audience
	Selling Points	Closing the gender gap in technology by teaching girls how to code, building a pipeline for future female engineers, empowering girls
	Imagery	Diverse gender/race representation in photographs of alumni/students
	Self Promotion	Mailing list, Medium, Twitter, Instagram, Facebook, Youtube, LinkedIn, Campaigns to spread awareness
Career	**Career Services**	Alumni support programs (e.g. #HireMe job board, mentorships)
	Networking Opportunities	Meeting professionals through their programs (e.g. guest speakers)
	Mentoring	Yes, for alumni
Education	**Educational Events**	No
	Skill Building	In-person educational programs
	Certification	No
	Materials	Curriculums and materials available for those who want to start a club

Qubit x Qubit ANALYSIS

Demographics	**Target Demographic**	Middle - high school students, early college students, educators who want to bring quantum computing education to their schools
	Amount of Users	10000 students
Accessibility	**Platforms Available**	Virtual programs
	Method to Join	Register for programs
	Cost to Join	~$400-$1200 (summer camps, scholarships available), free (workshops)
Presentation	**Tone Used**	Informative but friendly, inspiring, emphasis on diversity and inclusivity
	Selling Points	Providing educational programs on quantum computing for K-12 students, especially students from underrepresented backgrounds, preparing a diverse future quantum workforce
	Imagery	Diverse gender/race representation in photographs of students
	Self Promotion	Mailing list, social media (Twitter, Facebook, LinkedIn)
Career	**Career Services**	None
	Networking Opportunities	None
	Mentoring	No
Education	**Educational Events**	Workshops, Diversity in Quantum Computing Conference
	Skill Building	Quantum summer camps, intro to quantum workshops
	Certification	No
	Materials	None

Qiskit ANALYSIS

Demographics	**Target Demographic**	People with programming experience and an interest in math (Python and linear algebra)
	Amount of Users	n/a info provided
Accessibility	**Platforms Available**	Website: all access Qiskit program: computer that can run Python 3.6+
	Method to Join	Download program, join slack group
	Cost to Join	Free
Presentation	**Tone Used**	Emphasis on "easy" but high advantage
	Selling Points	$4000 research grant, pre-packaged algorithms, experimentation, modular programming package
	Imagery	Hand drawn images, diverse stock photos of young people
	Self Promotion	Slack, medium, twitter, youtube
Career	**Career Services**	Hints @ technology's application to different industries, access to advocates
	Networking Opportunities	Slack channel, Advocates + contact info,
	Mentoring	No, but they have "advocates" (evangelists)
Education	**Educational Events**	Yes - hackathons, talks
	Skill Building	QC SDK, educational materials to use SDK, communities relating to SDK
	Certification	Yes (IBM cert but not strictly about Qiskit SDK)
	Materials	Textbook (online), documentation, video series

Unitary Fund ANALYSIS

Demographics	**Target Demographic**	People who are interested in quantum related research (but open to all ages)
	Amount of Users	n/a info provided
Accessibility	**Platforms Available**	Website (all access) Mitiq - software package for Qiskit and Cirq (all desktop)
	Method to Join	Slack, discord, apply for grant
	Cost to Join	Free, they pay you if you get the grant
Presentation	**Tone Used**	Friendly, informal english. Uses first person language and is very upbeat sounding.
	Selling Points	$4000 microgrant program to advance QC through multiple fronts, doing own research, education, community building.
	Imagery	None. Uses bright colors
	Self Promotion	Twitter, discord, twitch, youtube
Career	**Career Services**	Job board (but only for internal hiring)
	Networking Opportunities	Yes, discord/slack
	Mentoring	No
Education	**Educational Events**	Yes - hackathons, talks
	Skill Building	community talks, community building via slack/discord, hackaton, educationaltalks
	Certification	No
	Materials	Mitiq documentation (their open source compiler), talks

WIQCA ANALYSIS

Demographics	**Target Demographic**	Women in Quantum and its application and "for folks who are interested and excited about quantum computing"
	Amount of Users	Slack channel: 76 members, Meetup group: 207 members
Accessibility	**Platforms Available**	Website and Social Media Groups
	Method to Join	No actual membership. Attend events or join Slack channel
	Cost to Join	Free
Presentation	**Tone Used**	Casual/informative language. Makes emphasis on inclusivity and being welcoming. Code of conduct is written in formal but simple language that is easy to understand.
	Selling Points	Brings together women and allies in Quantum through events. Many events are geared towards the general population with limited knowledge of QC.
	Imagery	Images are limited to the event banners on the front/event page. Some banners contain picture featuring women speakers
	Self Promotion	Twitter, Slack, Youtube, Meetup
Career	**Career Services**	None
	Networking Opportunities	Slack Channel, Events/Presentations and Meetups
	Mentoring	No
Education	**Educational Events**	Yes, Technical presentation and general introductory events for those interested but with limited knowledge (101s)
	Skill Building	Yes, but infrequent and dependant on event and presenter
	Certification	No
	Materials	None of their own. However, they upload their latest event/presentation to youtube

Femphys ANALYSIS

Demographics	**Target Demographic**	women, nonbinary individuals, and minoritized people in physics at University of Waterloo
	Amount of Users	Facebook group has 230+ members
Accessibility	**Platforms Available**	Website and social media groups. Events pre-pandemic were accesible in person and held on university grounds
	Method to Join	No membership, the group provides its events and services to those who aree interested.
	Cost to Join	Free
Presentation	**Tone Used**	Emphasis on support and being a safespace for everyone. Aims for political correctness but acknowledges people are human and make mistakes and will help correct them.
	Selling Points	Community building, connecting students, mentoring opportunities and educational and social events.
	Imagery	Limited to header at landing page and a very small photo gallery (only 5 images).
	Self Promotion	University page, Facebook and Twitter, Mailing List.
Career	**Career Services**	None
	Networking Opportunities	Social events such as "Tea & Talk"
	Mentoring	Access to mentors in both industry and academia through Mentorship Nights Events
Education	**Educational Events**	Yes, about physics and issues within the fields (diversity and ethic issues)
	Skill Building	No
	Certification	No
	Materials	None

Girls Who Code

Girls Who Code's main strengths are in its educational programs and outreach initiatives. With its three types of educational programs, GWC has taught 450,000 girls how to code, half of them coming from underrepresented backgrounds. Not only does GWC introduce and teach technical skills important for computing careers, it also exposes girls to the tech industry and provides opportunities to connect with female engineers and build community with their peers. GWC is quite active in its outreach initiatives, from its strong social media presence to campaigns to spread awareness about the gender gap in technology. It also partners with various corporations and companies to help attack the issue from the top down.

Alumni of GWC have access to various career resources to support them after going through the program and as they enter the computing workforce as professionals. However, what these resources for alumni include is considerably more hidden on their website—only by digging through the FAQ can one learn more about what this post-program support entails.

Although Girls Who Code is not specifically quantum computing-related, we can still draw inspiration from its presentation of its values. With their mission being to bring more women into technology, a field in which women are underrepresented, GWC makes an effort to point out on its website that diversity and inclusion are important to its organization. The website uses empowering language and imagery that depicts girls and women as do-ers and leaders. We would like to keep this type of portrayal and imagery in mind for our own designs, making sure women will be at the forefront of our presentation. In addition, we would also like to make continuing support a selling point in contrast to GWC, in which continuing support appears to be less prominent on their website.

Qubit x Qubit

QubitxQubit's strengths lie in its educational programs. Its programs, which include summer camps and workshops, allow young students to learn about quantum computing early on in their educational and professional paths. These programs provide opportunities to learn quantum computing especially for students from marginalized backgrounds who might not have the opportunity to learn about these topics otherwise. Programs with a longer duration, such as the 1-2-week summer camps and 4-week summer school, have a cost to attend but need-based scholarships are available. QubitxQubit also appears to be a strong advocate for diversity and inclusion in quantum computing. On the website, the organization emphasizes creating a diverse quantum workforce and touts the diversity of their students.

While QubitxQubit's programs provide students a strong introduction to the field of quantum computing, it is unclear what kinds of services or support is given to students after participating in these programs, if at all. The emphasis seems to be on introducing students to quantum computing rather than providing continued support as these students go on to pursue careers in quantum computing. In contrast to QubitxQubit, we would like to focus more on support given throughout one's journey through quantum computing rather than the entry point for our own design.

Unitary Fund

The Unitary Fund's strength is its financial incentive for community growth through its grant, which is given to approved projects reviewed by industry professionals. We've learned that quantum computing research is difficult outside of academia or industry due to funding, so providing this option to individuals could greatly increase the diversity of participants. Its publicity of such projects is evidence of the fund's success. As such, we believe that the Unitary Fund's target audience are educated individuals who are personally curious about quantum computing, but lack the financial backing to do so.

A pain point of the Unitary Fund's lack of visibility of its members, which may reinforce a false notion of homogenous members, especially because of quantum professionals traditionally being perceived as men. The names listed on the Grants page are also primarily male, which may further discourage women and nonbinary people from applying or engaging with the community. The site is also only available in English, which would also prevent non-english speaking researchers from accessing this resource and community.

To reinforce the Unitary Fund's goal of "helping create a quantum technology ecosystem that benefits most people", we would recommend that steps be taken to provide imagery that better reflect the diversity that they represent. We understand that the lack of photographs and pictures are visually neutral, but the preconceived notions of what a quantum professional looks like (white, older, man) creates a natural bias that needs counteraction. We would also recommend some sort of localization, because of the global messaging.

The Unitary Fund has revealed the power of supporting independent curiosity and passion. This aligns with our primary research and indicates that passion projects may be a way to help retain women professionals in quantum computing. It also helps us think of our project as a potential platform or beacon to showcase successes of other women in the community.

INSIGHTS + OPPORTUNITIES
Qiskit

Qiskit is an open source SDK created by IBM for individuals to interface with quantum computers. We opted to look at the community and resources built around the Qiskit SDK to see what the role of a unifying tool and educational resources has on community building.

Qiskit primarily targets young adults with an interest or background in computing who want to learn about quantum computing. The visual design of the Qiskit website is fairly playful with illustrations and photographs of diverse young adults working together. Its emphasis on education also suggests that their primary user would not be a professional quantum developer, but would have experience with programming (with Python).

Qiskit's main strength is its wealth of educational material and advocates who engage with the community. The ability to use a quantum computer for free is a unique resource, which would draw curious programmers. However, its lack of clear applicability outside of a personal exploration project weakens Qiskit's ability to contribute to quantum computing's long term growth. It may also disillusion learners because of the public hype surrounding quantum computing that is not tempered by vague descriptions of what Qiskit can help them do.

Based on our findings from both primary research and analysis of this product, we know that we would recommend IBM revise its copy in the Overview page to be more clear about both what current quantum computers can and cannot do. It does inspire us to create some sort of tool for experimentation, but it should ideally provide some value that ties into the individual's other interests.

INSIGHTS + OPPORTUNITIES

WIQCA

We initially came across this group through one of our subject matter experts who helps run it, and selected it as it seemed to specifically cater to women who work in the field. Though through our assessment, the audience it caters to is much broader. To this extent, as a community, it's strength lies in bringing together both those who are in the field and those looking to learn more about it. Doing so through various educational talks ranging from more general to more technical topics, as well as networking through Meetup groups and other online events.

However, it has its weaknesses as well. Much of its educational material/presentations are seemingly done through volunteers who apply to do so. This in turn means that there is a potential for large gaps of time in which the community it tries to maintain may not gather together. This also may affect networking possibilities that may occur when these presentations are done in person. Finally, it seems that the one digital networking event is largely organized by a single individual and subject to their own availability. This means that those who use this community as a main source of maintaining contact with others in the field of Quantum Computing may not be able to program this event into their schedules easily.

In terms of opportunities we could take note of, WIQCA takes advantage of social media platforms to promote its agenda and events, particularly on Twitter. This further confirms what we have heard from several participants and subject matter experts that it is a central point of networking and connecting with professionals in the field of Quantum Computing. Leveraging this platform in some form will be key to some level of success in engaging and gaining potential users of any future design solution. As well, taking note from the weaknesses, we should consider a decentralized approach to networking, this way people who wish to network and communicate with others in the field are still permitted to do so even when a primary organizer is unavailable. This allows for a more consistent experience for users to look forward to, which will in turn affect their retention and interest in the community.

FemPhys

Our general assessment of Femphys is that at some point it was a relatively active group prior to the Covid-19 pandemic. It was successful in organizing many in-person events that did not just present technical information about the field of physics, but also on pertinent topics such as inclusivity and ethics. Additionally it took the extra step to not isolate itself as a women's only group but expanded itself as a safe space for all people to educate themselves about inclusivity and diversity in physics, whilst still being able to commit mistakes without the fear of being chased out. We believe this may be an effective tool, that helps and encourages men to begin to understand their privileged position which in turn will help women not be as marginalized.

Despite its successes at different points, it also has several pain points as well. To begin with, it's initial presentation is relatively unsatisfactory. Upon reaching it's website landing page one is presented with a substandard wall of text, limited images, and a news section that has not been updated in 3 years. This leads us to believe that, unless a prospective individual is genuinely interested or aware of the group's activities, most people who visit the page will not engage with the group and take advantage of its offerings. In the same line, because the group seems to be composed mostly of volunteers, Femphys is reliant on external help to keep itself updated both on its webpage and social media presence, which has potentially led to the state of its public facing appearance.

Taking into consideration what we have learned from our analysis of Femphys is that we want to avoid a design which allows for the possibility of presenting itself as unattended or abandoned. At the same time, we should consider developing a language that is friendly enough that allows for all people to feel welcomed, not just women. By using a language that helps engage not just women, but everyone, it can exponentially speed up the development of communities that are diverse and inclusive that will ultimately make Quantum Computing a much more welcoming field, but also retain and keep women interested better.