

Patterns for Bridging the Digital Gender Divide in Afghanistan

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ABSTRACT

In Afghanistan, the digital gender divide is increased by restrictions of government on girls' education and women's employment. So, numerous girls and women do not have access to education, technology, and the skills needed for practical use. The digital gender divide is especially severe due to the country's complex political situation, characterized by decades of conflict and intensely rooted challenges. Afghan women encounter multiple layers of discrimination and gender-based barriers, severely limiting their access to and engagement with digital technologies. The digital gender divide hinders their opportunities for education, employment, and civic engagement, making them more vulnerable to exploitation. We explored women's systemic obstacles to accessing and using digital technologies, barriers shaped by restrictive cultural norms, political constraints, and limited institutional support in Afghanistan. In response to these issues, we introduced ten organizational patterns that offer actionable, community-driven approaches for bridging the digital gender divide in Afghanistan determined through numerous phone interviews and discussions with educators, decision makers, activists, and women engaged in technology-focused initiatives. Each pattern focuses on one of the aspects of inclusion, such as creating safe learning areas, building mentorship networks, supporting remote work, and enabling entrepreneurship. Together, they serve as a toolkit for practitioners, educators, nongovernment organizations, and community leaders aiming to close the gender digital gap through community-based innovation. Mentorship emerged as a recurring theme, with many patterns emphasizing the importance of connecting women with role models, peer support, and leadership development opportunities. These social structures play a vital role in confidence-building and long-term engagement in digital spaces.

CCS CONCEPTS

• **Software and its engineering** → **Patterns**.

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1 INTRODUCTION

The digital divide refers to the disparity between individuals, communities, or regions that have access to technology and those that do not. This includes inequalities in access to digital infrastructure and devices, digital literacy, and the capacity to use these technologies effectively. Although this is a global issue, it is particularly pronounced in developing countries such as Afghanistan.

The widespread impact of technology has transformed economies, societies, and global interactions in the modern era. Digitalization has become integral to daily life and influences how people access information, conduct business, and engage in social and civic activities. However, this digital transformation is uneven, resulting in substantial disparities, one of the most significant being the digital gender divide. This refers to the unequal access to and use of digital technologies between women and men, with women disproportionately disadvantaged.

In Afghanistan, the digital gender divide is intensified by the restrictions on girls' education and women's employment imposed by the government. As a result, many girls and women are excluded from access to education, technology, and the digital skills needed for meaningful participation. The divide is especially severe due to the country's complex political situation, shaped by decades of conflict and deeply rooted structural challenges. Afghan women face multiple layers of discrimination and gender-based barriers, which severely limit their access to and engagement with digital technologies. This, in turn, hinders their opportunities for education, employment, and civic engagement, making them more vulnerable to social and economic exploitation.

Recognizing the critical role Afghan girls and women can play in bridging the digital gender divide is essential, especially given the challenges they face, from limited access to education and restrictive social norms to entrenched structural inequalities. Empowering women to participate in the digital landscape actively is a key step toward achieving gender equality, promoting inclusive economic development, and fostering sustainable progress. Furthermore, the benefits of the digital age must be extended to all

segments of Afghan society to ensure equitable growth. Women’s digital inclusion enhances their socio-economic status and contributes significantly to national stability and development in an increasingly interconnected world. Therefore, closing the digital gender divide in Afghanistan is crucial to enabling all citizens to reach their potential and participate in shaping the country’s future.

This paper explores the digital gender divide in Afghanistan by highlighting the experiences, challenges, and contributions of Afghan women engaged in technology-related initiatives. It draws from qualitative data collected through interviews and discussions conducted over two to three months with approximately 40 to 50 individuals, including educators, policymakers, activists, and women working in digital empowerment. These conversations revealed recurring issues and local strategies for addressing them.

From these findings, a set of organizational patterns was identified. These patterns are grounded in Afghanistan’s socio-cultural realities and reflect women’s experiences navigating the digital space. Rather than offering abstract theory, they aim to provide culturally relevant, actionable insights that respond to real-world challenges. The methodology used to extract and refine these patterns follows the organizational pattern framework introduced by Coplien and Harrison; however, a full explanation of this method is provided later in the paper.

By understanding the complex dynamics shaping women’s digital engagement in Afghanistan, this paper contributes to broader efforts to close the digital gender divide. It emphasizes the importance of mentorship, representation, and advocacy in promoting women’s inclusion in the digital space and outlines practical strategies for supporting this progress.

The rest of the paper is structured as follows. Section 2 explains the problem of the digital gender divide in Afghanistan. Section 3 presents some success stories in overcoming this problem. Section 4 introduces the patterns we discovered to deal with the digital gender divide. Section 5 discusses related work. Section 6 concludes the paper.

2 DIGITAL GENDER DIVIDE IN AFGHANISTAN

Afghanistan is situated in the center of Asia and has a rich historical and cultural heritage shaped by the complex influence of historical events, traditions, and geopolitical consequences. The country’s socio-political landscape has been dramatically affected by the history of invasions, conflicts, and prolonged civil unrest, leading to significant disruptions across various sectors, including education, business, and economic development.

The Afghan population is ethnically mixed, including Pashtuns, Tajiks, Hazaras, Uzbeks, and other tribes. The majority adhere to Islam, which means the majority of people are Sunni Muslims. There were a few percent of pure Hindus and Sikhs who unfortunately left their homeland due to some issues. In many rural parts, traditional and tribal governance structures, such as Jirgas (tribal councils), play a pivotal role in community decision-making and dispute solutions.

Gender roles have traditionally been conservative in some areas, with women facing considerable limitations in education, employment, and public life, particularly in rural areas. Years of conflict,

limited government presence, and insufficient educational infrastructure have compounded these challenges. In many areas, cultural and societal norms restrict women’s access to technology and education, reinforcing expectations that prioritize domestic responsibilities over digital engagement.

Access to quality education remains a constant challenge for many women, particularly in remote areas. Obstacles such as unreliable electricity, limited internet connectivity, and a lack of resources hinder their ability to develop digital literacy skills. Additionally, security concerns further restrict their safe engagement with technology and limit their access to public spaces, making it even more difficult for them to pursue education and professional development.

Current restrictions on girls’ access to schools and universities have further exacerbated these educational and digital literacy challenges. Many women and girls experience gaps in higher education and technological skills, often worsened by financial constraints and insufficient family support. Handling these barriers requires a holistic and culturally informed approach that acknowledges the diverse realities Afghan women face across the country’s different regions.

Knowing Afghanistan’s sociocultural and political dynamics is crucial for designing effective strategies to bridge the digital gender divide and enhance opportunities for Afghan women in the digital age. Identifying and tackling these interconnected challenges will be essential in ensuring equitable access to technology and digital education, ultimately contributing to a more inclusive and empowered society.

The digital gender divide in Afghanistan shows considerable challenges to women’s education, employment, empowerment, and participation in the digital era. Access to the Internet, a crucial gateway to information, education, and opportunities, remains limited for most of the population, with a pronounced gender disparity. Women represent a disproportionately small fraction of Internet users, reflecting more profound systemic inequalities restricting their involvement in the digital technology and digital economy.

Mobile phones, computers, and other electronic devices, essential tools for online access, are lagging significantly for Afghan women compared to men. This lack of access limits their capability to connect with the digital world and reduces their potential to use technology for entrepreneurship, online education, or civic engagement. Research shows that even when women own devices, many face restrictions from family members or communities, further limiting their digital access.

Social media platforms, practical tools for networking, advocacy, and economic opportunities, also highlight the digital divide. Afghan girls and women are notably underrepresented, with cultural and societal barriers discouraging their participation. This decreased visibility on social platforms restricts their ability to engage in public dialogue, strengthen their voices, or build professional connections in the growing digital landscape.

A critical barrier is digital literacy, particularly among women in rural areas where traditional education systems are often inaccessible. Numerous women lack opportunities to acquire the foundational digital skills required for modern engagement, perpetuating cycles of exclusion from online resources, e-commerce, and the broader digital economy. Without focused interventions,

this divide will continue to isolate women from opportunities that could enhance their education and livelihoods.

The impact of the digital gender divide is especially prominent in the overall education system. With schools and universities heavily restricted for girls, digital learning could be an alternative pathway. However, lacking access to technology and digital literacy skills prevents many girls from using this avenue. The situation is dire, with schooling for girls often limited to the sixth grade. This limitation poses long-term risks for Afghanistan's future, leading to shortages of women doctors, nurses, teachers, and other professionals critical to the country's progress.

The divide is equally apparent in employment and entrepreneurship. Afghan women are significantly underrepresented across most sectors, including government institutions such as health, business, and education. Cultural and structural obstacles stop their equitable inclusion in workplaces, while a lack of access to technology further limits their ability to start or sustain businesses. With digital tools, women are included in emerging opportunities in online marketplaces, remote work, and tech-driven industries.

Struggles to bridge the digital gender divide require comprehensive and coordinated plans. These include implementing wide-scale digital literacy programs tailored to Afghan women's needs, improving access to affordable technology and resources, and fostering an inclusive environment in education and workplaces.

Localized interventions that address cultural and societal barriers are crucial to ensure these initiatives are effective and sustainable. Infrastructure development to bridge the gap is essential in bridging this divide. Developing broadband and mobile network coverage areas in underserved regions is necessary to connect Afghan women to the digital globe. Partnerships between government organizations, nongovernment organizations, and private organizations can handle affordability and accessibility, confirming that digital tools are within reach for all.

According to a UN Women report [20], Afghanistan ranks 157 out of 162 countries on the Gender Inequality Index, with a GII of 0.655. While over 85% of the population has access to a 3G network and one-third has Internet access, over 90% of Afghan women remain digitally illiterate. Factors such as lower literacy rates, social norms, financial challenges, and insufficient legislative frameworks significantly contribute to this disparity. Managing these inequalities is crucial to empowering Afghan women and fostering a more inclusive and equitable digital ecosystem.

3 SUCCESS STORIES

These success stories highlight the empowerment, invention, and strength of women who had addressed significant problems to succeed in the technology sector. They prove their talent and remarkable achievements that can emerge despite adversity and provide examples of how individuals and communities contribute to narrowing the digital gender divide. The patterns of overcoming these challenges and improving digital inclusion will be discussed in detail in the next section.

A prominent figure in Afghanistan's technology landscape, Dr. Roya Mahboob co-founded the Digital Citizen Fund, an organization committed to providing digital and IT education to girls and women

in underserved areas [4]. Through her work, she has launched computer centers in Afghan schools, offering digital literacy training to thousands of young girls. One of her most noteworthy initiatives is the Afghan Girls Robotics Team, founded in 2017, which promotes STEM education and robotics among Afghan girls. This team has gained remarkable success on the global stage, winning prestigious awards in competitions such as the First Global Challenge in Dubai (2017) and Washington, DC (2018) [23]. Their achievements have garnered widespread media attention, with features in outlets like BBC, CNN, and The New York Times [2]. Beyond their technological achievements, the team has served as ambassadors, inspiring young women worldwide to pursue careers in STEM fields. Their story exemplifies the potential of Afghan women to excel in technology with the proper support and opportunities.

As the founder and CEO of Code to Inspire, Fereshteh Forough has created coding and digital literacy programs for Afghan women, equipping them with the skills to succeed in the global technology industry [7]. Her community provides access to online education in coding, opening doors to careers in technology and programming for Afghan women.

Masooma Rahmaty, a young Afghan woman, is breaking stereotypes by pursuing a career as a mobile app developer. In a male-dominated field, Masooma works on projects that use technology to address social issues. Her success and dedication to using technology for positive change serve as an inspiration for Afghan women aspiring to enter the technology sector [29].

These stories highlight the strength and innovation of Afghan women actively contributing to narrowing the digital gender divide. By mastering technology and creating opportunities for other women, they are fostering a more inclusive and diverse technology industry in Afghanistan. Their journeys demonstrate the transformative power of digital inclusion and the potential that can be unlocked by empowering women in technology.

While personal success stories like those of Roya Mahboob, Fereshteh Forough, and Masooma Rahmaty underline the transformative power of technology for Afghan women, broader community-based endeavors and personal knowledge also demonstrate strength in the face of adversity. In recent years, community-led education programs have emerged as lifelines for Afghan girls and women who face educational restrictions. Many informal online learning platforms, local study groups, and mentorship networks have helped young girls and women continue their education despite challenges.

One example that we know of directly is Ahmad, an educator who lives in Afghanistan with his family. Ahmad has three daughters, each of whom attended school for six and seven grades. When schools and universities were closed to women, he took the initiative to personally teach his daughters and the families of young students who were banned from attending school.

Ahmad regularly assisted young learners when formal schooling was disrupted. Recognizing the importance of continued education, he ensured that his daughters and the young people in his family had access to digital learning tools and remote study resources. His efforts helped keep his daughters and family members engaged, develop digital skills, and also teach subjects and continue their education despite the challenging circumstances. Ahmad's story reflects the strength of independent initiatives in bridging the digital

gender divide. By creating alternative educational pathways, he demonstrated that even in restrictive environments, technology can be a powerful tool for empowerment and progress.

4 THE PATTERNS

This section introduces ten organizational patterns for bridging the digital gender divide in Afghanistan determined through numerous phone interviews and discussions with educators, decision makers, activists, and women engaged in technology-focused initiatives. They are rooted in Afghanistan’s socio-cultural complexities and reflect women’s lived experiences and relevant facts. Furthermore, they are confirmed by known success stories.

We expressed the patterns in an adapted Coplien and Harrison pattern format [3], with the problem expressed as a conflict of the two most prominent contradictory forces in the *but* form, as proposed by Vranić and Vranić [28]:

Pattern Name

...the context in which the pattern occurs.



The text in bold presents the problem as a conflict of the two most prominent contradicting forces. The rest of the text explains the details.

Therefore:

The text in bold emphasizes the essence of the solution. The rest of the text explains the details.



Examples.

Figure 1 shows an overview of these patterns as a pattern language. The arrows show typical directions in which these patterns are applied. The sections that follow describe the patterns.

4.1 Community Digital Literacy Initiatives

...in resource-limited communities, there is a pressing need to provide individuals with essential digital skills to access fundamental services and participate in the digital economy.



Many community associates lack the digital literacy needed to effectively use online platforms for essential services such as healthcare, education, and government assistance, but this digital skill gap not only limits their ability to access these services, but also hinders their participation in the digital economy.

Compounding this issue, many community members need more access to learning opportunities that would allow them to build these essential digital skills.

The community needs digital skills, but faces barriers such as educational gaps, limited access to technology, and fear of using digital tools.

Digital literacy programs are necessary, but there is resistance, especially among older adults, due to unfamiliarity with technology and doubts about the relevance of digital skills in daily life.

Providing flexible and accessible training is essential, but it is challenging due to limited resources and the need to accommodate diverse schedules and locations.

Therefore:

Establish a digital literacy initiative, presenting interactive workshops and online tutorials on essential skills like computer use and internet access. Partner with local schools and institutions to provide both in-person and virtual learning options. Offer sessions at diverse times and accessible locations to reach as many community members as possible. Cooperate with local businesses and organizations to secure resources and support. Regularly gather feedback to improve program delivery and ensure ongoing relevance and effectiveness.



In Afghanistan, during the closure of girls’ schools and universities, an educator named Ahmad took the initiative by personally teaching his daughters and the daughters of neighboring families. Despite limited access to formal education, Ahmad leveraged digital learning tools and informal teaching methods to ensure continuity in learning. His struggles reflect the power of community-based digital literacy initiatives, where community members fill systemic gaps, especially during troubles. His model preserved educational speed and introduced critical digital skills that empowered learners in an otherwise restricted environment.

4.2 Overcoming Barriers to Digital Access

...in many regions, particularly in Afghanistan, certain groups, especially Afghan girls, face significant barriers to accessing technology due to social, economic, and political restrictions. These barriers limit their ability to participate in the digital economy and access essential digital education.



Marginalized groups and populations, such as girls, also need access to digital infrastructure, but they are denied of it in order to satisfy the needs of prioritized groups and populations.

This digital exclusion limits their potential for economic participation and personal development, negatively affecting their quality of life and economic growth.

Afghan girls face obstacles in accessing digital services due to geographic isolation, lack of infrastructure, and low economic incentives for service providers, but there is an increasing demand among these girls for digital education and opportunities.

Cultural barriers and restrictive gender norms prevent girls from engaging with digital resources. But, technology must be used to empower women to overcome these social constraints and promote gender equality.

Supporting rural area infrastructure is crucial for equitable access to technology, but it requires cooperation and helpful approaches from the government and private sector to address economic and logistical challenges.

Therefore:

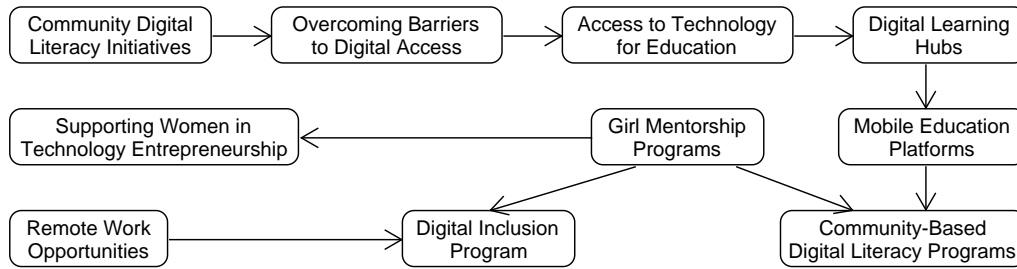


Figure 1: Patterns for bridging the digital gender divide in Afghanistan.

To manage infrastructural lacks and geographic isolation, create technology hubs and invest in rural areas. Enact laws that incentivize technology companies to work in these underdeveloped areas to encourage the creation of accessible technology learning environments for girls. By implementing these mechanisms, communities may advance socioeconomic growth and gender equality, bridging the digital divide and ensuring Afghan girls have fair access to digital education and opportunities.



Dr. Roya Mahboob co-founded the Digital Citizen Fund, an organization committed to providing digital and IT education to girls and women in underserved areas [4]. Through her work, she has launched computer centers in Afghan schools, offering digital literacy training to thousands of young girls. One of her most noteworthy initiatives is the Afghan Girls Robotics Team, founded in 2017, which promotes STEM education and robotics among Afghan girls [5]. This team has gained remarkable success on the global stage, winning prestigious awards in competitions such as the First Global Challenge in Dubai (2017) and Washington, DC (2018) [23]. Their achievements have garnered widespread media attention, with features in outlets like BBC, CNN, and The New York Times [2]. Beyond their technological achievements, the team has served as ambassadors, inspiring young women worldwide to pursue careers in STEM fields. Their story exemplifies the potential of Afghan women to excel in technology with the proper support and opportunities.

4.3 Access to Technology for Education

...addressing the digital divide in educational settings is essential, particularly for women students. Equal technological access is necessary for their learning, skill development, and future opportunities.



Women students cannot study effectively without access to digital tools, but these resources are costly.

Women students without access to digital tools face significant barriers to educational success, which limits their skill development and widens the gender gap in technology proficiency and academic achievement.

Many educational systems do not prioritize digital literacy specifically for women students, making it challenging to implement practical solutions to bridge the digital divide.

Socioeconomic disparities mean many women students from low-income families cannot afford digital tools, but providing equal access requires substantial investment, and funding for such programs is often limited.

Resistance to change within educational policies often keeps the focus on traditional learning methods over digital literacy, but shifting these policies can face bureaucratic resistance, slow processes, and cultural norms that deprioritize girls' education.

Therefore:

To provide every women student with a personal learning device, partner with community organizations and national/international bodies to secure reliable internet access for students. Advocate for inclusive policies that support digital literacy and equitable access to technology in education. It also pursues government funding and supports these programs, ensuring long-term effectiveness and scaling up access to meet future demands.



As the founder and CEO of Code to Inspire, Fereshteh Forough has created coding and digital literacy programs for Afghan women. The initiative provides students with personal learning devices, access to reliable internet, and a safe space for acquiring essential digital skills [7]. Her community provides access to online education in coding, opening doors to careers in technology and programming for Afghan women. Fereshteh's work proves how access to technology, with maintained support and education, can create transformative opportunities for marginalized learners and help close the digital gender gap.

4.4 Digital Learning Hubs

...women face many educational barriers in areas where they are prohibited from attending colleges and universities and are not allowed to work. They face severe educational limitations. With restricted access to learning environments, women have few safe options for continuing their education and developing essential skills.



Women are restricted from attending schools and universities, but they need a secure and supportive space to learn and develop essential skills for their future.

Access to secure educational opportunities is essential for women—and girls in particular—in restrictive environments. However, they require more internet connectivity and technology infrastructure to benefit fully from digital learning.

Women and girls require safe, easily accessible learning places to acquire critical skills, but creating spaces where they can voluntarily learn is difficult due to government regulations and insufficiently safe surroundings.

Digital learning centers are obviously needed, but greater internet access and technology infrastructure are needed in many areas. Without these resources, providing the digital tools and educational opportunities crucial for girls' learning becomes tough.

Therefore:

Create digital learning centers where women and girls may access computers, educational resources, and the Internet in safe locations. These hubs present a supportive learning atmosphere and security measures to safeguard the women and girls' privacy. Work with regional and global organizations to provide current instructional resources and a strong technology foundation. Furthermore, promote improved internet access and infrastructure development to maintain and grow these research hubs/centers over time, ensuring that future generations of women will update this area.



Soronko Academy is Africa's leading technology and digital skills development center, pioneering the way for young people, especially women and girls, to realize their economic prospects, providing them with the technological and soft skills they require to achieve distinguished, fulfilling employment, and overcome the gender gap in technology [21].

4.5 Mobile Education Platforms

...due to restrictions on physical movement and limited access to legal education, Afghan girls are usually unable to attend school or receive a consistent education. Social and political factors in many regions further limit educational infrastructure, leaving few possible alternatives for continuous learning.



Women are eager to continue their education, but movement restrictions prevent them from attending physical schools, limiting their access to formal learning opportunities.

Educational content must be accessible on mobile platforms for mobile education to be useful. However, much of the available material is irrelevant to the local context, creating a strong need for relevant, culturally sensitive, and up-to-date digital learning resources.

Mobile learning suggests a flexible solution for girls to study from home, but many need more reliable access to compatible mobile devices and internet connections, limiting their ability to use these platforms.

Platforms must deliver relevant and locally appropriate educational content, but creating such materials is often constrained by a need for more expertise and resources, reducing their effectiveness.

Therefore:

Create mobile education platforms that provide videos, e-books, and interactive assessments optimized for low bandwidth and offline use. Cooperate with local instructors and content creators to develop culturally appropriate and relevant materials that align with the needs of Afghan students. Provide user-friendly platforms adaptable to regional languages and accessible via essential mobile devices. Partner with nongovernment organizations and with the government to promote awareness and adoption of these tools in underserved regions.



Dost Education, meaning friend in Hindi, uses mobile technology to support parents in guiding the organization's early learning at home. In rural India, where internet access is limited, Dost delivers one-minute audio lessons via phone calls and WhatsApp, enabling evchildren' serate parents, especially mothers, to support education without formal schooling. Designed for low-bandwidth and offline use, Dost's model shows how mobile education platforms can bring inclusive, culturally relevant learning to underserved communities.¹

4.6 Girl Mentorship Programs

...in many Afghan communities, cultural and socio-political barriers limit girls' access to education, career guidance, and women role models. These restrictions require accessible mentorship to help Afghan girls envision and work toward broader educational and career goals.



Girls need motivation and guidance to pursue their educational and career goals, but they have no contact to those who would be willing and capable of guiding them.

Without accessible role models and mentors, Afghan girls often experience isolation and lack the motivation, guidance, and help needed to pursue their educational and career goals, especially in environments where social interactions and opportunities are limited.

Effective mentorship requires relatable women role models and a supportive community environment. However, in some areas, social norms or government restrictions can hinder establishing mentorship programs that encourage girls to pursue academic and career success.

Girls need positive female role models who have succeeded despite challenges, but due to social constraints, finding these mentors within their communities can be difficult.

A supporting community is essential for encouraging and guiding girls through their educational journeys, but resistance from local authorities or traditional elements within society may oppose initiatives aimed at women's empowerment.

Therefore:

¹hundred.org/en/innovations/dost-education

Create mentorship programs that pair Afghan girls with women mentors from both local and external communities. These mentors provide guidance, share experiences, and offer emotional support, helping girls develop resilience and confidence. Organize virtual mentorship sessions using secure communication channels to guarantee privacy and safety, overcoming practical and geographic obstacles. Design mentorship plans with sensitivity to cultural norms and values while gradually introducing positive examples of women’s empowerment to foster acceptance and inspire change.



Masooma Rahmaty’s success in mobile app development inspires and serves as a lived example of how visible women role models can function as informal mentors quietly yet powerfully. Her journey shows how simply witnessing someone succeed can fuel confidence and direction in others. Her story supports the need for structured women mentorship programs that intentionally connect young women with relatable guides to help them navigate similar paths in a supporting and culturally sensitive way.

4.7 Community-Based Digital Literacy Programs

...technology and digital resources are widely available in communities, and traditional educational institutions typically require additional infrastructure to teach critical digital skills. Girls’ exposure to technology is further limited by social and economic obstacles, which thoughtfully impairs their capacity to take advantage of digital learning opportunities and develop the fundamentals of digital literacy.



Girls need to gain digital literacy, but they have no access to the necessary resources.

Due to limited training and exposure, many girls lack opportunities to learn essential digital skills, such as computer use and Internet navigation. This skill gap limits their ability to interact with educational resources and limits their ability to personal and academic growth.

Due to limited training and exposure, many girls lack opportunities to learn essential digital skills, such as computer use and Internet navigation. This skill gap limits their ability to interact with educational resources and limits their ability to personal and academic growth.

Girls who want to gain digital skills often require physical resources like computers, internet access, and training materials. These resources are either scarce or nonexistent in many communities, which makes it challenging for women to learn the fundamental skills required for future chances.

Girls need access to computers and the Internet to develop essential digital skills, but many communities lack the infrastructure, equipment, and resources necessary to provide these tools.

Society and government support are critical for the success of educational programs for girls, but lack of interest and limited funding can prevent widespread acceptance or limit the availability of training materials and safe learning environments.

Therefore:

Establish community-based digital literacy programs in secure, accessible community centers where girls can learn basic digital skills, including computer use, Internet navigation, and online safety. Equip these centers with computers, Internet access, and training materials. Local authorities and community members should be interested in planning and executing the program to gain community support. This involvement encourages cultural acceptance and fosters a supportive environment for girls’ education. By securing the necessary resources and community participation, these programs provide girls with a safe, supportive space to develop digital literacy skills and access educational resources.



In northern Kenya, Fatuma Adan founded community-based centers that provide education and digital skills training to girls meeting cultural and economic obstacles. Through her organization, she worked with regional elders and families to create safe, trusted spaces where girls could learn, including access to technology and the Internet [11]. Fatuma’s model explains how digital literacy programs based on community leadership can achieve acceptance and succeed even in conservative or high-risk areas. Her story demonstrates that programs become more resilient, inclusive, and impactful when communities are involved in both design and delivery.

4.8 Digital Inclusion Program

...many community members in places with a significant digital divide lack access to necessary digital resources and skills, which limits their participation in the digital economy and the broader society. This digital exclusion restricts personal and educational development and reinforces social and economic inequalities across various community groups.



There is unequal access to digital resources, but they cannot be simply redistributed to those who lack them.

Unequal access to digital resources results in social and economic disparities, leaving specific communities without the means to fully participate in educational, career, and civic opportunities available to those with digital access. A lack of foundational digital learning and skills among community members further exacerbates this divide, making it difficult for individuals to use technology effectively even when access to digital resources is available.

Lack of internet connectivity and inadequate technology infrastructure hamper efforts to implement digital inclusion programs, but meeting these infrastructure gaps can significantly increase access to crucial digital resources.

Many members of society lack experience with digital tools and services, but targeted education programs that build essential digital skills can empower individuals and reduce the impact of the digital divide.

Therefore:

Establish community hubs that deliver access to internet connectivity and significant digital resources, providing a supportive environment for people to learn and use technology. Implement customized digital literacy programs that address the specific needs of diverse groups within the community, providing that the content is relevant and accessible. Develop strategic partnerships with local and national organizations to extend access to technology resources and training, facilitating a more inclusive digital environment that promotes equitable access to technology and digital skills.



As mentioned in the pattern Overcoming Barriers to Digital Access, Dr. Roya Mahboob has pioneered in advancing digital equity for Afghan girls. While her work is known for encouraging digital literacy, it also addressed more profound infrastructure, inclusion, and community access challenges. Her initiative created safe and inclusive digital areas within communities by establishing technology hubs with internet connectivity, computer access, and culturally sensitive support structures. Her approach demonstrates how digital inclusion is not only about tools and content but also about building long-term, locally grounded systems that support equitable access for women and girls, especially in restrictive environments.

4.9 Remote Work Opportunities

...remote work offers a transformative opportunity for people in undeveloped regions to experience the digital economy without needing relocation. For women in Afghanistan, it provides a culturally acceptable way to earn an income from home that is aligned with traditional norms. However, accessing remote work is hindered by systemic barriers, including inadequate infrastructure, gaps in digital literacy, and societal resistance.



Women need to work remotely, but they lack the capabilities for this.

Many women need more digital literacy and technical skills to access remote work opportunities. This skill gap makes them unprepared to compete for or perform in remote roles, limiting participation in the digital economy.

Many women need more digital literacy and technical skills to access remote work opportunities. This skill gap makes them unprepared to compete for or perform in remote roles, limiting participation in the digital economy.

Poor internet connectivity and the high cost of digital tools create significant barriers to accessing remote work. Social norms and misconceptions often devalue remote work, discouraging women from pursuing these opportunities and contributing to their exclusion.

Remote work offers a flexible and culturally acceptable way for women to earn an income, but limited Internet connectivity and unaffordable devices prevent consistent participation.

Employers increasingly seek remote workers with specific technical skills, but many potential workers lack training programs or resources to develop these skills. Women are drawn to remote work because it allows them to work from home, but families often misunderstand or devalue its legitimacy, leading to resistance.

Therefore:

Establish a remote work empowerment initiative that provides skill-building programs for in-demand roles such as virtual assistance, content creation, and graphic design. Establish community hubs with reliable Internet access and shared tools to overcome infrastructure barriers. Conduct targeted awareness campaigns to educate families and communities about the benefits and legitimacy of remote work through workshops and success stories. Partner with freelancing platforms like Upwork to provide localized onboarding support and mentorship programs. Finally, collaborate with nongovernment organizations and companies to connect participants with meaningful remote work opportunities.



In Mumbai, India, a randomized test offered married women the chance to work from home in data entry jobs tailored to their skill level. Over 56% of the women accepted the home-based positions, compared to fewer than 27% who opted for office-based work. The program provided income and flexibility, safety, and cultural acceptability, essential factors for women restricted by domestic or social constraints. This opportunity marked their first formal employment for many participants, increasing their economic independence and social confidence. The study found that remote jobs were significantly more sustainable in this context, showing how home-based digital work can unlock labor force participation for women in conservative or economically limited environments [12].

4.10 Supporting Women in Technology Entrepreneurship

...the technology industry and other institutions have been male-dominated, with fewer women in entrepreneurial positions. While the technology sector offers enormous opportunities, there has been limited emphasis on supporting women entrepreneurs. Over time, different initiatives have started to recognize the importance of gender diversity, yet challenges persist in encouraging women to pursue entrepreneurial ventures.



Women aspire to be technology entrepreneurs, but industry is dominated by males.

Women aspiring to be technology entrepreneurs need more mentorship and role models in a male-dominated industry that limits their access to guidance, networking, and support.

Women-led startups receive less venture capital than male-led ventures and are often excluded from crucial technology networks, hindering their ability to grow and compete in the technology ecosystem.

Women require mentorship and financial support to grow in technology entrepreneurship, but the technology industry is male-dominated, and gender biases in venture capital make it harder for women to find the resources and networks they need.

Entrepreneurial skills and access to networks are essential for development, but women are often excluded from these networks and need more business development skills to pitch, manage, and scale their startups effectively.

Therefore:

Connect women entrepreneurs with successful women technology leaders, offer funding possibilities through partnerships and grants for women-led startups, and establish networking platforms like women-only technology meetups and online forums. Additionally, providing entrepreneurial training in key skills such as pitching, financial management, and leadership will empower women to grow and manage their startups effectively.



Sadaf Abid, founder of the CIRCLE Women’s Association, has been a leading force in advancing women’s entrepreneurship in Pakistan’s tech ecosystem. After a decade of scaling the Kashf Foundation, she established CIRCLE to empower women through entrepreneurship and digital skills. She introduced Pakistan to She Loves Tech, a global platform supporting women-led startups, and founded Tech Karo, a skills-training initiative for young women from underserved communities [19]. Under her leadership, CIRCLE has connected hundreds of women with mentors, funding, and employment in companies like 10Pearls and IBEX. Sadaf’s work exemplifies how targeted initiatives can enable women to succeed as entrepreneurs and changemakers, even in traditionally male-dominated sectors.

5 RELATED WORK

Gerli et al. [8] showed how community networks and public-private partnerships, such as B4RN’s fiber-to-the-home (FTTH) project, can expand digital access in rural areas. These infrastructure-based solutions rely heavily on local investment and policy support. In contrast, our work does not focus on infrastructure. Instead, we introduce organizational patterns that help communities support digital inclusion through mentorship, education, and grassroots engagement.

Hilbert et al. [10] argued that women’s limited access to ICT in developing countries is due to barriers in employment, education, and income rather than a fear of technology. Their research showed that women become active users when provided access and recognize technology’s potential to address gender inequalities. While this highlights the importance of digital inclusion, our work responds by presenting practical, community-driven patterns that enhance women’s digital engagement through structured learning and support systems.

Jamil [13] examined urban-rural disparities, gender inequality, income, education, and cultural differences as major contributors to the digital divide. He highlighted the importance of comprehensive digital policies, cross-sector partnerships, and harmonized e-government regulations in bridging the gap. While Jamil focuses on general policies, our patterns provide tools that can be locally adapted and implemented by communities, especially in restrictive environments.

Antonio et al. [1] explored how education helps overcome sociocultural and financial barriers to women’s internet access in developing countries. Our work builds on this insight by proposing patterns tailored to Afghanistan’s unique cultural and educational

context, focusing on safe spaces, mentorship, and community participation.

Kuroda et al. [17] emphasized digital proficiency, critical thinking, and workforce reskilling as crucial skills for bridging the gender gap in technology access, recommending that targeted educational initiatives are necessary to prepare women for the Fourth Industrial Revolution. We contribute by introducing patterns that create inclusive learning environments and mentorship frameworks, ensuring Afghan women are equipped with digital literacy and leadership skills.

Mariscal et al. [18] found that family support and community engagement are crucial for digital inclusion in conservative societies. While we agree with their findings, we extend them by offering culturally adapted, actionable patterns that Afghan communities can apply directly.

The United Nations Development Programme [25] and ITU [24] discussed national and international efforts to improve digital access for women in Afghanistan through policy, infrastructure, and affordable services. These are essential top-down efforts. Our work complements them with bottom-up, grassroots strategies that are easier to implement in local community settings.

Similarly, the International Telecommunication Union (ITU) [24] discussed bridging the digital gender gap through infrastructure, affordable services, and localized content. While these studies focus on top-down policy initiatives, our patterns offer grassroots, community-driven solutions that complement these global efforts.

Nazari et al. [20] examined social norms and restrictive policies as the primary barriers to Afghan women’s access to digital education. Their study highlighted the negative impact of the digital gender gap on women’s education and career opportunities. Unlike their policy-focused approach, we introduce actual patterns that can be implemented within existing community structures to facilitate digital literacy and career growth.

UN Women [22] analyzed gender inequality in Afghanistan, focusing on legal and institutional barriers restricting women’s access to education, employment, and digital tools. While their research underscores systemic challenges, our approach provides realistic, context-aware interventions—such as peer mentorship and informal learning hubs—that can be applied even within those constraints.

Etinosa [6] showcased Afghan women navigating the technology startup ecosystem, highlighting educational and cultural challenges alongside successful initiatives that support women in technology entrepreneurship. We expand on this by presenting patterns that help women systematically navigate these challenges and build sustainable paths to tech entrepreneurship.

Vranić [26] introduces patterns for dealing with typical situations in creative writing classes, namely Plan Adjusts to Needs, Support Unblocks, Creativity Outgrows Activity, and Praising Those Who Dare Encourages Those Who Don’t. These patterns could be adapted to the context of digital literacy and included in our pattern language.

Drama patterns appear to be an accessible means that can help in understanding computer science topics even as complex as dynamic systems [9, 14–16, 27]. Drama patterns could be incorporated in our pattern language to support gaining digital literacy.

6 CONCLUSIONS AND FUTURE WORK

We explored women’s systemic obstacles to accessing and using digital technologies, barriers shaped by restrictive cultural norms, political constraints, and limited institutional support in Afghanistan. In response to these issues, we introduced ten organizational patterns that offer actionable, community-driven approaches for bridging the digital gender divide in Afghanistan determined through numerous phone interviews and discussions with educators, decision makers, activists, and women engaged in technology-focused initiatives: Community Digital Literacy Initiatives, Overcoming Barriers to Digital Access, Access to Technology for Education, Digital Learning Hubs, Mobile Education Platforms, Girl Mentorship Programs, Community-Based Digital Literacy Programs, Digital Inclusion Program, Remote Work Opportunities, and Supporting Women in Technology Entrepreneurship.

Each pattern focuses on one of the aspects of inclusion, such as creating safe learning areas, building mentorship networks, supporting remote work, and enabling entrepreneurship. Together, they serve as a toolkit for practitioners, educators, nongovernment organizations, and community leaders aiming to close the gender digital gap through community-based innovation.

Mentorship emerged as a recurring theme, with many patterns emphasizing the importance of connecting women with role models, peer support, and leadership development opportunities. These social structures play a vital role in confidence-building and long-term engagement in digital spaces.

While considerable progress is being made through community-based efforts, there is a need to expand digital literacy programs in underserved and rural regions, integrate technology-focused curricula into informal and formal education systems, establish structured mentorship initiatives led by trained women professionals, support women-led startups through funding, training, and access to digital markets, and promote partnerships between nongovernment organizations, government institutions, and global technology organizations. These directions will help ensure Afghan women are digital participants, innovators, leaders, and decision-makers in shaping the country’s digital future. Closing the digital gender divide is not just a development goal, but a strategic necessity for inclusive progress, national resilience, and global equity.

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