AI-mediated Reproductive-Care Infographic Tools

Title: Designing AI-mediated Reproductive-Care Infographic Tools Using Local and Indigenous Morals and Visual Communication Techniques with Global South Communities.

Project Website: https://www.sharifasultana.com/ai-reproductivecare

Amount Requested: USD 40,000 [UIUC $20K + Cardiff $20K]

Abstract:

We will co-design culturally appropriate AI-mediated infographic tools for reproductive care leveraging local Global South's knowledge and long-practiced indigenous visual communication techniques. Existing works show that many women in the Global South face many challenges in their reproductive journeys and turn away from reproductive well-being support offered by modern healthcare practices because of the stigma. Building upon established partnerships and findings from previous projects in Bangladesh and India, we will engage with women in low-resource settings in Bangladesh and India to further investigate women's stigma associated with reproductive health as well as their existing reproductive well-being challenges and practices. Additionally, we will engage with artists in the local communities to co-develop culturally appropriate visual infographic cues, tools, and techniques to design AI infographic tools to support and improve women's well-being in the Global South.

Background:

The stigma associated with reproductive health and sex-ed is inevitable in the Global South. This risks many Global South women's health as they reject many of the modern health and well-being supports offered by their local government and other organizations as their support and care policies do not understand the socio-cultural practices of the women in question. Existing works show that many women turn away from reproductive well-being support offered by modern healthcare practices because talking about or seeking help for such care is a taboo in their society, many women do not understand the modern terminologies, and many of the care practices do not reflect nor recognize the values women in the Global South hold. Like many other countries in the Global South, this problem is still prevalent in Bangladesh and India. Our existing research shows that many women in these areas are particularly stigmatized about birth control, pregnancy support, fertility service, contraceptive use, and menopause care and less frequently seek modern healthcare support. When seeking help, women find it difficult to navigate across community perceptions, sociocultural practices, norms, and relationships, as well as across the fragmented and distributed nature of healthcare services. All of these challenges

jeopardize women's reproductive health that have profound long-term consequences for parents, children, and society in general.

We will co-develop an AI framework to help address the stigma related to reproductive well-being in the Global South. We will leverage local knowledge and infographic practices on visual data curation and visual narratives. We will integrate rural Bangladeshi and Indian visual communication methods to co-develop AI-mediated infographic well-being tools for women to support their reproductive health and decision-making practices to improve their overall well-being We build on decolonial-AI literature and pluralistic co-design.

Goals of this research:

Broader goal: To co-develop a culturally appropriate AI framework and tool to address the stigma associated with women's reproductive care in the Global South.

Specific goal: To co-design AI-mediated reproductive-care infographic tools with Global South women in different countries based on their long-practiced local morals, cultural practices, and indigenous techniques of narrative visualization.

Study Design:

Stage-1: Getting Women's Insights and Validating Design Goals

Our research team and our long-term partners, Rural Reconstruction Foundation (RRF)–a local Bangladeshi NGO, and Design Beku –a local Indian NGO, will engage with the women (up to 100 per country) in low-resource communities from up to three villages through a survey and/or qualitative methods including observation, interview, and focus group discussion (FGD).

The research questions we will address in this stage are:

> ***RQ1a:*** *How do the local socio-cultural practices and traditions influence women's reproductive well-being practices?*
>
> ***RQ1b:*** *For which of the cases would women in these areas would turn to modern reproductive care? For which of the cases would they seek local traditional methods instead of modern methods? What are the reasons that women in the Global South ignore modern reproductive care in such cases?*
>
> ***RQ1c:*** *How do women experience the associated stigma attached to reproductive care? What are the local initiatives that work on this problem that they came across?*

The research teams in both countries will exchange their knowledge from the field and contribute to our development of design visions and goals.

Additionally, we will analyze their traditional process of record-keeping, data curation, and rational and design choices through traditional designer quilt making and "*Puthi*" (lyrical stories) composition using participatory observations and contextual inquiries. Our ongoing research with such local-traditional visual practices shows that many people from low-resource communities in the Global South are more comfortable, engaged, and interact more with such methods using data narratives over modern data representation and infographic methods. These findings motivated us to employ the knowledge from traditional designer quilt making and "*Puthi* in this research. The research question we will address through this part of the investigation:

> ***RQ1d:*** *What material tools, methods, and practices (e.g., paper, clothes, colors, threads, etc.) are employed, and what is their significance in traditional infographics?*

Our findings from the field in stage 1, will help us get insights from the field and validate and adjust our design decisions. Some of our initial design visions and goals include

> **G1:** Building an Intelligent and culturally appropriate open-access tool
>
> **G2:** Capability of conveying information in a way that under-resourced women are familiar with (e.g., rural traditional visual communication methods), regardless of their level of education and expertise.
>
> **G3:** Persuade the women to learn more about modern and safer reproductive well-being practices and help them make informed decisions.

Stage-2 Codesign with the Community and Stakeholders:

Our existing research team in Bangladesh and India will co-design prototypes with the local communities (up to 50 participants per country) in groups. We will invite local women and their families, rural artists, medical practitioners, seniors, AI and scientific data visualization experts, NGO staff, and any other relevant stakeholders to sit together to co-design and prototype AI-mediated infographic tools to support women's reproductive health and well-being. This step will take place through multiple iterations using co-design workshops and storytelling techniques, and we will gather knowledge from each iteration. We will solicit answers to the following research questions:

> ***RQ2a:*** *How do the community participants envision addressing the stigma associated with women's reproductive care in general?*

> ***RQ2b****: What are the shortcomings of existing initiatives (if any), and how do community participants ideate potential solutions to address them in their proposed design/prototype?*
>
> ***RQ2:*** *How an integration of situated knowledge and material practices with local visualization techniques can support the the design of AI tools that could be beneficial for women in these low-resource communities?*

Based on the findings and feedback we gather from the field, our software developer team members in Bangladesh and India will develop the emerging co-produced tools.

Stage-3 User Evaluation and Constructing AI-framework:

We will engage with women (n=100 + 200) from the local communities and encourage them to play with the developed tool, seeking their opinions and feedback in FGDs. We will also make the tool available for feedback through online surveys in Bengali and Hindi (or other local languages if our participants request it). The evaluation process will broadly address the following research question:

> ***RQ3:*** *How can we interpret and integrate rural visualization through local faith, history, and traditions and use them in modern AI-based visualization systems?*

We will use the results from the evaluation to construct an AI socio-technical framework to help address the stigma related to reproductive well-being in the Global South. This framework will employ value-sensitive visualization grammar that will uphold the community's cultural traditions and faiths and contribute to enhancing the well-being of women in the Global South. This socio-technical framework will support local intelligent well-being infographics, and it can be expandable and scalable for other low-resource communities with appropriate cultural adaptation.

Methods:

We will employ ethnographically-informed value-sensitive co-design methodologies, which is one of the core strengths of the research team and our NGO partners. Based on our previous engagement and existing networks in Bangladeshi and Indian communities, we will involve participatory observations, contextual inquiries, storytelling, focus-group discussion, participatory design, prototype development, and user studies. The members of the research team also share the same cultural roots. Our co-design methodology through situated qualitative research methods benefits both the local communities and the broader AI and Human-Computer Interaction research communities in growing insight into how different people, groups, values, and issues affect and are affected by the rural culture and highlight the need for preservation and promotion.

Intended Users:

The tool we design will be used by local women in Bangladesh and India and similar other local professional communities that support reproductive care practices.

The framework would be useful for advancing AI's scope for the Global South as both an analytical lens and a design tool and guideline.

Deliverables:

While this project is exploratory in nature, and it challenges some critical questions surrounding the epistemology of AI and data visualization, we expect it to produce important insights into designing next-generation AI systems with historically underserved communities in the Global South.

(a) **AI Framework:** This project will produce a socio-technical framework for leveraging and communicating with rural data visualization practices in the Global South. This will help the government, NGOs, researchers, medical practitioners, healthcare field workers, and other community practitioners to provide data-driven services in the Global South to support reproductive health.

(b) **Community Outreach:** We will involve the local students, professors, researchers, and modern medical and traditional healthcare practitioners in the Global South during the dissemination activities of this project. They will receive training in developing data-driven/AI systems, taking a community-centered approach.

(c) **Informing the Community:** The findings of this project will be disseminated among the community members through multiple discussion sessions led by the senior villagers and/or the community heads. We will also publish newspaper articles to mass circulate our findings and increase the accessibility of our findings and tools among the Global South communities.

(d) **Research Communities:** We will publish the novel scholarly findings of this project in one or multiple top venues for human-computer interaction and AI research for social good (e.g., CHI, CSCW, AAAI, COMPASS, ICTD, and related conferences and journals).

(e) **Conducting Interviews, FGDs, and Surveys:** We will conduct interviews, FGDs, and surveys with key stakeholders to evaluate our tool, and the findings will be submitted to the grant authorities and the universities.

(f) **Further advancement of this research:** We will use our initial findings to advance further our research in working together with local Global South communities as well as medical and healthcare experts in designing better AI

tools to support women's reproductive health and well-being in the Global South

(g) **Exchange of field knowledge:** Both Bangladeshi and Indian teams will meet every month to exchange their local knowledge, methods, findings, and insights.

Besides these, at a broader level, the methodology that we will test through this project can then be used to develop similar frameworks for other Global South communities and create opportunities for AI to address the reproductive care needs and related concerns of billions of women more effectively. Furthermore, this project will produce scientifically proven methods for integrating AI systems with rural traditional cultures and techniques through integrating local materials, community knowledge, history, and values, which will make a critical contribution to the development of AI and well-being in the Global South.

Impact:

We anticipate that our project will provide three different forms of impact: academic, technical, and social.

Academic:

In the West-centric assumptions of computing and technology design, Global South's low-resource communities and their art, and crafts, alternative ways of rational thinking, and moral perspectives are underrepresented and misrepresented. This West-centric approach leads to bias, prejudice, and discrimination, which exacerbates the existing marginalization of these communities. Our tool will be designed to incorporate decolonial and culturally appropriate perspectives into AI design, which will help to combat prejudice and discrimination against these underserved communities. This social justice concern is one of today's top most relevant agendas in computing education and research. Our project will engage in these conversations and publish our major findings in top HCI and AI most relevant venues (CHI, CSCW, AAAI, COMPASS, ICTD, etc.) Such venues are peer-viewed and renowned for maintaining standards by accepting only high-quality and high-impact research.

Technical:

We will design a tool that uses images and text to communicate complex ideas in a way that is culturally appropriate and accessible to people from different cultural backgrounds. This tool will leverage a community-centered approach recognizing how people in the Global South face, deal with, and combat stigma related to reproductive care by using community-based visual and innovative methods. We

hope this tool will make AI and healthcare more accessible and culturally appropriate for many other cultural groups. The usability and feasibility of the tool will be evaluated through iterative cycles of user testing and feedback, and the findings will be reported to both Cardiff and UIUC.

Additionally, our project will study how people from different cultures communicate visually and use their local knowledge to design tools and AI frameworks that can help people learn about complex topics in a way that is both culturally appropriate and scientifically accurate. This research will advance scientific knowledge and help rural, low-literate women in the Global South seek justice through AI in healthcare and well-being technology. The impact of their knowledge gathering will be evaluated through a survey with the women and other community stakeholders at the end of the project, and the findings will be reported to both Cardiff and UIUC.

Social:

The stigma associated with Sex-ed and reproductive health is inevitable in the Global South. This increases the health risks of many Global South women as they reject many of the modern health and well-being support offered by their local government and other support organizations as such support and care policies do not understand the cultural practices of the women in question. Our project will help both the AI researchers and such communities understand and participate in this conversation using AI-powered infographics using a co-design approach. This will help them to navigate healthcare services and sociocultural practices and make informed decisions in their care practices. The findings of our project will be presented in academic and newspaper articles and reports to the universities, and they will serve the public interest.

Also, the findings of our project, the tools we develop, and the AI framework we construct in this project- will all be open-sourced and will be used to promote reproductive care and well-being awareness in the Global South.

Timeline & Milestones:

Stage-1: Validate Design Goals	Week 1-16: Establishing and validating design goals with Global South (a) women and their local care providers and traditional healers to understand their reproductive care and well-being practices better and (b) artist communities to understand how to convey data narratives in local traditional ways
Stage-2: Codesign with the Community and Stakeholders	Week 17-24: Co-design and iterative prototyping with different community participants
	Week 25-36: System design and development
Stage-3: User Evaluation and Constructing AI-framework	Week 37-45: Deployment and user study
	Week 46-52: Data analysis, constructing an AI-framework, and preparing final reports

Description of the PI's research and team and how they are interdisciplinary:

(a) Team of Bangladeshi Side:

Our core team includes the PI, local partner NGO Rural Reconstruction Foundation (RRF), and our existing field connections in rural villages in Bangladesh.

PI Sharifa Sultana is an Assistant Professor of Computer Science at the University of Illinois Urbana-Champaign, USA. She is a human-computer interaction (HCI) designer and critical computing researcher. She engages with justice concerns, including designing decolonial data-driven systems and AI, computing for alternative rationalities and moralities, and gender justice in computing. She deploys a variety of qualitative, quantitative, and design methodologies to probe and address social justice agendas in low-resource, marginalized communities. She has more than 7+ years of experience conducting ethnography, co-design, and deployment with rural villagers in Jessore, Bangladesh. She builds and evaluates computing technologies, including accessible, low-cost, and intelligent mobile and web applications to improve the quality of their life. Multiple of her research projects on gender justice and well-being in the Global South were published, presented, and won awards in ACM SIGCHI and CSCW.

Support team in the field:

Salim Reza is the Director of the Microfinance Program at the Rural Reconstruction Foundation (RRF), Bangladesh, and also Sultana's long-term research partner in rural Bangladesh. He has been working with RRF for 17+ years. Some of the other notable World Bank-supported projects led by Reza include the Sustainable Enterprise Project on flower cultivation (SEP), the Low Income Community Housing Support (LICHS) Project, and the Recovery and Advancement of Informal Sector Employment (RAISE). With RRF, he has developed extensive experience in directing community healthcare projects, particularly on midwifery training for rural women, adolescent healthcare, pregnancy care, and family planning. He directs RRF's operation in 34 districts (among 64 districts) in Bangladesh.

In addition to RRF's support team, we have local Bangladeshi software developers and field researchers affiliated with local Bangladeshi industry and research institutions who have been conducting research with us in partnership for many years. Their contribution will be sought in different stages of this project.

(b) Team of Indian Side:

Our core team includes the PI, local partner NGO Design Beku, and our existing field connections in rural villages in India.

PI Nervo Verdezoto is the Lead of the Human-Centred Computer Research Unit and Senior Lecturer in Human-Computer Interaction and Digital Health at the School of Computer Science and Informatics at Cardiff University in Wales, UK. He has expertise in ethnographically informed design, user-centered and participatory design, and design and evaluation of sociotechnical systems with a particular interest in the healthcare and sustainability domains. His previous research has investigated how older adults and pregnant women use self-care technologies in their everyday lives and how these shape their everyday care practices, clinical encounters, and decision-making. His recent work has investigated care infrastructures in the Global South (e.g., India, Bangladesh, Ecuador, Peru, Ghana, South Africa, etc.) and how pregnant women use and interact with antenatal care services, especially to manage pregnancy complications and how socio-technical and cultural practices influence women, parents and young children's experiences of care. In addition, his research has explored the use of community-based co-design in low- and middle-income settings for digital maternal and child health. Google h-index 17. Research funded by GCRF, MRC, AHRC, EPSRC, Newton Fund, GW4, etc.

Support team in the field:

Co-PI Naveen Bagalkot is one of the founders of "Design Beku Services LLP" which explores the possibilities of manifesting alternative imaginaries for design and technology, grounded in a feminist ethics of care. He is also an Associate Professor at Srishti Manipal Institute of Art, Design, & Technology, Manipal Academy of Higher Education, Bangalore, India. His research is at the intersections of Human-Computer Interaction (HCI), Information and Communication Technology for Development (ICTD), Participatory Design, and Community Wellbeing. He has been working closely with grassroots, third-sector, and activist organizations, such as MAYA Health and Jatan Sansthan, combining ethnographic methods with community-based participatory design research to engage with women, young people, children, and other community stakeholders to support low-resource communities in different areas of health including sexual reproductive health and education. Through his ongoing work that spans beyond a particular health concern to encompass community wellbeing, he has successfully set up community networks for participatory research and action in South and North-West India. In collaboration with Karnataka Health Promotion Trust, he has also started a new project in the coastal region of Karnataka focusing on strengthening the local governance structures (Gram Panchayats) towards enabling holistic health. All his experience open the opportunities to engage in two or three sites within India.

Budget:

(in USD)		Year 1		Year 2		Total	
Expenses		**CU**	**U of I**	**CU**	**U of I**	**CU**	**U of I**
Personnel			12,011			-	12,011
Consumables		1,087	1,000			1,087	1,000
Domestic and International Travel		6,200	5,789			6,200	5,789
Computer Services		863				863	
Fieldwork Related Cost: Participant compensation, transcription, translation, printing, and other		5,250	1,200			5,250	1,200
Publication Cost		6,600				6,600	
Other						-	-
Subtotal		**20,000**	**20,000**	**-**	**-**	**20,000**	**20,000**
Project Total	**40,000**						

(a) UIUC side that intends to support the research in Bangladesh

Total: $20,000

Consumables: USD 1,087

- Materials and equipment for prototyping and conducting co-design sessions, technical cloud resources, and software licenses.

Domestic and International Travel: USD 6,200

- Travel to, from, and within Bangladesh for fieldwork. Include international and domestic flights, other transportation, accommodation, meals, etc.

Computer Service: USD 863

- Data Analysis software and related cost

Fieldwork Related Cost: USD 5,250

- Participant compensation, local experts' fee, transcription, translation, printing, and other

Publication Cost: USD 6,600

- Conference registration, Journal fees, airfare and commute, hotel/accommodation, visuals and graphics editing tools, proofing fee, etc.

(B) Cardiff Side that intends to support the research in India

Total: $20,000

Key budget areas:

Personnel: $12011

For 2 research assistants (1 Design RA and 1 Software Developer RA) to support the initial data collection, co-design process, analysis, pilot study of the tool as well as the implementation of the prototype. Each research assistant: $6005.6 (50000 INR/month x 10 months)

Consumables: $1000

- $1000: Materials and equipment for prototyping and conducting co-design sessions, technical cloud resources and software licenses.

Travel: $5789

- **$1800:** Attending Conferences for the **Indian team** (Conference registration, Airfare, Hotel). $1200-flight from Bangalore, $400 (4 nights accommodation, $100/night), $100-subsistence ($25/day), $100-airport transfer.
- **$600:** Travel to/from for fieldwork in India ($50/month x 12)
- **$3388.8:** for PI Verdezoto to attend a workshop in India and in Bangladesh. Per workshop: $1094.4-flight, $400 (4 nights accommodation, $100/night), $100-subsistence ($25/day), $100-airport transfer.

Other: $1200.

- **$1200:** Participant compensation. This includes dissemination of the call for participation, and participation costs in return to the time of community participants' efforts as part of the co-design process and data collection.

Sustaining This Cooperation Beyond the Initial Seed Grant:

We plan to sustain this cooperation between Cardiff and UIUC in three ways: sharing knowledge, securing funding to advance the project, and advancing science and technology.

Sharing Knowledge:

We will conduct a final team workshop to reflect on the key findings and cross-disciplinary learnings from the two research settings and discuss the emerging research questions and methodologies. We will invite the domain experts at both schools, share the knowledge we gathered from this project, and seek feedback. Additionally, we will write academic papers on this project together with the researchers in both teams and present them to broader academic communities.

Securing Further Funding:

Using the seed grant, we want to grow our knowledge and also expand our network within the domain and geography. This will help us expand this research in depth and breadth. Additionally, we will be able to plan more longitudinal and long-term studies based on the initial work funded by this grant. The work conducted through this project will also help this Cardiff-UIUC collaboration project on well-being-AI seek funding from global organizations like WHO, UNICEF, USAID, and the Gates Foundation, among others, for the advanced stages of this project.

We will seek support from the National Science Foundation (NSF), USA, the National Institutes of Health (NIH), USA, the Council for Science and Technology (CST), UK, the UKRI Medical Research Council (MRC), UK's call on Public Health Intervention Development (PHIND) or the Applied Global Health Research depending on the context, for research funding and collaboration opportunities. We will also seek funding from and collaboration opportunities with Bangladeshi and Indian governments and other local aid organizations.

Advancing Science and Technology Social Good Research:

The knowledge we gather from this research will be employed to advance AI in well-being research. This seed grant will add an opportunity for us to add a new avenue of designing culturally appropriate AI-mediated infographic tools for women's care to our existing long-term research on well-being in the Global South. This will advance both AI and well-being research in expanding their scope in serving historically underserved communities.

How Intellectual Property Will Be Addressed

We expect the pathways to impact will have direct and indirect impacts on the economic development and welfare of Bangladesh and India that can easily be replicated and explored in other Global South contexts. The project will transfer knowledge and expertise between USA, UK, and Bangladeshi and Indian researchers, practitioners, policymakers, and community members. We will be using open-source tools to increase the accessibility and dissemination of the co-created tool.

In the case of any Arising Intellectual Property, we will seek advice from the Technology Transfer Offices at the University of Illinois and Cardiff University. Each Party shall own the Arising Intellectual Property generated by its employees, students, and/or staff under the Project and shall ensure that it secures ownership of such Arising Intellectual Property from its employees, students, and staff.

For the avoidance of doubt, all Background Intellectual Property used in connection with the Project shall remain the property of the Party introducing the same. The Parties agree that any improvements or modifications to a Party's Background Intellectual Property arising from the Project which are not severable from that Background Intellectual Property will be deemed to form part of that Party's Background Intellectual Property