Cardiff Metropolitan University | Prifysgol Metropolitan Caerdydd

9 September 2026

Professor Tehmina Mangan
Vice Chancellor
The Begum Nusrat Bhutto Women University
Sukkur, Sindh
Pakistan

Dear Professor Tehmina,

Re: Smart Sindh Research, Innovation and Product Development at BNBWU

I am pleased to provide this update on the developing research and innovation collaboration between The Begum Nusrat Bhutto Women University, Sukkur, and Cardiff Metropolitan University in robotics, artificial intelligence, embedded systems and physical computing.

The collaboration has already established an initial R&I capability at BNBWU through the placement of two Arduino-based development kits and an Alpha Mini social robot, together with Muskan's placement at the EUREKA Robotics Centre, Cardiff Metropolitan University. During her placement, Muskan gained practical exposure to physical computing, sensors and actuators, and socially interactive robotics, while also networking with researchers from Cardiff Metropolitan University and Cardiff University. These activities provide a foundation for BNBWU to progress towards locally led prototype and product development.

The wider PIE (Partnership in Equality) for UK-Pakistan Women in Robotics & AI partnership was supported through a £25,000 British Council Going Global Partnerships grant and brought together Cardiff Metropolitan University with nine partner institutions in Pakistan. These included the National University of Sciences and Technology (NUST), Rawalpindi Women University, Lahore College for Women University, Government College University Faisalabad, The Women University Multan, The Begum Nusrat Bhutto Women University, Sardar Bahadur Khan Women's University, Karakoram International University, and Government Associate College for Women Chung. The project was subsequently selected as one of five winning projects at the inaugural British Council Going Global Partnerships Awards 2025 under *"Empowering Pakistani women into STEM"*. BNBWU is explicitly recognised as one of the Pakistani partner universities, and Muskan's international robotics placement is featured in the British Council's official project overview. This provides strong external validation of both the scale and impact of the partnership and creates a strong platform for progressing from STEM capacity building towards research, innovation and product development at BNBWU.

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- A first R&I direction could be a Smart Sindh Environmental Monitoring and Alert Platform, using BNBWU's existing Arduino/ESP32 capability to develop low-cost solutions for challenges such as heat and microclimate monitoring, flood and water-level alerts, water-quality screening, drainage and waste monitoring, and community-scale early-warning systems. These prototypes could progressively incorporate connectivity, data analytics and AI, creating locally adaptable products for climate resilience and community safety.
- A second direction could be a Smart Sindh Robotics, AI and Learning Companion, using Alpha Mini robot as an interactive platform for STEM education, computational thinking and introductory robotics, particularly for girls and underserved schools. The same platform could also be developed for Sindhi and English language learning, including conversational practice, vocabulary, pronunciation, storytelling and culturally relevant educational content. This creates opportunities for innovative educational products and research in human-robot interaction, multilingual educational technologies and inclusive learning.
- A third direction could focus on AI-IoT solutions for smart agriculture and rural livelihoods. Given the importance of date cultivation and the wider agricultural economy around Sukkur and rural Sindh, potential applications include smart irrigation, orchard and microclimate monitoring, post-harvest drying and storage, water-use optimisation and AI-assisted decision support for farmers and small agricultural enterprises. A distinctive strand could be a Smart Date Orchard and Post-Harvest Innovation Platform, linking digital technologies directly to a value chain of major regional importance.

Looking further ahead, these activities could form the foundation of a Smart Sindh Living Lab for AI & Physical Systems Innovation**,** with the longer-term ambition of establishing a Centre of Excellence for AI, Physical Systems and Inclusive Rural Innovation at BNBWU. The Living Lab would enable students, researchers, rural women, communities, government and industry to identify local challenges, co-design solutions and test them in realistic settings. In particular, rural women could contribute as sources of local knowledge, co-designers, innovators and potential entrepreneurs. This would provide BNBWU with a credible pathway from the capability already established through our collaboration towards tangible R&I products, locally tested solutions and ultimately a distinctive women-led innovation ecosystem rooted in the needs and expertise of Sindh**.**

I would be very pleased to continue supporting this development through collaboration with colleagues at Cardiff Metropolitan University, the EUREKA Robotics Centre and other research partners.

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Yours sincerely,

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