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Tando: An Interdisciplinary and Intercultural Approach to Inclusive Design for Local Empowerment

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Abstract

Tando is a conceptual open-source platform aiming to enable communities in resource-limited settings to design and produce essential medical and everyday goods with locally available resources. The project was initiated through a cross-cultural and cross-disciplinary collaboration between a Tanzanian medical student and a German design student, and it integrates principles of inclusive, participatory and systemic design approaches. This paper explores the conceptual development of Tando, examining how interdisciplinary expertise and intercultural dialogue have shaped an adaptable, community-centered design framework. Through the integration of traditional knowledge, open-source technology and digital literacy, Tando proposes a model of design-as-infrastructure and empowers communities not only to access but to define and produce contextually relevant solutions.

Keywords: *Inclusive design; Participatory design; Interdisciplinary design; Intercultural collaboration; Local empowerment; Community-driven solutions*

1. Introduction

Designing "with", rather than "for", communities has become a central paradigm in the development of inclusive, sustainable and culturally grounded solutions (Costanza-Chock, 2020, p. 70-72). Participatory and inclusive design approaches challenge the traditional notion of the designer as sole problem-solver, expanding the design's role to include facilitation, mediation and co-creation across diverse social and material contexts (Björgvinsson et al., 2010, p. 10). Inclusive approaches are particularly relevant in global or underserved settings, where life experience, local knowledge and cultural specificity play crucial roles in the success of any intervention.

This paper examines Tando, a conceptual design project initiated through an interdisciplinary and intercultural exchange between a Tanzanian medical student and a German design student. The idea of the project was conceived as a response to the systemic challenges facing medical infrastructure in rural Tanzania, including long distances to health facilities, high costs of imported equipment and the lack of local repairability.

Tando proposes a platform that not only addresses these material challenges but rethinks the design process itself: from object-based problem-solving to infrastructural, co-produced systems. The platform aims to enable individuals and communities to produce essential products, such as mobility aids, wheelchairs, crutches and recreational equipment, using materials and tools available in their own contexts.

This paper examines the project's beginnings, its development over time and the thinking behind its design. In doing so, it contributes to ongoing research that supports inclusive, participatory and context-sensitive design approaches. The project critically reflects on the limitations of conventional, top-down design interventions and illustrates how interdisciplinary and intercultural collaboration can be leveraged to create more equitable, resilient and user-driven design ecosystems.

2. Context, Collaborative Foundations and Problem Definition

The initial contact between the two students was established during a field visit organized by a non-governmental organization (NGO) supporting healthcare in rural Tanzania. The German design student accompanied the travel for documentation purposes and visited various institutions including a rural hospital and a medical university. In the course of this visit, she met with doctors, trainees and local students and gained valuable insights into the infrastructural and medical challenges of the region. During these encounters, she connected with a Tanzanian medical student, with whom she remained in contact after returning to Germany. Their ongoing dialogue was centered around the persistent shortages in medical equipment and the lack of affordable, repairable solutions.

East African countries face significant challenges in healthcare infrastructure and medical equipment is overwhelmingly imported as minimal local manufacturing capacity is available (Mwaura & Zander, 2021, p. 9, p. 16-17). This dependence on centralized procurement and foreign supply chains consolidates hegemonial structures and

inequality in healthcare access. The World Health Organization (WHO) (2008, p. 24-28) notes, that the majority of people with disabilities in low-income countries are unable to afford wheelchairs by themselves and that universal models are often unsuitable for local conditions. During the fieldwork in Tanzania and through exchanges among the students and with other Tanzanian medical personnel, it became evident that imported equipment frequently becomes unusable once damaged. Local users often lack the necessary tools, spare parts and technical support infrastructure to carry out repairs.
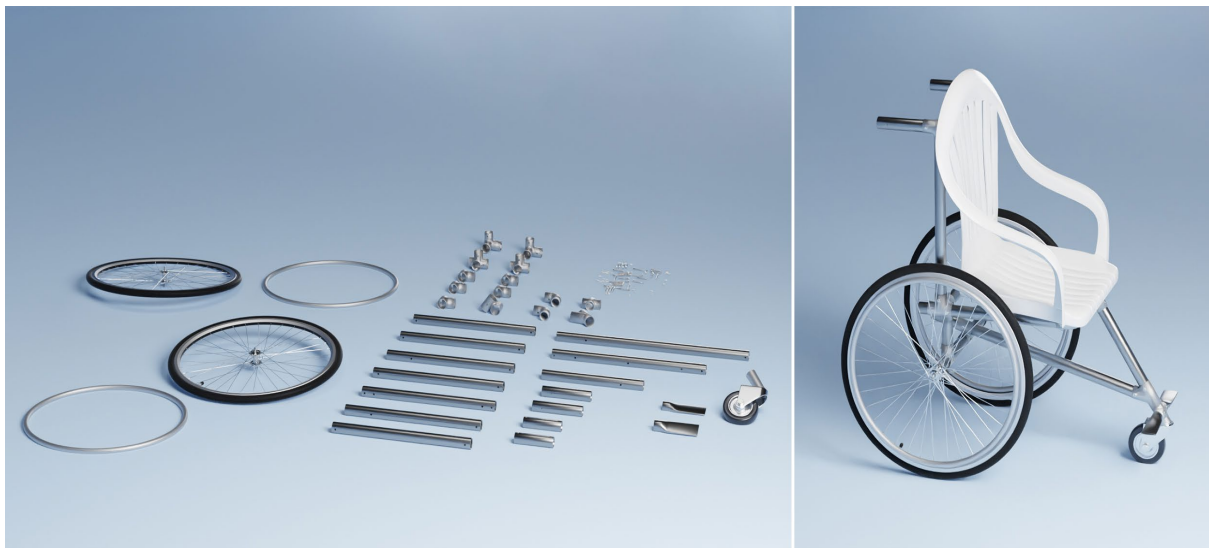

Figure 1: Modular construction kit with few pipes, connectors and wheels turning into a first wheelchair draft with a Monobloc plastic chair inspired by Don Schoendorfer's Gen-1 wheelchair (Wendler, 2022, p. 119)

These insights led the design student to explore potential responses within the framework of a university course. Initially, the focus was on developing a modular, low-cost wheelchair, accompanied by a visual construction manual. The Tanzanian student provided information of disabled people from his community, and told about their needs.

The initial idea of developing a low-cost wheelchair that could be assembled locally with a visual construction manual using few imported tools, soon expanded to include additional modular products. By using the same system of standardized metal pipes, connectors and wheels, a rollable hospital bed and a bicycle- or motorbike-drawn stretcher was designed. The idea developed into modular product kits mostly consisting of the same parts, so that spare parts are identical and therefore easier to get. The design student created visualizations, CAD models of the constructions and drafts of construction manuals

While the modular approach aligned with repairability and cost-efficiency goals, the Tanzanian exchange partners highlighted critical flaws in the concept: the reliance on standardized imported parts reintroduced dependency and the underserved regions would still be unlikely to have access to those modular product kits. They also mentioned the missing infrastructure in some rural areas and the lack of adaption to different terrain conditions of the wheelchair that was designed by the German student.

3. From Object to Infrastructure: Reframing the Design Approach

The early design phase classified the limitations of applying top-down design thinking from a distant context. The two students concluded that a more sustainable approach is to develop a solution that integrates into existing systems and can be defined and implemented by the local communities themselves. Eventually Tando developed

into an open-source platform promoting knowledge transfer and cooperation.

The revised version of Tando emphasizes the necessity of an interdisciplinary, intercultural and dialogic process, where lived experiences and local knowledge directly form the design framework. The realizations prompted a turning point: the project needed to move beyond delivering discrete objects and instead support systems for local problem-solving that can integrate into existing structures and material flows.

Based on the work of Björgvinsson et al. (2010, p. 3-4), the project reoriented toward designing for infrastructuring, an approach that shifts design practice from creating objects to fostering adaptive systems for ongoing co-creation and relationships. Further exchanges with the Tanzanian medical student uncovered region-specific materials and tools as the most viable inputs for local design. These conversations highlighted cultural practices of improvisation, mutual aid and traditional craftsmanship that could be included in the solution.

The Tanzanian student supported the idea of an online platform accessed via mobile app or the browser since most of Tanzanian population has access to a smartphone (Cowling, 2024a) and mobile phone network and internet in Tanzania are relatively well developed (Cowling, 2024b). Tando thus evolved into the concept of an open-source platform: a digital infrastructure that allows users to co-create, adapt and repair essential goods using tools and materials available in their specific contexts.

The dashboard features a clear and intuitive navigation system, using icons and colors to provide visual guidance. Users looking for goods can either browse the catalog for specific items or use the search function to filter by categories such as mobility, health or sports and search for manuals, materials or services. Each project includes a step-by-step guide, illustrated with images, pictograms or videos. Users can upload their own instructions or edit existing ones. Comments and ratings encourage active discussion about quality and improvements.

Via a stakeholder map and community chats, actors can connect and exchange on specific topics. Users can also help to further develop the app and refine the software. Open-source knowledge systems offer several advantages: they enable collective contributions to a shared knowledge database, promote continuous peer review that enhances quality, reliability and adaptability and reduce costs. (Pearce, 2012, p. 428) Accessible via app or browser, the platform hosts visual

construction guides, supports multilingual and non-literate communication formats and encourages user feedback and peer learning.
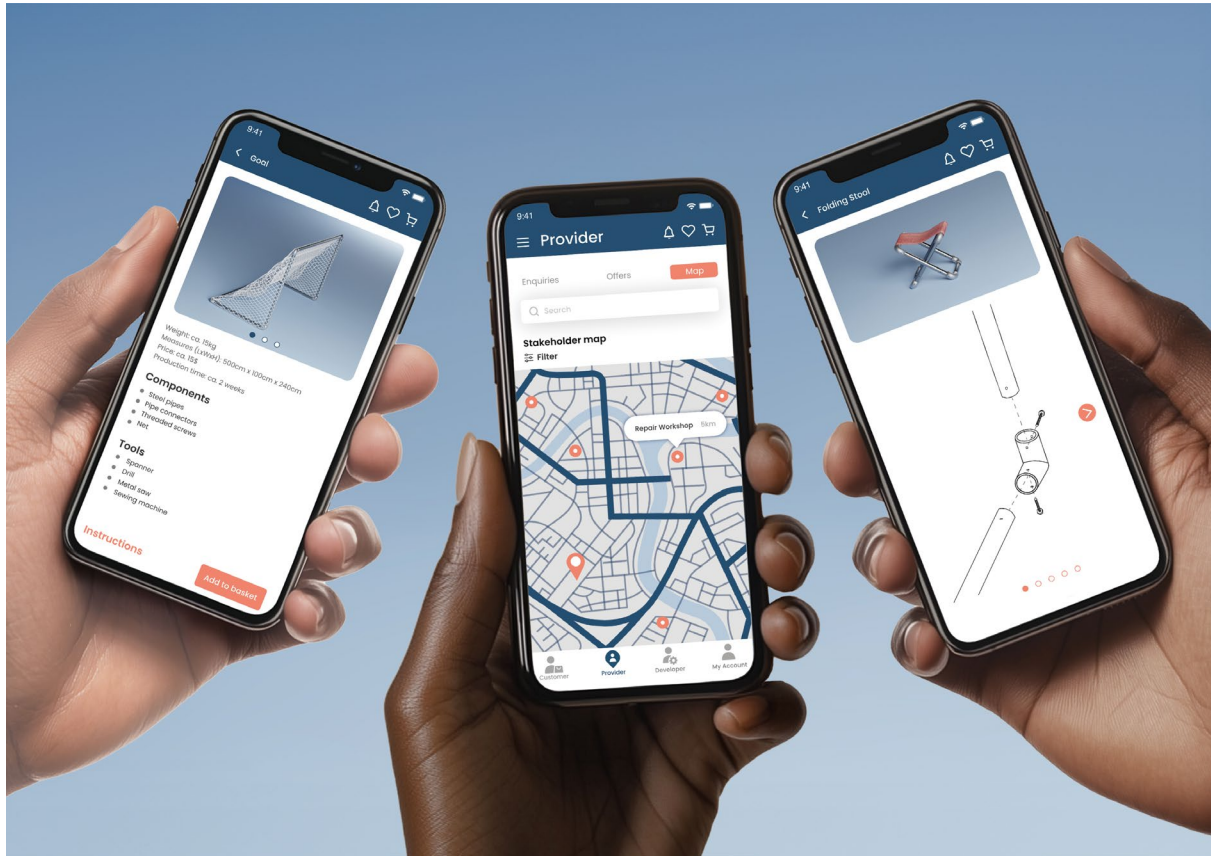

Figure 2: Possible app interfaces showing an item summary, a stakeholder map and a construction manual

4. Interdisciplinary and Intercultural Design Practice

Designing across disciplinary and cultural boundaries has become essential in addressing "wicked problems" that are complex, poorly defined issues with unclear information and span technical, social and infrastructural domains. (Buchanan, 1992, p. 15) Tando's foundation in interdisciplinary collaboration is not merely pragmatic, but central to its inclusive design ethos.

Cross-disciplinary collaboration enables the integration of domain-specific expertise, such as medicine, engineering and social sciences, with design methodologies that prioritize creativity, knowledge integration and adaptability (Badke-Schaub, & Voute, 2018, p. 25-28). In the case of Tando, the medical student's experiential knowledge of healthcare needs, logistics and patient experiences in underserved areas is complemented with the design student's expertise in visual communication, prototyping and systems thinking.

Intercultural collaboration offers a means of challenging assumptions and biases embedded in Eurocentric design traditions as Emans and Murdoch-Kitt (2021, p. 424) note and such collaborations invite reflection on relational ethics, cultural humility and the multiplicity of "correct" solutions. In Tando, intercultural dialogue shaped every phase of the design: From problem framing to material selection, ensuring the project remained rooted in context.

The platform also reflects what Akama and Yee (2016, p. 2) describe as an intimacy-based orientation to design: an approach that emphasizes relationships, emotions and place or community-based knowledge and draws sustenance from indigenous, spiritual and ecological dimensions. By valuing vernacular innovation and traditional craftsmanship, Tando aims not only to preserve indigenous knowledge, but to make it transferable and combinable with digital and technical systems across regions.

5. Participatory Principles and Inclusive Infrastructure

In essence, Tando seeks to operationalize inclusive design principles through participatory infrastructure. Rather than treating users as passive recipients, the platform invites them as contributors, co-developers and experts in their own right. Therefore, Tando aligns with Ehn's and Bannon's (2012, p. 42-45) perception of participatory design as a democratic practice and a space of ongoing negotiation.

In Tando, people can provide visual construction manuals to make them accessible for illiterates as well. The platform's design incorporates multilingual interfaces, modular customization and open feedback loops. Users can adapt designs to fit local conditions, share new instructions, access production and repair resources. In doing so, the platform facilitates not only the production of goods, but the transmission of technical knowledge, supporting long-term capacity building, social entrepreneurship and local economic growth.

The platform's structure reflects an expanded view of inclusivity, not only in terms of accessibility, but also in epistemology. It integrates technical schematics with traditional knowledge, digital skills with craft expertise and global resources with local agency. This reflects a shift from "designing for" to "designing with" and ultimately "designing by" communities. This approach transforms the designer's role into that of a facilitator, someone who enables dialogue, supports local innovation and helps build the conditions for communities to shape their own solutions (Björgvinsson et al. 2010, p. 10).

6. Cosmopolitan Localism and Knowledge Circulation

Tando exemplifies what Manzini (2009) terms in his work as cosmopolitan localism: a model in which global knowledge resources

are adapted and recontextualized by local actors. Through open-source frameworks, designs for essential goods developed in one region can be adapted, remixed and implemented in another, provided they align with local materials and practices. Since users define the solution according to their context, Tando is also applicable in other countries than Tanzania. Such an open-source model has already found traction in projects like the OpenFlexure microscope (Bowman et al., 2020), where researchers in the UK and Tanzania co-developed a 3D-printed lab instrument.

Tando's platform supports a wide range of applications: from health-

Figure 3: Selection of the wide range of possible items

related devices to agricultural, educational and recreational items.

Its integrated crowdfunding function allows communities to finance collective projects or to donate items, while its modular architecture encourages continuous adaptation. Importantly, the platform also serves as a learning environment, fostering digital literacy and reducing disparities in technical education.

7. Implementation Challenges and Future Directions

The project's interdisciplinary and intercultural character presents both: opportunities and challenges. Differences in communication styles, educational background and infrastructure required flexibility and ongoing negotiation. Yet these challenges deepened the project's reflexivity, leading to a more thoughtful and grounded design.

While Tando presents a promising framework, it remains a conceptual project and has not yet been tested in real-world settings, which limits the ability to evaluate its practical effectiveness. Its success depends on access to digital infrastructure, local facilitation and a certain level of technical engagement, which may vary significantly across regions. As such, the approach may not be universally applicable and will need to be carefully adapted or reconsidered in contexts where these conditions cannot be met.

Going forward, pilot testing and co-design workshops with communities in Tanzania are required to assess usability, relevance and adoption. Partnerships with local NGOs, maker spaces and vocational schools will be essential for facilitating access and building trust. Sustaining the platform will require attention to governance, moderation and community engagement. Mechanisms for quality control, design verification and knowledge curation must be

developed. Eventually, strategies to measure social impact, such as increased access to essential goods, local skill development and reduced dependency on imports, will inform future iterations.

8. Conclusion

Tando presents a compelling case for how interdisciplinary and intercultural design collaboration can generate inclusive, responsive and sustainable innovation. By integrating professional and lived forms of knowledge, it redefines design as a dialogic, participatory and context-sensitive process.

Rather than proposing universal solutions, Tando provides an adaptable infrastructure through which communities can co-create the tools they need. Its open-source, distributed model leverages global knowledge while centering local agency, reflecting an emerging paradigm in inclusive design that privileges equity, autonomy and mutual learning.

As the project advances toward implementation, Tando offers both a practical tool and a conceptual framework for inclusive design research. Its evolution underscores the value of interdisciplinary and intercultural cooperation, not as a supplement, but as the foundation for transformative design practice.

References

Akama, Y. & Yee, J. (2016). Seeking stronger pluralities: Intimacy and integrity in designing for social innovation. In: Kung, C., Lam, E. & Lee, Y. (eds.): Cumulus Hong Kong 2016 Working Papers 33/16. 173-180. Hong Kong Design Institute & Cumulus International Association of Universities and Colleges of Art, Design and Media: Hong Kong, China.

Badke-Schaub, P. & Voute, E. (2018). DESIGN METHODOLOGY: WHERE DO YOU GO? In: Bojčetić, N. Et al. (eds.): DESIGN, Vol.1. 25-32. Faculty of Mechanical Engineering and Naval Architecture: Zagreb, Croatia.
https://doi.org/10.21278/idc.2018.0550

Bannon, L. & Ehn, P. (2012). Design matters in participatory design. In: Robertson, T. & Simonsen, J. (eds.): Routledge International Handbook of Participatory Design. 37-63. Routledge: New York, USA.
https://www.routledgehandbooks.com/doi/10.4324/97802031085 43.ch3

Björgvinsson, E.; Ehn, P. & Hillgren, P. A. (2010). Participatory design and "democratizing innovation". In: Bødker, K. Et al. (eds.): Proceedings of the 11th Biennial Participatory Design Conference. 41-50. Association for Computing Machinery: New York, USA.
https://doi.org/10.1145/1900441.1900448

Bowman, R. et al. (2020). The OpenFlexure Project: Co-developing a microscope in the UK and Tanzania. In: IEEE Global Humanitarian Technology Conference (GHTC). 1-4. IEEE: Seattle, USA.

10.1109/GHTC46280.2020.9342860

Buchanan, R. (1992). Wicked problems in design thinking. In: Margolin, V. & Salomon, L. (eds.): Design Issues, 8(2). 5-21. The MIT Press: Cambridge, Massachusetts, USA.
https://doi.org/10.2307/1511637

Costanza-Chock, S. (2020). Design Justice: Community-Led Practices to Build the Worlds We Need. The MIT Press: Cambridge, Massachusetts, USA.

Cowling, N. (2024). Frequency of mobile phone usage in Tanzania as of 2021, by area of residence. In: Statista. Retrieved April 2, 2025.
https://www.statista.com/statistics/1289221/frequency-of-use-of-mobile-phone-in-tanzania-by-area-of-residence/

Cowling, N. (2024). Share of broadband mobile connections in Tanzania from 2017 to 2024. In: Statista. Retrieved April 2, 2025.
https://www.statista.com/statistics/1246793/share-of-broadband-mobile-connections-in-tanzania/

Emans, D. & Murdoch-Kitt, K. (2021). Improving intercultural collaboration with visual thinking. In: Bohemia, E. et al. (eds.): Learn X Design 2021: Engaging with challenges in design education, 24-26 September, Shandong University of Art & Design, Jinan, China. Shandong University of Art & Design: Jinan, China.
https://doi.org/10.21606/drs_lxd2021.09.235

Manzini, E. (2009). A cosmopolitan localism: Prospects for a sustainable local development and the possible role of design. In: Brody, D & Clark, H. (eds.): Design studies: a reader. 448-453. Berg Publishers: Oxford, UK.

Mwaura, H. & Zander, M. (2021). Medical and laboratory equipment landscape in East Africa. How to benefit from East Africa's potential? africon GmbH: Bremen, Germany.

Pearce, J. (2012). The case for open source appropriate technology. In: Environment, Development and Sustainability. A Multidisciplinary Approach to the Theory and Practice of Sustainable Development, 14(3). 425-431. Springer: London, UK.
https://doi.org/10.1007/s10668-012-9337-9

Wendler, Hauke (2022). Monobloc. Hatje Cantz: Berlin, Germany.

World Health Organization (WHO). (2008). Guidelines on the provision of manual wheelchairs in less resourced settings. WHO Press: Geneva, Switzerland.