INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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Programme of Study	:	Ph.D.

Thesis Title:
Design Approaches for Medical Technology Innovation and Implementation in Low-and Middle-Income Countries (LMICs)

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Thesis Submitted to the Department/ Center	:	Design
Date of completion of Thesis Viva-Voce Exam	:	01/07/2024
Key words for description of Thesis Work	:	Medical Device Innovation, Innovation Process, Design Process, Conversational User Interface, Heuristic Evaluation

SHORT ABSTRACT

This thesis delves into the intricate landscape of medical technology innovation within Low- and Middle-Income Countries (LMICs), focusing on India. The objective is to develop tailored design and innovation processes to enhance the effectiveness of medical technology in resource-constrained settings. An initial scoping review identifies critical challenges, such as regulatory complexities, funding constraints, cultural disparities, and inadequate infrastructure, that hinder successful implementation in LMICs. Despite existing literature acknowledging these challenges, a consolidated understanding of their impact on design and innovation activities is lacking.

The first research study critically assesses four well-established design and innovation processes—User-Centered Design (UCD), Human-Centered Design (HCD), Design Thinking (DT), and the Stanford Biodesign process—in the context of medical technology innovation. The study identifies process supports crucial for success and develops a modified framework, "Healthcare Centered Design (HCD)." The second study explores factors influencing innovation in LMICs, using Social Innovation Theory, Stakeholder Theory, Resource-Based View, and PESTEL analysis. It proposes a redefined conceptual model for innovation management.

Subsequent studies evaluate LMIC-specific challenges, enhancing the Stanford Biodesign Process for context-specific healthcare design, and propose a new toolkit validated in a case study focused on wound management and cervical cancer in India. Additionally, an extended study addresses the shortage of skilled professionals by integrating an offline AI bot within medical devices. This comprehensive thesis bridges gaps in understanding and addressing medical technology innovation challenges in LMICs, offering robust frameworks and tools for sustainable healthcare solutions in these settings.