ETL Working Paper

Equitable Technology: an evolving framework for analysis and action

This document provides an overview of the ETL's emerging framework for understanding and enabling equitable technology development. This framework informs the ETL research themes and locates research projects in relation to the inequities that are addressed, and the maturity of the technology that is being developed.

Equitable technology development

Figure 1 presents an overarching framework for technology development that enables analysis and action. The ETL Research themes (below) investigate aspects of this overarching framework.

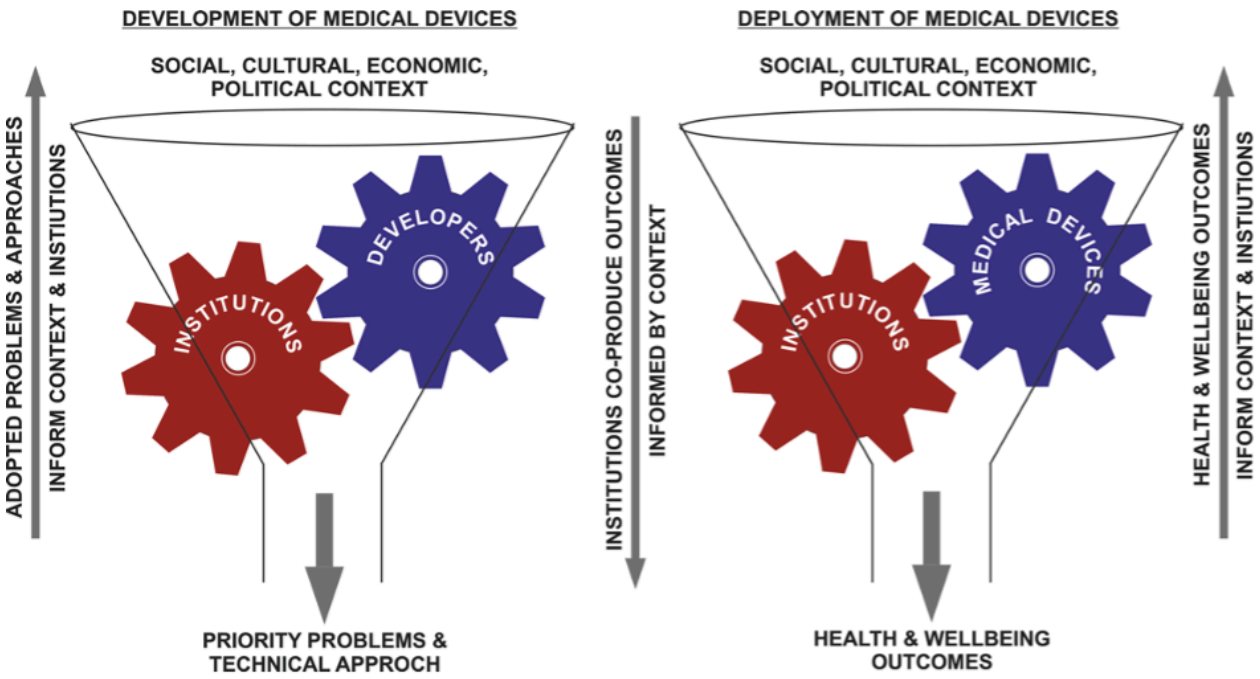

Figure 1: A framework for equitable technology

In Figure 1, inequities emerge and are reinforced through two central technology development processes. Interactions with institutions and the wider social context mean that inequitable outcomes can emerge during both the development and deployment of new technologies, here illustrated in relation to medical devices. In Figure 1, institutions refer to the formal and informal rules and arrangements that shape human interaction, including those embedded in settings such as the market, healthcare or environmental regulation and

delivery systems, or socially regulated conventions and practices. For example, during the design phase, developer choices may be constrained by the requirements of funding bodies or professional development incentives, or influenced by their wider social experiences or exposure to dominant political and economic discourse. At deployment, institutional arrangements will regulate (for example) device access and support, producing outcomes experienced by users who themselves differ in terms of their context and background. These processes not only lead to the production of devices that may fail to address user needs, but are also consequential for both science and society, potentially reinforcing inequitable social arrangements or drivers of inequalities and marginalisation.

Research theme 1: Socio-technical engineering

By understanding critical moments where inequity can enter into technology development (Figure 1) as opportunities for action, socio-technical engineering frames how a socio-technical perspective challenges our understanding of engineering, and enables a rethinking of engineering principles for equitable technology development. We differentiate between early stage technology innovation and later stage technology translation.

A. Innovation

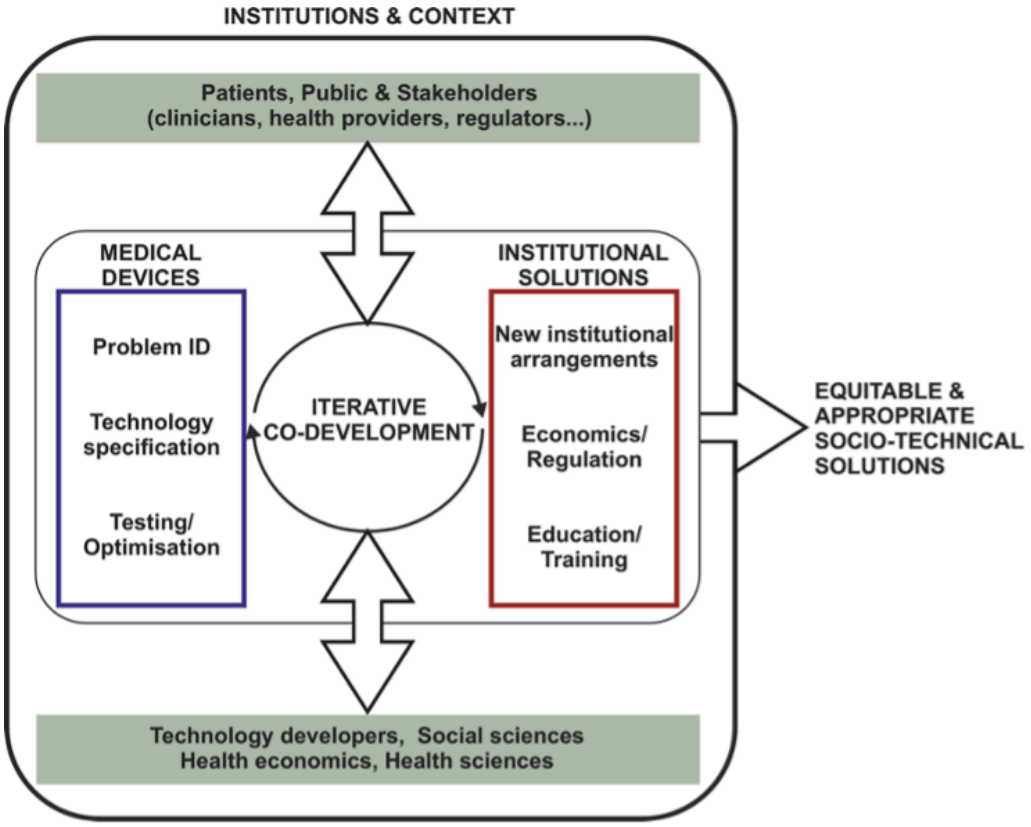

Figure 2: A design heuristic for equitable technology development

Figure 2 provides a design heuristic for equitable technology development. Early stage / low TRL engineering is reframed from purely a technical challenge to a search for linked, co-designed institutional and technical (socio-technical) solutions that are appropriate for diverse user groups. Co-development engages users, scientists and stakeholders in a process that iterates between consideration of technical and institutional needs and requirements, and is designed to respond to inequitable power, experience and knowledge production practices embedded in the social and institutional context.

B. Translation

The technology translation phase presents opportunities to refine socio-technical solutions to fit diverse social, political and economic contexts and promote equitable access, use and benefits. We define technology translation as moving from prototypes to a technology and associated institutional arrangements that are ready to be widely distributed and used in practice. Our emerging framework proposes a *user-directed translation process*, the result of which is a socio-technical intervention that supports users to adapt technologies to their local contexts and promotes equitable access and outcomes.

Research theme 2: Technology and inequality

Figure 2 suggests, on the one hand, the potential for technology to produce or sustain inequality, reflecting underlying contexts and enforced or reinforced through institutional arrangements. On the other hand, technologies can also be seen to play a central, generative role in relation to contexts and institutions, holding the potential to transform social relations and underlying inequalities. Equitable technology development can thus act on some combination of:

- The sources of inequality (or bias) in knowledge production processes. Acting on this is to *transform the design process, problem prioritisation and technology specification*.
    - For example, this might mean supporting marginalised groups to have their knowledge heard and legitimised in technology specification development processes.
- The drivers of inequality in society. Acting on this is to *transform power relations through science and technology knowledge production.*
    - For example, this might mean developing decision support technologies (such as sensors, algorithms or models) that represent the experiences of communities that are routinely overlooked in decision making.

Research theme 3: Equitable technology methods

Methods for equitable technology development are emerging through interdisciplinary collaboration in the ETL-funded research projects. Collating these is a work in progress (see for example those set out here), but central is grounding technology development in the social context (Figure 3).

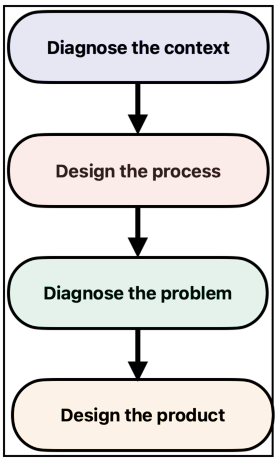

Figure 3: methodological set up for grounded technology development, enabling process design to respond to existing relations of knowledge and power that would otherwise permeate processes of specification acquisition and solution development.

Research themes and research projects

Figure 4 illustrates how the ETL research projects map against the first two ETL research themes (Socio-technical engineering; Technology and inequality), with work on each contributing to the development of the third theme (Equitable technology methods). These research themes are further developed in the sections below, which set out progress made in conceptualising equitable technology. The emerging ETL approach to analysis of equity and technology is captured within an overarching Equitable Technology Framework.

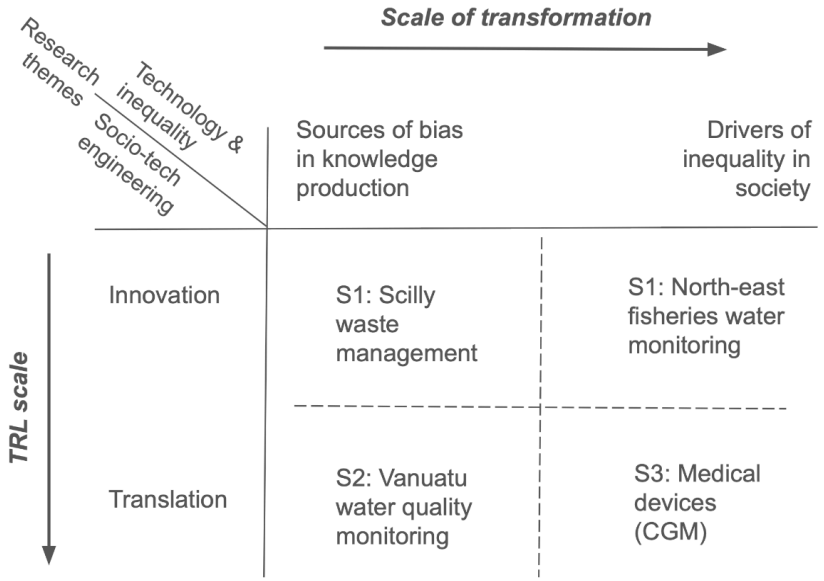

Figure 4: mapping of research projects onto ETL research themes