The impact of technology intervention on the sustainable development goals[1]

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Achieving the 17 United Nations Sustainable Development Goals (SDGs) set out in the 2030 Agenda for Sustainable Development adopted in 2015 requires progress along multiple dimensions of human development. In many cases, the progress will involve using new or improved technology. However, some technological interventions can lead to contradictory changes among other indicators. As a very simplified example, building a new factory may increase employment (positive progress on Goal 8.2, 8.3, 8.5), creating higher incomes and potentially reducing hunger in a community indirectly (positive progress on Goal 2.1), but might simultaneously increase greenhouse gas emissions from manufacturing in the country (reverse progress on Goal 13.2).

This simple example epitomizes larger and more complex questions, including a need to understand these types of interactions between different goals more comprehensively. Specific questions include: how do simplified, and more complex, contradictions such as the example described above emerge? Are there combinations of technologies that make them less likely, and if so, why? Does the sequence (of how technologies are introduced) make a difference? This project builds on recent work addressing the interconnections among SDG indicators using a complexity and network theory approach. We take a technology-focused view and investigate the effects of introducing a new or improved technology portfolio into an existing network of resources, technologies, and industries.

The 17 SDGs are delineated into 232 indicators detailing sub-components necessary to the achievement of each goal. Since many technologies require a similar set of resources and industrial support regardless of where they are being manufactured or used, this project focuses on building a location-independent network of interdependencies between technological intervention and the resulting interconnections at the level of the SDG indicators. A specific technological intervention (addition of photovoltaic electricity) aimed at positive progress in a specific SDG goal (Goal 7) is then studied as a network problem and evaluated in terms of resulting changes cascading through the larger SDG indicator network. One goal of this work is to set up a methodology that can be adapted to address country-specific policy questions and study a variety of technologies.
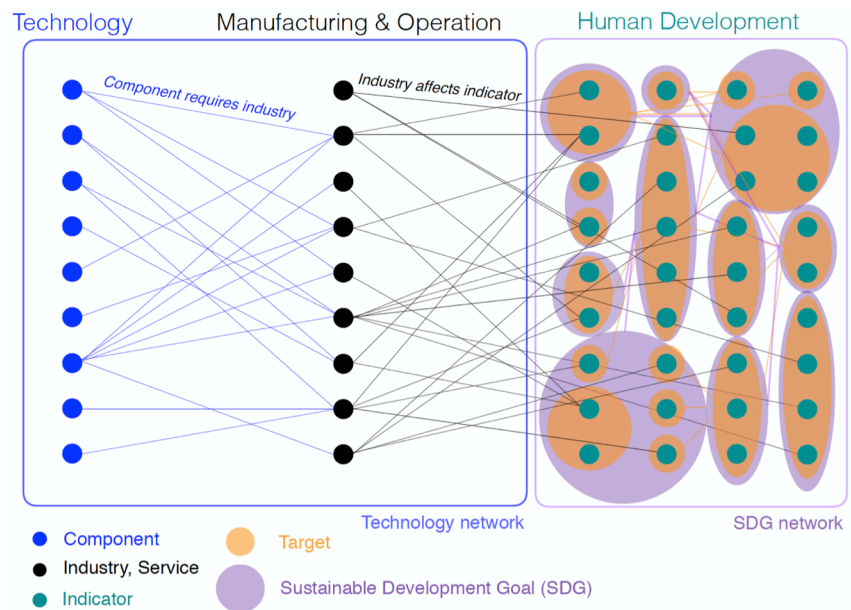

Figure 1: Technology networks (large blue box, left) consist of technology components (blue circles: e.g., the module or the inverter of a photovoltaic system) and the industries and services needed to manufacture, deploy, operate, and maintain these components (black circles). SDG networks (large purple box, right) consist of indicators (green circles) that measure progress towards the targets (orange shapes) underlying each SDG (purple shapes). Technology networks are connected to SDG networks through development indicators (green circles) that are affected by technology-supplying industries and services. One SDG is connected to another (purple lines) if one or more targets related to that SDG are related to targets related to the second SDG (orange lines).

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