The technology of need: technology of sustainability?

A tecnologia da necessidade. Tecnologia da sustentabilidade?

La tecnología de la necesidad ¿tecnología de la sustentabilidad?

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1. Introduction

Hyper competitiveness accelerates the pace of innovation and generates an impressive increase in the number of products that are introduced in the market daily (Harvey and Griffith 2007). Nevertheless, most of these products are not designed to satisfy basic needs and their distribution among the population is uneven, increasing social exclusion. The technological systems (Hughes 1987) in which innovations take place have, in many cases, evident features of unsustainability. This is because there is an increased use of raw materials and energy to manufacture consumer goods (tangible or intangible) especially those oriented to satisfy the consumption aspirations of a little fraction of humankind.

This is supported by an important rise in the capabilities of knowledge production, posing a paradox: on the one side, more efficient technologies are developed allowing the increase of industry and services efficiency which can result in a reduction of the environmental impact. On the other side, it increases the possibility of nature appropriation and transformation, mainly by the intensive exploitation of resources, both traditional (e.g. iron, bauxite, copper, coal, petroleum, limestone, etc.) and new ones (e.g. rare earth, coltan, Lithium salts), and the growing generation of new waste polluting. Therefore, outputs are often unsustainable. This leads to questioning the current socio-technical structure and the need of exploring alternatives that, inevitably, must induce a rethinking of the notions of technology, production, and consumption.

During the sixties and seventies of the past century, there was a debate about development models and the technological systems supporting them. Several studies warned against the negative impacts of technological development and industrial growth, urging for their reorientation (Carson 1962; Meadows et al. 1972; Dickson 1980; Schumacher 1978). Nevertheless, an economic-productive model, based on continuous growth, in
rapid expansion and acceptance at the global level, made some technological alternatives proposed in several of these works unfeasible, not extending beyond academic settings. Therefore, technological systems of industry and the services remained fundamentally unaltered.

In the interim, the microelectronic revolution emerged and consolidated, and a new techno-economic paradigm based on intensive knowledge arose, meant to displace the old one based on the intensive use of materials and energy (Pérez 2009). However, reviewing the evolution of economic growth and the exploitation and consumption of resources in the last four decades, there is evidence that the new techno-economic paradigm continued to be intensive in the use of materials and energy (Mercado and Córdova 2018).

Nowadays, we witness an accelerated development of convergent technologies (nanotechnology, biotechnology, ICTs, and knowledge sciences) circumscribed to the institutional, cognitive, and juridical structures inherited from the old paradigm (Robinson 2013). But recently, institutional imperatives induce a reduction of environmental impacts such as emission regulations of greenhouse gases, waste reduction, and voluntary norms (e.g. ISO 1400, ISO/TC 207, Responsible Care). This normative framework may have contributed to increasing the efficiency of production processes and services according to sustainability principles. But, in response to the patterns of accumulation and consumption inherent in the paradigm of continuous growth, their operation is still inserted into production forms that require large investment, big scales, and are strongly concentrated, helping to consolidate the current unsustainable economic-productive structure.

2. Social technology: an adequate response?

Environmental degradation and social exclusion are inherent in most of the current technological systems. Reacting to this, at the beginning of this century, some Latin American researchers (Dagnino 2009; Thomas 2009), questioned the fundamentals of conventional technologies and even the so-called appropriate technologies (Novaes and Dias 2009). As an alternative to technology developed by and for business, they proposed the concept of Social Technologies, defined as that “including replicable products, techniques and/or methodologies developed in interaction with the community and that represent effective solutions for social transformation.”

However, these conceptualizations face some obstacles to their acceptance and diffusion. First, because of their generality. For example, some may argue that many of the current technologies are developed in interaction with the communities, and, certainly, many of them continually transform social life, although not leading to a decrease in inequality and asymmetries. Second, the term is used to name activities and technological areas with very different meanings. For example, there is a significant current of thought that relates social technologies to the large information and communication platforms that, paradoxically, in many cases have become “antisocial” mechanisms of appropriation and unlawful use of people’s information (Kalantzis-Cope 2016). As if this were not enough, its operations generate a high environmental impact, especially in the use of energy (Cummimg 2021).

1According to the most widespread definition in Brazil, which is where the concept was generated (Dagnino 2009).
There is a third problem: the broad meaning of what is social makes it difficult to define what is social technology. Which social actors are considered? What is the role of the economy? These questions do not seem to be sufficiently addressed by the Latin American researchers who propose social technologies, for they tend to underestimate the role of important economic actors and producers of knowledge. Additionally, according to the social construction approach of technology, a social output is a result of a process of social negotiation between different relevant social groups (Pinch and Bijker 1987). The problem lies in the fact that in the prevailing socio-technical structure “the outputs,” in most cases, derive their results from extremely uneven negotiation processes.

Jasanoff (2003) argues that scientific and technical advances bring benefits, but also generate uncertainties and negative consequences, so the control over technological systems should be reexamined. Dominant predictive methods – she points out – have limitations to handle uncertainty and ambiguity. They tend to pre-empt political discussion, creating high entry barriers to legitimate positions that cannot express themselves in terms of the dominant discourse, and have limited capacity to internalize challenges arising outside their framing assumptions.

Therefore, it is imperative to deliberate on technical issues to support decision-making by integrating the “can-do” orientation of science and engineering, with the “should do” issues of ethical and political analysis. Jasanoff has talked of “technologies of humility” – a social technology – with reference to institutionalized methods or habits of thought that help to embrace the limitations of human understanding of uncertainty and the uncontrollable, and which may complement the predictive approaches of the “technologies of hubris.” Can this proposal lead to the necessary changes in technological systems to advance towards sustainability, or does it just serve to improve their control and reduce uncertainty and risks?

Epistemological problems and, above all, the socio-environmental crisis, highlight the need to re-elaborate concepts to orient the discussion of technological development towards the sphere of basic needs – many of them still unsatisfied – of a vast portion of humankind, and the reduction of the impact and mitigation of anthropic activities, in order to prevent the much feared environmental catastrophe.

3. Technology of need – technology of sustainability

Several convergent technologies may contribute to the advancement of more sustainable technological trajectories. This is because, although they are intensive in knowledge, in contrast to many current technologies, they may not be so intensive in capital requisites. In addition, they present some attributes of flexibility and of scale, that can enable less concentrated forms of production and services (Mercado and Cordova 2020) and, therefore, be more accessible to communities and even households.

The Venezuelan architect José Fructoso Vivas2 (2011) introduced the term “technology of need” to describe

processes within the category of maximum efficiency and reach of the people. Many of these techniques belong to the ethnotechnology inherited from our ancestral cultures; they

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2Known as Fruto Vivas (1928–), he is one of the most renowned Venezuelan architects. In 2014, he received the Iberoa-american architecture prize. His work has paid special attention to the social necessities of housing.
emphasize bioclimatic adaptation and are made with the minimum number of materials, differentiating themselves from wasteful technologies – those prevailing in many of current technological systems – that make excessive use of materials and induce an exaggerated and often unnecessary consumption.

Is it possible to approximate traditional technologies and/or ethnotechnologies with convergent technologies guided by sustainable principles, to seek alternatives to current technological systems? The answer seems to be implicit in the concept of sustainable development: “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (World Commission of Environment Development 1987).

This poses important challenges to producing context-sensitive knowledge (Gibbons 2000). The development of convergent technologies with a social orientation should be promoted by trying to establish a dialogue with other forms of knowledge production that allow to co-create hybrid solutions for satisfying needs (Vessuri 2004). From the notion of necessity, a new conceptual base of technology development (technology of need – technology of sustainability) must be thought, useful to advance in the transformation of technological systems and, in this way, contribute to mitigate the environmental impact of anthropic activities and social exclusion, essential prerequisites to move towards sustainability.

In agreement with the Sustainable Development Goals (SDGs), discussion should be centered in the sphere of the basic or essential needs of human beings and society, considering their implications in the scope of the technique (tools, machines, products, and processes), work (types, distribution, interfaces, rights), and in the relationships with nature.

Advancement to a sustainable socio-technical structure requires overcoming the institutional, cognitive, and juridical structures inherited from the old paradigm (Robinson 2013) and, above all, decoupling the production of scientific and technological knowledge from the precepts of the continuous growth paradigm. So, based on a review of alternative proposals on technology and studies about work, technique, and nature, as well as on the analysis of controversies about existing technological systems and their trajectories (Dosi 1982), we propose to develop the theoretical and conceptual elements of the “technology of need.”

The current technological systems consume resources and pollute at a rate that will make it impossible to guarantee the right of future generations to satisfy their needs. The technology of need can contribute to establish the basis for setting up adequate bonds of the “society-nature-technology” triad. Due to its characteristics, by reducing the propensity to the unnecessary use of materials and energy, and to the possibility of reducing the imbalances of power between social actors in relation to the orientation of technological development, it intrinsically entails the fulfillment of the fundamental postulate of sustainability.

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3https://sdgs.un.org/#goal_section.
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