High-Tech/Low-Tech: Appropriate Technologies for Developing Nations

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A central (and long-standing) debate in the fields of Information Technology (IT) and Economic Development has centered around what (if any) information and communications technologies are ethically “appropriate” for developing nations. IT has largely been developed in the industrialized West under capital-rich, labor-scarce economic conditions, and inherently, a technology will address the special constraints in its generative environment. Indeed, Schumacher pointed out long ago that “intermediate” technologies (developed especially for a developing nation’s special circumstances) might be preferable. Now, with the resurgence of interest in industrial technology (a la Schumpeter) as the driving force for economic development, policy makers, business leaders, and citizens in developing nations are asking whether advanced information and communications technologies are appropriate for the capital-scarce, labor-rich developing nations. Indeed, the real question may not be whether they are appropriate, but whether there is an inherent difference between industrial and information technology (which would make “intermediation” unnecessary or even detrimental), whether IT can be (or needs to be) effectively adapted, and whether lack of access to advanced IT bars developing economies from the global marketplace, thus impeding economic advancement. The current paper first presents the context in which “appropriateness” has been argued, including the question of whether being part of the global marketplace really benefits developing nations. The paper then outlines and provides criticism of the bipolar debate and activity to date, and offers a new approach to the question in the context of an “information age” world economy.

The proliferation of computing, networking (especially the ubiquitous Internet), and other forms of information and communications technologies in the industrialized nations in the 1990s has brought about tremendous benefits to the population in those parts of the world. The question of whether the developing economies in Asia, Africa, Eastern Europe and Latin America can take advantage of these technologies (and what those advantages might be) is a matter well worth pondering.

What constitutes the “appropriateness” of a particular technology? Of course, it depends on the purpose to which the technology is applied. In the context of developing economies as well as in the industrialized nations, technology is used, among other equally important purposes, to stimulate economic growth, thereby improving the quality of life of its population as a whole. As a means to this end, what type of communications and information technologies are suitable for developing economies? There are really three perspectives from which we can view the issue of appropriateness. From the economic perspective, a technology is appropriate if it optimizes productivity, provides future opportunities for further economic growth and utilizes the cheapest resources (usually local, if available). When seen from a social viewpoint, a technology is appropriate if its employment does not lead to negative social ramifications. For example, a sociologist might consider a technology appropriate if it is environmentally friendly, if it does not have an adverse effect on the community, and if it improves employee satisfaction and quality of life. Last but not least, for a modern technology like communications and information technology to be effective, we also need to consider the technical aspect of appropriateness. Certain vital infrastructures have to be present before such a technology is viable (Avgerou and Land, 1992). These may include:

• Skilled manpower and the presence of educational and training facilities to equip a critical mass of the population with the required skills. This has a powerful impact on the...
level of the technology that can be employed.

• **Electrical power** for information technology hardware such as personal computers, mini computers, workstations and mainframes.

• **Communication channels** ranging from conventional telephone lines and postal services to fiberoptic networks, cable links and communication satellites.

• At a higher level, a **legal infrastructure** to protect the intellectual property rights of the software writers.

However, it would be myopic to assume that these three perspectives of appropriateness are mutually exclusive. To achieve sustainable benefits for the population, attention must be paid to all three. Some of the criticisms of advanced technology have focused on this very issue — that decisions are often made using one perspective (e.g., economic) without taking into account the others (e.g., social). Wherever possible, this paper will take into account all three.

One of the primary benefits may be that technology can equip a nation with an enhanced ability to participate in worldwide commerce by bringing forth a vast reduction in communications and transaction costs. Worldwide information and communications enables production to be more decentralized, allowing firms to base different parts of their business in different parts of the world, connected by computer networks. If access to global markets is used as justification for appropriateness, then, the “Globalization Question” must be asked: Does it actually benefit developing economies to “hook into” the global marketplace?

The following sections provide first a brief review of the “globalization question,” then an overview of the predominant schools of thought (which have polarized into “high-tech” and “low-tech”) on the topic of appropriate technologies for developing economies. The paper then points out some inherent deficiencies in the arguments, and finally concludes by proposing a possible middle ground between these extremes — a new approach to understanding information technologies in the context of the “global information age.”

**Review of Literature**

The discussion on this topic has, at some level, followed a dichotomous route. There are some who advocate the application of high technologies to aid economic growth in developing economies, but there is an equally vocal group of experts who favor Schumacher’s concept of intermediate technologies (Schumacher, 1973). Part of the discrepancy centers around the question of whether globalization helps or hurts developing economies. This section will first outline the globalization question and will then address the “high-tech” and “low-tech” arguments, in turn.

**Globalization & Economic Development**

In recent times, there have been serious doubts over the effects of globalization on developing economies. The deluge of Multi-National Corporations (MNCs) into the developing world has been criticized on several accounts. Environmentalists have attacked these foreign enterprises for taking advantage of lax environmental laws to reduce costs in waste disposal and pollution control, thereby leading to destructive effects on the environment (Goldsmith, 1996). Studies have also linked globalization to a resurgence of diseases (The Harvard Working Group on New and Resurgent Diseases, 1996). Some developing economies have even acted against the over-liberalization of trade by imposing restrictions on manufacturers from industrial nations to protect domestic manufacturers against what they deem to be unfair foreign competition. These countries have charged that the industrialized nations often have the benefit of superior technical know-how and capital and hence, are in an unfair position to compete against the local producers (Bernama News Agency, 1996). Traditional methods of production and livelihood have also declined as the MNCs often employ capital-intensive methods of production, using their own “modern” technology. Even when more labor-intensive or traditional methods are feasible, the MNCs have a strong propensity to purchase capital-intensive equipment from their home countries because of the reduction of search and information costs (Wells, 1973).

However, despite these drawbacks, it is undeniable that globalization does have overwhelming benefits. Technology transfer as a consequence of globalization often has the effect of stimulating advances in education within a developing economy. The mere presence of a multinational firm and its need for staff often acts as a catalyst in a developing economy’s efforts to promote education (Arghiri, 1982). Although certain older forms of employment have been made obsolete, foreign direct investment, which presently accounts

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**Figure 1: Real Wage Growth in Manufacturing and Export Orientation: Wages Rose in Countries Whose Export Orientation Increased.** Data are annual averages for 1970-90 for a sample of 37 countries with falling and 32 countries with rising export-GNP ratios. (Source: World Development Report, 1995.)
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