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# What Makes a Technology Appropriate?

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# WHAT MAKES A TECHNOLOGY APPROPRIATE?

Barrett Hazeltine



Nearly all technology would be appropriate somewhere, so a general meaning of the term "Appropriate Technology" is elusive but the term is often used, as I will, in a narrower sense. An accepted meaning is that Appropriate Technology is small scale, labor intensive, creates meaningful jobs, maintainable by the local community, environmentally sound, and energy efficient. A major early proponent was E. F. Schumacher, an economist who visited Burma after World War II and recognized that the technologies effective in Britain and the rest of the industrialized world were inappropriate in much of the world, partly because the capital cost to create a job, a work place, using western technology was prohibitive--£2000 (in 1966). On the other hand, local artisans were using tools costing tools costing £2 and were not producing

much. Schumacher argued for an "Intermediate" technology, where the capital cost per workplace would be about £100, large enough to be effective, small enough so many jobs could be created. The term "Intermediate" was found to be offensive and was replaced by "Appropriate".

The reasons Schumacher pushed appropriate technology in the Third World are probably evident—the capital investment required to create many jobs is not feasible if industrialized world technology is used but would be feasible with a smaller scale technology. Appropriate technology would reach many more people than high technology, reducing economic inequality. A second advantage is that jobs would be created in the villages, avoiding social disruption, such as caused by urban migration. Another advantage expected was that the artisans using these improved but still comprehensible tools would develop attitudes of self-reliance and responsibility. Further, proponents of small-scale technologies believe such technologies are easier on the environment.

Another reason why "appropriate" was used is a reaction to the many attempts to transplant a technology into a situation where it did not fit. Machines that worked well when used and maintained by experienced operators in Britain and the US failed permanently at the hands of untrained staff lacking support. When machines were exported to less industrialized regions, spares and lubricants did not always follow. Local people tend to be ingenious and motivated but are at a tremendous disadvantage without the engineering ecosystem we take for granted. A gross simplification, which has a kernel of truth, is that people in less industrialized countries have an excess of time and a lack of capital. The opposite is true in industrialized countries; hence the risk of transplanted technology being inappropriate.

One concern about appropriate technologies is whether it can

produce sufficient goods and services to meet needs. The answer, of course, depends on the situation and the technology chosen. Another concern is whether users or designers will accept a simple solution when a more complicated one is available—perhaps this bias toward complexity is a North American phenomenon. I suspect people doing planning for third world nations have a concern that promoting appropriate technology will permanently exclude a nation from participating in modern industry. A suspicion may exist that appropriate technology is in fact a strategy to keep less industrialized nations that way forever. A final concern about appropriate technology is that it is difficult to manage because it supports self-reliant artisans working on locally selected projects.

How did thinking about appropriate technology evolve? In the first place appropriate technology is becoming accepted. I am struck when I visit places in Africa and Asia that appropriate technology is recognized as a viable option. In the United States people seem less familiar with the term but the ideas are gaining hold. Thinking about appropriate technology changed in another way—a recognition that technology is only part of the solution. In the Third World, aid organizations that once focused heavily on designing devices are now focusing more on the entire value chain—realizing that creating jobs requires attention to suppliers and customers, as well as technology. A third way that thinking has evolved how local people are involved. At least some aid organizations are paying much attention to existing community knowledge, choosing technologies that build on what the community has been doing, using appropriate technology ideas to help people do things better.

So, is appropriate technology really useful beyond helping poor farmers in remote places? Are the ideas applicable in other contexts? I see several generally useful themes coming out of the appropriate technology effort:

- Bias for simplicity, for small scale solutions

- Avoidance of technology that creates major cultural change
- Recognition that successful innovation requires more than technology advances
- Being attentive to the quality of jobs produced

Schumacher would be disappointed that community development is not included but appropriate technology ideas do not seem to be leading in that area.

I should elaborate. People become engineers because they like to make things. They feel rewarded when their solution to a challenging problem works and often feel more rewarded when the solution is sophisticated. This aspiration for technological elegance can overcome awareness of what is needed. Aiming for perfection narrows a designer's vision. A solution that satisfies and meets other requirements is needed in many cases, especially in unfamiliar settings, and such a solution is very likely to be small scale

Appropriate technology tends to be close to the traditional technology so the cultural change required when it is introduced is usually small. The work people do after the new technology is introduced is similar but more productive. Successful implementation of appropriate technology has, in most cases, focused on villages—where poor people tend to live. Having productive jobs in a village retains village culture, easing the adjustment to the different sort of life a new technology will bring. The admonition to the engineer introducing a new technology is to learn about the existing culture and forecast, as best as possible, the affect of an engineering advancement.

The history of appropriate technology, and other instances of attempting technology change, is that for sustainable improvement much more must be done than simply deliver a new device. Certainly problems of spares and lubricants must be addressed but

broader problems must be considered. For example, how will the customer get the cash to pay? Who will sell the new technology? Who will buy the output? Must insurance be provided and who will organize that? And so forth. As noted, improving devices is not sufficient for significant change.

To genuinely improve people's lives better jobs are needed, as well as more jobs. One aspect of a better job is being more productive, so some sort of a surplus is created. Anecdotes abound of how a better tool has taken a farmer or artisan out of poverty to middle class, allowing, for example, school fees to be paid and a cement floor installed in the home. Another aspect of a better job is giving opportunities for users to think resourcefully and to advance themselves.

A technology is appropriate, it seems to me:

- If it produces sufficient goods and services,
- If the capital needs are reasonable,
- If it matches local resources, both physical and human
- If the user can understand and maintain it,
- If it does not cause a major cultural disruption,
- If it fits into a viable value chain,
- If it promotes responsible jobs.

