The Impact of Environment on Information Infrastructure Enhancement: A Comparative Study of Singapore, France, and the United States

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An enhanced information infrastructure enables a wide range of communication services. Predictions differ regarding the impacts of these services on business practices and individual rights. This paper introduces a technology-environmental fit (TEF) model that proposes that characteristics of an emerging technology are modified by the political, economic, and cultural environment where they become available. The TEF model is applied to infrastructure development and use in Singapore, France, and the United States. The influence of these nations’ industrial policies on infrastructure capacity and range and the influence of their degree of individualism on the services made available are examined. Nations whose industrial policies are characterized by strong government intervention create a more conducive environment for infrastructure enhancement. Individualistic cultures are more likely to use the infrastructure to support N:M communication patterns, collectivist cultures are more likely to use the infrastructure to support 1:N communication patterns.

Computers and communication devices are being linked together at an increasing rate throughout the world. The result is an information exchange infrastructure designed to support the transmission of voice, data, and images.

A nation’s infrastructure has three key characteristics: capacity, range, and available services. Capacity is a function of the bandwidth of the transmission media and the speed at which the information can travel. The installation of fiber optic transmission media permits tremendous increases in bandwidth. Alternatively, significant increases in speed are possible through the use of ISDN, a set of standards and switches that permit digital transmission through existing transmission media. Range is a function of the number of other sites that a user may access through the network, and the geographical distance between them. Adding new sites to a network, or linking one network to another, increases range. Available services consist of the software applications developed for use on the infrastructure. These services depend upon the existence of sufficient transmission capacity and range and are often the motivation for their enhancement.

Business services include:

- image-based networks that eliminate paper (Keen, 1994),
- reengineered work processes (Davenport, 1993; Hammer and Champy, 1993) in which data links between an organization and its suppliers or customers increase efficiency,
- systems for multinational firms which permit centralized management from the home country (Roche, 1992).

Personal applications include:

- shop at home videotext services,
- “virtual communities” (Rheingold, 1993) based upon
electronic forums for discussing topics of interest,
• a wide range of electronic news sources.

The availability of infrastructure-based services has become a major factor in determining the desirability of a country as a site in which to live and do business (Porter, 1990; Ball, 1991; Roche, 1992). Yet, countries differ widely in terms of infrastructure capacity, range and available services.

**Predictions About Infrastructure Impacts**

Some proponents of enhancing a nation’s infrastructure claim that an increased use of computers and communication technologies will lead to a “democratization of knowledge.” Businesses and individuals will benefit from the availability of a wider range of information sources and access to other people with whom they can form business, political, or social relationships (Gore, 1991; Clinton, 1992; Ronfelt, 1992). Others have even claimed that the empowerment of individuals resulting from enhanced access to a global audience will make it impossible for totalitarian regimes to exist, and make national borders meaningless (Wriston, 1992).

Those with a more pessimistic view of the potential impacts of technology argue that the infrastructure will be used to centralize power and control. Early evidence indicates an increase in employee monitoring within organizations (Garson, 1988), and a tendency for multinationals to favor centralized infrastructures where the majority of computing power and data is kept in the home country (Roche, 1992). On a large scale, say the pessimists, such uses of the infrastructure would lead to a loss of privacy and power by individuals in favor of institutions (Rothfeder, 1992; Branegan, 1993), alienation in one’s personal and work life (Beninger, 1991), and a greater disparity between rich and poor (Reich, 1992).

Both sets of predictions, however, share a fundamental idea — that the impacts of a new technology will be a direct function of the technology itself and the new forms of behavior it makes possible. In other words, whatever the technology permits to happen, will happen. Direct, often revolutionary, impacts on the nation involved are predicted as a result. Contradictory predictions about impacts are likely to occur as different possibilities of the technology are emphasized by optimists versus pessimists.

In contrast, this paper provides an alternative theory, called **technology environmental fit (TEF)**, which argues that the nation’s politics, economy, and culture will play a major role in determining which technologies are made available and how they are used (Figure 1). Because the technology’s possibilities are filtered through the characteristics of its environment, impacts are likely to be more indirect and less revolutionary. More accurate, less contradictory predictions can then be made about the likely impact of a given technology in a given country.

This paper will compare infrastructure development and use in three countries: Singapore, France, and the United States in terms of the variables in the TEF model. The three nations will be compared in terms of their political, economic and cultural environments and

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**Figure 1: The Technology-Environmental Fit Model**