



# Enabling Connections: Information Technologies for Rural Development in Thailand\*

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Telephone, radio, satellite-based communications and computer data networks can play a strategic role in improving communications for rural areas and for organizations providing services to rural people.

Computers, for instance, offer the potential to assist government agencies and private organizations to manage large amounts of information and to provide faster, more responsive services.

Computers can link together in networks, combining computers and telecommunications, to overcome distance. Networks carrying voice, fax, computer data and, eventually, video information, form the "infrastructure of the information age." They will be a crucial factor influencing the course of development in both cities and rural areas over the coming decades (Williams 1991). Such an information infrastructure can enable people to improve their lives and actively participate in social and economic development (Pool 1990).

Telephones are often mistakenly viewed as luxury goods in development, relevant in urban areas only. Yet research in Thailand and elsewhere has shown that telephones provide major benefits in improving economic productivity and quality of life in rural areas as well (Chu, Srivisai, and McDowell 1985, Leff 1984, Hudson 1984). Similarly, telecommunications can help businesses and government agencies to provide better services and to deliver goods and services quickly in response to local needs. Telecommunications can allow people in rural areas to keep in touch with friends and relatives elsewhere, and quickly call for help in emergencies. Telecommunications can give farmers and other rural businesses better access to timely, specialized information about markets, leading to better decisions. Telecommunications can also enable businesses to locate in rural areas while still being competitive in the global economy ([Figure 1](#)).

Current projects to add three million new telephone lines are an example of how Thailand is beginning to address the need for better telecommunications. The government has opened up many areas, such as cellular telephones, paging, and data networks for private participation, under concessions from state agencies. There is extensive debate over how to improve the performance of the agencies involved and the role the private sector should play. Plans are now underway for the launching of a Thai satellite. Almost all the activity and discussion has focused, however, on services for the Bangkok area. There is little discussion of telecommunications in the development of rural areas.

This report provides information from an exploratory study of information technologies and rural development in Thailand. Interviews were conducted at government offices, businesses and non-government organizations, as well as service providers-ranging from the Telephone Organization of Thailand (TOT) to operators of public telephones in rural areas. The results of this research suggest that there are many opportunities for information technologies in promoting rural development.

## **VILLAGE TELEPHONES: THE BASIC LINK**

The fundamental requirement for rural telecommunications is access to telephone services. The present distribution of telephones in Thailand is highly concentrated in Bangkok. According to the 1990 Census, 38 percent of private households in the Bangkok Metropolitan Area have telephones.<sup>1</sup> For other regions, rates range from 7.2 percent in the Central Region to 2.6 percent in the Northeast. For non-municipal areas

overall, the rate is 2.6 percent of households. These are mostly in district towns.

Of the 60,000 plus villages in Thailand, TOT has installed telephones in only about 3,000. By the end of the Seventh National Plan in 1996, telephones should be installed in 4,500 additional locations. Yet over 50,000 villages will still be without telephone services ([Figure 3](#)).

The present program concentrates on installing public telephones in the main village of each *tambon* (subdistrict), based on the assumption that the primary need is for calls outside the village.

The aim is to install three telephones per village, usually with one telephone at the home of the *kamnan* (subdistrict headman), and two public coin phone booths. In practice, however, often only a single telephone is installed-at the home of the kamnan. His household operates the phone as a public call service. They receive 10 percent of the revenue from calls. If there is an outside call, they notify the person concerned. Their fee may range from 10 to 50 baht, depending on how far away the person to be notified lives. The operator also receives 10 percent of the revenue from the call.

Often only a single telephone is installed, due to technical problems with the TDMA radio system, which usually links telephones with local exchanges.<sup>2</sup> Installing only a single telephone creates a local monopoly of sorts. This makes those villagers operating the phones unenthusiastic about more telephones, which would create competition. Locating the telephone in the kamnan's home further increases his power.

Emphasizing public services was supported by the research of the Thailand Telephone Study conducted by the East-West Center of the University of Hawaii (Chu, Srivisai, and McDowell 1985). The study estimated that benefit-cost ratios ranged from 2.0 to 8 or more, suggesting very large benefits from installing telephones. Most benefits come from reduced time spent travelling to deliver messages and are not reflected in telephone revenues. Telephone organization officials, therefore, tend to view rural telephone services as a money-losing activity. They are accustomed to making investment decisions based on the revenues which can be obtained. They give less weight to equity issues or to the indirect economic benefits of telecommunications.

Leff (1984) argues that in developing countries the indirect economic benefits of telephones are high, and that current planning fails to take them adequately into account, thus leading to under-investment in telecommunications. This seems to be the case in Thailand, where the availability of rural telephone services is still very low. An alternative in rural areas is cellular telephones.

## **CELLULAR TELEPHONES FOR RURAL SERVICE**

Thailand is rapidly expanding cellular telephone services, which now include three services-at 470, 800 and 900 MHz. While these principally serve urban areas, they also provide an available, although expensive, alternative for areas currently lacking regular telephone services.

The service area of cellular cells is usually given as 10 to 20 kilometers. However, depending on terrain and other factors, cellular phones can often be used much farther away from base stations, particularly the 470 MHz frequencies. With a fixed antenna these can operate up to 100 kilometers from base stations ([Figure 2](#)). The cost of a 470 MHz mobile phone unit and antenna is 100,000 baht or more.

The number of base stations is rapidly expanding for all three networks. Planning for expansion could give more explicit weight to a cellular service as an alternative for areas where private wired lines are unlikely to be available soon.

Current plans are to begin a digital cellular service in 1993. This will provide a service compatible with a fully digital system and ISDN standards. Telecommunications theorists have suggested that in the long run almost all telephone services will use radio links as personal communications networks (PCN). Individuals will have their own telephones and the "intelligent network" will locate them-or act as an answering machine when they do not want to receive messages.

The growing global system of satellites, proposed by Motorola and its competitors, will probably make cellular-type telephone services available from anywhere in the world by the mid 1990s. As currently envisioned, this may require dual-purpose telephone sets which would use local cellular systems where possible, and satellite links where ground cellular base stations are too far away. Initial charges may be somewhat higher than current international telephone rates (perhaps \$3.00 per minute). While expensive, telephone services should thus be available anywhere in the world before the end of this century.

Another emerging technology is the micro-cellular service. The clustered nature of villages in rural Thailand means that investment in this technology could become a viable alternative to eventually installing wired telephones. The costs of cellular telephones should continue to decline, while the greater flexibility, reliability, and lower maintenance costs of cellular telephony should continue.

### **EXPANDING VILLAGE TELEPHONE SERVICES**

The program to provide public telephones at the subdistrict level reportedly compares favorably with attempts to provide rural telephone services in many other nations. When set against the total of more than 60,000 villages, however, services for 5,000 subdistrict centers only fulfill about 10 percent of the need for even minimal services.

The question is how long will it take before telephone services can be provided for at least a few public telephones per village? At installation rates for 4,200 stations over five years envisaged in the Seventh Plan, complete coverage of public phone services for all villages would not occur until the year 2061 (B.E. 2604).

It seems likely that basic public telephone services should be considered a public service and subsidized to the extent necessary. Most benefits, however, are indirect and do not show up in revenues. The increasing pressures toward privatization and competition mean that using revenues from urban areas to cross-subsidize rural areas will be progressively reduced. Therefore, if village telephone services are to be made available, it will probably require an explicit subsidy, for example to cover the initial installation cost.

During interviews, the cost per station of the tambon telephones was reported to be about 1.5 million baht per station, with each station serving three telephones. However, the overall cost for installing 1,813 locations from 1984-92 was 1,200 million baht (US\$45.7 million) or about 662,000 baht per station. For the 1992-96 program, the average cost per station is estimated to be 800,000 baht, or US\$32,000 (Warachat and Wuttisarn 1990; Cusripituck 1987).

There is little information publicly available on this program and analyzing the costs per line quickly becomes complex.<sup>3</sup> Costs seem high compared to installations in other countries, where costs are reported as only 50,000 to 250,000 baht (US\$2,000 to US\$10,000) per line. If the cost of 800,000 baht per station is accurate, more consideration should be given to using cellular telephones instead of the current TDMA links.

Current policies provide little opportunity for further expansion of telephone services-to local businesses, schools, health stations, temples or other organizations-which might have the ability to pay. Nor do current policies allow much scope for local initiative and expansion.

The provision of rural telephones could be accelerated by making telephones available to those willing to pay. This is likely to be both more efficient and fairer than rationing telephones according to positions on a waiting list.

### **TWO-WAY RADIOS**

Many government agencies, including schools, agricultural extension and health services, are currently expanding the use of portable two-way radio transceivers ([Figure 4](#)). Local administration and police officials have used such networks for a longer time. Typically, such systems are composed of different

levels-one to link officials working within a local district, and a separate network to link district offices with the provincial center.

For two-way radios, each person must pay for the radio unit on his own, a cost of nearly 10,000 baht. Willingness to spend this amount again shows the value placed on good communications, which help reduce travel, improve coordination of activities, and make emergency assistance more readily available.

Compared to telephones, two-way radios have the advantage that users do not have to pay service charges. They do have to listen for messages. The main disadvantage is that such radios only link a relatively small group of people on a single channel. Thus they are ultimately inferior to telephones, either fixed or portable. Yet, in the short term, they may be the only relatively cheap alternative in rural areas. In the long term, it will be more efficient to make rural telephone services more widely available. A decline in the price of portable telephones will also reduce the gap between the two technologies, making full-scale telephone services more affordable.

These networks are an example of the tendency of individual agencies and organizations to set up their own private networks. The Interior Ministry has received authorization for several billion baht to set up a trunked radio system, linking district offices all over the country in a national network providing phone, fax, and data services. It already has a network linking provincial offices with the Ministry headquarters in Bangkok.

In some cases, a private network may be the only choice. Creating private networks, however, reduces the number of larger, more technically-advanced users employing the public network, thus reducing pressure for innovation. Large users gain access to services unavailable to smaller businesses and individuals. Bypassing the public network also reduces the number of users contributing to fixed costs, thus losing economies of scale.

## **DATA COMMUNICATIONS**

Computer data can be transmitted over existing telephone lines, though the present maximum rate is only about 9600 baud-slow for high speed or high volume uses. Other alternatives are direct satellite links or packet switching networks set up specially for computer communications.

Satellites already relay telephone calls both internationally and between different parts of Thailand. Very small aperture terminals (VSATs) allow businesses to have access to satellite-based communications. Banks, factories, and other businesses, located in areas where regular telephone services are not available, already use VSATs. They are obviously an important alternative.

Most rural businesses and households cannot afford VSATs. As do private radio networks, VSATs *bypass* the public switched telephone network. Except for very high band width uses, such as video links, the public telephone network is likely to be a cheaper alternative. As fiber optic cables become more available, the band width from the public telephone network will continue to increase for areas within reach of cables. The increasing "intelligence" of the telephone network makes possible "virtual private networks" which offer large users the benefits of their own network.

The Communications Authority of Thailand provides a packet switching network (Thaipak), available both within the country and for international links. This offers reliable communications between computers. In theory, packet switching should allow more efficient use of communications networks, and thus lower costs. But the system's rates are prohibitive for most users for services other than low volume electronic mail. There are no discounts for educational users or for times of day when demand is low. Rates are apparently set by a monopoly not particularly responsive to customers. At current Thaipak rates, high speed error correcting modems, operating over voice lines, offer competitive performance, at least for some uses.

The technology of packet switching data networks does not require a monopoly for domestic or

international services (Ambrose, Hennemeyer, and Chapon 1990:11). Domestically, such value added services could be offered on a competitive basis. The increasing number of satellites means there is also no natural monopoly in international linkages and means an increasing potential for competition, although INTELSAT and the interests associated with it may try to block or delay liberalization (Hudson 1990).

One of the major uses for packet switching networks is to send and receive electronic mail. Electronic mail is rapidly growing in the U.S. and other countries. E-mail can be cheaper and far faster than postal mail. E-mail allows people to send and answer messages at their own convenience. E-mail can be cheaper than fax, while providing higher quality. The recipient can store the message and manipulate data, without retyping it, or send it on without loss of quality.

Computer information services rely on data communications and are a large and growing business in the U.S. and Europe, and elsewhere. Early versions were on-line research services for bibliographic research or services to provide timely information, for example on stocks. Currently, CompuServe, GENIE, Prodigy, America On-line, and other smaller, specialized organizations, provide electronic mail, special interest discussion groups, shopping, research and many other services. Government agencies, researchers and private organizations are linked by the worldwide Internet system. The Internet system provides not only electronic mail links between many different computer networks, but also real-time links to remote computers and access to a huge volume of on-line information, such as library catalogs and computer programs.

These services have great potential for helping people to connect with others who share similar concerns. There is still much to be learned about how to organize the availability of information in computer information services. It is, however, clear that, while the volume of information is potentially overwhelming, there are many techniques for helping to filter information so that people can more easily obtain only the information they need. Such services can have a major impact on activities, such as agriculture, where timely and in-depth information can be crucial. They could help enable such services as agricultural extension to shift from a largely one-way broadcast mode of operation to an interactive approach more responsive to client requests.

Computerized information services are still in their infancy in Thailand. Datanet provides a special service allowing simultaneous use of a single telephone line for both voice and data communications. Datanet services include a computer bulletin board service, electronic mail, plus other services. At present, these are only available in Bangkok. A national project is in the process of linking together major universities and will provide them with a linkage to the Internet. An interesting proposal has been made, and efforts begun, to organize a public access data network which could open electronic communications to all users in Thailand, rather than just those with access to university or corporate systems (Tantsetthi 1991).

Facsimile machines have spread widely in Thailand. They are much used where available. Permitting individual users to buy fax machines, requiring no prior permission, seems a successful example of deregulation. Fax machines provide documents which can be either copied or saved, particularly important to government bureaucracies. Public fax services make technology available to those unable to buy a fax machine of their own. However, since fax communications usually depend on telephone links, they can only be used where telephone services are available.

All these technologies help make distance irrelevant, potentially allowing people in rural areas to connect with information resources and people wherever they are. This is important not only for farmers or businessmen in rural areas, but also for organizations providing services to rural areas.

## **COMPUTERS AND DATABASES**

The use of computers is transforming businesses and other organizations in the U.S., Europe, and Japan. Rapid, computer-based communications, for instance, can play a key role in such innovations as "just in time" inventory management.

While there are many success stories of individual organizations using computers and communications to gain strategic advantages, there is also a growing concern that investments in computers do not necessarily increase productivity. The first lesson is that investments in hardware alone are not sufficient. A variation of Parkinson's law may operate so that, rather than bringing benefits of higher productivity or lower costs, "work expands to fit the newly available time".<sup>4</sup>

In Thailand, computers have yet to have much impact on the operation of most businesses, government or organizations outside Bangkok. Computers are being adopted relatively slowly. Most computers are used merely to make activities faster and more convenient. They seldom lead to new goods or services.<sup>5</sup> Banks are the leading private organizations using computers and telecommunications, mostly for automatic teller machines and on-line transfer of funds.<sup>6</sup>

Libraries may be the most advanced public sector organizations employing information technologies, particularly computerized data bases. This began with on-line databases. More recently, these have been largely replaced by CD-ROM discs. These hold huge amounts of data. The discs themselves are cheap to manufacture.

Provincial libraries in Thailand are establishing a network (PULINET) which will eventually enable computer searches of all libraries to help those libraries who need to borrow books from others. This network will offer better services and allow some libraries to specialize.

Within government agencies serving rural areas, a number of factors hinder the use of computers. Even though the national committee for screening computer purchases has been abolished, procurement is still relatively difficult, requiring much red tape. Government purchasing requires detailed specifications and it usually takes a long time before funds become available. By the time it arrives, the equipment is too often obsolete. If decisions to purchase computers could be made at lower levels, this could lead to better choices of hardware, software, and support services.

There is also a bias toward capital investment, to the neglect of operations and maintenance costs. Banks have addressed this issue by contracting-out activities for installing and maintaining both hardware and software. This is likely to be a more realistic alternative than trying to build up a large capacity within the government. Service contracts offer predictable costs, and thus fit government budgeting procedures better than delaying maintenance until the equipment breaks down.

Lack of staff to operate computers was the most frequent complaint of people in government offices interviewed during the research. Existing courses train only one person at a time from any given office. These trained people then often transfer away or leave government service altogether. Wages are more attractive in the private sector. A possible solution might be to change the view that computers are specialized equipment, only to be used by highly trained persons. If computers are to be used effectively, all staff should know how to use them.

Computer use in government offices seems largely restricted to provincial offices. The two district offices visited during this study previously had computers, but in both cases their computers had been borrowed, and not returned, by provincial offices.

According to those interviewed, the main use for computers is to store information. This could reduce the great mass of paper files currently kept. For records, computers are a convenient way to keep files up to date and accessible.

In many cases computers' potential go unrealized. Information is stored but never recalled. There is the appearance of computer technology, but little actual benefit. In theory, computers could help greatly in managing complex activities, such as budget planning and allocation. These activities are still largely done by hand or typewriter. Even planning systems have had little impact on operations at the provincial or district level.



The lack of a single standard for the Thai language commands on computers is another significant obstacle. Conversion programs exist, but are not widely available, making it difficult to combine information from different government agencies. As long as multiple standards exist, government or private efforts should try to ensure that conversion of data between standards is easy and widely available. Lack of Thai language software is another problem though it is now becoming available. What is needed are more incentives for producing software in Thai-either locally-written programs or localized versions of software from other countries.

The adoption of computers is far from a panacea. Hardware alone may go unused, or merely replace existing methods with little real gain. Making productive use of information technologies usually requires new skills and changes in how organizations work, if major increases in productivity are to be achieved ([Figure 5](#)).

## CONCLUSIONS

Thailand is currently making major efforts to increase the number of telephone lines available country-wide. This could be strengthened by providing public phones to all villages as soon as possible. Upgrading local contributions to cost could help expand networks beyond a few public telephones per village to also serve businesses, schools, health stations, and other organizations. Cellular telephones could play a significant role in providing a flexible, quickly available service without expensive investments in wiring.

Two-way radios provide communications for limited groups of users. VSAT satellite dishes allow businesses in rural areas good communications links, even when the local telephone service is inadequate. Such alternatives should be allowed, given the current limitations on expanding telephone services. Most users would, however, prefer to use a public telephone network were it available. Expanding the public network would broaden the customer base and help cover the overheads in providing services and in fostering innovations in services available to all users.

By promoting competition, privatization could promote innovation, better services, and reduced costs. Competition pushes businesses to extend services to more customers, innovating and seeking new market niches, rather than just focusing on wealthier clients in urban areas.

But privatization, which simply replaces government monopolies with private ones, may combine the worst aspects of both-high costs and slow bureaucratic service. Technological changes have eroded many of these outdated, "natural" monopolies. Competition can now be encouraged in almost all areas except, perhaps, basic wired service. Pricing and service should mainly be left up to market forces. If subsidies are needed for basic rural telephone services, they should be funded directly, rather than hidden in cross-subsidies from urban or business users.

Investment in computer hardware alone, however, is unlikely to increase productivity. Investment in equipment must be accompanied by training and funding for technical assistance and maintenance. Given the scarcity of computer skills, service contracts are likely to be a more effective approach than trying to develop strong computer skills within each government agency. So far, most computer use-except for banking-seems largely directed at speeding up existing activities. Using computers to manage and deliver information will require training more people and reorganizing institutions. Better access to other people and to information resources can help people in rural areas to improve their lives, and take an active part in their nation's social and economic development ([Figure 6](#)).

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