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<th>Telecommunications, information and development : the Singapore experience</th>
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<td><strong>Author(s)</strong></td>
<td>Kuo, Eddie Chen-Yu; Chia, Choon Wei</td>
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<td><strong>Date</strong></td>
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Telecommunications, Information And Development:
The Singapore Experience

By

Eddie C Y Kuo
&
Chia Choon Wei
TELECOMMUNICATIONS, INFORMATION AND DEVELOPMENT:
THE SINGAPORE EXPERIENCE

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Introduction

Telecommunications have become an essential part of modern civilization and play an increasingly important role in the development of the economy. Telecommunication services such as telephony, telegraphy, telex and data transmission provide the means for fast and accurate transfer of information. Such communication facilities have made it easier to link markets and business establishments at different locations, facilitating the growth of nation-wide and multi-national industries and promoting industrial efficiency by closer coordination of activities. At the same time telecommunications also link up the world as one single homogeneous unit where information on the economic, political and social environment can be collected, analyzed and transformed into valuable tools for strategic planning, charting the future direction of the country.

This trend towards greater utilization of telecommunications and information is transforming a great number of societies into what Bell (1973) calls a 'post-industrial' stage. The impact of this transformation on these fast-changing societies is far-reaching, with not only economic but also social and political implications. While it would certainly be desirable to attempt a comprehensive
understanding of the overall impact of telecommunications in Singapore, we feel such an attempt would be too ambitious at this stage. In the present paper, we make a more modest effort to concentrate on the economic impact of increasing telecommunications and information usage. We will draw heavily on recent studies and statistics to illustrate the Singapore experience in this regard.

Telecommunications and Economic Development

A number of studies on telecommunications have been conducted with the aim of establishing the relationship between telecommunications and economic development. Chen and Kuo (1985) have posited that the relationship between the two variables is mutually causal. They propose a model which shows that:

Improvement in support factors such as capital expansion and the quality of manpower, and an effective communication system provided by the telephone network contribute to economic development... (and) on the other hand, growth in telephone availability and use depends on sound economic development and increase in telephone affordability and demand, represented by lower telephone fees and active business activities.

(Chen and Kuo, 1985:241)

They then use available statistical data in Singapore to verify this mutually causal relationship. Although their study is limited to the Singapore context, it is nevertheless a significant case study because of the impressive economic development that took place in the country in the last twenty-five years.

More importantly, the study also puts forward some policy implications vis-à-vis these two variables. Thus, firstly, an underinvestment in telecommunications would hinder economic
development. A comprehensive telecommunications system provides an efficient information system for management, marketing, production and distribution—activities which are crucial for economic growth. On the other hand, telecommunications infrastructure depends on a sound economic base for its growth and viability. In the former case, its share of a nation's resources is subjected to availability, derived from economic prosperity. In the latter case, an over investment in telecommunications may arise if there is no demand for it. This is very probable if the economy is not growing or when it is contracting. This will ultimately lead to a wastage of valuable resources.

Hence, the emphasis on telecommunications as an infrastructural variable in economic development should also consider the variable's dependence on a country's economic growth level. Telecommunications planning should be carried out with knowledge about the economic demand for it. Chen and Kuo (1985) also suggest how this could be achieved. They gave the example of the Telecommunication Authority of Singapore (Telecoms) which is a quasi-government body. The organization has on the one hand strong governmental support in terms of policy implementation, and on the other, the availability of highly skilled expertise. This form of organization is able to function without the problem of bureaucratic inertia, which is often characteristic of a government body. In the following section, a more detailed discussion of telecommunications development in Singapore will be presented.

Telecommunications Development in Singapore

The emphasis on a sound infrastructure, particularly telecommunications, has always been considered fundamental to
economic development. The development of the economic system and of telecommunications go hand in hand. As suggested earlier, this is because economic development creates a demand for telecommunications, while the availability of telecommunications facilities in turn is a pre-condition for the growth of efficient industrial and commercial organizations.

Since the beginning of the industrialization programme in the early 1960s, Singapore Government has been encouraging the building of a strong and supportive telecommunications system. The relentless pursuit of economic development meant that the country's infrastructure must be made attractive to investors. Table 1 shows the overall growth in the traffic for the various telecommunication facilities since 1963. It is interesting to note that the traffic volume for telegrams has greatly reduced over the years, corresponding to the improvement in telex and international telephone facilities. The number of telephones installed has increased steadily over the years. Correspondingly, the telephone density has increased from 41 per 1,000 population in 1963 to about 420 per 1,000 in 1985. On the whole, except for telegram service, there is a vast increase of these facilities' traffic volume over the years, paralleling the nation's economic growth which enjoyed an average rate of 8.5 percent per annum for the past twenty years.

It is to be noted too that Telecom Singapore has been successful in handling this increased demand. Telecoms has always been seeking to keep abreast with the latest technology in telecommunications. Its ability to do so, apart from the strong governmental support, is attributed to its high generated revenue and its subsequent reinvestment of a portion of this revenue. For example, the projected
capital expenditure for the next five years is estimated at 620 million dollars per annum, of which a large portion will be internally generated (Telecoms, Annual Report 1984/85:5).

The year 1979 saw the beginning of a shift into a technology intensive economy and thereon an information society, as the New Economic Policy was put to implementation. Since then, Telecoms has been earmarked to provide and enhance the telecommunications infrastructure necessary for the purpose. In fact, Telecoms now plays the supportive as well as the catalytic role in bringing about the information society (Telecoms, Annual Report 1984/85:4). In this respect, Telecoms has recently introduced several new services (See Appendix A) and more are to be introduced in the near future. Likewise, the technical infrastructure for the provision of these services has also improved. For example, the Maritime Satellite Communication System has been in operation since November 1982 to facilitate better communication at sea. Also, three new submarine cable systems are under construction. Their completion will provide for a new telecommunication 'highway' for traffic to and from Western Europe, the Middle East and South-east Asia and through to North Asia and Australia.

With all these new and advance services, the efficiency and convenience in communication, both domestic and international, have improved tremendously. This has brought about substantial savings and greater productivity in all sectors of the economy. This highly sophisticated telecommunications system has also enhanced the country's image as an ideal place for investment.
The Information Economy in Singapore

An information economy, which contributes to a country's gross national product, consists of two sectors. The first and primary sector is one which produces communication goods like data processing equipment or sells information services in established markets like research and consultancy services. The secondary sector, on the other hand, deals with a collection of resource consuming informational functions like planning, coordinating and monitoring which make up both the private and public bureaucracies (Jussawalla and Cheah, 1983:162). These transacting activities in both sectors are supported by a telecommunications infrastructure.

Based on this characterization of an information economy, different approaches have been suggested to enumerate its size or contribution to the country's GNP. (See, for example, Machlup, 1962; Porat, 1976.) In the Singapore context, there have been notably two attempts in such studies. Kuo and Chen (1985) have analyzed the changing employment or occupation pattern and its consequences in relation to an expanding information economy. This particular aspect will be elaborated in the next section. Jussawalla and Cheah (1983), on the other hand, attempted to enumerate the expanding GDP contribution of the Singapore information economy within an input-output framework. They concluded that the primary information sector contributed to 24% of Singapore GDP in 1973. In a later study by Cheah (1983), this figure increased to 26% in 1978.

The study by Jussawalla and Cheah (1983) represents an important contribution to the study of Singapore's information economy. It is, however, also limited in two aspects. First, as they did not have all the relevant statistics available, their estimates tended to be on the
conservative side. Secondly, the period of analysis is quite dated, that is, based on 1973 figures. As such, the study does not reflect the growth over the years when the emphasis on an information-based society has been made stronger. In the Singapore context, there are indeed indirect signs indicating that the share of the information sector in the total economy is expanding.

Firstly, it should be noted that the service sector has always been large given the nature of Singapore's economy. This is important as it subsumes a large portion of information activities. Since early 1960's, when the Government embarked on the industrialization program, the sector contracted slightly because of the expansion in manufacturing and construction sectors. It nevertheless remains substantial. Compared to the other sectors of the economy, even though there is a dip in the early eighties, the service sector still enjoyed relatively stable growth. (See Figure 1.)

Secondly, this pattern of growth in the service sector, particularly the information economy, has been emphasized and is in the process of being exploited by the Government. This can be gauged from the various policy statements released, notably the *Singapore Economy: New Directions* (1986), a report prepared by the Economic Committee which was commissioned in 1985 to make an overall evaluation of the economic situation and to suggest recommendations for future development. The report stresses, among other areas, the importance of the information industry and point out that this industry worldwide will grow by 10 per cent per annum by the early 1990s from the current total revenue of US$530 bn (*New Directions*, 1986:152).

Singapore's exploitation of this industry is of two pronged. Firstly, the information industry is a business end by itself. This
means that the manufacturing sector will increasingly gear itself towards production of information goods like computers, word processors and others. Secondly, and perhaps more significantly, the information industry should enable Singapore to regain its competitiveness with regards to production costs and attractiveness as a financial and business center.

Following the emphasis on information industry is a series of strategies to realise it. For example, manpower needs in this industry will be developed through the education system and also by attracting foreign talents. Furthermore, an information culture is to be created whereby the people will be familiar with computer usage and technology. As mentioned earlier, the telecommunications system will also be enhanced and developed further.

Thus, even though we do not have extensive or precise statistics of the size and growth of the information economy in Singapore, evidence abounds to show that it is indeed large and expanding. In the next section, another indicator — employment pattern — offers more detailed statistics and firmer conclusions. The discussion will not only show how expansive the information economy is but also paves the way for a discussion on the wider social and cultural ramifications.

Information Economy and Changing Occupational Structure

In a society which is undergoing social change, its occupational structure is one of the areas which can illuminate the change with some clarity. It has been observed that changing occupational structure mirrors changes in social organization and human relationships. In this regard, Kuo and Chen (1985) make an attempt to
analyze the changing occupational structure in Singapore, using census statistics since 1921.

Kuo and Chen's study included data spanning a period of sixty years. Three sets of data were looked into: (1) employment according to sector; (2) employment according to four occupational categories — white collar, blue collar, agricultural and fishing, and service; and (3) distribution of employment in the information industry. Only the last set of data which is pertinent to this paper will be discussed.

In the analysis of the workforce engaged in the information industry, that is, in activities related to the production and processing of information, Kuo and Chen make use of the typology outlined by the OECD for its study on information occupation (1981, Vol. 1:122-124). They include:

1. Information Producers;
2. Information Processors;
3. Information Distributors, and
4. Information Infrastructure Occupation

As the census data prior to World War Two were not quite comparable for the present purpose, Kuo and Chen's analysis begins with the 1947 census. From Table 2, it can be seen that in 1947, 18.59 per cent of the national workforce were involved in the information industry. In 1980, the figure increased to 34.07 per cent. Thus, on the average there was an annual increase of 0.67 per cent in the share of information workforce as a proportion of the total economically active.
The findings made can be compared to those of the OECD study of developed countries:

- Austria (1976) - 32.2%
- Canada (1971) - 39.9%
- Finland (1975) - 27.5%
- France (1976) - 32.1%
- Japan (1975) - 29.6%
- Sweden (1975) - 34.9%
- U.K. (1975) - 35.6%
- U.S.A. (1970) - 41.1%
- West Germany (1978) - 33.2%
- Singapore (1970) - 28.0%
- (1980) - 34.1%

(Kuo and Chen, 1985:9)

These countries in fact have a lower average annual growth rate (0.5%) compared to Singapore between 1947 and 1980 (0.67%). The Singapore experience appears to be quite similar to the above mentioned countries which have moved into the information age. It must, however, be cautioned that inspite of this similarity, Singapore's unique economy (and structure) may not permit a simple comparison.

The four categories mentioned have different rates of growth and share of the national workforce. Information processors took up the highest share of all with 20.22 per cent in 1980 and also demonstrates the most rapid growth of all since 1947. Occupations under this category includes administrative, management and clerical positions. These skills are greatly required to deal with the manipulation and
administration of information input in complex bureaucracies or organizations.

Information producers formed the second largest category and has a growth rate of 0.10 per cent since 1947. Its expansion is due to the demand for scientific and technical and consultancy services in recent years.

The third largest category is the information distributors. The occupation which contributed to this category's expansion is the teaching profession. As suggested by Machlup (1962) and Bell (1973), the increasing role of education highlights the importance of knowledge in an information society.

Finally, the category of information infrastructure occupation has a relatively small share of the workforce and shows a growth rate smaller than the other categories. The increase is mainly due to the expansion in telecommunications infrastructure and technology.

Hence, Kuo and Chen's (1985) have shown that the trend towards an information society is indeed present in Singapore. With this analysis, the wider social ramifications of such a transformation can now be discussed.

Conclusion and Discussion

The development of telecommunications and the information economy is of particular importance to Singapore at the present trying state of economic re-structuring. The information economy is viewed as the important economic growth area which will bring Singapore out of the present economic recession. If there is any area which will come out from the economic doldrum, this sector is perhaps the first. In a longer term perspective, Singapore's competitive edge over other
countries in the region depends on how well the information economy is developed through the availability of a sound telecommunications system.

In this respect, mobilization of resources must be and indeed has been initiated by the Government. The Government is constantly looking for ways to provide the necessary facilities and manpower for this purpose. The education authority has announced the policy to expand higher education and post-graduate training. A more established strategy is the encouragement given to computer courses in schools. The Vice-Chancellor of the National University of Singapore has announced that the University aims to reach 100 per cent computer literacy among the student population by 1990 (Campus News, 1986, 53:1). For the present workforce, courses like BEST (Basic Education for Skills Training) and CET (Continuing Education and Training) are provided for the same purpose of upgrading the workforce.

With these changes taking place in society, certain social ramifications can be expected. In particular, a changing occupational structure will result in a corresponding change in value-orientations and attitudes. The growing white collar middle class will become more concerned with greater equality and greater participation in the decision-making process. On the other hand, the increasing independence of an individual may lead to self-sufficiency and apathy. This may adversely affect the society.

A more immediate consequence to a changing occupation structure is the displacement of workers, who may have problems in becoming retrained in other more technologically based occupations. As observed by Chen and Kuo, there is no reason to believe that the
number of new information workers generated will always surpass the
number of workers displaced by new technologies (1985:15).

The amount of information exchanged in an increasingly
information based society cannot but be greater. We may find the
infiltration of new values and ideas into the society. The increasing
difficulty in censoring may compound the problem of disunity of values
which the Government frowns upon.

Thus, from the above, we see that although the impact of
increasing telecommunications and information usage has immediate
impact on the economy, this will inevitably spread and affect the
wider socio-political aspects. Our understanding of this modern and
new phenomenon will be better gained with a comprehensive study which
includes these aspects. Social scientists must and should concern
themselves in this relatively new social trend.
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Porat, Marc

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## Table 1. Telecommunications and Postal Indicators

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<th>Year</th>
<th>Telephone ownership (per 1000)</th>
<th>Outgoing int'l phone calls (per 1000)</th>
<th>Outgoing Telex Calls (per 1000)</th>
<th>Outgoing Telegrams (per 1000)</th>
<th>Annual postal articles (per person)</th>
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<td>Other countries</td>
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Table 2: Information Workers in Singapore, 1921–1980

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<td>25,152</td>
<td>44,305</td>
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<td>7.69</td>
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<td>5.24</td>
<td>6.81</td>
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<td>10.44</td>
<td>11.71</td>
<td>15.21</td>
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<td>4.16</td>
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<td>% of work force</td>
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<td>1.72</td>
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<td>Total Information Workers</td>
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<td>Total Work Force</td>
<td>238,550</td>
<td>274,314</td>
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<td>480,267</td>
<td>650,892</td>
<td>1,077,090</td>
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**Figure 1.**

**REAL ANNUAL GROWTH RATES OF MAJOR SECTORS, 1974–1984**

Source: *Singapore Statistical Charts 1984/85* (p. 25)
APPENDIX A: TELECOMMUNICATIONS SERVICES RECENTLY OFFERED BY TELECOMS

1. RADIO PAGING

Commission Date: This service was introduced in 1973 on a manual-tone system. It went fully automatic in May 1983 and incorporated the display paging facility. A premium model pen-size pager was introduced in January 1984.

What Is It For: This is an island-wide automatic contact service to alert those whose work or leisure takes them away from direct telephone contact that someone is trying to reach them with this service.

Who Uses It: Salesmen or service personnel on the move.

2. TELEFAX SERVICE

Commission Date: This service, a high-speed international counter-to-counter facsimile service, was introduced in December 1978. On 1 October 1984, Telecoms introduced a facsimile transceiver on a rental basis. On 1 November 1984, Telefax Service on an administration-to-administration basis was extended. It is now available at all customer services outlets and post offices.

What Is It For: It is a service which allows one to send and receive exact replica of copies of documents to or from overseas or locally almost instantaneously, thereby eliminating transport cost and time and saving labour cost.

Who Uses It: Engineers, architects, lawyers, accountants, bankers and real estate agents.

3. SERVICE 800

Commission Date: 22 June 1982.

What Is It For: It is an automatic international service that enables a caller in Singapore to dial a local telephone number and be reconnected to an overseas company which will be billed for the international call.

Who Uses It: Mostly business men.

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4. TELEXMAIL SERVICE

Commission Date: 15 January 1983.

What Is It for: It enables subscribers to send and receive telex to or from overseas telex subscribers or telex booth users through Telecoms.

Who Uses It: It is used by companies and individuals whose operating levels of activities do not justify the subscription to a telex line and terminal.

5. FLIGHT INFORMATION DISTRIBUTION SERVICE (FIDS)

Commission Date: 21 February 1983.

What Is It For: It provides flight arrival and departure times on visual display units located in hotels and other organizations which require such information.

Who Uses It: Hotels, airlines, travel agencies, car rental companies or any other tourist-related business.

6. TRAVELNET SERVICE

Commission Date: This service, introduced on 15 June 1983, is a multi-access travel reservation service. The facilities include flight schedule, departure/arrival time, seat availability, passenger name records and queue messages from airlines.

What Is It for: This is a computerized network for travel reservations. It gives travel agents direct access to most airline reservation computers, thereby enabling them to check availability of seats, make reservations and obtain flight information in seconds.

Who Uses It: Travel agents and airlines.
7. CREDIT CARD AUTHORIZATION TELEPHONE SERVICE

Commission Date: 1 December 1983.

What Is It For: It is an enhanced telephone instrument with in-built magnetic reading facility which enables the identification and transmission of a credit-bank card code registered on the card. It is used to communicate with compatible remote computers for the purpose of credit card authorization.

Who Uses It: Shops, restaurants and hotels.

8. TELEBOX

Commission Date: 1 June 1984.

What Is It For: This service enables one to send and retrieve mail anytime and anywhere. It cuts down on the enormous amount of papers needed for conventional office communications.

Who Uses It: It is suitable for businesses with multiple outlets and requiring comprehensive internal and external communications, such as the banks, departmental stores and the MNCs.

9. PHONE PLUS SERVICE

Commission Date: On 1 May 1985, six Phone Plus facilities were introduced, namely, Abbreviated Dialling, Absentee, Auto Redial, Call Transfer, Call Waiting and Three-Way Calling.

What Is It For:

Abbreviated Dialling - Use of two digit codes for often-called numbers.

Absentee - Channelling of all incoming calls to a standard pre-recorded message in English at the telephone exchange.

Auto Redial - Automatic redial of last number when that number is engaged.

Call Transfer - Re-directing of incoming calls to another telephone number.
Call Waiting - Signals an incoming call when is engaged in a telephone conversation. Enables one to answer the incoming call while putting the first caller on 'hold'.

Three-way Calling - A third party can be added on to an already established conversation.

Who Uses It: Mainly by residential subscribers.