TELECOM IN QUEENSLAND
1975–1987

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Telecommunications are the nervous system of all modern economies. In Australia, the Australian Telecommunication Commission (Telecom) has been for decades the only supplier of communication services to the business community and households.

The emergence of what has been called the "information" age and the development of new technologies has put into jeopardy the existence of this monopoly. The divestiture of AT & T in the United-States and the privatisation of British-Telecom have been turning points which can no longer be ignored.

In 1988, the government has set itself to de-regulate the industry and in 1989, Telecom will become a public corporation entirely owned by the government, only 15 years after its creation.

In this thesis, we look back on the period 1975-1987 and focusing on Queensland we describe the industry, how efficient it has been in achieving the government objectives and its own objectives.

I wish to thank Dr. Docwra for his helpful comments and patience, the many people of Telecom from the Engineering Department, Human resources, Finance and Accounting as well as the Marketing department for the wealth of information they provided me with and authorised me to use. The views which are expressed in this thesis are however my own.
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I. INTRODUCTION

1.1 General

Telecommunications hold a more crucial role in our society today than it did 30 years ago. This is not to deny that telecommunications were not important then, but simply to observe that the rapid and accelerating technological change has stimulated public interest in and awareness of, the telecommunications industry. Technological breakthroughs (i.e., optical fibers, satellites, videotex systems, etc...) have made possible the rapid growth of information markets by extending their geographical limit to encompass global markets. Concurrently advances in the computer industry have pushed back the limit of the market by reducing the costs of generating more and more information.

The most important effect of these changes had been to blur the boundaries between the telecommunications industry and the computer industry, whereby telephone switching systems became in the last decade similar to large-scale computers. Manufacturers of telecommunications equipment have been required to master computer technology whilst communications became an indispensable part of distributed computer networks. The merging of these two industries has resulted in new and aggressive competition in the telecommunications industry which had been from the beginning of this century generally dominated by one firm to provide the necessary networks and that firm in all western nations — except the United-States — is government-owned. Competition had generally been ruled out on the ground that competition would create inefficiencies and high

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costs of provision.

While two nations, namely the United-States and Great-Britain have introduced -in principle- at least competition in the industry, most European nations have been reticent in adopting this philosophy, especially France and West-Germany. The reasons for this reticence are well beyond the scope of this thesis as they include social, cultural and sovereignty issues. Although the basic services provided through the public network should not be affected, the telecommunications network is now so complex and the number of services provided so numerous - They include not only voice communications but also data transmission and images- that for relatively large and generally multinational firms it becomes attractive in terms of price to own a telecommunications network. Information previously provided free can now be sold and the returns on investing in a network can be recouped well within 10 years instead of 25 to 30 with the old technology. Any policy affecting these services also has an impact on the basic products. Once a firm owns a network for provision of specific services or for transmission of information between its branches, it is only a small step to connect customers to their network in case de-regulation occurs. The deciding factor is whether the private network can connect with other

4. These issues refer to information transfers. Telecommunications companies such as Telecom are supposed to provide only the means to carry the flows of information through their networks. With satellite communications, it becomes very difficult for governments to control these flows if the networks are private. Marc PORAT describes communications technology as the controlling factor which promotes changes in all other aspects of economic, political, social and ideological life, Marc PORAT, "Communication Policy in an Information Society in Communications for Tomorrow, Policy Perspectives for the 1980's" Glen O'ROBINSON (Ed.), N.Y. Praeger, 1978, pp.3-60. Focusing also on social issues are HEINECKE and SCHULTZ, The Phone Book: The Future of Australia's Telecommunications on the Line Penguin Books, 1983, chapter 12. More radical is Herbert I. SCHILLER, Information and the Crisis Economy Oxford University Press, 1986. Some of these issues will be taken in sections 4 and 5 as they become relevant to telecommunications policies. Furthermore, social benefits should be taken into account with the costs.
networks as the sum of the value of independent networks is less than the value of these networks interconnected. In Australia, product competition has been sought for some years and network competition in some services already exists. But basic products such as local calls and trunk calls are still excluded. However these services will be affected by competition in other services, since in a free environment, Telecom’s scarce resources should be allocated to achieve optimum returns, that is to upgrading the network where added value services are in demand. Businesses and residential customers are dissatisfied with the high prices of these services. This higher price is deemed to be necessary to subsidise services which are not profitable. Therefore from the economist’s point of view, there is a high level of inefficiency and its removal requires a complete change of philosophy which until now the government has been unwilling to adopt.

In a de-regulated environment, the policy of cross-subsidisation will become untenable. Based on egalitarian principles, it discriminates in fact amongst its customers and makes attractive the entry of potential competitors in selected areas. The cross-subsidisation exists at three different levels:

1- Classes: businesses subsidise residential customers
2- Areas: City customers subsidise country customers
3- Products: Long distance calls subsidise short-distance calls (4a)

1.2 Ambit

The goal of this thesis is to analyse how Telecom allocates its resources in Queensland and its


5. The benefits of a communications network grow with its size. Anyone can call everyone else connected to the network but also can be called by everyone else. The latter benefit has a very high value as demonstrated by the preference of people to possess a private telephone rather than to use a public telephone.
performance against the objectives set by the government and Telecom itself from 1975 until 1987. As such this is not a criticism of Telecom, but of the policies and regulations which restrict the organisation's efficient operations. In fact, it will be shown that given the constraints imposed upon its managers, Telecom in Queensland is relatively efficient in fulfilling the given objectives.

Before analysing the policies imposed upon Telecom and their effects in terms of costs, the abundant literature of public authorities business undertakings (PABU's) is reviewed in Section 2. The central issue raised in this literature is of efficiency in these enterprises and a variety of other issues are raised which relate to the methods of achieving efficiency such as ownership, regulations, pricing and raising of capital. While most authors do not find any difficulty in accepting the objectives set for PABU'S, two schools of thought can be distinguished as to the methods to be utilised to achieve the stated objectives. These two lines of thought will be described. Another important issue which relates to pricing is how valid is the "natural" monopoly concept. The telecommunications industry was competitive in its development stages in the United-States and Great-Britain (refer appendix 1) but was then turned into a monopoly (regulated in the former and government owned in the latter). Today it is becoming highly contestable but to what extent is unknown. We

5a. The concept of contestability has been introduced by BAUMOL, BAILEY and WILLIG "Weak invisible hand theorems on pricing and entry in multiproduct natural monopoly", American Economic Review, 1977, pp.350-365, and developed in BAUMOL (1982), "Contestable markets: An uprising in the theory of industry structure, American Economic Review, pp.1-15, BAUMOL, PANZAR and WILLIG (1982), Contestable markets and the theory of industry structure, Harcourt Brace Jovanovitch, N.Y., and the reply in American Economic Review, pp.491-496, 1983. In a perfectly contestable market there are no barriers to entry, the potential entrants can serve the market as well as the existing firms and they evaluate the profitability of entry at the incumbent firms "pre-entry price". This theory is still controversial, refer to BROCK, "Contestable markets and the
believe an element of natural monopoly does exist in the industry and if left alone, this natural element would eventually surface over time.

The environment in which PABU's operate is also an important factor affecting their economic efficiency. Kolsen (1982) has categorised them as follows:

(i) where outputs are sold in direct competition with privately produced goods and services, with restrictions on further entry by privately owned suppliers of substitutes.

(ii) where outputs are sold for which there is no private supply of reasonably good substitutes, and where such private supply is prohibited or otherwise effectively prevented, or

(iii) where outputs are sold for which there may be no private supply of identical goods or services, but where reasonably good privately supplied substitutes are available and entry into the competitive private market is not effectively restricted.

The period of Telecommunications studied falls in category(ii)

Section 3 familiarises the reader with the telecommunications industry: the history of Telecom, its organisational structure, its network, its objectives and constraints.

Section 4, part I briefly describes the corporate philosophy which has driven Telecom for the period under analysis. Part II analyses the pricing of the basic services. In part III, we try to identify on what basis the allocation of funds is made in each district and whether the allocation is consistent over time. Factors which are sought to be the basis for funding are tested.


In part IV, we analyse the performance of each district. Lack of data at a district level preempts us to analyse the other types of cross-subsidies occurring. The efficiency is not measured in terms of returns on funds allocated, which in any case is meaningless for a monopoly, but in terms of productivity and in terms of the objectives which the policies seek to achieve.

The final section assesses the impact of the May 1988 Economic Statement on the basic products and its implications for funds allocation.

It was not possible to compare the post 1975 allocations with the pre-1975 because the data are not reliable, accountability was at the state level and districts did not exist. Therefore the effects of the break-up of Telecom from the PMG on profitability of the change from PMG to Commission can only be reliably analysed from the annual reports which are on a state and national basis, but are not relevant to our main task.

Also, important sources of data were not included for confidentiality, (eg. actual amount of capital and operational expenditures allocated in each district). However the shares allocated are included. Also, although the Commission began its operations as a separate entity in 1975, the data pertinent to this "new" organisation were not available until 1978-79 when the districts became operational.

** ** **
II: LITERATURE SURVEY

The literature dealing with public enterprises is extensive and only the relevant theoretical issues are dealt with here: why public enterprises exist, their objectives, efficiency and performance.

2.1 Public Enterprises: Reasons of existence

In the western world, most public enterprises were created after the second world war. However, TISDELL (1982) points out that unlike the United-Kingdom, most Australian Public Enterprise Business Undertakings (PABU's) now existing were established before World War II. The main reason many potential ones were not created stems from section 92 of the Australian Constitution which relates to free trade between States. Creation or dis-vestissement of PABU's as a feature of Australian elections has always been a very sensitive issue.

The most common reason cited for the existence of public enterprises is that they fulfill a role which, if left in the hands of private interests would harm the public interest, or put in another way some sections of the public would not be served if left in the hands of private interest. In other words, public enterprises are created in this context to fulfill a social role and when contrasted with private firms, WALKER (1984) summarizes the debate clearly by stating that

"the advantages of public provision are that they promote social purposes rather than individual self-interest, social integration rather than individual differentiation".

This view is however not shared by some economists


(POSNER 1972, DEMETZ 1968) who believe that the public would be better served if the public authorities were in private hands. Their underlined philosophy for privatisation is that the free market is a prime vehicle for promoting individual freedom. The reasoning behind this line of thought is that the resulting better allocation of resources would benefit consumers. Sub-section 2.2 deals further with this aspect. Tisdell (1982) lists the following as reasons to establish public enterprises:

(a) to improve economic efficiency in resource allocation.
(b) to promote the redistribution of income
(c) to maintain quality standards and
(d) to facilitate economic planning or policy making by government.

In the first case, the argument put forward has been that the environment in which they operate is a natural monopoly. Such a monopoly is said to exist when one firm can satisfy demand at a lower cost than could two or more firms. For example, if the fixed costs can be spread over the entire output of market, a firm supplying that output may have a lower average cost of production than two firms, each of which incurs the same fixed costs but spreads them over only half of the market. POSNER (1972) has shown that such a condition exists when fixed costs are very large in relation to demand. These fixed costs are easily identified with networks which physically link the firm to the consumer.

11. TISDELL C.A., op. cit., p. 171
12. POSNER R., op. cit. p. 252
The existence of natural monopolies raises two types of problems. The first is the difficulty of devising an efficient price structure. If the average cost curve is falling, the marginal cost curve will lie below it. Consequently if the price is set to equal marginal cost, the firm will make a loss. The second is that a natural monopoly has the ability to set a monopoly price by restricting output.

To remedy these problems, various solutions have been advanced such as covering the loss from public revenue, or the prices must be modified to be above marginal costs in inverse proportion to the individual prices elasticities of demand. (See for example RAMSEY 1927 and BAUMOL and BRADFORD 1970). In practice, these methods are seldom used and regulations have been the norm in all nations to deal with these problems (Refer sub-sect.2.4).

Secondly, public authorities may be used as a means to redistribute income. While special concessions to classes of consumers are often set up to promote certain services, an other method which will be dealt with in detail is the controversial method of cross-subsidisation. Although cross-subsidisation is not intended to be used as a method of re-distribution of income, it has the same effect. It is controversial for two main reasons, while concessions are easily costed and the class of consumers which benefits is known, with cross-subsidisation, the extent of the cross-subsidy is generally not well-known.


15. Other public authorities such as public transport authorities use concessions to supply certain classes of consumers with a service (eg: pensioners, students). These classes are easily identified and the amount of subsidy is visible.
nor are the beneficiaries, whose income traverses all class structures.

Secondly, the re-distribution of income in this case is a by-product of constraints compelling the public firm to expand its output or to allocate its resources to unprofitable areas in order to achieve other objectives.

Thirdly, a weak argument for their existences is to maintain a set of standards. This argument is weakened by the fact that private firms could be compelled to follow standards set by independant tribunals. The standard set by a monopoly however, can be used as a barrier to any potential entrants by setting it higher than socially desirable.

Finally, the existence of public authorities may be the result of ideological preference: Public authorities are easy to control and therefore uncertainty is reduced. They are also frequently used to promote macro-economic objectives such as reducing unemployment, improving trade through better communications networks or the standard of living.

It is without saying that the above arguments are all severely criticised by "free-marketeers".

The main concern is that while there are many valid reasons for their creations, these reasons do not stand the test of time. Public enterprises become "institutionalised" and continue to exist well after the original reasons have been forgotten. This is the view taken by RAE (1979, P.47):

"...It may well be that some authorities have continued when the need for their creation has passed, or at least when they were no longer a need for them to exist as a separate entity."

Notwithstanding the political motives behind the

16. RAE, cited in H.V. EVATT, op.cit., p.170. I was unable to find the original article and it did not figure in the bibliography.
establishment of public enterprises, the most powerful
criticism levelled against them relate to their
efficiency. The efficiency concept is at the core of
welfare economics. It is reviewed in the following
section.

2.2 Efficiency

Every voluntary exchanges are of net social benefits
because, by definition, they leave both parties better
off. The degree to which the parties are made better off
is measured by the sum of the producer and consumer
surpluses. The latter measures the excess of the maximum
the consumer is willing to pay -the demand price- over
the price paid. The producer surplus is measured by the
difference between the price received, which is the same
as the price paid by the consumer, and the minimum the
producer would have accepted - the marginal cost. The
marginal cost is thus a measure of the benefits foregone
by the exchange. Thus, in quantitative terms, the total
net benefits from an exchange can be measured by the
difference between the demand price which is the point on
the market demand curve, and the marginal cost curve.\(^\text{17}\).

Economic efficiency is achieved when the whole economy
has reached a Pareto-optimum. At this optimum, the
economy is in equilibrium and no-one can be made
better-off without someone else being made worse-off.
This equilibrium has been shown to exist when marginal cost
equals the price of the good or service. In a perfectly
competitive market, whereby perfect information prevails,
this level of efficiency will be reached when both the
allocation of inputs and the production of goods are
efficient. In reality, no such ideal economies exist, and
the subject type (ii) enterprises are monopolies with no

\(^\text{17}\). WENDERS J.T. and EGAN B., "The Implications of
Economic Efficiency for US Telecommunications Policy
Telecommunications Policy", March 1986, p.34
close substitutes (Mail is a weak substitute for direct one to one voice communications and of course telex is also controlled by Telecom during the period under study) 18

While this could be a further argument to let potential competitors enter the market, the belief that the private sector is on this ground more efficient than the public authority has been strongly criticised. Some authors remark that these views depend on the assertion or the assumed superiority of the private sector.

Clearly, efficiency defined in its narrow terms cannot be applied in its pure form. Further, perfect information must be available and all resources must be freely mobile and placed in their current use by perfectly flexible prices and wages.

Therefore, in practise, such an ideal situation can never occur and the theory of second-best was developed. LIPSEY and LANCASTER (1956) have shown that optimal solutions even in a second-best framework are also very complex 20. In 1965, DAVID and WHINTON have argued that the second-best theory is

"to indicate the circumstances under which the non-fulfilments of the conditions necessary for the marginal pricing rule in those parts of the economy not of immediate concern invalidate the enforcement of these conditions in that part of which is of immediate concern". 21

This shifting in the literature from general prescription

18. Mail and telephones are more complementary products that substitutes. Exceptions to this exist for international calls which are perceived to be expensive compared to postal communications and the recent introduction of electronic mail which is yet in its infancy and did not pose any threat to the telephone during the period 1975-1987.


to a piecemeal approach has been emphasised by WEBB (1976)\textsuperscript{22}. It was the approach adopted by COASE\textsuperscript{23} and VICKERY\textsuperscript{24} in their discussion of public enterprises with focus on telecommunications. TURVEY\textsuperscript{25} adopts a similar approach to the electricity industry. Within this approach, applied to government enterprises, efficiency is also and mainly referred to the cost effectiveness in which the whole set of government objectives is met\textsuperscript{26}.

The problem of setting an efficient pricing structure for natural monopolies is compounded by their being multi-products firms. The products frequently have joint costs and are demanded in different quantities at different periods leading to problems of peak and off-peak demand.

The pricing of telephone calls is dealt with in section 4, but at the simplest level, the price should include a short-run fixed cost associated with the provision of the service and a variable cost associated with usage. While some costs can be allocated directly to each component, many are inseparable. To these costs components, the price generally includes a fixed amount and a fee which varies with usage. A single usage fee, however is viable only if the output of the enterprise can be stored. With a limited capacity and a demand which cannot be met by adjusting stock levels, peak-load problems are encountered. STEINER (1957) made a further distinction

\begin{itemize}
\item \textsuperscript{22} WEBB M., Pricing Policy for Public Enterprises, MacMillan Press ltd, 1976.
\item \textsuperscript{26} This definition of efficiency is used in EPAC, "Economic Infrastructure in Australia", Council Paper No.33, June 1988.
\end{itemize}
between peak and shifting-peak cases. In the former a change of tariff does not change the peak, while in the latter it does. Firm peak period optimum pricing is based on the theory that peak period consumers should bear capacity charges, with these charges being determined solely by demand. In this situation, off-peak consumers would pay only a price equal to the capacity's running costs. In the shifting case the pricing solution involves differential pricing according to the relative strengths of the demand for the same output level per sub-period.  

In practice more than 2 periods may be identified corresponding to different demand schedules and averaging costs from period to period becomes inevitable, however as more sub-periods are chosen, costs of metering and complexity of the corresponding tariffs to the consumer increase.

2.3 Regulations

In the case of public utilities, KAY and THOMPSON (1986) have shown that ownership of the entity is irrelevant to its performance. Two major factors which are important are the level of competition which exist in their market and the level of regulations. The major aim of regulations is as Kolsen (1972) put it "to ensure efficiency in the use of scarce resources" but he also states that "Efficiency must always be qualified by specifying the objectives to be achieved."

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31. Ibid.
Another factor which affects efficiency is derived from the belief that private sector managers are subject to incentives and disciplines different from, and more demanding than, those which apply to their public sector counterparts. The main difference is that public enterprises have goals or objectives which are vague or a history of statutory restrictions (KAY & THOMPSON 1986)32.

It is obvious that in a natural monopoly, prices could be set to such an extent that very high profits could be earned. However the distinction between private and state monopoly is here warranted as far as re-distribution of income is concerned. In the case of a private monopoly, the profits will be distributed to the share-holders while in a state monopoly, the profits are put back into the business which benefit all consumers using the product. The risk of over-capitalisation or the state firm becoming a large bureaucracy is therefore great. The private monopoly has however no incentive either to ameliorate its product or services. Regulations are therefore necessary. In Australian telecommunications, both over-capitalisation and large bureaucracy have developed. While profits have been large, the return on capital has been lower than for firms of similar sizes and borrowing has been a feature of Telecom. The first implication is what NISKANEN (1971) has analysed in "The peculiar economy of bureaucracy". About what the technocrat maximizes, he writes:

"Salary, perquisite of the public office, public reputation, power, patronage, ease of managing the bureau and ease of making changes- are the main arguments entering the bureaucrat's utility function. As the bureau grows, so is its status in the bureau. The personal officer will hire more

32. KAY AND THOMPSON, op.cit.
clerks, the chief engineer more technicians, build bigger network etc...”33.

The inefficiencies attached to those had been encapsulated in the theory of X-inefficiency, a concept introduced by LIEBENSTEIN (1966)34. These studies when related to KAY & THOMPSON (1986)35 imply that misallocation of resources in state owned firms is not more prevalent than if the market were competitive or the monopoly private, but that different and sometimes conflicting goals (however vague they maybe) have been set by regulations for them. The constraints besides setting some profit figures to be reached, also require a fair return. They require supply to the public of the service even if by providing it, the firm cannot make a profit. Restriction of borrowing requirements is a feature by imposition of a set of priorities in certain areas which may conflict with current planning. Finally there are constraints in the form of conditions of employment and wages which lead to a cost structure difficult to modify under changing economic conditions and the requirement for the enterprise to justify any price change or other changes affecting price to the Price Surveillance Authority (PSA).

The next section describes the industry in Australia, the organisational structure of Telecom and since, 1975, its objectives and its constraints.


III. THE TELECOMMUNICATIONS INDUSTRY IN AUSTRALIA: 1975-1987

3.1 Overview

Public telecommunications in Australia are provided by the Australian Telecommunications Commission (Telecom Australia) which is responsible for the domestic public network (PSTN), the Overseas Telecommunications Commission (OTC) responsible for international communications traffic and a domestic communications satellite (AUSSAT Pty ltd.) which was launched in 1981 (owned 75% by the Commonwealth government and 25% by Telecom) to operate Australia's domestic communications satellite system. Private networks also exist, they are owned by news agencies, railways departments or state governments.

There are also many providers of telecommunications equipment whose existences are closely linked with the needs and demands of the networks providers, especially Telecom Australia. Up to 75% of all equipment output is directed to Telecom. Most of the local production is accounted for by seven firms, only one of which, Amalgamated Wireless Limited is fully australian owned. The equipment provided includes switching equipment, line transmission equipment, mobile telephones, standard and supplementary telephone handsets, modems and multiplexers and other more specialised terminal equipment. Six of these firms provided 80% of their output to Telecom. The exception is Philips Industries Holdings Limited, which is 25% Australian owned and does not have Telecom as its dominant customer but is responsible for about half of Australia's exports of telecommunications equipment.

The picture which therefore emerges is a monopoly in the

36. ASTEC, Telecommunications Research and Development in Australia A Report to the Prime Minister by the Australian Science and Technology Council (ASTEC), AGPS, Canberra, November 1985, p. 15.
supply of communication services and a monopsony in 
the equipment market. However this picture is deceptive 
because both markets are created by government policies 
and regulations. The monopsony in the equipment market 
compounds the problem associated with cross-subsidisation 
as cheaper equipment could be bought overseas. These extra 
costs are then passed on to the consumer. The following 
figures show the strength exercised by Telecom in the 
product market:
In 1981, the annual total market for the supply, 
installation and maintenance of terminal equipment and 
wiring was estimated at $500 million. The PABX segment 
shows the highest growth rate accounting for some $200 
million. The approximate value of terminal equipment 
purchases from the Australian telecommunications 
manufacturing industry in 1981 was some $230 million37.

($M.)

- Telephone handsets 60
- PABX 100
- Teleprinters 20
- Modems 10
- Small business systems 30
- Facsimile machines 3
- Telephone Answering Machines 1
- Radio paging units 1
- Others 5

230

Telecom held some 70% of this terminal equipment 
market.

Telecom has also a reserved market in PABX systems 
supplied to Federal Government organisations and sells in 
competition with the private sector to State, local and 
semi-government organisations. It has an exclusive market

37. Ibid.
in small business systems for both public and private sectors; maintains with a few exceptions all PABX systems; supplies all teleprinter equipment to be connected to its public switched telex network; supplies, installs and maintains all data modems except those used in conjunction with the analog data service; has an exclusive market in installing wiring in customers' premises; preserves its monopoly over the "first telephone" and has an exclusive market for Intercom, PMBX systems, 'Commander' systems and Multicom systems. The number of PABX suppliers and the range of new PABX systems are restricted.

From the above, the customer may be excused for believing that the Telecom network and the terminal products are one and the same monopoly. Since 1981, competition has become fiercer but the market share of Telecom has decreased only marginally.

With more freedom given to Telecom now, one might expect the local terminal product market to become more and more competitive. It remains to be seen if the main network products: local calls and trunk calls will follow the same trend. Those are policy issues which will be examined in section 5. The following sections give a brief history of Telecom, its organisational structure, its objectives, constraints and efficiency.

3.2 Telecom: history

In 1880, only two years after the first telephone exchange was built in the Unite-States, Melbourne, Sydney and Brisbane had their first telephone exchanges opened. One of the first automatic exchange in the world opened in Geelong, Victoria in 191236.

In 1901, at Federation, the Commonwealth Postmaster-General's was created, to take over the several

postal and telecommunication services existing at that time and the basic structure was inherited from the British colonial presence\(^3\). By the late 1930s, automatic telephones services exceeded manual services and by 1939, there were 500,000 telephones services in total.

In 1956, Suscriber Trunk Dialling was first introduced and a 1959 Government White Paper on Telecommunications policy developments was published followed by the Community Telephone Plan in 1960\(^4\). These documents outlined strategies to achieve nationwide STD and progression towards a fully automatic network.

In 1975, the PMG Department was disbanded and the Australian telecommunications Commission was formed by an act of parliament (the Telecommunications Act 1975)

In July 1989, as a result of a group of enquiries into various areas of Telecom, the commission is to become a public corporation\(^5\).

Any moves by Telecom to affect any of these practices have policy implications, be employment implications not only for Telecom but the whole industry or wage policy or political implications (ie: timed local calls, higher contribution towards costs by country customers) and uncertainty caused by the establishment of an independant regulator in 1989. These problems will be analysed in section 5, but it is important to understand how the system worked during the 1975-1987 period and why changes were necessary.

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40. Ibid. p.16

41. This was announced in the Budget Speech of the Federal Treasurer Paul Keating in May 1987.
3.3 Organisational structure

3.3.1 The administrative structure

88761 staff were working for Telecom at June 1988. Staff numbers have been declining for the past few years, (94,503 at June 1987 and 96,546 at June 1986) but Telecom is still the second largest employer in Australia.

This massive organisation has two major levels plus other minor levels which may be considered for particular studies. This is essentially a hierarchical organisation or top to bottom model. Three main divisions can be distinguished: Headquarters, States and Districts (or regions if engineering is focused upon).

(i) Headquarters, as in most large organisations, establishes the policies and goals of the organisation within the government guidelines contained in the Telecom charter and the constraints imposed time to time by the government.

(ii) The states implement the policies and provide headquarters with state information such as economic forecasts and targets and the funds required to reach these targets.

(iii) The district is the operating level whereby connections, maintenance of lines as well as customer relations takes place. The district is assimilated to a sale center. They were conceived in 1975 to allow closer contact with and quicker response to customer demand.

(iv) The region is concerned mainly with the construction of the network—its design and capacity. Since the network bears no relations with district boundaries,

42. TELECOM AUSTRALIA, Annual Report 1988, Statistical Supplement, p.95 and Annual Report 1987, p.79
regions are very large (only 3 in Queensland while they are 13 operating districts). The district and the region are funded separately through a bidding system based on previous years fundings and expected demographic and business growth.

3.3.2 The network

Consumers wishing a telephone need a link between themselves and the party they are calling. The link is provided by a cable. While a direct link could be possible, it would also be very expensive. Instead the cable goes to an exchange (local exchange) and the call is directed to the destination. The local exchange, however serves only a small area. For longer distances and a larger number of consumers, local exchanges would not be able to cope. Local exchanges are therefore linked to minor switching centres whose role is to switch incoming calls to other local exchanges or minor switching exchanges. The minor switching centres or MSC are in their turn linked to Secondary switching exchanges which link to a Main.

In Queensland, in 1987, there are just under 900 local exchanges, 48 minor switching exchanges, 6 secondary and one main located in Brisbane.

This set up is hierarchical as shown in diagram 3.1.

![Diagram 3.1](Reproduced from HEDEMAN, op. cit., p.17).

Non-hierarchical networks are slowly implemented, but in
Queensland, the overall network is hierarchical and for the time being, new types of exchanges will be ignored. It must be pointed out that they do not affect basic services but have the capacity to provide new services which add value to the network by increasing network usage.

The physical network is divided into regions. Three regions cover Queensland. They are:

- The North-Queensland region
- The Trunk & Country region and;
- Metropolitan region

Each region is responsible for the resources which are needed for on-going projects, new projects and the workforce.

These regions furthermore are broken up into districts. 13 districts exist in Queensland:

<table>
<thead>
<tr>
<th>Metropolitan region</th>
<th>Trunk and country region</th>
<th>North-Queensland region</th>
</tr>
</thead>
<tbody>
<tr>
<td>-Metro north</td>
<td>-Roma</td>
<td>-Cairns</td>
</tr>
<tr>
<td>-Metro south</td>
<td>-Toowoomba</td>
<td>-Rochkamptom</td>
</tr>
<tr>
<td>-Metro central</td>
<td>-Mackay</td>
<td>-Townsville</td>
</tr>
<tr>
<td></td>
<td>-Nambour *</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-Ipswich *</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-Mackay</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-Gold-Coast*</td>
<td></td>
</tr>
</tbody>
</table>

(* Since June 1988, these districts are part of the metropolitan region)

3.4 Objectives

The main objectives are found in the Telecom charter. The Charter has been developed to embody the statutory requirements as established by the Telecommunication Act 1975. The charter provides:

1. "Telecom Australia is responsible to provide, maintain and operate telecommunication services in Australia which best meet the social, industrial and commercial needs of the people of Australia and, so far as it is in its opinion reasonably practicable to do so, make its telecommunications services available throughout Australia for all people who reasonably require those services" (Section 5 and section 6(1))

2. Telecom must comply with directions from the Minister to act "in the public interest" (Section 6(2)).
3. Telecom has the objective of growth in response to technological change (Section 6(2)b(i))

4. It is required to operate "as efficiently and economically as practicable" (Section 6(2)b(ii)).

5. To consider the "special needs" for non-city services (Section 6(2)b(iii)).

It is important to realise that these objectives are constraints insofar as they affect the efficient use of resources.

All of these objectives are very vague in that no targets are used (contrary to a private firm's objectives) to measure performance. This has created the need for interpretation by Telecom management.

Within these objectives, Telecom has set itself some targets.

- To provide telephone service to 90% of the population by 1990.
- To convert all manual services to automatic services by 1990.
- 90% of all customer repair reports to be cleared by the end of the following working day.
- Ineffective calls due to switching loss should not exceed 1.5% and plant congestion should not exceed 1% for local calls and;
- Switching loss not to exceed 3% and plant congestion not to exceed:

<table>
<thead>
<tr>
<th>Preferred</th>
<th>Maximum allowable</th>
<th>between</th>
</tr>
</thead>
<tbody>
<tr>
<td>2%</td>
<td>2%</td>
<td>8am-6pm</td>
</tr>
<tr>
<td>7%</td>
<td>15%</td>
<td>6pm-9pm</td>
</tr>
<tr>
<td>10%</td>
<td>15%</td>
<td>9pm-10pm</td>
</tr>
</tbody>
</table>

- 75% of local calls should be effective (that is answered)
- 70% of STD calls should be effective.
- Tariffs to be fair and reasonable.

All the above targets can be measured and are measured. The difficulty is to translate this performance in terms of cost for Telecom to reach those targets. Tariff equity can only be assessed by comparison with overseas rates or against the consumer price index. Both are however
ineffective indicators if the quality of service is not included (which the above targets relate to). It is important when comparing with services in the United-States or Canada where party lines are predominant in country areas. In Australia, the aim is for exclusive service and identical quality in both metropolitan and country areas.

3.5 Constraints

Against the objectives set for Telecom, the charter also provides a set of constraints in which the stated objectives must be fulfilled:

1. **Telecom requires Ministerial approval in setting prices.** (Section 11).

2. **The Minister of Finance determines Telecom's interest and repayment of government loans** (Section 71).

3. **The Treasury is required to approve Telecom's public borrowings** (Section 72).

4. **Telecom is required to earn sufficient revenue on an annual basis to cover "properly chargeable" expenditure** (Section 73(1)(a)).

5. **Telecom is restricted to a minimum of 50% internal funding of capital expenditure** (Section 73(1)(a)).

6. **Telecom is required to charge minimum prices, subject to the above provisions** (Section 73(2)).

7. **The Minister's has complete control over the distribution of Telecom's surplus.** (Section 76(2))

8. **Telecom is exempt from Commonwealth, State and Territory taxes** (Section 80(1))

Most of these constraints have been lifted in the May 1987 statement, except (1), while (8) is no longer applicable.

Other constraints are historical (untimed local calls) or remnants of the PMG as a public service department such as employment conditions. Those are identical to the public service and conducive to rigidity which may not be appropriate for a business enterprise in a rapidly changing environment.

The set of objectives and constraints may be perceived as
sets which balance each other. It is not unique to Australia and the whole question of their necessity hinges on the belief that Telecom is a natural monopoly. Indeed, if it was, is it still one? This is a debated question difficult to answer in a period of rapid change. The answer will be in terms of the development of telecommunications in Great-Britain and the United-States, especially the former. It suggests that while competition ruled on technologies at the exchange level and the handset, inefficiencies were great in establishing the networks which sometimes were parallel to each other (Appendix 1). In the United-States competition kept the major providers' price on line.

Without regulations, however, a monopoly would have emerged. The problem is that although economies of scale in American empirical studies suggest that the conditions for a natural monopoly exist (KISS and LEFEBVRE 1987), one cannot infer that the extent of the monopoly should be the whole nation, but perhaps the State or the Region such as in the USA. There is certainly not a natural monopoly extending to erection and maintenance of lines (Sections 94 and 13 of the Act) which provide that Telecom

"may authorise the erection, maintenance or operation of the telecommunications installation, and the attachment of a line, equipment or apparatus to Telecom's network" but that in providing such authorisation, Telecom may specify the terms and conditions to apply".

The line adopted here is identical to the one adopted 100 years ago by the Post-Office in Britain to stop the introduction of the telephone by private firms. The most important factor to determine if competition or contestability is possible at the network level is the number of customers which would connect to an alternative network at a lower cost (including interconnection fees
between networks)\textsuperscript{44} than with one network and the services available through these networks. With this possibility—the risk of losing customers to another network—there will be a trend to increase the interconnection fee, raising the total cost to the customer above the costs he would have incurred with one universal network.

Furthermore, without the above constraints, the rate of development of advanced technologies would have been quicker while tariffs could be lowered in profit making centers discouraging any competition or cream-skimming.

The lack of definite objectives, the employment conditions and the establishment of exchanges in non-profitable areas further the potential for X-inefficiencies. Thus during the period under consideration, Telecom is perceived to act as an entity whose objective is to grow for growth's sake and make profits without consideration for its customers while in fact, notwithstanding that inefficiencies do exist in some areas, the policies which Telecom has followed and were put into practice in 1975 have for main purpose to supply a \textit{basic} service to the majority of Australians.

\textsuperscript{44} Charges for interconnections for Voice grade leased lines are available in \textit{TELECOM AUSTRALIA, Private Networks and Data Services-Price Guide}, November 1986. The charge includes for example $100 in respect of each application if the line is not provided by the Commission or the private network contains private lines plus an annual charge of $800 for 1 to 9 services, $1,500 (10-19), $2,500 (20+)
IV. TELECOM, POLICIES, PRICING, RESOURCES ALLOCATION AND PERFORMANCE

Introduction

This section consists of 4 parts. In the first, we describe the philosophy adopted by Telecom in 1975, its goals and the Plans which shaped its direction. Special attention is given to the Rural Policies.

In the second, we review the studies relating to the pricing of telephone services and how prices are determined in Australia.

In the third part, we analyse which factors influence the allocation of resources in each district. The lack of data for some years (1975 till 1978) and the short period involved where the data became available (8 years) has compelled us to use the simple regression technique on selected years (1977, 1981 and 1987) where all the data was available for all districts. Extrapolating data for the missing years and using the seemingly better technique of pooling together cross-section and time-series data has not been attempted here. The main reason is that too many extrapolations would have been necessary with the implication that the data would have been smoother when our main object is to find out if there are variations and/or consistencies in the system and if so to explain why. Many problems related to the interpretation of the coefficients using this method are analysed in KLEIN (1962), ALLEN (1956) and SHUPACK (1962) if the predictive power of the method is required. Since our interest lies mainly on what factors in any particular year the level of expenditure

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is based upon, the Ordinarily-Least-Square method was used. A problem inherent with this method is that the signs of the coefficient cannot be explained if they differ from year to year. This was not the case for our sample. Another problem associated with this method is that explanatory variables, in one hand can be rejected when by themselves but accepted as significant when in conjunction with others or in other hand be rejected when they are with others but not when they are by themselves. We avoided this problem caused by multicollinearity by ignoring the variables with the lowest t values.

In the last part, we analyse the performance of Telecom on productivity, quality of services, level of penetration by population and dwellings and profitability against the objectives set for the period.

PART I. CORPORATE PHILOSOPHY AND RURAL POLICIES

4.1.1 Telecom 1975-1987: Corporate Philosophy

A background Plan: Telecom 2000, result of a study carried out by a telecommunication planning team of the PMG's Department was released in 1975. It provided an analysis of the social, economic and technological options for telecommunications in Australia to the year 2000. It was also in this period that the need for strategic planning was recognised and in 1977 the Plan was launched. Corporate planning was strategic and institutional, directed at wide fundamental long-term goals. In substance, it offered planning to identify and handle corporate issues, explore financial possibilities and timing, formulate options within an environment that was subject to considerable social, political, technological and economic change.

The Plan, encompassing Telecom's Charter under the Act, had four corporate thrusts: service and its improvement to meet customer needs; efficiency in the organisational
structure and work environment: staff relations and development, and technological improvement. Such aims were broad. For the ten years from 1977 to 1987, the Plan projected a specific series of goals which included a continuing decline in the real cost of telecommunications; a continuing investment programme to provide the availability and diversity of services; particular attention to the needs of small businesses and rural consumers; STD penetration of 95% by 1987; greater efficiency from the timely introduction of new technology; and a telephone in 9 out of 10 Australian homes by 1987.

Besides the Corporate Plan, other far-reaching plans were developed. Of particular importance was after the advice of management consultants CRESAP, McCORMICK and PAGET the restructure in 1975 of the basis of the state operational administration. This restructure resulted in the introduction of 83 geographically organised Telecommunication Districts Management (30 in NSW, 21 in Victoria, 13 in Queensland, 9 in South-Australia, 7 in West-Australia and 3 in Tasmania). This was the single and largest restructuring in scope and magnitude in 50 years. These districts were gradually implemented and became fully operational by the end of 1978. Their establishment marked for the first time the "end" of the "engineering" supremacy to the beginning of a more administrative and more management orientated Telecom to implement the plans although engineers held a very important consultative role in all facets of management, planning and product evaluation. The creation of the district was to change the environment of service, widen its range and accessibility and offer a new spectrum of special business services.

4.1.2 Rural and Zoning Policies

An important aspect of Telecom and successive governments has been the commitment to supply country areas with an automatic telephone system and plans in this direction were developed.

The basis of Telecom's zoning and charging system is the Community Development Plan which was introduced in 1960.

Prior to 1960, local call areas in the country encompassed only those exchanges within 8 kilometres of the calling exchange. The introduction of the new zoning and charging scheme from May 1st 1960 meant that local calls was typically available between exchanges up to 24-32 km apart.

Throughout Australia the net effect was that about 40% of all trunk calls became local calls. The other benefit to customers of the Community Telephone Plan was a longer-term one - the provision of a fully automatic system.

In May 1980, the Community Access Scheme was introduced. It provided a low (Community) call rate for all rural customers on calls to/from their service centre (service town) if a local call was not already available. The criteria for a given zone were that it should be the nearest, accessible town which provides a reasonable flexibility in the choice of a service centre. At the same time, ceilings were placed on charges for some STD calls within and between districts which had previously been charged at higher rates. These reductions in call charges in rural areas were implemented against the general increasing cost trend for the provision and operation of rural service.

In October 1983, the Countrywide Calling Scheme was introduced as a zoning and charging system to provide a means of call charging in the less densely settled areas of rural and remote Australia and to facilitate the provision of world class telecommunication services within a reasonable timeframe, with costs divided between rural and remote customers and the wider Australian community.

This scheme which involves larger, "extended" zones, significantly increases the area over which customers can call at Community Call rates and lowers many of the trunk rates that would otherwise apply between adjoining zones. These zones can cover up to about 100,000 square kilometres. In addition, calls between customers connected to, and located within a 32 kilometre radial distance of the same automatic exchange, are charged at the local rate. While the overall benefits to rural customers are substantial, some customers lost or will lose in the process local call access to each other when the smaller exchanges are closed.

From July 1974 to June 1984, 82% of manual services were upgraded to automatic service and the number of customers with part privately erected lines (PPE) and maintained services was reduced by 62%. The remaining services were predominantly in the most remote areas and were those which were most costly to modernise (Refer sub-sect. 4.3.3).

In 1984, Telecom began a national programme costing more than $500 million at 1986/87 prices to modernise 36,000 of the remaining services and provide some 8,000 new services, mostly to people who previously did not have access to service at all.

This initiative, called the Rural and Remote Areas Program (RRAP), is an activity of a kind not undertaken by any comparable national telecommunication authority in
the world. By the end of June 1988, the RRAP had modernised about 29,700 services and provided about 4,300 new services.

4.1.3 Financial Position

In July 1975, Telecom had net assets of approximately $4,000 million, 3.5 million telephone customers and a projected budget of $1,900 million. It needed in addition to funds to meet inflation and expansion, an extra $32 million to cover interest in past profits which had been converted to Commonwealth advances and some $118 million for the policy set by the Act of financing at least 50% of its capital expenditure from internal sources. In contrast, the "old" PMG provided only 38% of its total expenditure from internal funds. This resulted in an increase of 28% across the board of all telecommunications services. Local telephone calls, an area of overall loss in country regions only minimally offset by metropolitan returns, rose across the nation from 6 cents to 9 cents, while business rentals increased by 42% against 31% for non-business telephones. The reasoning behind the Commission being that the "telephone has a greater value to the business sector". Charges for new connections rose by 50%. The Commission explained that these rises "took care of only a fraction of the real cost of adding a new telephone to the network". The 1975 cost which covered use of junctions, averaged about $2,000.

By the end of 1976, Telecom had a network growth of 4.6% in telephone connections, 5% growth in local calls and 7% in trunk calls. Other services such as Telex rose by 16% and the data service by 50% in spite of tariff jumps. The general agreement to reduce borrowing by $11 million increased its internally generated funds from 50 to 53% with the commitment to expand to 57% in 1977 and 68% in 1978.
4.1.4 Implications

The plans had major implications for the funding and pricing of the services to be provided. It has been noted that as a result of becoming a separate entity and the requirement to fund at least 50% of its work programme, Telecom had to increase substantially the price of its services. This rise applied to everyone, yet with the implementation of a rural telephone policy, the utmost was done to decrease the price of these calls by judicious re-zoning. This had the effect of increasing the gap between revenue generated in country areas and the revenue generated in metropolitan areas since no re-zoning took place there. This effectively increases the amount needed to cover the costs of country local calls and "community" calls which without re-zoning would be trunk calls. It also means that the tariff structure, although established originally to give an identical service at equal price (and this egalitarian approach is already discriminatory in itself) is a myth, since even on this ground, pressure groups distort it to their advantage by forcing Telecom to change the definition of the type of calls they actually make.

50. The definition of rural and metropolitan areas is subjective since it does not include large regional towns. The definition as adopted by Telecom is: "Telephone services connected to exchanges located within 40.2km radius of the Sydney and Melbourne General Post Offices and within 32.2km radius of the Brisbane, Adelaide, Perth and Hobart General Post Offices"Annual Report 1987, Telecom Australia, p.72.
PART II: PRICING OF BASIC SERVICES

4.2.1 Telecommunications studies

In the Telecommunications industry, the pricing structure should be the following: A charge per call in addition to the connection fee, and a variation of that charge by the time of day and distance. Such a structure does not exist for local calls in Australia and the tariff structure of trunk calls, although going some way towards this ideal is very far from it as we shall see. Such a structure grounded in the marginal pricing theory does not exist in any country in the world and only some public authorities have adopted it but for electricity pricing. One of the main barriers which so far has existed for such a structure has been the costs of implementing the metering system. In 1985/86 an electronic meter reader was designed to perform a number of metering functions. The reliability of such advanced meters are however "function of the number of interconnections on their printed circuit board and thereby the number of soldered joints."

MATHEWSON and QUERIN (1972) have suggested that benefits net of metering costs will usually accrue when moving from flat to usage-sensitive pricing. In addition MITCHELL suggests that...

"...peak-load pricing applied to residential customers in metropolitan areas would double or...


52. RESEARCH LABORATORIES, Review of Activities 1985-86 Telecom Australia, 1986, p.81


triple the welfare gains achieved from a two-part tariff alone."

In his article, HAZELWOOD (1951) has presented a number of proposals for telephone pricing. He writes:

1- Traffic costs are primarily related to peak traffic, and should therefore be allocated to peak calls,

2- Off-peak calls should be charged only on the basis of customer related costs, e.g.: metering, billing, etc.

3- For any call there are costs associated with setting it up and with continuing it. The former dominates the latter, however during the peak period, capacity is utilized which prevents other calls from being made. As such calls should be independent of duration, but not so for peak calls.

These suggestions have however left several dimensions of the tariff structure undefined. How long should the peak period be and when should it start? Should there be a finer division of times than just peak and off-peak? What should the actual magnitude of these prices be? Should there be weekly or seasonal variations in these prices?

The answers to these questions are empirical as they require information on how consumers respond to time of usage pricing and in particular to the many variants mentioned above. The alternatives are to proceed by trial and errors or to test certain market segments. The analysis of the data is also problematic. WILKINSON (1983) notes in reference to GTE Measured Service Experiment that was conducted in the Jacksonville, Clinton and Tuscola exchanges in Illinois:

that the ideal circumstance would have been to compare the telephone usage of control groups


having very similar demographic and economic characteristics which did not experience the changes in local service tariffs with the usage of the exchanges which had been converted to measured services.\footnote{a7}

This was not the case in the above experiment. This problem can easily be overcome by comparing countries which use time of use pricing and the ones which don’t. The issue then is the problem of transferability. Some work has been done in this area recently although not in the telecommunication industry. Focusing on the electricity industry several studies: AIGNER and LEAMER (1984)\footnote{a9}, CAVES, CHRISTENSEN and HERRIGES (1984)\footnote{a9} and KOLHER and MITCHELL (1984)\footnote{a9} have statistically analysed whether it is possible to transfer these findings to areas where experiments have not been carried out. On balance they suggest that it is possible. However, more experience is required with this methodology before a complete evaluation is available.

4.2.2 Pricing in Australia

The price consists of three elements: a once connection fee, a rent and a usage fee. We briefly describe the costs associated with each of these elements as it was done in detail elsewhere\footnote{a1}.


\footnote{61. Refer to HEDEMANN A.E., Pricing of the Telephone Service in Australia, MBA Thesis, Universityof
a- Connection costs

The basic service consists of a pair of wires linking the customer to the local exchange and a telephone instrument. The pair of wires is provided in underground cables which leave the local exchange and branch at pillar terminals into smaller cables which serve a few streets of a particular suburb. From these smaller cables, a single pair eventually reach the customer premises in a "lead-in" cable.

The task of connecting customers is labour intensive with a high cost of laying it, although as the cable increases in size, the cost per wire rapidly decreases: 62

<table>
<thead>
<tr>
<th>cable size: (pairs)</th>
<th>2</th>
<th>6</th>
<th>10</th>
<th>30</th>
<th>50</th>
<th>70</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>cost (laid) per km ($)</td>
<td>3954</td>
<td>4182</td>
<td>4810</td>
<td>5255</td>
<td>6098</td>
<td>6955</td>
<td>8004</td>
</tr>
<tr>
<td>0.64mm PEJH cable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unit cost per pair ($)</td>
<td>1977</td>
<td>697</td>
<td>481</td>
<td>175</td>
<td>121</td>
<td>99</td>
<td>80</td>
</tr>
</tbody>
</table>

When Telecom lay the main cable, it allows for population growth, therefore the cost of connecting a new customer is relatively low. The connection fee was for the same period (1978) $120. The exception was for very remote customers which had to pay an additional "capital contribution towards the costs of providing the subscriber cable network at the rate of $160 per half-kilometre beyond 16 kilometres radially from their local exchange. The limit was initially 8km, raised later to 12 km until 1978 where 16 km was adopted. In June 1978, customers had also the option to pay the capital contribution or an annual rental of $500 as opposed to the rental of $85. This policy, however is no longer applicable.

- Rent

The meaning of what the rent represents is difficult to define. Officially, it is the cost of maintaining and 

62. HEDEMAN A.E., op.cit. p.18
using the line. There are some difficulties with this, because a line needs to be maintained even if it is not used, if it relates to usage then it should varied with it (eg: x$/call). In the latter, the rent differential between business and non-business customers seems to support this definition. The problem is that not all businesses and not all residential customers use the telephone in the same way. An other interpretation of the rent is that it should be equal to the value that customers attach to it.

For example, people in remote areas or lonely people might never use the telephone but its presence alone gives re-assurance and security. The possibility to receive calls is also an important aspect reflected by the fact that people prefer to have their own telephone rather than to use a public telephone.

The rent, as it is now does not reflect these values, nor the discrimination which exists between business and non-business reflects the higher value which business place on their telephone. The differential of $35 in 1978, is far exceeded by the losses business make if the telephone is out of order. The higher rental gives to businesses preferential treatment for repairs.

c- Costs associated with making a call

Two separate costs can be identified: The cost of connecting the call and the cost associated with the time spent on a line.

i) To connect a call requires switching equipment at an exchange to receive dialled information and determine the destination. At this level, the equipment is accessed by all customers using different products. The problem of separating the costs from this common equipment has never been done and the benefits which

63. The word "telephone" is often used loosely, the rental is for the actual line, not the instrument.
would arise would be easily outstripped by the costs.

ii)- Controlling equipment at the exchange to maintain the connection. Provision of this equipment is function of the number of calls and pattern of calls. It is basically in demand at peak periods and idle or under full capacity at off-peak. The assumption made by Telecom is that the duration of a call is the same at the peak period one day as it is in the next. The exception to this is Sunday where a different tariff has been set reflecting the lower traffic measured in Erlang.

HEDEMAN had estimated the average and marginal costs associated with different traffic levels and costs per call.

The costs per peak minute varied from $2.69 for 2x40 erlangs with an average per call-minute of 3.4 cents and a marginal cost of 1.4 cent to $3.85 for 2x100 erlang and an average cost per call-minute at peak of 1.9 cent. The marginal cost per call was estimated at 1.9 cent for a peak traffic of 2x40 erlangs.

Using marginal cost pricing would mean that the price of calls would be different for every exchange areas. To this, various types of exchanges do exist and in a predominantly hierarchical network, the path taken by a call is predictable. If a direct route is congested, the call will switch in a simple network to a final route which is also the one which determines the grade of service (GOS) for the entire routing pattern. Typically for a metropolitan area, the GOS is 1 call lost in 500.

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64. The Erlang is a measure of traffic intensity as follows: The number of Erlangs of traffic is the number of calls in progress in a given group of circuits (at a given point in time). An Erlang Hour which is the unit of traffic volume is equal to the mean traffic intensity of one Erlang maintained for one hour= 10 Erlangs for 6 minutes = 2 Erlangs maintained for 1/2 hour, etc...

65. HEDEMAN, op. cit., pp.38-40

In summary, the costs associated with a call therefore can be put into the following formula:

\[ C_c = (E_{p} \cdot \$/B) + (X \cdot \$/X) \]

where \(E_p\) is peak-hour usage, \(B\) the Busy Hour Erlang, \(C_c\) is the total cost of a call and \(X\) the number of calls by distance and path.

While this formula would reflect costs and set a base for pricing, Telecom charges a flat rate for the calls and does not time local calls. This is in contrast with most other western nations. In the United-States, local calls are in some states free because the costs of metering and administration would be too high or they are included in a flat monthly payment irrespective of the number of local calls made.

However the definition of a local call is different. The local call is defined by the area served by a local exchange, that is from customers calling customers in the same exchange area. If a customer who is called lived in another exchange area, the call is a trunk call. In Australia to understand what a local call is requires a knowledge of the zonal systems.

67. In most other OECD countries local calls are timed in the same way as trunk calls are.

68. A call is local if made within a 16 kilometre radius from a local exchange. To this there are charging zones whereby any calls made from one zone to an adjacent one are also local calls. If the zones are not adjacent, the call is an STD call. Such a call is however not related to distance between the origin and the destination of the call, but of the distance between zones, some of which are very vast in country areas. Furthermore, the adoption of zones for charging reveals some anomalies because of the different shape and size of the zones although Telecom minimizes as far as possible those anomalies as reflected in the following diagram:

Diagram 4.1

In this diagram, a call from \(x\) to \(y\) will be charged as a local call, while \(y\) to \(z\) will be an STD call.
The multi-tariffs structure used in Australia for trunk calls is not unique. It has been adopted by most Telecommunications owned authorities around the world. It is basically design to discourage the marginal user to use his line during peak-hours and encourage him to call at a different time. This makes a better use of the network by smoothing the flow of traffic. The main reason why this does not occur is because as KOLSEN puts it people have the persistent bad habit to sleep at night.

The distance related cost component of a call has decreased substantially over the years, but is still kept relatively high on long-distance to cross-subsidise short-distance calls.

In this respect, this statement is true for inter-capital city traffic or between large regional towns, but unfounded in country areas where distance is a substantial component of cost, but not reflected in price. It must be noted, in one hand that in a regulatory authority, there can exist subsidy free price (eg: by raising the price of all products from the existing situation), but this would obviously make everyone worse off. If in the other, the regulatory authority is compelled to cross-subsidise, then it must be protected from entrants (Refer sub-sect. 4.3).

69. KOLSEN, op. cit., p.182
PART III ALLOCATION OF RESOURCES IN QUEENSLAND

4.3.1 Introduction

Resources are allocated on two different levels: the district level and the Engineering level.

Resources allocated to the Engineering department are to cover new capital network expenditures (eg: exchanges, trunk routes, conversion etc...). It is difficult to determine the allocation of funds on a district basis. This has been done in the context of the 1984 government Inquiry. However with a national network the results become somewhat subjective when one tries to apportion this allocation to a particular district/product to extract the level of profitability and the level of cross-subsidisation. The methodology adopted was limited by the availability of data and therefore the results must be taken as order of magnitude. In this context, more confidence must be attached to the non-capital expenditures attributed to each district than for the capital allocation. The latter is a function of the type of equipment built and the depreciation rate of that equipment. It was also difficult to attribute the portion of interest on borrowed funds by Telecom at a district level.

While an independent investigation of these apportionments would have increased the validity of our results, the benefits and costs had to be considered. Therefore the available data has been used and relevant parts extracted wherever possible. It must be noted that trunk and local calls are the largest in term of usage and revenue. It was therefore appropriate to infer that the main purpose of the equipment built was to supply these services.

products, especially in country areas under the period considered.

4.3.2 Allocation of funds by district

The allocation of funds (percentage share)\footnote{Actual amounts cannot be shown for this level of analysis.} on a district basis for the years 1978-1987 is shown in tables 4.2 and 4.3.

i) Capital allocation

Investments in telecommunications equipment are long-term. Therefore an annual apportionment for depreciation is required until the value fell to nil. It varies with the life of equipment and the capacity requirements. Economies of scale and scope exist at this level. In a growing network, most of the investment will be directed to the building of exchanges. The period 1975-1987 was characterised by this type of investment to complete the national network and provide a basic service to every household. The next period is dominated by modernisation of the network to supply new services which are profit orientated rather than government price regulated. Therefore a growing portion of investment or capital work would be directed to replacement of existing out-dated plant, mainly in metropolitan areas.

A major problem associated with the investment programme is that Telecom's accounting method is based on historic costs, when depreciation allowance should be based on current replacement costs. When capital is directed towards new technology, there should be a decrease in maintenance costs at the district level, but part (or all) of this gain would simultaneously be negated by the cost of training to operate these new and more sophisticated exchanges. Unfortunately, it was not possible to establish this inverse relationship empirically. While a fair return on these investments could be expected, at a district level, expenditure

\footnote{Actual amounts cannot be shown for this level of analysis.}
### TABLE 4.2

#### % SHARE OF CAPITAL EXPENDITURE PER DISTRICT

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Metro Central</td>
<td>13.34%</td>
<td>12.89%</td>
<td>12.49%</td>
<td>13.18%</td>
<td>11.97%</td>
<td>10.96%</td>
<td>9.72%</td>
<td>8.30%</td>
<td></td>
</tr>
<tr>
<td>Metro North</td>
<td>4.78%</td>
<td>9.33%</td>
<td>9.06%</td>
<td>7.94%</td>
<td>7.04%</td>
<td>6.72%</td>
<td>5.64%</td>
<td>4.97%</td>
<td></td>
</tr>
<tr>
<td>Metro South</td>
<td>13.62%</td>
<td>11.89%</td>
<td>11.58%</td>
<td>11.14%</td>
<td>10.62%</td>
<td>10.22%</td>
<td>9.39%</td>
<td>17.74%</td>
<td></td>
</tr>
<tr>
<td>Gold Coast</td>
<td>6.79%</td>
<td>7.52%</td>
<td>8.36%</td>
<td>9.20%</td>
<td>8.13%</td>
<td>8.00%</td>
<td>7.10%</td>
<td>10.97%</td>
<td></td>
</tr>
<tr>
<td>Ipswich</td>
<td>5.61%</td>
<td>5.58%</td>
<td>5.25%</td>
<td>5.35%</td>
<td>5.18%</td>
<td>5.48%</td>
<td>5.25%</td>
<td>5.40%</td>
<td></td>
</tr>
<tr>
<td>Nambour</td>
<td>7.83%</td>
<td>7.71%</td>
<td>8.15%</td>
<td>9.68%</td>
<td>10.59%</td>
<td>9.70%</td>
<td>10.63%</td>
<td>8.34%</td>
<td></td>
</tr>
<tr>
<td>Operations Metro Total</td>
<td>51.96%</td>
<td>54.91%</td>
<td>54.89%</td>
<td>56.50%</td>
<td>53.53%</td>
<td>51.08%</td>
<td>47.74%</td>
<td>55.72%</td>
<td></td>
</tr>
<tr>
<td>Maryborough</td>
<td>8.54%</td>
<td>8.48%</td>
<td>8.78%</td>
<td>8.75%</td>
<td>8.81%</td>
<td>9.87%</td>
<td>10.78%</td>
<td>9.25%</td>
<td></td>
</tr>
<tr>
<td>Rockhampton</td>
<td>9.39%</td>
<td>8.17%</td>
<td>8.95%</td>
<td>9.83%</td>
<td>9.70%</td>
<td>10.42%</td>
<td>10.87%</td>
<td>9.16%</td>
<td></td>
</tr>
<tr>
<td>Roma</td>
<td>6.23%</td>
<td>5.61%</td>
<td>4.39%</td>
<td>4.17%</td>
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<td>5.35%</td>
<td>4.30%</td>
<td>5.95%</td>
<td></td>
</tr>
<tr>
<td>Toowoomba</td>
<td>7.26%</td>
<td>6.70%</td>
<td>6.24%</td>
<td>5.69%</td>
<td>5.72%</td>
<td>6.22%</td>
<td>7.63%</td>
<td>6.78%</td>
<td></td>
</tr>
<tr>
<td>Cairns</td>
<td>5.94%</td>
<td>5.30%</td>
<td>6.28%</td>
<td>5.32%</td>
<td>6.95%</td>
<td>7.12%</td>
<td>5.74%</td>
<td>5.48%</td>
<td></td>
</tr>
<tr>
<td>Mackay</td>
<td>4.02%</td>
<td>3.47%</td>
<td>3.93%</td>
<td>3.08%</td>
<td>3.68%</td>
<td>4.32%</td>
<td>5.16%</td>
<td>4.78%</td>
<td></td>
</tr>
<tr>
<td>Townsville</td>
<td>6.65%</td>
<td>7.36%</td>
<td>7.07%</td>
<td>6.65%</td>
<td>7.42%</td>
<td>6.98%</td>
<td>6.73%</td>
<td>4.53%</td>
<td></td>
</tr>
<tr>
<td>Operation Country Total</td>
<td>48.04%</td>
<td>45.09%</td>
<td>45.11%</td>
<td>43.50%</td>
<td>46.47%</td>
<td>48.92%</td>
<td>44.26%</td>
<td>44.28%</td>
<td></td>
</tr>
</tbody>
</table>

### TABLE 4.3

#### % OF EXPENDITURE PER DISTRICT

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Metro Central</td>
<td>13.99%</td>
<td>13.23%</td>
<td>12.96%</td>
<td>12.92%</td>
<td>12.80%</td>
<td>12.76%</td>
<td>13.21%</td>
<td>13.15%</td>
<td>13.62%</td>
</tr>
<tr>
<td>Metro North</td>
<td>10.83%</td>
<td>10.38%</td>
<td>9.12%</td>
<td>9.23%</td>
<td>8.59%</td>
<td>8.46%</td>
<td>8.39%</td>
<td>8.31%</td>
<td>8.19%</td>
</tr>
<tr>
<td>Metro South</td>
<td>12.22%</td>
<td>12.00%</td>
<td>11.73%</td>
<td>11.56%</td>
<td>11.22%</td>
<td>11.37%</td>
<td>11.55%</td>
<td>11.75%</td>
<td>11.41%</td>
</tr>
<tr>
<td>Gold Coast</td>
<td>6.46%</td>
<td>7.12%</td>
<td>7.99%</td>
<td>9.04%</td>
<td>8.28%</td>
<td>8.54%</td>
<td>8.54%</td>
<td>8.81%</td>
<td>9.14%</td>
</tr>
<tr>
<td>Ipswich</td>
<td>5.89%</td>
<td>5.84%</td>
<td>5.47%</td>
<td>5.50%</td>
<td>5.41%</td>
<td>5.51%</td>
<td>5.49%</td>
<td>5.75%</td>
<td>5.76%</td>
</tr>
<tr>
<td>Nambour</td>
<td>6.90%</td>
<td>7.26%</td>
<td>7.94%</td>
<td>8.80%</td>
<td>9.08%</td>
<td>8.61%</td>
<td>9.03%</td>
<td>8.88%</td>
<td>9.05%</td>
</tr>
<tr>
<td>Operations Metro Total</td>
<td>42.30%</td>
<td>42.59%</td>
<td>42.26%</td>
<td>44.12%</td>
<td>42.58%</td>
<td>42.51%</td>
<td>43.02%</td>
<td>43.49%</td>
<td>43.56%</td>
</tr>
<tr>
<td>Maryborough</td>
<td>8.67%</td>
<td>9.03%</td>
<td>8.82%</td>
<td>8.20%</td>
<td>8.18%</td>
<td>8.38%</td>
<td>7.76%</td>
<td>8.04%</td>
<td>7.99%</td>
</tr>
<tr>
<td>Rockhampton</td>
<td>9.92%</td>
<td>9.29%</td>
<td>9.79%</td>
<td>9.55%</td>
<td>10.66%</td>
<td>10.82%</td>
<td>9.92%</td>
<td>9.99%</td>
<td>10.15%</td>
</tr>
<tr>
<td>Roma</td>
<td>8.36%</td>
<td>8.15%</td>
<td>7.94%</td>
<td>7.75%</td>
<td>7.42%</td>
<td>6.58%</td>
<td>7.44%</td>
<td>6.97%</td>
<td>6.64%</td>
</tr>
<tr>
<td>Toowoomba</td>
<td>8.08%</td>
<td>7.74%</td>
<td>7.46%</td>
<td>7.13%</td>
<td>6.45%</td>
<td>6.97%</td>
<td>6.88%</td>
<td>6.98%</td>
<td>7.38%</td>
</tr>
<tr>
<td>Cairns</td>
<td>7.99%</td>
<td>8.03%</td>
<td>8.52%</td>
<td>8.25%</td>
<td>8.93%</td>
<td>9.04%</td>
<td>8.86%</td>
<td>8.62%</td>
<td>8.91%</td>
</tr>
<tr>
<td>Mackay</td>
<td>4.77%</td>
<td>4.76%</td>
<td>4.65%</td>
<td>4.47%</td>
<td>4.95%</td>
<td>5.22%</td>
<td>5.36%</td>
<td>5.66%</td>
<td>5.47%</td>
</tr>
<tr>
<td>Townsville</td>
<td>9.90%</td>
<td>10.40%</td>
<td>10.55%</td>
<td>10.13%</td>
<td>10.84%</td>
<td>10.47%</td>
<td>10.73%</td>
<td>10.26%</td>
<td>9.91%</td>
</tr>
<tr>
<td>Operation Country Total</td>
<td>57.70%</td>
<td>57.41%</td>
<td>57.74%</td>
<td>55.88%</td>
<td>57.42%</td>
<td>57.49%</td>
<td>56.98%</td>
<td>56.51%</td>
<td>56.44%</td>
</tr>
</tbody>
</table>
exceeds revenue in all country districts and one metropolitan district. (Refer Appendix 2).

From the regression equations of appendix 4.5, it appears that Telecom uses a rule of thumb to allocate resources.

The major factors influencing allocation of capital seems to be capital spent in previous years and staff level, except for the year 1986/87 which was determined by staff level only.

The equation includes population (P), density (D) growth (G) and personnel required (S):

that is: \[ Y_t = f(P, D, G, S) \]

This model when tested by the regression method did not find any relationship between P, D, G and Y. Only S was the main factor influencing the allocation.

A second regression was made on previous expenditures. The three years prior to any given year used as the base was accepted as being the main factors influencing present allocation. The exception was 1986/87 which did not rely on previous expenditure levels.

The explanation lies is that capital investments are planned long in advance and are allocated more or less evenly over the period considered. The year 1987, however, was the beginning of a new planning development period (which ends in 1995). It is reasonable that the relationship which had existed in previous years would break down.

The results were:

\[ Y_{1986} = -534087 + 0.7X_1 + 0.353X_2 + 0.672X_3 \]
\[ (-0.505) (1.04) (0.483) (1.22) \]

\[ R^2 = 0.98 F*= 182.98 F_{(tab)}= 6.99 a=0.01 v1=3 v2=9 dof \]

\[ Y_{1987} = 594990 + 0.988X_1 + 0.685X_2 - 0.775X_3 \]
\[ (1.076) (5.875) (3.966) (-3.248) \]

\[ R^2 = 0.99 F*= 299.09 F_{(tab)}= 6.99 a=0.01 v1=3 v2=9 dof \]

\[ Y = \text{capital expenditure at time } t \]
\[ X_1 = \text{capital expenditure at } t-1 \]
\[ X_2 = \text{capital expenditure at } t-2 \]
\[ X_3 = \text{capital expenditure at } t-3 \]

Figures in brackets are t values.
ii) Capital Programme in Remote Areas

In the above capital expenditures funds allocated to RRAP are included. Table 4.4 shows how funds have been allocated, their purpose and the average cost per customer.

Table 4.4

<table>
<thead>
<tr>
<th></th>
<th>84/85</th>
<th>85/86</th>
<th>86/87</th>
<th>87/88</th>
<th>88/89</th>
<th>89/90</th>
</tr>
</thead>
<tbody>
<tr>
<td>Services converted</td>
<td>3231</td>
<td>1611</td>
<td>1190</td>
<td>390</td>
<td>180</td>
<td>120</td>
</tr>
<tr>
<td>Plant replaced</td>
<td>406</td>
<td>943</td>
<td>980</td>
<td>1070</td>
<td>980</td>
<td>550</td>
</tr>
<tr>
<td>New services connected</td>
<td>408</td>
<td>486</td>
<td>600</td>
<td>900</td>
<td>910</td>
<td>800</td>
</tr>
<tr>
<td>Total customers to have modernised and new services</td>
<td>4045</td>
<td>3040</td>
<td>2770</td>
<td>2360</td>
<td>2070</td>
<td>1470</td>
</tr>
<tr>
<td>Capital funds allocated ($M.)</td>
<td>21.2</td>
<td>33.2</td>
<td>48.4</td>
<td>41.3</td>
<td>40.5</td>
<td>24.4</td>
</tr>
<tr>
<td>Average cost per customer ($)</td>
<td>5,241</td>
<td>10,921</td>
<td>17,472</td>
<td>17,500</td>
<td>19,565</td>
<td>16,598</td>
</tr>
</tbody>
</table>

In this programme, the main factor influencing the amount allocated is the technology to be used and density. The technology is chosen to minimize high costs associated with low-density areas. Two main technologies are available: Satellite technology and Digital Radio Convertors Systems (DRCS). The costs associated with both are graphed in appendix 4. DRCS is cheaper, but costs are only partially recovered. Satellite systems are very expensive but the full cost, in some instances, can be recovered by Telecom. Since the goal of RRAP is to provide services at a reasonable price the DRCS fulfills the government charter.

72. The system can connect up to 120 customers spread over a 600 km area from an exchange, from a series of connecting towers placed between 30-50 km apart. HOUGH J.L., Telecom Services in Rural and Provincial Australia—A Resource for Progress and Change, Rural Australia Symposium, July 1987.
iii) Allocation to the districts

The main expenditures in districts are associated with maintenance, connections and dis-connections. These costs should be determined by factors such as population, distance, density, personnel required, number of services and type of equipment. If a rule of thumb is used the allocation made the previous year should apply. The functional relationship should therefore be:

\[ Y = f(P, S, SIO, L/100, D, E_{t-1}) \]

The regression output is for the year 1987:

\[ Y = 304,987 - 15,759X_1 + 12,000X_2 + 31,795X_3 - 1,1816X_4 + 0.754X_5 \]

\[ (0.339) \quad (-1.021) \quad (1.224) \quad (0.908) \quad (-0.178) \quad (3.33) \]

\[ Y = 1986/87 \text{ Expenditures} \]
\[ X_1 = \text{Population} \]
\[ X_2 = \text{Employees} \]
\[ X_3 = \text{Services in operation} \]
\[ X_4 = \text{Density} \]
\[ X_5 = 1985/86 \text{ Expenditures} \]

\[ R^2 = 0.99 \quad F = 3.97 \text{ (with v1 = 5 and v2 = 7 dof)} \]
\[ F* = 198 \]

Similar results were obtained for previous years. This pattern suggests that once a pattern of expenditures has been set, it is more or less the same year after year, even if it is inappropriate. As the percentage share of resources shows in table 4.3, it has been relatively constant over the period. Disregarding expenditures at \( t-1 \), personnel and density become influential factors for allocating resources. In fact, the regression output which also includes SIO is

\[ Y_{1987} = 1,246,222 + 40,913X_1 + 6,838X_2 - 23,694X_3 \]

\[ (0.889) \quad (7.639) \quad (0.245) \quad (-2.019) \]

\[ R^2 = 0.99 \quad F* = 232.39 \quad F(\text{tab}) = 8.45 \quad a = 0.01 \quad v1 = 3 \quad v2 = 7 \]

where \( X_1 = \text{Employees} \), \( X_2 = \text{number of lines} \) and \( X_3 = \text{density} \).

This was in contrast to Expenditure of 1977/78 which were a function of population (P), staff (S), number of lines (L), lines per 100 inhabitants (L/100) and density (D). Expenditure for 1976/77 were not available at a
district level). The result was:

\[ Y_{1978} = 316,060 - 62.250X_1 + 20.792X_2 + 206.994X_3 - 192201X_4 - 25,344X_5 \]
\[ (1.302) \quad (-3.999) \quad (9.632) \quad (3.856) \quad (-3.006) \quad (-4.278) \]

Where \( X_1 \) is population, \( X_2 \) is the staff level, \( X_3 \) the services in operation, \( X_4 \) S10 per 100 inhabitants and \( X_5 \) the density.

Expenditure per service increases as population, density and S10/100 decrease. The difference with \( Y_{1978} \) above is that 1978 was the first year when allocation was made within the "new" organisation. The best "rule of thumb" was therefore to use the above variables for benchmark. As the years went by, the allocation became more and more a function of the previous years' expenditures with little regard for the original variables. Therefore the latter became completely insignificant by 1987. Regressions done for the intervening years seem to confirm this theory.

Collinearity amongst the explanatory variables is a serious problem in all the above equations since the number of employees is a function of services in operation and density.
PART IV PERFORMANCE OF TELECOM

4.4.1 Productivity

A measure of performance widely used for international comparison in the telecommunication industry is productivity calculated as access lines per employee. As we will show, there are numerous short-comings with this method, mainly when the purpose is to make international comparison. Factors said to influence productivity are density, network growth and level of telephone penetration.

A study conducted by the Bureau of Industry Economics (BIE)\(^7\) showed that these variables did not affect productivity when applied to a cross-section of 16 OECD nations. The result of the analysis using simple linear regression technique was:

\[
Y_{1983} = 83.082 + 0.077X_1 + 1.043X_2 - 0.820X_3
\]

\[
\begin{align*}
(0.869) & \quad (0.622) & \quad (0.578) & \quad (-0.134)
\end{align*}
\]

\[R^2 = 0.056\]

The 13 Queensland districts were subjected to the same analysis. In 1983, where the OECD analysed productivity in telecommunications, Australia had on average 64 lines per employee. The figure for Queensland was 50 lines per employee. If only employees directly attached to the supply of basic services are taken into account, the figure increases to 97 lines. This is because total personnel includes staff attached to telex, data, Datel, Auspac services etc… This personnel is mainly based in metropolitan centers and productivity should be assessed against the services they provide, not the number of access lines in basic services. The advanced services rely on the existence of basic connections and advanced types of exchanges to operate. A multi-purpose line carrying

---

local and trunk calls, data transmission from computers, special services such as 008, Dial-It, 0055 is counted once. A more appropriate approach then would have been to use the total number of services provided (eg: Telex services, Datel, Auspac 008, Dial-It, computerphones etc...). Even then, we may expect that under competition, the productivity for each would be different. Weights therefore should be attached to each of these so that an overall productivity can be calculated for the Commission as a whole. The BIE study did not do that and it seems a serious defect in the analysis. If one assumes (since it is not specified) that productivity -as calculated by the BIE- refers to basic services, then it is not a reflection of the real productivity of Telecommunications companies. Nor can the factors influencing that productivity be relevant, for many services are independent of density or penetration of basic services since their connections are made at the exchange level or use different networks altogether. The expectation is that productivity in these services will be high since competition exists in these areas. The work involved is independent of density, but dependent on existing services, types of exchanges for some products and demand.

If therefore a large proportion of personnel is employed in these tasks, the relationship will not show between the dependent and independent variables. It is not surprising that the relationship breaks down. In the OECD countries there is a vast range of products, especially since the introduction of VAS (Value Added Services) which numbered over 500 in some nations, with presumably personnel attached to their sales and marketing. While we use in the following the same variables, the number of personnel which is taken into account is only the estimated number of personnel which can be directly linked with these basic services.
Furthermore, in the United-States contracting-out is frequent and this was not taken into consideration. While contracting may be cheaper, productivity as measured in the BIE study loses its meaning?4

Table 4.5 shows the productivity levels in each district:

<table>
<thead>
<tr>
<th>Districts</th>
<th>Access Lines</th>
<th>Employees</th>
<th>Telephone lines per employee</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metro Central</td>
<td>146,098</td>
<td>1,068</td>
<td>136.80</td>
</tr>
<tr>
<td>Metro North</td>
<td>146,522</td>
<td>658</td>
<td>222.68</td>
</tr>
<tr>
<td>Metro South</td>
<td>185,413</td>
<td>892</td>
<td>207.86</td>
</tr>
<tr>
<td>Gold-Coast</td>
<td>92,154</td>
<td>766</td>
<td>120.31</td>
</tr>
<tr>
<td>Ipswich</td>
<td>51,767</td>
<td>430</td>
<td>120.39</td>
</tr>
<tr>
<td>Nambour</td>
<td>73,523</td>
<td>699</td>
<td>105.18</td>
</tr>
<tr>
<td>Maryborough</td>
<td>50,339</td>
<td>559</td>
<td>90.05</td>
</tr>
<tr>
<td>Rockhampton</td>
<td>57,535</td>
<td>715</td>
<td>80.47</td>
</tr>
<tr>
<td>Roma</td>
<td>23,797</td>
<td>468</td>
<td>50.85</td>
</tr>
<tr>
<td>Toowoomba</td>
<td>54,632</td>
<td>547</td>
<td>99.88</td>
</tr>
<tr>
<td>Cairns</td>
<td>55,884</td>
<td>683</td>
<td>81.82</td>
</tr>
<tr>
<td>Mackay</td>
<td>34,081</td>
<td>421</td>
<td>80.95</td>
</tr>
<tr>
<td>Townsville</td>
<td>69,978</td>
<td>794</td>
<td>88.13</td>
</tr>
</tbody>
</table>

District productivity as a function of density:

\[ Y_{1977} = 47.149 + 0.481 X_1 \]
\[ (4.983) (5.611) \]
\[ R^2 = 0.777 \]
\[ F* = 38.32 \text{ } F=9.65 \text{ } a=0.01 \text{ } v1=1 \text{ and } v2=11 \]

\[ Y_{1987} = 86.337 + 0.438 X_1 \]
\[ (4.116) (4.114) \]
\[ R^2 = 0.652 \]
\[ F* = 20.609 \text{ } F=9.65 \text{ } a=0.01 \text{ } v1=1 \text{ and } v2=11 \]

If we include density, lines/100 and growth of lines/100 as in the BIE regression, the result for 1987 was:

\[ Y_{1987} = 54.645 + 0.418X_1 + 1.229X_2 - 289X_3 \]
\[ (2.684) (3.756) (1.074) (-0.942) \]
\[ R^2 = 0.726 \text{ } F* = 8.06 \text{ } F=6.99 \text{ } a=0.01 \text{ } v1=3 \text{ and } v2=9 \]

74. Canada has nine regional regional companies, some private, some public and about 150 small systems. Productivity, measured in the BIE sense might be appropriate there, if one assumes that all companies offer the same type of service and the technology is homogeneous (eg: same level of development).
While lines/100 inhabitants and growth of lines are rejected, density is still an important factor which affects productivity. If the 3 central metropolitan districts of mes Metro Central, South and North are disregarded the relationship becomes even stronger. However, as equations (1) and (2) seem to show, the relationship seems to weaken with time.

The explanation lies in the stage of development in the network. Australia, during the period was still developing its network and this requires a large number of employees\textsuperscript{75}. Once a network is completed or modernised, the relationship between productivity and density breaks down.

For example, in an old analog exchange, the number of lines per employee is very low while in a digital exchange, it is very high. In a metropolitan area, a technician can connect many lines in one day while in a country area, it might require one technician for one line for a day, with costs involved in travel time, petrol and travelling allowance. Productivity therefore increases with high density of population, because of the economies of scale involved in setting-up exchanges and laying down cables. It is the choice of technology adopted which becomes a crucial factor affecting productivity.

This has been reflected in the last three years in the substantial decrease in staff numbers throughout the Commission and in Queensland, especially in technical occupations, while the trend is towards an increase in clerical/management/sales occupations.

\textsuperscript{75} For international comparison of productivity, one would need to know the capital and labour intensities of other Telecommunication companies to have a base for comparison. Institutional factors are also present which influence productivity (eg: the number of hours worked in Australia is less than in the other OECD countries, this means that more hours are worked on one day).
This is related to the increasing number and complexity of products which become available and a more customer orientated approach which is slowly being adopted by the Commission.

4.4.2 Profitability

There are many difficulties in using profit as a measure of efficiency in a monopoly environment, which is the case for basic services. REES (1984) prefers to focus on the gross trading surplus of public enterprises because it does not matter how it is divided between 'interest', 'depreciation' and 'profit' since it is its total size which matters.

Profitability by district has been done since 1984. The results are reproduced in appendix 3. All country districts and two metropolitan districts show a trading loss.

This is expected since the level of service is identical to metropolitan areas in most instances but the costs related to RRAP not absorbed by the price of provision and calls. An internal study has shown that if RRAP is excluded from the analysis, most of these districts would actually show a profit in spite of higher costs of provision. The main reason is that more revenue per call is generated in the country areas. In fact, about 48% of trunk call revenue is generated there although the share of lines is only 33% (This excludes Ipswich, Nambour and Gold-Coast districts).

The average cost per customer in RRAP for Queensland has been shown in the previous section. The maximum to be paid by any customer is about $1,250. This means that other customers cross-subsidise the difference (Refer to to table 4.6).

76. REES R., op. cit., p148
Table 4.6

<table>
<thead>
<tr>
<th></th>
<th>84/85</th>
<th>85/86</th>
<th>86/87</th>
<th>87/88</th>
<th>88/89</th>
<th>89/90</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average cost per customer ($)</td>
<td>5,241</td>
<td>10,921</td>
<td>17,472</td>
<td>17,500</td>
<td>19,565</td>
<td>16,598</td>
</tr>
<tr>
<td>Average cost actually paid ($)</td>
<td>16,222</td>
<td>16,250</td>
<td>18,315</td>
<td>15,348</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loss</td>
<td>1,250</td>
<td>3,991</td>
<td>1,250</td>
<td>9,671</td>
<td>1,250</td>
<td>1,250</td>
</tr>
</tbody>
</table>

4.4.4 Pricing

If price of telephones calls were equal to their marginal costs, the system might be economically efficient but perform badly (eg: price being too high for the majority of the population and this would be contrary to the objective set). Deregulation could double the price of short-distance calls. A Canadian study seems to show that a double of telephone rates would decrease telephone telephone penetration in that country from 92% to 84%.

The most significant aspect is that it would most affect telephone penetration in poor, minority and rural households.

If cross-subsidy is an issue, the full-cost approach, the rate of return approach or the incremental approach have been widely used, however those are product based approaches which do not indicate if some individuals are cross-subsidising others, but only whether some products are subsidising others.

The alternative method is to use FAULHABER's definition which is based on whether or not a coalition (group of customers) can actually do better on its own. Although this does not mean that leaving the existing system will

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lead to optimal allocation, it surely means that they are charged too much. Given that under the period considered it was not feasible to leave the system, and if in the future this becomes possible, transaction costs would have to be taken into account by the consumer groups involved. This cost might be a deterrent for existing groups.

The last method is to compare the domestic tariffs with other foreign companies' tariffs. Such comparisons are done frequently. However there are complications: the lack of data, the multi-product nature of the output, the multiple inputs used jointly in the production of output. In addition, the interpretation of the monetary variables used in the generation of efficiency measures as well as the level (generally unknown) of cross-subsidy should be taken into consideration when interpreting the result.

SMITH and FEDDERSON (1988) have done such comparisons, using alternative methods. Their conclusion is that:

"Consideration of all the various external constraints and factors affecting the operations of telecommunications companies tend to reinforce the conclusion that basic labour, materials and equipment inputs are translated into telephone services efficiently in Australia in comparison with other OECD countries."

4.4.5 Penetration of telephone services

This measure is widely adopted to measure the efficiency with which telecommunication firms fulfill the objective of the government charter. It is independent of costs and


81. Ibid. p. 24
as shown may be highly inefficient in economic terms. The level of penetration targeted was 95% by 1989/90. It appears from table 4.7 that at a state level, the target will be reached. The lower penetration in North-Queensland is due to the rough climatic conditions and therefore the high costs of provision as well as the low population densities which is also the main problem in the Roma district (Refer map in appendix 5).

**Table 4.7 Penetration of Telephone Services in Queensland 1987**

<table>
<thead>
<tr>
<th>District</th>
<th>Pop.86</th>
<th>No. of H'hold</th>
<th>No. of SID</th>
<th>Non-SID</th>
<th>SID H'hold</th>
<th>POP. Bus. SID</th>
<th>H'hold</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metro</td>
<td>1,221,144</td>
<td>357,379</td>
<td>478,033</td>
<td>39.14</td>
<td>332,460</td>
<td>93.02</td>
<td></td>
</tr>
<tr>
<td>Gold-Coast</td>
<td>219,000</td>
<td>66,387</td>
<td>92,154</td>
<td>42.07</td>
<td>64,403</td>
<td>97.01</td>
<td></td>
</tr>
<tr>
<td>Ipswich</td>
<td>155,052</td>
<td>55,281</td>
<td>73,523</td>
<td>48.03</td>
<td>55,083</td>
<td>96.56</td>
<td></td>
</tr>
<tr>
<td>Maryborough</td>
<td>133,392</td>
<td>39,887</td>
<td>50,339</td>
<td>37.73</td>
<td>36,973</td>
<td>91.99</td>
<td></td>
</tr>
<tr>
<td>Rockhampton</td>
<td>150,156</td>
<td>43,777</td>
<td>57,535</td>
<td>38.31</td>
<td>40,310</td>
<td>92.08</td>
<td></td>
</tr>
<tr>
<td>Roma</td>
<td>62,614</td>
<td>16,922</td>
<td>23,797</td>
<td>38.00</td>
<td>13,560</td>
<td>90.13</td>
<td></td>
</tr>
<tr>
<td>Toowoomba</td>
<td>108,148</td>
<td>40,565</td>
<td>54,632</td>
<td>50.51</td>
<td>39,279</td>
<td>96.82</td>
<td></td>
</tr>
<tr>
<td>Cairns</td>
<td>175,002</td>
<td>43,430</td>
<td>55,884</td>
<td>31.93</td>
<td>34,976</td>
<td>80.53</td>
<td></td>
</tr>
<tr>
<td>Mackay</td>
<td>110,854</td>
<td>28,748</td>
<td>34,081</td>
<td>30.74</td>
<td>23,342</td>
<td>81.19</td>
<td></td>
</tr>
<tr>
<td>Townsville</td>
<td>196,665</td>
<td>51,753</td>
<td>69,978</td>
<td>35.58</td>
<td>46,995</td>
<td>90.80</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>2,661,412</td>
<td>787,328</td>
<td>1041723</td>
<td>39.14</td>
<td>725,899</td>
<td>92.19</td>
<td></td>
</tr>
</tbody>
</table>

**4.4.5 Quality of service**

Quality of services may refer to many things. In telecommunications, it may refer to the time a customer has to wait to be connected, to the time he has to wait for the destination he is calling to be free, to the quality of the line itself (eg: noise, interferences, cut in the communication) or time it takes for a technician to repair a faulty line. Those may be grouped into two main categories:

i) Where quality is dependent of the technology (eg: noise, interferences) and the capacity of the network (eg: congestion).

ii) Where quality is dependent of the commission's interest in its customers (eg: to provide a service quickly, to answer metered call charge queries).

iii) Where quality is measured by customers' perceptions.

We now consider each of these measures:
i) Technical losses

The targets for ineffective local calls due to switching loss and plant congestion should not exceed in the case of local calls 1.5% (Switching loss) or 1% (plant congestion). This assumes that the number called is not busy or does not reply or is the wrong number.

Switching loss (Failure due to plant defect) was about 1.7% for the metropolitan districts in 1984/85, 1.4% in 85/86 and 1.5% in 86/87. In the country districts the figures were 0.8%, 0.4% and 1.6% respectively.

For trunk calls (QLD) the targets and performance (in %) are the following:

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>(As at June 85(a) 86(a) 87(b) 85(a) 86(a) 87(b))</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Switching loss 3</td>
<td>3</td>
<td>3.1</td>
<td>2.4</td>
<td>2.4</td>
</tr>
<tr>
<td>Congestion (c)</td>
<td>2</td>
<td>2</td>
<td>1.7</td>
<td>2.0</td>
</tr>
<tr>
<td>(d)</td>
<td>7</td>
<td>4.0</td>
<td>3.9</td>
<td>3.9</td>
</tr>
<tr>
<td>(e)</td>
<td>10</td>
<td>3.9</td>
<td>3.8</td>
<td>2.2</td>
</tr>
</tbody>
</table>

(Source: Telecom Australia, Service Performance 1985/86 (a) and 1986/87 (b) Network Management Division, Network Engineering Department (H.Q.). Melbourne, 1986, pp.37-43.)

(c) 8am-6pm   (d) 6pm-9pm   (e) 9pm-10pm

The quality of services provided is high and the fact that 99% of customers have automatic services (Manual services decreases from 146,000 in 1975 to 6,291 in June 1987 Australia-wide) provides a level of quality second to none.

ii) Speed of service

This measure is an important one, since in a competitive environment, it makes the difference between a business success and failure, prices being equal. It was noted previously that business customers receive preferential treatment (translated in a higher rental). For residential customers the targets are as follow:
Service installation - from the issue of the order to the installation date- is set at 10 working days. In 1984/85, 83% of new connections were connected within the target time, 82% in 85/86 and 87% in 86/87. While by international comparison, this is slow, it must be noted that telephone lines are already included in many houses and flats in the USA, in a similar fashion as electricity or gas are. This was not the case in Australia where a separate application is required. Also given that the cost of the service is not directly recovered from the customer, customers in remote areas have to wait for funds to become available. If however they require a service before the time quoted to them (which may be months or years) they have to pay the full cost.

iii) Customer perceptions

Telecom introduced in 1987 a national customer survey programme to measure Telecom Customers Attitude to Services (TELCATS). The national figures were that 87% of customers were satisfied with telephone service installation (Target was 80%), 79% satisfied with new service connections (Target was 75%) and 75% satisfied with fault repair (Target 75%). In promptly answering queries, 82% were satisfied with Directory assistance (Target 85%), 82% with Telephone service difficulties and faults (Target 90%)82

Partial figures for Queensland were available for customers' satisfaction regarding their trunk calls (Tevget$<5%).

<table>
<thead>
<tr>
<th>Table 4.8</th>
<th>Metro Central</th>
<th>Mackay</th>
<th>91%</th>
<th>Townsville 75%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metro North</td>
<td>91%</td>
<td>Maryborough</td>
<td>79%</td>
<td>Queensland 86%</td>
</tr>
<tr>
<td>Metro South</td>
<td>86%</td>
<td>Nambour</td>
<td>81%</td>
<td>Queensland 86%</td>
</tr>
<tr>
<td>Cairns</td>
<td>81%</td>
<td>Rockhampton</td>
<td>91%</td>
<td></td>
</tr>
<tr>
<td>Gold-Coast</td>
<td>86%</td>
<td>Roma</td>
<td>87%</td>
<td></td>
</tr>
<tr>
<td>Ipswich</td>
<td>86%</td>
<td>Toowoomba</td>
<td>82%</td>
<td></td>
</tr>
</tbody>
</table>

(Source: TELCAT 1988)

82. TELECOM, Annual Report 1987/88, p. 87
The only comparison is against the targets set internally by the Commission. They suggest that no substantial difference in quality exist between Telecom and other firms of similar size. The fact that Telecom is mainly directed towards improving the network rather than developing its resources towards customer satisfaction was obviously still the major influence in 1987/88. No comparison, however can be made with 1975/76. Even if it were possible, the perception of quality and the expectations in the community have certainly changed. In a competitive environment, the level of satisfaction would have to be increased. No private competitive firm would be able to survive with over 10% of its customers dissatisfied.
V. IMPACT OF THE MAY 1987 STATEMENT

5.1 Introduction

The May 1987 Statement by the Federal Treasurer has implications for Telecom and the telecommunications industry in Australia unprecedented in this country. The policy is to free Telecom of government restraints and let competitive firms enter the market in order to benefit the public. While this policy is grounded in the theory that competition will benefit the consumer, many problems exist and have not been clearly answered. It is important to realise that this liberalisation of the industry did not emerge suddenly. It is basically the result of a serie of Public Inquiries into the industry.

5.2 Public Inquiries

The 1986 public Inquiry into Telecom is the latest of a series of public enquiries beginning in 1974 into the provision of Telecommunications in this country. In 1974, the Vernon Inquiry resulted in the split into the Postal and Telecommunications Commissions. Other enquiries such as the 1978 Task Force Report on the domestic communication satellite system prompted by the Bond Report recommended the development of a satellite system operated by a body independent of Telecom. This recommendation confirmed in 1979 resulted in AUSSAT, a company originally 51% government owned which became 49% publicly owned on the direction of the Minister for Communications. This policy decision represented the first major break in Telecom’s monopoly. However Telecom owns 25% of the company.


In 1982, two more inquiries were conducted including one into Cable and Subscription Television and the other chaired by Mr. King into the roles of Telecom and the private sector in providing telecommunications services and terminal equipment. This report was later included into the Davidson Inquiry. The purpose of the latter was to examine the extent to which the private sector could be more widely involved in telecommunications. The Davidson Inquiry is especially important because its purpose was to create a new framework for the development of Australia's telecommunication industry and this in turn has influenced the growth of many information industries such as computer services, newspaper and television networks.

5.3 Independent Regulator and Re-regulations

A major feature of the 1980's has been what has been termed a re-regulation of the industry rather than deregulation. While a regulatory and independant body existed in the United-States since 1934, no such bodies existed in other western nations. However the United-Kingdom at the same time as creating its duopoly created also OFTEL, Japan created MPT and Australia is going to have AUSTEL. In the United-States, MACAVOY and ROBINSON (1985) point out that:

"Following divestiture, the telecommunications industry has required almost constant regulatory oversight by the judgment court. This oversight is itself a form of government intervention, and is


85. BIE, op. cit. p.41
inimical to the sought-after 'competitive' and 'deregulated' telephone industry which divestiture was supposed to allow".

Regulations and liberalisation of the industry seems paradoxical. If the industry is one where competition is beneficial to the public, why then does the industry need to be regulated? and how different in nature are the new regulations from the old ones? Finally, how will these regulations affect the allocation of resources in the industry?

In a monopoly environment such as the one existing in Australia, regulations exist not only to protect the monopoly from potential entrants but to make sure that monopoly profits are not made. Therefore, Telecom cannot set its tariffs, but must go to the Prices Surveillance Authority (PSA) and argues its case for tariff change. In turn, part of the profits earned are being used to cross-subsidise the unprofitable services, achieving in this way the objective of uniform affordable services (universal service).

Re-regulation covers a different philosophy. In the United-States, the long-distance market is highly competitive but the local market is largely monopolised and heavily regulated. Hence the local networks could subsidise their operations if there were no regulations excluding them from the long-distance market.

Furthermore, the role of regulation is to protect the new entrants from the dominant carrier:

An efficiently run Telecom network - which is what competition is turning AT&T into - ought to exhibit continuously increasing return to scale. Governments can interfere by, for example, insisting that a dominant carrier charges the same for a call along a busy route as for one in the middle of nowhere. But they cannot alter the basic economies of an industry which has enormous start-up costs and diminishing marginal costs especially with new technology".


87. The Economist, October 17, 1987 p.12
Therefore liberalisation has been designed to foster efficiency by threatening entry by resale carriers on the dominant carriers including the previous monopoly carrier. In the absence of an independent regulatory authority, the old carriers could force out other carriers by prohibiting access or by overpricing access to the PSTN.

In the USA, Japan, the UK, and in Australia, liberalisation has not come to term with the conflict of the efficiency objective and the universal service objective. BT and NTT in Japan have kept these responsibilities while in Australia, Telecom will keep providing these services to remote and rural areas.

In the two former countries, the prices have not changed from previous tariffs. In the United-States, the long-distances carriers pay high access charges to local companies, thereby maintaining a cross-subsidy from long-distance to local traffic.

In Australia, it seems that a full-cost approach to such services may be adopted for customers who want their basic services quickly. However, at costs of $10,000 plus per service, it is unlikely that the demand will be high and any threat from the government to liberalise the industry to such an extent would suffer heavy political backslash. Under these circumstances, liberalisation on long-distances means that rural areas might have to wait even longer than at present to have a telephone service.

5.4 Effects of cross-subsidy withdrawal and imposition of taxes

An ORANI model of the impact of the withdrawal of the cross-subsidy and the imposition of taxes on Telecom show the negative effects of liberalisation on the

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agro-industries, education (long-distance education, access to information, libraries), tourism industry (restaurants, hotels) and retail trades. The manufacturing sector would benefit as well as the majority of the population living in the cities. Employment variations are negligible. With the introduction of a production tax on Telecom, the macro effects becomes non-negligible as shown in the ORANI model:

Table 5.1
Macro effects of a $100m (1980/81) production tax

<table>
<thead>
<tr>
<th>Variable</th>
<th>Projected Change</th>
<th>Projected Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private sector Income</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disposable Labour Income</td>
<td>-0.0557</td>
<td>-46.376</td>
</tr>
<tr>
<td>Disposable Non-Labour Income</td>
<td>-0.0172</td>
<td>-41.505</td>
</tr>
<tr>
<td>Private sector expenditure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Private Consumption</td>
<td>-0.0306</td>
<td>-37.525</td>
</tr>
<tr>
<td>Private Investment</td>
<td>-0.0470</td>
<td>-14.827</td>
</tr>
<tr>
<td>International Trade</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Export Revenue</td>
<td>-0.0709</td>
<td>-22.085</td>
</tr>
<tr>
<td>Import expenditure</td>
<td>-0.0553</td>
<td>-10.328</td>
</tr>
<tr>
<td>Balance of Trade</td>
<td>0.1891</td>
<td>5.760</td>
</tr>
<tr>
<td>Gross Domestic Product</td>
<td>-0.0140</td>
<td>-28.518</td>
</tr>
<tr>
<td>Employment (persons)</td>
<td>-0.1221</td>
<td>-28.518</td>
</tr>
</tbody>
</table>

(Source: BLAMPIER C.W., op. cit. p. 25)

For the State of Queensland, the economic losses would be worse since the state economy relies on farm products and tourism for its development. Communications play a major part in this process. As shown in appendix 2, only 4 districts (Metro includes 3 districts) are profitable mainly through inter-capital traffic.

5.5 Necessity of Regulations

ii) Sovereignty Issues

Those are not explicitly stated in the policies which have been mentioned, although security is often quoted as an argument for the existence of regulations of the
industry. Countries such as Canada explicitly state this factor as a major issue.

These issues have also economic implications. Except OTC, the Australian international carrier, the potential competition is foreign. Even if security is not a major issue, the difficulties in controlling trans-border data flows are: who controls the networks also controls the flows of information. Although many authors try to distinguish both, the two problems must be answered simultaneously since the suppliers of network and of informations are often the same. In other words, while in Australia, the revenue come from rentals and usage, in a private and de-regulated network, the main source of revenue would come from provision and transfer of information. In money terms, the loss can be very large for the nation.

Finally, regulations are needed to have an homogeneous standard in the networks for compatibility, consumers' safety and in the medium term to stop the major carrier from undercutting its rivals.

5.4 Is Telecom in 1987 and beyond a Natural Monopoly?

It is not clear however if a natural monopoly such as the telecommunications industry should serve the whole nation. It is argued by WELLENİUS (1979) that while

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89. Bill C-16) outlining the Canadian Government's policy objectives with respect to telecommunications states:

"It is hereby declared that a) efficient telecommunications systems are essential to the sovereignty and integrity of Canada, and telecommunications services and production resources should be developed and administered so as to safeguard, enrich and strengthen the cultural, political, social and economic fabric of Canada.
(Underlining added)

90. Australia is already a net debtor in communications equipment. If Australia cannot control the flow of information (which is costly—Refer to the now vast literature dealing with the Economics of Information) the national deficit will worsen.
economies of scale do exist in telecommunications, they apply most clearly to the situation where there is increasing intensity of operation within bounded geographical areas, or increasing traffic on specific routes rather than expand geographical areas. In fact, there is no economic rationale for a single firm to own all exchanges, consumers' premises equipment and all traffic routes. Under these circumstances, one cannot say for certain if more than one firm would operate at higher costs than one if they operate in different areas or have different responsibility.

Furthermore, while the number of firms who wish to enter the profitable markets of telecommunications suggest that the industry is highly contestable, many factors suggest that in fact it is not. It is generally omitted by these firms that the higher tariffs of long-distance calls exist because of the need to cross-subsidise short-distance and local calls. In a de-regularised industry, Telecom would bring these tariffs down to a point which would stop most competitors. Secondly, it is recognised that with the introduction of ISDN, firms will have any services they desire. Because such services will be provided on demand, excess capacity will not exist. It is this flexibility which makes KERR and BOHACEK writes:

"Although the use of private data networks gives business users a great deal of control and capacity, these networks represent rigid installations that do not provide the opportunity to change, reconfigure or add new stations in an easy or cost-efficient way. ISDN will satisfy much of these data needs through the PSTN while providing users with true flexibility at a tremendous annual cost savings. The immediate benefits of ISDN applied to business are increased flexibility and considerable equipment and operating costs savings." 


92. KERR T.J. and BOHACEK P.K., "The New Business Opportunities offered by Universal Information Services", paper presented at Integrated Services
P.5 Re-structuration of Telecom

The response to this challenge has been to re-structure the organisation along customer and geographical lines. However, Government policies on tariffs of local and trunk calls have not changed and the policy of cross-subsidisation is maintained. With pressures to decrease long distance tariffs, this subsidy will have to be found as follows: through reducing overall costs, by increasing short-distance and local calls, or by aligning the prices of connection of country customers more closely to their installation costs.

The major short-term advantages (3 to 5 years) will be that the amount of cross-subsidy will be more easily identified.

The second is that the level of service provided will be more "in tune" with what a particular class of customers wants and therefore increase satisfaction level. It is unlikely that network de-regulations will take place. If it does, new set of re-gulations will be needed to compel firms to supply low density areas at a "fair" price, which undoubtly will be cross-subsidisation.

91 (cont.) Digital Network (ISDN) Symposyum, Sydney, March 1987. Also refer to: HARRISON P., "ISDN for corporate branch office", ibid. 1987, he writes: "...leased dedicated data and voice lines in a corporate network can be replaced by switched ISDN connections, giving rise to the concept of the ISDN virtual private network. Such a network can be seen as the next logical step in the evolution of private networks. In effect, it will place ISDN public network resources fully at the disposal of organisations, allowing them to use the resources in any manner that they desire, with all the security they desire, without the overheads and responsibilities of actually owning those resources."
VI. CONCLUSION

The aim of this thesis was to examine how resources were allocated within Telecom in Queensland from 1975 till 1987. As anticipated, the lack of data and confidentiality have compelled us to take a direction which is more qualitative than quantitative.

The allocation of funds to the State is not only determined by what is available but by sets of constraints and regulations. Those compels Telecom to provide a "universal service at a reasonable price".

While Telecom has almost achieved this objective, the diversion of funds from areas where better returns would have been made, meant that the large majority of Australians and consumers living in metropolitan areas had to forego cheaper basic services, have to wait longer to be connected and were not provided with many advanced services available overseas. This has created a level of unsatisfaction which would be unbearable in a private firm working in a competitive environment.

It has been shown, however that density is a factor affecting expenditures in Queensland and only internal political factors can explain why expenditures have been allocated in the same proportion years after years. The fact that density was a factor affecting productivity runs contrary to previous studies made at an international level. This result suggests that the type of technology and the stage of development of the network is an essential element in productivity upon which expenditures are funded. Ignored in these studies are institutional factors (eg: hours worked per employee) and sub-contracting.

Besides universal services, other objectives such as automatic services and a degree of quality similar to all means that international comparisons become even more hazardous. Against these objectives, Telecom has fared
relatively well, although the quality of customer services would require some improvements if de-regulation of the network had to occur.

If de-regulation was to occur, prices of local and short-distance calls would increase substantially. The first impact would be a decrease of the level of penetration and put the poorest consumers out of reach of a basic service as shown in the Canadian study.

To be cross-subsidy free would not affect the major macro-economic variables drastically (eg: employment in rural sector or trade). The impact would be substantially felt by the rural sector and the agro-industries (agro-industries) which rely upon this sector.

A production tax, however would be felt at every level including trade.

Since the May Economic Statement, the government has not come to grisp with the dual objectives of universal service and de-regulation. If overseas experience is of any guide, the creation of an independant arbitrator will only help in creating new sets of regulations. As it stands, Telecom needs to cross-subsidise at many levels.

The extent of the losses made in low density areas is only one level of cross-subsidisation. Recent studies in the United-States show that these cross-subsidies keep existing even after de-regulation in the short-distance and local calls.

The point made by many authors that the industry is contestable is a short-sighted one. Economies of scale exist at a network level and the phase the industry is in Australia is only a transitory one. New comers have the advantage of introducing the latest and cheapest technology and their main purpose is not to sell calls but information which add value to the private network.

At this point of time, only businesses have realised the
importance of having access quickly to information and disseminating it.

With the advent of ISDN, such cost advantage will disappear. Private networks are essentially rigid while the ISDN is not; it can supply services on demand and integrate voice, data and images. If the network was privatised, the lower price of calls which would arise (although the British experience suggests the contrary) may be outweighed by the price of inter-connections between networks. This is certainly one of the first elements which will have to be regulated.

The re-structure of Telecom has for main object the improvement of customer services and for our purpose to try to find out the exact level of cross-subsidy. This is necessary in order to find what the impact of network de-regulation would be. Furthermore, the people of Australia would be able to make a choice on how the losses have to be funded.

A better alternative is to make unprofitable areas profitable. To achieve this goal Telecom should not rely on trunk calls for its main source of revenue but to provide the means to consumers to have access to information they need. Programs to educate the consumer

92. This source of revenue will in real terms decrease because of competitive and political pressures with the consequence that it will become more difficult to cross-subsidise unprofitable areas. While other services/products will increase, their prices are set by the level of competition, not by the PSA. The cost of the network can only be covered by usage, it does not matter what services are provided, the losses occurring in country districts are caused by the fact that usage do not cover the capital costs plus maintenance costs. To increase usage and make profits will only be determined by the level of services and information that country consumers wants. This is a step which will require investing more capital in regional centers and this runs against business conservatism. This step was made successfully in France with train transportation which for decades run at a loss. Large capital investments were made so that the trains became more comfortable, quicker and more reliable and they probably one of the few government transport in the world which generates profits.
in using computer technology and give them access to that information (probably on the same line than France did with Minitel) are crucial if Telecom wants to be profitable in rural areas. (ie: stocks, crops and educational information are examples of relevant information needed in these areas). Since the basic network already exists in many regional centres, this would increased dramatically the level of profitability of the districts and network usage. Consumer education is however necessary to overcome the fear of using computer technology and to demonstrate the advantages of possessing timely information.

** ** **
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IV MEDIA

APPENDICES

**  **  **
The current telecommunications industry in the western world, which includes Australia, experiences in reverse what occurred from the 1880's to 1912 in the United-Kingdom. There was then an emergence of parallel technologies developed by many different private firms primarily the Bell Telephone Co. and the Edison Telephone Co.. This resulted in incompatibility of standards and in parallel networks being built. At the height of competition, municipalities began to acquire their own exchanges but they lacked the funds to up-date them with improved technology. Eventually bankruptcy occurred or whole exchanges were scrapped by their new owners; for example the Glasgow Telephone Co.. ROBERTSON describes these inefficiencies in provision of a telecommunication service to the customer in his "History of the Telecommunications industry in Britain". These inefficiencies led in 1912 to the take-over of the industry by the Postmaster General.

Some of these inefficiencies were not directly caused by competition, but by the system of licences which were controlled by the Postmaster General and the virtual monopoly they had on the wayleaves. The Postmaster was reluctant to grant licences because of the loss of revenue in the telegraph services as the telephone was introduced by private firms.

The first reaction of the Post Office had been to point out the illegality of the provision of services by private firms under the Acts governing the conditions of Post Office control of the Telegraph system (Act of 1863, Act of 1868 and Act of 1869). This attempt failed and the Post Office began to acquire their own telephone exchanges. For a short-time, they had a monopoly on trunk lines although at that time most calls were local calls and they were to pay 10% royalties to the private companies.

In 1898 the municipalities were granted licences, their victory, however, was short-lived because of bad planning and bad management. At this stage, private firms and the Post Office related the price to the cost of provision, for example the Post Office had a tariff which was structured around distances from the local exchange by half-mile increments. Municipalities, however, began charging every one the same flat rate, 5 guineas a year for ordinary unlimited services, 4 guineas a year for two party lines and 3 guineas for four party lines. They made insufficient allowance for depreciation. As a result, important municipalities such as the Glasgow Telephone Corporation failed within 5 years and the Tunbridge Wells Municipal Telephone system was scrapped after being sold. These two examples show the inefficiencies caused by the competition and the licence system. There were no telecommunication policies or planning. This state of affairs changed in 1901, when the municipal networks became merged with the Post Office's.
The National Telephone Company (NTC) which itself was the result of a merger between the Bell and Edison companies a few years earlier remained and an agreement between the NTC and the PostMaster eventuated in 18/01/1901. They shared the market to avoid duplication and wastage. They also agreed to charge the same rate with free and constant intercommunications between them. (ROBERTSON, P.78).

This co-operation was criticised by the municipalities on the ground that it was a virtual monopoly, although competition did exist in the quality of services rendered and the speed with which connections were established. The major advantage of the Post Office during this period was the way-leaves. The government however yielded under pressure and the assets of the National Telephone Co. were bought by the Post Office at the end of the licence expiration.

It is worth noticing that although mention of the public interest was made, no effort was made to define what the term meant and why it was in the public interest. Even in the period 1924-1928, the Post Office had to advertise heavily to gain rural customers. The main arguments put forward by the Post Office administrators were that telephone expansion raised revenue, increase employment and improved communications means amongst others.

Also worth noting is that when the networks were competitive (ie: banks network, insurance network etc...) the services were not only to provide a means to communicate between each others, but special services were also introduced, for example one could listen to a whole concert on tele- phones. These services disappeared when the Post Office monopoly began.

### APPENDIX 3: District Profitability

#### 1984/85

<table>
<thead>
<tr>
<th>District</th>
<th>R ($000)</th>
<th>E ($000)</th>
<th>P/L ($000)</th>
<th>SID (000's)</th>
<th>P/L SID</th>
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<td>32,278</td>
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#### 1985/86

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<th>P/L ($000)</th>
<th>SID (000's)</th>
<th>P/L SID</th>
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#### 1986/87

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<th>P/L ($000)</th>
<th>SID (000's)</th>
<th>P/L SID</th>
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<td>916,026</td>
<td>430</td>
<td>1,013</td>
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- **R** = Total revenue of the district
- **E** = Total expenditure
- **P/L** = Total Profit or Total Loss
- **P/L SID** = Profit or Loss per service
- **SID** = Services in operation

S.T.D. calls are charged by the customer's meter registering one Local Call Fee for each specified number of seconds. The time for each meter registration depends on the distance called, and the day and time.

<table>
<thead>
<tr>
<th>Effective Date</th>
<th>Local Call Fee</th>
<th>Number of seconds allowed for each local call registration (Day Rate)</th>
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<tbody>
<tr>
<td>1. 9.75</td>
<td>90</td>
<td>0-50k 50-85k 85-165k 165-325k 325-485k 485-645k 645k+</td>
</tr>
<tr>
<td>26.11.78</td>
<td>90</td>
<td>36     36 12 9 8 6</td>
</tr>
<tr>
<td>4. 5.80</td>
<td>90</td>
<td>45     20 12 9 8 6</td>
</tr>
<tr>
<td>26. 4.81</td>
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<td>45     20 12 9 8 6</td>
</tr>
<tr>
<td>25. 1.82</td>
<td>90</td>
<td>45     24 15 12 10 9</td>
</tr>
<tr>
<td>23. 1.83</td>
<td>90</td>
<td>45     24 18 12 7.5 6</td>
</tr>
<tr>
<td>1.10.83</td>
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<td>45     27 165-745k</td>
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<tr>
<td>1. 2.85</td>
<td>100</td>
<td>50     30 20</td>
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<tr>
<td>1. 8.86</td>
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<td>54     36 27</td>
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<tr>
<td>1. 9.87</td>
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<td>54     36 28.5</td>
</tr>
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</table>

Calls are charged in multiples of the Local Call Fee. Different rates apply from coin-operated telephones.

*Day Rate:
8.00 am - 6.00 pm, Mon-Sun, prior to 15.1.78
8.00 am - 6.00 pm, Mon-Sat, 15.1.78 - 25.4.81
8.00 am - 12.30pm, 1.30 pm - 6.00 pm, Mon-Sat, 26.4.81 - 31.8.87
8.00 am - 6.00 pm, Mon-Sat, from 1.9.87.
Discounted rates apply at other times.

PUBLIC RELATIONS
BRISBANE
December 1987
Appendix 4

Diagram: Total Satellite Costs vs Total DRCS Costs
(Satellite costs based on optimum per customer cost as shown by the lowest point on the graph in the diagram.)
COST PER CUSTOMER (SK)

INCLUDES $15K FOR BASIC EARTH STATION ELECTRONICS
INCLUDES $25K FOR BASIC EARTH STATION ELECTRONICS

NUMBER OF CUSTOMERS PER TRANSPONDER

DIAGRAM: SATELLITE COSTS PER CUSTOMER
TOTAL STATE REVENUE DISTRIBUTION

- STD 38.0%
- Local 19.0%
- Telephone Rental 12.2%
- Connection Fee 2.6%
- 'The Rest' 28.1%

STD REVENUE TIME PROPORTIONS

- DAY 68.6%
- ECONOMY 11.8%
- NIGHT 19.6%

STD REVENUE DISTANCE PROPORTIONS

- 'M' Rate 14.6%
- 'O' Rate 31.1%
- 'F' Rate 9.8%
- 'A' Rate 2.0%
- 'C' Rate 1.1%
- 'Y' Rate 41.5%