VALUE ADDED SERVICES: APPLICATIONS, ACCEPTABILITY AND POLICIES — THE CASE OF TELECONFERENCING*

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Recent technological developments have fused computer and telecommunications technologies together creating the scope for a wider and more diversified array of communication services. The new services rising out of this integration are called value-added services (VAS) and are offered on value-added networks (VAN). One such new offering is teleconferencing which involves multipoint simultaneous or store and forward connect facilities using audio, video, computer or graphic support systems. This paper reports on some results collected from a recent study on the applications and acceptability of teleconferencing as a new value-added service. It compares views recently collected from the United States and explores the actors that will determine acceptability and take-up of the new service offering. Some attention is also paid to new regulator provisions and pricing practices for the VAS and contends that teleconferencing may well be a test case to determine the boundary between old and new technologies.

Keywords: Teleconferencing, technology, regulation, telecommunications policy, market boundaries, diffusion.

In July 1987 the Hawke Labor government was returned to office on a platform of microeconomic reform. One of the first measures taken was for the then Minister for Transport and Communication, the Hon. Senator Gareth Evans, to announce in a ministerial statement in May 1988 a restructuring of the Australian telecommunications industry.[1] The industry was to be deregulated and opened up to more competitive pressures from the market place. A new regulatory environment between the government and domestic carriers was to be created along similar lines to that in the UK, USA and Canada; a regulatory authority, AUSTEL was to be established that would oversee the enforcement of technical regulations, the protection of carriers' monopolies, specification of product boundaries, and the protection of consumer rights against misuse of the carriers'monopoly powers.

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New product boundaries were to be defined, distinguishing between new value-added services and basic network connections. Telecom, OTC and Aussat's monopoly domains for their respective networks were to be preserved. In particular, Telecom's monopoly of the provision of the first telephone would be safeguarded for the first three years and would be exempted from infringement of the *Trade Practices Act 1974* for that period. In return, Telecom would be required to fulfil its community service obligations (CSO) of providing uniform access to standard telephone services on an equitable basis and at affordable prices.

The new environment would encourage existing carriers and new equipment suppliers to cope with burgeoning technological pressures and to respond to commercial imperatives arising from the internationalisation of communication services, the diversification of product attachments and other recent global developments. Moreover, the integration of computer and communications transmission technologies was to be acknowledged as would be new value-added services (VAS) and value-added networks (VAN). Provision of these products will redraw conventional boundaries of basic products and services.

Despite the strong conviction of the government to implement new regulatory guidelines for the Australian telecommunications industry, it would seem inevitable that preservation of Telecom's monopoly of its basic network facility will continue to restrict access through interconnection of other public (Aussat) and private (e.g., Australian Associated Press (AAP)) carriers. Substantial efficiency gains that could have been achieved from the deregulation most certainly will now be diluted.

While it is well acknowledged that the industry had to respond to changing pressures and new opportunities emerging from business requirements, the balance between public and private networking is not likely to change to a large extent in the near future. New technologies create the scope to diversify the range of services and proliferate the types of equipment that will be competitive in an increasingly integrated world market. Most of the provisions in the new deregulated (re-regulated) framework favour the further technical advancement and commercial market penetration by Telecom Australia rather than competing carriers. The basic telephone network has been preserved, and the opportunity for offering new value-added services through the public switched telephone network (PSTN) has been extended to Telecom as has the installation of private value-added networks. Notwithstanding these concessions, these two new service offerings are also available from competitive suppliers of new private networks, but lack the advantage of being able to integrate such services or networks with the public switched telephone network, giving Telecom a distinct advantage in these service offerings.

Technological developments have fused computer and communication switching/transmission technologies together thus extending the accepted

boundaries of conventional analogue voice transmission makets. Digitalisation and the development of Integrated Services Digital Network (ISDN) have widened the scope and diversification of product availability to include voice, data text and video transmissions in either broad or narrow band format with exceptionally high quality output compared to analogue technology. It is the outstanding developments of digitalisation, computer and communication technology fusion together with the interfacing and intermixing of a number of transmission formats that has enhanced the network and paved the way for value-added services and value-added networks. Teleconferencing services can be considered as one of the newly defined value-added services.

VAS AND VANS

The ministerial statement describes a value-added telecommunications service as " . . . one delivered or accessed by telecommunication means and involving the addition of significant value to the basic switching and transmission functions . . . "[2] Some of the more acknowledged types of VAS include secretarial and personal answering services, information providing services such as recorded messages, electronic mail and electronic databases. In all but the first, interface with customer premises computer equipment is necessary. VAS are distinguished as operating beyond a simple manual or automated telephone service, requiring an integration of telecommunication and computer technology and application. Normally, VAS go beyond the simple analogue transmission system, transgressing the barriers of digitalisation, ISDN, and electronic computerisation, facilitating a wider and growing demand for information services that store, forward, process, retrieve and disseminate information. In fact, VAS are taking the Australian economy into a truly information age.

Any service that operates at the intersection of telecommunications and computer developments adding value to the public voice or data network or enhancing the diversity of product availability and application, can be considered as a value-added service. Such services can be supplied through either public or private networks. Needless to say, the Telecom controlled public switched telephone system is the largest network available and other private carriers or corporate network operators desirous of interconnection of links outside their own networks must seek interconnection facilities (private leased lines) from Telecom.

Most notably, services such as manual secretarial and personalised answering devices, information services, information processing services, transaction services for the banking sector and time delay voice and text message store and forward services are classified as VAS. Their common feature is that apart from the simple manual voice service all require computer transmission interfacing for effective output. The value-added component of the service is endemic in this new interfacing process, without which no new product diversification would be possible.

Such new technology and interfacing has added teleconferencing services to the VAS list. Before the introduction of computer equipment and software packaging, teleconferencing was offered as an operator assisted service where all audio teleconferencing lines were manually linked into a network for private conferencing on the public network. Two-way audio and either two or one-way video conferencing was arranged mainly for corporate customers between set studio locations in Sydney and Melbourne. With the availability of computer software and the integration of computer and communication technologies, teleconferencing has shifted across the product boundary which separates reserved standard switched voice interconnections of callers using the public switched telephone system and that of new value-added service products.[3]

Having made this transition, teleconferencing as a VAS theoretically faces effective competition from other suppliers of teleconferencing services, in particular, Aussat and AAP. To ensure fair and equitable competition in the supply of VAS in the new environment, suppliers other than Telecom have to be guaranteed access to circuits either as permanent or temporary private lines for connection at fair and reasonable rates. The new regulatory authority is responsible for overseeing correct and proper access and pricing procedures for these services.[4]

Teleconferencing as a service can also be offered on private VAN. A value-added network can be defined as a private internal network where the user operates facilities which it has provided on its own account or obtained from an infrastructure provider for its own internal communication needs.[5] These networks are usually integrated, digitalised and switched networks internalised within individual organisations in the corporate sector. Data and voice transmissions are the main traffic carried on the networks through sophisticated computer and transmission technology interfacing. The technological structure of private VAN allows their full gamut to be provided on the system including teletext, electronic mail, PABX, telex, facsimile, digital data services and switched packet services for bulk information which is loaded into 'packets' or groups for transmission to different locations. Teleconferencing services, audio and audio-graphic, are also accessible product lines on these private networks as is video conferencing with computer visual interface available through broadband transmission networks using satellite frequency relay systems. But despite these technological developments advancing the growth possibilities of private networks, the new regulatory environment has given little encouragement for the widespread adoption of such networks due to the difficulties that arise from interconnecting with Telecom's public switched telephone network (PSTN).

Private networks are regulated through Telecom's control and pricing policies of its leased lines to the private networks. Alternative circuitry could be accessed from Aussat but receiving dishes at each location

would be required; alternatively, Telecom leased lines to Aussat's main receiving antennae connecting end-users and the satellite relay switching facility would be necessary. Telecom also restricts the use and type of user of these leased circuits so as to maintain appropriate technical standards for all circuits connecting into the PSTN and to protect its monopoly on reserved traffic. Supposedly, this policy is to ensure that it has the revenue capacity to meet its CSO. Teleconferencing services offered by Telecom using the PSTN are recognised as VAS; the value being added to the public network as it connects with the private VANS.

WHAT IS TELECONFERENCING?

Teleconferencing is a group medium designed to connect a number of people or groups of people at different locations at the same point of time to transfer information by voice data or video image. In its simplest form low level technology is required with a switching system or a bridge, a switch operator for connection, phone lines and receivers either personal or loud speaker telephones. All participants are connected into the bridge manually by the operator to form a grid network using dedicated lines in the PSTN which become private lines for the conference during the period of connection. When all n parties are connected two-way voice communication between all participants results, with every connectee hearing the conversations of the other $n\text{-}1$ connectees. In many respects it is simply an advanced version of an old concept — the party line telephone.

The traditional party line telephone connected a number of subscribers to the same manually operated exchange on the one access line. Each subscriber on the line had a different calling code usually the number of rings on the receiver bell to distinguish which subscriber on the line was to receive the call. There were no measures preventing other subscribers on the line from listening-in on the conversation. In fact, party lines were still quite common in rural Australia up to the early 1970s when a commitment was taken by Telecom to upgrade all services to automatic exchanges and private subscriber access lines. With a number of people listening-in on the line a telephone conference could be said to be in progress.

Today, new technology has reshaped this old product concept and modernized it so that it easily integrates with the sophisticated PSTN or private internal networks to provide facilities and services beyond the simple audio connection. The number of subscribers that can be connected into the conference depends on the technical capacity of the conference bridge and the reliability of the switching equipment at the required telephone exchanges, access lines and customer premise equipment installations. Until recently audio teleconferencing had been restricted in its commercial and educational applications by the technical capacity of the bridge. Only ten subscribers could be connected on a

narrow band two-way voice circuit conference call. Telecom had installed a number of 10C conference bridges with a maximum capacity of ten call ports which required the operator to give assistance in connecting all designated subscribers to the bridge. These audio services could also be complemented by data transmission on the same telephone lines or extra lines provided appropriate receiving and decoding equipment was installed at each station. Much success has been attributed to the 10C bridge as a low-base cost effective technology which has encouraged the introduction and familiarisation of teleconferencing as a value-added service to the public, and more recently, private network subscribers.

In contrast, the new teleconferencing bridge, recently installed by Telecom, has a number of technical features that has changed the very nature of the product. The new bridge is supported and controlled by an advanced computer software package that has expanded the capacity of the bridge manyfold with the potential to connect more than 50 nodes to the network. Several conferences can be convened simultaneously; they can be recorded; automatic disconnection is available; all or any conferee can recall the operator; and conferences can be programmed for automatic connection dispensing with operator-assistance. These are but some of the new features of Telecom's improved teleconferencing service.

In all, this system will have the capacity to provide or support three main types of conferencing activity: audio, video and audio graphic; all of which are merging into a single medium characterised by a motion video signal and desk top facilities requiring transmission capacity of only 112 kilobits per second — the equivalent of two digital phone lines. This level of technology is now becoming available in Australia. Previously, an analogue video signal required the equivalent of 90 megabits per second of frequency space which could only be supplied through the introduction of digitally compressed video through satellite transmission, microwave or optical fibre systems.[6] With the introduction of digitally compressed video through the use of a coder/decoder (codee) signals can now be compressed sufficiently to reduce frequency bandwidth requirements to a mere 1.5 megabits per second or one sixtieth of the capacity previously required to transmit video.

Not only do such developments have implications for the cost per transmission as less frequency is required, but also they alter the balance between the various applications for teleconferencing. More face-to-face meetings, interviews, and consultations will occur rather than audio confirmation and explanation of matters being on conference agenda. In the immediate future, Telecom's new teleconferencing system with its operator assisted controls will be confined to providing audio, audio graphics and computer graphic services — with the last two merging into a single technology using computers which facilitates simultaneous graphic and text being transmitted with audio signals to multi-point

locations. These technologies will govern the breadth, depth and intensity of applications to which this facility will be put.

APPLICATIONS

Base level technologies of the audio and studio-to-studio video type have mainly determined teleconferencing applications in the past while computer and desk top video will pave the way for new and diversified applications in the future. Audio conferencing was used for more day-to-day routine matters, for monthly or even weekly events to consult, explain or seek alternative managerial and educational views; while two-way video conferencing (being much more expensive because of broadband transmission requirements) normally was reserved for special events, *viz.*, an annual address by the managing director or for a guest speaker at a conference or seminar. But whatever the event the generic nature of the activity was always the same — the transfer of information by voice or video to multiple points simultaneously. The applications for which teleconferencing could be utilised depended on multiple point connections. Only in those activities did teleconferencing have a comparative advantage over other product lines in the same technology set. Needless to say, the product in whatever form of delivery is attractive because of its simultaneous spatial distribution connection grid capabilites. It provides an acceptable medium to geographically divided work groups that have to work together. Wherever these characteristics are found potential applications for teleconferencing VAS will also be found.

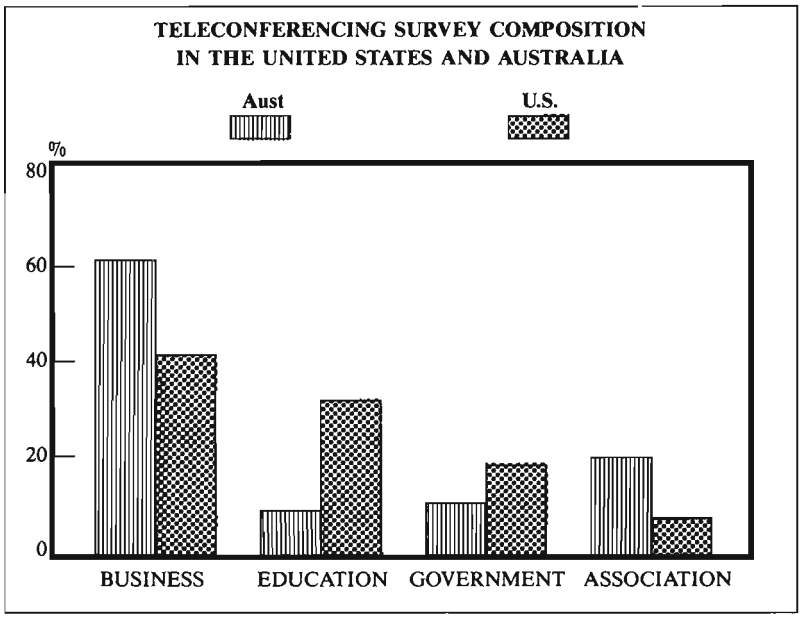
Unlike other technologies which had their origin in business and industry, teleconferencing services arose from the education sector; this was particularly the case in the United States and in Australia. Equipment and technology development has been oriented towards applications in this sector (particlarly at the tertiary end). It is only recently that business began to appreciate the potential of the value-added service and to adopt it for its own requirements.

In 1983 Parker commenced a survey of the teleconference industry in the United States to study the process of acceptance and the various applications for which teleconferencing was being used.[7] His survey focussed on general activity applications which were easily identifiable in any type of organisation, be it business, industry, government, professional or community group. Parker's study extended over an eight year period and covered some 1200 user and non-user cases including the top 100 performing corporations. He identified seven substantive application classifications, *viz.*, work sessions, problem solving, information exchange, project review, project planning, schedule reviews, presentations and meetings. Education institutions, businesses and industry were all represented in the survey. The emphasis on education

is understandable as teleconferencing originated in the education sector, and was adapted to various uses in that sector before shifting to the business sector for commercial application. Forty-one per cent of all persons or groups surveyed by Parker came from business, thirty three per cent from education and a further eighteen per cent from the government sector. While the education sector used the service primarily for formal education and training exercises, business was more interested in using it on a regular basis for project planning, scheduling, review and presentation.

More recently, the author of this article completed a cross-section analysis of teleconferencing services in the Australian market for Telecom Australia.[8] The objective of this study had a slightly different focus to that of the Parker study. Covering a sample size of some 887 cases across a similar classification of organisations (see Figure 1) the objective was to identify communication activity zones and to gauge the level of activity in each zone. Five major activity zones were identified as potential application possibilities for teleconferencing in any organisation. They included: education and staff training, internal administrative functions, problem solving and information sharing, marketing and after sales support, and product procurement.

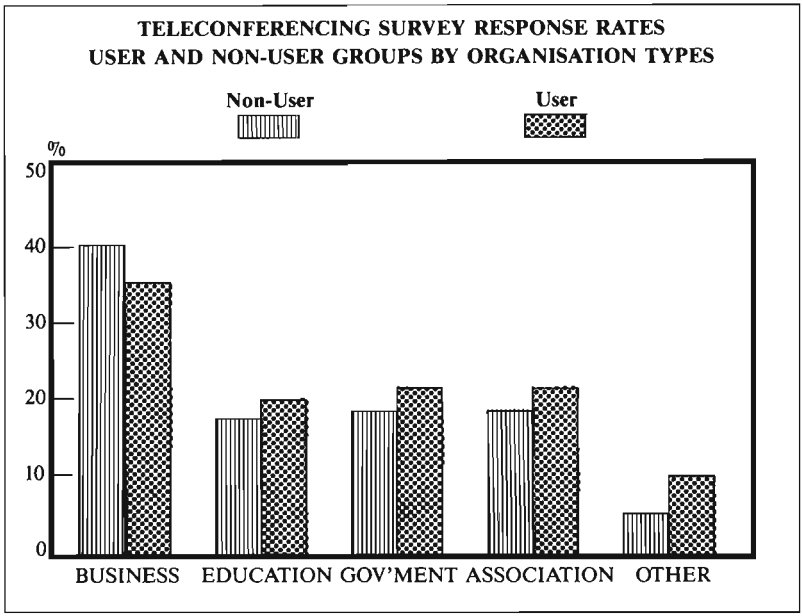
Figure 1



Two separate surveys were used for the Australian study — one for current users called the user group and the other for non-users called

the non-user group. Both these samples were selected from business and government directories on a stratified random basis in order to minimise the likelihood of self-selection distortions. A comparison of the response rates for these two sub-groups helps to verify whether non-users (latent customers) have genuine interest in the product. The response rate composition for the non-user survey indicated 39 per cent of all respondents came from the business sector, 41 per cent from the government and education sectors, and a further 21 per cent from professional associations or community groups. This last category included trade unions and professional bodies. The user group sample (drawn from current audio teleconference customers of Telecom Australia) consisted of 336 cases from which a total of thirty one per cent responded. A comparison of the response rates for these two groups and therefore the interpretative genuine interest level expressed by both user and non-user groups in the Australian study is given in Figure 2 below.[9]

Figure 2



Even though the user group sample was sourced from a separate population of audio-only teleconferencing customers using the PSTN with Telecom operators making the appropriate connections, it is interesting to note from Figure 2 that both users and non-users had a similar response rate pattern for each organisation type.[10] These results suggest that interest in the new technology by each of the classifications

in the non-user group is similar to that expressed by the same units in the user group. Drawing on this comparison one could be confident that application opportunities for the new technology are the same for both user and non-user groups.

Other interesting information sourced from the surveys dealt with respondents' opinions on the suitability of various forms of teleconferencing in each of the identified application activity zones.

Despite the user group surveys producing incomplete results on certain aspects of communication dimensions and applications for the technology, the non-user group results proved to be quite informative.

Table 1
Activity Application and Teleconferencing Complementarity

	Type of Conference			
Activity Application	**Audio** %	**Audio Graphic** %	**Computer Graphic** %	**Video** %
Education and Training	63 (6)	46 (23)	49 (22)	70 (8)
Internal Administration	56 (11)	37 (26)	39 (22)	50 (14)
Information Sharing/Problem Solving	55 (12)	35 (25)	37 (20)	45 (14)
Marketing/Sales Support	36 (10)	27 (19)	28 (18)	40 (13)
Product Procurement	20 (11)	14 (17)	17 (18)	19 (14)

Source: Quayle, 1989.
Note: Bracket entries are 'don't know' responses indicating an uncertainty factor.

Table 1 presents the response pattern of the non-user group to questions relating to the potential application of teleconferencing to the five activity zones. All responses are in percentage terms and measure the number of respondents expressing a positive opinion about the suitability of each of the teleconferencing options complementing current communication practices in each of the five major activity zones. For example, 70 per cent of non-user respondents indicated a positive response to the suitability of video conferencing application in the activity zone of education and training, with 63 per cent of respondents believing audio conferencing had complementary application in this area. Percentages given in brackets represent 'don't know' responses and have been included as an indication of the uncertainty factor for application of the technology.

Clearly, the most highly perceived activity zone for the application of teleconferencing is in the education and training area for conducting formal meetings, seminars, conferences and classroom instruction. Both audio conferencing and video conferencing were perceived as the most complementary with audiographics and computer conferencing regarded less so, recording lower registrations of interest. This response pattern could well be explained by the lack of knowledge of the value-added benefits of the product, the technology and its applications. Conventional base level technologies were possibly more familiar and more easily accepted.

Internal administration and information sharing/problem solving activity zones were also considered as probable application possibilities. Again, video conferencing and audio conferencing were both considered as complementary products for these activity zones with positive response rates in the 45-56 per cent range. Audio graphic and computer conferencing which had a lower 35-39 per cent positive response range were perceived as having less application. Surprisingly, the product was perceived as having a lower acceptability level for application in the marketing/after sales support and product procurement activity zones. A possible explanation for this observation could well be found in the fact that teleconferencing is perceived as an education and training device suitable for the public and education sectors rather than having strong application in the business community.

Notwithstanding these comments the base technologies of simple audio conferencing and conventional studio video conferencing were perceived as the most complementary to current communication modes and as having the widest application prospects in each of the stated activity zones. Interestingly, Parker reported similar trends of new product adoption patterns for teleconferencing in the United States.[11] Seventy-five per cent of all new users of teleconferencing in the United States used base level audio switched PSTN systems for their first teleconference. Another ten per cent followed with audio and graphics; with the remainder using two-way video, one-way video or freeze frame technology. It would therefore seem that familiarity with the technology and an understanding of its capabilities in various applications may well be a sufficient condition for the product to be demanded, suggesting that most of the market will cross the threshold to the new technology only when it is fully acquainted with conventional technological products and processes.

This notion is not new. The literature on the diffusion of new technology and innovation emphasizes that the growth rate in product and process adoption is dependent mainly on prospective profitability and the degree of riskiness.[12] Knowledge and the distance along the learning curve is usually related with the degree of risk; the greater the knowledge of the process or product, the lower the risk. Rogers explains that there are several stages in the adoption process, *viz.*, the awareness stage, the interest stage, the evaluation stage, the trial stage and finally

adoption. It is in the interest stage that ". . . . the cognitive or "knowing" component of behavior is involved . . . which affects where (the adopter) seeks information as well as how he interprets this information about the innovation."[13] Davies points out that

> the depth of this initial information concerning the process will surely be rather limited for many potential adopters. After all, the profitability of adoption for many new processes will vary widely depending on the operating conditions, such as the nature of existing processes, inputs and products of the potential adopter. In which case, it is unlikely that the innovation supplier will possess sufficient knowledge and/or experience to provide each individual customer with immediate detailed information as to how the process will perform given his own peculiar requirements.[14]

Moreover, Davies goes on to explain that "many . . . innovations are technically very sophisticated . . . [and] can only be operated efficiently and balanced with existing plant if managers, staff and workers understand the technical complexities involved."[15] Therefore, profitability or the returns to be gained from adoption may well depend on the technical skills and educational attainment of managers, staff and the labour force. As teleconferencing is an innovation to be used at the managerial and office level adoption would depend on, among other factors, the technical capabilities of the process and the familiarity of the process by staff members.

Evidence presented here appears to run counter to the view held by Alemson[16] and its exponent Lynn Arnold who argued in early work that "revitalisation and expansion of our industries is no longer about incremental steps in improving the old; it is about a whole new philosophy which only becomes possible because of the rapid advances in information technology."[17]

Who is to determine what is old technology or new technology? The process of change and technology adoption emerges from the need to develop technologies for performing certain functions and process. New knowledge is added to old, new systems are grafted onto existing systems, but underlying the total process of change and commercial success from new product adoption is the requirement that users understand the technology and are familiar with its operations. As well, users must be prepared to accept it into various activity zones. Evidence from the current surveys would suggest that potential users of teleconferencing services in the value-added mode are willing to accept the new technology because they have some understanding of the base level technologies required for this service. As already stated, it is under these circumstances t at organisations of all dimensions will cross the threshold to use the new technologies.

CURRENT POLICIES AND NEW DIRECTIONS

Although Telecom has been offering audio teleconferencing services to customers since 1958 through the public switched telephone network

it was never considered as a separate product. The service was never identified as a product different from a normal point to point telephone call, nor were accounts maintained of the revenues and costs in providing the service until the 1980s. Under the new provisions as laid out in the ministerial statement, "Telecom, OTC and Aussat will be required to maintain separate accounting records for their value added services. . . ."[18]

Telecom has already complied with these regulations and is constructing a data base to record revenues collected, the number of calls, the duration of the calls and the number of legs connected into each call. Conventional operator assisted audio teleconference communications has not developed into a large market over recent years. Many people are unaware that the service is available and even fewer are familiar with its application potential. Revenue varied with the number of legs per call, the duration of the call and the geographical location of each node connected. Standard STD subscriber trunk dialling charges applied. However, with the new deregulated framework, pricing practices have changed.

Under the new provisions not only must separate accounts be maintained for VAS, but also "Telecom, OTC and Aussat . . . VAS charges will be required to reflect the standard tariffs for associated use of monopoly facilities and services . . . "[19] Telecom has elected to adopt a two part tariff pricing structure for teleconferencing and is to charge each call a call-connect fee or access fee at a flat rate of $5.00 per link for national connections and $10.00 per link for international connections. Conferences will also have a minimum connect time of 30 minutes. Usage charges have been set at $0.57 per minute per link (the schedule tariff for calls in excess of 745 kms) irrespective of the location and distance from the call-originating node.

There are two implications arising from this new pricing policy. The first is the prospect that the new regulatory authority Austel will use teleconferencing as a test case to challenge irregular pricing practices of VAS by Telecom which do not conform with the new provisions of reflecting standard tariffs for associated use of monopoly facilities and services. Ironically, Telecom is overcharging on the service rather than undercharging which is normal practise to capture the dominant share of the market. Such a challenge, if there is to be one, will determine whether teleconferencing is a value-added service or not and will draw the boundary between the conventional basic network service offerings and those which have value-added attachments. The second implication is for optimal pricing and investment policy. Telecom has recently expanded its teleconferencing VAS capacity by installing a number of the computer controlled bridges; but the prospect for growth in customer numbers and higher demand by existing customers for more audio, audio graphic and computer graphic conferencing could well be stifled by the higher tariff structure, leaving excess capacity on the system.

Teleconferencing, particularly audio conferencing, has always been considered as a base level cost effective technology. Pricing undoubtedly will influence preservation rates for existing customers and take-up rates by new customers. Nevertheless, the take-up rate of value-added teleconferencing services offered on private and public networks in the 1990s could well depend more on the psychographic dimensions of the market and developments in population and business dispersion than on demographic characteristics or pricing. Diffusion and acceptability rates of these new network services will be affected more by customer familiarity with the product, the ease with which it can be operated, and its potential applications rather than the mere fact that these services are available in the market place. For organisations, government departments, community and professional groups to take full advantage of teleconferencing and for them to be convinced that it should be added to their information technology armoury they will have to feel comfortable in operating it and exploring possible further applications for the technology. Being a cost effective base level technology with a comparative advantage for spatially distributed communication requirements will not be enough in a rapidly and diversifying telecommunications technology world.

NOTES AND REFERENCES

1. *Australian telecommunications services: a new framework,* Canberra, Australian Government Publishing Service 1988.
2. *ibid.,* p. 198.
3. Lundin argues that teleconferencing is now considered as a value-added service VAS, particularly in education and training applications. See R. Lundin, 'The domain of teleconferencing and applications in education', in R. Lundin, (ed.), *Australian Teleconferencing Directory,* Brisbane, Brisbane College of Advanced Education, 1989, p. 11.
4. *op. cit.,* p. 74.
5. Ergas describes a value-added network as '. . . . involving largely a telecommunications type of service such as messaging, or one which combines the provision of information with facilities for its transmission . . . '. See H. Ergas, *Telecommunications and the Australian Economy,* Report to the Department of Communications, Canberra, Australian Government Publishing Service, 1986, p. 80.
6. See P. Portway, 'Teleconferencing — its time has come' in R. Lundin, *op. cit.,* 1988.
7. L. Parker, 'Marketing the teleconferencing technology', in R. Lundin, *op.cit.,* 1988.
8. M. Quayle, *Teleconferencing: A Market Evaluation Study in Australia,* A Report to Telecom Australia, December 1989.
9. Notwithstanding the Parker study being a longitudinal analysis and the present paper being cross sectional, some interesting comparisons of the two samples are evident. While the sample sizes are relative to the respective size economies (1200 in the USA, 887 in Australia) structure and composition of the two studies do vary. The Parker study showed a more even distribution in the representation mix of the various organisation classifications than did the Australian study. For consistency reasons, Parker maintained the same compositional mix through time from 1980 to 1989, whereas the Australian study had a stronger focus on business applications as the author believed that developments in technology in the past few years made teleconferencing more attractive to the business community.
10. The two sample groups (user and non-user) were tested for similarity in their

proportions of their response rates to the survey and it was verified that at the 95 per cent confidence level there was no statistical difference in the response rates between the two groups.

11. Parker, *op. cit.,* p. 59.
12. See E. Mansfield, 'Technical change and the rate of imitation', *Econometrica,* 29, October 1961, pp. 741-66; S. Davies, *The Diffusion of Process Innovations,* Cambridge University Press, Cambridge, 1979; P.A. David, *Technical Choice, Innovation and Economic Growth,* Cambridge Press, Cambridge, 1975; P. Stoneman, *Technological Diffusion and the Computer Revolution: the U.K. Experience,* Cambridge University Press, Cambridge, 1976.
13. See E.M. Rogers, *Diffusion of Innovations,* The Free Press, New York, 1967, pp. 82-3.
14. Davies, *op. cit.,* p. 61.
15. *ibid.,* p. 45.
16. M.A. Alemson, 'Teleconferencing', *Prometheus,* 5, 2, December 1987, pp. 386-94.
17. L. Arnold, M.P., 'Government strategy for industry development: the South Australian viewpoint', in A.W. Goldsworthy (ed.), *Technological Change: Impact of Information Technologies,* National Information Technology Council, Canberra, p. 46.
18. *op. cit.,* p. 200.
19. *ibid.*