Charging for Memorable Phone Numbers

Vince Humphries and David Round

The demand for phone numbers is increasing rapidly in Australia, both for private and business use. Mobile phone use is growing fast, and increasing numbers of households are installing a second line for fax and Internet purposes. A phone number allocated to a subscriber is a unique product — a pure private good. In general, no other person or organisation can be assigned the same number at the same time (an exception is Telstra's Homelink numbers, where the same number can be assigned many times, but the separate use by different people can be distinguished through the use of a PIN when calls are made).

Businesses derive marketing and commercial value from an easily remembered phone number. Commercial demand for such phone numbers is escalating, as businesses begin to follow the American phenomenon of offering easily-recalled numbers and phonewords for people to dial. Numbers like 1-800-800-800 or 13-13-13, because of their ease of recall, yield value to their owners. Similarly, numbers that form a combination of letters known as 'phonewords' when dialled on the alphanumeric keypad recommended for worldwide use by the International Telecommunication Union (see Figure 1), have a recognised and therefore valuable meaning.

Figure 1: Alphanumeric Keypad Recommended by ITU

1	2 ABC	3 DEF
4 GHI	5 JKL	6 MNO
7 PQRS	8 TUV	9 WXYZ
0		

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There are three main categories of phonewords¹ which could have commercial value:

- Numbers that correspond to the spelling of a product or service — for example, 040-PLUMBER, 1-300-VIDEOS, or 13-TAXI.
- Numbers that correspond to the spelling of a business name — for example, 1-800-ANSETT.
- Numbers that begin with a 4 (corresponding to the word 'for') and a 2 ('to') and end with a product, service or business name — for example, 1-800-4-LOANS, 1-300-4-PIZZA, 1-900-2-ORDER, or 0403-2-CLEAN.

Such value is found not only in subscriber numbers, but also in access codes and short numbers. Access codes (notably those used as a prefix to another number to override temporarily a customer's pre-selected carriage service provider) and short numbers (typically less than six digits long, such as the Telstra 12456 operator-connect number) are increasingly viewed as having great marketing power (for ease of user familiarity or recall) and, hence, value. This value stems from a belief that certain numbers facilitate differentiation between the products of one carriage service provider and another, or between products of the same provider.

The increasing use of phonewords carries efficiency, revenue and administrative cost implications. An exploratory conceptual analysis of a mechanism for the efficient provision and sale of memorable phone numbers and phonewords at prices which reflect their true commercial value is presented in this paper.

The Current System of Number Allocation and Charging

Carriage service providers (like Telstra, Optus or One.Tel) are allocated subscriber numbers in large blocks by Australia's numbering management authority, the Australian Communications Authority (ACA). They are then free to issue those numbers to any customer. Therein lie two problems.

Increasing demand for numbers to which value is attributed has resulted in these providers demanding more and more blocks of numbers, in the hope that they will secure valuable numbers that can be sold (or in other ways provided) to their customers. Unwanted numbers sit unused in their possession. The introduction in 1997 of an annual charge — payable to the Commonwealth — on non-geographic numbers held by carriage service providers provided some

¹ Use of the ITU recommended keypad is assumed as the standard. Use of non-standard keypads would be problematical to callers, the organisation promoting the phoneword, and the entity receiving the misdialled call.

discouragement for this practice, but only for numbers for less profitable services (such as paging) or for numbers held by smaller carriage service providers. In other cases, applications continue to be submitted periodically to the ACA for allocation of blocks of numbers to meet a requirement from a carriage service provider's customer for a particular number. The ACA is not always successful in identifying the very limited nature of the underlying requirement for numbers in these cases, and allocations of blocks of numbers have been made where it subsequently becomes evident that only one or a very few numbers were genuinely required. Such demand puts an increasing pressure on the remaining blocks of numbers available for distribution, as well as on the administration of these numbers. The current allocation system does not recognise that particular numbers have intrinsic value and it is unresponsive to demands for such numbers. As a result, Australia's numbering resources are being used inefficiently.

Carriage service providers pay an annual charge for each number held on their books. These charges treat all numbers of the same length in the same way and hence they bear no relationship to the value attributed to particular numbers. To date, the charges have been calculated on an opportunity cost approach, based on the number of digits in each number, where the amount of charge varies according to the amount of theoretical numbering resource occupied by a particular number. Any price or other advantage which a carriage service provider can extract from a customer in excess of this mandatory charge is pure profit — it appropriates the scarcity rent which belongs to the Commonwealth as the ultimate owner of phone numbers.

This is not to say that the current charging system fails to recognise that generically, numbers have an intrinsic value. That recognition exists, but the system does not attempt to translate that recognition into higher or lower numbering charges which vary according to the perceived intrinsic value attached to a particular number. Phonewords or numbers which are easily memorable have value to those to whom they have been allocated, as well as to end-users who dial these numbers. In all these circumstances, subscribers may be prepared to pay significantly higher amounts (in the parlance of economists, they might enjoy considerable consumer surplus) than the current numbering charges, the extent of the premium depending on the perceived value of the number.

The practical problem is to get subscribers to reveal their true valuation of the phoneword or number which they seek. If they are to be charged according to this valuation, they will naturally seek to provide a lower valuation. An auction system could be used to derive a market value if a number has a memorable sequence of digits, or if it corresponds to more than one desirable phoneword,² or

² For example, in the US American Express uses 1-800-843-2273, promoted as 1-800-THE-CARD, for its customer service number. It could also spell many other words, including: 1-800-THE-CAPE, 1-800-THE-BASF, 1-800-TIE-CARE, 1-800-THE-BARD and 1-800-THE-ACRE and therefore would likely be desirable to other businesses (see Dame, 1997:1235-6).

if a phoneword corresponds to a valuable generic name like 1-300-VIDEOS. But in the case of a firm or brand name, there is likely to be only one party interested in that phoneword, unless the name or brand is identical to that of other firms. However, speculative bidding, as has occurred with Internet domain names, is probably inevitable as bidders try to secure such a phoneword for eventual resale.

The Current Charging Model for Phone Numbers

Currently, the ACA charges carriage service providers for the numbers they are allocated via a two-part fee — a one-time relatively small application fee designed to achieve administrative cost recovery, and a recurring annual charge. How these providers then distribute the more valuable numbers to their customers, and whether the customers are charged for them, is generally not known to the ACA. One notable exception is Cable and Wireless Optus, which has identified various categories of freephone and local rate numbers depending on their perceived intrinsic value. Information provided in the *Standard Agreement for the Supply of the Optus Total Access Services*, dated 1 January 2000, indicates that monthly charges applicable to these numbers range between \$300 and \$1,000 per month for longer numbers and between \$750 and \$2,500 per month for shorter numbers. Numbers in the most expensive category are allocated to customers whose anticipated annual expenditure on calls to the number will be at least \$1m. In contrast, at least one other carriage service provider appears to believe that it is socially more efficient to promote specific memorable numbers because of the greater chances of misdialling an alphanumeric number, the existence of non-standard keypads, and the extra marketing resources necessary for companies to promote phonewords.

The logic behind the charging model currently employed by the ACA is that the relative amount of charge captures the opportunity foregone in allocating shorter numbers. Telephone switches (except in mobile networks) do not process a call until all the digits expected for a particular number are dialled. For example, a switch waits for all ten digits of a freephone (1-800) number to be dialled before starting to process a call. If the switch began processing after only nine digits were dialled, the longer number would never be called. Hence the opportunity to allocate ten numbers is foregone for each less digit in a number. For example, using a 9-digit number eliminates the capacity to use ten 10-digit numbers in the same number 'space' and so a 9-digit number is charged ten times more than a 10-digit number. This principle can be expressed by the following formula:

$$A_G = A_S \times 10^{(10-L)}$$

where: A_G = amount of charge on a given number.

A_S = pre-determined amount of charge on a 'standard' 10-digit number.

L = length of a given number.

In 1999 the individual number charge levied by the ACA varied from the maximum charge currently permitted under legislation, \$100,000 for any four-digit number (such as override code 1414), to \$5,620 for any 6-digit number (such as local rate number 13-13-13), to 56.2 cents for any 10-digit number (such as freephone number 1-800-062-058). In general, all numbers of the same length were regarded as equal (thus, mobile numbers attract the same charge as 1-800 numbers), and no account was taken of the different values associated with numbers within a given range (thus, the freephone number 1-800-800-800 pays the same charge as 1-800-753-926). The revenue to be collected each year (which is paid into the Treasury) is determined by the Government. For 1998-99, the Government set a revenue target of \$60m.

The Process of Allocating Phone Numbers

Carriage service providers issue numbers to their customers, and they may also retain numbers for their own use. These providers will generally respond commercially to demands from customers for certain numbers. They can deal with such demands by either charging their customers a premium, or by reserving numbers that they can identify as potentially possessing value for their high-revenue customers. The absence of any attempt by the ACA to charge according to a number's intrinsic value gives these numbers the status of a low cost resource to providers, in relation to the revenue that they can secure. These desirable numbers have in effect been acquired by the provider as part of a parcel of numbers, at a certain specific, relatively low average cost determined by the length of these numbers.

Numbers are allocated by the ACA to the carriage service providers in blocks of 100, 1,000, 10,000 or 100,000 numbers, depending on the length of the number. The allocation process involves the provider making an application to the ACA specifying its requirements, usually including an indication of the particular numbers it seeks. The ACA ensures that the proposed use of the numbers sought is in accordance with rules regarding the use of that type of number, and assesses the application against a set of criteria, the key criterion asking whether the allocation would represent an efficient use of the numbers. If two applications are made for the same numbers, the first application submitted will, other factors being equal, receive the numbers.

The growing popularity of phonewords and other numbers with intrinsic value among businesses encourages carriage service providers to apply for the allocation of blocks of numbers that contain specific numbers which they perceive as having value for existing or prospective customers. Where the ACA identifies that the primary purpose of such an application is to meet a demand for one or only a few numbers from that block, rather than being based on the overall level of demand for numbers by customers in general, it will normally be refused.

This simple administrative model of assigning numbers has a number of strengths. It is relatively quick (most allocations are made within a fortnight of

receipt), transparent and fair, as all allocations are made in accordance with a clear and consistent set of rules and on the basis of a 'first-in, first-served' principle. It is not expensive (the application must be accompanied by a fee of \$322 which covers the processing costs), and many numbers can be allocated in the one application.

However, the system possesses a number of weaknesses. It lacks in its response to the value which carriage service providers and customers place on certain numbers, whether subscriber numbers or access codes or short numbers, and is unresponsive to the value which end users place on numbers. This is most frequently revealed in the frustrations expressed by business users about their inability to obtain particular numbers that are not contained in any blocks currently allocated to a carriage service provider.

Change is desirable so that numbers in general can be allocated efficiently from the existing number pool, and so that individual numbers can be issued to the parties that value them most highly. The current allocation system fails to recognise explicitly either market-driven demand for particular numbers or the value inherent in those numbers. Moreover, the current allocation system is not readily able to meet such demands.

Trademarks and Phonewords

A problem that arises from the increasing interest in phonewords is that the ACA, as well as providers, could be caught in the cross-fires of potential trademark disputes, and trademark owners could be subject to potential 'ambush' demands from a third party which has secured the corresponding phoneword. This is because a number which can correspond to a registered trademark could be allocated innocently to a party which does not hold the corresponding trademark rights (and which seeks to make a profit by possessing a phoneword known to be of value to another party). Difficulties for the ACA and trademark holders in identifying the numbers that could be used as a trademark are especially marked because of the multiple translations of a given phone number into phonewords (although there is a website at www.phonespell.org which purports to enable the determination of all alphabetic and alphanumeric translations of a given phone number, using the international standard keypad). This type of problem has already been encountered with Internet domain names³ and with US freephone numbers.

Even if phonewords are excluded from consideration, many companies invest heavily in promotion of their telephone numbers and are readily identifiable by those numbers. Thus, a company which is associated with a particular freephone

³ In April 1999, the World Intellectual Property Organisation (1999) recommended, and subsequently established, a dispute resolution procedure for generic top level domain names (those ending in .com, .org, .edu, etc.). The procedure was used recently to resolve a dispute over the use of 'telstra.org' by an organisation unrelated to Telstra.

number may lose business if a rival obtains and uses a local rate (1-300) number which is identical except for the prefix, or if another firm seeks a phoneword which corresponds to that number. Legal action may be necessary to protect a firm's interests in each case.

Potential Solutions to Problems Associated with Value in Numbers

With few exceptions, numbering plan administrators in most countries use a similar approach to number allocation as the ACA uses in Australia, involving:

- allocation of subscriber numbers in blocks, often very large blocks;
- allocation of numbers only to network operators and sometimes service providers;
- allocation of numbers via a simple administrative model, usually involving an assessment of applications against a set of specific assessment criteria; and
- allocation of numbers on a permanent basis.

There is an annual charge for the continuing use of numbers in Australia — a practice also followed by an increasing number of national numbering plan administrators. However, the discrepancy between the commercial value of certain numbers and the charge imposed on them has several consequences:

- there is an advantage in obtaining the most memorable or meaningful numbers, so that a valuable number will be obtained by the first carriage service provider or the first customer that recognises its value, and not necessarily by the party to which a number is worth most;
- there is some incentive for both providers and customers to obtain greater stocks of numbers than are required for immediate or medium-term use;
- over time, the numbers that remain available for allocation to new carriage service providers (or for new products of existing providers), and for issue by carriage service providers to new customers or to existing customers, will be the less valued numbers;
- the gap between what is paid for a number — whether the payment takes the form of an annual charge imposed on a carriage service provider, or a special number fee imposed on its customers — and what that number is worth means that the holder of a valued number derives a benefit from it in excess (possibly by a lot) of what is paid for it; and
- the gap between what is paid for a number and its worth to its holder means that there is potential for development of a trading market in which the additional value can be realised. If such markets are outside the ACA's influence, these activities could place significant pressures on the management of the numbering resource.

In reviewing ways of better managing the limited numbering resource, the key issues appear to be whether numbers might be more efficiently managed, allocated and used if:

- subscriber numbers were allocated in smaller units;
- customers were eligible for direct allocation of subscriber numbers;
- market-based methods of allocating and charging for numbers were adopted;
- numbers were allocated for a fixed period of time.

Each of these is now considered in turn.⁴ An important factor to remember when addressing these issues is whether, in the pursuit of greater efficiencies in the allocation of numbers, significant additional costs might be incurred such that the changes may not on balance be worthwhile.

Units of Allocation

Numbers are allocated by the ACA in various block sizes. The block size for each type of number is determined on the basis of a range of factors relating to technical constraints, capacity, tariffing factors and practical considerations (see Schwarz-Schilling, 1997 for a discussion of factors that can determine block sizes). Access codes and short numbers are generally allocated as individual numbers. Most subscriber numbers are allocated in blocks of 10,000 numbers, with the major exceptions being:

- short freephone (1-80) and local rate (13) numbers (blocks of 100);
- geographic numbers for use in non-metropolitan areas (blocks of 1,000); and
- mobile numbers and personal numbers (blocks of 100,000).

Inevitably, because of the allocation block size, many carriage service providers find themselves holding stocks of subscriber numbers substantially in excess of the number of active services and expected medium-term demand. Improvements in the efficiency of use of numbers could possibly be achieved by allocating numbers in smaller blocks. For instance, carriage service providers are likely to issue valued numbers to their customers more quickly than numbers with no intrinsic value. In a value-aware market, a 10,000-number block might be stripped quickly of its recognisably valued numbers by astute customers (some of whom may have been waiting for particular numbers to become available). The carriage service provider holding the block may thus find itself holding thousands

⁴ Regulators in other countries are also considering these issues (see, for example, Oftel, 1998 and 1999).

of numbers in which prospective customers have little interest. Smaller number blocks would reduce the size of these number inventories.

Ultimately, the greatest efficiencies in managing the numbering resource would potentially come from allocating individual numbers, although this would depend, obviously, on the costs of implementing this method of allocation. To route calls successfully to the carriage service provider responsible for supply of service on a particular number, telecommunications networks must be able to work out the correct carriage service provider from the called number. This is a relatively expensive process, and it may be easiest to move to such an approach together with the introduction of number portability (see later). The introduction of individual freephone number allocation in the US, Germany and the Netherlands has been aligned closely with the introduction of number portability.⁵

The case for individual number allocation is more straightforward where:

- the implementation of number portability relies on the establishment of a centralised number database;
- the quantity of numbers involved is not very large; and
- value is attributed to the numbers.

It could be expected that value would be only relatively infrequently attributed to eight-digit geographical numbers, in recognition of the distinction between the value of intrinsically attractive numbers and that of ordinary numbers whose owners undertake their own efforts to make them well-known.

Eligibility for Specific Numbers

At present, carriage service providers are the only entities in Australia eligible to be allocated numbers. They assign subscriber numbers either directly to their customers or else to intermediaries (such as mobile service providers or premium rate service providers) who further assign the numbers to their direct customers. By contrast, a single-step allocation process would allow the ultimate customer to apply for and be allocated numbers without any involvement by providers. A single-step allocation process could achieve a high level of efficiency in managing numbering resources as it would eliminate the stockpiles of numbers inherent at each step of a multi-step allocation model. If individual number allocation is adopted, demand for particular numbers (but not numbers in general) may increase substantially as their individual value becomes more readily capable of being realised, as has happened in the US since 1993 for freephone numbers. A hybrid allocation process might open up eligibility for allocation of numbers to content service providers, major corporations and government bodies, while

⁵ In May 1999 the ACA announced its intention to allocate local rate and freephone numbers individually when portability is introduced in November 2000.

requiring all other customers to obtain numbers from carriage service providers. However, in theory, this could run into problems on competition and equity grounds.

Another factor that may support expansion of eligibility is the increasing specificity of customer requirements for numbers. For example:

- *Content providers* have requirements for premium rate numbers that are determined by the number of their services, the means by which these services are delivered, the level of call charge, and marketing strategies. As marketing of content via phonewords increases, it will become more important to content providers to be able to exercise choice directly over the numbers they obtain.
- *Large corporations and government bodies* with freephone, local rate and premium rate number requirements usually dictated by their marketing and client contact strategies, increasingly demand marketable numbers.
- The numbering requirements of *small businesses and retailers* are primarily influenced by the extent of the association of a particular type of number (geographic, freephone, mobile, premium rate or other) with the name of the business and the use of that number in connection with the business. While choice of number can be important for this type of user, it is not often critical, although anecdotal evidence suggests that their numbering requirements are becoming more sophisticated and closer to that of large corporations.
- The numbering requirements of *the general public* are more modest than that of small business: the types of numbers concerned would rarely extend beyond geographic numbers and mobile numbers (and, potentially, personal numbers). Choice of number is regarded as desirable but is rarely important.

The disadvantages of implementing any form of single-step allocation include the extra administrative burden placed on the ACA through the multiplicity of organisations with which it would need to interact, and any new issues which may arise in protecting the rights of customers to the continued use of their numbers.

Methods of Allocation

A simple application process would be the most efficient for numbers for which no other demand is foreseen. Ideally, the ACA could apply a contingent valuation process to discover the true worth of the number to the applicant, and charge accordingly. But it would constitute an enormous administrative burden to try and discover true valuations for a large group of numbers. Would-be customers could not be relied upon to declare the true worth of the number to them. Rather, a pre-determined fee should continue to be charged which reflects in some way the scarcity value of the desired number, and which allows for the opportunity cost

(lost revenue) of that number precluding the future use of any other phonewords corresponding to that set of digits.

Another possibility for market revelation of the true valuation of a number would be for the ACA to announce the availability of a certain series of numbers and invite parties to express interest in particular numbers or their phoneword equivalents. A further alternative would be for the ACA to identify through data mining techniques a pool of numbers and implied phonewords corresponding to trademarks and company names, and progressively dispose of them according to their expected value. It would, however, be difficult to identify reliably such attributions of value in advance. Attribution of value to a number generally appears to be subjective. Consequently, identification of particular numbers that are highly valued by customers may not be straightforward. This problem is likely to be greater for phoneword numbers, such as 1-800-GROCER and less severe for numbers containing memorable sequences of digits, such as 1-800-888-888. With block, rather than individual, number allocation, the challenge in identifying blocks to which value is likely to be attributed would be even greater. One of the following methods could be used to value and allocate numbers.

Lotteries

Lotteries are a competitively neutral and non-discriminatory method of assigning numbers, and involve applying a chance generator to determine the assignment of a number, without any recovery of its value. (The descriptions in this section are drawn from Schwarz-Schilling (1997). See also Organisation for Economic Cooperation and Development (1995)). The different forms of lottery are:

- *Raffling of numbers* in a pre-determined order, while the participant to whom a number is assigned is determined randomly. The lottery proceeds until all numbers are assigned or there are no more participants.
- *Raffling the right to select a number*, where a ranked order of participants is randomly generated and each participant, in order of ranking, chooses a number from those remaining. Participants waiting to exercise their choice are able to adapt their preferences to align with the remaining numbers.

The first form would be best applied where there is an excess demand for particular numbers and there is no wish to allocate numbers via a method that relies on price. In this type of lottery the preferences of participants for particular numbers is ignored, and so this form of lottery would likely lead to subsequent trading of numbers. The second form of lottery has the advantage of taking account of the preferences of participants. The highest ranked participants have the greatest freedom in exercising their preferences. This type of lottery is not suited to situations where there are many participants or if the quantity of numbers to be allocated is very large, as the conduct of the lottery becomes unwieldy.

The benefits of allocating numbers via lotteries would apply mainly to situations where, although there may be many persons or organisations interested

in a particular number, there is little difference between the amounts they would be willing to pay to secure the right to use the number. Lotteries may also make sense where it is a matter of policy not to utilise price-based methods of allocation in order to reduce obstacles to market entry, and where trading of numbers is tightly controlled. However, given the maturity of the Australian telecommunications market, price-based allocation is not regarded as likely to be a significant obstacle to market entry.

Although the design and conduct of lotteries is generally simple (and can be simpler than some auctions), they may be impractical or cause undesirable outcomes if participants regard the numbers subject to the lottery as valuable. In such circumstances, the winning participant gains a 'windfall profit' which may be quickly realised if the commodity is immediately traded for profit. Such an outcome could not be regarded as consistent with an efficient allocation process.

Tenders

Two forms of tender are regularly used to assign rights or commodities: highest bid tenders, and 'beauty contests'. In highest bid tenders the number would be assigned to the tenderer who nominates the highest monetary bid. Beauty contests differ in that the monetary bid is only one of several factors deciding which tenderer is assigned the particular number (and may not even be a factor at all). They are adopted when it is considered necessary that the assignment be decided on the basis of the use to which the number will be put or on the basis of the qualities of the tenderer. Although it is important for reasons of transparency that the criteria on which a decision to award the tender is made are clearly and precisely stated in advance, it is often difficult in practice to avoid subjectivity in the application of the stated criteria.

Beauty contests are useful when it is considered that financial factors should not constitute a major factor in deciding the outcome of an allocation. Their use may involve an implied subsidy. They can provide a solution to a shortcoming of auctions (their inability to take account of ability to pay) by introducing criteria which attempt to measure through non-financial factors the value of the use to which a number will be put. These same criteria make it difficult to achieve transparency and efficiency in the allocation process. This lack of transparency can result in legal challenges to a regulator's decisions, because bidders are not aware of the details of how their bids were judged. Beauty contests do not generally involve disclosure of price information to the market, and so there is a strong chance the winner of a tender will pay a considerably higher price than the market would expect (the 'winners curse'). Beauty contests also become very complex to administer as soon as there are many applicants. Their time- and resource-consuming nature make them best suited to allocations of resources where those allocations are somewhat infrequent.

Auctions

Allocating numbers by auction enables the market to determine the value of a number via bidding. Auctions are increasingly used world-wide to assign radiocommunication spectrum rights, but their use to allocate phone numbers would be quite different. Perhaps the most important practical difference is that spectrum sales are relatively infrequent and attract high dollar bids from relatively few bidders, while individual phone number sales open to customers would, in comparison, be frequent, of relatively low value, and could be expected to involve many potential bidders. This could well involve a great administrative effort and hence proportionately higher costs.

The use of auctions to allocate numbers has, however, been considered in the United States, Germany and the United Kingdom, and is under active consideration in the Netherlands. Auctions are generally regarded as non-discriminatory in that each participant has an equal opportunity to bid and be the successful purchaser. Auctions are best suited to circumstances where the seller (often in a monopoly position) does not know how much potential buyers are willing to pay for a particular commodity. Auctions may provide a means of realising the value carriage service providers and customers place on particular numbers and which is otherwise difficult for the ACA to determine. Economic theory regards the person who is most willing to pay for a commodity as the person who values the commodity most highly, and holds that a commodity will be put to the most efficient use by the party who values it most highly.⁶

The introduction of auctions as a means of allocating numbers would be likely to affect the perceptions that allocatees have regarding their rights and responsibilities in respect of numbers they hold. The Australian numbering plan currently sets out responsibilities that carriage service providers have in relation to numbers they issue. These responsibilities can be regarded as corresponding to a set of rights which customers have in relation to the numbers. Payment of money for a particular number is likely to increase the allocatee's perception of its rights to the number and lessen perception of any responsibilities.

Duration of Allocation 'Rights'

Placing a limit on the duration of an allocation is an option used in the assignment of various commodities (including, in Australia, certain radiocommunications spectrum), and would apply a 'franchise' concept to the use of numbers. Limited duration allocation would mean that a number would again become available for allocation at the end of a specified period. The particular merit of this option is the elimination of any permanent monopoly that an allocatee obtains over a

⁶ For a consideration of which of the many possible auction types might be most suitable for auctioning phone numbers, see Nett (1998).

particular number, especially a number to which value is attributed. At the expiry of a fixed duration allocation, a new auction would permit a new assessment of which person or organisation values the number most. This could include rivals who might want to use the number to 'switch' the previous owner's customers who continue to use the number out of habit. One possible way to overcome this problem would be for the ACA to take the number out of service for a stipulated period prior to re-allocation.

Adoption of allocations with limited duration, however, would have the effect of wiping away any investment made by the holder of a number at the end of the specified period, such as in promotion of a number. This deficiency would have less impact if the limited duration on the use of a number is understood at the time of allocation, and if it is not applied retroactively. The ACA would need to model carefully the optimum period of duration, as this would critically affect the time pattern of revenues that a customer is prepared to pay, and this would affect the net present value of receipts from the number allocation process. But this procedure should result in the highest net present value of receipts — allocating the number 'forever' may well extract lower revenues than a process which charges for the revealed incremental value of a number over time.

The Determination of Charges

Currently, the charging regime employed by the ACA involves a simple annual charge, as well as a small once-only application fee, imposed on the carriage service provider. Should phone numbers and phonewords be subject to individual allocation to customers, there remains the task of determining the optimal charging procedure.

From a revenue raising perspective, it would be desirable to extract from the customer as much of the surplus associated with a phoneword or memorable phone number as possible. The aim should be to maximise the present value of the net revenue stream (that is, after allowing for all the costs associated with the process) accruing to the government as a return to its ownership of each unique number, although it should not be forgotten that other concurrent government objectives such as geographic and social equity, and the timely provision of numbers, also need to be taken into account.

It needs to be considered whether payment should be in one initial lump sum, or whether a multi-part tariff is optimal, in which an initial fee is charged together with an annual charge which might reflect more than annual administration costs. The current annual charges do not reflect and are not used to reimburse the ACA's administrative costs. In advocating such a scheme, care is needed to ensure that any efficient charges are not added to any other pre-existing or new non-efficient numbering charges which can act like taxes and produce their own distortions and efficiency losses. It should also be considered whether the right to use the phoneword or number will be in perpetuity or for a limited term, and whether it can be sold privately or whether it must be returned to the number pool if no

longer required. If private trading is permitted, it needs to be determined whether on-sales should be taxed at some rate by the ACA in order to recoup the additional value not revealed at the first sale, or whether — if an allocation is limited in duration — this additional value will be realised when the allocation expires and a new auction is held.

A less satisfactory charging method which could be employed under the current allocation system for each number of a given length, would be to charge all phonewords and other memorable numbers at their calculated average value. How the ACA could determine this, however, is difficult to predict, and it is possible that the average would be so affected by a few highly desirable numbers that many customers would drop their demands for these special numbers — a sort of adverse selection process.

Cost of a New Allocation System

As indicated throughout this paper, the introduction of individual number allocation would not be without set-up and continuing incremental operating and administrative costs which could exceed those currently being incurred. The per-number average cost of allocation will always be less if it is possible to bundle many numbers into the one application, as occurs with the present-day allocation of subscriber numbers in blocks. Thus, regardless of the method that is used to allocate numbers individually — whether via price-based means or administrative means — there is likely to be less work, and hence less expense, in allocating numbers in blocks.

There is an additional important incremental engineering systems cost to be considered. When numbers are allocated in blocks, rules for routing of calls between interconnected telecommunications networks are based on a presumption that calls to all numbers in a particular number block should be sent to the network to which that number block has been allocated. This is achieved by examining the first few digits of a number to determine which network is responsible for the corresponding number block. Individual number allocation means that these rules can no longer apply, since the network responsible for one particular number is not likely to be the same as the network responsible for the next number in sequence. Instead, calls must be routed by working out the appropriate network to which to send the call on a number-by-number basis. This means that a database listing every number and the corresponding network must be consulted on every call. This approach involves establishment and maintenance of very large databases which can be consulted without noticeably delaying the progress of a call. Although routing of calls in this manner is expensive to introduce, it is, however, identical to that required for the more sophisticated implementations of number portability.

Trading in Numbers

Greater economic efficiency in the use of numbers will be achieved when parties to which a number is worth most can obtain the particular numbers they seek. This objective can be achieved via trading in numbers, separately from the adoption of any market-based method of allocation. Trading means that an entity to which a number is assigned is able to transfer the number to another entity which has a greater interest in possessing it, usually in return for some financial benefit.

While the Australian regulatory environment now places no restrictions on trading in numbers, there is no evidence at present that number trading is extensive. Most exchange of numbers appears to occur between customers, usually small businesses, in situations where an established business, whose goodwill may include the numbers it has used, is liquidated or sold. Anecdotal evidence in Australia suggests that there is a significant level of transfers of mobile numbers between members of families (often extended families) and between friends. There is very limited evidence of speculation in numbers, where a number with special qualities is obtained by a customer from a carriage service provider with the intention of offering it for sale at a premium to an organisation which is prepared to pay for the number.

Trading of numbers is unlikely to be popular in the absence of portability for tradeable numbers. This is because, without portability, a buyer of the right to a particular number would be 'locked in' to the provider supplying service on that number, an outcome which could reduce the attractiveness of the transaction. It is probable that the volume of trading in freephone and local rate numbers will increase after portability and individual number allocation commences for these numbers, and would increase further if the numbers were to be directly allocated to customers via price-based methods.

Conclusions

The procedures for allocating phone numbers in Australia have not responded to new patterns of demand and new types of numbers. It is highly likely that numbering resources are being used inefficiently and consolidated revenue is missing out on securing a share of the monetary value many customers attach to their phone numbers (although it is conceded that some carriage service providers or customers might be paying more than the intrinsic value they place on the number allocated to them). With the increasing commercial popularity of phonewords and numbers with memorable characteristics, it is suggested that appropriate steps be taken to issue these numbers in a more efficient and revenue-enhancing way. The benefits of market-based allocation procedures, especially by permitting customers to 'buy direct' from the ACA, would be great, both to government revenue and to business marketing strategies.

There would, of course, be additional costs in administering sales of numbers in this manner, compared with the current system of the ACA allocating blocks of numbers and letting the carriage service providers 'mine' these blocks for any desirable numbers for which their customers or potential customers would be prepared to pay a significant yearly price premium. Changed allocation procedures would need to be carefully screened to ensure that the costs of seeking to reduce inefficiencies did not outweigh the expected gains in allocation efficiencies. The administrative process would, at least initially, be inherently controversial and would need to be implemented carefully, especially to ensure that the costs of implementation did not negate the benefits to subscribers. But, if the incremental costs of introducing price-based allocation are relatively low, there is a potential for the creation of a significant positive increment to social welfare.

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