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Mason COMMUNICATIONS

BENCHMARKING STUDIES

FOR OFTEL

COMPARISON OF UK TELECOMS WITH OTHER LEADING COUNTRIES

HEAD OFFICE

WORLD TRADE CENTRE
EXCHANGE QUAY
MANCHESTER M5 3EJ
ENGLAND
TEL: +44 (0)161 877 7808
FAX: +44 (0)161 877 7810

SCOTTISH OFFICE

WESTFIELD PARK
ESKBANK
EDINBURGH EH22 3BD
SCOTLAND
TEL: +44 (0)131 660 6595
FAX: +44 (0)131 660 6596

E-Mail: masoncom@masoncom.co.uk
URL:http://www.masoncom.co.uk/masoncom/

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1. EXECUTIVE SUMMARY

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OBJECTIVES

1 Benchmarking is one of the mechanisms by which OFTEL tests the extent to which it has achieved its goal of ensuring the best deal for UK consumers. This report presents the findings of a benchmarking study to determine a ranking of the UK, in world terms, with regard to the availability, scope, quality and value for money of telecommunications services for business customers, and to investigate the underlying reasons. The study was carried out by Mason Communications, an independent international telecoms consultancy, who were supported by Nucleus Consulting.

WORK DONE

2 The study involved data collection from Public Telecommunications Operators (PTOs) and Mobile Communications Operators (MCOs) across an initial selection of nine countries worldwide. An initial data collection exercise was carried out to review which countries should be considered in detail for each service. The selection criteria were that the service must be widely available in the selected country and that information regarding the price and availability of service should be available (published or via an established contact) or obtainable. Following the initial data analysis, the following country selections were made:

- UK, USA, Sweden, France and Australia included for all services;
- Germany included for ISDN and Mobile due its strong reputation for these services;
- Japan included for Virtual Private Networks (VPNs) and High Speed data;
- Hong Kong and Singapore excluded due to their relatively small size.

3 Each of the major telecommunications operators in the selected countries was asked to complete structured questionnaires about the prices, availability, scope and quality of the following telecommunications services:

- Business Telephony Services (Public Switched Telephone Network);
- ISDN;
- Analogue Mobile;
- Digital Mobile;
- Private Circuits;
- Calling Cards;
- Specially Tariffed Services;
- Virtual Private Networks;
- High Speed Data Services.

4 The questionnaire data was supplemented through local research, including reference to the local regulatory environment. Research was divided geographically into the Pacific Rim (Australia and Japan, researched from Australia), North America (USA, researched from the USA) and Europe (UK, France, Germany and Sweden, researched from the UK). The data was then analysed, using market information from other

sources, including the companion OFTEL benchmarking study conducted by Nucleus Consulting and Mason Communications, "Customers views of telecoms: case studies of UK and USA businesses", which compares the use of telecommunications services by businesses in the UK and the USA.

5 Analysis of pricing information (as of July 1995) was carried out employing profiles for network services of typical large, medium and small businesses, derived from the information obtained during the case studies. In addition to providing realistic usage profiles, the benefit of this approach was that, unlike many previous benchmarking studies, the effects of actual discounts on published tariffs could also be considered. This is particularly relevant to the USA market where few users pay standard tariff prices and tend to negotiate significant individual discounts.

6 Price comparisons were carried out in Purchasing Power Parity (PPP). This provides a comparison of the "value for money" of the goods provided in different countries. When country expenditures are converted into a common currency by means of PPPs, they are, in effect, expressed at the same set of international prices so that comparisons between countries reflect only differences in the volume of goods and services purchased. The effective reductions to country prices through PPP are shown in Table 1 below:

Country	UK	France	Germany	Sweden	Australia	Japan	USA
PPP Effect (%)	100	75	69	74	97	52	98

Table 1 Impact of PPP on Price Comparison

FINDINGS

7 The quality of price information provided by operators was generally good. However, the quality and availability of prices for two of the newer services (virtual private networks and high speed data) was insufficient to produce a meaningful ranking.

8 Information regarding service availability and scope was inconsistent across operators but efforts were made to provide comparisons where possible.

9 Also, information on quality of service was not available from some operators and the information provided by others was inconsistent. The availability of quality of service information largely depends on whether the regulator has required or encouraged statistics to be published (USA, UK and Australia all publish quality data).

PPP Price Ranking

10 The following table compares the overall PPP price ranking of each country for each service (The usage profiles of businesses are set out in Appendix A).

Service	UK	USA	Sweden	France	Australia	Germany
Business Telephony	3	2	1	5*	4*	
ISDN	2*	3*	1	5	6	4*
Analogue Mobile	4	5	1	6	2	3
Digital Mobile	3	5	1	4	2	6
Private Circuits	3	2	1	5*	4*	
Calling Cards	2	4	1	3	5	
Freephone Services	3	1	2	5	4	
*Shows where rankings differed between small, medium and large firms						

Table 2 Summary of Business PPP Price Ranking

PPP Impact

11 The impact of PPP on the pricing comparisons is demonstrated in Table 3 by comparing PPP with £ currency for the three leading countries (UK, Sweden, USA).

	PPP			£		
Service	UK	USA	Sweden	UK	USA	Sweden
Business Telephony	245	215	178	245	219	242
ISDN	13	14	8	13	14	11
Analogue Mobile	28	36	15	28	36	21
Digital Mobile	28	36	13	28	36	18
Private Circuits	47	16	14	47	32	20
Calling Cards	0.6	0.8	0.4	0.6	0.8	0.5
Freephone Services	8	6	8	8	6	11
Discounted prices in £000's per annum for a medium sized business						

Table 3 Comparison of PPP versus Currency Price Ranking

CONCLUSIONS

12 The following conclusions can be drawn from the above data:

- **Sweden** is cheapest for almost all services;
- **USA** has lower telephony and private circuit prices than Sweden when measured in currency (with actual discounts applied);
- **UK** is generally third in the price ranking, but close to Sweden in the currency comparison (except private circuits);
- **Australia** ranks second in price for mobile, but otherwise trails the UK by a significant margin;
- **France** has the highest overall prices;

13 The use of PPP instead of exchange rates for price comparison does not significantly affect the rankings with the exception of PSTN and private circuits. In a comparison in £ sterling, based on discounted prices, USA PSTN prices are significantly lower than Sweden's prices. UK prices are lower, but much closer to Sweden's prices (2% higher). France is also a long way behind Australia, which is closer to the UK. For most other services, using exchange rates, Sweden remains in first position, although the USA and UK are much closer. These results occur since changing from exchange rates to PPP increases Sweden's costs by approximately 36% and the USA by only 2%. Only in the case of PSTN and private circuits, however, are the PPP rankings sufficiently close for the change to alter the rankings between USA and Sweden.

Availability/Scope of Service

14 There is insufficient information to compare country offerings on availability, (i.e. access to the service within the country).

15 There is little consistency in the country rankings for scope of service offering. The UK generally compares favourably to other countries in terms of features available on individual services. For example, the UK does rank equal number one for analogue mobile. The rankings suggest that UK businesses have access to widely featured service offerings which are likely to be at a higher price than in Sweden and the USA.

Quality

16 There is insufficient substantiated information to rank countries on service quality. From the limited evidence available UK business customers do have better access to quality of service information than most other countries.

PROBABLE REASONS FOR THE RANKINGS

17 The potential reasons for the rankings identified fall into a number of categories:

- Geographic factors;
- Cultural factors;
- Strong competition;
- Effective regulation;
- Efficient operation;
- Historic investment in infrastructure;
- Large market size;
- Maturity of Service

Probable reasons for the ranking follow.

18 **Sweden** has a modern, low priced, telecommunications service, developed during the 1980s by a state owned monopoly (Televerket). Televerket, later renamed Telia, were encouraged by the Swedish government, during the 1980s, to provide low cost telecommunications services as part of their social policy. During this time Televerket manufactured their own equipment which may have provided Sweden with an advantage through access to a low cost manufacturer.

19 Whilst there was no regulation to prevent competitors from entering the Swedish fixed network market, no-one did so until 1992. The market has now been subject to regulation, and also a price cap introduced on the dominant operator. The introduction of competition has meant that new operators have put further downward pressure on the already low prices of the dominant operator. Telia is required to interconnect with new operators at fully allocated cost.

20 Sweden has had a competitive mobile network market since 1981, with two operators who have adopted very aggressive pricing policies. This has resulted in the world's highest penetration of mobile users at 16% of inhabitants.

21 **USA** has had strong competition in its large long distance fixed service market since the mid 1980s. Strong competition and large market size has served to produce low prices and high discounts to businesses. Where there is limited competition, (e.g. mobile), then the USA performs poorly in the rankings. Further comparison of the USA telecommunications services, against the UK, is available in the companion Oftel benchmarking report.

22 **Australia** has a high cost telecommunications infrastructure, largely due to its need for wide geographic coverage across a very low population density. Deregulation was introduced in 1992 into fixed services, and competition is starting to have some impact through the discounts offered to business users.

23 Australia has three competing mobile networks and a fairly high user base, which is leading to very strong competition, and consquently to moderate prices.

24 **France** lags the other study countries, largely due to its monopoly provision of fixed telecommunications services and lack of incentive for the monopoly operator to reduce prices. Whilst competition has been introduced to mobile services, there are still only two operators, whilst other study countries have three or more.

25 **UK** prices have significantly reduced during the last five years, largely through the use of the price cap on the dominant operator, significant competition in the long distance mobile markets, and growing competition in local loop. Further pressures now exist through competition in all services. Discounts offered to businesses for PSTN and ISDN calls are now substantial, typically around 15% for large businesses, although they are still significantly less than the USA and cannot be customised to specific customers.

2. INTRODUCTION

Paragraphs

2. INTRODUCTION

BACKGROUND

26 The Office of Telecommunications (OFTEL), is a non-ministerial Government Department responsible for regulating the UK telecommunications industry. OFTEL's goal is to obtain the best possible deal for the customer in terms of quality, choice and value for money. To achieve this, OFTEL has the following policy objectives:

- to promote competition between providers of telecommunications services where this competition is sustainable and economically efficient;
- where competition is not immediately possible, or where sufficient competition has not emerged, to encourage - and if necessary to regulate for - the lowering of prices, the improvement of quality and an increase in variety of services offered in order to achieve better value for money for customers.

BENCHMARKING

27 Benchmarking is one of the mechanisms by which OFTEL tests the extent to which it has achieved its goal of ensuring the best deal for UK consumers. OFTEL started this Benchmarking Project in 1994. The first stage comprised a comparison of the position of UK consumers with those in the USA and France, in terms of the quality and availability of telecommunications services. Stage two of the Benchmarking Project comprises three linked studies:

- study one: a comparative analysis of the availability, quality and cost of telecommunications services available to business users in the UK and other leading countries;
- study two: case studies comparing the services available to large businesses in the UK and USA;
- study three: case studies examining the services available to small and medium sized enterprises in the UK and USA.

28 Study one was carried out by Mason Communications, an independent international telecoms consultancy based in Manchester, supported by Nucleus Consulting, an independent international networking consultancy based in London and Chicago. This report contains the findings from study one. The results of studies two and three are in a separate document, "Benchmarking case studies of large, medium and small sized businesses". Studies two and three were conducted by Nucleus Consulting, supported by Mason Communications.

OBJECTIVES

29 The objective of study one was to determine a ranking of the UK in world terms with regard to the availability, scope, quality and value for money of a range of telecommunications services and to investigate the underlying reasons. The services reviewed were:

- Business Telephony (Public Switched Telephone Network);
- ISDN;
- Analogue Mobile ;
- Digital Mobile;
- Private Circuits;
- Calling Cards;
- Freephone Services;
- Virtual Private Networks;
- High Speed Data Services.

A second objective was to undertake a comparative analysis of the provision of these services in the UK and in the countries regarded as world leaders for each of them.

3. METHODOLOGY

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STUDY PROCESS

30 The study involved data collection from Public Telecommunications Operators (PTOs) and Mobile Communications Operators (MCOs) across an initial selection of nine countries worldwide. An initial review was carried out to review which countries should be considered in detail for each service. The selection criteria were that the service must be widely available in the selected country and that information regarding the price and availability of service should be available (published or via an established contact) or obtainable. Following this initial data analysis, the following country selections were made:

- UK, USA, Sweden, France and Australia included for all services;
- Germany included for ISDN and Mobile due its strong reputation for these services;
- Japan included for Virtual Private Networks (VPNs) and High Speed data, to determine whether Japan's successful businesses are aided through wide availability of these modern services;
- Hong Kong and Singapore excluded due to their relatively small size.

IN COUNTRY REGULATORY ENVIRONMENTS

31 The **UK** has operated a competitive market for telecommunications services since 1984, when BT was privatised and issued with a licence to operate as a public telecommunications operator. Similar licences were granted to Mercury and Kingston Communications. From 1984 until 1990 there was a duopoly for basic services, whilst new licences were issued to operators of cellular mobile and satellite services. Following the end of the duopoly in 1990 a large number of additional licences have been granted, including national and regional PTOs and cable operators.

32 The UK regulatory environment is managed by the Office of Telecommunications (OFTEL). OFTEL regulates the telecommunications market in three main ways:

- through enforcement and modification of licences;
- through exercise of powers under general competition legislation;
- through the exercise of consumer protection powers.

33 OFTEL's overall aim is to obtain the best possible deal for the customer in terms of quality, choice and value for money. To deliver the aim, OFTEL has five objectives which provide an appropriate framework to describe the characteristics of the regulatory regime in the UK.

34 Promoting network competition. The UK regulatory regime is designed to encourage the development of competing and interconnecting networks so that there is a choice of operators offering either retail services to customers or wholesale services to other operators.

35 Services competition. The regulatory framework is designed to encourage the expansion of the number of players offering an increasing variety of retail services to consumers.

36 Ensuring fair trading. The regulatory framework is designed to ensure that competition is fair, that anti competitive practices are prevented and that the abuse of market dominance is prevented.

37 Fair distribution of benefits. The regulatory regime is designed to ensure that all consumers benefit from competition, not just those with market power.

38 Consumer protection. As well as licence conditions designed to protect the consumer (e.g. requiring operators to produce Consumer Codes of Practice), the main regulatory mechanisms to protect customers who have yet to benefit from competition is BT price control. This exists to protect consumers by imitating the competition in those areas of the market where competition is not yet effective.

39 The regulatory environment in the **USA** is significantly different to all other study countries due to the different structure of the industry. Following deregulation in 1984, local services are provided by the Regional Bell Operating Companies (RBOCs). RBOCs are generally limited to providing services within their geographic region. For long distance services, RBOCs interconnect with long distance carriers. The long distance market is very competitive including companies such as AT&T, Sprint and MCI. Long distance operators are able to offer specific tailored discounts to large users, a system referred to as a 'Tariff 12' arrangement.

40 Overall responsibility for regulation is held by the Federal Communications Commission (FCC). In practice, however, the FCC focuses on the activities of the long distance carriers, whilst State Public Utilities Commissions (PUCs) regulate the local operators. The local and long distance operators are now able to negotiate prices with businesses for the use of their services. In many cases, large discounts are offered for the "bundling" of services, i.e. additional discount based on a commitment to take more than one service.

41 The provision of telecommunications in **Sweden** is fully open for competition. In practice, Telia operate almost a monopoly in local access, other operators using Telia's infrastructure to access customers. Tele2 are Telia's main competitor, although in total there are currently eight licensed operators for PSTN services, seven for leased lines and four for mobile.

42 Responsibility for reviewing licensing rests with the National Post and Telecom Agency. The licence merely states that the operators have to agree to certain technical interfaces and interconnection. Telia are 100% government owned and have a price cap of Retail Price Index (RPI) -1% imposed on them until the end of 1996. This applies to residential and small business only. Telia are able to negotiate prices with large businesses. All pricing has to be cost based on historical fully allocated costs. In addition, competition law also applies with heavy penalties for collusive behaviour.

43 Fixed telecommunications services in **France** are provided as a monopoly service by France Telecom. Mobile services are provided by SFR and Bouygues Telecom in addition to France Telecom. Regulatory control is undertaken by the Direction Generale des Postes et Telecommunications (DGPT), established in 1993. France Telecom are subject to a price cap which, in 1994, limited price increases to RPI -3%.

44 The provision of telecommunications in **Australia** is being opened up to competition in all sectors. Telstra (formerly Telecom Australia) is the dominant operator and is fully government owned. In fixed services, competition is now provided by Optus. It has been guaranteed a duopoly environment until 1997 for fixed communications. For mobile services, Telstra and Optus compete with Vodafone, review due in 1997.

45 The Australian regulator is Austel, set up in 1989 to look after the interests of telephone users and to administer the 1989 Telecommunications Act. Telstra is subject to a number of clauses in its licence including a price cap, universal service obligation, non discriminatory pricing and a need to publish prices.

46 Telecommunications services in **Germany** are dominated by Deutsche Bundespost Telekom (DBT). DBT has a monopoly on the provision of all fixed services. Mobile services are subject to competition, DBT competing with Mannesman Mobilfunk (established 1992) and E-Plus (established 1994). Regulatory control is undertaken by the Federal Minister of Posts and Telecommunications (MPT), whose role was established in 1989 following the separation of DBT into regulatory and operational functions.

47 **Japan** has operated a competitive environment for telecommunications services since 1985. Five new companies are licensed to operate fixed services in addition to the previous two monopoly operators (NTT for domestic and KDD for international). Japan has also licensed five operators to provide mobile services (three analogue and two digital). Regulation in Japan is the responsibility of the Ministry of Posts and Telecommunications. The MPT also issue and monitor licences.

BEST IN CLASS ASSESSMENT MODEL

48 Due to the breadth of the scope of the study, both in terms of the range of services and the range of data required, the study required primary data collection from representative operators for each service in each of the study countries. In total, data was collected from twenty six operators across the seven countries. In order to ensure that meaningful and useful output was generated, a simple but effective process was required. This requirement led to the development of the model described in Figure 1.

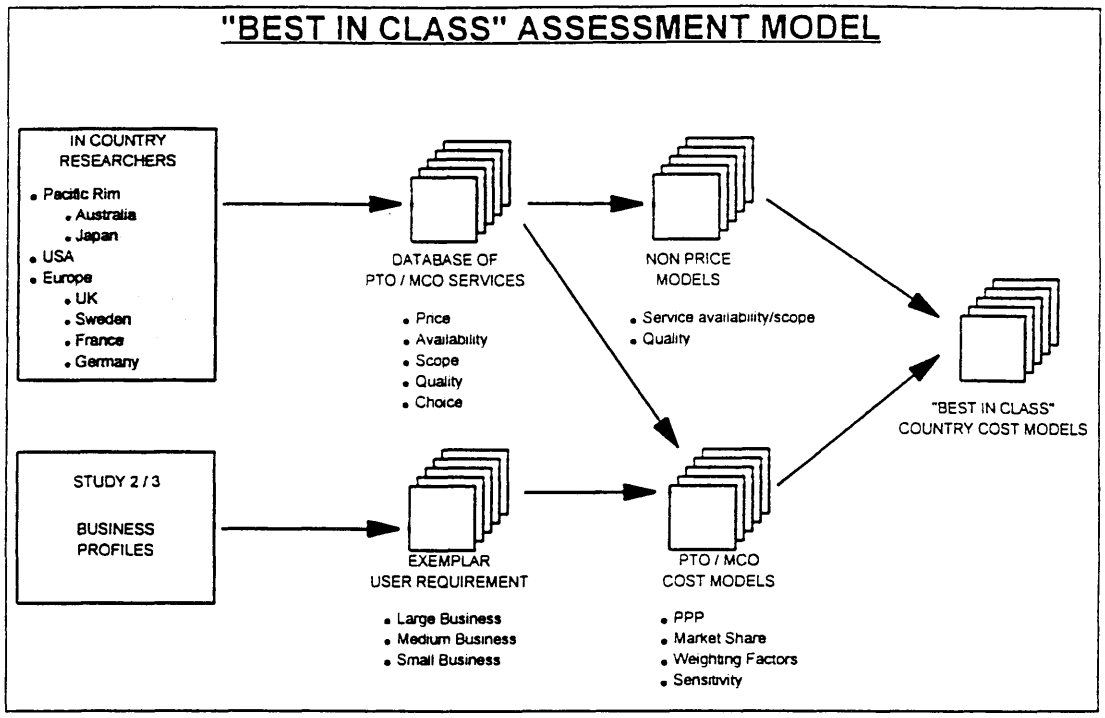

Figure 1 Best in Class Assessment Model

49 The database of services was developed through requesting data directly from operators in each of the countries. The data collection process was undertaken using a structured postal questionnaire which is attached as Appendix B. The major operators were selected and are listed in Appendix C. In addition, the data was supplemented by published data from tariff research organisations. Data was collected for each of the key components of cost, availability, scope of service offering and service quality.

50 The second key input to the model was the typical usage profile of each of the services by large, medium and small businesses. This user requirement provides the input to determine the overall cost comparison. This reflects the usage levels of typical small, medium and large businesses and is calculated based on the actual usage of UK businesses in case study businesses[1]. A summary of the user requirement is included in Appendix A.

51 Typical profiles which represent an "exemplar user" include:

- Large Business based on:

  50 large offices
  200 smaller subsidiary offices (10-15 staff)
  Mix of local, national, international calls
  Significant user of mobile telephony
  General user of all telecommunications services;

Case study companies comprised the following sectors in the USA and the UK: Retail, Banking, Leisure, Health, Pharmaceutical, Professional Services, Mail Order, Software, Financial, Construction, and Travel

[1] OFTEL benchmarking study, "Customers views of telecoms: case studies of UK and USA businesses"

- Medium Business based on:
  10 medium offices
  Primarily national telephone calls
  User of most telecommunications services;

- Small business based on:

  1-2 offices
  Up to 50 staff total
  User of PSTN and Mobile services only.

52 Given that the specific businesses cover a very broad industry base, it was necessary to model alternative user requirements, to determine the robustness of the overall price rankings. Typically, this was applied by varying the volumes of usage by each business profile. Full details of the sensitivity analysis are included in Appendix A.

53 The exemplar user requirement was "priced" using the input from the database of services with the following additional parameters applied:

- PSTN rates are converted to "effective rates" by the OFTEL methodology which uses negative exponential distribution to convert nominal charges per minute, taking into account minimum charges, the actual rates per minute paid for calls which average three minutes in duration but whose durations reflect a typical range of lengths.

- Annual costs added to 20% of initial (connection) charges to produce a total annual charge for the service based on the user requirement.

- The figures were converted to UK £ and then to UK £ Purchasing Power Parity (PPP) based on the OECD[2] figures (1994 figures, from August 1995 "Main Economic Indicators").

54 A second set of total figures for each basket was produced based on the discount available for that service against standard tariffs. The operators prices are accurate at 1st July 1995.

55 Where the service has a single dominant operator, then the country cost model was generated from the single operator data. Where the market share of the secondary or next largest operator is estimated to exceed 10%, the model multiplies the total costs of each in country operator by its respective market share to produce an average figure for that service in that country; and thus generates the country cost model. The exception to this is the USA, where the large number of operators necessitated the use of representative suppliers. Nynex were selected to represent local operators, in conjunction with AT&T, representing long distance operators.

56 Two types of price comparison have been carried out for all services. First, the price of the basket of services identified in the user requirement has been calculated (with

2 Organisation for Economic Co-operation and Development, Paris

and without discounts where available). Different user requirements have then been applied to the basket comparisons to determine the robustness of the overall ranking. Second, a series of simple rate comparisons shows the comparison of specific parameters, e.g. call costs (local and national) and fixed costs (rental plus connection).

BACKGROUND RESEARCH

57 Previous research into "Best in Class" has tended to focus on the cost of PSTN services. Typically, studies cost up a basket of telephone calls of different durations to different locations. Three detailed reports which recently considered this approach are:

- OECD "Communications Outlook", 1995. Based on data gathered during 1994 on a range of economic factors, including price;
- Bureau of Industry Economics "Telecommunications 1995". Wide review of prices, quality and efficiency, added to the OECD data;
- Analysis study in 1994, repeated in 1995. Comparison of telephone charges in European countries.

58 Each of these studies is based on an OFTEL methodology, developed in 1987 and published each year until 1993. Each of the above studies was taken into account when developing the methodology for this study.

THE USE OF PPP IN THIS STUDY

59 Price Comparisons are carried out in Purchasing Power Parities (PPPs). These are the rates of currency conversion which eliminate the differences in price levels between countries. This means that a given sum of money, when converted into different currencies at the PPP rates, will buy the same basket of goods and services in all countries. Thus, when expenditures on GDP for countries are converted into a common currency by means of PPPs, they are, in effect, expressed at the same set of international prices so that comparisons between countries reflect only differences in the volume of goods and services purchased. A further advantage of PPPs is their relative stability over time. In addition, they measure relative efficiencies of the operators.

60 The impact of PPP on the overall country costs is shown below. The figures are that percentage by which the exchange rate comparisons are multiplied to give the PPP comparison.

Country	UK	France	Germany	Sweden	Australia	Japan	USA
PPP Effect (%)	100	75	69	74	97	52	98

Table 4 Impact of PPP on Price Comparison

61 Hence, the effect of PPP is to reduce the prices of other countries relative to a currency comparison. Whilst the prices of the USA and Australia are not significantly reduced, all others reduce by at least 25% in the PPP comparison.

62 The disadvantage of PPP is that they are less relevant to those businesses who trade mainly internationally and take account of exchange rates to a greater extent in their decisions than consumer purchasing power. Overall, however, PPP was considered more representative of the value for money of the services in each country. To supplement the PPP comparison, the PSTN prices were also presented in currency form in UK £.

THE USE OF TARIFF BASKETS IN THIS STUDY

63 The use of tariff baskets for price comparisons necessitates broad assumptions which are detailed in Appendix A. The methodology used in this study is intended to provide a general comparison of the positioning of tariffs in different countries and their overall competitiveness with tariffs in other countries. The tariff basket methodology does not take into account the following on national calling patterns:

- the geographic size;
- country location;
- the effects of population size;
- the characteristic business enterprise size;
- the regulatory environment of the country (the regulatory environment is considered in the explanation of the differences between country offerings).

64 The net effects of the above assumptions are to produce a bias against larger countries, countries with lower than average population densities, and countries with untimed local calls. In our opinion, however, this bias does not have a significant effect on the overall rankings.

65 The remaining chapters cover the results of the study, including the country rankings for each of the services considered.

4. FINDINGS - BUSINESS TELEPHONY
(Public Switched Telephone Network)

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(Public Switched Telephone Network)

INTRODUCTION

66 Business Telephony, generally referred to as the Public Switched Telephone Network (PSTN) is the most widely used telecommunications service by businesses worldwide. In a separate case study review of businesses in the UK[3], it was identified that for the majority, over 75% of their total spend on telecommunications was accounted for by PSTN services. PSTN is the service which, in deregulated countries, is often the first to have a competitive offering introduced. In certain countries (UK, Sweden, Australia), the dominant operator is faced with a price cap which impacts primarily on PSTN prices.

67 A comparison of the PSTN services in the UK with the other study countries is given below in terms of price comparison, scope of service and quality of service.

PRICE COMPARISON

68 Figure 2 shows the overall ranking of the different countries in the study for large business users, based in UK £ PPP.

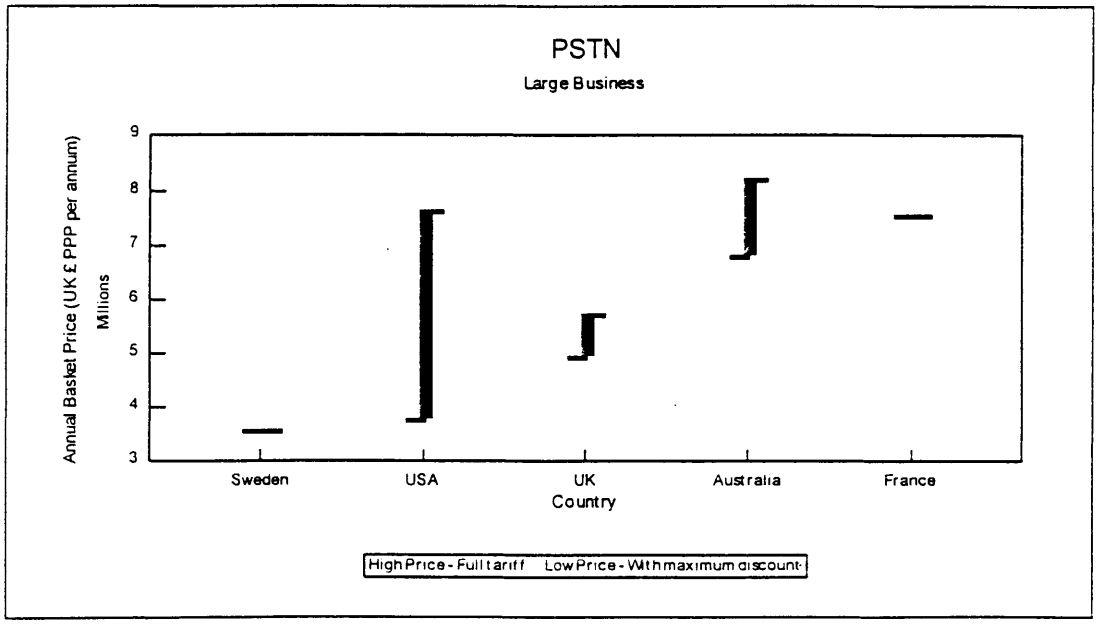

Figure 2 Basket Comparison of Large Business PSTN Charges by Country

69 The graph indicates the following:

- Based on undiscounted prices, the UK ranks second, behind Sweden, and followed by France, USA and Australia;

[3] OFTEL Benchmarking Case Studies, 1995

- Based on discount prices paid, the UK ranks behind Sweden and the USA, followed by Australia and France;

- Prices in Sweden and France are unchanged by discounts (hence lack of range). In Sweden, no published data on discounts is available although it is understood that large businesses may achieve up to 10% discount off the figures used. In France, discounts only apply when very high usage is made through a single line. This was not considered applicable to the user profiles costed in this study.

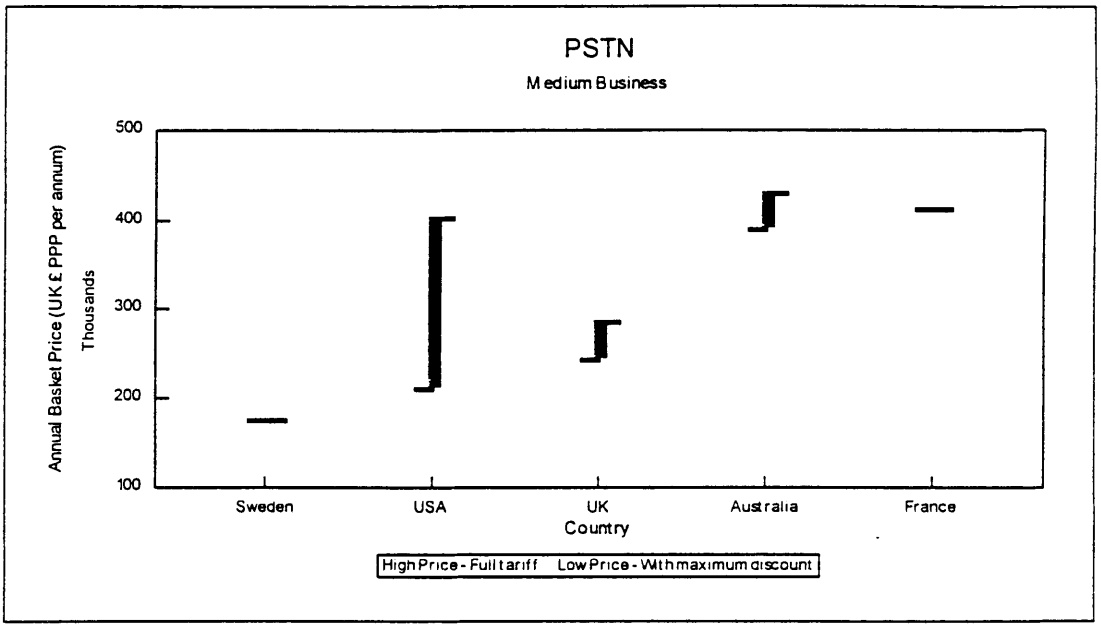

Figure 3 Basket Comparison of Medium Business PSTN Charges by Country

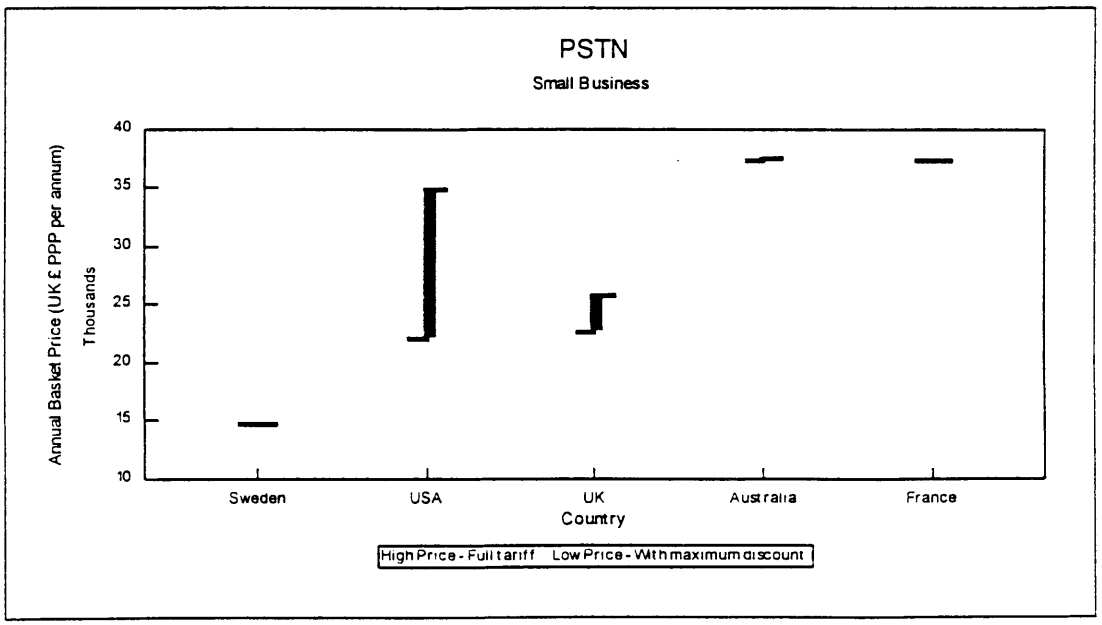

Figure 4 Basket Comparison of Small Business PSTN Charges by Country

70 Figures 3 and 4 show the overall ranking for medium and small business users. This indicates the following:

- Based on undiscounted prices the UK again ranks second behind Sweden, followed by the USA, France and Australia;
- Volume discounts have a lesser impact on small users;
- Based on discount prices paid, the UK ranks behind Sweden and the USA, followed by Australia and France.

The impact of Volume Discounts

71 The above comparisons indicate both list tariffs and published volume discounts. The discounts vary by operator in each country and apply only to calls. Different levels of discount apply to local, national and international calls. The net discounts that result, over list prices, from the base user requirement, are shown in Table 5.

Net Discount	Sweden	USA	UK	Australia	France
Large Business (%)	0	54	15	18	0
Medium Business (%)	0	49	15	10	0
Small Business (%)	0	38	14	0	0

Table 5 Summary of Discounts

72 The impact of using discounts rather than list tariffs is to move the USA up the ranking, from fourth to second for large businesses and from third to second for small and medium businesses. This has the impact of moving the UK position from second to third in both cases. Further, the impact of discount prices moves Australia up the ranking for large and medium businesses, from fifth to fourth. Where a fee is charged for participation in the discount scheme (UK, Australia), this has been included in the discounted prices.

The impact of PPP

73 The merits of PPP are discussed in Section 3. To demonstrate the impact of PPP, Figures 2, 3 and 4 have been reproduced using a direct currency comparison, not taking PPP into account. The results are shown below.

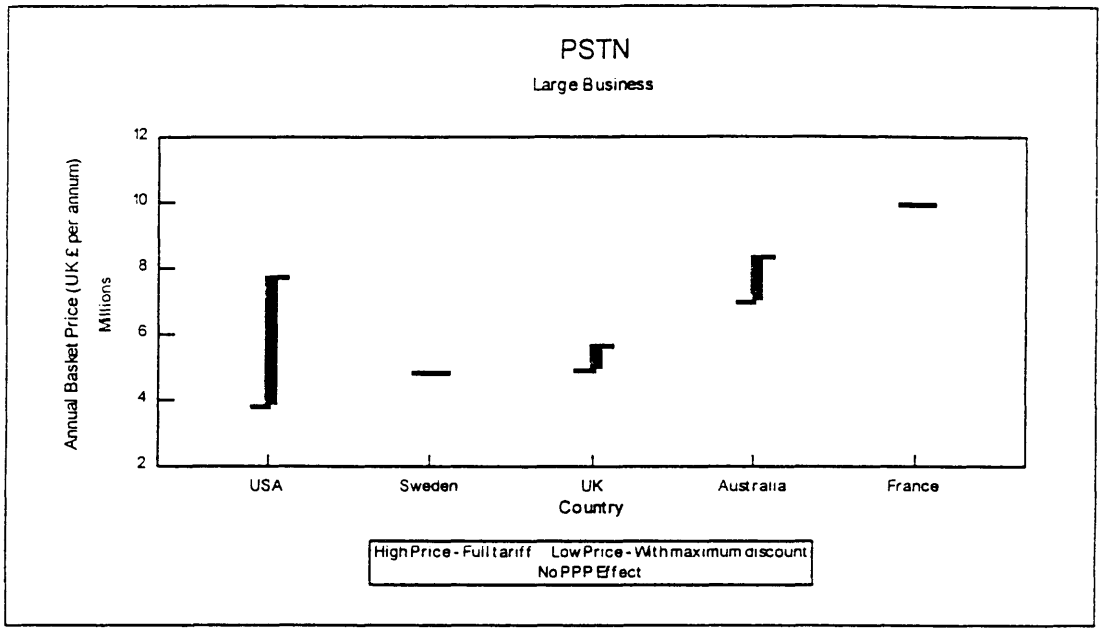

Figure 5 Comparison of Large Business PSTN Charges by Currency

74 The graph indicates the following:

- Based on undiscounted prices, the UK again ranks second, behind Sweden, and followed by USA, Australia and France;
- Based on discount prices paid, the USA ranks first, followed by Sweden, UK, Australia and France. Whilst the USA is substantially cheaper than all other countries, the UK is ranked very close to Sweden.

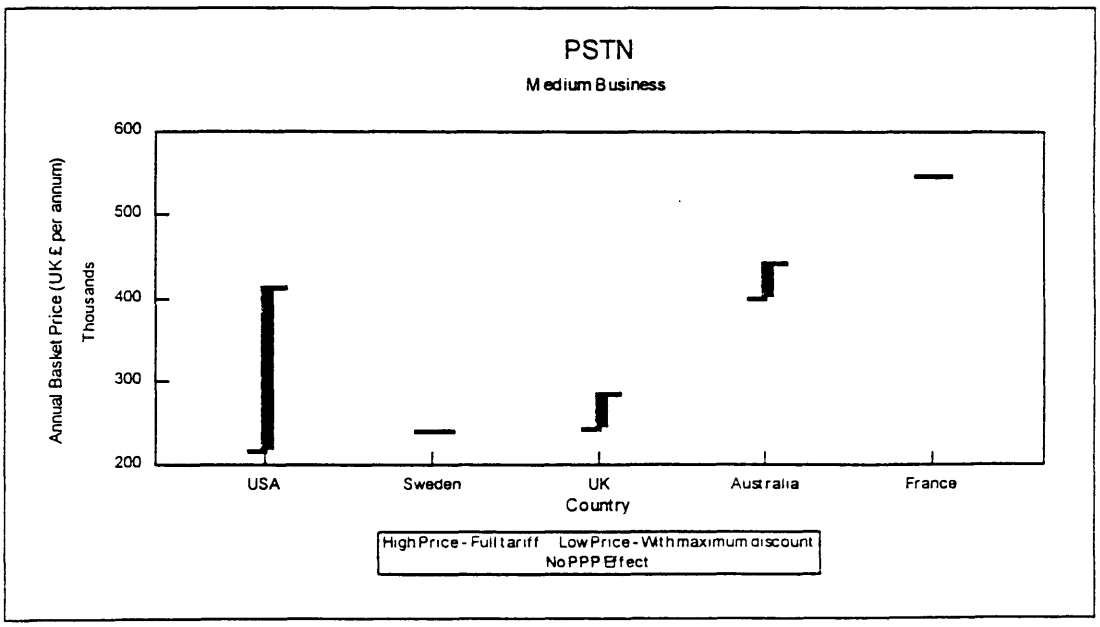

Figure 6 Comparison of Medium Business PSTN Charges by Currency

75 For medium businesses, based on discounted prices paid, the ranking remains USA, Sweden, UK, Australia, France.

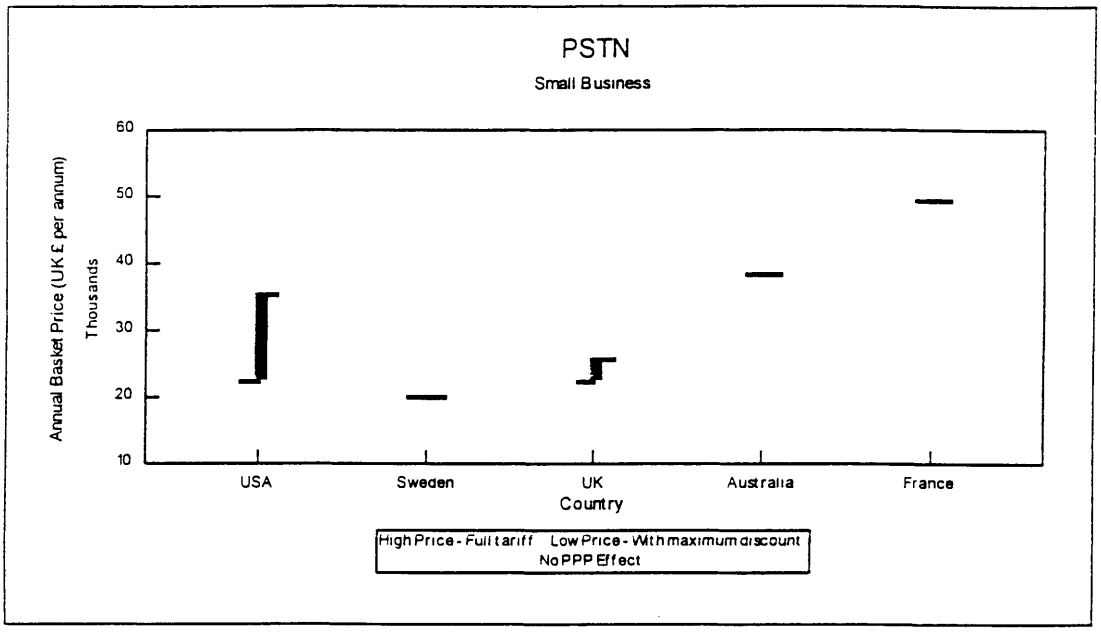

Figure 7 Comparison of Small Business PSTN Charges by Currency

76 For small businesses, based on discounted prices paid. Sweden is ranked first, followed by the USA, UK, Australia and France.

Varying the User Requirement

77 The User Requirement was varied in each of the business categories to reflect the differing profile of businesses' PSTN usage. This variation was carried out in two forms:

- Increase and decrease of the call volumes used by small, medium and large businesses, by 100% and 50% respectively, to measure the sensitivity of the country rankings to usage volume;

- Variation of the ratio of local, national and international calls used by small, medium and large businesses by increasing the volumes by 100% and reducing the volumes by 50% to measure the effect of a predominantly local, national or international user usage profile.

Changes to overall Call Volumes

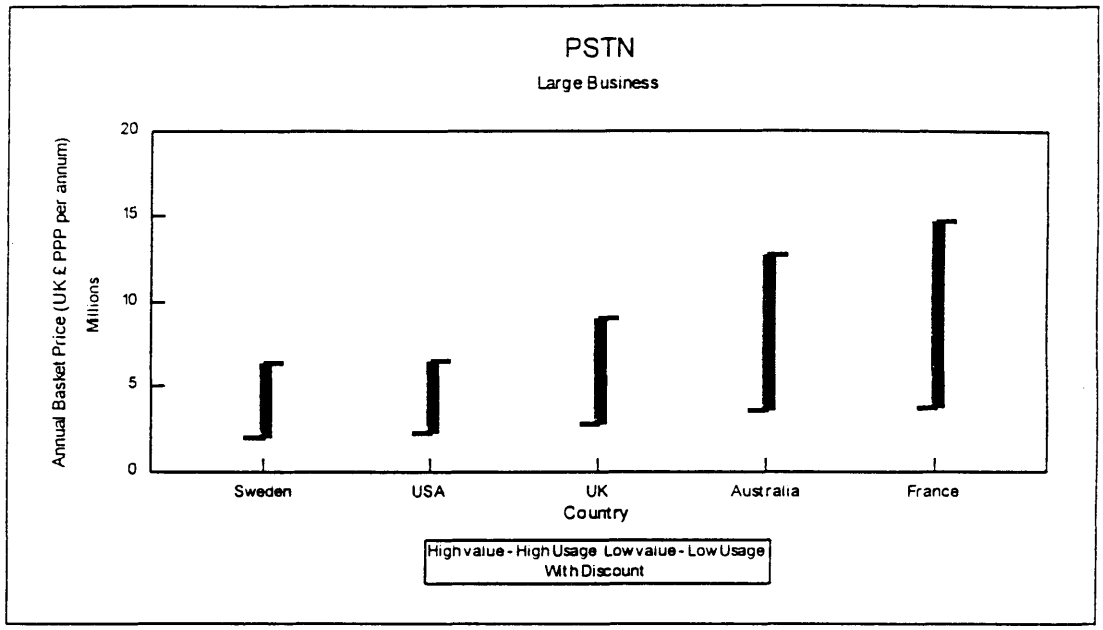

Figure 8 Impact of Changing overall call volumes on Large Users

78 Figure 8 indicates the range of costs from the high user to the low user. The graph shows that for large users, for both high and low usage, the positioning of the UK, Sweden and the USA remains the same; each performing better than Australia and France. In addition, the impact of higher call volumes causes a significantly greater impact on the basket costs in France and Australia than other countries.

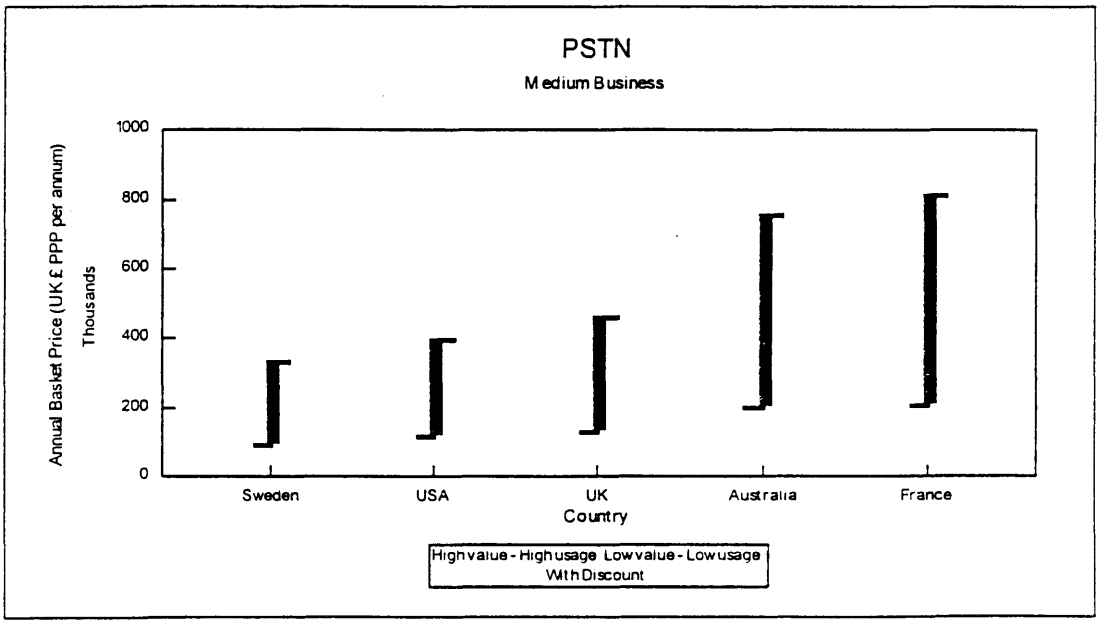

Figure 9 Impact of Changing overall call volumes on Medium Users

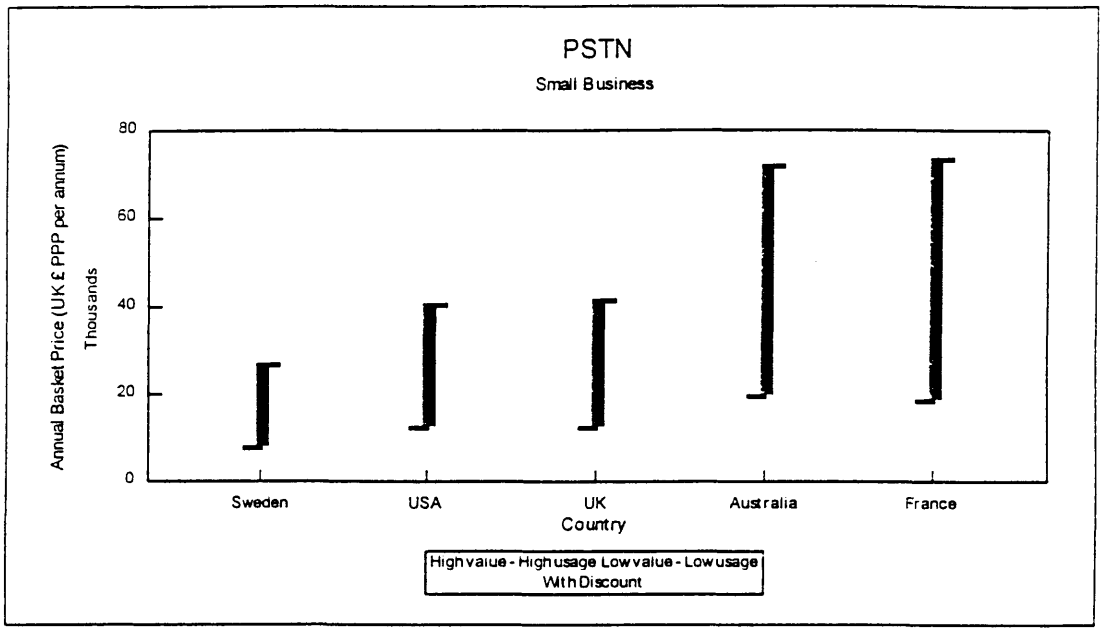

Figure 10 Impact of Changing overall call volumes on Small Users

79 Repeating the analysis of high and low usage for medium and small businesses shows that, again, the ranking remains Sweden, USA, UK, Australia, France for the high user, but that France moves ahead of Australia for the low user, for small businesses.

Modelling of alternative Call Profiles

80 Where call usage is predominantly local, the ranking is Sweden, USA, UK, France, Australia for all business sizes. It should be noted, however, that the maximum distance classified as a local call varies in different countries, and that Australia offers untimed local calls (i.e. Australia would become relatively cheaper for local calls of longer duration).

81 Where call usage is predominantly national, the UK remains third for large and medium businesses behind Sweden and the USA, but moves to second for small businesses, overtaking the USA.

82 In the international user comparison, the UK is again third for all sizes of business, with the USA ahead of Sweden for large businesses.

Summary Of Rankings

Table 6, below, shows the overall ranking of countries for different user requirements:

Business Type	Sensitivity	Sweden	USA	UK	Australia	France
Large	Base Comparison	1	2	3	4	5
Medium		1	2	3	4	5
Small		1	2	3	5	4
Large	Base Comparison - Without PPP	2	1	3	4	5
Medium		2	1	3	4	5
Small		1	2	3	4	5
Large	Low User Comparison	1	2	3	4	5
Medium		1	2	3	4	5
Small		1	2	3	5	4
Large	High User Comparison	1	2	3	4	5
Medium		1	2	3	4	5
Small		1	2	3	4	5
Large	Local User Comparison	1	2	3	5	4
Medium		1	2	3	5	4
Small		1	2	3	5	4
Large	National User Comparison	1	2	3	4	5
Medium		1	2	3	4	5
Small		1	3	2	4	5
Large	International Comparison	2	1	3	4	5
Medium		1	2	3	5	4
Small		1	2	3	5	4
KEY 1 = Lowest price of the basket 5= Highest price of the basket						

Table 6 Ranking of Countries by User Requirement

Summary of Basket Comparisons

83 A number of variations have been applied to the basket figures to reflect the potentially different usage patterns. In all cases the UK, Sweden and the USA offer the most competitive prices in PPP terms. Whilst the UK is generally behind Sweden and the USA, all three countries are significantly ahead of France and Australia.

Simple rate comparison - Local and National Call Charges

84 The underlying data behind the basket comparisons are the fixed and variable PSTN charges. This breakdown is used to provide some of the explanations behind the country comparisons.

85 Local call charges are difficult to present in a comparable form as, in some cases, they are free (included in fixed charges) or are for unlimited duration. Based on the

operators selected, the peak rate costs per minute are compared (based on a three minute average call length) to reflect typical business usage. The rates quoted are the effective rates, described earlier, calculated using an OFTEL call duration statistical model, based on negative exponential distribution, to convert nominal rates to effective rates paid by customers.

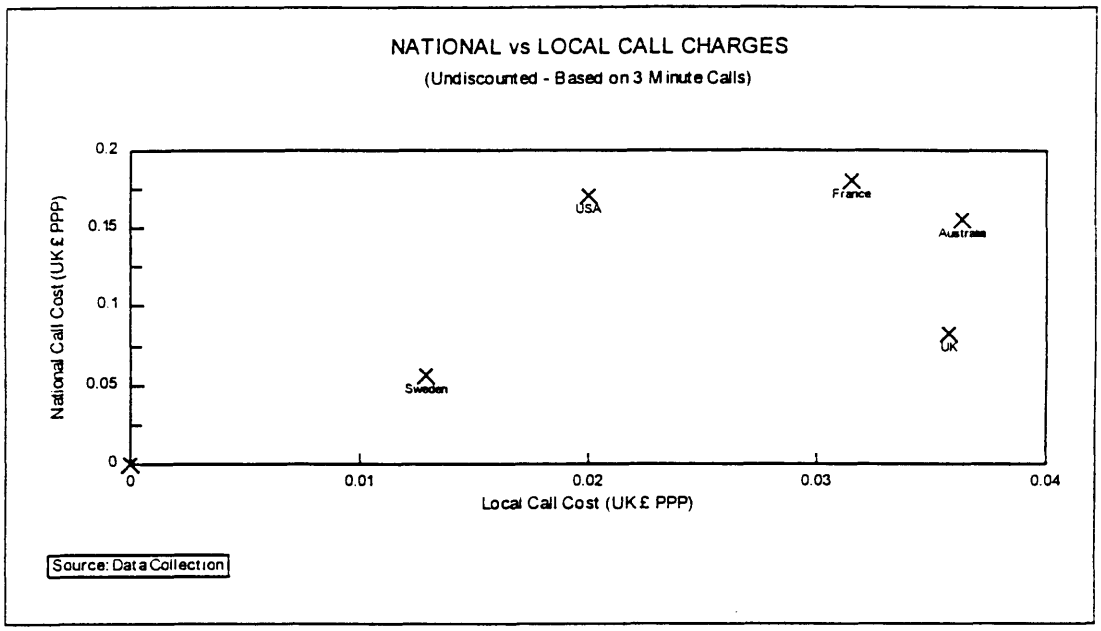

Figure 11 Simple Rate Comparison of Local and National Call Charges

86 Figure 11 shows that Sweden has the lowest cost for both local and national calls. Australia is most expensive for local calls whilst France is the most expensive for national calls. Whilst the UK has the second highest local call costs, it has the second lowest national call costs. This links with the basket calculations whereby the UK moves from third to second for small businesses with a national call focus. It also partly explains Australia's move from fourth to fifth for all business sizes for local usage.

Simple rate comparison - Fixed Charges

87 Figure 12 describes the relative fixed costs of PSTN services in each country. "Fixed costs" are defined as the annual line rental plus 20% of the initial connection charge, to spread the initial charges over five years.

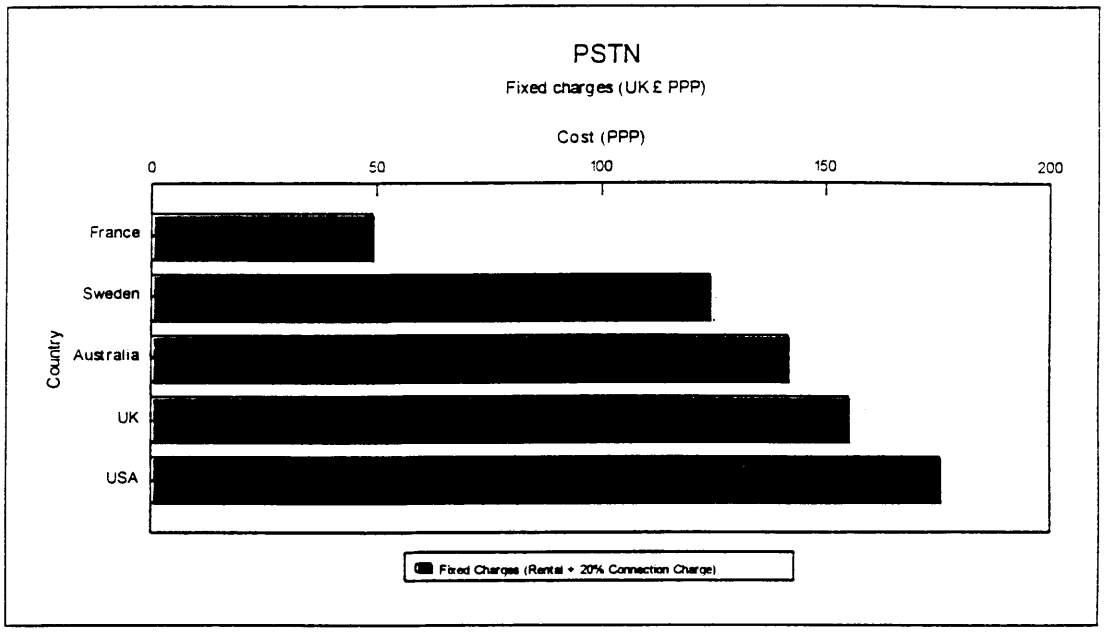

Figure 12 Simple Rate Comparison of Fixed Charges

88 The UK ranking on fixed charges is fourth, following France, Sweden and Australia respectively, ahead of the USA. The most dramatic difference is in France, where fixed charges are significantly below other countries. This explains France's move from fifth to fourth for the small business with a standard or local user pattern, where the fixed costs become more significant.

Implications of Price Ranking

89 The key implications of the price ranking based in UK £ PPP for UK businesses are:

- Overall, UK businesses pay more for telephone services than Sweden and the USA, whilst paying less than Australia and France.
- Using the base comparison, UK large businesses pay approximately 38% more for PSTN services than businesses in Sweden and 31% more than businesses in the USA.
- Using the base comparison, UK medium businesses pay approximately 37% more for PSTN services than businesses in Sweden and 15% more than businesses in the USA.
- Using the base comparison, UK small businesses pay approximately 52% more for PSTN services than businesses in Sweden and 2% more than businesses in the USA.

90 When price ranking is carried out in currency rather than PPP, the UK has basket prices very similar to Sweden, albeit approximately 20% higher than the USA.

91 UK businesses already pay more in fixed charges than all study countries except the USA. Further rebalancing of tariffs is likely to further increase fixed charges.

COMPARISON OF SERVICE AVAILABILITY AND SCOPE

92 The scope of service offering for PSTN is largely based on the capability of the telephone exchanges used to connect users to the network. Digital exchanges have many features which have been replicated worldwide by the major telephone exchange manufacturers. Table 7, below, describes the service features provided in the study countries.

Facility	USA	UK	Australia	France	Sweden
Call Waiting	Y	Y	Y	Y	Y
Call Forwarding	Y	Y	Y	Y	Y
Itemised Billing	Y	Y	Y	Y	Y
Call Barring	Y	Y	Y	Y	Y
Conference Calling	Y	Y	Y	Y	Y
Aggregate Billing	Y	Y	Y	Y	Y
Voicemail	Y	Y	Y	N	N
Calling Line ID	Y	Y	Y	N	N
Local Number Portability[1]	N	N	N	N	N
Personal Numbers	Y	N	N	N	N
Total Available	9	8	8	6	6

KEY

Y- Facility Available N- Facility not Available N/A - Information not Available

[1] Trial underway between BT and Cable Operators

Table 7 Summary of PSTN Facilities

The table shows a full set of facilities which may not be available to all users.

93 Overall, the UK is well served in terms of scope of service offering, as are all of the study countries. In most cases, however, the facilities will only be available to businesses connected to digital exchanges (System X and AXE 10). Some of the facilities are also available to users connected to TXE4 analogue exchanges when co-sited with a digital exchange. The USA has a slightly more comprehensive set of services, whilst Sweden has many of the services available at no charge. All other countries, except Sweden, make a charge for extra facilities.

COMPARISON OF QUALITY OF SERVICE OFFERING

94 Information was sought on the following quality factors:

- The time taken to install new lines;
- The mean time between line failures;
- The time taken to clear faults;
- The frequency of call failure;
- The target levels of network performance.

Availability of Information

95 Overall, PSTN operators select their own quality parameters and these differ between countries. They were generally unwilling to release additional quality of service parameters. France and Sweden make no quality of service information available. The USA and Australia do publish regular quality bulletins. In the USA this is provided by the Federal Communications Commission (FCC) who produce a quarterly quality bulletin covering all Long Distance and Local carriers. In Australia, the dominant operator produces a quarterly Quality of Service document covering different components of their services. In the UK, since the late 1980s Mercury have produced quarterly Quality of Service data whilst BT produce six-monthly data. More recently, a wide range of fixed telecommunications companies have produced comparable information regarding performance across several aspects of service.

All data quoted in this section is based on the dominant in country operator, with the exception of the USA where Nynex and AT&T are again used as representative operators.

Time to Install New Telephone Lines

96 Across the countries considered, no country had a waiting list for PSTN services, all scheduling installations immediately on receipt of order.

Figure 13 describes the quoted lead time for installation of a new business PSTN line.

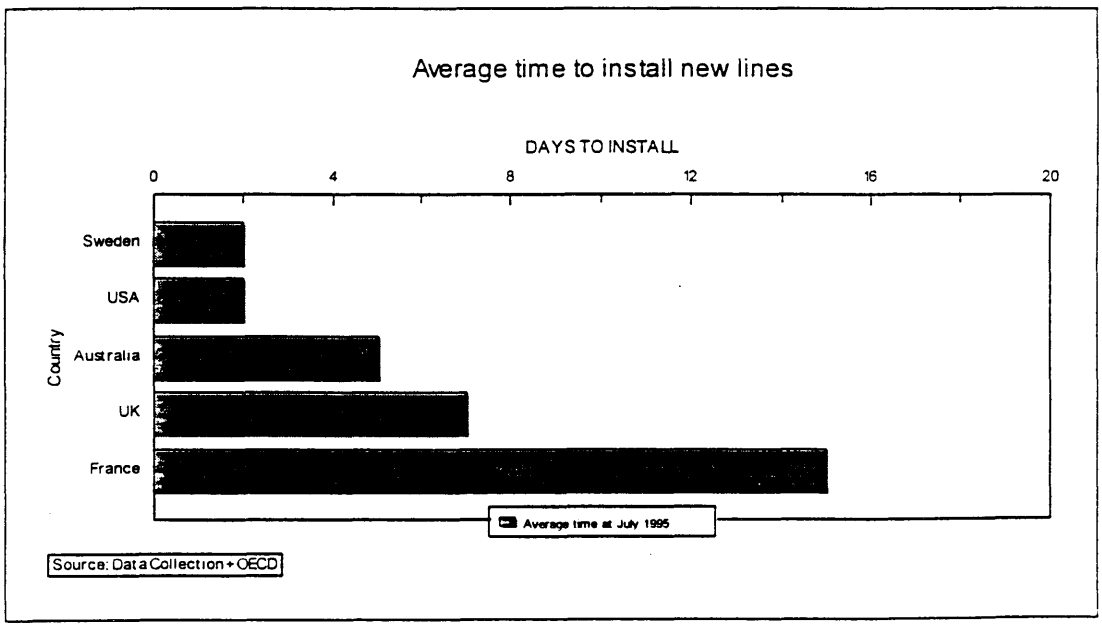

Figure 13 Average time to install new PSTN lines

97 The UK, with an average time to install of seven days, ranks behind the USA, Sweden and Australia.

Time Taken to Clear Faults

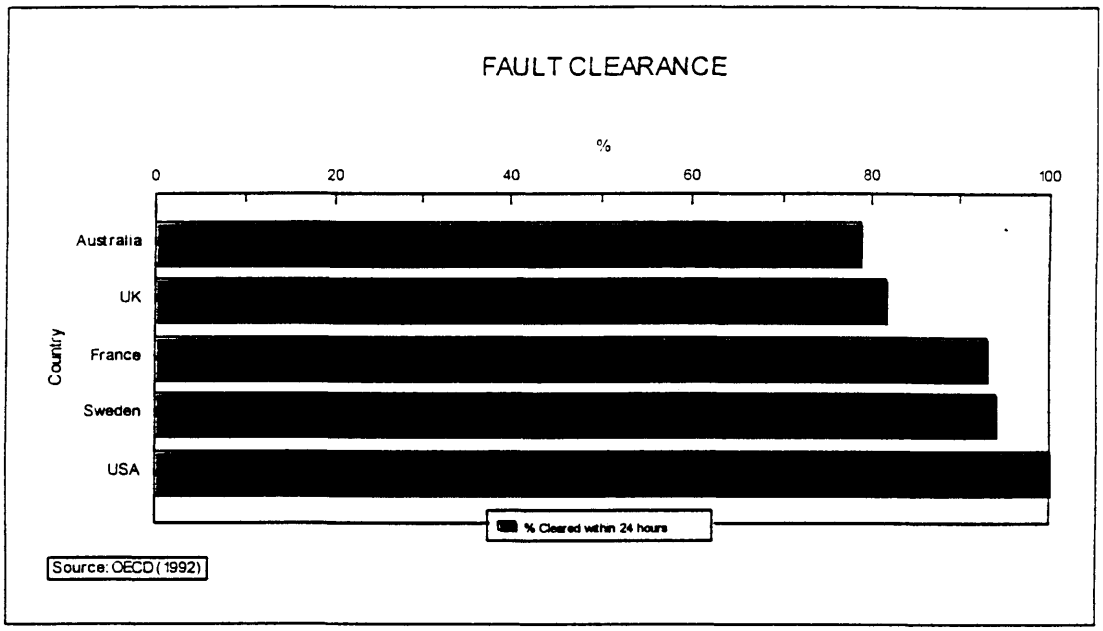

Figure 14 Time taken to clear faults

98 Based on OECD data which is now several years old, the UK ranks fourth on faults cleared, behind the USA, Sweden and France and just ahead of Australia. The USA quote a target clearance of all faults within 24 hours. More recent data, however, published by OFTEL[4], indicates that across a range of UK telecommunications companies between 78% and 99% of faults are cleared within the target repair times, which are typically less than 24 hours.

Summary

99 Given the lack of consistent quality parameters, it is difficult to determine an indicative ranking. However, the USA appears to rank first, based on the shortest time to install new lines and the highest percentage of faults fixed within 24 hours. The UK is in common with the USA and Australia in measuring quality of service statistics and making them generally available. In France and Sweden, if quality of service data is produced, it is not made available outside of the operators.

CONCLUSIONS

100 This section briefly discusses the conclusions from the previous data and the overall "Best in Class" positioning.

FACTOR	BEST IN CLASS	POSITION OF UK
PRICE	SWEDEN	3
SCOPE	USA	JOINT 2

[4] "Telecommunications Companies - Comparable Performance Indicators , July - September 1995", Oftel, 1996

101 Sweden is ranked number one for all PPP price basket comparisons with the standard user requirement. In most cases the USA is second, with the UK third, followed by Australia and France.

102 For direct currency comparisons (without PPP) the USA ranks first for large and medium businesses, followed by Sweden, UK, Australia and France.

103 This ranking is consistent with the OECD positioning, with the exception of the USA. OECD based their prices on full tariff list prices which leads to the USA being ranked behind Sweden, UK and France, with Australia ranked last.

104 The USA ranks highest in the scope of service offering, providing the widest range of facilities from their digital exchanges.

105 The USA ranks highest in quality of service, based on having the shortest lead time to install new lines and the fastest fix time for faults.

POSSIBLE REASONS FOR THE RANKING

106 The USA and the UK have had competitive markets for telecommunications for over five years. Whilst Sweden had a single dominant operator until recently, there has been no regulation to stop a second operator commencing service, merely an unattractive market due to low prices from the dominant operator. These conditions have provided downward pressure on prices, which were already low, and pressure on operators to provide high quality and responsive services. More recently the second operator in Sweden has introduced further downward pressure on prices, in particular on international calls. In comparison, Australia has only allowed competition for the past two years and France remains a monopoly.

107 The use of PPP for price comparison has a significant impact on the prices of Sweden and France, relative to the UK, USA and Australia. Without PPP the USA would be clearly ranked number one, with the UK in third place, very close behind Sweden, well ahead of Australia and France.

108 Sweden, the UK and Australia operate a price cap mechanism over the dominant operator to provide further pressure on prices. This is particularly effective in the small user and local markets where little competition exists.

109 Sweden and the USA (but not UK, Australia or France) allow all suppliers, including the dominant operator, to discount their prices to large users on an individually negotiated basis. The only constraint on the prices offered is that they must not be priced below fully allocated cost. This produces significant discounts for users in the USA of up to 70% discount on national and international calls.

110 New operators in Sweden have focused on indirect access, utilising Telia's local access network, thereby introducing competition quickly without the overhead of building a new physical infrastructure. Competitors pay for interconnect with Telia based on the cost of installation.

111 The geography of Sweden, based on two main distributed centres of business (Stockholm and Gothenburg), means that national infrastructure can be installed fairly simply, should a competitor wish to do so.

112 Alternative procurement strategies have been adopted for digital switching equipment. Operators in the UK, USA and Australia utilise a competitive procurement of digital switching equipment. In comparison, France and Sweden tend to develop products in conjunction with local suppliers. While the resulting exchanges in use are of similar technical ability, the equipment competitively procured and operating in a competitive market has, in practice, been used to offer more facilities to users.

5. ISDN

5. ISDN

INTRODUCTION

113 The Integrated Services Digital Network (ISDN) is designed to be the digital upgrade to the PSTN. It is an end to end digital network which, in addition to being a high quality voice service, is also used for data communications and videoconferencing. Standards for ISDN were set in 1984. It is only in the past three years, however, that ISDN services have been widely available in the study countries.

114 There are two types of ISDN access. First, there is basic rate access, where the user is presented with two digital channels which can be used for voice and data communications, and a further digital channel which is used primarily for signalling purposes by the network. Second, there is primary rate access, where the user is presented with 30 digital channels for voice and data communications and one digital channel for signalling. In the USA, ISDN primary rate access presents 24, rather than 30, user channels. This study includes both basic rate and primary rate services.

115 A comparison of the ISDN services in the UK with the other study countries, is given below in terms of price comparison, service availability, scope of service and quality of service.

PRICE COMPARISON

116 Figure 15 shows the overall ranking of the different countries in the study for large business users. The basket includes ISDN basic rate and primary rate services.

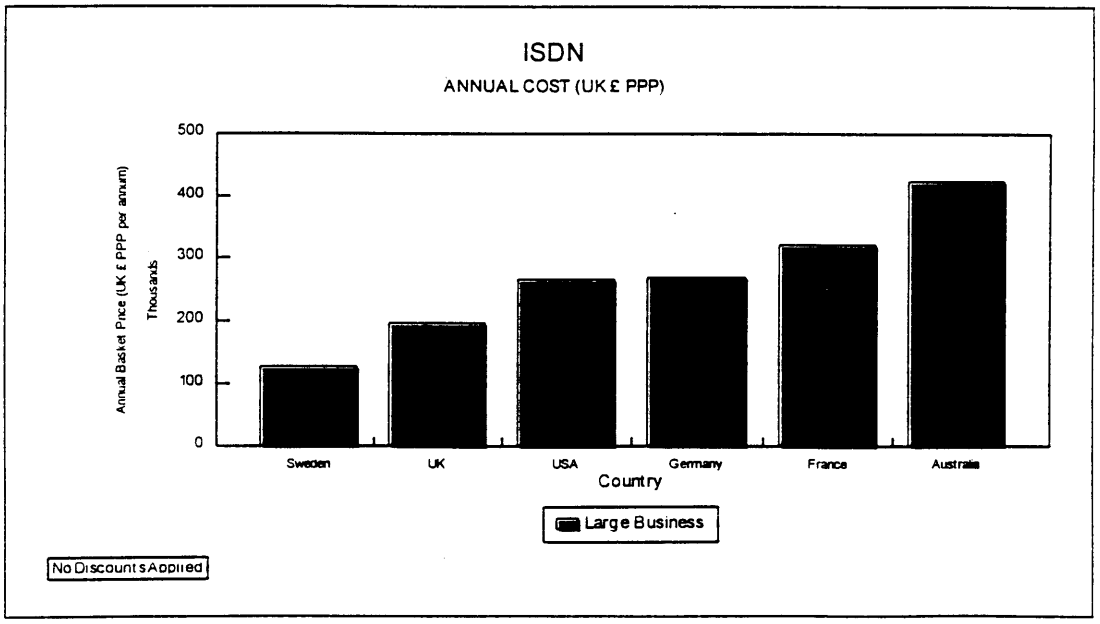

Figure 15 Basket Comparison of Large Business ISDN Charges by Country

117 The graph shows that, for large businesses, the UK ranks second, behind Sweden, and followed by USA, Germany, France and Australia.

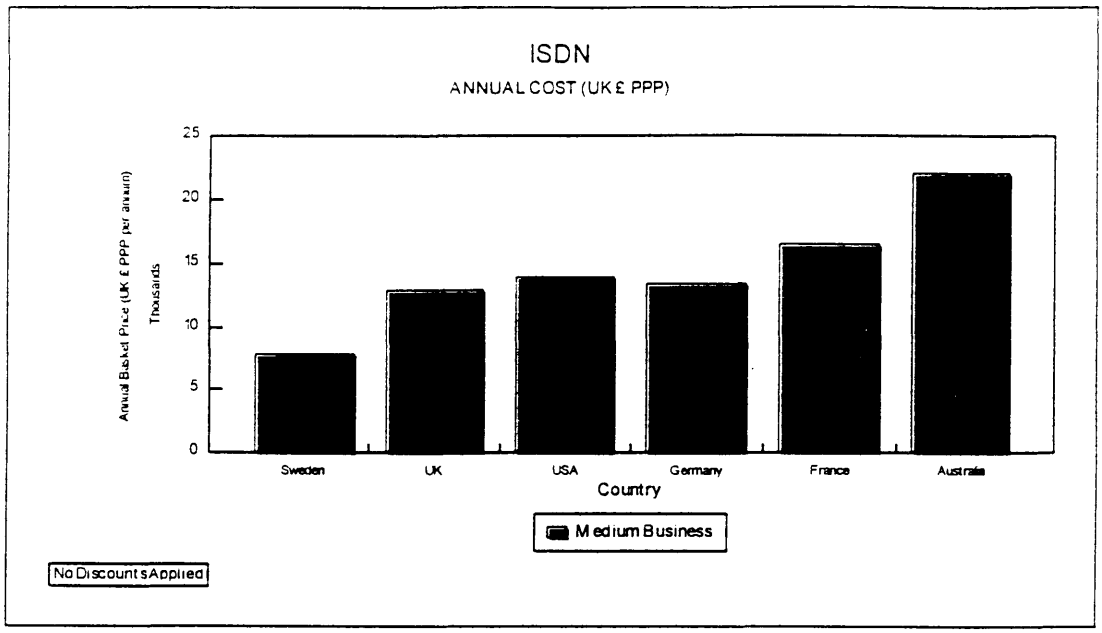

Figure 16 Basket Comparison of Medium Business ISDN Charges by Country

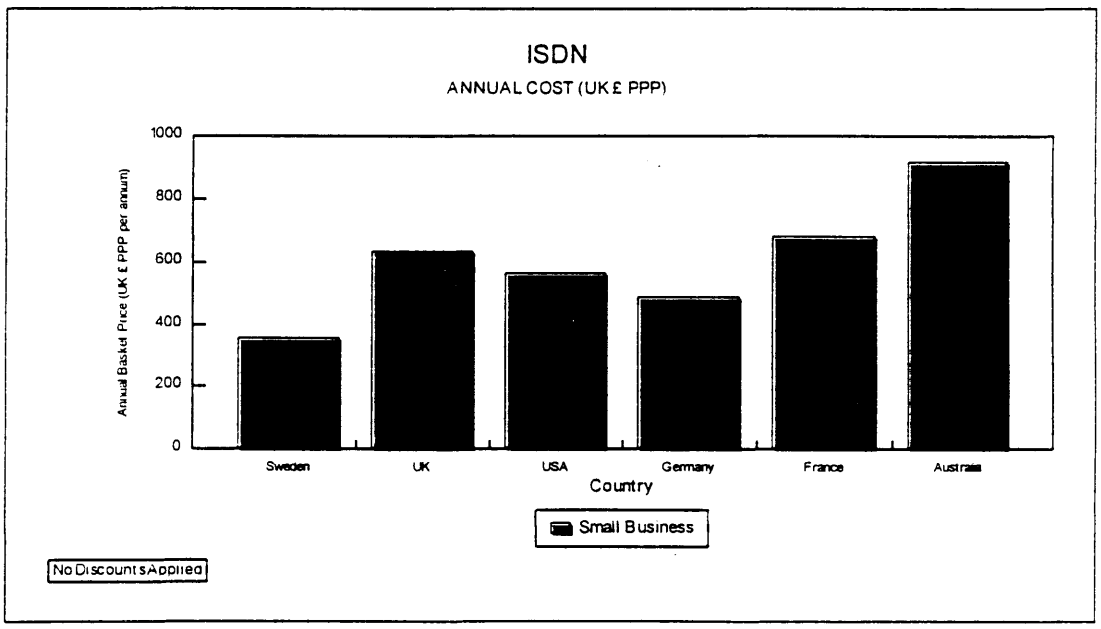

Figure 17 Basket Comparison of Small Business ISDN Charges by Country

118 Figures 16 and 17 show the overall ranking for medium and small business users. The graphs indicate the following:

- For medium businesses, the UK ranking for ISDN remains second in the ranking, behind Sweden and followed by Germany, USA, France and Australia;

- For small businesses, the UK ranking for ISDN falls to fourth, behind Sweden, Germany, USA, and followed by France and Australia.

The Impact of Volume Discounts

119 All ISDN prices are compared based on full list price. In some countries (USA, UK, Australia) some discount may occur for large businesses, although it is not considered to have a significant impact on the ranking.

Varying the User Requirement

120 The User Requirement was varied in each of the business categories to reflect the differing profile of business ISDN usage. This variation was carried out in two forms:

- Increase and decrease of the call volumes used by small, medium and large businesses by 100% and 50% respectively to measure the sensitivity of the country rankings to usage volume;
- Variation of the ratio of local, national and international calls used by small, medium and large businesses by increasing the volumes by 100% and reducing the volumes by 50% to measure the effect of a predominantly local, national or international user usage profile.

Changes to overall Call Volumes

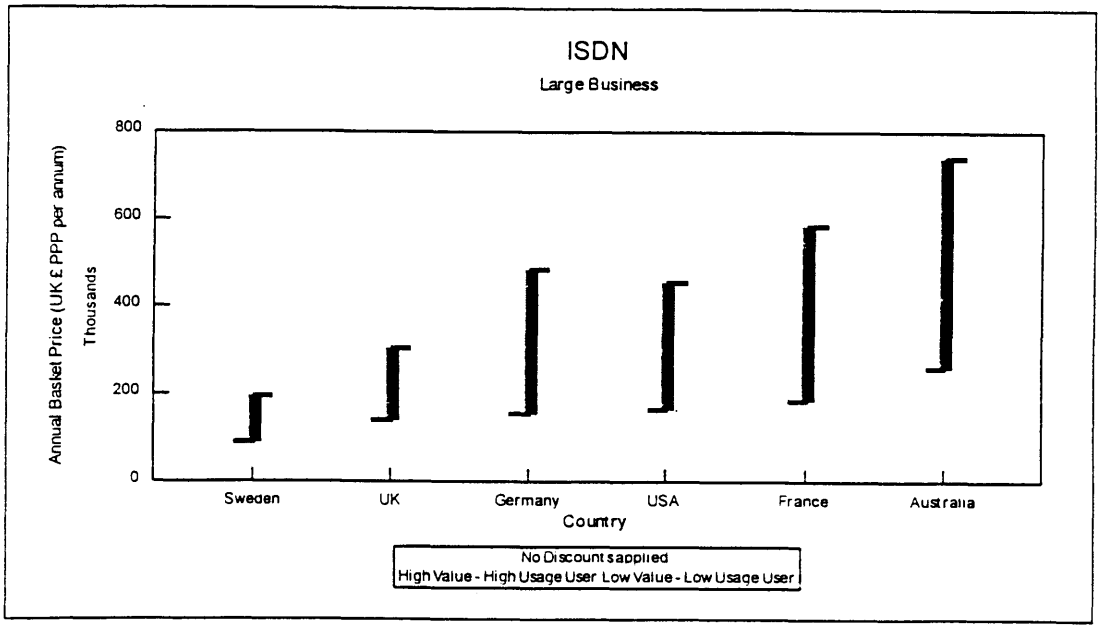

Figure 18 Impact of Changing overall call volumes on Large Users

121 Figure 18 indicates the range of costs from the high user to the low user. The graph shows that for large users, for high usage the ranking remains Sweden, UK, USA, Germany, France, Australia. For low usage, Germany moves ahead of the USA to third; other rankings remain unaltered. Germany moves ahead of the USA for low usage/large businesses when (excluding volume related discounts) its lower fixed charges outweigh the impact of its higher national call costs.

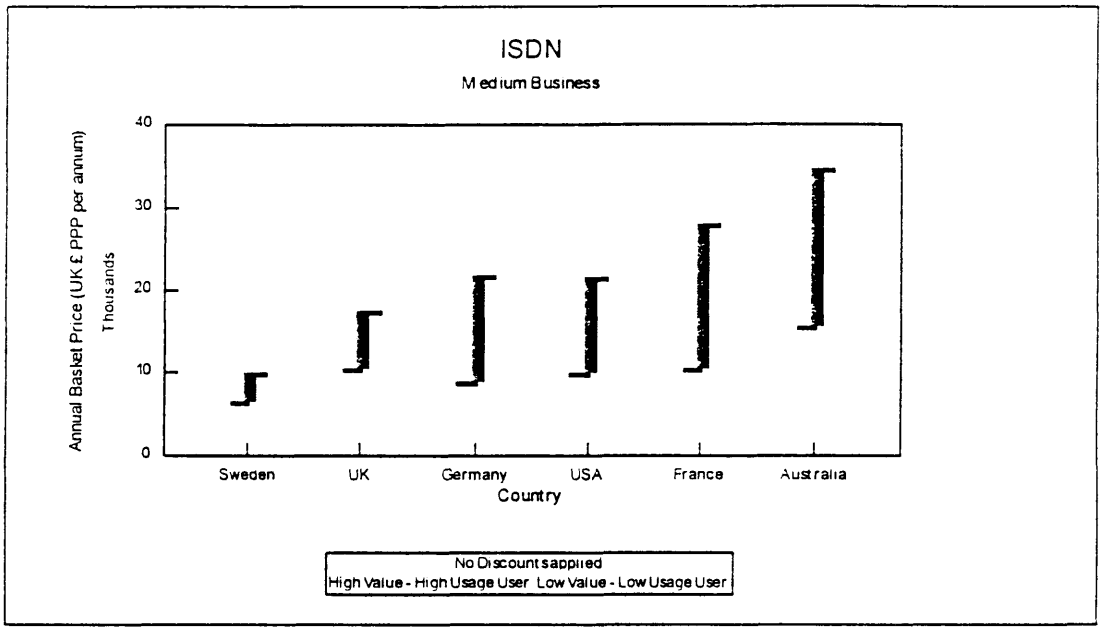

Figure 19 Impact of Changing overall call volumes on Medium Users

122 Repeating the sensitivity for medium businesses shows that, for high usage the ranking remains unaltered, whilst for low usage, the UK falls to fourth place, following Sweden, Germany, USA and followed by France and Australia.

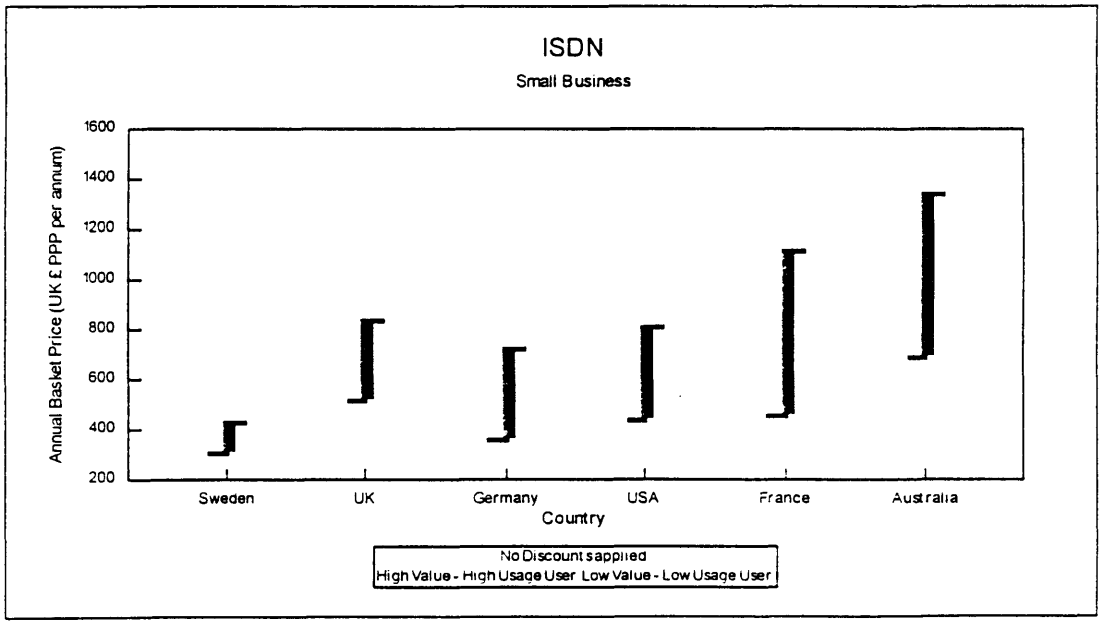

Figure 20 Impact of Changing overall call volumes on Small Users

123 Completing this analysis of high and low usage for small businesses, shows that for high usage the UK is ranked fourth, behind Sweden, Germany, USA and followed by France and Australia. For low usage, the UK is ranked fifth, following Sweden, Germany, USA and France, followed only by Australia.

Modelling of alternative call profiles

124 For large businesses, where usage is predominantly local, the ranking is Sweden, UK, Germany, USA, France, Australia. For predominantly national usage, USA moves above Germany to third.

125 For medium businesses the ranking is Sweden, Germany, USA, UK, France, Australia for both local and national usage.

126 For small businesses, the ranking of the UK falls to fifth, for both local and national usage, following Sweden, Germany, USA, France, and followed by Australia.

127 In the international user comparison, the UK is second for large and medium businesses, falling to fourth for small businesses.

128 Table 8, below, shows the overall ranking of countries for the different user requirements:

Business Type	Sensitivity	Sweden	UK	USA	Germany	France	Australia
Large	Base Comparison	1	2	3	4	5	6
Medium		1	2	4	3	5	6
Small		1	4	3	2	5	6
Large	Low User Comparison	1	2	4	3	5	6
Medium		1	4	3	2	5	6
Small		1	5	3	2	4	6
Large	High User Comparison	1	2	3	4	5	6
Medium		1	2	3	4	5	6
Small		1	4	2	3	5	6
Large	Local User Comparison	1	2	4	3	5	6
Medium		1	4	3	2	5	6
Small		1	5	3	2	4	6
Large	National User Comparison	1	2	3	4	5	6
Medium		1	4	3	2	5	6
Small		1	5	3	2	4	6
Large	International Comparison	1	2	4	3	5	6
Medium		1	2	3	5	4	6
Small		1	4	3	2	5	6
KEY 1 = Lowest price of the basket 6= Highest price of the basket							

Table 8 Ranking of Countries by User Requirement

Summary of basket comparisons

129 A number of variations have been applied to the basket figures to reflect the potentially different usage patterns. In all cases, Sweden offers the most competitive

prices in PPP terms, as demonstrated in Table 3. Whilst the UK ranks second for large businesses, for small and medium businesses the UK often ranks fourth or fifth.

Simple rate comparison - local and national call charges

130 The underlying data behind the basket comparisons are the fixed and variable ISDN charges. This breakdown will be used to provide some of the explanation behind the country comparisons.

131 Similar difficulties apply when modelling ISDN local calls to those discussed in the PSTN section, i.e. for some USA operators they are free; in Australia they are of unlimited duration. In addition, the sizes of the local call boundaries are different.

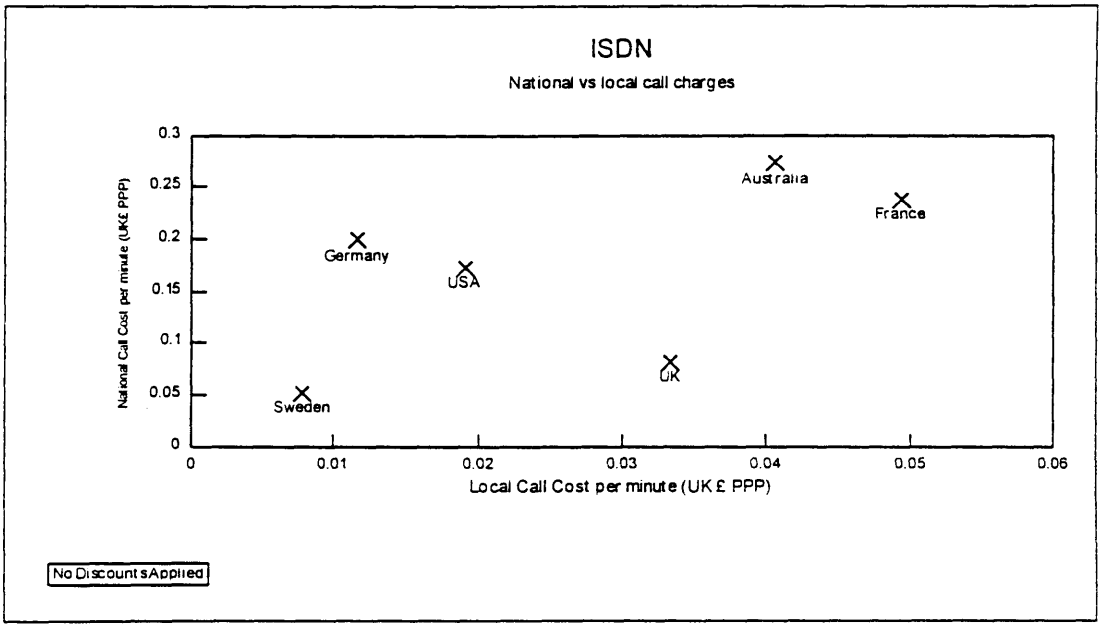

Figure 21 Simple Rate Comparison of Local and National Call Charges

132 Figure 21 shows that Sweden is relatively lowest cost for both local and national calls. France is most expensive for local calls whilst Australia is the most expensive for national calls. Whilst the UK has the third highest local call costs, it has the second lowest national call costs. Call costs are identical for basic rate and primary rate services.

Simple rate comparison - fixed charges

133 Figures 22 and 23 describe the relative fixed costs of ISDN services in each country. "Fixed costs" are defined as the annual line rental plus 20% of the initial connection charge, to spread the initial charges over five years.

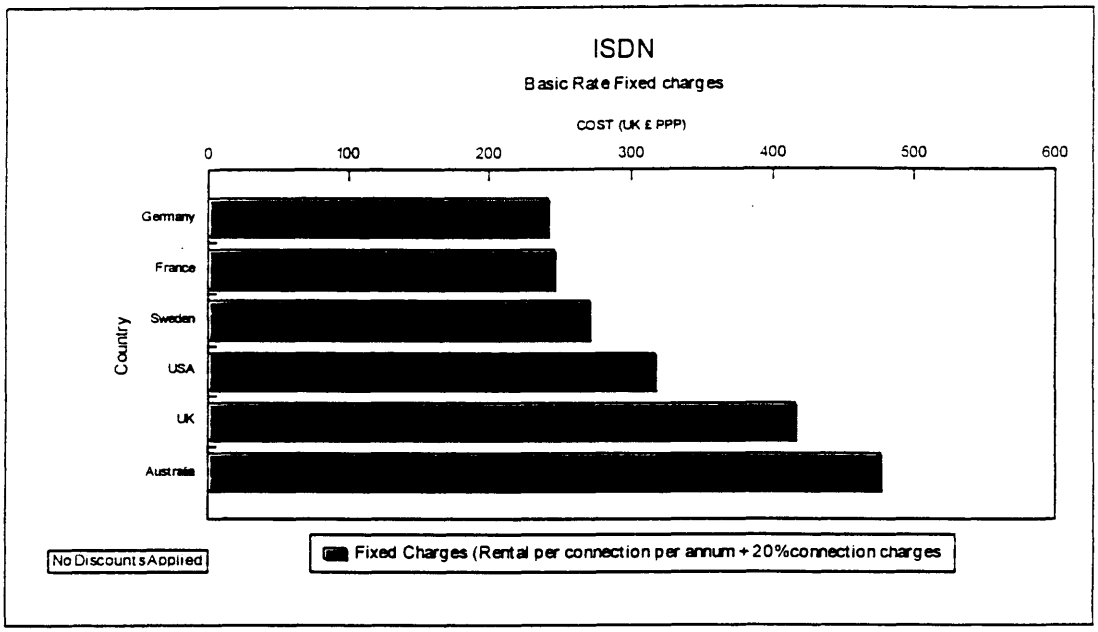

Figure 22 Simple Rate Comparison of Fixed Charges - Basic Rate ISDN

134 The UK ranking on basic rate fixed charges is fifth, following Germany, France, Sweden and USA respectively, ahead only of Australia. This explains why the UK falls in the ranking for small and medium businesses when the fixed costs become a higher percentage of the total cost.

135 The UK has the highest connection charge for basic rate services. At £400 (PPP) it is six times the price charged in Germany, three times the price in France and approximately twice the price charged in Sweden, Australia and the USA. This has led to significant criticism from UK business users who find the initial costs of ISDN prohibitive.

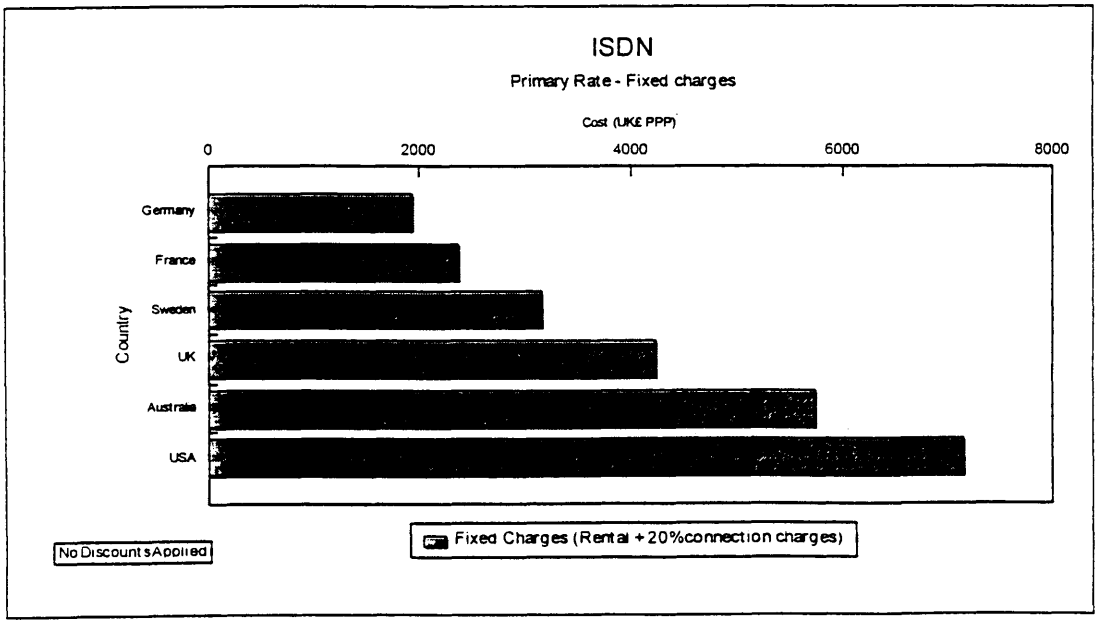

Figure 23 Simple Rate Comparison of Fixed Charges - Primary Rate ISDN

136 The UK ranking on primary rate fixed charges is fourth, following Germany, France, and Sweden, ahead of Australia and the USA. This explains why the USA falls in the ranking for large businesses with low and local usage profiles when primary rate fixed costs become more significant. In addition, the USA service has only 80% of the capacity of the other services, providing only 24 channels.

Implications of Pricing Ranking

137 The key implications of the ISDN ranking for UK businesses are as follows:

- Overall, in the UK businesses have ISDN services available which are higher cost than Sweden, but lower cost than all other study countries;
- Using the base comparison, UK large businesses pay approximately 55% more for ISDN services than businesses in Sweden;
- Using the base comparison, UK medium businesses pay approximately 65% more for ISDN services than businesses in Sweden;
- Using the base comparison, UK small businesses pay approximately 78% more for ISDN services than businesses in Sweden, 29% more than businesses in Germany and 12% more than businesses in the USA.

138 UK businesses pay at least 31% more in fixed charges for basic rate ISDN than all study countries except Australia, and at least 34% more for primary rate ISDN than Germany, Sweden and France.

139 UK businesses pay at least 56% more to connect to basic rate ISDN than all other study countries. In comparison with European counterparts, UK businesses pay more than six times the connection charge of businesses in Germany, more than three times the charge of businesses in France, and 56% more than businesses in Sweden.

COMPARISON OF SERVICE AVAILABILITY AND SCOPE

140 The data collection and analysis comparing availability of services was focused on the following individual factors:

- Business population coverage for basic rate and primary rate ISDN;
- Lead time to install basic rate services.

The resulting data is shown in Table 9 below.

Country	UK	France	Germany	Sweden	Australia	USA
Coverage - Basic Rate (% Business Users)	N/A*	N/A	N/A	N/A	70 - 80	100 **
Coverage - Primary Rate (% Business Users)	N/A*	100	N/A	N/A	100	100 **
Lead time to install basic rate services (days)	6 - 30	N/A	10 - 20	N/A	N/A	N/A
KEY N/A = Information not available * Generally available to users in the UK ** = Data based on Nynex service area, varies from different operators						

Table 9 Comparison of ISDN availability

141 For most of the countries the operators contacted did not provide all of the information requested.

142 In addition to the standard voice and data communications facilities of ISDN, there is also a set of supplementary services providing additional facilities. The supplementary services considered in this study were:

- Closed User Groups - enabling businesses to define a private group for all of its ISDN connected locations, increasing the overall security to the business;
- Sub Addressing Facility - allowing businesses' individual terminals to be directly connected to an incoming ISDN call;
- D-Channel Facility - allowing the ISDN D-Channel to be available for low speed customer data transfer in addition to signalling, thus providing a third data channel on a basic rate service.

143 Table 10 describes the service features provided in the study countries.

Country	UK	France	Germany	Sweden	Australia	USA
Closed User Groups	Y	Y	Y	Y	Y	Y
Sub Addressing Facility	Y	Y	Y	Y	Y	Y
D-Channel Facility	N	Y	Y	N	Y	Y
KEY ** = Data based on Nynex service area						

Table 10 Summary of ISDN Facilities

144 The UK is in common with all other countries in having access to closed user groups and sub addressing facilities. Only the UK and Sweden do not currently offer customers access to the D-Channel facility.

COMPARISON OF QUALITY OF SERVICE OFFERING

145 Information was sought on a number of quality factors including:

- The mean time between line failures:
- The time taken to clear faults:
- The frequency of call failure:
- The target levels of network performance.

Availability of Information

146 Little or no data is provided by the operators on the quality of their ISDN services. The operators contacted in the UK and Germany were willing to quote target call set up times (UK, 2 seconds busy hour, 1.5 seconds average; Germany, 1.5 seconds average and busy hour), and Germany and Australia were willing to quote average time to repair (Germany 2 days, Australia 1 day). Whilst quality of service data is produced in the UK, USA and Australia, this is primarily focused on PSTN services, sometimes considering private circuits and mobile.

CONCLUSIONS

147 This section briefly discusses the conclusions from the previous data and the overall "Best in Class" positioning.

FACTOR	BEST IN CLASS	POSITION OF UK
PRICE	SWEDEN	2

148 Sweden is ranked number one for all price basket comparisons with the standard user requirement. The UK is, in most cases second, with the USA or Germany third, followed by Australia and France.

149 Although the UK ranks second on overall annual costs for ISDN users, based on large businesses, the high cost of connection is likely to discourage many UK businesses from using ISDN, in particular small businesses and large businesses with large numbers of distributed locations.

150 Given the limited data available on the other factors, it is not considered appropriate to rank on availability, scope or quality at the present time. Once the services have reached a greater degree of maturity, more information is likely to be available from operators to allow this ranking to be measured.

POSSIBLE REASONS FOR THE RANKING

151 Sweden, UK, Germany and Australia charge for local and national ISDN calls at the same rate as PSTN calls, whereas USA and France charge more for local and national ISDN calls than PSTN calls. All countries charge more for international ISDN calls than PSTN calls. The overall effect is to move the UK up the rankings above the USA when there is a significant call spend.

152 Based on the charging structures above, it is not surprising that Sweden maintains its number one price ranking, based on its PSTN charges being "Best in Class".

6. ANALOGUE MOBILE

6. ANALOGUE MOBILE

INTRODUCTION

153 The first cellular service in the world was introduced in Sweden in 1981. Analogue mobile services were introduced in all countries in the 1980s to provide portable telephony facilities from car phones and hand portables. In recent years, business users have begun to migrate onto digital mobile services. At the present day, however, the majority of mobile usage remains analogue.

154 A comparison of the Analogue Mobile services in the UK with the other study countries is given below in terms of price comparison, service availability, scope of service and quality of service.

PRICE COMPARISON

155 Figure 24 shows the overall ranking of the different countries in the study for large business users. All call charges are based on peak rate business tariffs.

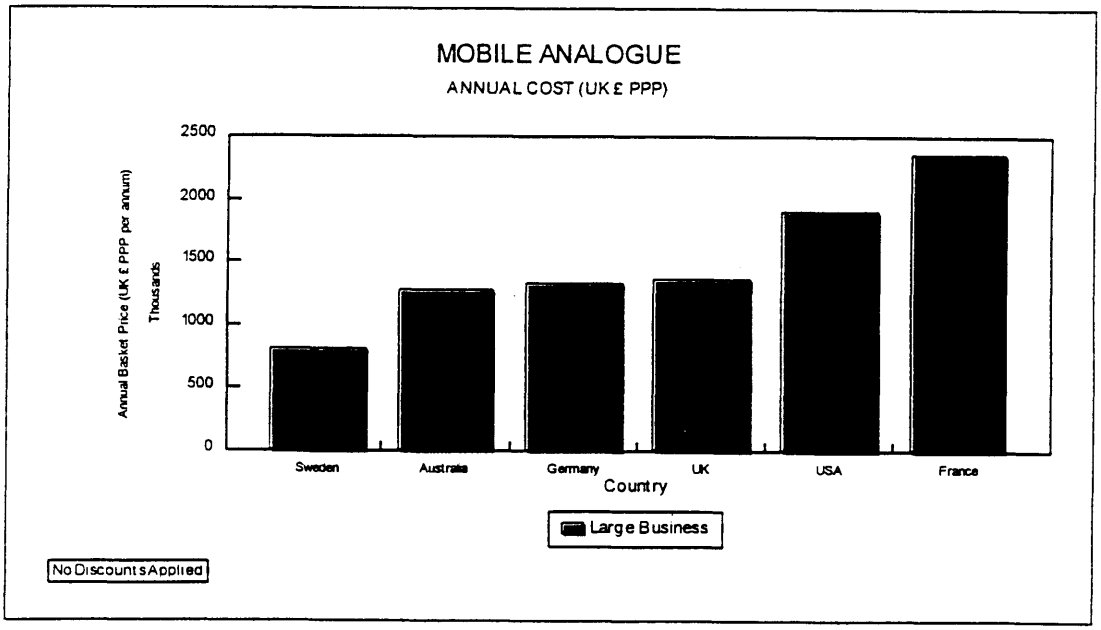

Figure 24 Basket Comparison of Large Business Analogue Mobile Charges by Country

156 The graph shows that, for large businesses, the UK ranks fourth, behind Sweden, Australia, Germany, and followed by USA and France.

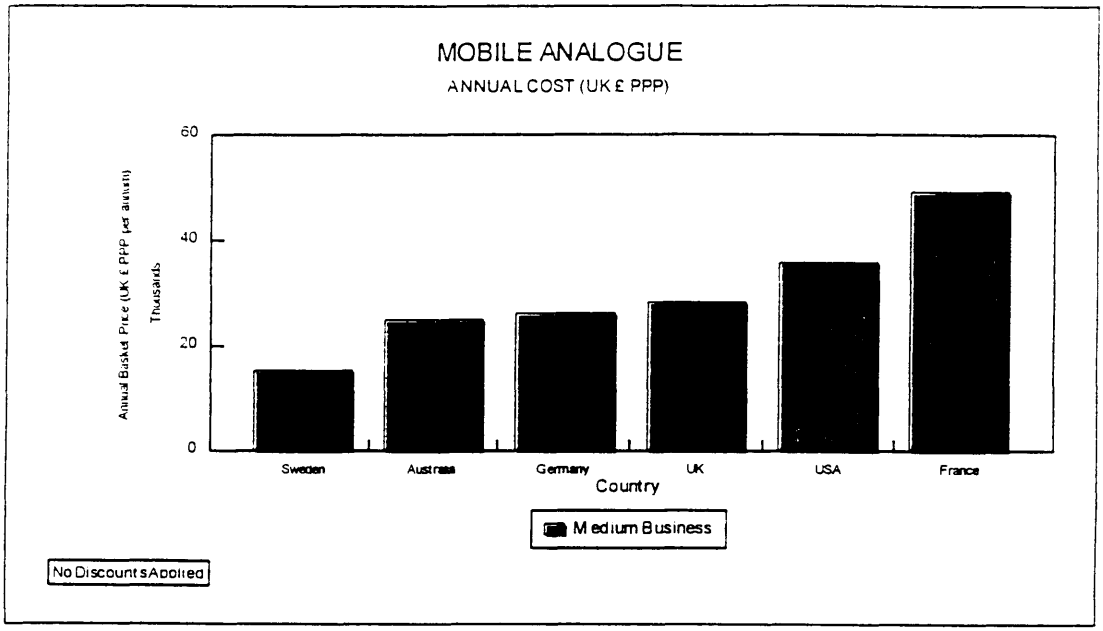

Figure 25 Basket Comparison of Medium Business Analogue Mobile Charges by Country

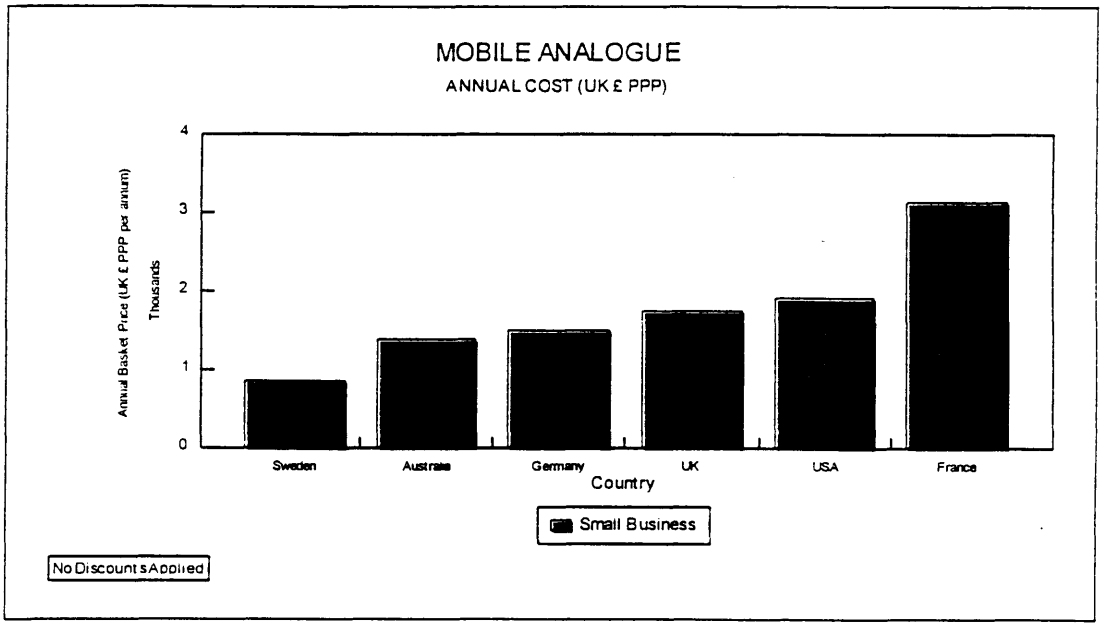

Figure 26 Basket Comparison of Small Business Analogue Mobile Charges by Country

157 Figures 25 and 26 show the overall ranking for medium and small business users. The graphs indicate that, for the base user requirement, the ranking remains Sweden, Australia, Germany, UK, USA, France.

158 For all rankings, the UK is very close to Australia and Germany, just ahead of USA and significantly ahead of France. These rankings are so close that they could change with a different user requirement or discounting plan.

The impact of volume discounts

159 All Analogue Mobile prices are compared based on operators' full list price for Business usage. In some countries (USA, UK, Australia), it is possible for businesses to negotiate a small discount with a service provider on call charges, over and above discounts which are available to very high usage users. In addition, other incentives may be given to new business customers, e.g. free connection. For this study, the comparisons are based on published prices using business rate, peak time charges. These are considered to be fully representative for country ranking.

Varying the user requirement

160 The User Requirement was varied in each of the business categories to reflect the differing profile of businesses' Analogue Mobile usage. This variation was carried out by increasing and decreasing the call volumes by 100% and 50% respectively to measure the sensitivity of the country rankings to high or low usage.

Changing the overall call volumes

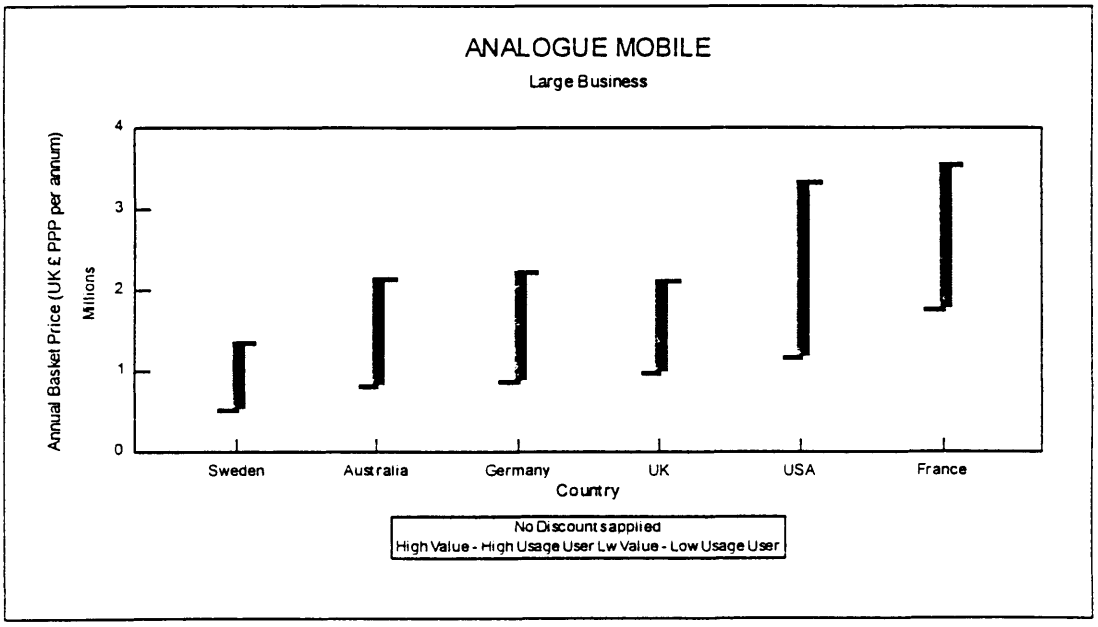

Figure 27 Impact of Changing overall call volumes on Large Users

161 Figures 27-29 indicate the range of costs from the high user to the low user. The graphs show that, for low usage, the ranking remains Sweden, Australia, Germany, UK, USA, France for large, medium businesses.

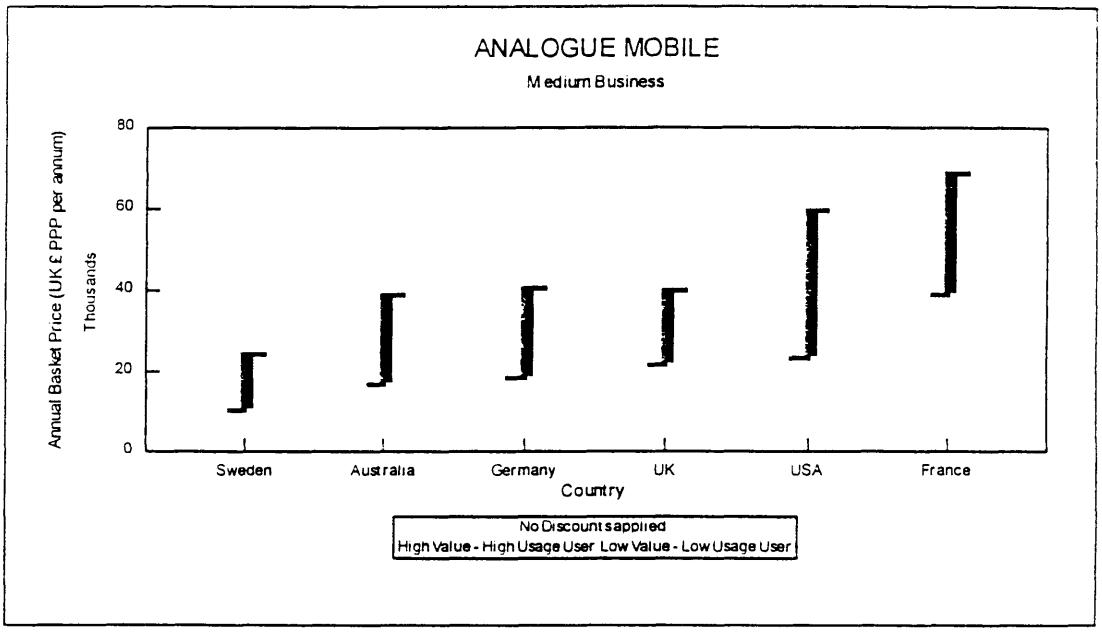

Figure 28 Impact of Changing overall call volumes on Medium Users

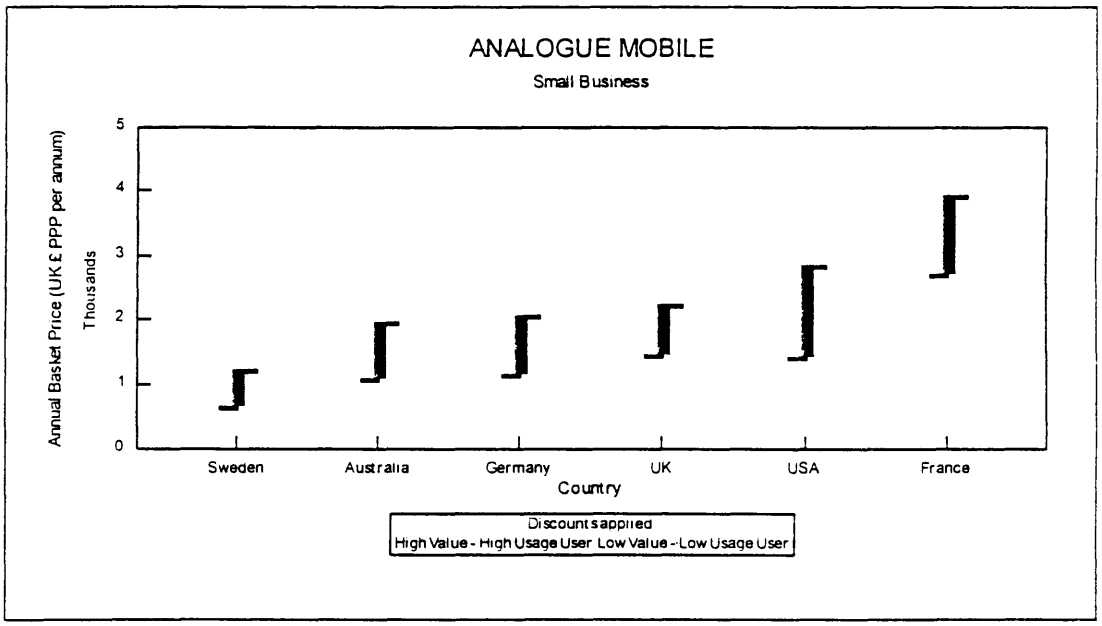

Figure 29 Impact of Changing overall call volumes on Small Users

162 For high usage, UK moves to second position for large businesses and to third position for medium businesses. For small businesses, the UK remains fourth. All other country rankings are unaltered.

163 Table 11, below, shows the overall ranking of countries for the different user requirements:

Business Type	Sensitivity	Sweden	Australia	Germany	UK	USA	France
Large	Base Comparison	1	2	3	4	5	6
Medium		1	2	3	4	5	6
Small		1	2	3	4	5	6
Large	Low User Comparison	1	2	3	4	5	6
Medium		1	2	3	4	5	6
Small		1	2	3	4	5	6
Large	High User Comparison	1	3	4	2	5	6
Medium		1	2	4	3	5	6
Small		1	2	3	4	5	6
KEY 1 = Lowest price of the basket 6 = Highest price of the basket							

Table 11 Ranking of Countries by User Requirement

Summary of basket comparisons

164 A number of variations have been applied to the basket figures to reflect the potentially different usage patterns. In all cases, Sweden offers the most competitive prices in PPP terms.

Simple rate comparison - peak rate business call charges

165 The underlying data behind the basket comparisons are the fixed and variable charges. This breakdown will be used to provide some of the explanation behind the country comparisons.

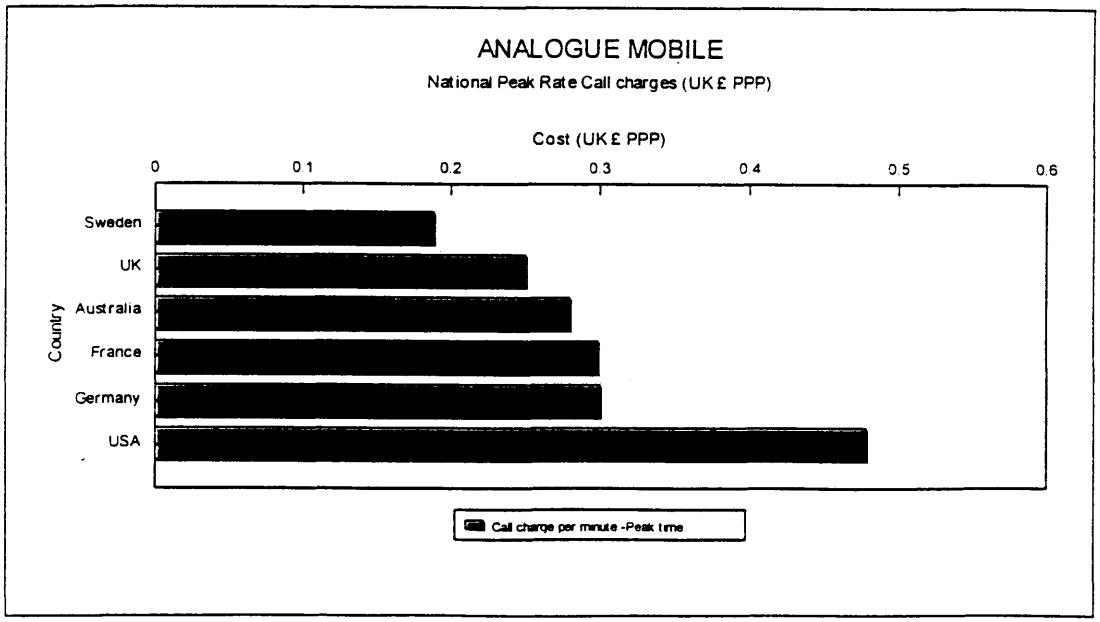

Figure 30 Simple Rate Comparison of Peak Rate Call Charges

166 Figure 30 shows that Sweden has the lowest cost for peak rate business calls, followed by the UK, Australia, France, Germany and the USA. This explains why the UK performs better in the basket ranking for high usage, where calls make up a higher percentage of the total cost.

Simple rate comparison - fixed charges

167 Figure 31 describes the relative fixed costs of Analogue Mobile services in each country. "Fixed costs" are defined as the annual line rental plus 20% of the initial connection charge, to spread the initial charges over five years.

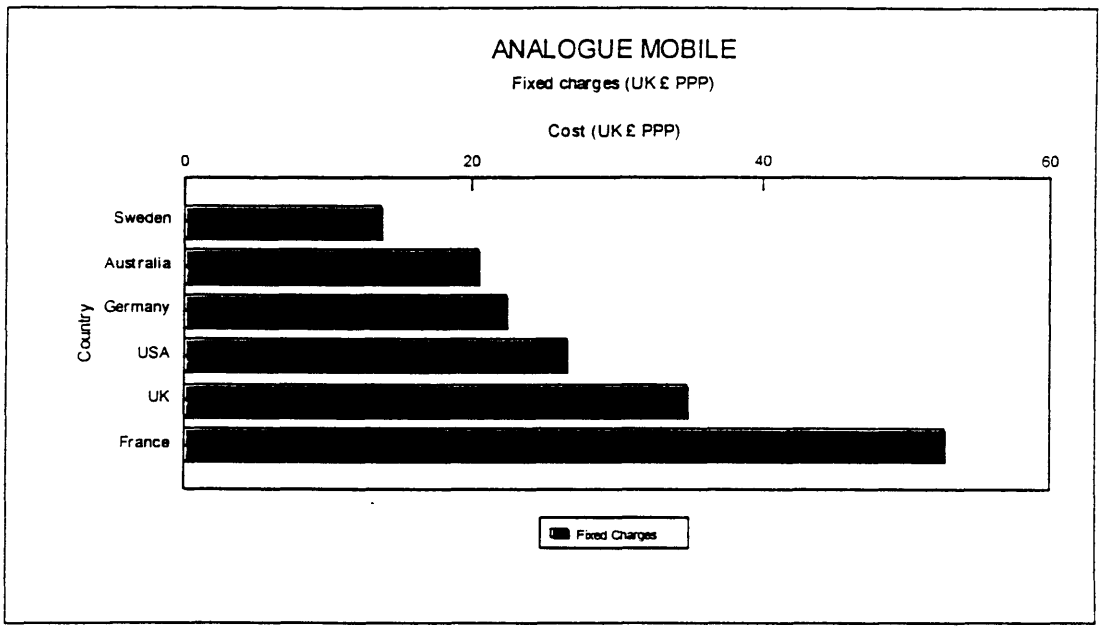

Figure 31 Simple Rate Comparison of Fixed Charges - Analogue Mobile

168 The UK ranking on fixed charges is fifth, following Sweden, Australia, Germany, USA, ahead only of France.

Implications of the Pricing Ranking

169 The key implications of the Analogue Mobile ranking for UK businesses are as follows:

- Overall, in the UK, businesses pay more for Analogue Mobile services in comparison with businesses based in Sweden, Germany and Australia, but less than the USA and France.

- Using the base comparison, UK large businesses pay approximately 41% more for Analogue Mobile services than businesses in Sweden, 6% more than businesses in Australia, and 2% more than businesses in Germany.

- Using the base comparison, UK medium businesses pay approximately 45% more for Analogue Mobile services than businesses in Sweden, 12% more

than businesses in Australia, and 7% more than businesses in Germany.

- Using the base comparison, UK small businesses pay approximately 51% more for Analogue Mobile services than businesses in Sweden, 20% more than businesses in Australia, and 15% more than businesses in Germany.

- UK businesses pay more in fixed charges for Analogue Mobile services than all study countries except France.

170 The UK has the highest connection charge for analogue mobile services. At £50 (PPP) it is around twice the price charged in all other countries. In many cases, however, the connection charge is waived as an incentive to new potential users. Similarly, operators often subsidise the initial purchase price of a handset.

COMPARISON OF SERVICE AVAILABILITY AND SCOPE

171 The data collection and analysis comparing availability of services was focused on the following individual factors:

- Business population coverage for analogue mobile service;
- Whether the network operator sells direct to businesses or through resellers;
- Lead time to connect to the network;
- Take up of service as a percentage of population.

172 The resulting data is shown in Table 12 below.

Country	UK	France	Germany	Sweden	Australia	USA
Business Population Coverage (% businesses)	87 - 98	N/A	N/A	N/A	87 - 90	100 **
Network operator selling direct or through resellers?	Resellers	Direct and Resellers	Direct and Resellers	Direct and Resellers	Direct and Resellers	Direct and Resellers
Lead time to connect to network (days)	Dependent on Reseller	1	Dependent on Reseller	N/A	1	N/A
KEY N/A = Information not available ** = Data based on Nynex service area (AT&T McCaw as service provider) where multiple operators have different figures the range is provided						

Table 12 Comparison of Analogue Mobile availability

173 Since the majority of customers are served via resellers in most countries, it is not possible to provide a definitive comparison.

Until recently, UK regulation did not allow operators to sell directly to businesses. Whilst this is no longer the case, the operators continue to sell only via service providers.

174 The take up of service is shown in Figure 32 below.

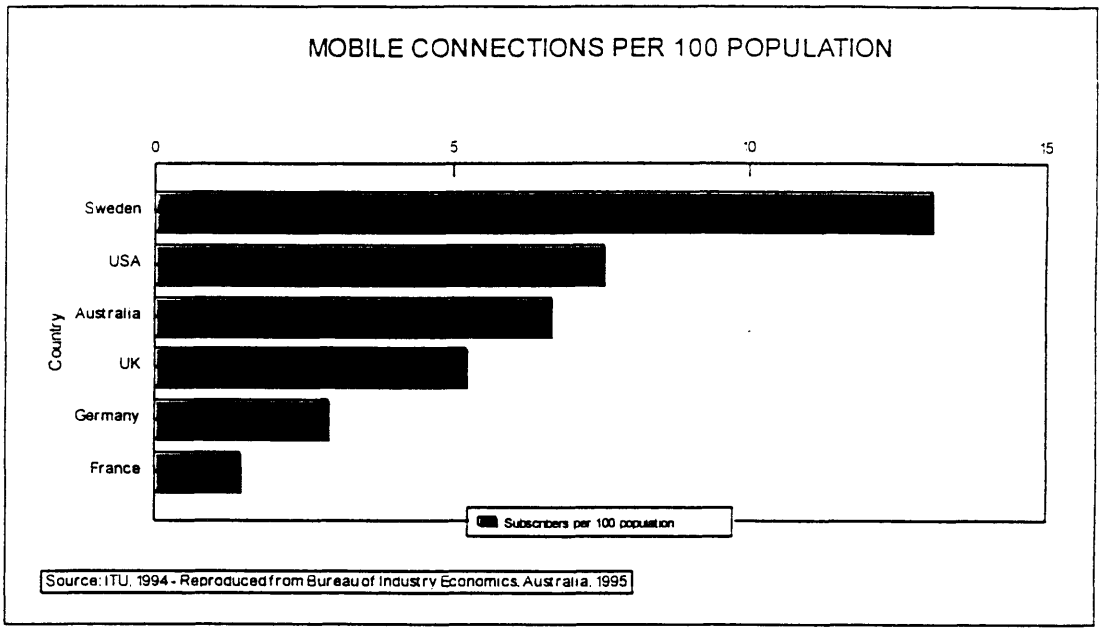

Figure 32 Comparison of Mobile connections per 100 population

175 The above graph is not specific to businesses and includes analogue and digital mobiles. It does indicate, however, that where the basket prices are lowest (Sweden), there is the highest take up of service, and that where the basket prices are highest (France), there is the lowest take up. Further reasons for the high levels of take up in Sweden include the length of time the service has been available (and hence the opportunity to build up the user base) and the possibility of its use as an alternative to fixed services in rural areas. In contrast, take up in France may have been slowed by the availability of alternative technologies such as telepoint. Numbers of mobile subscribers are continuing to grow in all countries.

176 In the USA, many of the mobile networks are regional, and if roaming agreements are not implemented with neighbouring networks, the coverage available will be very small. In addition, the roaming agreements involve additional cost to the user and an additional inconvenience. Where roaming agreements are used, the user may incur multiple subscriptions, hence inflating the USA's position in Figure 32.

177 In addition to the standard telephony features of analogue mobile, there is also a set of supplementary services providing additional facilities. In a similar way to PSTN, the services are largely based on the capability of the exchanges used to connect users to the network. Table 13 describes the service features provided in the study countries.

Country	UK	Australia	Germany	USA	Sweden	France
Call Waiting	Y	Y	N	Y	N	N
Call Forwarding	Y	Y	Y	Y	Y	Y
Calling Line Identification	N	N	N	N	N	N
Call Barring	Y	Y	Y	Y	Y	Y
Conference Calling	Y	Y	Y	Y	N	N
Voicemail Facility	Y	Y	Y	Y	Y	Y
Fax Support	Y	Y	Y	N	N	N
Data Support	Y	Y	Y	N	N	N
Total Available	7	7	6	5 **	3	3
KEY ** = Data based on Nynex service area						

Table 13 Summary of Analogue Mobile Facilities

178 Overall the UK and Australia have the widest set of service facilities on the analogue mobile network, followed by Germany, USA, Sweden and France.

COMPARISON OF QUALITY OF SERVICE OFFERING

179 Information was sought on a number of quality factors including:

- The frequency of call failure;
- The call set up time;
- The percentage of calls considered to be of acceptable quality.

180 One of the UK operators provided the requested information. All of the other operators either did not have the information, or were unwilling to release it.

CONCLUSIONS

181 This section briefly discusses the conclusions from the previous data and the overall "Best in Class" positioning.

FACTOR	BEST IN CLASS	POSITION OF UK
PRICE	SWEDEN	4
SCOPE	UK/AUSTRALIA	=1

182 Sweden is ranked number one for all price basket comparisons with the standard user requirement. The UK is, in most cases, fourth, following Sweden, Germany, Australia, and followed by USA and France.

183 This ranking is largely consistent with OECD ranking of January 1994 (published 1995) with the exception of the UK and Germany, whose positions were reversed in that study. This is a result of using different user requirements.

184 The UK ranks highest in the scope of service offering, equal with Australia.

POSSIBLE REASONS FOR THE RANKING

185 Sweden has had an established mobile infrastructure for longer than any of the other study countries. This, along with a competitive market (two analogue networks) and a low cost PSTN service which minimises the cost of calls to fixed users, has led to a high take up of service and, therefore, allows the mobile network also to be provided at lowest cost.

186 Swedish operators use a different technical specification for their radio interface, using the NMT 450 standard as opposed to the UK TACS system and the USA AMPS specification. In addition, the most widely used mobile switch is manufactured by Ericsson, a Swedish company.

7. DIGITAL MOBILE

7. DIGITAL MOBILE

Introduction

187 Digital Mobile services have been introduced to study countries over the past three years. With the exception of the USA, all of the networks are based on the GSM standard which, in addition to providing more uniform speech quality, has the ability, by design, to allow users seamless operation across networks where required. Users who are registered on a GSM network in one country, but travel to a second country with GSM service, are automatically able to make and receive calls (assuming that there is an interconnection agreement between the two networks).

188 A Variations on the national GSM networks are also being built in the UK, called Personal Communication Networks (PCNs), which use GSM technology in a different radio frequency band. These networks have only recently reached nationwide coverage and do not provide the international roaming facilities. They have not, therefore, been considered in this study.

189 The higher quality of Digital Mobile also allows mobile data applications to be supported at speeds of up to 9600 bps. The international roaming and data facilities are the reasons why Digital Mobile technology is becoming increasingly popular with business users.

190 A comparison of the Digital Mobile services in the UK with the other study countries is given below in terms of price comparison, service availability, scope of service and quality of service.

PRICE COMPARISON

Digital Mobile basket comparison

191 Figure 33 shows the overall ranking of the different countries in the study for large business users. All call charges are based on peak rate business tariffs.

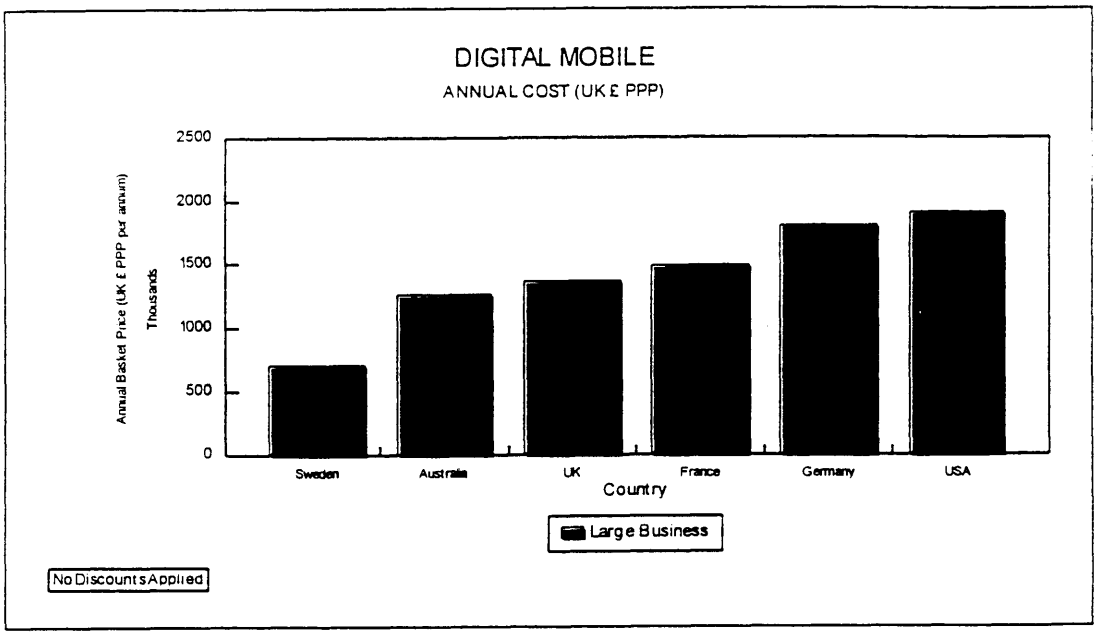

Figure 33 Basket Comparison of Large Business Digital Mobile Charges by Country

192 The graph shows that, for large businesses, the UK ranks third behind Sweden and Australia and followed by France, Germany and the USA.

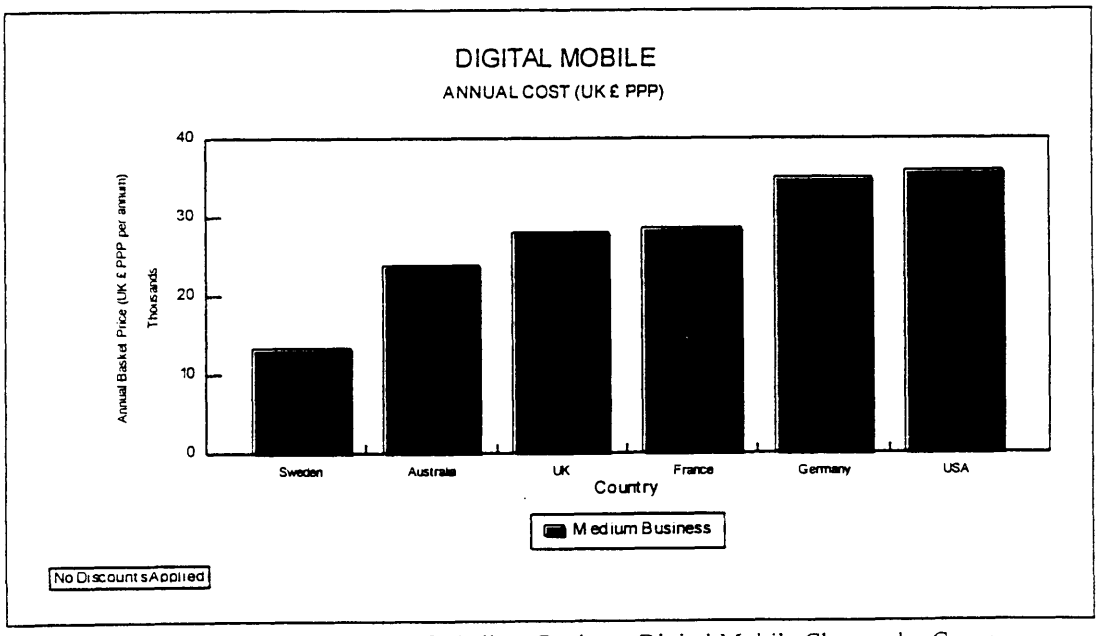

Figure 34 Basket Comparison of Medium Business Digital Mobile Charges by Country

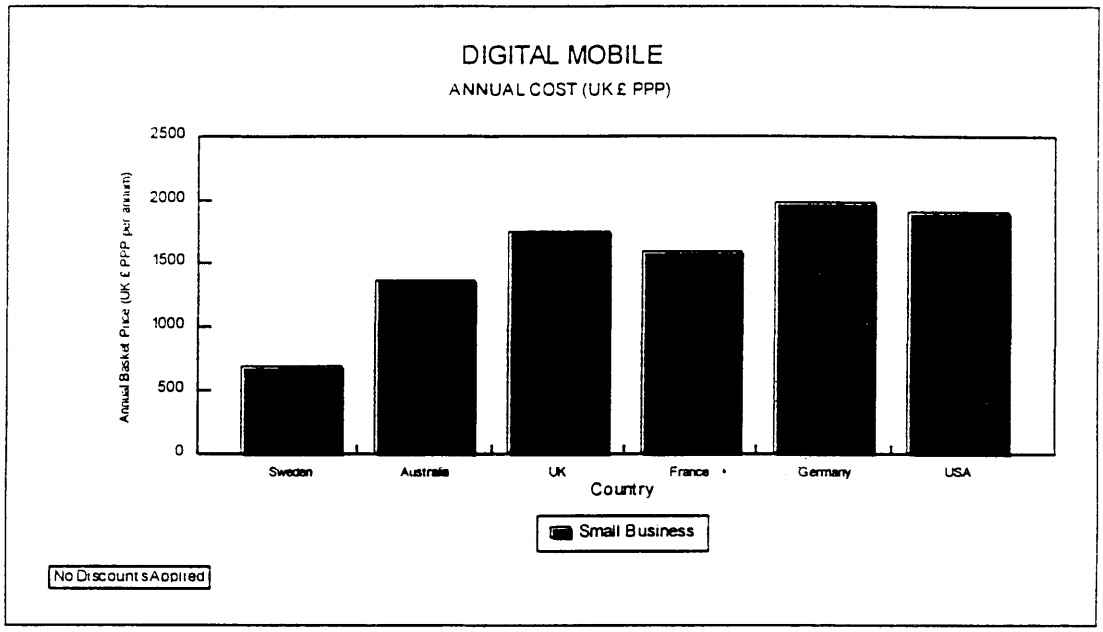

Figure 35 Basket Comparison of Small Business Digital Mobile Charges by Country

193 Figures 34 and 35 show the overall ranking for medium and small businesses users. The graphs indicate that for the base user requirement the ranking remains Sweden, Australia, UK, France, Germany, USA for medium businesses, whilst France moves ahead of the UK for small business users.

The impact of volume discounts

194 Similar to analogue, all Digital Mobile prices are compared based on operators full list price for Business usage. In some countries (USA, UK, Australia) it is again possible for businesses to negotiate a small discount with a service provider on call charges, over and above discounts which are available to very high usage users. In addition, other incentives may be given to new business customers e.g. free connection. For this study, the comparisons are based on published prices using business rate, peak time charges. These are considered fully representative for country ranking.

Varying the user requirement

195 The User Requirement was varied in each of the business categories to reflect the differing profile of businesses' Digital Mobile usage. This variation was carried out by increasing and decreasing the call volumes by 100% and 50% respectively to measure the sensitivity of the country rankings to high or low usage.

Changing the overall call volumes

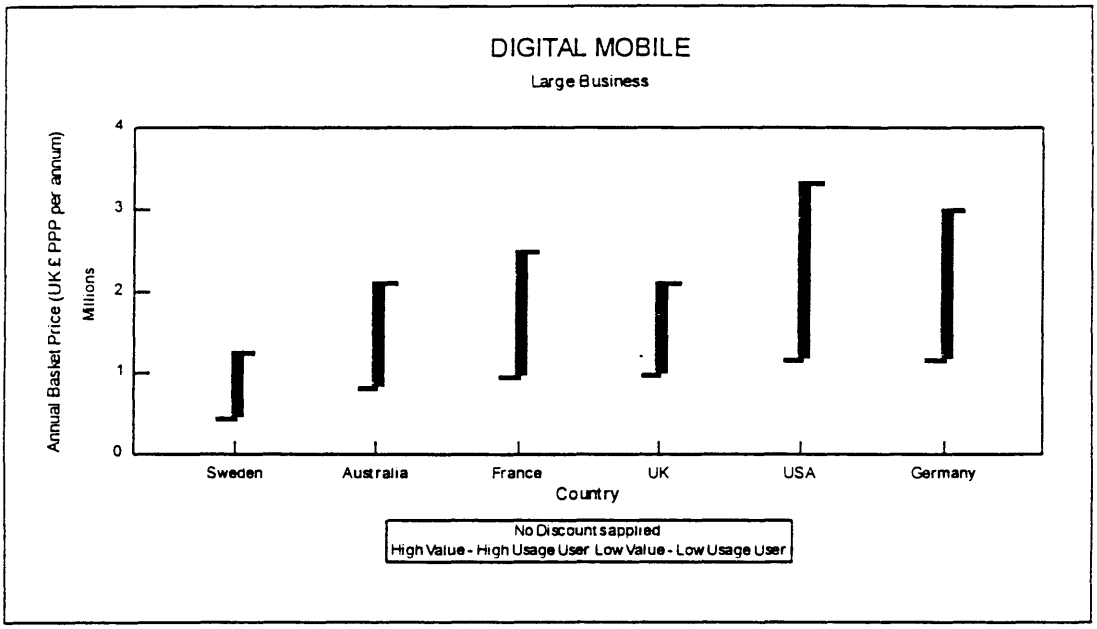

Figure 36 Impact of Changing overall call volumes on Large Users

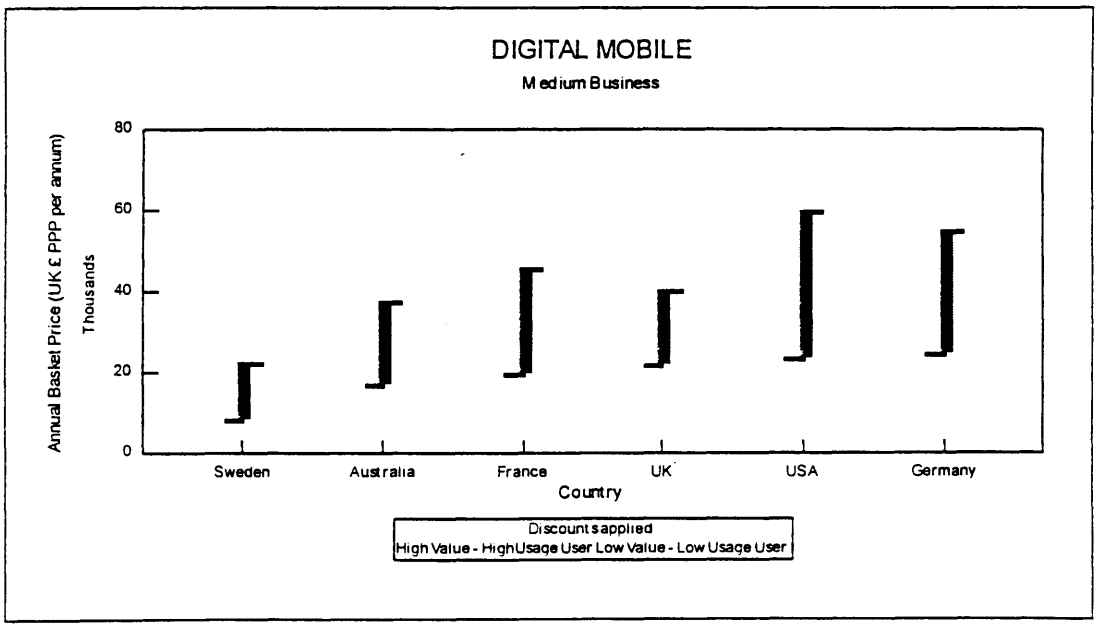

Figure 37 Impact of Changing overall call volumes on Medium Users

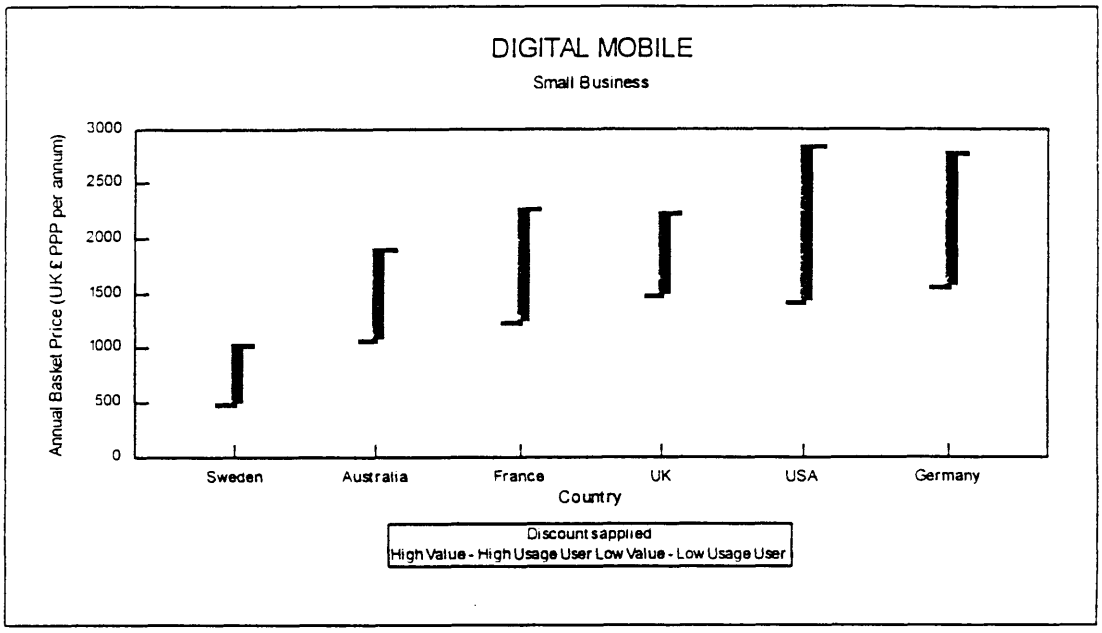

Figure 38 Impact of Changing overall call volumes on Small Users

196 Figures 36 to 38 indicate the range of costs from the high user to the low user. The graphs show that. for high usage, the ranking is Sweden, Australia. UK, France, Germany, USA for large, medium and small businesses.

197 For low usage, the UK moves to fourth position for large and medium and small businesses, fifth for samll businesses.

198 Table 14 below shows the overall ranking of countries for the different users requirements:

Business Type	Sensitivity	Sweden	Australia	UK	France	USA	Germany
Large	Base Comparison	1	2	3	4	5	6
Medium		1	2	3	4	5	6
Small		1	2	3	4	5	6
Large	Low User Comparison	1	2	4	3	5	6
Medium		1	2	4	3	5	6
Small		1	2	5	3	4	6
Large	High User Comparison	1	2	3	4	6	5
Medium		1	2	3	4	6	5
Small		1	2	3	4	6	5
KEY 1 = Lowest price of the basket 6 = Highest price of the basket							

Table 14 Ranking of Countries by User Requirement

Summary of basket comparisons

199 A number of variations have been applied to the basket figures to reflect the potentially different usage patterns. In all cases, Sweden offers the most competitive prices in PPP terms.

Simple rate comparison - peak rate business call charges

200 The underlying data behind the basket comparisons are the fixed and variable charges. This breakdown will be used to provide some of the explanation behind the country comparisons.

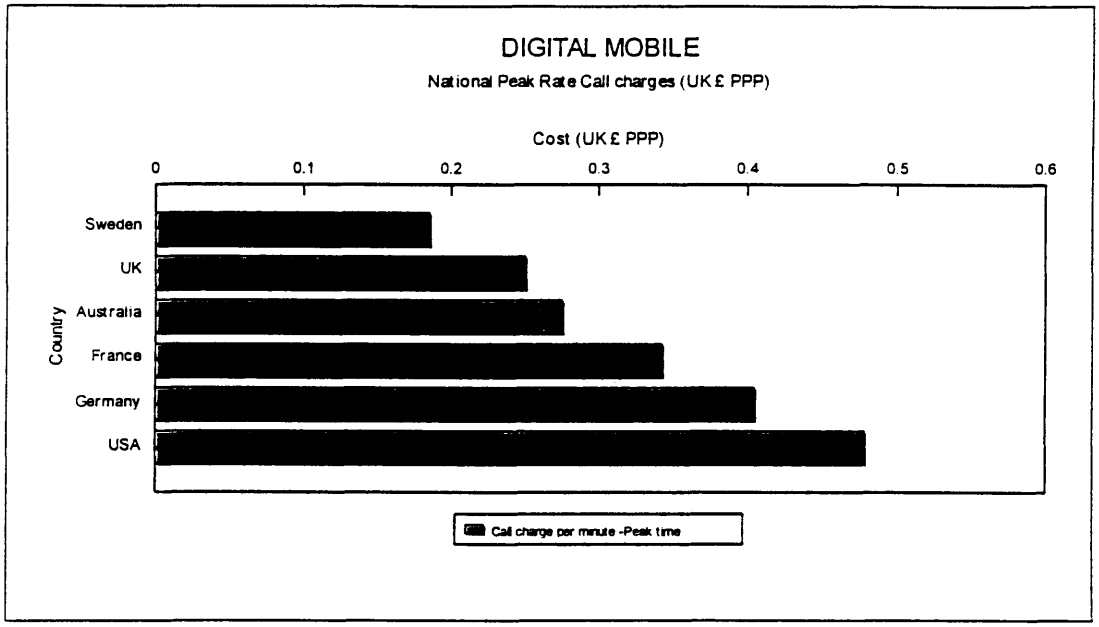

Figure 39 Simple Rate Comparison of Peak Rate Call Charges

201 Figure 39 shows that Sweden is the lowest cost for peak rate business calls, followed by the UK, Australia, France, Germany and the USA. This ranking is the same as for analogue mobile, although there is a greater price difference between France and Germany.

Simple rate comparison - fixed charges

202 Figure 40 describes the relative fixed costs of Digital Mobile services in each country. "Fixed costs" are defined as the annual line rental plus 20% of the initial connection charge, to spread the initial charges over five years.

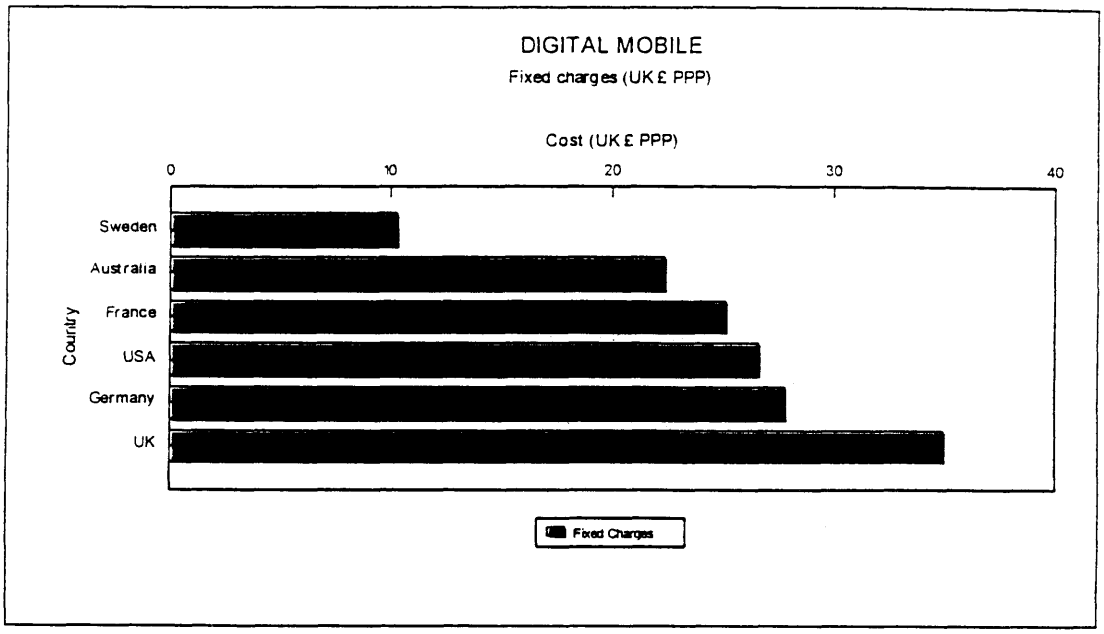

Figure 40 Simple Rate Comparison of Fixed Charges - Digital Mobile

203 The UK ranking on fixed charges is sixth, following Sweden, Australia, France, USA, and Germany.

Implications of the Pricing Ranking

204 The key implications of the Digital Mobile ranking for UK businesses are as follows:

- Overall, in the UK, businesses pay more for Digital Mobile services in comparison with businesses based in Sweden and Australia, whilst paying less than businesses in France, Germany and the USA.

- Using the base comparison, UK large businesses pay approximately 48% more for Digital Mobile services than businesses in Sweden and 8% more than businesses in Australia.

- Using the base comparison, UK medium businesses pay approximately 53% more for Digital Mobile services than businesses in Sweden and 15% more than businesses in Australia.

- Using the base comparison, UK small businesses pay approximately 60% more for Digital Mobile services than businesses in Sweden and 21% more than businesses in Australia.

- UK businesses pay more in fixed charges for digital mobile services than all study countries except France.

205 The UK again has the highest connection charge for digital mobile services. At £50 (PPP), it is around twice the price in all other countries. In many cases, however, the connection charge is waived as an incentive to new potential users. Again, operators often subsidise the initial purchase price of a handset.

COMPARISON OF SERVICE AVAILABILITY AND SCOPE

206 The data collection and analysis comparing availability of services was focused on the following individual factors:

- Business population coverage for digital mobile service;
- Whether the network operator sells direct to businesses or through resellers;
- Lead time to connect to the network.

207 The resulting data is shown in Table 15 below.

Country	UK	France	Germany	Sweden	Australia	USA
Business Population Coverage (% businesses)	87 - 98	85	95	50 - 94	86 - 90	75 **
Network operator selling direct or through resellers	Resellers	Direct and Resellers	Direct and Resellers	Direct and Resellers	Direct and Resellers	Direct and Resellers
Lead time to connect to network (days)	Dependent on Reseller	1	Dependent on Reseller	<1	1	N/A
KEY N/A = Information not available ** = Data based on Nynex service area (AT&T McCaw as service provider) where multiple operators have different figures the range is provided						

Table 15 Comparison of Digital Mobile availability

208 Since the majority of customers are served via resellers in most countries, it is not possible to provide a definitive ranking.

The UK did not, until recently, allow operators to sell directly to businesses. Whilst this is no longer the case, and newer providers do sell direct, the major operators continue to sell only via service providers.

209 In addition to the standard telephony features of digital mobile, there is also a set of supplementary services providing additional functionality. In a similar way to Analogue Mobile, the services are largely based on the capability of the exchanges used to connect users to the network. Table 16 below describes the service features provided in the study countries.

Country	Germany	Australia	UK	Sweden	USA	France
Call Waiting	Y	Y	Y	Y	Y	N
Call Forwarding	Y	Y	Y	Y	Y	Y
Calling Line Identification	Y	Y	N	Y	N	N
Call Barring	Y	Y	Y	Y	Y	Y
Conference Calling	Y	Y	Y	N	Y	N
Voicemail Facility	Y	Y	Y	Y	Y	Y
Fax Support	Y	Y	Y	Y	Y	N
Data Support	Y	Y	Y	Y	Y	N
GSM Support	Y	Y	Y	Y	N	Y
Total Available	9	9	8	8	7 **	4
KEY ** = Data based on Nynex service area						

Table 16 Summary of Digital Mobile Facilities

210 Overall, Germany and Australia have the widest set of service facilities on the digital mobile network, followed by the UK, Sweden, USA and France.

All of the operators have a wider range of facilities on the digital mobile networks than the analogue mobile networks.

COMPARISON OF QUALITY OF SERVICE OFFERING

211 Information was sought on the following quality factors:

- The frequency of call failure;
- The call set up time;
- The percentage of calls considered to be of acceptable quality.

212 Results were similar to the analogue mobile data, i.e. one of the UK operators provided the requested information. All of the other operators either did not have the information, or were unwilling to release it.

CONCLUSIONS

213 This section briefly discusses the conclusions from the previous data and the overall "Best in Class" positioning.

FACTOR	BEST IN CLASS	POSITION OF UK
PRICE	SWEDEN	3
SCOPE	GERMANY / AUSTRALIA	JOINT 3

214 Sweden is ranked number one for all price basket comparisons with the standard user requirement. The UK is, in most cases, third, following Sweden, and Australia, and followed by France, USA and Germany.

215 The UK ranks third in the scope of service offering, following Germany and Australia and followed by Sweden, USA and France.

POSSIBLE REASONS FOR THE RANKING

216 Sweden's digital operators face strong competition against the existing analogue services which are already established and have low prices.

217 In addition, there is a very competitive market (three GSM networks) and a low cost PSTN service which minimises the cost of calls to fixed users. This has led to a high take up of service and allows the mobile network also to be provided at lowest cost.

8. PRIVATE CIRCUITS

8. PRIVATE CIRCUITS

Introduction

218 Private circuits are used by businesses having significant requirements for telecommunications services between fixed locations. Traditionally, private circuits have been used as an alternative to using dial up, usage based services such as PSTN and ISDN, as they allow businesses to operate with a known, fixed cost. Increasingly, however, private circuits are used by businesses to support access to data networks, which cannot be achieved effectively over dial up services. At the same time, some businesses are looking at services such as virtual private networks and frame relay as alternatives to using dedicated private circuits for traditional applications.

219 A comparison of the Private Circuit services in the UK with the other study countries is given below in terms of price comparison, service availability, scope of service and quality of service.

PRICE COMPARISON

220 Using the methodology outlined in Section 3, this comparison is based on the dominant service providers in the chosen countries. In the USA, the local operator will only provide the total private circuit where it is relatively short distance. For longer circuits (over 50km), the local operator will typically interconnect with a long distance operator to fulfil the total circuit. For this reason, the USA costs are the inclusive cost of a local and a long distance operator. In all other countries, the operators considered were licensed to provide an end-to-end national service.

221 The user requirement for private circuits is based on 64Kbps and 2Mbps digital circuits. The only exception is the USA, where 64Kbps and 2Mbps circuits are not provided and the closest equivalent standard line speeds are used (56Kbps and 1.5Mbps).

Private Circuit basket comparison

222 Figure 41 shows the overall ranking of the different countries in the study for large business users.

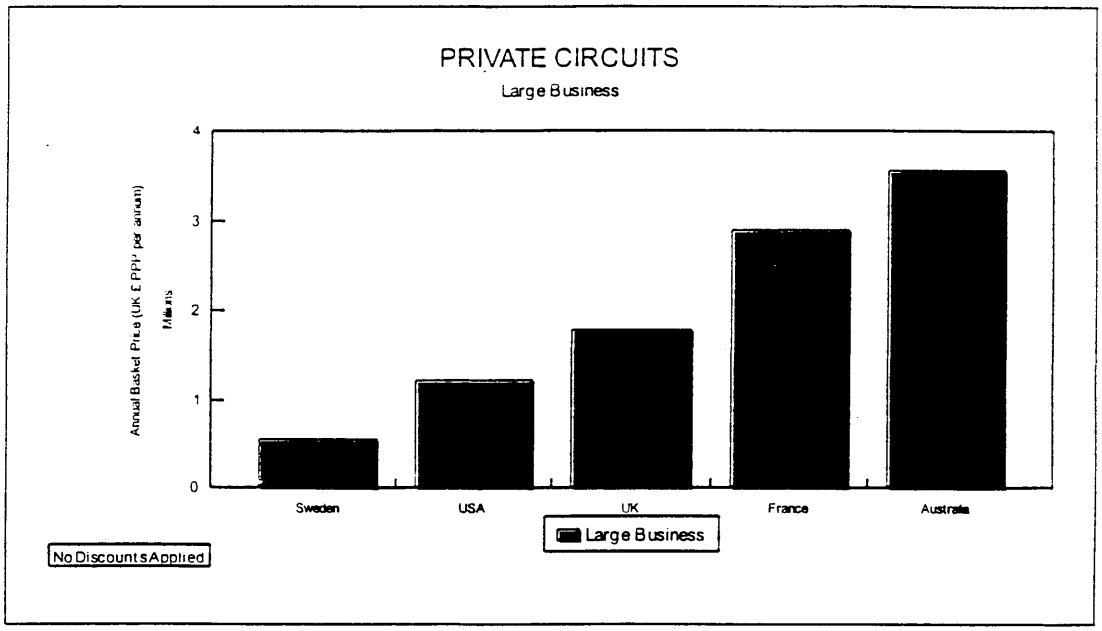

Figure 41 Basket Comparison of Large Business Private Circuit Charges by Country

223 The graph shows that for large businesses the UK ranks third, behind Sweden and the USA, followed by France and Australia.

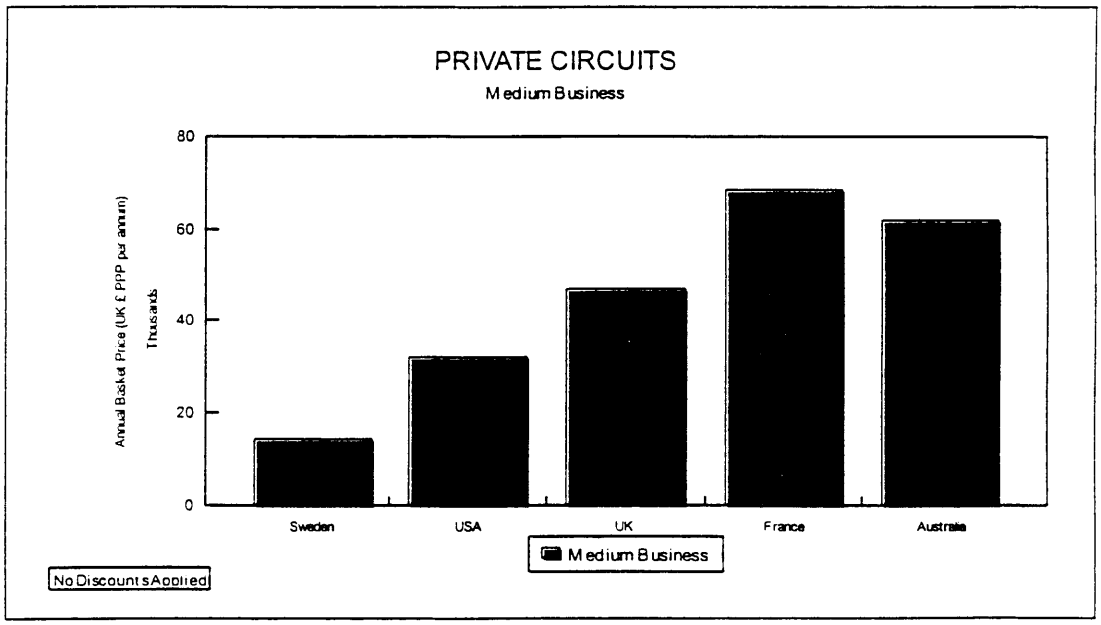

Figure 42 Basket Comparison of Medium Business Private Circuit Charges by Country

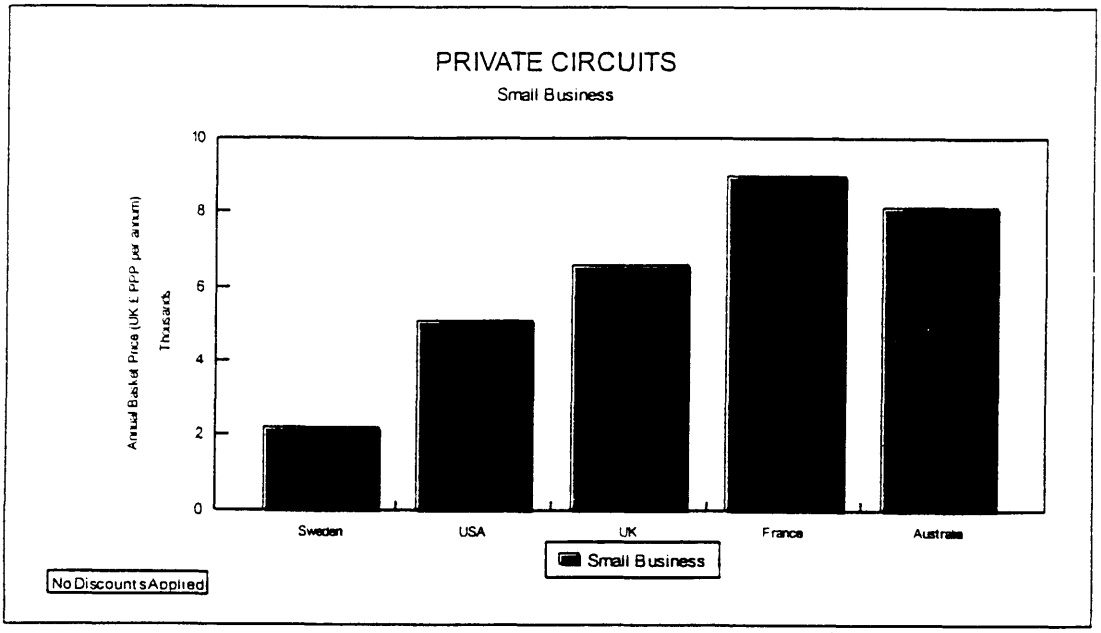

Figure 43 Basket Comparison of Small Business Private Circuit Charges by Country

224 Figures 42 and 43 show the overall ranking for medium and small business users. The graphs indicate that Australia moves ahead of France, still behind Sweden, USA and UK in both cases.

The impact of volume discounts

225 All Private Circuit prices are compared based on full list price. In some countries (USA, UK), some discount may occur for large businesses. In the UK, the discount is provided for a long term commitment (e.g. five years), whereas in the USA it is based on total spend. In the UK, the maximum discount is 15%. Overall, however, the discounts are considered unlikely to affect the overall country rankings.

Varying the user requirement

226 The User Requirement was varied in each of the business categories to reflect the differing profile of businesses private circuit usage. This variation was carried out in the following way:

- Increase of the number of low speed (64Kbps) private circuits used by small, medium and large businesses by 100% to measure the sensitivity of the country rankings to a user requirement based on low speed circuits. Also, for this comparison, the number of high speed (2Mbps) circuits was reduced by 50%.

- Increase of the number of high speed private circuits used by small, medium and large businesses by 100% to measure the sensitivity of the country rankings to a user requirement based on high speed circuits. Also, for this comparison, the number of low speed circuits was reduced by 50%.

The graph showing the resulting range of costs is shown in Figure 44.

Variation of the mix of low speed/high speed circuits:

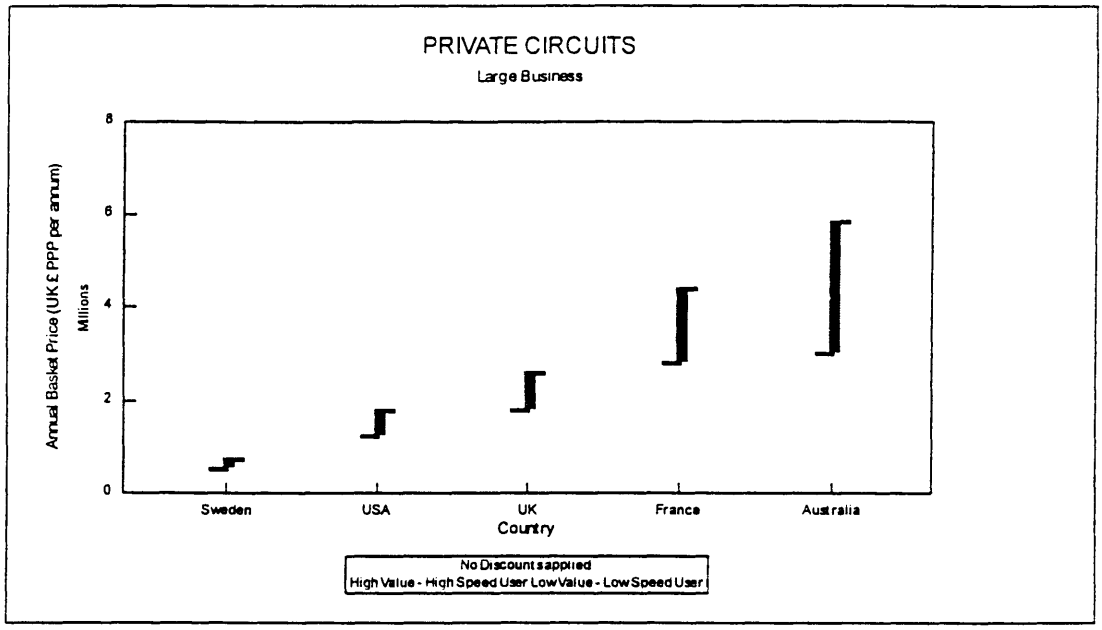

Figure 44 Impact of Changing mix of low speed/high speed circuits on Large Users

227 Figure 44 indicates the range of costs from the high speed user to the low speed user, for large businesses. The graph shows that the ranking remains as the base comparison.

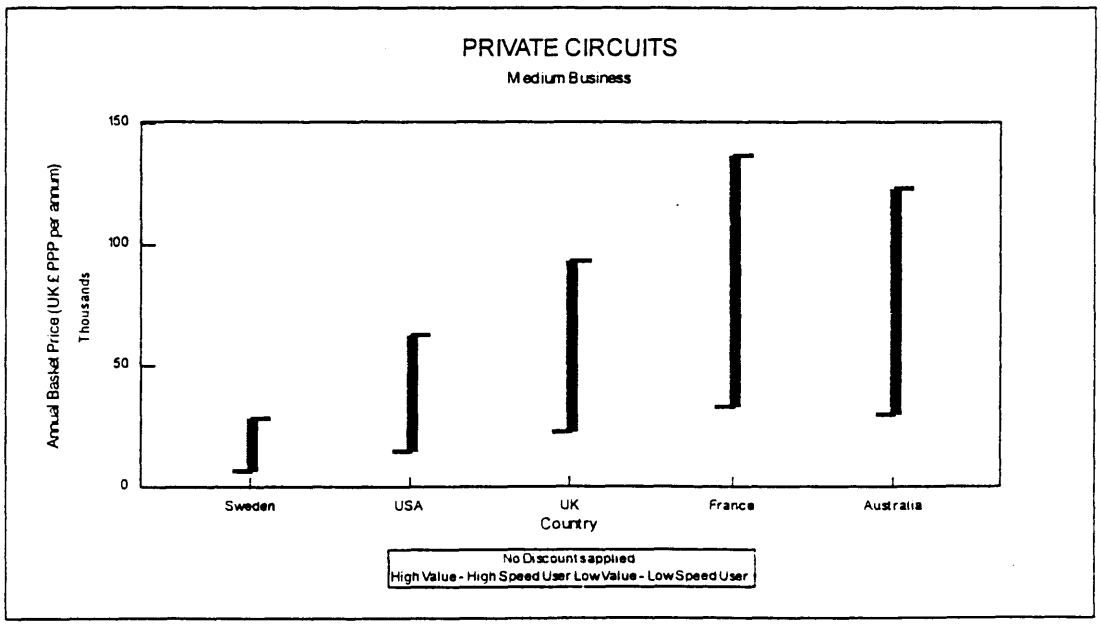

Figure 45 Impact of Changing mix of low speed/high speed circuits on Medium Users

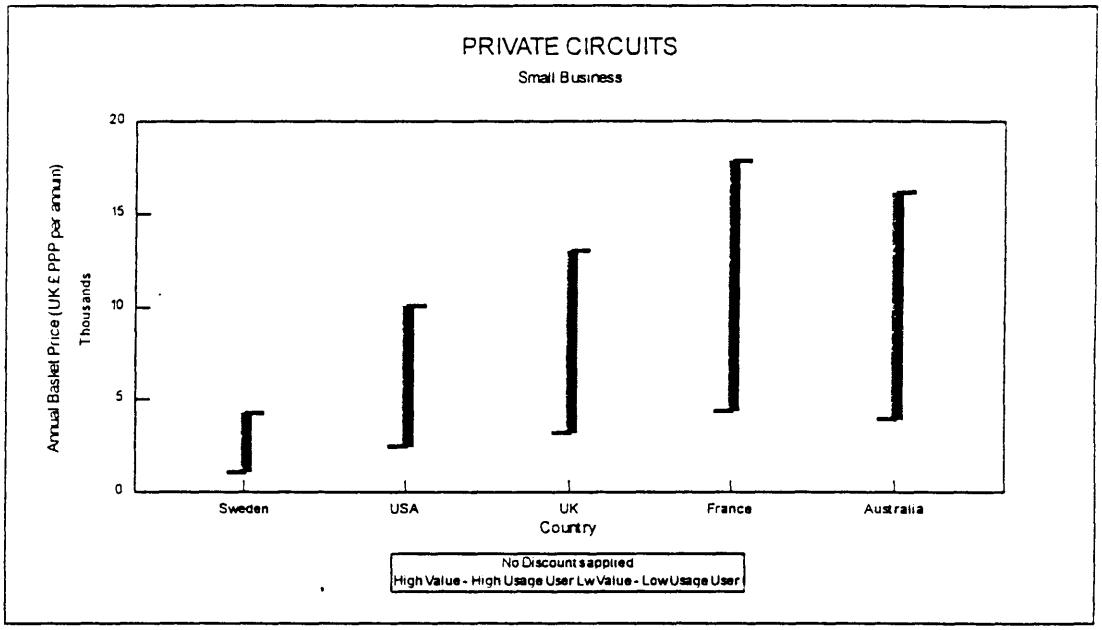

Figure 46 Impact of Changing mix of low speed/high speed circuits on Small Users

228 Figures 45 and 46 indicate the range of costs from the high speed user to the low speed user, for medium and small businesses. The graph shows that the ranking remains as the base comparison, Australia moving ahead of France to rank fourth in both cases.

229 Table 17 below shows the overall ranking of countries for the different users' requirements:

Business Type	Sensitivity	Sweden	USA	UK	France	Australia
Large	Base Comparison	1	2	3	4	5
Medium		1	2	3	5	4
Small		1	2	3	5	4
Large	Low Speed User Comparison	1	2	3	4	5
Medium		1	2	3	5	4
Small		1	2	3	5	4
Large	High Speed User Comparison	1	2	3	4	5
Medium		1	2	3	5	4
Small		1	2	3	5	4
KEY 1 = Lowest price of the basket 5 = Highest price of the basket						

Table 17 Ranking of Countries by User Requirement

Summary of basket comparisons

230 A number of variations have been applied to the basket figures to reflect the potentially different usage patterns. In all cases, Sweden offers the most competitive prices in PPP terms.

Simple rate comparison

231 The underlying data behind the basket comparisons are the relative costs of low speed and high speed circuits. This breakdown will be used to provide some of the explanation behind the country comparisons. The annual circuit costs are calculated to be the ongoing rental charge plus 20% of the initial connection charge.

Simple Rate Comparison - 64Kbps Circuits

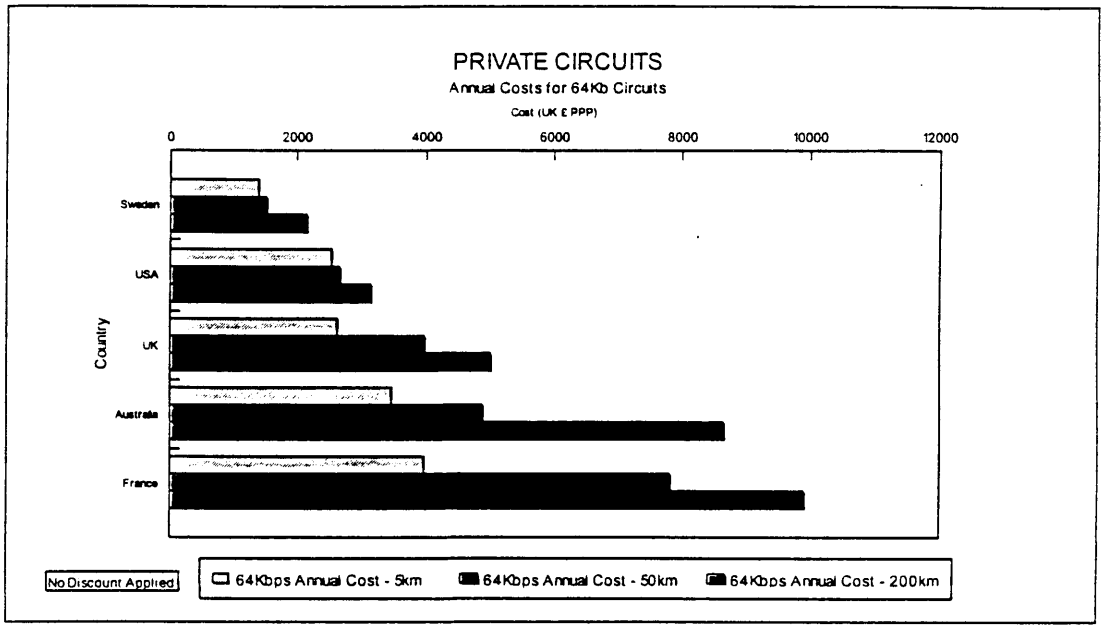

Figure 47 Simple Rate Comparison of 64Kbps circuits

232 Figure 47 shows that for 64Kbps circuits the ranking is Sweden, USA, UK, Australia, France for all calculated circuit lengths.

Simple rate comparison - 2Mbps charges

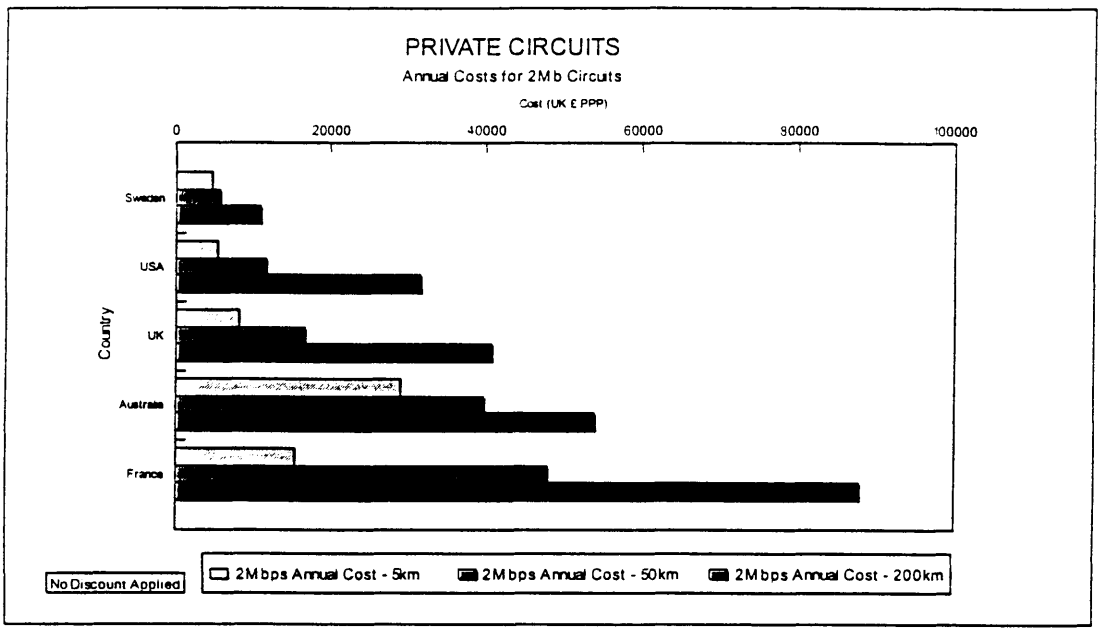

Figure 48 Simple Rate Comparison of 2Mbps circuits

233 Figure 48 shows that the ranking remains Sweden, USA, UK, Australia, France for all calculated circuit costs except 5km circuits, where France moves ahead of Australia into fourth position.

Implications of the Price Ranking

234 The key implications of the Private Circuit ranking for UK businesses are as follows:

- Overall, in the UK, businesses pay more for Private Circuits than businesses based in Sweden and the USA, whilst paying less than businesses in France and Australia.
- Using the base comparison, UK large businesses pay approximately 231% more for Private Circuits than businesses in Sweden, and 45% more than businesses in the USA.
- Using the base comparison, UK medium businesses pay approximately 224% more for Private Circuits than businesses in Sweden, and 47% more than businesses in the USA.
- Using the base comparison, UK small businesses pay approximately 200% more for Private Circuits than businesses in Sweden, and 30% more than businesses in the USA.

COMPARISON OF SERVICE AVAILABILITY AND SCOPE

235 The data collection and analysis, comparing availability of services, was focused on the following individual factors:

- Geographic availability of circuits;
- Lead times for installation of new services.

The resulting data is shown in Table 18 below.

Country	UK	France	Sweden	Australia	USA **
Availability - 64Kbps (%)	100	100	N/A	100	100
Availability - 2Mbps (%)	100	100	N/A	100	98
Lead Time - 64Kbps (Days)	10	N/A	N/A	20	15-20
Lead Time - 2Mbps (Days)	10-30	N/A	N/A	20	15-20
KEY N/A = Information not available ** = Data based on Nynex service area (AT&T Interstate Circuits)					

Table 18 Comparison of Private Circuit availability

236 Private circuits are not a service associated with "features" since they tend to be used as a part component in an overall network design. The one piece of information sought was the maximum bandwidth private circuit available. The results are shown in Table 19.

Country	UK	France	Sweden	Australia	USA
Maximum bandwidth Private Circuit Provided (Mbps)	140	34	34	N/A	45
KEY N/A = Information not available ** = Data based on Nynex service area (AT&T Interstate Circuits)					

Table 19 Comparison of Private Circuit availability

237 Of the countries providing information, the UK has the highest speed private circuit offering.

238 Insufficient information is available to produce a definitive ranking. However, UK businesses are well served in Private Circuit services in comparison with all other study countries.

COMPARISON OF QUALITY OF SERVICE OFFERING

239 Information was sought on the following quality factors:

- Mean time between failures;
- Mean time to repair;
- Guaranteed overall availability.

Country	UK	France	Sweden	Australia	USA **
Mean time Between Failure (years)	2	N/A	N/A	N/A	3.2
Mean Time to Repair (days)	N/A	N/A	N/A	1	0.5
Guaranteed overall Availability (%)	N/A	N/A	N/A	N/A	N/A
KEY N/A = Information not available ** = Data based on Nynex service area (AT&T Interstate Circuits)					

Table 20 Comparison of Private Circuit Quality of Service

240 None of the operators were willing to provide information regarding guaranteed availability. The UK (major operator) estimates 90% faults cleared within target time of 5 hours.

CONCLUSIONS

241 This section briefly discusses the conclusions from the previous data and the overall "Best in Class" positioning.

FACTOR	BEST IN CLASS	POSITION OF UK
PRICE	SWEDEN	3

242 Sweden is ranked number one for all price basket comparisons. The UK is always third, following Sweden and the USA, whilst always ahead of France and Australia.

POSSIBLE REASONS FOR THE RANKING

243 Sweden has a low cost network infrastructure, which is reflected in Sweden's number one ranking for all previous services.

244 Sweden does have some competition in the provision of private circuits, although this is really only available to larger businesses.

9. CALLING CARDS

9. CALLING CARDS

Introduction

245 Calling Cards are used as a form of "credit card", as a method of payment for telephone calls. They are typically used by regular business travellers who wish to make calls whilst travelling but have those calls charged to a company account. The service characteristics are, therefore, identical to the in-country PSTN service with the exception of payment and billing services.

246 A comparison of the Calling Card services in the UK with the other study countries is given below in terms of price comparison, scope of service and quality of service.

PRICE COMPARISON

247 Figure 49 shows the overall ranking of the different countries in the study for large business users, based in UK £ PPP.

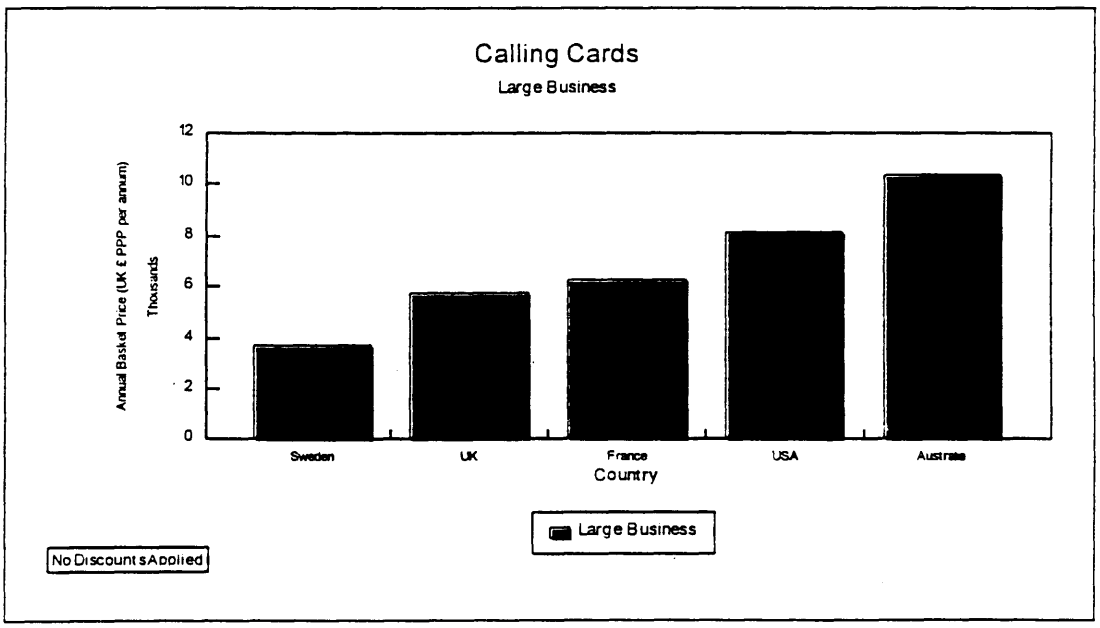

Figure 49 Basket Comparison of Large Business Calling Card Charges by Country

248 The graph indicates the following:

- Based on undiscounted prices, the UK ranks second behind Sweden, followed by France, USA and Australia. The ranking is the same as the undiscounted PSTN ranking.

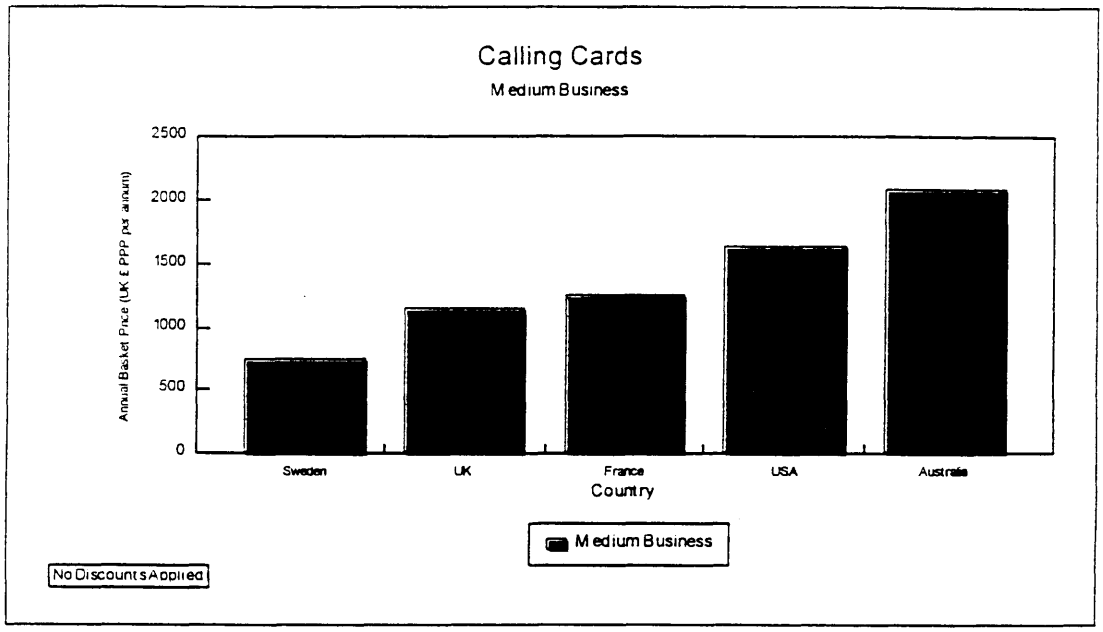

Figure 50 Basket Comparison of Medium Business Calling Card Charges by Country

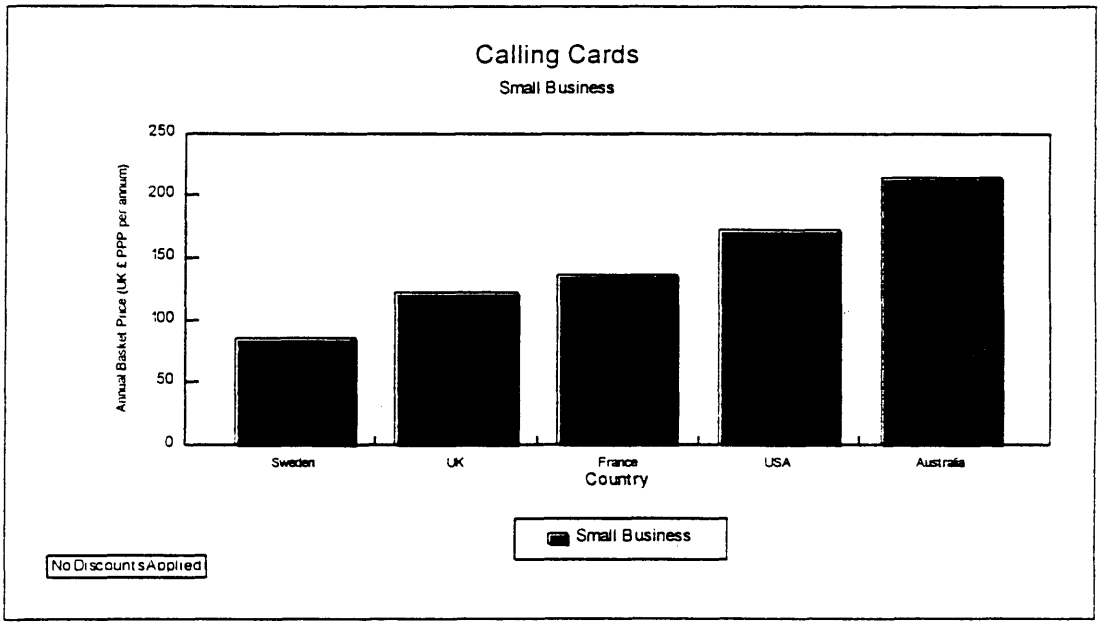

Figure 51 Basket Comparison of Small Business Calling Card Charges by Country

249 Figures 50 and 51 show the overall ranking for medium and small business users. This indicates that the ranking remains Sweden, UK, France, USA and Australia.

The impact of volume discounts

250 The above comparisons are based on list tariffs. Since the user requirement volumes for Calling Cards are very low, they do not qualify for significant discounts. However, it is possible that the requirements would be combined with the businesses' PSTN spend and qualify for an overall discount. In this case, the discounts would be similar to those described in Table 5; the ranking would also change, the USA moving up to second position, ahead of the UK, and Australia moving up to fourth position, ahead

of France. For the purposes of the study, overall comparisons are based on non discounted prices to reflect the individual service comparison.

Varying the user requirement

251 The User Requirement was varied in each of the business categories to reflect the differing profile of businesses' Calling Card usage. This variation was carried out by increasing and decreasing the call volumes used by small, medium and large businesses by 100% and 50% respectively to measure the sensitivity of the country rankings to usage volume.

Changing the overall call volumes

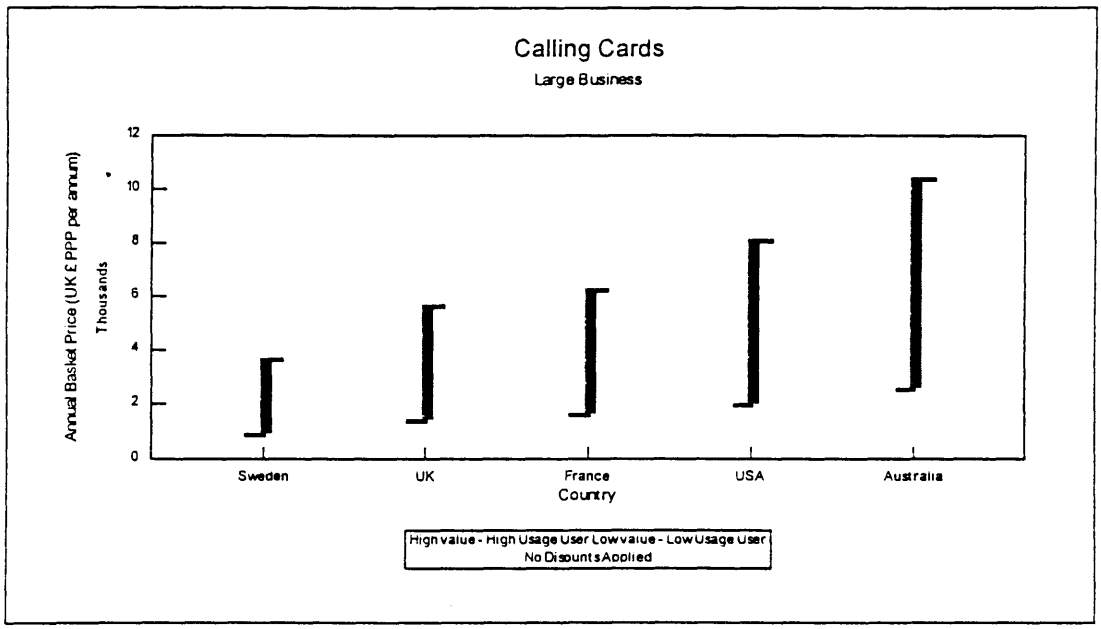

Figure 52 Impact of Changing overall call volumes on Large Users

252 Figure 52 indicates the range of costs from the high user to the low user. The graph shows that for large users, for both high and low usage the ranking remains Sweden, UK, France, USA, Australia.

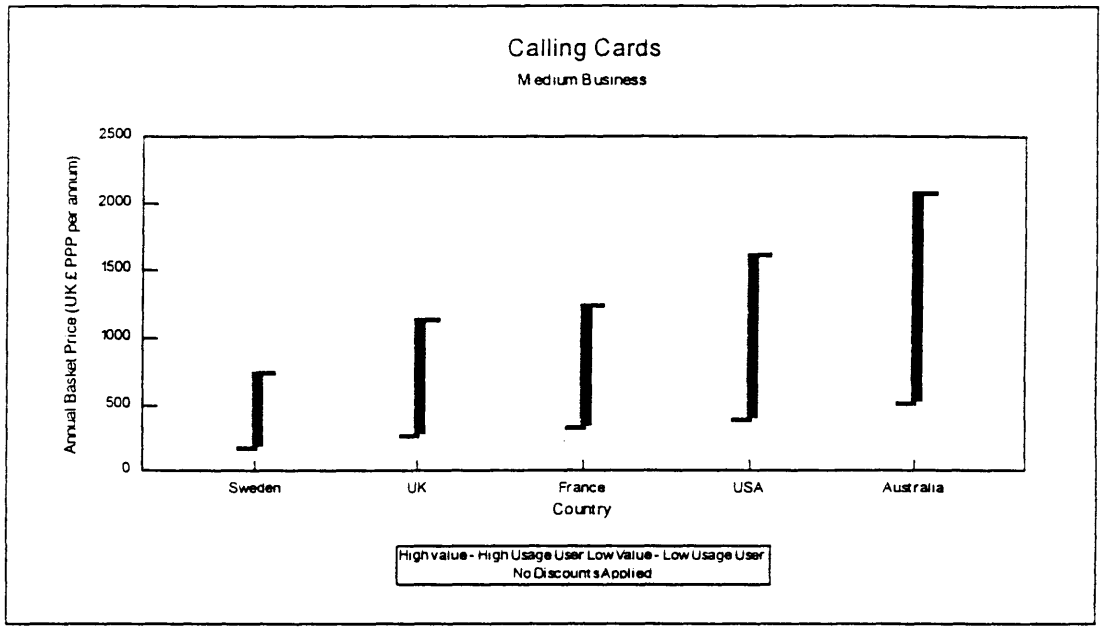

Figure 53 Impact of Changing overall call volumes on Medium Users

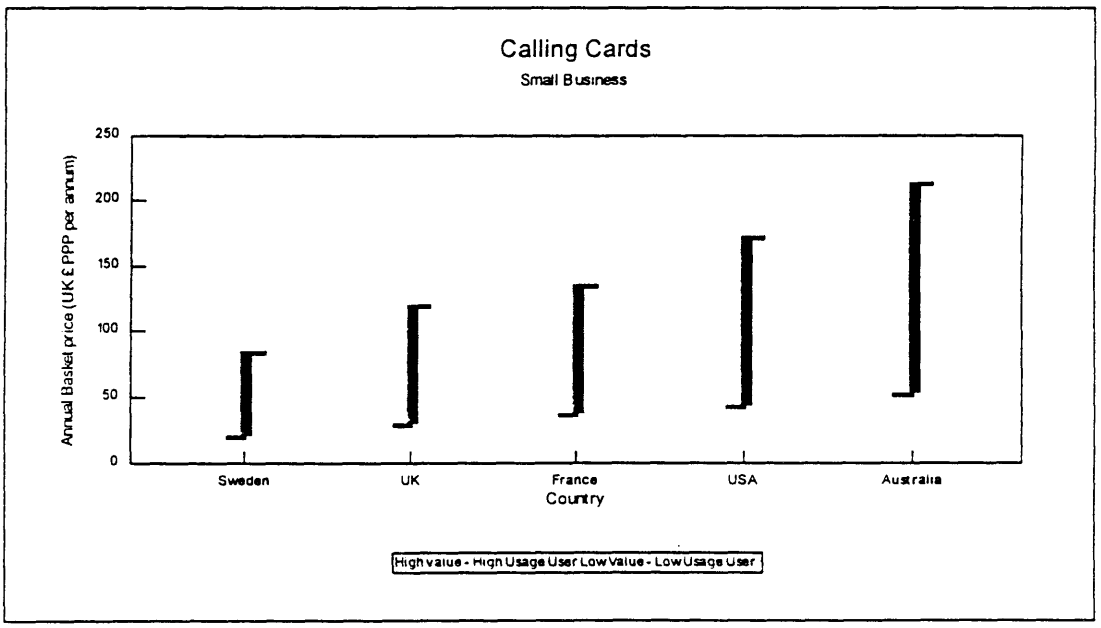

Figure 54 Impact of Changing overall call volumes on Small Users

253 Repeating the analysis of high and low usage for medium and small businesses shows that, again, the ranking remains Sweden, UK, France, USA, Australia in both cases.

Summary Of Ranking

254 Table 21 below shows the overall ranking of countries for different user requirements:

Business Type	Sensitivity	Sweden	UK	France	USA	Australia
Large	Base Comparison	1	2	3	4	5
Medium		1	2	3	4	5
Small		1	2	3	4	5
Large	Low User Comparison	1	2	3	4	5
Medium		1	2	3	4	5
Small		1	2	3	4	5
Large	High User Comparison	1	2	3	4	5
Medium		1	2	3	4	5
Small		1	2	3	4	5
KEY 1 = Lowest price of the basket 5 = Highest price of the basket						

Table 21 Ranking of Countries by User Requirement

Summary of basket comparisons

255 Variations have been applied to the basket figures to reflect the potentially different usage patterns. In all cases, Sweden and the UK offer the most competitive prices based on standard list prices. However, if the calls were added to PSTN volumes as part of a total business purchase, the discounts achieved would move the USA to second and Australia to fourth.

Simple rate comparison - local and national call charges

256 The underlying data behind the basket comparisons are the fixed and variable charges. These comprise the annual cost of the card and the local plus national call charges. This breakdown is used to provide some of the explanations behind the country comparisons.

Again, local call charges are difficult to present in a comparable form. However, they represent a relatively small component of the basket of calls.

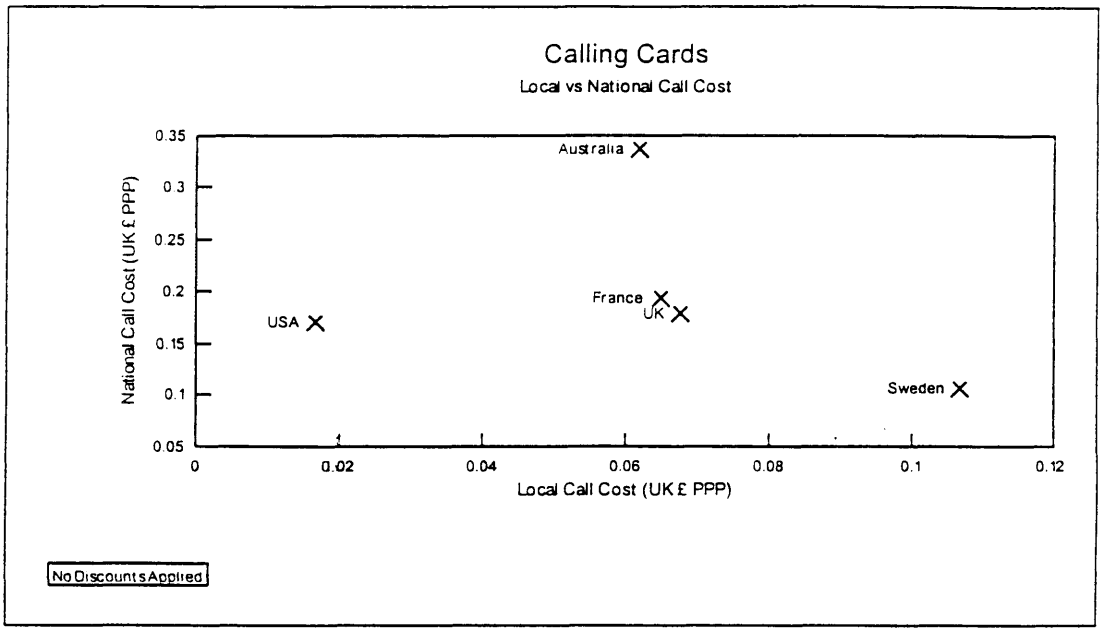

Figure 55 Simple Rate Comparison of Local and National Call Charges

257 Figure 55 shows that Sweden is lowest cost for national calls, whilst the USA is lowest cost for local calls. Australia is most expensive for national calls whilst Sweden is the most expensive for local calls. Whilst the UK has the second highest local call costs, it has the third lowest national call costs.

Simple rate comparison - fixed charges

258 Of the study countries, fixed costs for Calling Cards are only charged in France. UK, Sweden, USA and Australia supply cards for no initial or annual charge; charges are made only for calls.

Implications of Pricing Ranking

259 The key implications of the price ranking based in UK £ PPP for UK businesses are:

- Overall, UK businesses pay less for Calling Card services than all study countries except Sweden.
- Using the base comparison, UK businesses (small, medium and large) pay approximately 53% more for Calling Card services than businesses in Sweden, whilst paying 11% less than businesses in France, 30% less than businesses in the USA and 45% less than businesses in Australia.

COMPARISON OF SERVICE AVAILABILITY AND SCOPE

260 The scope of service offering for Calling Cards is largely based on the simplicity of making calls. Table 22 describes the service features provided in the study countries and the geographic coverage offered.

Facility	USA	UK	Australia	France	Sweden
Direct Dial	Y	Y	Y	N/A	Y
Abbreviated Dialling	Y	Y	Y	N/A	N
Geographic Coverage (% Business Users)	100	99	100	N/A	N/A
KEY Y - Facility Available N - Facility not Available N/A - Information not Available					

Table 22 Summary of Calling Card Facilities

The table shows a full set of facilities which may not be available to all users.

COMPARISON OF QUALITY OF SERVICE OFFERING

261 Information was sought on a number of quality factors including:

- Guaranteed overall availability;
- Frequency of connection failure;
- Frequency of card rejection;
- Losses due to fraud.

Availability of Information

262 The dominant UK operator was able and willing to supply some of the information. Operators in all other countries were unable or unwilling to do so.

CONCLUSIONS

263 This section briefly discusses the conclusions from the previous data and the overall "Best in Class" positioning.

FACTOR	BEST IN CLASS	POSITION OF UK
PRICE	SWEDEN	2

264 Sweden is ranked number one for all price basket comparisons, followed by the UK, France, USA and Australia.

POSSIBLE REASONS FOR THE RANKING

265 Calling Card prices are linked to PSTN pricing; it is, therefore, not surprising that the rankings are the same as the undiscounted PSTN figures. As explained earlier, should the Calling Card volumes be incorporated in a wider procurement of PSTN services, the resulting rankings are likely to be similar to the discounted PSTN rankings, i.e. Sweden, USA, UK, Australia, France.

10. FREEPHONE SERVICES

10. FREEPHONE SERVICES

Introduction

266 Freephone numbers are used to encourage users to call businesses. The call will be free to the user, charged in full to the business. These calls typically used by telesales companies or customer service departments. The service characteristics are therefore similar to the in-country PSTN service with the exception of payment and billing services.

267 It was also the intention of this section to compare Local Call and Premium Call services. This was not possible, however, since Local Call services are not generally available in the study countries, and Premium Call services were not consistent, i.e. not directly comparable.

PRICE COMPARISON

268 Figure 56 shows the overall ranking of the different countries in the study for large business users, based in UK £ PPP.

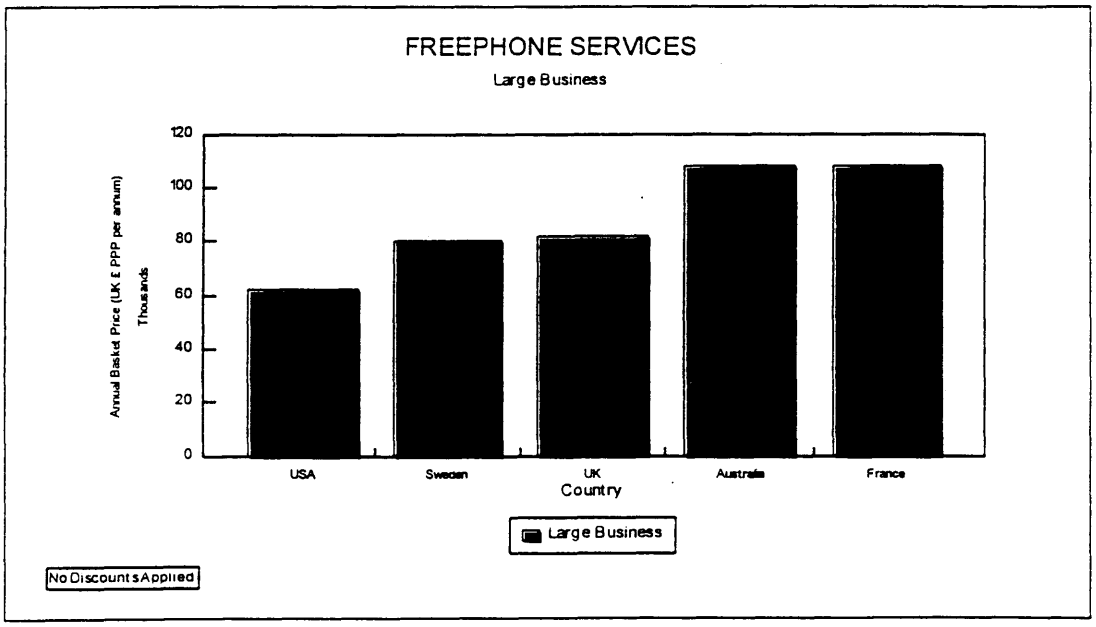

Figure 56 Basket Comparison of Large Business Freephone Charges by Country

269 The graph indicates that, for large businesses, the UK ranks third, behind the USA and Sweden, followed by Australia and France.

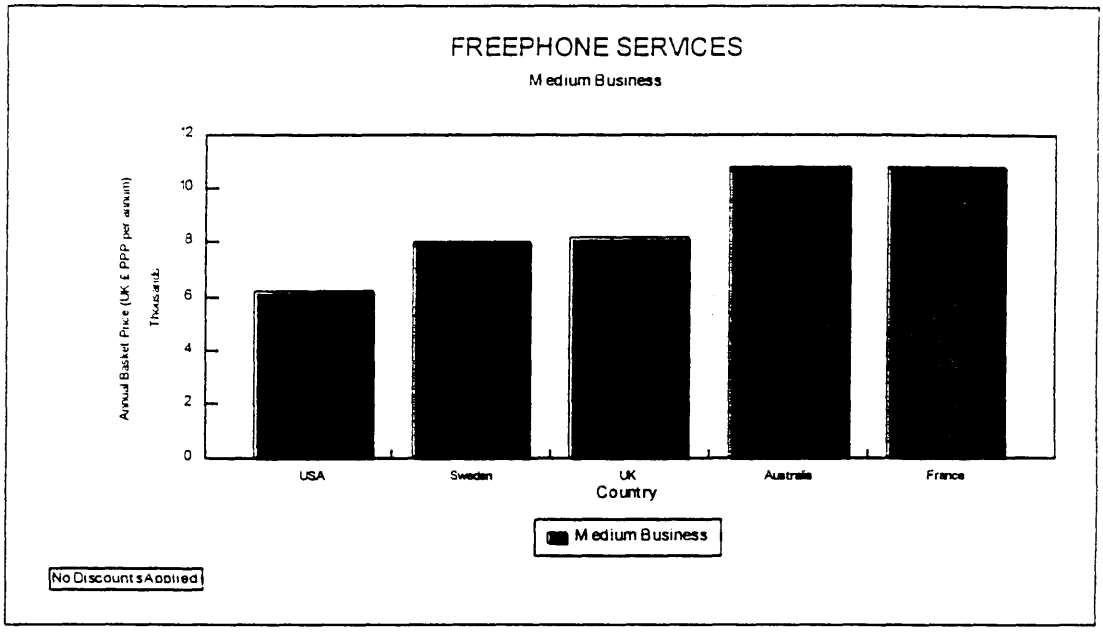

Figure 57 Basket Comparison of Medium Business Freephone Charges by Country

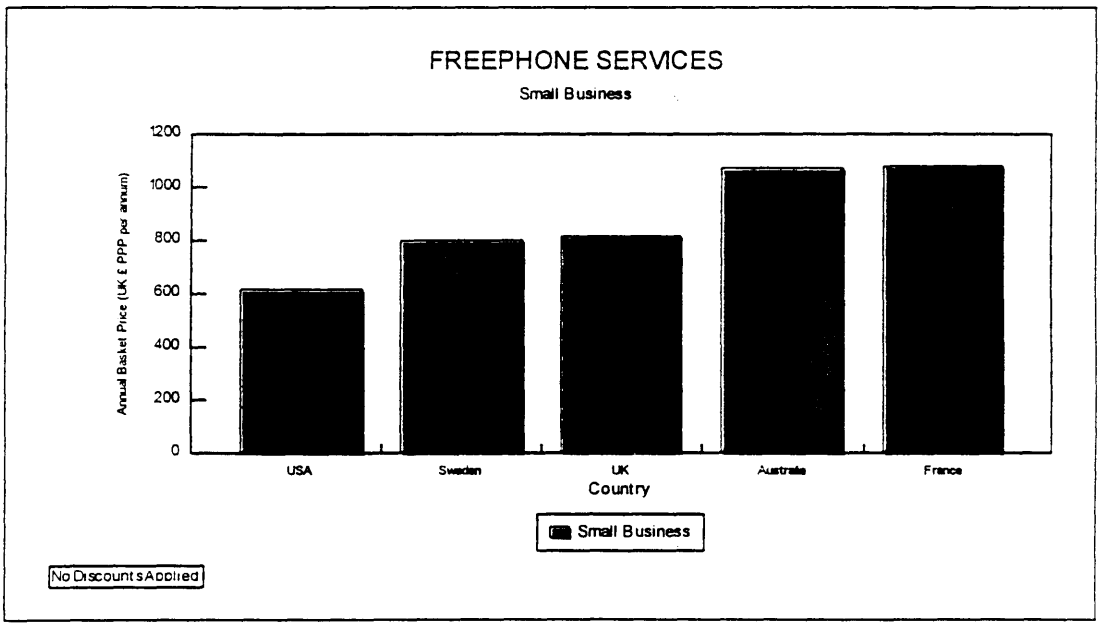

Figure 58 Basket Comparison of Small Business Freephone Charges by Country

270 Figures 57 and 58 show the overall ranking for medium and small business users. This indicates that the ranking remains USA, Sweden, UK, Australia, France.

The impact of volume discounts

271 The above comparisons are based on list tariffs. However, it is likely that the requirements would be combined with the businesses PSTN spend and qualify for an overall discount. In this case, the discounts would be similar to those described in Table 1. The ranking however is unlikely to change.

Varying the user requirement

272 The User Requirement was varied in each of the business categories to reflect the differing profile of businesses' Freephone usage. This variation was carried out by increasing and decreasing the call volumes used by small, medium and large businesses by 100% and 50% respectively to measure the sensitivity of the country rankings to usage volume.

Changing the overall call volumes

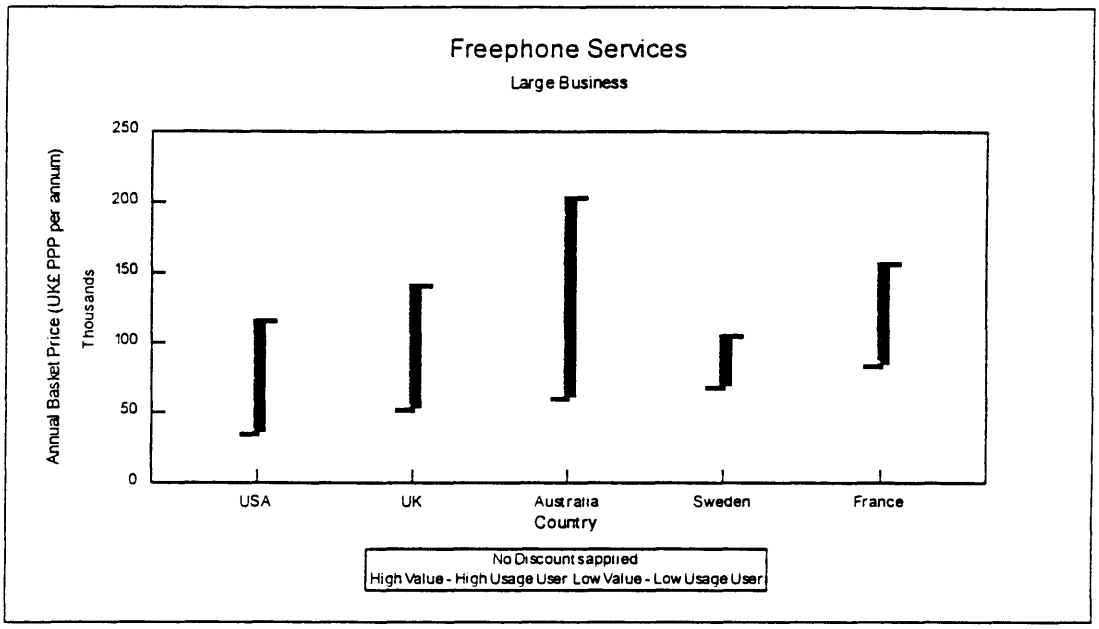

Figure 59 Impact of Changing overall call volumes on Large Users

273 Figure 59 indicates the range of costs from the high user to the low user. The graph shows that for large businesses, for low usage Sweden moves to fourth, and other ranking remaining the same. For high usage, Sweden moves to first, followed by the USA, UK, France and Australia.

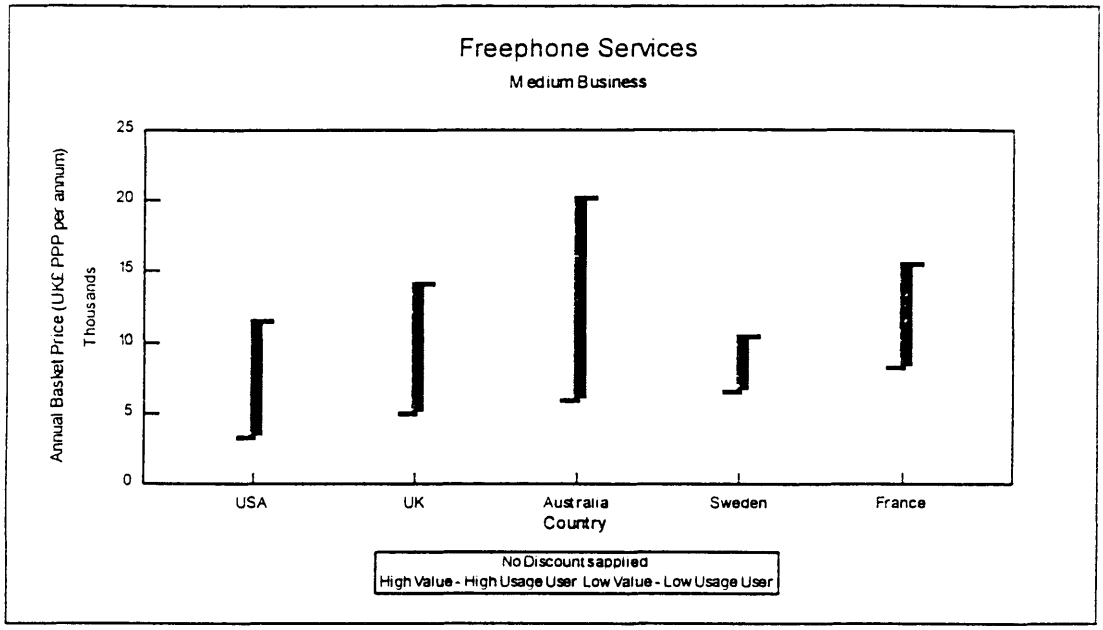

Figure 60 Impact of Changing overall call volumes on Medium Users

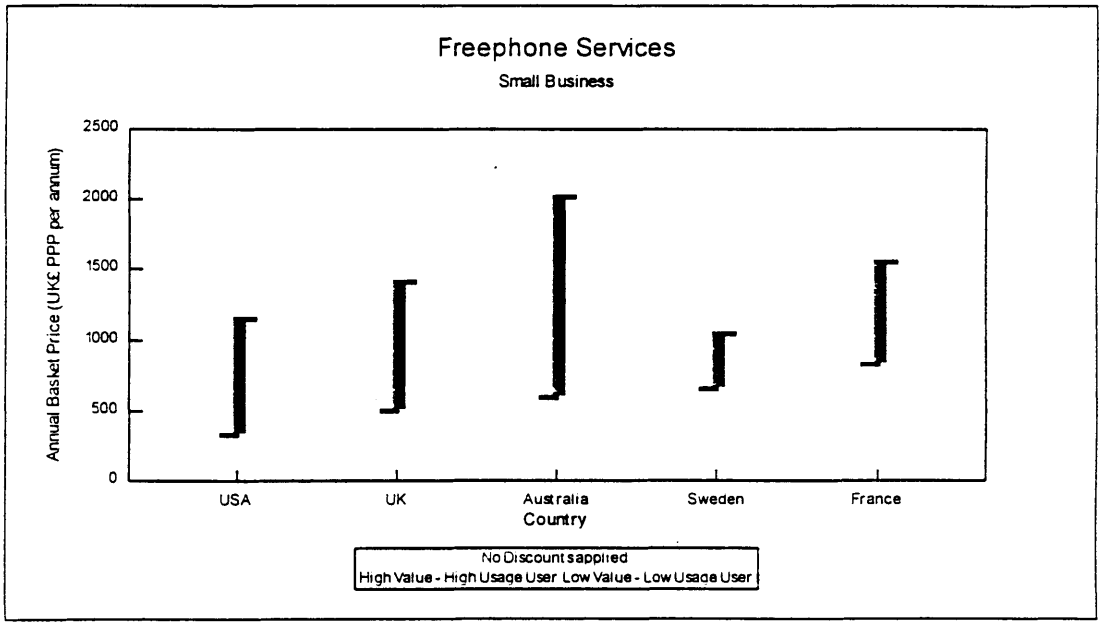

Figure 61 Impact of Changing overall call volumes on Small Users

274 Repeating the analysis of high and low usage for medium and small businesses shows that, for low usage users, the ranking remains USA, UK, Australia, Sweden, France, whilst for high usage, the ranking remains Sweden, USA, UK, France, Australia.

Summary Of Ranking

275 Table 23 below shows the overall ranking of countries for different user requirements:

Business Type	Sensitivity	USA	Sweden	UK	Australia	France
Large	Base Comparison	1	2	3	4	5
Medium		1	2	3	4	5
Small		1	2	3	4	5
Large	Low User Comparison	1	4	2	3	5
Medium		1	4	2	3	5
Small		1	4	2	3	5
Large	High User Comparison	2	1	3	5	4
Medium		2	1	3	5	4
Small		2	1	3	5	4
KEY 1 = Lowest price of the basket 5 = Highest price of the basket						

Table 23 Ranking of Countries by User Requirement

Summary of basket comparisons

276 Variations have been applied to the basket figures to reflect the potentially different usage patterns. In all cases, the USA or Sweden offer the most competitive prices based on standard list prices. Similar to Calling Cards, additional discounts may be achieved if the Freephone services were purchased alongside other services.

Simple rate comparison - local and national call charges

277 The underlying data behind the basket comparisons are the fixed and variable charges. This breakdown is used to provide some of the explanations behind the country comparisons.

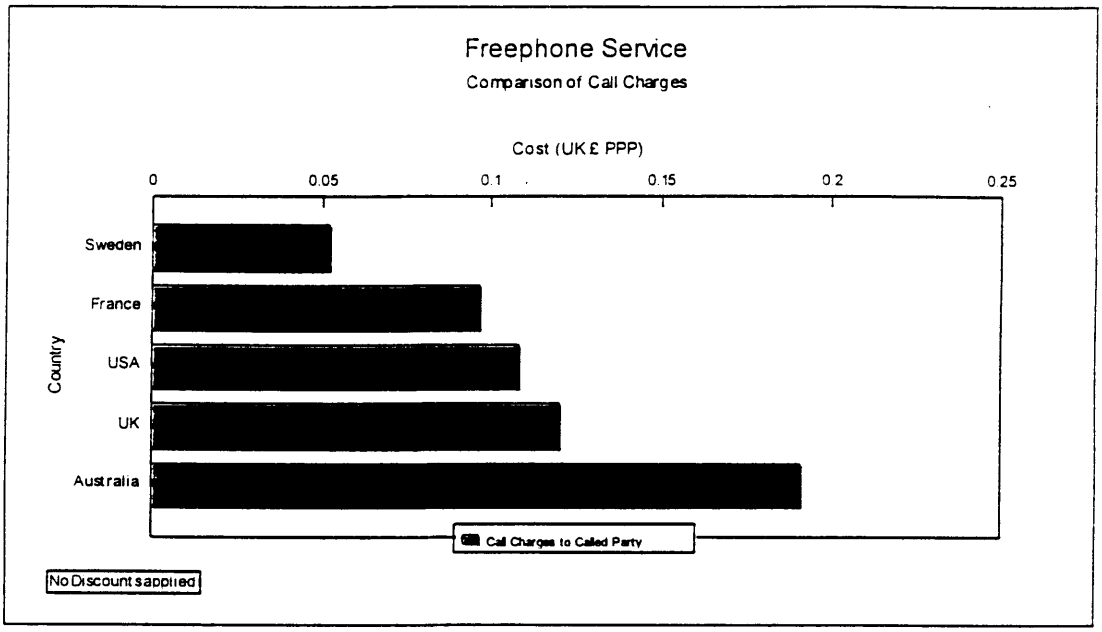

Figure 62 Simple Rate Comparison of Freephone Call Charges

278 Figure 62 shows that Sweden has the lowest cost for Freephone calls, followed by France, USA, UK and Australia. This explains why Sweden and France perform better in the high user comparisons.

Simple rate comparison - fixed charges

279 Figure 63 describes the relative fixed charges for Freephone services. "Fixed Costs" are defined as the annual line rental plus 20% of the initial connection charge, to spread the initial charge over five years.

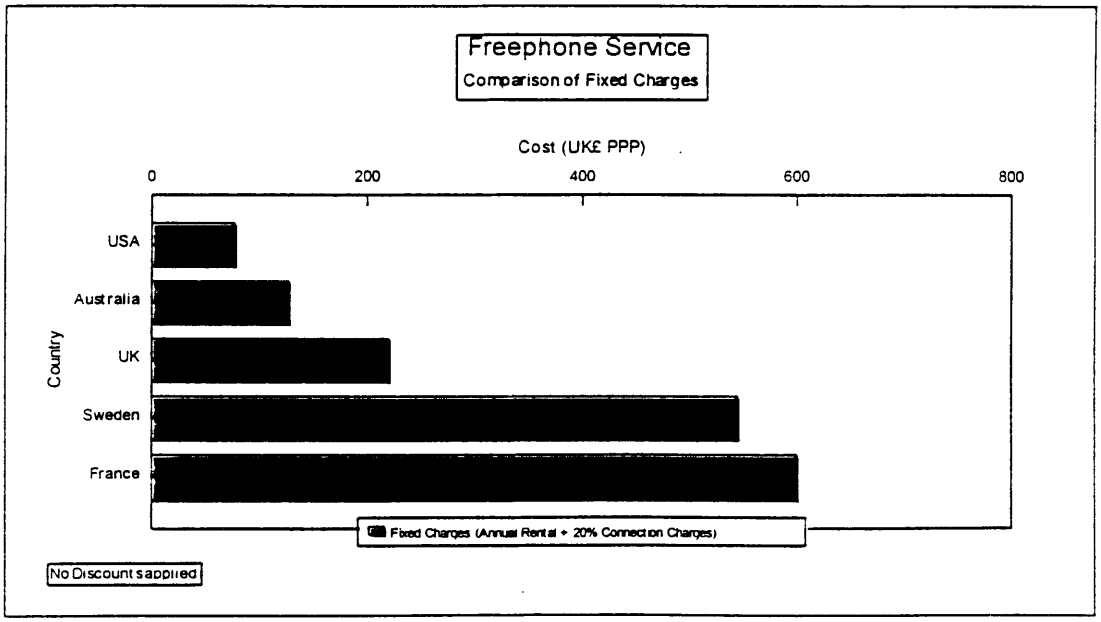

Figure 63 Simple Rate Comparison of Freephone Fixed Charges

280 Figure 63 shows that the USA has the lowest fixed charges for Freephone services, followed by Australia, UK, Sweden and France. This explains why the USA perform best in the base and low user comparisons.

Implications of Pricing Ranking

281 The key implications of the price ranking, based in UK £ PPP for UK businesses are:

- Overall, UK businesses pay more for Freephone services than the USA and Sweden, whilst paying less than businesses in Australia and France.

- Using the base comparison, UK businesses (small, medium and large) pay approximately 33% more for Freephone services than businesses in the USA and 2% more than businesses in Sweden, whilst paying 24% less than businesses in France and Australia.

COMPARISON OF SERVICE AVAILABILITY AND SCOPE

282 Table 24 below, describes the availability and scope of Freephone service features provided in the study countries.

Factor	USA	UK	Australia	France	Sweden
Number Portability (Between Operators)	N/A **	N	N/A	N/A	N
Lead Time (days)	N/A	4	1	N/A	N/A
Geographic Coverage (% Business Users)	100	100	100	100	N/A
KEY Y- Facility Available N- Facility not Available N/A - Information not Available ** Within Nynex service area only					

Table 24 Summary of Freephone Facilities and Availability

COMPARISON OF QUALITY OF SERVICE OFFERING

283 Information was sought on the following quality factors:

- Call Set-up Time;
- Billing Accuracy.

Availability of Information

284 None of the operators contacted were able or willing to provide the requested information specific to Freephone services.

CONCLUSIONS

285 The USA is ranked number one for all price basket comparisons with the base user requirement, followed by Sweden, UK, Australia and France.

286 There is insufficient comparable data to make an effective ranking on the non price factors.

POSSIBLE REASONS FOR THE RANKING

287 The major components of cost for Freephone services are the line and call costs, routed via the PSTN. Freephone prices are linked to PSTN pricing; it is therefore not surprising that the rankings are similar to the undiscounted PSTN figures, but with the USA ahead of Sweden. The USA performs relatively better than it does for undiscounted PSTN services. This is partly due to the limited range of the Nynex service area and that, overall, the USA does not charge such a high premium as other countries for Freephone services over PSTN services.

11. VIRTUAL PRIVATE NETWORKS

288 This review considered Virtual Private Network (VPN) services in the UK, France, Sweden, USA, Australia and Japan. As a relatively new service, the selection of these countries was made in order to compare the UK with countries whose successful economies could have been partly due to the use of very modern telecommunications services.

289 VPN services are offered by operators primarily as an alternative to businesses building private voice networks. Such networks would traditionally have been provided through a combination of private circuits and PSTN services. Typically, a business will buy a VPN service which routes all calls over a public switched infrastructure. Such routing will, however, be transparent to the end user, such that the service behaves as a private network.

290 The advantages claimed by suppliers for VPN services are that:

- a public network can offer bandwidth to accommodate peaks in traffic, without incurring the fixed cost of renting private circuits;
- VPN services can be economically delivered to small businesses or sites were private circuits would not be economical.

291 All of the study countries now offer VPN services. These have typically been introduced during the past 2-3 years. Given the complexity of the tariffs and service structures, operators were not able to supply information which could be used to undertake a direct comparison of services. Only the major UK operator has a comprehensive list of tariffs.

292 Information gained during study 2/3[5] indicated that VPN services are widely used by large businesses in both the UK and USA, but with a higher take up in the USA. The reasons identified for this were that VPNs are of lower cost in the USA and have been available for longer. In addition, there is a wider choice of VPN service providers in the USA who can negotiate volume discounts with clients.

293 Some of the above differences were felt to reflect the immaturity of the VPN service offerings in the UK. In comparison, VPN services in France, Sweden, Australia and Japan are considered to be equally immature, having been introduced during the last two years and having no detailed list prices.

294 The VPN service offering is expected to develop and mature rapidly in all countries. There are likely to be more international services in addition to domestic services.

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[5] Benchmarking Case Studies 1995

12. HIGH SPEED DATA SERVICES

Paragraphs

295 - 302

12. HIGH SPEED DATA SERVICES

295 This review considered High Speed Data services in the UK, France, Sweden, USA, Australia and Japan. As a relatively new service, the selection of these countries was made in order to compare the UK with countries whose successful economies could have been partly due to the use of very modern telecommunications services

296 Information was collected from the operators in each of the study countries concerning their offerings for Frame Relay, Switched Multimegabit Data Services (SMDS) and Asynchronous Transfer Mode (ATM).

297 Frame Relay is a switched data networking service which is typically used by businesses with multiple locations to interconnect Local Area Networks (LANs) at each site, and to provide access to central computing facilities. In some cases, businesses are moving to Frame Relay services to replace dedicated data networks that have been used historically. Line speeds of up to 2Mbps per site are typically supported on Frame Relay networks.

298 SMDS is a further alternative for providing high speed LAN interconnection, normally at speeds from 2Mbps up to 140Mbps.

299 ATM is an even higher speed service, operating at speeds of between 155 Mbps and 2Gbps. The nature of ATM is such that it can potentially support time interactive services like voice and video with a predictable level of service.

300 All of the above services are relatively new. Frame Relay services were introduced in the USA and the UK in the early 1990s. Whilst they have been very successful in the USA, growth in usage has remained very low in the UK. ATM services are much talked about as the "future of networking". However, it is likely to be towards the end of the century before public service offerings are widely available.

301 None of the study countries was able to provide full tariffs for any of the services. The only data available was that regarding Frame Relay services in the USA and Japan; but the data available was only partial and not suitable for comparison. As the take up of services increases over the next few years, such a comparison will become possible.

302 Study 2/3 concluded that High Speed Data services were only used by some of the large participants in the study. Frame Relay is the most widely used service, but this is often provided privately or by a third party service provider. Reports from the USA indicate that Frame Relay take up amongst medium and large businesses is growing rapidly. SMDS is used by one UK and one USA participant, and a number of organisations in the USA and the UK were reported as being interested in using ATM.

Rapid growth of each of the High Speed Data services is expected during the next five years.

APPENDIX A

APPROACH TO DATA ANALYSIS

APPENDIX A

CONTENTS

BACKGROUND

1 Study 1 of the Oftel 1995 Benchmarking Project is focused on identifying the "Best in Class" country for the following services:

- Business Telephony;
- ISDN;
- Analogue Mobile;
- Digital Mobile;
- Private Circuits;
- Calling Cards
- Specially Tariffed Services (Freephone);
- VPN;
- High Speed Data.

2 Following the initial data review, the study focused on five countries (UK, USA, France, Sweden and Australia) for all services, plus Japan (VPN and Frame Relay) and Germany (ISDN and Mobile). The total information gathering, therefore, includes data from 26 PTO/MCO operators across seven countries.

3 The Best in Class classification was made on each of four criteria; price, availability, scope and quality. This Appendix describes the approaches taken to analyse previous published studies and the approach adopted by this study.

APPROACHES TAKEN BY PREVIOUS STUDIES

General

4 A number of related studies which have some relevance were reviewed. The four described here are those undertaken by Oftel (previous study), OECD, Analysys and the Bureau of Industry Economics in Australia. Each of these studies varied in scope from each other and from this study. A summary of the previous studies is included as Annex A to this Appendix.

Oftel (International Tariff Comparison)

5 Oftel first published an international comparison of telephone charges in 1987 in Oftel Working Paper No. 2, *International Comparisons of Telephone Charges*, by M E McDowall. The methodology developed was subsequently reused every year from 1989 to 1993. The key characteristics of the Oftel Study were:

- Covered only PSTN services and only factors related to price;
- Basket comparison based on estimated call usage patterns;
- Included annual rental, local and national calls;
- Did not include one-off connection charges or international calls;
- Detailed study based on call costs for 12 distance and 6 time/day factors;
- Tariffs taken from existing published data from Eurodata and Tariffica;
- Four countries (UK, France, Italy, Germany);

- Considered business and residential users;
- Comparison based on Price Purchasing Parity (PPP), the strengths and weaknesses of which are discussed later.

6 This detailed methodology had a number of weaknesses:

- Priced calls by geographic distance, therefore assuming a uniform sixe of local call area;
- Lacked International call charges, a significant potential spend;
- Ignored impact of discount schemes on business PSTN spend initially, although this was later included;
- Published data was based on BT only as the dominant operator. Other operators were included for internal comparison.

However, this appears to be the first study of its type and was influential as other organisations looked to carry out definitive comparisons of PSTN cost. The methodology was updated throughout the years of issue.

OECD

7 OECD publish a report titled *Communications Outlook* which describes and compares services in 25 member countries. It was first produced in 1991 and the third issue has recently been published, based on 1994 data. The OECD publication covers a wide variety of issues in addition to price, including economic data, status of network competition, and some quality of service data. The key characteristics of the tariff comparison are:

- Based on Oftel's methodology;
- All OECD countries;
- Wider comparison of services, includes separate studies of international calls, mobile, leased line and X.25 tariffs;
- Assumes a PSTN split of 20% fixed charge, 80% usage charge;
- Assumes a mobile split of 33% fixed charge, 67% usage charge;
- Includes installation charges;
- International calls based two types of comparison. Firstly the "call pairs" method is used. This represents the relative price of making a call from one country to another. The call pairs are weighted by the population size of the terminating country to derive an index for each country.
- Did not include discounts to large users
- Comparison in US$ converted to PPP.

The issues of local call area, discount schemes and dominant operators described in paragraph 6 still apply.

8 Quality of Service data includes:

- Waiting time for a new PSTN line connection;
- Outstanding connections by country;

- Call failure rates;
- Fault incidence and repair times;
- Availability of itemised billing.

The information data on quality is somewhat sketchy and not available for all countries. The data is only up to date to 1992.

9 Little or no data was included on availability/scope of services.

OECD, recognising the significant effort required to keep the evaluation up to date, recently contracted with Eurodata to produce the data on OECD's behalf. The latest update was recently released, based on the Eurodata tariffs at July 1995. It incorporates connection charges based on a five year write off period for all services covered. It still does not include discounts on standard tariffs.

Analysis

11 Analysys produce and sell independent research material, and in 1994 published a document *Cutting the Cost, The Falling Price of Telephony in Four European Countries.* This was a comparison of PSTN charges, taken over a series of years from 1983 to 1994. The cost comparison is again based on the original Oftel methodology. Key characteristics of the Analysys study include:

- Changes to the call basket; assumes linear increase of call length as distance increases, and increased weekend traffic;
- More complex modelling of local call areas;
- Four countries compared, as Oftel study;
- Includes international calls based on UK, France, Germany, Italy, EC, Rest of Europe, North America and Rest of the World;
- Additional business user baskets based on 1 to 100 lines and distribution of national and international calls;
- Includes estimate of standard discounts available;
- Based on UK £ converted to PPP.

At the time of writing, Analysis released an update to the report based on 1995 data.

12 The results were provided in graphs based on total cost of telephone service, total cost of calls and cost of international calls. Business comparisons are provided for 3, 6, 12, 25, 50 and 100 line users. The total cost includes one year's line rental but no connection charges. BT and Mercury costs are provided and identified separately. The results indicate a consistent country ranking for all business comparisons.

Bureau of Industry Economics (Australia)

13 The Bureau of Industry Economics (BIE) took a wider, and in some cases simpler, comparison of PSTN and other services. This data is now being considered by Austel as a possible standard performance indicator. Previously, Austel incorporated a

summary of the OECD data in its *1994 Competitive Safeguards & Carrier Performance* publication. Characteristics of the BIE data are:

- Inclusion of simple rate comparisons in addition to basket data;
- Simple rate comparisons of:
  - Business User fixed PSTN charges;
  - Long distance call charges;
  - International call charges;
  - Mobile fixed charges;
  - Mobile call charges.
- Basket data based on OECD data;
- Includes PSTN, Mobile, Leased lines and PSDN;
- Prices in US$;
- Provided separately for each operator;
- No estimate of discounts;
- Based on 28 countries.

14 The simple rate comparisons give the ranking of individual parameters. Fixed cost comparisons include the installation cost spread over ten years for fixed services and three years for mobile.

Summary

15 Each of the published methodologies is built, to some extent, on the Oftel methodology, a complex comparison of PSTN costs based on a number of assumptions regarding call profiles and durations. There is, however, little consistency regarding:

- International calls;
- Consideration of initial connection charges;
- Consideration of discounts available to major users;
- Services other than PSTN;
- Factors other than price.

16 It was difficult, therefore, to take too much by way of standard factors from these previous studies. The methodology section considers the factors which are pertinent to this study and discusses an appropriate method to meet the objectives of the Study.

METHODOLOGY

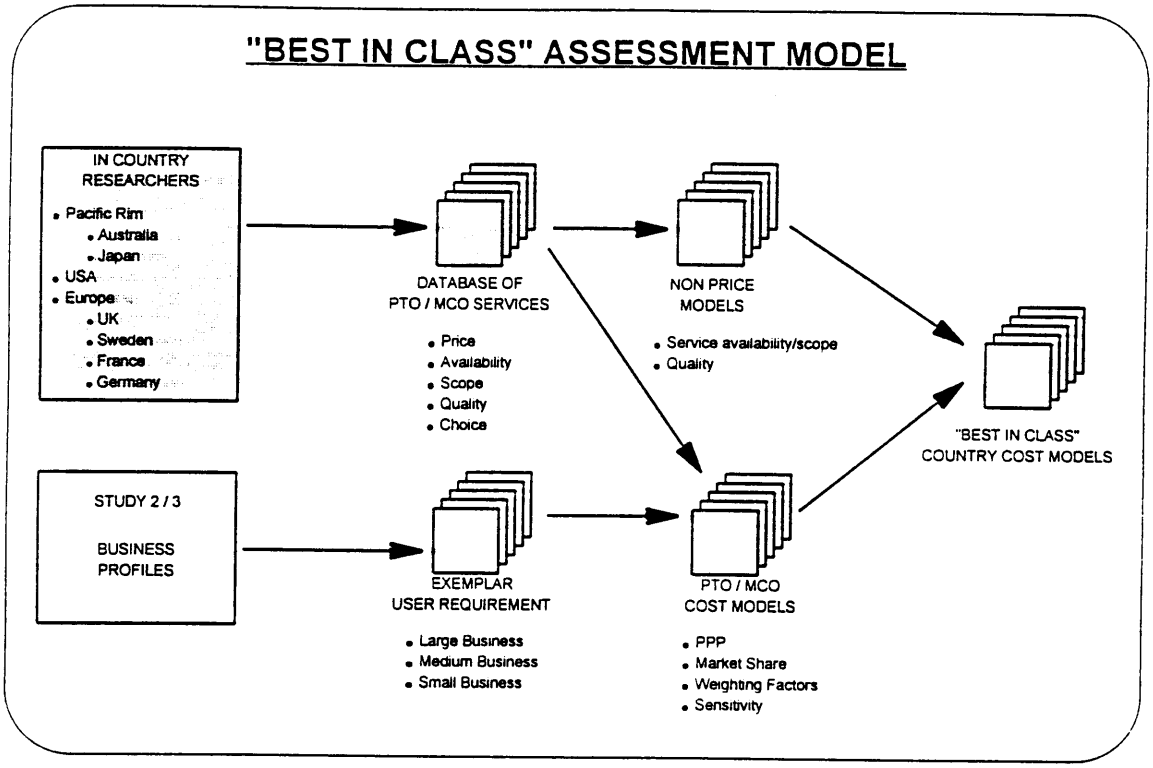
General

17 The key difference of this study, in comparison with the above studies, is the breadth of the scope in terms of both the range of services and the range of data requested. An immediate consequence of both of these factors is that the data collection could not be conducted purely from existing published information. Hence, primary data collection was undertaken directly with the 26 Public Telecommunications Operators (PTOs) and Mobile Telecommunications Operators (MCOs) across seven countries. In order

to ensure that meaningful and useful output is provided, a simple but effective analysis process was required. A workplan was developed to provide effective analysis within the Oftel project budget.

The "Best in Class" Assessment Model

18 The structure of the model is shown below.



Database of PTO/MCO Services

19 The database of services was developed through requesting data directly from operators in each of the countries. The data collection process was undertaken using a structured postal questionnaire which is attached as Appendix B of the main report. The major operators were selected and are listed in Appendix C of the main report.

Exemplar User Requirement

20 The exemplar user requirement provides the input to determine the overall cost comparison. This reflects the usage levels of typical small, medium and large businesses and is calculated based on the actual usage of Study 2 and 3 UK businesses.

21 Typical profiles which represent an "exemplar user" include:

- Large Business based on:

  50 large offices

200 smaller subsidiary offices (10-15 staff)
Mix of national, international calls
Significant use of mobile
User of all services;

- Medium Business based on:

  10 medium offices
  Mainly national calls
  Significant user of analogue mobile
  User of most services;

- Small business based on:

  1/2 offices
  Up to 50 staff total
  User of PSTN and Mobile services only.

22 The user requirements input to the model are included as Annex B.

Varying the User Requirement

A key input to the model is the user requirement, since it is this which determines the ranking for each service. The approach to determining the base user requirement is discussed above and is derived from data generated from the businesses involved in the study. However it is important that variations to the user requirement are applied to the results to ensure that reasons for specific differences are incorporated.

The user requirement could differ for a number of reasons:

- The different business sectors have different usage profiles for the services considered e.g. different customer base, more telephone intensive businesses;
- The usage requirements may differ in individual countries due to business needs or affordability of the service;
- Some services are substitutions for each other, e.g. ISDN vs Frame Relay.

23 Since it is not proposed to "add together" the costs of the different services, substitution not a problem. The base user requirement is one which represents the quantity of the service used by a typical business. However, it is still important that the different levels of usage are considered to determine the robustness of the result. The following section describes the variations used and the rationale behind the factors considered. Generally, sensitivity is based on a reduction by 50% or an increase of 100% on the relevant parameter to represent a significant shift in the calling pattern. The table below describes the different user requirements modelled.

SERVICE	USER REQUIREMENT	VARIATIONS
PSTN	Low User	All call volumes reduced by 50%
	High User	All call volumes increased by 100%
	Local User	Local call volumes +100%, other calls -50%
	National User	National call volumes +100%, other calls -50%
	International User	International call volumes +100%, other calls -50%
ISDN	Low User	All call volumes reduced by 50%
	High User	All call volumes increased by 100%
	Local User	Local call volumes +100%, other calls -50%
	National User	National call volumes +100%, other calls -50%
	International User	International call volumes +100%, other calls -50%
ANALOGUE MOBILE	Low User	All call volumes reduced by 50%
	High User	All call volumes increased by 100%
DIGITAL MOBILE	Low User	All call volumes reduced by 50%
	High User	All call volumes increased by 100%
PRIVATE CIRCUITS	Low Speed User	Low Speed Circuits +100%, High Speed -50%
	High Speed User	High Speed Circuits +100%, Low Speed -50%
CALLING CARDS	Low User	All call volumes reduced by 50%
	High User	All call volumes increased by 100%
FREEPHONE SERVICES	Low User	All call volumes reduced by 50%
	High User	All call volumes increased by 100%

Table 1 Summary of User Requirement Variations

PTO/MCO Cost Models

24 The exemplar user requirement was "priced" using the input from the database of services with the following additional parameters applied:

- PSTN rates are converted to "effective rates" by the Oftel methodology which uses negative exponential distribution to convert nominal charges per minute, taking into account minimum charges, the actual rates per minute paid for calls which average three minutes in duration but whose durations reflect a typical range of lengths.

- Annual costs added to 20% of initial (connection) charges to produce a total annual charge for the service based on the user requirement.

- The figures were converted to UK £ and also to UK £ Price Purchasing Parity (PPP - See Below) based on the OECD figures (1994 figures, from August 1995 "Main Economic Indicators"). This was done to facilitate two methods of comparison:

    - A second set of total figures was produced, based on the estimated discount available for that service against standard tariffs for PSTN services only. Discounts are based on published levels, where possible, (UK, Australia) and on estimated levels in the USA. The discount levels were estimated from levels being achieved by US customers in Study 2/3 case studies. Sweden does have PSTN

discounts which have been suggested as being up to 10% although no formal confirmation was received, and therefore they are not included. France only offers discounts for very high usage on individual lines, which meant that no user requirement qualified for them.

- Prices are accurate at 1st July 1995.

25 Price Comparisons are carried out in Purchasing Power Parities (PPPs). These are the rates of currency conversion which eliminate the differences in price levels between countries. This means that a given sum of money, when converted into different currencies at the PPP rates, will buy the same basket of goods and services in all countries. Thus, when expenditures on GDP for countries are converted into a common currency by means of PPPs, they are, in effect, expressed at the same set of international prices so that comparisons between countries reflect only differences in the volume of goods and services purchased. An advantage of PPPs is their relative stability over time. In addition, they measure relative efficiencies of the operators

26 The impact of PPP on the overall country costs is shown below. The figures are that factor by which the exchange rate comparisons are multiplied to give the PPP comparison.

Country	UK	France	Germany	Sweden	Australia	Japan	USA
PPP Effect	1	0.75	0.69	0.74	0.97	0.52	0.98

Table 2 Impact of PPP on Price Comparison

27 Hence, the effect of PPP is to reduce the prices of other countries relative to a currency comparison. Whilst the prices of the USA and Australia are not significantly reduced, all others reduce by at least 25% in the PPP comparison.

28 The disadvantage of PPPs is that they are less relevant to those businesses who trade mainly internationally and take account of exchange rates to a greater extent in their decisions than consumer purchasing power. In addition the reader is cautioned against making purchase decisions on the comparisons presented. The prices represent costs which are related to the price of other goods and services in the country, rather than the exact cost of purchase. Overall, however, PPP was considered more representative of the value for money of the services in each country. To supplement the PPP comparison the PSTN prices were also presented in currency form in UK £.

The use of tariff baskets in this study

29 The use of tariff baskets for price comparisons necessitates broad assumptions. The methodology used in this study is intended to provide a general comparison of the positioning of tariffs in different countries and their overall competitiveness with tariffs in other countries. The tariff basket methodology does not take into account the following on national calling patterns:

- the geographic size;

- country location;
- the effects of population size;
- the characteristic business enterprise size;
- the regulatory environment of the country (the regulatory environment is considered in the explanation of the differences between country offerings).

30 The net effects of the above assumptions are to produce a bias against larger countries, countries with lower than average population densities and countries with untimed local calls. In our opinion, however, this bias does not have a significant effect on the overall rankings, since call traffic over 200km distance represents only 2-3% of all telephone calls. A summary of the assumptions made is included in Annex C.

Non Price Models

31 A ranking factor was applied to the availability, scope and quality of service figures (where available) to indicate "Best in Class" for each individual factor.

"Best in Class" Country Cost Model

32 Where the service has a single dominant operator, then the country cost model was generated from the single operator data. Where the market share of the secondary or next largest operator is estimated to exceed 10%, the model multiplied the total costs of each in country operator by their respective market share to produce an average figure for that service in that country, and thus generates the country cost model. The exception to this is the USA, where the large number of operators necessitated the use of representative suppliers. Nynex were selected to represent local operators, in conjunction with AT&T, representing long distance operators. A full list of operators is included in Appendix C.

CONCLUSIONS

33 Each of the previous studies provided some guidance factors in undertaking the analysis work for this study. Where appropriate, the experience of these studies was applied to this study. For example:

- Comparisons made on dominant operators;
- US input to OECD based on AT&T/Nynex data.

34 However, each of the previous studies focused on producing definitive pricing comparisons on a specific range of services. We considered the 1995 Benchmarking Project to differ in many respects from the previous studies due to the following:

- Very broad set of services and factors, many not previously assessed;
- Intended to represent "real world" data from representative businesses;
- Includes potential service discounts.

35 The approach, therefore, was to collect primary data direct from PTO/MCO operators and apply it to a user requirement derived from the data collection from Study 2/3

businesses (See Annex B). Whilst this, in some cases, produces results which are different to previous studies, it is felt that they represent a realistic view of the service offerings and costs available to UK businesses in comparison with their peers in other countries. It is also an approach which is not too onerous in analysis terms and which could be continually updated at reasonable cost.

ANNEX A

SUMMARY OF PREVIOUS STUDIES

STUDY	SERVICES	FOCUS	DATA SOURCE	COUNTRIES	OPERATORS	DISCOUNTS	INITIAL CHARGES	CALL PATTERNS	CURRENCY
OFTEL STUDY, 1987	National PSTN	Price, Residential and Single Line Business	Published tariffs from Eurodata and Tariffica	UK, France, Italy, Germany	Dominant PTO's.	Published discounts included in later studies	Not included	Basket of calls; 12 distance and 6 time/day factors. Updated for negative exponential distribution.	UK £ PPP
OECD STUDY, 1995	National PSTN, International PSTN, Mobile, Leased circuits, Packet Switching	Residential and single line business	Direct from operator survey at the start of 1994.	All 24 OECD countries	Dominant PTO (UK/BT, USA/Nynex/ATT), Cellnet and Vodafone included for mobile.	Not included	5 year write off for fixed services, 3 years for mobile. Assumes fixed to usage ratio of 20/80 (PSTN and 33/67 (mobile)	Based on Oftel baskets, updated to reflect increased usage.	US$ PPP
UK £ and UK £ PPP	National and International PSTN	Residential, Single Line and Multi Line Businesses (Average user and high user)	Not described in the report	UK, France, Italy, Germany	Dominant PTO, BT and Mercury in the UK	Published discounts included	Not included.	Minor revisions to Oftel Basket	UK £ and UK £ PPP
BUREAU OF INDUSTRY ECONOMICS AUSTRALIA, 1995	National PSTN, International PSTN, Mobile, Leased circuits, Packet Switching	Residential and single line business	Not described in the report	24 OECD countries plus Hong Kong, Korea, Malaysia, Singapore, Thailand, Taiwan	Dominant PTO's, BT and Mercury in UK, Multiple operators for mobile	Included where published	10 year write off for fixed services	As OECD plus simple rate comparisons	US$
OFTEL BEST IN CLASS STUDY, 1995	National PSTN, International PSTN, ISDN, Analogue Mobile, Digital Mobile, Leased Circuits, Calling Cards, Specially Tariffed Services, VPN, Frame Relay	Price, Availability, Quality and Scope. Small, Medium and Large Businesses	Direct from operators supplemented by published tariffs	UK, France, Sweden, USA, Australia, Japan (VPN and High Speed), Germany (ISDN and Mobile).	All PTO's, MCO's with over 10% market share	Published discounts plus market assessment of negotiated discounts	5 year write off for all services	Exemplar user requirement based on UK Businesses	UK £ PPP

ANNEX B

USER REQUIREMENT DATA

	LARGE BUSINESS	MEDIUM BUSINESS	SMALL BUSINESS
PSTN			
Number of Exchange Lines	5,000	150	20
Number of Locations	200	10	2
Total Calls	29,666,667	1,533,333	150,000
Total Call Minutes - Local	62,000,000	3,000,000	300,000
Total Call minutes - National	25,000,000	1,500,000	150,000
Total Call Minutes - Europe	1,250,000	65,000	0
Total Call Minutes - North America	500,000	25,000	0
Total Call Minutes - Far East	250,000	10,000	0
ISDN			
Number of Basic Rate Lines	200	20	1
Number of Primary Rate Lines	2	0	0
Total Calls	113,000	8,000	500
Total Call Minutes - Local	100,000	40,000	4,000
Total Call minutes - National	1,000,000	40,000	1,000
Total Call Minutes - UK	10,000	0	0
Total Call Minutes - USA	10,000	0	0
Total Call Minutes - Hong Kong	10,000	0	0
VPN			
Total VPN Sites	30	10	0
Total VPN Extensions	5,000	200	0
Total VPN calls	100,000	10,000	0
On-net Call Minutes	50,000	5,000	0
National call Minutes	100,000	10,000	0
UK Call Minutes	0	0	0
USA Call Minutes	0	0	0
Hong Kong Call Minutes	0	0	0
MOBILE (ANALOGUE)			
Number of Handsets	2,000	50	4
Number of Lines	2,000	50	4
Total Calls	1,500,000	25,000	1,000
Peak Rate call Minutes	3,000,000	50,000	2,000
Off Peak Rate Call Minutes		0	0
UK Call Minutes	0	0	0
USA Call Minutes	0	0	0
Hong Kong Call Minutes	0	0	0
MOBILE (DIGITAL)			
Number of Handsets	2,000	50	4
Number of Lines	2,000	50	4
Total Calls	1,500,000	25,000	1,000
Peak Rate call Minutes	3,000,000	50,000	2,000
Off Peak Rate Call Minutes		0	0
UK Call Minutes	0	0	0
USA Call Minutes	0	0	0
Hong Kong Call Minutes	0	0	0

HIGH SPEED DATA			
Frame Relay Sites @ 64Kbps	80	0	0
Frame Relay Sites @ 2Mbps	2	0	0
Usage per day (Mbytes)	2	0	0
PRIVATE CIRCUITS			
9.6kbps Private Circuits @5km	0	0	0
9.6kbps Private Circuits @50km	0	0	0
9.6kbps Private Circuits @200km	0	0	0
64kbps Private Circuits @5km	30	2	1
64kbps Private Circuits @50km	100	8	1
64kbps Private Circuits @200km	30	2	0
2Mbps Private Circuits @5km	50	0	0
2Mbps Private Circuits @50km	20	0	0
2Mbps Private Circuits @200km	10	0	0
CALLING CARDS			
Number of Cards	100	20	4
Total Calls	5,833	1,167	133
Local Call Minutes	2,500	500	100
National Call Minutes	15,000	3,000	300
UK Call Minutes	0	0	0
USA Call Minutes	0	0	0
Hong Kong Call Minutes	0	0	0
SPECIALLY TARIFFED			
Freecall Lines	100	10	1
Freecall Minutes	500,000	50,000	5,000
Local Call Lines	50	0	0
Local Call Minutes	5,000	0	0
Premium Call Lines	50	0	0
Premium Call Minutes	5,000	0	0

Notes:

1. All call minutes per annum
2. Information based on interview profiles.
3. Costs calculated by operator for each service.

ANNEX C

LIST OF MODEL ASSUMPTIONS

ASSUMPTIONS

The following assumptions were made in calculating the prices for the model:

- All prices are exclusive of tax;
- Call durations for PSTN, Calling Cards, Freephone of 3 minutes;
- Call durations for ISDN of 10 minutes;
- Call durations for mobile of 2 minutes;
- All calls priced at peak business daytime tariff;
- National calls based on 200km+ distance;
- Local calls based on 10km or less distance;
- Call basket includes no regional calls;
- International calls based on three destinations (Europe, North America, Far East);
- Discounts only calculated for PSTN, based on published levels with the exception of the USA where negotiated levels have been estimated;
- 20% of any initial connection charge is added to annual recurring costs to produce a net annual cost. Same percentage used for all services;
- Tariffs included for all operators with a 10% or greater market share. Market share estimated during data collection.

APPENDIX B

DATA COLLECTION - DEFINITION OF TERMS

Service	BUSINESS PSTN
Country	
Operator	*PTO or MCO operator*
Currency of Tariffs	*Local Currency*

Criteria	*Notes*
Cost	
Installation cost per line (£)	*Initial installation cost for the first line*
Installation cost, subsequent lines (£)	*Initial installation cost for additional lines*
Rental per line per annum (£)	*Annual rental fee for a single PSTN line*
Initial Call Set up Cost (£)	*If charged, set up cost with no call time*
Minimum Call Charge (£)	*If applicable*
Time included in minimum charge (minutes)	*If applicable*
Call charge per minute (Local) (£)	*Based on the charge for subsequent minutes. Based on weekday, prime business tariff. Where distances vary, base Local on less than 10km and National on greater than 100km.*
Call charge per minute (National) (£)	
Call charge per minute - UK (£)	
Call charge per minute - USA (£)	
Call charge per minute - Hong Kong(£)	
Call volume discount (max %)	*Maximum discount available on standard tariffs*
Calls routed at local rate (%)	*As a percentage of total calls*
Availability	
Waiting list (Y/N)	*Standard lead time to get onto installation schedule?*
Average wait time (days)	*What is it?*
Average time to install if no waiting list (days)	*Standard lead time once onto installation schedule*
Percent of lines served by digital exchange (%)	*Total % of lines on digital switch rather than analogue switch*
Size of Local Call Area (km)	*Maximum distance for a call to be routed at local rate*
Can PTO connect Call Routing Equipment (Y/N)	*As opposed to the Pre Connection inspection by the maintainer*
Scope	
Call Waiting (Y/N)	
Local Call Forwarding (Y/N)	*Ability to forward calls to an alternative telephone number*
Number Portability between PTO's (Y/N)	*Ability to retain incoming number between PTOs*
Calling Line Identification (Y/N)	*Is the facility available from the PTO? Also indicate whether the services are available free of charge or additional charges are made.*
Call Barring (Y/N)	
Conference Calling (Y/N)	
Personal numbers (Y/N)	
Voicemail Facility (Y/N)	
Itemised Billing (Y/N)	
Aggregated Billing (Y/N)	
Quality	
Mean Time Between Failure per line (months)	*From PTO/MCO quality of service data*
Mean Time To Repair (days)	
Frequency of Call Failure (1 in n)	
Call set up time - Busy Hour (seconds)	*Set up time from completion of dialling to establishment of ring tone.*
Call set up time - Average (seconds)	
Measurement of Billing Accuracy (Y/N)	*Is it measured by the PTO/MCO?*
Choice	
Subject to competitive offering (Y/N)	*Are there local suppliers of a similar service?*
Estimated market share (%)	*Of this PTO, based on revenue income from business customers*
Universal Service Obligation (Y/N)	*Does it exist for this service?*

Service	ISDN
Country	
Operator	*PTO or MCO operator*
Currency of Tariffs	*Local Currency*

Criteria	*Notes*
Cost	
Installation cost per line - Basic Rate (£)	*Initial installation cost for the first Basic Rate connection*
Rental per line per annum - Basic Rate (£)	*Annual rental fee per Basic Rate line*
Installation cost per line - Primary Rate (£)	*Initial installation cost for the first Primary Rate connection, assumes fibre or coax already installed to the building.*
Rental per line per annum - Primary Rate (£)	*Annual rental fee per Primary Rate line*
Initial Call Set up Cost (£)	*If charged, set up cost with no call time*
Minimum Call Charge (£)	*If applicable*
Time included in minimum charge (minutes)	*If applicable*
Call charge per minute (Local) (£)	*Based on the charge for subsequent minutes. Based on weekday, prime business tariff.*
Call charge per minute (National) (£)	
Call charge per minute - UK (£)	
Call charge per minute - USA (£)	
Call charge per minute - Hong Kong (£)	
Call volume discount (max %)	*Maximum discount available on standard tariffs*
Availability	
Average time to install (days)	*Standard lead time once onto installation schedule*
Business Population coverage - Basic Rate (% Users)	*What % of business locations can be connected to the service?*
Business Population coverage - Primary Rate (% Users)	
Scope	
D - Channel facility (Y/N)	*Are the facilities available for customer use? Also indicate whether the services are available free of charge or additional charges are made.*
Closed User Groups (Y/N)	
Sub Addressing Facility (Y/N)	
Quality	
Mean Time Between Failure per channel (months)	*From PTO/MCO quality of service data*
Mean Time To Repair (days)	
Frequency of Call Failure (1 in n)	
Call set up time - Busy Hour (seconds)	*Set up time from completion of dialling to establishment of ring tone.*
Call set up time - Average (seconds)	
Billing Accuracy (% accurate)	*Is it measured by the PTO/MCO?*
Choice	
Subject to competitive offering (Y/N)	*Are there local suppliers of a similar service?*
Estimated market share (%)	*Of this PTO/MCO, based on revenue income from this service*
Universal Service Obligation (Y/N)	*Does it exist for this service?*

Service	Virtual Private Network
Country	
Operator	*PTO or MCO operator*
Currency of Tariffs	*Local Currency*

Criteria	*Notes*
Cost	
Installation cost per site (£)	*One off Cost to connect each site to the VPN network*
Rental per site per annum (£)	*Annual Cost to connect each site to the VPN network*
Installation cost per extension (£)	*Per individual telephone extension*
Rental per extension per annum (£)	
Initial Call Set up Cost (£)	*If charged, set up cost with no call time*
Minimum Call Charge (£)	*If applicable*
Time included in minimum charge (minutes)	*If applicable*
Call charge per minute (On-net) (£)	*Call charges to other locations on the same VPN network*
Call charge per minute (Local) (£)	*Based on the charge for the first full minute after any initial charge. Based on weekday, prime business tariff.*
Call charge per minute National (£)	
Call charge per minute - UK (£)	
Call charge per minute - USA (£)	
Call charge per minute - Hong Kong (£)	
Call volume discount (max %)	*Maximum discount available on standard tariffs*
Availability	
Average time to install (days)	*Standard lead time once onto installation schedule*
Business Population coverage (% Users)	*What % of business locations can be connected to the service?*
Total switches offering VPN Services	*All switches with VPN capability, included shared switches*
Total VPN Points of Presence	*Total number of access points to the VPN network*
Scope	
64KB Data Support (Y/N)	*Dial up 64kb connections?*
Interconnection with International VPN (Y/N)	
Aggregated 64KB support (Y/N)	*Multiple 64kb services eg. 128kb, 256kb*
Support for Dial up Videoconferencing (Y/N)	
Quality	
Frequency of total failure to an individual site (years)	*From PTO/MCO quality of service data*
Frequency of Call Failure (1 in n)	
Call set up time - Busy Hour (seconds)	*Set up time from completion of dialling to establishment of ring tone*
Call set up time - Average (seconds)	
Billing Accuracy (% accurate)	*Is it measured by the PTO/MCO?*
Choice	
Subject to competitive offering (Y/N)	*Are there local suppliers of a similar service?*
Estimated market share (%)	*Of this PTO/MCO, based on revenue income from this service*
Universal Service Obligation (Y/N)	*Does it exist for this service?*

Service	Analogue Mobile (Business User)
Country	
Operator	*PTO or MCO operator*
Currency of Tariffs	*Local Currency*

Criteria	*Notes*
Cost	
Connection Charge per handset (£)	*Charge to connect to the network*
Rental per line per month (£)	*Annual fee per handset*
Initial Call Set up Cost (£)	*If charged, set up cost with no call time*
Minimum Call Charge (£)	*If applicable*
Time included in minimum charge (minutes)	*If applicable*
Call charge per minute -Peak time (£)	*Based on the charge for subsequent minutes after any initial charge. Based on weekday, prime business tariff.*
Call charge per minute - Off Peak (£)	
Call charge per minute - UK (£)	
Call charge per minute - USA (£)	
Call charge per minute - Hong Kong (£)	
Call volume discount (max %)	*Maximum discount available on standard tariffs*
Availability	
Average lead time to connect to network (days)	
Geographic coverage - (% Business Users)	
Does the network operator sell direct to the public (Y/N)	
Number of service resellers	
Minimum length of Service Contract (Months)	
Scope	*Is the facility available from the MCO. Also indicate whether the services are available free of charge or additional charges are made.*
Call Waiting (Y/N)	
Call Forwarding (Y/N)	
Calling Line Identification (Y/N)	
Call Barring (Y/N)	
Conference Calling (Y/N)	
Voicemail Facility (Y/N)	
Fax support (Y/N)	
PCMCIA Data Support (Y/N)	
Quality	
Frequency of Call Failure (1 in n)	*From MCO quality of Service Data*
Call set up time - Busy Hour (seconds)	
Call set up time - Average (seconds)	
Billing Accuracy (% accurate)	
Percent Calls of acceptable quality (%)	
Choice	
Subject to competitive offering (Y/N)	*Are there local suppliers of a similar service?*
Estimated market share (%)	*Of this PTO/MCO, based on revenue income from this service*
Universal Service Obligation (Y/N)	*Does it exist for this service?*

Service	Digital Mobile (Business User)
Country	
Operator	*PTO or MCO operator*
Currency of Tariffs	*Local Currency*

Criteria	*Notes*
Cost	
Connection Charge per handset (£)	*Charge to connect to the network*
Rental per line per month (£)	*Annual fee per handset*
Initial Call Set up Cost (£)	*If charged, set up cost with no call time*
Minimum Call Charge (£)	*If applicable*
Time included in minimum charge (minutes)	*If applicable*
Call charge per minute -Peak time (£)	*Based on the charge for subsequent minutes after any initial charge. Based on weekday, prime business tariff.*
Call charge per minute - Off Peak (£)	
Call charge per minute - UK (£)	
Call charge per minute - USA (£)	
Call charge per minute - Hong Kong (£)	
Call volume discount (max %)	*Maximum discount available on standard tariffs*
Availability	
Average lead time to connect to network (days)	
Geographic coverage - (% Business Users)	
Does the network operator sell direct to the public (Y/N)	
Number of service resellers	
Minimum length of Service Contract (Months)	
Scope	
GSM Support (Y/N)	*Is the facility available from the MCO? Also indicate whether the services are available free of charge or additional charges are made.*
Call Waiting (Y/N)	
Call Forwarding (Y/N)	
Calling Line Identification (Y/N)	
Call Barring (Y/N)	
Conference Calling (Y/N)	
Voicemail Facility (Y/N)	
Fax support (Y/N)	
PCMCIA Data Support (Y/N)	
Quality	
Frequency of Call Failure (1 in n)	*From MCO quality of Service Data*
Call set up time - Busy Hour (seconds)	
Call set up time - Average (seconds)	
Billing Accuracy (% accurate)	
Percent Calls of acceptable quality (%)	
Choice	
Subject to competitive offering (Y/N)	*Are there local suppliers of a similar service?*
Estimated market share (%)	*Of this PTO/MCO, based on revenue income from this service*
Universal Service Obligation (Y/N)	*Does it exist for this service?*

Service	High Speed Data
Country	
Operator	*PTO or MCO operator*
Currency of Tariffs	*Local Currency*

Criteria	*Notes*
Cost	
Charge to connect to Frame Relay @ 64Kbps (£)	*From published data or local estimate*
Rental per site per annum - Frame Relay @ 64Kbps (£)	
Charge to connect to Frame Relay @ 2Mbps (£)	
Rental per site per annum - Frame Relay @ 2Mbps (£)	
Charge to connect to SMDS @ 2Mbps (£)	
Rental per site per annum - SMDS @ 2Mbps (£)	
Charge to connect to ATM @ 2Mbps (£)	
Rental per site per annum - ATM @ 2Mbps (£)	
Usage charge - Frame Relay (Y/N)	
Usage charge - SMDS (Y/N)	
Usage charge - ATM (Y/N)	
Volume discount (max %)	
Availability	
Number of Frame Relay Nodes	*How many actual switches exist and how many virtual points of presence are there?*
Geographic coverage - Frame Relay (% Users < 50km)	
Number of SMDS nodes	
Geographic coverage - SMDS (% Users < 50km)	
Number of ATM nodes	
Geographic coverage - ATM (% Users < 50km)	
Scope	
Frame Relay - Switched Virtual Circuits (Y/N)	*Are the facilities available?*
Service inclusive of bridge/router (Y/N)	
Maximum Speed Access - Frame Relay (Mbps)	*Maximum speed supported to the customer*
Maximum Speed Access - SMDS (Mbps)	
Maximum Speed Access - ATM (Mbps)	
Quality	
Guaranteed overall availability - Frame Relay (%)	*From PTO Quality of service data*
Guaranteed overall availability - SMDS (%)	
Guaranteed overall availability - ATM (%)	
Target Bit Error Rate - Frame Relay (1 in N)	
Target Bit Error Rate - SMDS (1 in N)	
Target Bit Error Rate - ATM (1 in N)	
Choice	
Subject to competitive offering (Y/N)	*Are there local suppliers of a similar service?*
Estimated market share (%)	*Of this PTO/MCO, based on revenue income from this service*
Universal Service Obligation (Y/N)	*Does it exist for this service?*

Service	Private Circuits
Country	
Operator	*PTO Operator*
Currency of Tariffs	*Local Currency*

Criteria	*Notes*
Cost	
Connection charge per 9.6Kbps circuit (£)	*Based on published tariffs for digital private circuits, distances refer to main link. Assume no unusual construction work.*
9.6Kbps Circuit Rental - 5km (£ per year)	
9.6Kbps Circuit Rental - 50km (£ per year)	
9.6Kbps Circuit Rental - 200km (£ per year)	
Connection charge per 64Kbps circuit (£)	
64Kbps Circuit Rental - 5km (£ per year)	
64Kbps Circuit Rental - 50km (£ per year)	
64Kbps Circuit Rental - 200km (£ per year)	
Connection charge per 2Mbps circuit (£)	
2Mbps Circuit Rental - 5km (£ per year)	
2Mbps Circuit Rental - 50km (£ per year)	
2Mbps Circuit Rental - 200km (£ per year)	
Connection charge per 8Mbps circuit (£)	
8Mbps Circuit Rental - 5km (£ per year)	
8Mbps Circuit Rental - 50km (£ per year)	
8Mbps Circuit Rental - 200km (£ per year)	
Volume discount (max %)	*Maximum available for private circuits*
Availability	
Geographic availability - 9.6Kbps (% Business Users)	*From standard PTO data*
Geographic availability - 64Kbps (% Business Users)	
Geographic availability - 2Mbps (% Business Users)	
Geographic availability - 8Mbps (% Business Users)	
Lead time for connection - 9.6Kbps (days)	
Lead time for connection - 64Kbps (days)	
Lead time for connection - 2Mbps (days)	
Lead time for connection - 8Mbps (days)	
Scope	
Maximum available bandwidth (Mbps)	*Maximum offered to customers*
Quality	
Mean Time Between Failures (years)	*From PTO Quality of Service Data*
Mean Time to Repair (days)	
Guaranteed overall availability (%)	
Billing Accuracy (% accurate)	*Is it measured by the PTO?*
Choice	
Subject to competitive offering (Y/N)	*Are there local suppliers of a similar service?*
Estimated market share (%)	*Of this PTO/MCO, based on revenue income from this service*
Universal Service Obligation (Y/N)	*Does it exist for this service?*

Service	Calling Card Services
Country	
Operator	*PTO Operator*
Currency of Tariffs	*Local Currency*

Criteria	*Notes*
Cost	
Cost per card per year (£)	*Annual fee for the card*
Initial Call Set up Cost (£)	*If charged, set up cost with no call time*
Minimum Call Charge (£)	*If applicable*
Time included in minimum charge (minutes)	*If applicable*
Call charge per minute -Local (£)	*Based on the charge for the first minute and subsequent minutes. Based on weekday, prime business tariff.*
Call charge per minute - National (£)	
Call charge per minute - UK (£)	
Call charge per minute - USA (£)	
Call charge per minute - Hong Kong (£)	
Charge for itemised billing per year £)	
Discount for frequently called numbers (%)	
Volume discount (max %)	
Availability	
Access via operator connection only (Y/N)	
Direct dial facility (Y/N)	*User call connection, not via operator*
Geographic coverage (% Business Users)	*What % of users can use the service?*
Scope	
Abbreviated dialling of selected numbers (Y/N)	*Is the facility available?*
Account code facility (Y/N)	
Quality	
Guaranteed overall availability (%)	*From PTO Quality of Service Data*
Frequency of connection failure (1 in n calls)	
Billing Accuracy (% accurate)	
Frequency of card rejection (1 in n calls)	
Losses due to fraud (% billings)	
Choice	
Subject to competitive offering (Y/N)	*Are there local suppliers of a similar service?*
Estimated market share (%)	*Of this PTO/MCO, based on revenue income from this service*
Universal Service Obligation (Y/N)	*Does it exist for this service?*

Service	Specially Tariffed Services
Country	
Operator	*PTO Operator*
Currency of Tariffs	*Local Currency*

Criteria	*Notes*
Cost	
Connection charge per freecall number (£)	*From standard PTO tariffs*
Annual rental per freecall number (£)	
Client cost per call via freecall per minute £)	
Connection charge per local call number (£)	
Annual rental per local call number (£)	
Client cost per call via local call per minute £)	
Connection charge per premium call number (£)	
Annual rental per premium call number (£)	
Client income per call via premium call per minute £)	
User cost per call via premium call per minute (£)	
Volume discount (max %)	*Maximum available to customers*
Availability	
Geographic coverage - Freecall (% Business Users)	*From PTO information*
Lead time for connection - Freecall (days)	
Geographic coverage - Local call (% Business Users)	
Lead time for connection - Local call (days)	
Geographic coverage - Premium call (% Business Users)	
Lead time for connection - Premium call (days)	
Scope	
Number Portability between operators (Y/N)	*Ability to retain existing incoming number when changing PTO*
Local call distribution (Y/N)	*Are the facilities available?*
Additional Schemes (Y/N)	
Quality	
Call set up time - Busy Hour (seconds)	*Set up time from completion of dialling to establishment of ring tone*
Call set up time - Average (seconds)	
Billing Accuracy (% accurate)	*Is it measured by the PTO?*
Choice	
Subject to competitive offering (Y/N)	*Are there local suppliers of a similar service?*
Estimated market share (%)	*Of this PTO/MCO, based on revenue income from this service*
Universal Service Obligation (Y/N)	*Does it exist for this service?*

APPENDIX C

SUMMARY OF OPERATORS

SERVICE	COUNTRY	OPERATORS
PSTN	UK	BT, Mercury
	SWEDEN	Telia, Tele2
	USA	Nynex, AT&T
	AUSTRALIA	Telstra, Optus
	FRANCE	France Telecom
ISDN	UK	BT, Mercury
	SWEDEN	Telia
	USA	Nynex, AT&T
	AUSTRALIA	Telstra
	FRANCE	France Telecom
	GERMANY	Deutsche Bundespost
ANALOGUE MOBILE	UK	Cellnet, Vodafone
	SWEDEN	Telia
	USA	McCaw
	AUSTRALIA	Telstra, Optus
	FRANCE	France Telecom, SFR
	GERMANY	Deutsche Bundespost
DIGITAL MOBILE	UK	Cellnet, Vodafone
	SWEDEN	Telia, Comviq, Nordictel
	USA	McCaw
	AUSTRALIA	Telstra, Optus, Vodafone
	FRANCE	France Telecom, SFR
	GERMANY	Deutsche Bundespost, Mannesman

APPENDIX D

BEST IN CLASS MODELS

PSTN	UK	France	Germany	Sweden	Australia	Japan	USA
COST (STERLING)	£	£	£	£	£	£	£
Full Tariff							
Large Business	5,752,443	10,044,735		4,878,968	8,442,159		7,841,879
Medium Business	288,469	549,289		242,425	444,526		414,497
Small Business	26,067	49,742		20,317	38,732		35,806
Max Discount							
Large Business	4,947,286	10,044,735		4,878,968	7,018,014		3,862,906
Medium Business	244,901	549,289		242,425	402,282		218,574
Small Business	22,759	49,742		20,317	38,578		22,748

PSTN	UK	France	Germany	Sweden	Australia	Japan	USA
ANNUAL COST (UK £ PPP)	PPP	PPP	PPP	PPP	PPP	PPP	PPP
Full Tariff							
Large Business	5,752,443	7,570,093		3,585,312	8,215,645		7,697,721
Medium Business	288,469	413,965		178,146	432,599		406,877
Small Business	26,067	37,488		14,930	37,693		35,148
Max Discount							
Large Business	4,947,286	7,570,093		3,585,312	6,829,711		3,791,894
Medium Business	244,901	413,965		178,146	391,489		214,556
Small Business	22,759	37,488		14,930	37,543		22,330

ISDN	UK	France	Germany	Sweden	Australia	Japan	USA
COST (STERLING)	£	£	£	£	£	£	£
Full Tariff							
Large Business	198,282	425,856	390,424	174,526	434,565		270,640
Medium Business	12,913	21,806	19,428	10,626	22,710		14,243
Small Business	631	905	707	482	938		576
Max Discount							
Large Business	198,282	425,856	390,424	174,526	434,565		270,640
Medium Business	12,913	21,806	19,428	10,626	22,710		14,243
Small Business	631	905	707	482	938		576

ISDN	UK	France	Germany	Sweden	Australia	Japan	USA
ANNUAL COST (UK £ PPP)	PPP	PPP	PPP	PPP	PPP	PPP	PPP
Full Tariff							
Large Business	198,282	320,941	268,715	128,250	422,905		265,665
Medium Business	12,913	16,434	13,372	7,809	22,101		13,981
Small Business	631	682	487	354	913		565
Max Discount							
Large Business	198,282	320,941	268,715	128,250	422,905		265,665
Medium Business	12,913	16,434	13,372	7,809	22,101		13,981
Small Business	631	682	487	354	913		565

MOBILE (ANALOGUE)	UK	France	Germany	Sweden	Australia	Japan	USA
COST (STERLING)	£	£	£	£	£	£	£
Full Tariff							
Large Business	1,370,000	3,137,013	1,946,232	1,095,238	1,300,099		1,942,635
Medium Business	28,000	65,239	37,748	20,988	25,084		36,398
Small Business	1,740	4,164	2,147	1,168	1,413		1,938
Max Discount							
Large Business	1,370,000	3,137,013	1,946,232	1,095,238	1,300,099		1,942,635
Medium Business	28,000	65,239	37,748	20,988	25,084		36,398
Small Business	1,740	4,164	2,147	1,168	1,413		1,938

MOBILE (ANALOGUE)	UK	France	Germany	Sweden	Australia	Japan	USA
COST (UK £ PPP)	PPP	PPP	PPP	PPP	PPP	PPP	PPP
Full Tariff							
Large Business	1,370,000	2,364,172	1,339,520	804,836	1,265,215		1,906,923
Medium Business	28,000	49,166	25,981	15,423	24,411		35,729
Small Business	1,740	3,138	1,478	858	1,375		1,903
Max Discount							
Large Business	1,370,000	2,364,172	1,339,520	804,836	1,265,215		1,906,923
Medium Business	28,000	49,166	25,981	15,423	24,411		35,729
Small Business	1,740	3,138	1,478	858	1,375		1,903

MOBILE (DIGITAL)	UK	France	Germany	Sweden	Australia	Japan	USA
COST (STERLING)	£	£	£	£	£	£	£
Full Tariff							
Large Business	1,370,000	1,969,960	2,615,394	969,958	1,296,093		1,942,635
Medium Business	28,000	37,871	50,676	17,953	25,326		36,398
Small Business	1,740	2,120	2,877	933	1,428		1,938
Max Discount							
Large Business	1,370,000	1,969,960	2,615,394	969,958	1,296,093		1,942,635
Medium Business	28,000	37,871	50,676	17,953	25,326		36,398
Small Business	1,740	2,120	2,877	933	1,428		1,938

MOBILE (DIGITAL)	UK	France	Germany	Sweden	Australia	Japan	USA
COST (UK £ PPP)	PPP	PPP	PPP	PPP	PPP	PPP	PPP
Full Tariff							
Large Business	1,370,000	1,484,637	1,800,080	712,774	1,261,317		1,906,923
Medium Business	28,000	28,541	34,878	13,193	24,646		35,729
Small Business	1,740	1,597	1,980	685	1,390		1,903
Max Discount							
Large Business	1,370,000	1,484,637	1,800,080	712,774	1,261,317		1,906,923
Medium Business	28,000	28,541	34,878	13,193	24,646		35,729
Small Business	1,740	1,597	1,980	685	1,390		1,903

FREEPHONE SERVICES	UK	France	Sweden	Australia	USA
COST (STERLING)	£	FF	SKr	AU$	$
Full Tariff					
Large Business	82,000	143,945	109,347	110,941	62,946
Medium Business	8,200	14,394	10,935	11,094	6,295
Small Business	820	1,439	1,093	1,109	629
Max Discount					
Large Business	82,000	143,945	109,347	110,941	62,946
Medium Business	8,200	14,394	10,935	11,094	6,295
Small Business	820	1,439	1,093	1,109	629

FREEPHONE SERVICES	UK	France	Sweden	Australia	USA
COST (UK £ PPP)	PPP	PPP	PPP	PPP	PPP
Full Tariff					
Large Business	82,000	108,482	80,354	107,965	61,789
Medium Business	8,200	10,848	8,035	10,796	6,179
Small Business	820	1,085	804	1,080	618
Max Discount					
Large Business	82,000	108,482	80,354	107,965	61,789
Medium Business	8,200	10,848	8,035	10,796	6,179
Small Business	820	1,085	804	1,080	618

PRIVATE CIRCUITS	UK	France	Germany	Sweden	Australia	Japan	USA
COST (STERLING)	£	£	£	£	£	£	£
Full Tariff							
Large Business	1,771,482	3,846,906		727,178	3,649,666		1,245,672
Medium Business	47,026	91,023		19,707	63,488		32,515
Small Business	6,596	11,913		2,996	8,383		5,172
Max Discount							
Large Business	1,771,482	3,846,906		727,178	3,649,666		1,245,672
Medium Business	47,026	91,023		19,707	63,488		32,515
Small Business	6,596	11,913		2,996	8,383		5,172

PRIVATE CIRCUITS	UK	France	Germany	Sweden	Australia	Japan	USA
ANNUAL COST (UK £ PPP)	PPP	PPP	PPP	PPP	PPP	PPP	PPP
Full Tariff							
Large Business	1,771,482	2,899,174		534,367	3,551,740		1,222,772
Medium Business	47,026	68,598		14,482	61,784		31,918
Small Business	6,596	8,978		2,202	8,158		5,077
Max Discount							
Large Business	1,771,482	2,899,174		534,367	3,551,740		1,222,772
Medium Business	47,026	68,598		14,482	61,784		31,918
Small Business	6,596	8,978		2,202	8,158		5,077

CALLING CARDS	UK	France	Sweden	Australia	USA
COST (STERLING)	£	£	£	£	£
Full Tariff					
Large Business	2,862	4,268	2,546	5,343	4,156
Medium Business	572	854	509	1,069	831
Small Business	61	93	58	110	88
Max Discount					
Large Business	2,862	4,268	2,546	5,343	4,156
Medium Business	572	854	509	1,069	831
Small Business	61	93	58	110	88

CALLING CARDS	UK	France	Sweden	Australia	USA
ANNUAL COST (UK £ PPP)	PPP	PPP	PPP	PPP	PPP
Full Tariff					
Large Business	2,862	3,216	1,871	5,200	4,080
Medium Business	572	643	374	1,040	816
Small Business	61	70	43	107	87
Max Discount					
Large Business	2,862	3,216	1,871	5,200	4,080
Medium Business	572	643	374	1,040	816
Small Business	61	70	43	107	87

APPENDIX E

USER REQUIREMENT VARIATION MODELS

Low User

PSTN	UK	France	Germany	Sweden	Australia	Japan	USA
ANNUAL COST (UK £ PPP)	PPP	PPP	PPP	PPP	PPP	PPP	PPP
Full Tariff							
Large Business	3,251,661	3,907,662		2,103,704	4,451,548		4,287,789
Medium Business	155,508	210,661		98,405	226,620		216,606
Small Business	14,538	19,234		8,709	20,224		19,330
Max Discount							
Large Business	2,856,198	3,907,662		2,103,704	3,764,081		2,334,875
Medium Business	133,991	210,661		98,405	207,715		120,446
Small Business	12,974	19,234		8,709	20,149		12,921

High User

PSTN	UK	France	Germany	Sweden	Australia	Japan	USA
ANNUAL COST (UK £ PPP)	PPP	PPP	PPP	PPP	PPP	PPP	PPP
Full Tariff							
Large Business	10,754,008	14,894,955		6,548,528	15,743,837		14,517,587
Medium Business	554,390	820,573		337,629	844,557		787,419
Small Business	49,124	73,995		27,372	72,631		66,785
Max Discount							
Large Business	9,129,464	14,894,955		6,548,528	12,960,970		6,705,932
Medium Business	466,721	820,573		337,629	759,036		402,775
Small Business	42,331	73,995		27,372	72,330		41,149

Local User

PSTN	UK	France	Germany	Sweden	Australia	Japan	US
ANNUAL COST (UK £ PPP)	PPP	PPP	PPP	PPP	PPP	PPP	PPP
Full Tariff							
Large Business	6,569,909	6,831,841		3,309,014	7,967,235		6,147,956
Medium Business	316,069	352,153		156,726	396,734		306,615
Small Business	30,594	33,384		14,541	37,236		28,331
Max Discount							
Large Business	5,725,318	6,831,841		3,309,014	7,085,258		4,195,042
Medium Business	272,820	352,153		156,726	377,829		210,454
Small Business	27,001	33,384		14,541	37,160		21,922

National User

PSTN	UK	France	Germany	Sweden	Australia	Japan	USA
ANNUAL COST (UK £ PPP)	PPP	PPP	PPP	PPP	PPP	PPP	PPP
Full Tariff							
Large Business	6,339,902	10,676,150		4,242,158	10,350,832		10,696,805
Medium Business	340,803	616,770		226,712	580,577		601,147
Small Business	33,068	59,845		21,540	55,620		57,784
Max Discount							
Large Business	5,369,187	10,676,150		4,242,158	8,221,905		4,257,580
Medium Business	284,771	616,770		226,712	509,101		274,262
Small Business	28,303	59,845		21,540	55,319		32,148

Low User

ISDN	UK	France	Germany	Sweden	Australia	Japan	USA
ISDN ANNUAL COST (UK £ PPP)	PPP	PPP	PPP	PPP	PPP	PPP	PPP
Full Tariff							
Large Business	143,016	186,294	159,397	93,383	262,249		168,204
Medium Business	10,616	10,675	9,094	6,616	15,821		10,159
Small Business	524	464	364	313	695		441
Max Discount							
Large Business	143,016	186,294	159,397	93,383	262,249		168,204
Medium Business	10,616	10,675	9,094	6,616	15,821		10,159
Small Business	524	464	364	313	695		441

High User

ISDN	UK	France	Germany	Sweden	Australia	Japan	USA
ISDN ANNUAL COST (UK £ PPP)	PPP	PPP	PPP	PPP	PPP	PPP	PPP
Full Tariff							
Large Business	308,814	590,236	487,350	197,985	744,218		460,587
Medium Business	17,505	27,952	21,927	10,193	34,660		21,625
Small Business	846	1,118	733	437	1,349		814
Max Discount							
Large Business	308,814	590,236	487,350	197,985	744,218		460,587
Medium Business	17,505	27,952	21,927	10,193	34,660		21,625
Small Business	846	1,118	733	437	1,349		814

Local user

ISDN	UK	France	Germany	Sweden	Australia	Japan	USA
ANNUAL COST (UK £ PPP)	PPP	PPP	PPP	PPP	PPP	PPP	PPP
Full Tariff							
Large Business	148,035	193,711	161,141	94,549	268,351		171,071
Medium Business	10,616	10,675	9,094	6,616	15,821		10,159
Small Business	524	464	364	313	695		441
Max Discount							
Large Business	148,035	193,711	161,141	94,549	268,351		171,071
Medium Business	10,616	10,675	9,094	6,616	15,821		10,159
Small Business	524	464	364	313	695		441

National user

ISDN	UK	France	Germany	Sweden	Australia	Japan	USA
ANNUAL COST (UK £ PPP)	PPP	PPP	PPP	PPP	PPP	PPP	PPP
Full Tariff							
Large Business	265,056	544,061	458,397	171,145	672,207		426,189
Medium Business	10,616	10,675	9,094	6,616	15,821		10,159
Small Business	524	464	364	313	695		441
Max Discount							
Large Business	265,056	544,061	458,397	171,145	672,207		426,189
Medium Business	10,616	10,675	9,094	6,616	15,821		10,159
Small Business	524	464	364	313	695		441

Low User

MOBILE ANALOGUE	UK	France	Germany	Sweden	Australia	Japan	USA
ANNUAL COST (UK £ PPP)	PPP	PPP	PPP	PPP	PPP	PPP	PPP
Full Tariff							
Large Business	995,000	1,767,893	889,070	522,949	832,077		1,190,298
Medium Business	21,750	39,228	18,473	10,725	17,192		23,786
Small Business	1,490	2,741	1,178	670	1,087		1,425
Max Discount							
Large Business	995,000	1,767,893	889,070	522,949	832,077		1,190,298
Medium Business	21,750	39,228	18,473	10,725	17,192		23,786
Small Business	1,490	2,741	1,178	670	1,087		1,425

High User

MOBILE ANALOGUE	UK	France	Germany	Sweden	Australia	Japan	USA
ANNUAL COST (UK £ PPP)	PPP	PPP	PPP	PPP	PPP	PPP	PPP
Full Tariff							
Large Business	2,120,000	3,556,729	2,240,420	1,368,610	2,131,492		3,340,173
Medium Business	40,500	69,042	40,996	24,819	38,849		59,617
Small Business	2,240	3,933	2,078	1,234	1,953		2,858
Max Discount							
Large Business	2,120,000	3,556,729	2,240,420	1,368,610	2,131,492		3,340,173
Medium Business	40,500	69,042	40,996	24,819	38,849		59,617
Small Business	2,240	3,933	2,078	1,234	1,953		2,858

Low User

DIGITAL MOBILE	UK	France	Germany	Sweden	Australia	Japan	USA
ANNUAL COST (UK £ PPP)	PPP	PPP	PPP	PPP	PPP	PPP	PPP
Full Tariff							
Large Business	995,000	970,165	1,192,655	435,164	832,691		1,190,298
Medium Business	21,750	19,967	24,755	8,566	17,760		23,786
Small Business	1,490	1,254	1,575	500	1,114		1,425
Max Discount							
Large Business	995,000	970,165	1,192,655	435,164	832,691		1,190,298
Medium Business	21,750	19,967	24,755	8,566	17,760		23,786
Small Business	1,490	1,254	1,575	500	1,114		1,425

High User

DIGITAL MOBILE	UK	France	Germany	Sweden	Australia	Japan	USA
ANNUAL COST (UK £ PPP)	PPP	PPP	PPP	PPP	PPP	PPP	PPP
Full Tariff							
Large Business	2,120,000	2,513,581	3,014,930	1,267,994	2,118,569		3,340,173
Medium Business	40,500	45,690	55,126	22,446	38,419		59,617
Small Business	2,240	2,283	2,790	1,055	1,941		2,858
Max Discount							
Large Business	2,120,000	2,513,581	3,014,930	1,267,994	2,118,569		3,340,173
Medium Business	40,500	45,690	55,126	22,446	38,419		59,617
Small Business	2,240	2,283	2,790	1,055	1,941		2,858

Low Speed User

PRIVATE CIRCUITS	UK	France	Germany	Sweden	Australia	Japan	USA
ANNUAL COST (UK £ PPP)	PPP	PPP	PPP	PPP	PPP	PPP	PPP
Full Tariff							
Large Business	1,824,546	2,814,919		558,733	3,023,237		1,251,332
Medium Business	94,052	137,196		28,964	123,569		63,835
Small Business	13,192	17,956		4,404	16,316		10,154
Max Discount							
Large Business	1,824,546	2,814,919		558,733	3,023,237		1,251,332
Medium Business	94,052	137,196		28,964	123,569		63,835
Small Business	13,192	17,956		4,404	16,316		10,154

High Speed User

PRIVATE CIRCUITS	UK	France	Germany	Sweden	Australia	Japan	USA
ANNUAL COST (UK £ PPP)	PPP	PPP	PPP	PPP	PPP	PPP	PPP
Full Tariff							
Large Business	2,604,159	4,433,016		777,185	5,856,113		1,805,599
Medium Business	23,513	34,299		7,241	30,892		15,959
Small Business	3,298	4,489		1,101	4,079		2,538
Max Discount							
Large Business	2,604,159	4,433,016		777,185	5,856,113		1,805,599
Medium Business	23,513	34,299		7,241	30,892		15,959
Small Business	3,298	4,489		1,101	4,079		2,538

Low User

Calling Cards	UK	France	Germany	Sweden	Australia
ANNUAL COST (UK £ PPP)	PPP	PPP	PPP	PPP	PPP
Full Tariff					
Large Business	1,431	1,674	936	2,600	2,040
Medium Business	286	335	187	520	408
Small Business	30	38	21	54	43
Max Discount					
Large Business	1,431	1,674	936	2,600	2,040
Medium Business	286	335	187	520	408
Small Business	30	38	21	54	43

High User

Calling Cards	UK	France	Germany	Sweden	Australia
ANNUAL COST (UK £ PPP)	PPP	PPP	PPP	PPP	PPP
Full Tariff					
Large Business	5,724	6,302	3,742	10,400	8,160
Medium Business	1,145	1,260	748	2,080	1,632
Small Business	121	135	86	214	173
Max Discount					
Large Business	5,724	6,302	3,742	10,400	8,160
Medium Business	1,145	1,260	748	2,080	1,632
Small Business	121	135	86	214	173

Low User

FREEPHONE SERVICES	UK	France	Sweden	Australia	USA
COST (UK £ PPP)	PPP	PPP	PPP	PPP	PPP
Full Tariff					
Large Business	52,000	84,243	67,394	60,306	34,717
Medium Business	5,200	8,424	6,739	6,031	3,472
Small Business	520	842	674	603	347
Max Discount					
Large Business	52,000	84,243	67,394	60,306	34,717
Medium Business	5,200	8,424	6,739	6,031	3,472
Small Business	520	842	674	603	347

High User

FREEPHONE SERVICES	UK	France	Sweden	Australia	USA
COST (UK £ PPP)	PPP	PPP	PPP	PPP	PPP
Full Tariff					
Large Business	142,000	156,960	106,275	203,282	115,934
Medium Business	14,200	15,696	10,627	20,328	11,593
Small Business	1,420	1,570	1,063	2,033	1,159
Max Discount					
Large Business	142,000	156,960	106,275	203,282	115,934
Medium Business	14,200	15,696	10,627	20,328	11,593
Small Business	1,420	1,570	1,063	2,033	1,159