Contents

Annex F

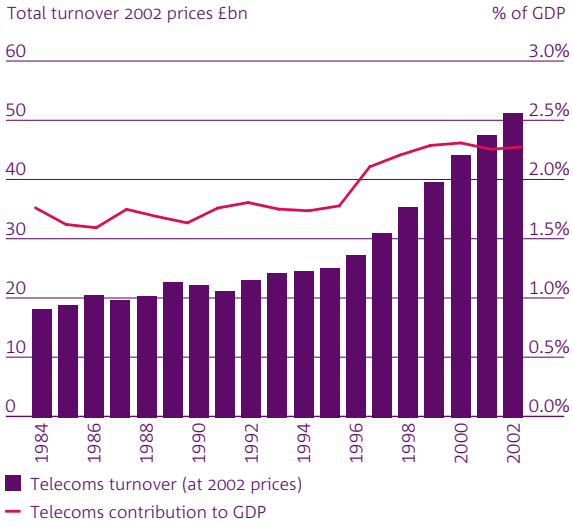
The role of telecoms in the economy

F.1 This annex reviews the contribution that telecoms makes to the UK economy. It underlines the importance of telecoms regulation. Assessing the contribution of telecoms to economic growth is also important in weighing up the static and dynamic benefits that telecoms can deliver, as discussed in Section 4 of the main consultation document.

F.2 Telecommunications is an important and influential sector of the economy. In 2002 the Office for National Statistics (ONS) estimated that the value added by the UK telecoms industry was over £20bn, or over 2 per cent of GDP.[1] By way of comparison, the gas, electricity and water supply industries together contributed 1.9 per cent, and the radio and TV sector less than 1 per cent.

F.3 Currently, the total turnover for the sector is estimated to be £50bn per annum.[2] In real terms this turnover has increased three-fold since 1984. Some of this growth can be attributed to a growth in competition in the industry. Wholesale revenues (for example, interconnection) are effectively transfer payments within the industry and, therefore, adding up the revenues of all the players in the industry results in an element of double counting. Analysis estimates that wholesale revenues made up around 21 per cent of the turnover of the largest 20 telecoms companies in the UK in 2002, compared with a negligible proportion in 1984. Assuming this proportion is representative of the whole industry, it would imply that retail revenues have increased in real terms by 240 per cent since 1984. Telecoms revenue growth and its contribution to UK GDP are shown in Figure 1.

Figure 1: UK telecoms revenues and contribution to GDP[3]



1 Source: ONS Annual Business Inquiry, 2002.
2 Source: ONS Monthy Turnover Inquiries, year to September 2003.
3 Source: 1984-1994: BT and Oftel estimates. 1995-2002: ONS Annual Business Enquiry.

F.4 Analysis of revenue growth and the contribution of telecoms to UK GDP hides, to some extent, the enormous growth in the use of existing and new telecoms services since liberalisation, driven by technological innovation and significant price reductions. Figure 2 shows, for example, how the number of fixed lines has grown by almost 80 per cent since 1984, but nevertheless has been overtaken by the number of mobile subscribers. The number of internet subscribers has also grown to over 14m from a standing start in the early 1990s. The total volume of call minutes (fixed and mobile) has increased seven-fold from 55bn in 1984 to around 400m in 2003, and use of fixed and mobile data services continues to grow.

F.5 This increased use has contributed to increased consumer spend, although to a great extent this has been held in check by price reductions resulting from both regulation and enhanced competition. For example, the average proportion of household expenditure spent on telecoms has increased from around 1.5 per cent in 1984 to 2.5 per cent in 2002. But as Figure 3 shows this increase is due in its entirety to the take-up of mobile and internet services. Fixed telecoms expenditure, as a proportion of overall expenditure, has remained flat and is now roughly the same as that of gas and electricity.

Figure 2: Take-up of telecoms technology[4]

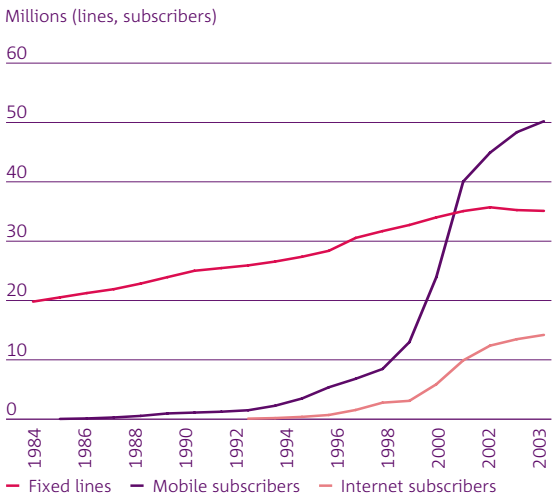
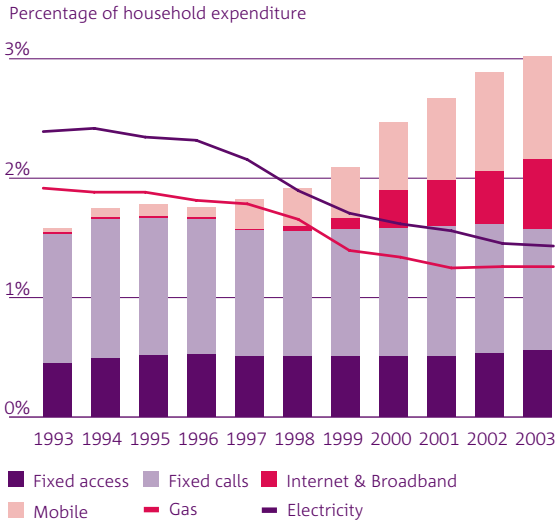


Figure 3: Residential consumers' telecoms spend as proportion of household expenditure[5]



4 Source: Ofcom market intelligence.
5 Source: ONS, Ofcom market intelligence.

F.6 The telecoms sector is notable for the size of its annual investment. For example, in 2002 it represented 7 per cent of all capital expenditure in the UK.[6] Telecoms investment is considered in more detail in Annex H.

F.7 In terms of employment, the sector as a whole employs about 250,000 people, around 1 per cent of the national workforce.[7] These figures have been relatively stable over recent years. A decline in employment at BT has been matched by the growth of employment in other telecoms companies.

Contribution of telecoms to economic growth

F.8 Not only is telecoms an important part of the economy, but innovation and increased take-up of telecoms services contribute to economic growth.

F.9 It is very difficult to quantify the extent of this effect. Historically, the influence of information, communications and telecoms (ICT) on productivity growth was considered minimal. In 1987, Robert Solow famously coined what came to be known as the 'productivity paradox' when he quipped that "you can see the computer age everywhere but in the productivity statistics".[8] Whilst there have been some technical arguments over what should be included in the productivity statistics,[9] the broad view of economists has been one of scepticism until very recently.[10]

F.10 More recent macro-economic analysis has identified the ICT industries in developed countries as being associated with enhanced productivity levels, this primarily being through stimulating innovation in product and service provision. For example, analysis carried out in 2001 for the Bank of England suggested that ICT accounted for 13 per cent of output growth in 1979-89 and 21 per cent in 1989-99 "despite its small share in GDP".[11]

F.11 It is unclear, however, how useful historic estimates of productivity due to ICT growth will be in determining future contributions. Most of the work on this issue, particularly in the US, has focused on the period 1995-2000, a boom period during which the growth rate was well above trend. Moreover, it is generally considered that the ('dotcom') boom was driven particularly by ICT. The high growth period between 1995-2000 may have been a temporary phenomenon from which one should be cautious in drawing wider conclusions.

F.12 More recent studies take a more positive view of recent growth due to ICT. In particular, examining evidence from the US in the last three years has shown that while business investment in IT fell sharply, and economic growth slowed, the rate of US productivity growth has accelerated still further. The explanation for this, according to work by Erik Bryonjolfsson,[12] is IT-related productivity. His studies show that the development of electronic communications networks has impacted significantly

6 Source: ONS Annual Business Inquiry, 2002.
7 Source: ONS Employee Jobs, September 2003.
8 Robert M. Solow, *We'd Better Watch Out*, New York Times Book Review, July 12, 1987, p. 36.
9 See Gordon (2000) for discussion of some of these issues.
10 This view can be typified by Blinder (1997), who characterised growth of productivity due to ICT as "mostly poppycock".
11 Oulton (2001), *ICT and productivity growth in the United Kingdom*, Bank of England Working Paper 140.
12 Professor of Economics at MIT's Sloan School of Management.

on residential consumers and the business sector in terms of the way that they run their affairs. It is difficult, however, to identify just how much telecoms services have contributed to economic growth, independently of other elements of the ICT industry.

F.13 Measuring the impact of these changes for the economy as a whole is not straightforward. Often, parallel changes need to take place in other sectors before technological change in any one sector can impact the economy as a whole. Therefore the relationship between telecoms and economic growth is complex and diffused. A study commissioned by Oftel (Office of Telecommunications) and the OEE (Office of the E-Envoy)[13] looked at how other innovations in products and services eventually took hold in the economy. It concluded that all were related to the development of a bandwagon effect, which has yet to be felt in the context of broadband services. It is also plausible that because of their pervasive influence on all sectors of the economy, the continued development of electronic communications networks is critical to ensuring that prospective improvements in productivity across the economy actually take place.

F.14 Just because the effects of telecoms on economic growth are hard to measure and open to some debate, does not mean that they are not important. In weighing up the trade-offs between static and dynamic benefits of alternative regulatory policies, Ofcom will need to take into account their likely impact on economic growth.

13 *Propelling the Broadband Bandwagon*, Strategic Policy Research, August 2002.

Annex G

Review of regulatory policy in the telecoms sector

Annex G

Review of regulatory policy in the telecoms sector

G.1 This annex builds on the discussion in Section 4 of the main consultation document by summarising the evolution of telecoms sector regulation in the UK to date, highlighting the positions that have been taken in the past on the trade-offs in telecoms regulation. It looks at three areas in turn:

- fixed line telecoms;
- mobile telecoms; and
- universal service regulation.

Fixed line telecommunications

The duopoly years (1984-91)

G.2 The British Telecommunications Act 1981 separated British Telecommunications (BT) from the Post Office. Although this act ended the statutory monopoly in telecoms, it was not until the privatisation of BT in 1984 that an explicit regulatory regime was deemed necessary. Unlike AT&T in the US, BT retained its vertically integrated structure. At the same time, the 1984 Telecommunications Act created the Office of Telecommunications, or Oftel, headed by the Director General of Telecommunications.

G.3 At the outset, regulation was never intended to be a permanent feature of the telecoms industry. To allow regulation to be relaxed in future, the Government wished to create competition within all levels of infrastructure. With BT having a 100 per cent market share, the Government decided that multiple competitors would not be sufficiently strong to provide the efficiency gains from competing infrastructures. Consequently, a decision was taken to license a single firm (Mercury) for a limited period during which it would grow sufficiently strong to provide competition to BT at all levels. In line with the desire for infrastructure-based competition, particularly in access infrastructure, a decision was taken from the outset not to allow Mercury to lease elements of BT's infrastructure (except for interconnection for call termination).

G.4 Although infrastructure competition was foremost on the Government's mind, privatisation had created a private sector monopolist, and thus safeguards on prices were required. Recognising the low productive efficiency incentives of rate-or-return regulation, the Littlechild Report proposed price-cap regulation. Price rises would be capped at inflation (as measured by the Retail Price Index) minus some 'X' percentage for a period of five years. During this period any cost reductions could be kept as profits, until the next review. Thus from 1984 to 1989 BT's retail prices were regulated at RPI-3%, and at RPI-4.5% until 1991.

G.5 For Mercury to be a viable competitor, it was not sufficient for it simply to build its own network. Suitable terms of interconnection between its network and BT's were essential. After direct negotiations between BT and Mercury failed, Oftel was forced to intervene. In coming to a decision, Oftel faced a dilemma due to the unbalanced nature of BT's tariffs. Before privatisation, there was an understanding that BT would fund certain unprofitable services that the Government deemed desirable, through cross-subsidisation with profitable services. The dilemma was that if Oftel allowed interconnection at marginal cost, Mercury could be less efficient than BT, yet could still make a profit by supplying only the products that BT used to subsidise its loss-making services. If Mercury proved to be successful, this would have left BT with an 'access deficit', such that it would have been harder to meet its fixed costs of providing access. However, without favourable interconnection terms, there was the possibility that Mercury would be unable to compete with the larger-scale BT.

G.6 This dilemma was reflected in Oftel's 1985 Interconnection Determination. It required that all BT's direct costs of providing interconnection should be paid by Mercury via some up-front charges and a per-minute charge for use of BT's local network. However, if Mercury's payments increased to greater than 7 per cent of BT's annual revenue, additional charges would be levied to reflect the unbalanced access tariffs. The interconnection charges themselves would be price-capped at RPI-3%.

Post-duopoly market (1991-93)

G.7 By 1991 Mercury had secured only 3 per cent of the market, and in late 1990, the Government's commitment not to license other companies expired. It was felt that the duopoly period had given Mercury sufficient chance to develop its business without competition. The Government had also come to the decision that promoting a single firm to provide infrastructure competition was not providing a competitive outcome rapidly enough. For these two reasons, the duopoly framework was reviewed, and ended in 1991.

G.8 The Duopoly Review marked a move towards introducing competition into both the network infrastructure and services. To facilitate competitive entry into call markets (and thus improving allocative efficiency), BT was permitted to resell leased lines to other competitors. However, wary of this eroding the incentives for competing firms to invest in access infrastructure, BT was only allowed to resell leased lines at the retail price level. Soon after the Review, a host of network providers such as Colt, Energis and the TV cable companies entered the network infrastructure market. The cable TV companies had started to provide broadcasting services in franchise regions during the duopoly years, although until the Review they had been forbidden from providing telephony services on their own account.

G.9 From 1991 to 1993, many of the regulatory issues arose from the changes made in the Review. Once again, the problem of interconnection was extremely important, especially for the new competitors. The process of securing interconnection which Mercury had followed was cumbersome, taking months of negotiation before it was referred to Oftel. If every provider had to go through this procedure to get interconnection, this would have created a significant barrier to entry. Consequently, in early 1994, Oftel decided that the December 1993 Mercury/BT Interconnection Determination would be used as the basis for determinations for all new entrants.

G.10 The level of the 1993 interconnection charges once again reflected the trade-off between mandating interconnection at marginal cost, thus encouraging allocative efficiency through service competition, and providing a means for BT to recoup its access deficit. Immediately after the Duopoly Review it was unclear whether the waiver from access contribution charges previously allowed would continue for both Mercury and the new competitors. Oftel's decision again attempted to balance the risk of 'cream-skimming' with the need for encouraging competition. The 1993 Interconnection Determination gave Mercury and other firms (through a separate determination in 1994) a full waiver to access deficit contributions on their first 10 per cent of market share, only paying when competition had eroded BT's market share to the point where cross subsidies would start to become unsustainable for BT.

Infrastructure competition (1994-97)

G.11 Determining the level of interconnection involved a myriad of problems around allocating common and joint costs, and therefore a longer-term solution was required. In 1994 Oftel required BT to separate its accounts for the network, retail and access businesses. Although undue discrimination was already prohibited,[14] the requirement for accounting separation was introduced to provide greater transparency, to prevent BT discriminating between its retail arm and third parties.

G.12 The period of regulation from 1994 saw a strong shift in favour of infrastructure competition, particularly in access. It became clear that Oftel's long-term strategy was to promote network competition in favour of service competition, being "convinced that the key to achieving a vibrant market for services provided over telecommunication networks is the promotion of fair, efficient and sustainable network competition[15]."

14 Undue discrimination was a specific concept included in Telecommunications Act 1984 licences.
15 Oftel: *Promoting Competition In Services Over Telecommunication Networks*, June 1996.

G.13 In the context of this shift, the trade-off between continuing unbalanced tariffs and promoting competition similarly shifted. Promoting competition in calls threatened competitors' incentive to invest in access infrastructure. Oftel's solution, put forward in the 1996 price review, moved towards infrastructure competition underpinned by the desire eventually to leave regulation to competition.[16] BT would be allowed slowly to rebalance its tariffs, removing the necessity for an access deficit charge.

G.14 From 1996, competition in services remained subsidiary to competition in infrastructure as a goal. This affected Oftel's treatment of issues such as number portability and equal access. The lack of portability of numbers was cited as one of the main barriers to access infrastructure competition, as it acted as a barrier to consumers switching access providers. Therefore number portability was a high priority for Oftel. Following BT's refusal of a modification to its licence, the case was referred to the Monopolies and Mergers Commission (MMC) in 1995, who ruled in favour of Oftel.

G.15 In contrast, equal access (later called carrier pre-selection (CPS)) had the potential to undermine infrastructure competition. Equal access was a technology that allowed consumers automatically to pre-select a carrier to carry their calls, rather than dialling an access code before each call (known as indirect access). Oftel's view was reflected in the 1996 statement; "Oftel is concerned that [CPS's] introduction could discourage operators from developing alternative access networks if they risked the benefits of their investments to competing operators. Oftel concluded, on balance, that there is no case for directing BT to provide equal access."[17]

G.16 The network charge controls introduced in 1997 again broadly supported access infrastructure competition. As part of the controls, the cost base used in deriving interconnection charges was changed from historic cost (HCA) on a fully allocated basis (which valued assets on the basis of what was paid for them), to a current cost (CCA) on a Long Run Incremental Cost basis (LRIC), which valued assets on the basis of their replacement costs. A corresponding change to the valuation of access network assets was made in the Retail Price Charge Review in 1997. This movement to a replacement valuation impacted the measurement of recoverable costs for regulatory purposes. At a simple level, for access infrastructure, labour is a significant proportion of the cost. As labour costs are increasing over time, the move to a replacement basis caused the level of costs deemed to be recovered by line rental to rise over time relative to HCA. This increased the incentive to invest in infrastructure. However, for usage-dependent elements of the network (such as termination and origination charges), equipment is a significant cost component, and the price of telecoms equipment tends to fall over time. Thus relative to historic cost, current cost using Long Run Incremental Cost reduced the amount that BT could charge for interconnection services. These lower charges benefited consumers directly through the reduction in service providers' costs and hence prices, but also indirectly through the competitive pressure on BT's prices.

G.17 In December 1997, BT still had a 83% market share in terms of fixed access lines, Mercury 7%, cable companies 7%, and other companies the remaining 3%.[18]

Services competition (1998 onwards)

G.18 The end of the 1990s and the early 21st century saw the regulatory balance shift away from promoting infrastructure competition. The previously clear goal to promote infrastructure competition became complicated by three major events.

G.19 The first was the 1997 EU directives. The directives encouraged national regulators not to discriminate between firms that were building networks, and those that were not. They also mandated several elements of service competition that Oftel had previously ruled out as reducing the incentives to build infrastructure.

16 "It has been a constant theme in all recent Oftel consultation documents that regulation is a poor substitute for the operation of an effectively competitive market. Oftel has made clear that its aim is to pull back from regulation as competition advances and to ensure that remaining rules match the market." *Pricing of Telecommunications Services* from 1997 – Statement, June 1996.

17 Source: Oftel, *Policy on Indirect Access, Equal Access and Direct Connection to the Access Network* – Statement, July 1996.

18 Source: Ofcom market intelligence.

G.20 The second event was the collapse in investor confidence in the telecoms sector. This called into question the viability of investment in infrastructure. Significantly, one of the great hopes of infrastructure competition using new wireless technology, Ionica, went bankrupt in 1999. The rapid change in investor sentiment meant alternative network providers increasingly demanded access to BT's own infrastructure in order to offer new products, rather than building their own.

G.21 The third stimulus was the phenomenal growth of the internet. This had been partly stimulated by the provision of pay-as-you-go (at local rate) packages through the number translation services (NTS). As BT was the only firm able to provide an end-to-end service across the UK, this created a demand for new wholesale products. One of these was Flat Rate Internet Access Call Origination (FRIACO), a wholesale product introduced by BT in 2000 on Oftel's requirement, which delivered narrowband internet traffic on an unmetered basis from a customer to the tandem network.

G.22 As a result of the EU directives, the previous distinction between network providers (who had cost-based access to BT's network), and resellers (who had 'retail minus'-based access) blurred. This lengthened the list of those who could obtain wholesale interconnection rates and marked a shift away from a policy designed to encourage infrastructure build.

G.23 Along with the more general requirements mentioned, the EU directives mandated a number of service competition elements. As discussed above, Carrier Pre-Selection (CPS) had been rejected by Oftel as it encouraged service competition at the expense of infrastructure competition. However, with the introduction of the EU Numbering Directive in 1998 it became a mandated requirement. Consequently, in 2000, CPS was introduced. By the beginning of 2004, consumers using 2.75m BT lines had taken up the option of Carrier Pre-Selection.

G.24 The introduction of CPS and the relaxation of licensing requirements increased competition in the market for calls. However, it had not created competition in the provision of access lines. BT's ability to provide a bundled calls and access service to consumers was seen as a competitive advantage. To redress this, in August 2002 Oftel modified BT's licence to require it to provide a new 'Wholesale Line Rental' (WLR) product. This product was intended to allow alternative suppliers to rent access lines on wholesale terms from BT, and then resell the access lines to the end-user, issuing a single bill that covers both line rental and telephone calls. A revised WLR product, with similar objectives, is being launched.

G.25 The EU directives also speeded up the opening of BT's local loop to its competitors. Prior to 2001, BT had not been required to provide wholesale access to its local loops. With the roll-out of ADSL in the US and EU, there was increasing pressure to speed up the deployment of broadband within the UK. Consequently, in December 1998 Oftel published a paper entitled *Access to Bandwidth*[19] detailing a number of different strategies to promote the roll-out of broadband. The decision was taken to mandate local loop unbundling (LLU). By the EU deadline of January 2001, BT had began to unbundle its loops. To date, the take-up of unbundled local loop by alternative carriers has been much lower than anticipated at the time, with only 8,919 loops unbundled up to January 2004.[20]

G.26 The UK regulation implementing the Interconnection Directive also specifically required ATM-based interconnection to be introduced. Oftel based the price of ATM-based interconnection upon the price charged to ISPs (retail minus). This meant that if BT wanted to reduce the price charged to ISPs it must also reduce the ATM interconnection price.

G.27 In summary, fixed telecoms regulation has been characterised by trade-offs, in particular the trade-off between promoting service competition and network competition. In the early period the creation of a

19 Source: Oftel, *Access to Bandwidth, bringing higher bandwidth services to the consumer*, December 1998.
20 Source: BT.

single infrastructure competitor to BT very much took precedence over greater service competition. However, the Duopoly Review created the scope for some service based competition. During the mid-1990s, the balance was firmly tilted strongly in favour of infrastructure providers, but was interrupted by the legal and financial developments of the late 1990s.

Mobile telecoms

G.28 The first two analogue cellular licences were granted in 1984 to Cellnet (now O_2) and Vodafone. From the start, there have been two major differences relative to fixed line regulatory policy. Firstly, mobile operators have never had retail prices explicitly regulated using a price cap (indeed Oftel considered the retail mobile market competitive). Secondly, Vodafone and Cellnet were required to supply third-party service providers, and to do so on non-discriminatory terms, the aim being to increase service competition over networks.

G.29 In the beginning of the 1990s, Oftel received several complaints from these service providers alleging unfair cross-subsidisation of the service provider operations owned by the mobile networks. In 1994, Oftel found that because the network operators exercised a considerable degree of influence over the retail price through their retail arms, independent service providers were subject to a 'margin squeeze'.

G.30 In 1989, two additional mobile licences were allocated; to a consortium which became Orange, and to One2One (now T-Mobile). The new companies built their infrastructure using backhaul transmission from BT bought largely at retail price levels. Competition between the mobile networks grew rapidly (with current market shares very similar). The introduction of pre-pay opened up access to many consumers, including low-usage consumers, and was accompanied by aggressive subsidies on handsets and an expansion in the range of distribution outlets.

G.31 Recently, the interconnection charges between mobile networks, and between fixed and mobile networks, have received significant attention. In 1998, the Monopolies and Mergers Commission (now the Competition Commission), concluded that the termination charges of Vodafone and Cellnet were too high. To counter this, these companies' termination charges were reduced to a ceiling of 11.7 pence per minute, and further reduced by RPI-9% until March 2002.

G.32 In 2001, Oftel revisited the termination charges, finding that each of the mobile providers had market power over termination of calls to their own subscribers. The review proposed to lower termination charges by RPI-12% until March 2006. This was appealed by several of the mobile networks and went to the Competition Commission. The Competition Commission's assessment went further than Oftel's analysis and in December 2002 it ruled that charges should fall 15% by July 2003 and be subject to RPI-15% until 2005.[21]

G.33 In summary, because infrastructure competition has been much more widespread in mobile telecoms, the sector has not faced the same degree of regulatory intervention as the fixed market. From 1991 onwards consumers had the choice between four separate networks (now five with the launch of '3' in 2003), thus providing significant access competition. However, as in all telecoms, interconnection is one of the keys to service provision. This has been as much a problem in mobile as it has been in the fixed network.

Universal service obligations

G.34 In parallel with regulation to promote competition, regulation has also aimed to ensure that everyone, and in particular certain vulnerable groups, has access to certain telecoms services. This is known as universal service regulation, and the obligations on telecoms companies to provide these services are known as Universal Service Obligations (USOs). There is both an economic and a social rationale for such obligations.

21 Vodafone and O2 were subject to RPI-15% while T-Mobile and Orange were subject to RPI-14%.

Economic rationale for USOs

G.35 The economic rationale for USOs is based on network externalities. A customer will only pay to connect to a network if the benefits they themselves expect to receive are greater than the price. But all the other customers connected to the network would benefit too – because the number of people those other customers could use the network to connect to would have increased.

G.36 If there is a monopoly telecoms supplier, it is in the commercial interest of the supplier to 'internalise' this externality by reducing the price of access and increasing the price of calls, thus encouraging more people to join the network, and making money from other customers who then call them. If there is more than one supplier, however, the company providing the connection to a new customer may not be the same company that benefits from other people calling that new customer. Therefore competition tends to make it more complicated to internalise this externality.

G.37 There may also be other types of economic efficiency that a USO can address. For example, provision of telephony services to rural villages might reduce residents' need to come into town so frequently, thus reducing traffic congestion. These types of effects, while important, are extremely hard to measure.

Social rationale for USOs

G.38 Being connected to the telephone network is increasingly a requirement to participate fully in society, for example by accessing public services, such as the emergency services, NHS Direct or Childline. Therefore part of the rationale for USOs is to ensure that people on low incomes, those living in remote rural areas, disabled people and other vulnerable groups are still able to obtain the advantages of telephony and perform a full role in society. This role for USOs corresponds closely to Ofcom's duty towards citizens.

Current USO regulation

G.39 Under the Communications Act 2003, the Secretary of State sets out the extent to which networks, services and facilities are to be provided throughout the UK as universal services. The Secretary of State published her Universal Service Order on 25 July 2003. This order implements in part the EU Universal Service Directive, which addressed universal service and users' rights relating to electronic communications networks and services.

G.40 Some aspects of universal service are ensured by means of general conditions imposed on all providers of publicly available telephone services; for example, that measures to effect payment or disconnection must be proportionate and not unduly discriminatory. The remaining aspects of universal service are ensured through specific universal service obligations imposed on particular communications providers, designated by Ofcom as Universal Service Providers. Following consultation, Oftel designated BT as a universal service provider outside Hull, and Kingston Communications in the City of Hull. For example, BT is required to:

- provide a connection to the fixed telephone network at a uniform price following a reasonable request, and provide a connection that allows functional internet access;
- provide at least one scheme for consumers with special social needs who have difficulty affording telephone services;
- provide uniformly priced public call box services;
- ensure that tariffs for universal services do not entail payment for additional unnecessary services;
- provide a basic level of itemised billing at no extra charge;
- provide universal services that accord with defined quality thresholds;
- provide funds for a relay service for textphone users; and
- supply and maintain directories and databases for the provision of directory services.[22]

22 Kingston is required to provide all except the last two of these in Hull; BT is responsible for the last two of these in the whole of the UK.

G.41 Some of the historic issues around financing USOs were discussed earlier in this annex. The Universal Service Directive requires that where national regulators find that an operator is subject to an unfair burden in providing USOs, a mechanism should be introduced either to compensate the USO provider(s) from public funds, or to share the net cost of USOs between communications providers.

G.42 However, Oftel carried out analysis in its review of universal service from 1999-2001, which concluded that the net cost to BT of being a universal service provider was broadly neutral. Oftel's view was that, in view of the absence of effective competition in many retail markets, the cost of measures to protect vulnerable customers did not represent an unfair burden on BT and Kingston. Oftel recognised that as competition increases, the burden on BT and Kingston of universal service may increase, and consideration may need to be given to the provision of alternative methods of funding. This issue is considered further in Section 5 of the Phase 1 consultation document.

Annex H

The performance of the UK telecoms sector

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The performance of the UK telecoms sector

H.1 This annex provides an assessment of the telecoms industry's performance in delivering benefits to society. It looks at four areas:

- performance with consumers – how well the telecoms sector is delivering value and choice to consumers, how this is changing over time, and how it compares to other countries;
- competition – the different forms of competition in telecoms, and the existence of alternative networks providing competition in infrastructure. The extent to which the various forms of competition have developed in different UK telecoms markets, how this is changing over time, and how it compares to other countries;
- innovation and investment – how well the UK telecoms sector has made new products available to consumers, and the extent to which it has invested in making these products widely and rapidly available; and
- industry financial performance – the profitability of the UK telecoms sector and the evolution of investor sentiment.

H.2 Throughout this annex, we have provided data to support our assessments. In general we have provided figures going back in time as far as we have the data available. For some data, this a longer period than for others.

Performance with consumers

H.3 This section assesses the benefits that the telecoms sector is delivering to the consumer in terms of the price of services, quality of service and customer satisfaction, service choice, and access to services. We then assess the degree of competition between suppliers.

H.4 These are very conventional measures of performance. One of the conclusions of the Telecoms Review may be that other measures of success of the sector are appropriate. Annex I discusses a number of emerging trends in consumer demand, which we will be researching further as part of Phase 2 of this Review. One aim of this research is to identify other measures of the sector's performance with consumers.

H.5 Figure 4 summarises our findings. The scores are intended to be illustrative only, and further analysis to support the table's conclusions is provided later in this annex. The table assesses the sector's performance based both on comparative measures (for example, is there more competition in the UK than abroad?), and absolute measures (for example, how much competition is there in the supply of mobile voice telephony?).

H.6 In general, it shows that the UK is performing well. It has generally lower prices and higher levels of competition and choice than many other markets. However, there are some important exceptions; in particular, business PSTN prices are higher, and broadband take-up lower than many of the UK's peers. BT, in common with the incumbent fixed network operator in almost all markets, has a very high market share of access lines and certain call markets.

Figure 4: Performance measures of benefits to the consumer from the UK's telecoms sector

	Price	Quality of service and customer satisfaction	Service choice	Access to services	Competition
Fixed voice telephony	UK residential prices compare well with other countries; business prices above average	Very high levels of SME and residential consumer satisfaction; declining incidence of faults	Wide range of tariff structures and bundling options	Near ubiquitous take-up, only 1% of households do not own either a fixed or a mobile phone	More competition in calls and access lines than other countries. Much of the call competition is from service providers, using alternative long distance networks. BT still provides most access infrastructure
Internet	Narrowband and entry level broadband prices compare well with comparable markets; higher speed broadband more expensive	High satisfaction with broadband, lower satisfaction with connection speeds of narrowband	Full range of narrowband price structures. Some choice of broadband connection speeds, contention ratios, but flexibility in price structures only just emerging	Ubiquitous availability of narrowband. Broadband only available recently in many areas. Other areas need a 'trigger' level of demand in an exchange, and some households and exchanges not DSL enabled	Many service providers, but none with market shares over 30%. Infrastructure provision largely provided by BT and cable companies. Almost all DSL lines use BT's access infrastructure
Mobile	Prices for pre-pay are lower than many other markets, and the UK is also relatively competitive in post-pay pricing	High overall satisfaction, although less satisfaction on cost and value for money. Incidence of dropped calls improving	3G services starting to become available but slow roll-out by incumbent operators. A full range of 2G and 2.5G tariff packages and devices is available	Mature networks cover almost all population and all except remote areas. Near-ubiquitous take-up among younger consumers; voice and text message usage increasing	High (licensing) barriers to entry at the network level, but the least concentrated market in Europe. Some new service provider competition, but many existing service providers now bought by network operators
Corporate network services	Published leased line prices are above European average	High levels of overall satisfaction with suppliers and reliability of service; less so for value for money and customer service	These services are the key focus of many Altnets. Competition has encouraged development of bespoke and tailored solutions	Most large corporate businesses are using some form of data network service. They may be reliant on BT infrastructure for some services	At least six players with significant market share although BT still retains around half the market; more for lower capacity leased lines

Key: ● Good ○ Poor

H.7 Below, we look at the fixed voice telephony, internet mobile and corporate network services sectors in turn.

Fixed voice telephony

Price

H.8 The rate of decline of both business and residential fixed telephony prices has slowed substantially over the last three years. Figure 5 measures the overall price paid for voice telephony including access and calls. The increased take-up of indirect access offerings has lead to a significant reduction in average call prices. However, in parallel there has been a move by service providers to offer increased fixed fees including line rental in return for a certain amount of call time. Therefore, although call prices are falling, fixed charges are increasing, resulting in an overall flat price basket.

H.9 Price comparison work carried out by Oftel over the last four years (shown in Figure 6) shows that residential services in the UK are cheaper than in many other countries. This is broadly confirmed by other surveys including the OECD T-Basket and Analysys's 'Cutting the Cost' comparison.

Figure 5: Real Price index of telephony services in the UK[23]

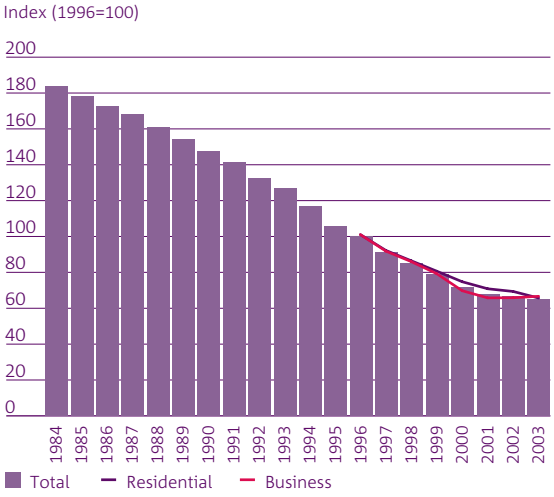
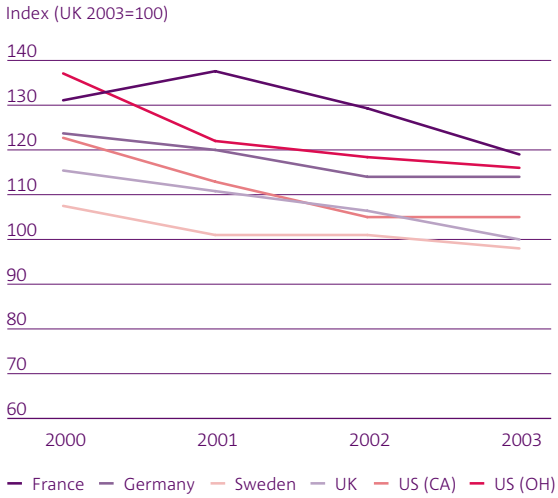


Figure 6: Comparision of residential PSTN prices in the UK with other markets[24]



23 Source: Ofcom market intelligence. Index reflects a basket of services (access and calls) and is calculated using individual unit revenues from all major operators and service providers. The basket weights are re-calculated on an annual basis (chain linked) to account for any changes in usage patterns. Data prior to 1996 are for BT only, which at that time still represented over 90 per cent of the total fixed line market.

24 Source: Oftel benchmarking study, February 2000-2003. Comparisons represent a basket of calls and access services. Currency comparisons made using purchasing power parity.

Figure 7: Comparision of small business PSTN prices in the UK with other markets[25]

Figure 8: Comparision of medium-sized business PSTN prices in the UK with other markets[26]

H.10 Prices for UK small[27] businesses are slightly more expensive than in the same comparator countries although prices for medium businesses are about average, as shown in Figures 7 and 8. Using published tariff data to compare prices for medium sized and larger businesses may be misleading, as these customers tend to negotiate prices on a bespoke basis, and the terms of those deals are not made public. Larger corporate customers have been excluded from this comparison for this reason.

25 Source: Oftel benchmarking study, February 2000-2003. Comparisons represent a basket of calls and access services. Currency comparisons made using purchasing power parity.

26 Source: Oftel benchmarking study, February 2000-2003. Comparisons represent a basket of calls and access services. Currency comparisons made using purchasing power parity.

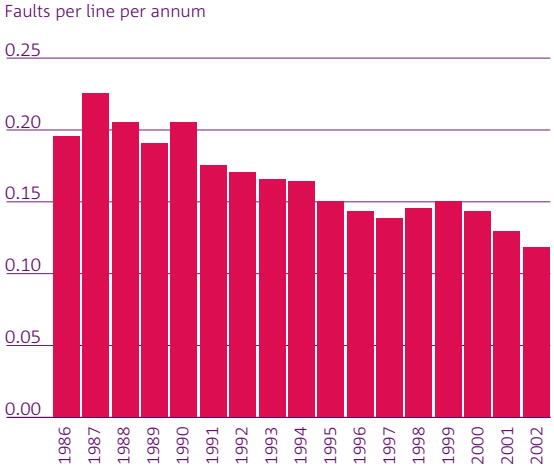
27 Definition of 'small' and 'medium' business is explained in Oftel's benchmarking study. These terms reflect the level of telecoms usage rather than standard definitions based on employee size.

Quality of service and consumer satisfaction

H.11 Consumers have experienced steady improvements in fixed telephony service quality. Research by Oftel in 2003[28] found that 97 per cent of residential customers claim to be very or fairly satisfied with the overall standard of service they receive. There were 0.22 faults per exchange line per year in 1987, but only 0.12 in 2002,[29] as shown in Figure 9.

H.12 International comparisons of quality of service are difficult to make. However, the OECD reported that in 2001 the UK figure for fault incidence was about average among those countries who reported data, and similar to the US. The UK figure for the percentage of faults repaired within 24 hours (78 per cent in 2001) was below average.[31]

Figure 9: Faults per exchange line per annum[30]



Service choice

H.13 In recent years, UK consumers have had access to a number of innovations in voice telephony. These include the continued evolution of telecoms tariff schemes, allowing consumers to pick options tailored to their own specific requirements, as well as other services such as call-back, calling line identity and voice mail services.

H.14 Choice of supplier in fixed telephony is considered in the analysis of competition below.

Access to services

H.15 Access to fixed voice telephony is ubiquitous in the UK, because it is included in the Universal Service Order, as discussed in Annex G. Take-up is also almost ubiquitous. At the end of 2003, for example, 76 per cent of UK households had access to both a landline and a mobile phone, 14 per cent had access to a landline only, while 9 per cent had access via a mobile phone only. Only 1 per cent of households did not have a phone of any kind, with cost cited as the main reason for not having a phone.[32]

28 Source: Oftel residential customer research, February 2003.
29 Source: BT.
30 Source: Ofcom market intelligence. BT data from 1986 to 1991. From 1992 onwards based on customer-reported network faults. Data not available for earlier years.
31 Source: OECD. For the UK, figures relate to faults repaired within five or nine working hours.
32 Source: Oftel residential consumer research, November 2003 and May 2003.

Internet

Price

H.16 The UK is one of the cheapest places in the world for basic dial-up internet services, as evidenced in Oftel's benchmarking study in August 2003. This has partly been due to a number of innovations in internet access in the UK. For example, these included the development of the 'Freeserve model' of free connection and pay-as-you-go internet access in the late 1990s. Unmetered narrowband internet access was pioneered by the cable companies, and later adopted by BT and other service providers following regulatory intervention. Figure 10 compares dial-up internet prices in the UK with other countries.

H.17 Oftel also found that prices in the UK for entry level broadband services also compare well, although prices for higher speed business services were the most expensive of the countries considered. This is shown in Figure 11.

H.18 The conclusion that prices for residential broadband services in the UK are relatively low compared to other countries is not supported by some other studies that have used different methods. For example, Analysys found residential ADSL prices in the UK to be higher than those in Germany and the US[34], Analysys surveyed a wider selection of markets to show that UK broadband prices were very substantially higher than, for example, those in Japan, South Korea and Canada.

Figure 10: Comparison of dial-up internet prices[33]

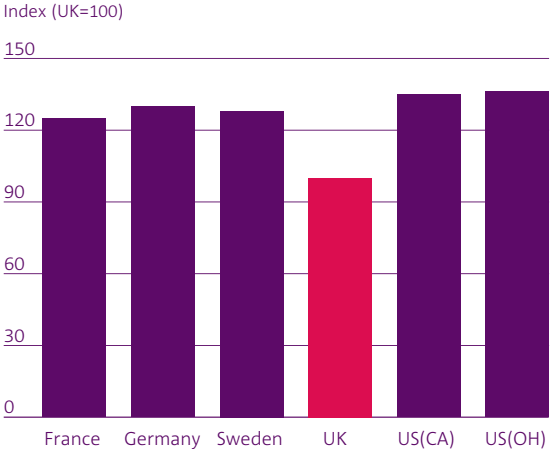
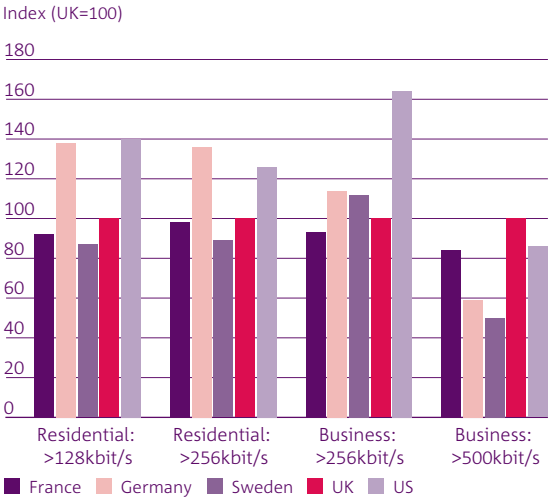


Figure 11: Comparison of broadband prices[35]



33 Source: Oftel benchmarking, August 2003. Currency comparisons made using purchasing power parity.
34 Oftel took the average of the two lowest prices available, Analysys is based on the average price of services weighted by market share.
35 Source: Oftel benchmarking, August 2003. Currency comparisons made using purchasing power parity.

H.19 Any price competitiveness in the UK is also relatively recent. For example, in October 2000, Oftel found residential broadband prices in the UK to be the most expensive of these five markets[36].

Quality of service and consumer satisfaction

H.20 Overall satisfaction with internet services in the UK is good, and higher for broadband than for narrowband. Oftel found overall satisfaction with the service to be 94 per cent among broadband customers in November 2003. Overall satisfaction among narrowband customers was slightly lower, at 89 per cent, perhaps on account of the fact that narrowband customers were less satisfied with the speed of their online connection[37].

Service choice

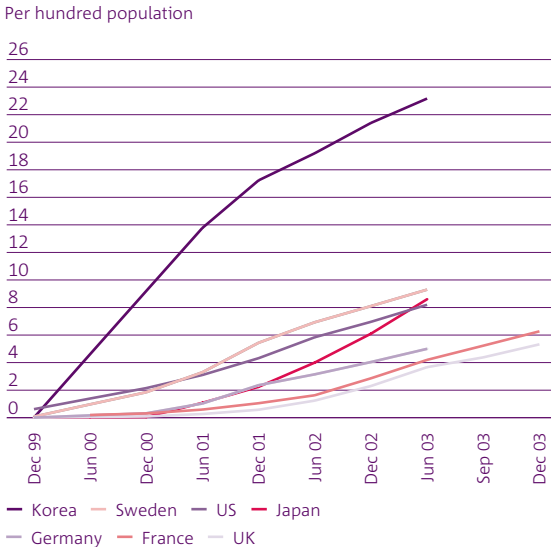
H.21 The UK compares well with other countries in terms of internet service choice. Metered, unmetered and partially unmetered narrowband packages are widely available, both from the BT and from alternative suppliers. In broadband, choice can be measured in terms of access to different payment structures, bandwidths, contention ratios, levels of IT support and other services (such as virus protection or content blocking) provided by ISPs. The UK provides choice in some of these areas but not others. There is some variety in connection speeds, contention ratios and ISP add-on services. However, there is less variety in terms of payment structures. For example, metered broadband tariffs are not available in the market. BT's recently announced broadband product which includes 1 Gb of usage per month is the market's first major foray into volume-based pricing.

Access to services

H.22 The UK's internet penetration of around 50 per cent of households lags behind the Far East, US and Scandinavia, but is broadly comparable to Germany, and is ahead of France and most of southern Europe[38]. There are substantial age variations in UK internet penetration, with penetration being lower amongst the over-55s, possibly as a result of the costs of PC ownership, and lack of knowledge and interest[39]. Internet penetration among small businesses is around two thirds, but has remained fairly static since mid 2002[40].

H.23 The UK lags behind its peers on broadband take-up, both among residential consumers and among SMEs. Residential broadband penetration is now 22 per cent of households with internet[41], and 35 per cent of SMEs with Internet access. Figure 12 compares broadband take-up in the UK with a number of other markets. Comparisons with Korea should bear in mind the impact of its high level of population density, and public financing of roll-out.

Figure 12: Broadband take-up[42]



36 Source: Oftel benchmarking, October 2000.
37 Source: Oftel SME research, November 2003.
38 Source: Nielson Net Ratings, August 2003.
39 Source: Oftel residential consumer research, November 2003.
40 Source: Oftel SME research, November 2003.
41 ADSL and cable modem penetration. Source: Oftel research and industry estimates.
42 Source: OECD.

H.24 The UK's lower broadband take-up could be due to a number of factors, including higher prices for broadband services in the UK (until recently), limited availability of ADSL-enabled exchanges (again until quite recently), and the widespread availability of unmetered narrowband packages which some consumers use as a 'half-way house' between metered narrowband services and broadband.

Mobile

Price

H.25 Ofcom's benchmarking in November 2003 found mobile prices in the UK to be very competitive with other markets, as shown in Figure 13. The comparison is different depending upon whether the costs of handsets are included or not. When handsets are excluded, the cheapest packages are typically pre-pay packages, and the UK is very price competitive in this sector of the market. When handsets are included, the cheapest packages are typically contract packages. Though the UK remains price competitive, the various countries are much closer together on prices for these services.

H.26 In spite of the UK's price competitiveness, the rate of decline of mobile prices has slowed very substantially in the last four years, as shown in Figure 14.

H.27 In contrast, research reports by the OECD and Analysys[43] find prices in the UK to be higher than many of its peers. The differences in results are largely due to methodology. In general, Ofcom's benchmark includes a wider range of service providers and packages than either Analysys or the OECD.

Figure 13: International comparisons of mobile prices[44]

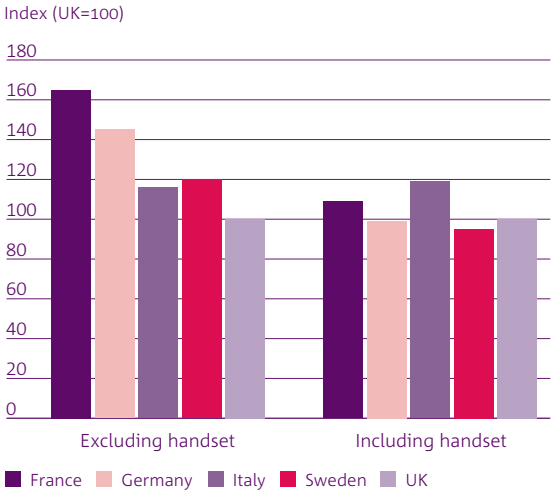
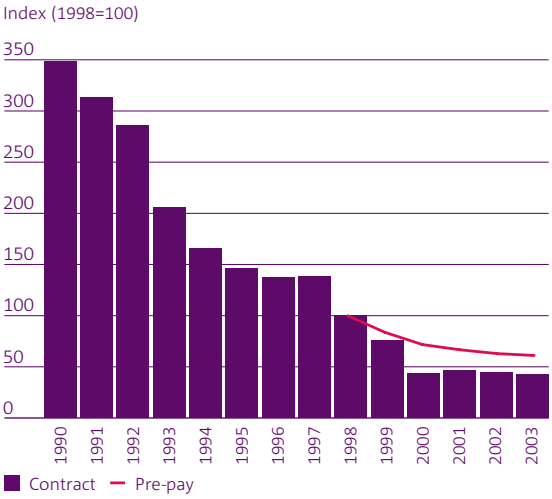


Figure 14: Index of the real price of mobile services[45]



43 OECD T-Basket comparison, and Analysys 'Cutting the Cost' price benchmarking study.
44 Source: Oftel benchmarking, November 2003. Currency comparisons made using purchasing power parity.
45 Source: Ofcom market intelligence (from 1998), Analysys (pre-1998). Real prices, based on 2003 price levels.

Quality of service and consumer satisfaction

H.28 With the 2G operators' networks now mature, network quality is very good. Figure 15 gives the results of Oftel's call completion survey in May 2003. It shows very high call completion in general, except in certain regions that have large rural areas.

Service choice

H.29 The UK offers a substantial diversity in mobile services. A broad range of handsets and tariff packages, including varying levels of device subsidies, is available. The mobile sector has brought a steady stream of new services to market over the last few years, including WAP, picture messaging, java applications, ringtones and logos.

H.30 Though the UK market is one of the few European markets to have commercial 3G services, the incumbent operators have nonetheless delayed full-scale launches of 3G services to date.

Access to services

H.31 Oftel's survey in November 2003 found adult mobile penetration to have levelled off at around 75 per cent, as shown in Figure 16. Mobile penetration is significantly lower for older age groups, and over 50 per cent of consumers between 65 and 74, and over 75 per cent of consumers over 75, do not have a mobile phone. The survey also found that mobile penetration amongst SMEs has fallen after a peak in 2002.

H.32 As Figure 17 shows, average mobile voice usage has begun to increase again over the last couple of years. The decline from 1999 to 2002 was the result of a dilution of the user base by lower-usage customers, following the surge in mobile penetration as a result of the introduction of pre-pay. The recent slight increase has been driven entirely by contract customers. There has also been an increase in the average number of text messages sent per subscriber to nearly 40 a month since the widespread take-up of SMS in the late 1990s.[46]

H.33 The combination of growing usage, growing penetration and yet (recently) relatively flat prices has resulted in a steady increase in consumer spend on mobile, which now makes up around a third of consumer spending on telecoms in the UK.

46 Source: Ofcom market intelligence.

Figure 15: Mobile networks call success rates surveys, May 2003[47]

Region	% of calls completed successfully
East Anglia	98.0%
London	97.2%
Midlands	98.1%
Northern England	98.0%
Northern Ireland	97.4%
Scotland	93.9%
South East England	96.9%
South West England	95.7%
Wales	87.8%
UK	96.9%

Figure 16: SME and residential consumer mobile penetration[48]

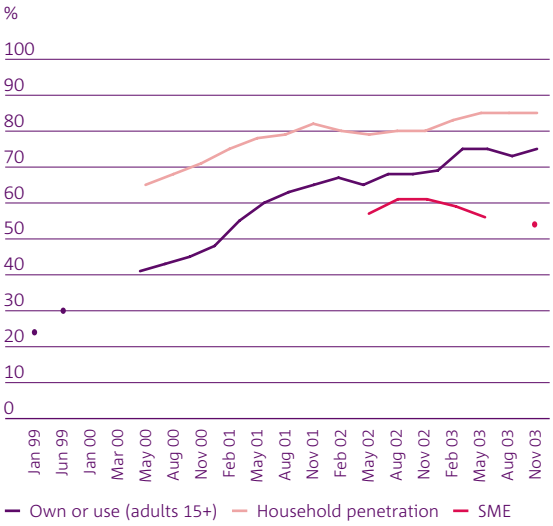
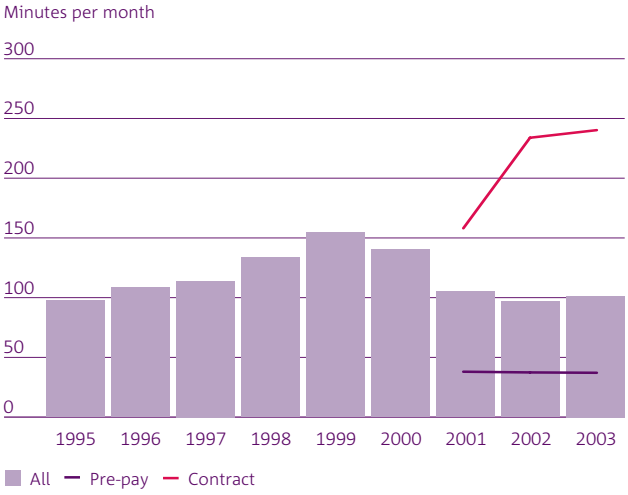


Figure 17: Average mobile usage (outgoing minutes per month per user)[49]



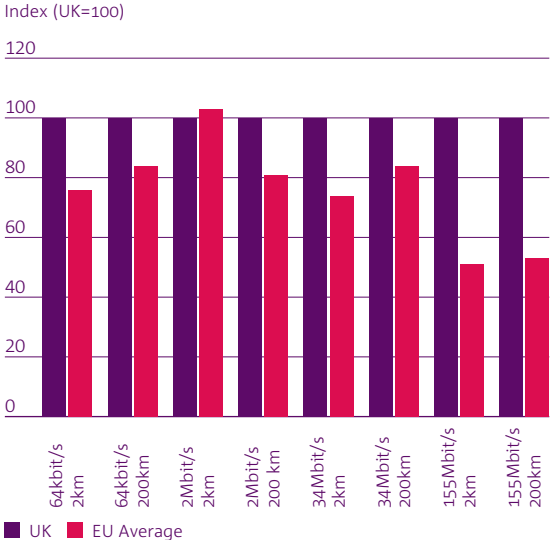
47 Source: Oftel mobile networks call success rates surveys, May 2003.
48 Source: Oftel residential and SME research, November 2003.
49 Source: Ofcom market intelligence.

Corporate network services

Price

H.34 Leased lines are the product making up the largest proportion of business consumers' spending on network services (around 30 per cent in 2003).[50] Therefore the relative price of leased lines is a key indicator of the UK's overall position in terms of price for corporate services. As Figure 18 shows, most types of leased line are substantially more expensive in the UK than the EU average.

Figure 18: Comparison of UK leased line prices with EU average[51]



H.35 However, price comparisons such as these tend to rely on the incumbent operator's published prices. In reality businesses receive discounts or bespoke bundled solutions which incorporate a range of services, and they often buy from sources other than the incumbent. Though this situation will be the same in all the comparator countries, it means that these data cannot be taken as definitive.

H.36 In addition, leased lines only make up around 30 per cent of business's spend on corporate network services. Because the remaining services are often highly bespoke, it is hard to make price comparisons between markets. However, because the corporate network services market in the UK is highly contested, being a main focus of many alternative network operators, it is likely that prices in the UK are relatively competitive with other countries.

H.37 Results from Oftel's Large Business Panel in October 2003 suggested that around one in five corporate customers were not satisfied with the value for money of their overall fixed telecoms service.

Quality of service and customer satisfaction

H.38 Overall, customer satisfaction among corporate consumers is good. Results from the same panel survey showed that overall, around nine in ten large businesses[52] are satisfied with their telecoms suppliers and the reliability of the service provided. The same businesses are, however, less satisfied with the customer service and aftercare provided by their suppliers, with only two-thirds being satisfied with this aspect of service.

50 Source: Analysys *Business Data Services; growth opportunities and forecasts 2002-2007*.
51 Source: *EC 9th Implementation Report*, data to 2002. Price comparisons made using purchasing power parity.
52 Defined as businesses with 250 or more employees.

Service choice

H.39 Because of the need for bespoke services, and the integration required with existing IT systems, service choice is particularly important for these services. It is also a key driver to innovation in business processes, and hence possibly to economic growth, as discussed in Annex F.

H.40 The UK has more infrastructure-based suppliers offering corporate network services to large businesses than almost any other market in the EU. For example, Cable and Wireless, Energis, MCI, Thus, COLT, Global Crossing as well as other suppliers all have a large UK presence in this segment. In addition, a number of systems integrators compete for some types of services.

H.41 Though Ofcom does not collect data in this area, it is likely that this competition has encouraged easy accessibility of bespoke and tailored solutions to suit individual businesses, using products such as IP managed router services, Frame Relay and ATM, and Ethernet. IP VPNs are becoming increasing common and large businesses are also taking advantage of the increased availability of DSL to encourage home and tele-working.

Access to services

H.42 Ofcom estimates nine in ten corporate businesses are using at least one corporate network service – such as leased lines, VPN, Frame Relay/SMDS, ATM or other high bandwidth data network.[53] While much of this is based on alternative network operators' infrastructure, it is likely that many businesses are still reliant on BT infrastructure to some extent, particularly outside major business centres.

Competition

H.43 We now assess the level of competition in the various telecoms markets. As in most sectors, competition in telecoms can deliver many benefits to consumers by reducing prices, raising quality, ensuring that services are produced efficiently, and creating incentives for providers to innovate and to increase service choice.

H.44 Measuring competition is difficult for a number of reasons:

- the relationship between market share and market power is not a precise one. A high market share may in some cases be the result of successful competition rather than a sign of its absence – though the latter is a possibility too;
- the implications for the degree of competition of there being more similar or divergent operator sizes are not straightforward. Therefore, comparisons between market structures with different divisions of the market between operators are difficult to draw;
- the availability of a range of service providers may not equate to a competitive market if customers face high barriers to switching between them, or if reliable information about alternative suppliers is difficult to obtain and compare; and
- finally, the ability of firms not currently operating in the market (which may be either new firms, or ones currently operating elsewhere) to enter the market easily and serve customers can be an important constraint on the exercise of market power.

H.45 However, broadly speaking, the existence of a greater number of competitors tends to imply stronger competition, while the existence of a large, dominant supplier tends to imply weaker competition.

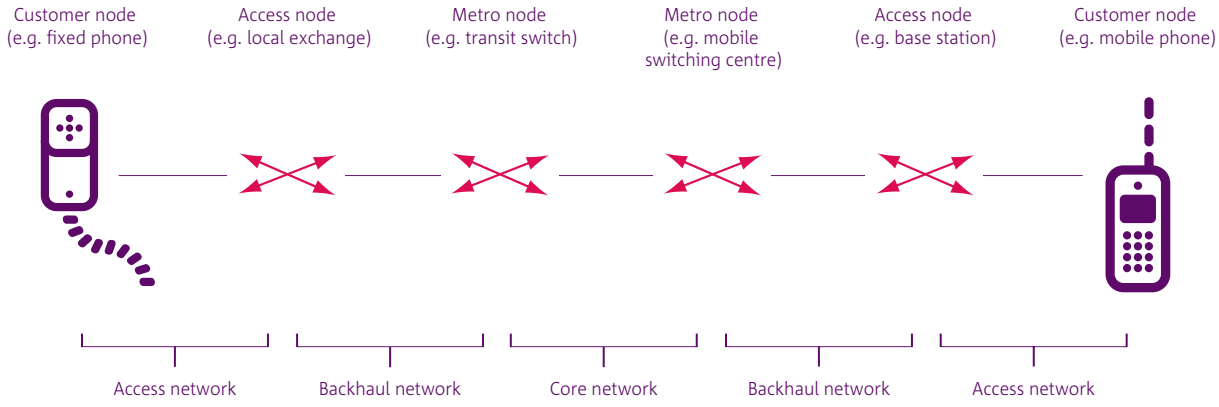
53 Source: Oftel Large Business Panel, October 2003. Note results are based on a relatively small sample size (c.200).

H.46 In telecoms, competition can take different forms depending upon whether competitive suppliers use the same, or an alternative infrastructure to the established operator. Figure 19 shows the (very simplified) routing of a typical long-distance telephone call.

H.47 The different forms that competition can take are:

- **Access competition:** competitors have their own networks reaching all the way to the customer. For example, when a cable operator competes with BT, it does so by having a separate wire into a home or business. This form of competition typically requires the least regulation to maintain, and gives competitors maximum scope to innovate and introduce service choice. In some cases it may also allow further service provider competition to develop without wholesale access to networks being mandated;
- **Long-distance network competition:** competitors use their own networks for the long-distance portion of the call, but use the established operator's network for the local access part of the call. This form of competition typically requires regulation to allow the competitor access to the established operator's network. It allows some scope for innovation, but only where competitors can provide the new product using the local access part of the network that they buy from the established operator; and
- **'Service provider' competition:** competitors use other networks' transmission infrastructure. Often, they use the established operator's network to access the customer, and another operator for the long-distance part of the call. This form of competition can deliver benefits in terms of lower prices if wholesale prices are heavily regulated. However, service providers often have little ability to innovate except in price structures, customer service or other non-network product elements.

Figure 19: Routing of a long-distance call through the telecoms network



H.48 Because access and long-distance network competition can in principle deliver greater benefits than service provider competition, the scope for benefits due to telecoms competition in the UK depends on the extent to which alternative networks are rolled-out. The current roll-out of these networks in the UK is discussed below.

Extent of alternative network roll-out

H.49 The UK has a number of telecoms companies that operate long-distance telecoms networks. These networks vary in their breadth (i.e. how many regions of the UK they pass through), and their depth (i.e. how many points of access and interconnection they have). These companies have varying business models – some long-distance network providers focus purely on carrier services to wholesale customers, while others offer retail services, usually to business customers. The UK networks of two alternative networks providers are shown in Figure 20.

Figure 20: UK long distance networks of Thus and Cable & Wireless[54]

Thus

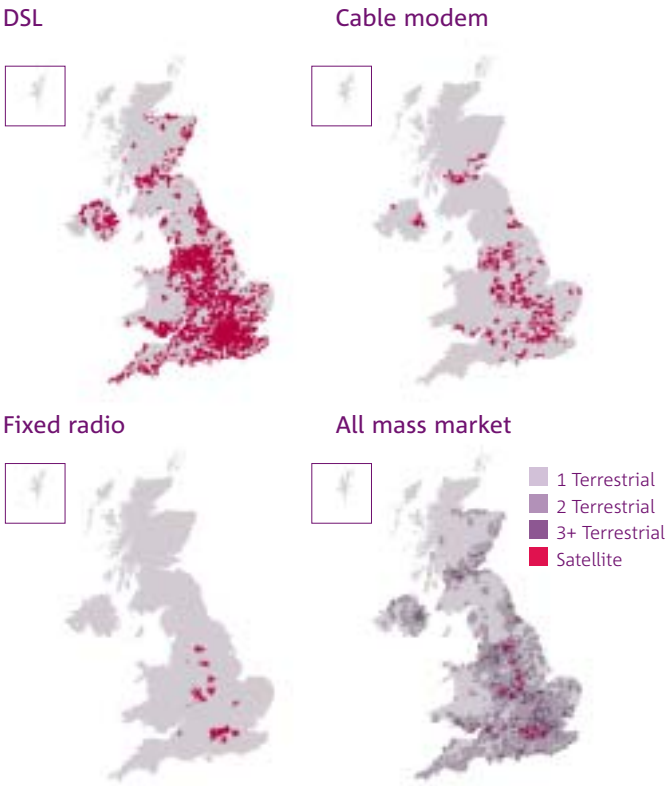
Cable & Wireless

54 Source: Thus, Cable & Wireless.

H.50 The extent of consumer choice in access provision depends on location, and the type of consumer. In general, residential and low- or medium-use business consumers have no choice of fixed access provider other than BT, unless they live in an area which has been passed by a cable network. Cable roll-out extends to around 55 per cent of the UK population. The cable companies have captured over a third market share[55] in their franchise areas, giving them just under 20 per cent of UK lines in total. In addition to this infrastructure competition, the entire population has a choice of a large number of fixed call service providers using other suppliers' access infrastructure.

H.51 In general, larger volume business customers have a greater choice of infrastructure-based fixed telecoms provider. Many of these providers are long-distance network operators. Whether a long-distance network operator also supplies access infrastructure typically depends on the size of the customer and their location. For large sites, and in densely populated metropolitan centres or business parks, many alternative suppliers provide access infrastructure. For other sites, regulation allows alternative network operators to use BT's infrastructure to provide access at regulated wholesale prices, and many use this method instead.

Figure 21: Broadband availability[56]

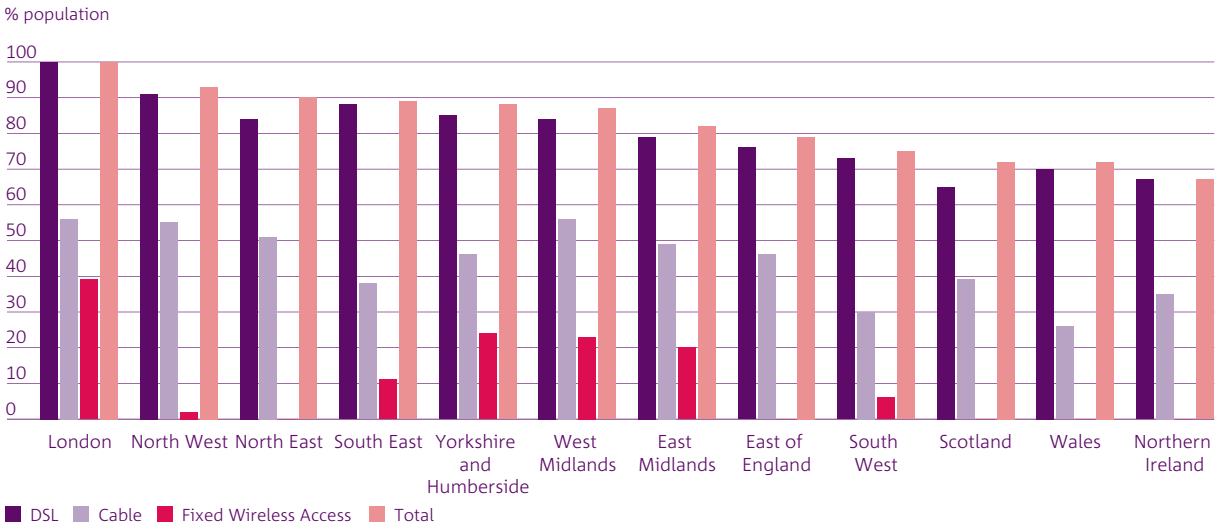


55 Source: Oftel research, November 2003.
56 Source: Analysys, December 2003.

H.52 The extent of infrastructure roll-out also has implications for broadband competition. Only BT and the cable companies have mass-market broadband fixed access infrastructure, though not all BT or cable customers can yet access a broadband service. In addition, there are some areas where broadband access via fixed wireless is available, although take-up remains very low.

H.53 At the end of 2003, broadband was available to 85 per cent of the population.[57] Figures 21 and 22 show broadband coverage by percentage of the population, by region.

Figure 22: Broadband availability by region[58]



57 Source: Analysys, December 2003.
58 Source: Analysys, December 2003.

H.54 Analysys estimates that 99 per cent of households in 'urban centres' now have access to broadband. This figure falls to 95 per cent in 'suburban centres", 65 per cent in 'market towns', 18 per cent in 'rural villages' and just 4 per cent of 'rural' households.

H.55 In addition to these fixed networks, almost all of the UK population has access to four mobile networks. With the 2G networks of the four established mobile operators now mature, coverage extends to most of the country except certain rural areas. In addition, 70 per cent of the population[59] also has access to 3G services over 3's network.

Assessment of competition in UK telecoms

H.56 We now discuss the extent of different types of competition in the various UK telecoms market sectors. In summary:

- BT retains a high share of fixed narrowband retail access and related markets. Competitors have a higher share of business narrowband access than residential. Nonetheless, competing suppliers with their own access infrastructure (largely cable television companies) have a much higher market share than in most other developed economies;
- BT's competitors have a higher share of fixed narrowband retail call markets than they do in access markets, though much of this is service provider-based competition. In many markets, BT still has significant market power. Its competitors have a higher share of international calls, long-distance calls and calls to mobile, than of local calls;
- narrowband internet access is supplied by a number of providers, none with very large market shares. The market is slightly more concentrated now than three years ago;
- fixed broadband access is a rather more concentrated market than narrowband access. Much of the competition for residential and SME consumers is at the service provider level. At the infrastructure level, the market is largely divided between BT and the cable operators; and
- mobile services are provided by four established network operators and a new entrant, and there is also some service provider competition. Oftel found no firm to be dominant in the market for calls from mobiles, though the high barriers to entry are likely to constrain competition.

H.57 Our assessment begins with a summary of the market reviews carried out by Oftel in 2003, then looks in more detail at fixed narrowband access, fixed narrowband calls, internet access, corporate voice and data services, and mobile.

Market reviews

H.58 In accordance with the new EU regulatory framework which came into force in July 2003[60], Oftel carried out market reviews of a broad range of telecoms markets. The narrowband reviews are now closed, while others are still at the draft proposal stage. These reviews will form the basis for telecoms regulation in the UK over the next few years. For each market, Oftel has assessed whether one or more supplier has Significant Market Power (SMP) and, if so, what regulatory remedies are appropriate. A summary of Oftel's assessment for the UK excluding Hull[61] is shown in Figure 23.

59 Source: '3' press release, 22 December 2003.

60 This requires national regulatory agencies to define markets for telecoms services; and, where one or more operators have significant market power in each market, to implement appropriate remedies.

61 In Hull, Kingston Communications is the incumbent operator and therefore significant market power assessments are different in that region.

Figure 23: Summary of Oftel Market Reviews for UK excluding Hull

Market	Operators with SMP?	Explanation
Narrowband exchange line services[62]	Yes (BT)	Assessment based on static and high market shares, and high entry barriers.
Narrowband call markets[63]	Yes (BT)	Although market shares are being eroded in call markets, profitability remains very high.
Wholesale unmetered narrowband internet termination[64]	No	Revenue figures in this market fluctuate and show strong signs of competition.
Wholesale international services markets	BT in 108 markets (routes) C&W in 4 markets (routes) No SMP in 123 markets (routes)	Barriers to entry critical to the assessment of SMP. Certain high volume routes (e.g. to the US) are very competitive, many low volume routes (e.g. to Ascension Island) are not.
Fixed geographic call termination[65]	Yes (many operators, by definition)	Any operator that terminates fixed geographic traffic has SMP by definition as no other operator can terminate calls to those customers. This applies to 54 telecoms operators.
Call origination, transit and conveyance[66]	Yes (BT)	BT originates around 79% of UK calls, and provides 62.5% of local-tandem conveyance. For inter-tandem conveyance, single transit and inter-tandem transit, operators need to connect with BT in order to send calls to it and to all other providers.
Broadcasting terrestrial transmission services[67]*	Yes – television (Crown Castle and ntl) No – radio	In television, each area is covered by only one mast owned by one or the other company, and therefore each has 100% market share in a given area. Radio was considered a single national market.
Wholesale broadband access*	Yes (BT)	BT has a market share approaching 60%, which is expected to grow further.
Wholesale leased lines*	Yes (BT), except for very high bandwidth terminating segments of traditional interface circuits	Market shares vary by bandwidth and type of circuit, reflecting the significance of costs of provision of basic infrastructure, and scale effects.
Retail low bandwidth leased lines*	Yes (BT)	BT has a very high market share. Effects of upstream regulation expected to be fairly muted in this market.
Wholesale mobile access and call origination	No	No operator has a market share exceeding 40%, or have significant advantages on other criteria such as technology or economies of scale.
Mobile wholesale call termination*	Yes (Mobile network operators)	Because the calling party pays on calls to mobile, each network operator has a 100% share of the separate markets for voice termination on their own networks.

* These market reviews are not yet complete

62 Residential analogue and ISDN2 exchange line services, business analogue, ISDN2 and ISDN30 exchange line services.

63 Residential and business local, national and international calls, calls to mobiles, IDD category A and category B calls (on a route by route basis).

64 Wholesale unmetered narrowband internet termination, plus retail links used by ISPs in order to provide retail narrowband unmetered internet access services.

65 Fixed geographic call termination on each individual network, including retail links. Excludes fixed non-geographic termination – this market has previously been found to be competitive.

66 Call origination, local-tandem conveyance and inter-tandem conveyance and single transit on fixed public narrowband networks, plus retail links.

67 Analogue and digital terrestrial television transmission in each of the areas served by masts and sites operated by ntl, and areas served by Crown Castle. Terrestrial radio transmission was taken to be a single national market.

Fixed narrowband access

H.59 Figure 24 shows the share of analogue exchange lines supplied by BT. It reveals that:

- BT's overall market share is very high, at over 80 per cent, and is higher in business than in residential lines. Cable companies account for most of the remaining residential lines, although other alternative networks have a higher share of business lines than do the cable companies; and
- the rate of growth of competitive analogue exchange line services is very slow – in the residential market competitors have gained just two percentage points of market share in the last five years.

H.60 At present, almost all the competition in this market is at the infrastructure level; there is very little service provider competition. The obligation on BT to provide wholesale line rental at cost-oriented prices may result in future in an increase of competition from service providers.

H.61 In future, mobile may provide increasingly effective competition to BT in the supply of narrowband access. There is some evidence that this kind of competition is already starting to emerge. In November 2003, 9 per cent of consumers had only a mobile phone for telephony services; in May 2000, this figure was 5 per cent. The proportion of consumers claiming to use a mobile as their main method of telephony has risen from 17 per cent of adults in February 2002 to 22 per cent currently.[68] The issue of substitution between fixed and mobile is discussed further in Section 5 of the Phase 1 consultation document.

H.62 BT's share of the market for fixed narrowband access is less than the incumbent's share in many other markets. For example, in France, Italy, Germany, the Netherlands and Sweden the incumbent's market share of fixed access lines is over 95 per cent.[69]

H.63 Market power in this market is particularly relevant because it creates a potential for leverage into many other markets. BT's SMP in this market generates the need for many of the regulatory remedies proposed for BT by the market reviews in other markets.

Fixed narrowband call markets

H.64 Figures 25 and 26 show BT's share of retail call revenues for different types of geographic calls and for calls to mobile. This does not always reflect where the revenues for the call end up. For example, operators that originate calls to mobile typically pay out a large proportion of the call revenues to the mobile operator that terminates the call. The figures reveal four things:

- in general, competitors have a higher market share in providing calls than they do in providing fixed narrowband access. Much of this is service provider-based and/or long-distance network-based competition;
- BT's share of local fixed calls is significantly higher than its share of national calls and calls to mobiles. Competitors' share of international calls is highest of all;
- BT's share of fixed call revenues is continuing to fall in the business market but has recently stabilised in the residential market; and
- BT's share of the residential fixed call market is significantly higher than its share of the business market.

68 Source: Oftel research, November 2003.
69 Source: *EC 9th Implementation Report*, data to end 2002.

Figure 24: BT's market share of analogue exchange lines[70]

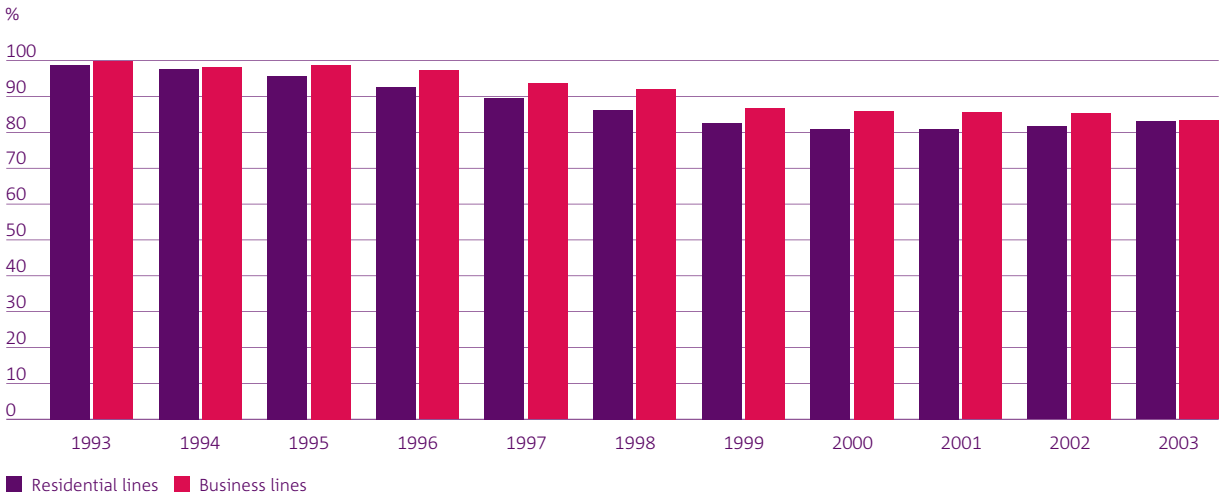


Figure 25: BT's share of narrowband call revenues[71]

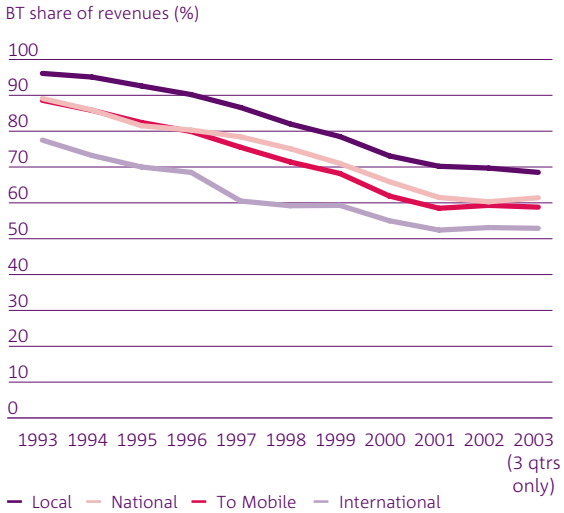
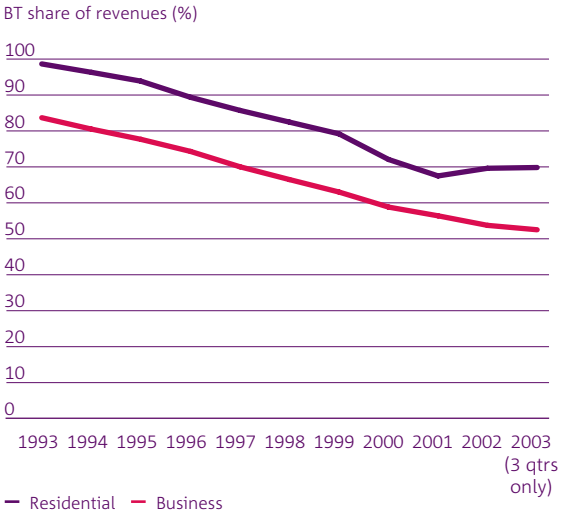


Figure 26: BT's share of business and residential fixed call revenues[72]



70 Source: Ofcom market intelligence, all data end March; includes PSTN and ISDN.
71 Source: Ofcom market intelligence.
72 Source: Ofcom market intelligence. Data represents calls to mobiles and geographic numbers only.

H.65 Trends in BT's market share of call volumes are largely consistent with those in its revenue share. BT's share of international call volumes and, to a lesser extent, national call volumes are below its respective revenue shares. This reflects both BT's higher prices for similar types of call, and BT's greater market share in the less competitive, smaller volume and higher price international routes.

H.66 Despite BT's continued high market share, non-incumbents have a higher market share in UK call markets than they do in many other European countries. For example, France Telecom and Deutsche Telekom have over 70 per cent shares of call markets in France and Germany respectively.[73]

H.67 Because of BT's high market share in fixed narrowband access, much of the competition in calls takes place at the service provider or long-distance network level, using BT or another access provider to originate or terminate calls. So, for example, BT originates 78 per cent of UK outgoing calls, and it provides local tandem conveyance for 65 per cent.[74]

H.68 The fixed call market share trends shown do not take account of the fact that mobile may be beginning to provide competition to fixed call services. In 2000, calls from mobiles represented 12 per cent of all outgoing calls in the UK. In 2003, they represented 17 per cent.[75] As the price differential narrows between mobile and fixed services, and consumers' behaviour alters, consumers may increasingly switch towards using the mobile, rather than the fixed network, for making calls. This is discussed in Section 5 of the Phase 1 consultation document.

H.69 The above trends exclude non-geographic calls such as calls to premium rate services, directory enquiries and dial-up internet. While originating volumes are consistent with access market shares, the market for terminating these calls is much more competitive. For example, BT terminates just around a third of all dial-up calls to the internet. Revenues from these calls are largely retained by the terminating operator. For example, BT retains less than 20 per cent of combined freephone, special local rate and special national rate termination revenues.[76]

Internet access

H.70 A variety of ISPs supply services to both residential and SME customers, with no supplier having more than a 30 per cent share in either market, as Figure 27 shows.

H.71 Competition in broadband can be measured both at the service provider and the infrastructural level. At the service provision level, the market is split between a number of suppliers. Though BT, ntl and Telewest have 70 per cent of broadband subscriptions between them, the remainder of the market is split between other service providers.[77]

H.72 At the infrastructural level, the market is made up of three players; BT, ntl and Telewest. BT, through DSL connections, has a 50 per cent share of broadband infrastructural provision. In addition, a small amount of broadband access is also available in the UK via fixed wireless access, satellite and unbundled local loops.

H.73 As Figure 28 shows, the level of competition in broadband both at the infrastructural and service provision levels is higher in the UK than in some other European countries.

73 Source: *EC 9th Implementation Report*, data to end 2002.
74 Source: Oftel, 2003.
75 Source: Ofcom market intelligence.
76 Source: Ofcom market intelligence.
77 Source: Ofcom market intelligence.

Figure 27: Share of residential and business ISP markets, November 2003[78]

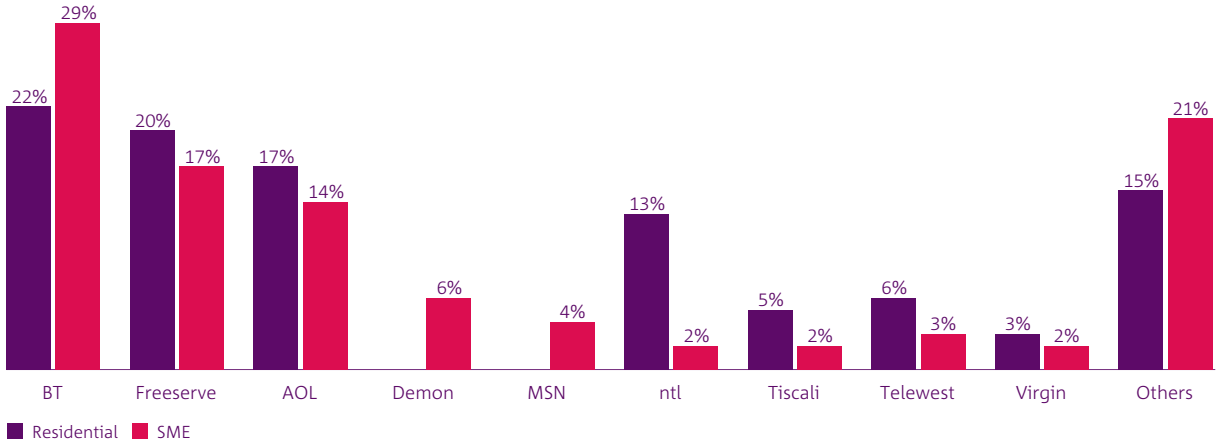
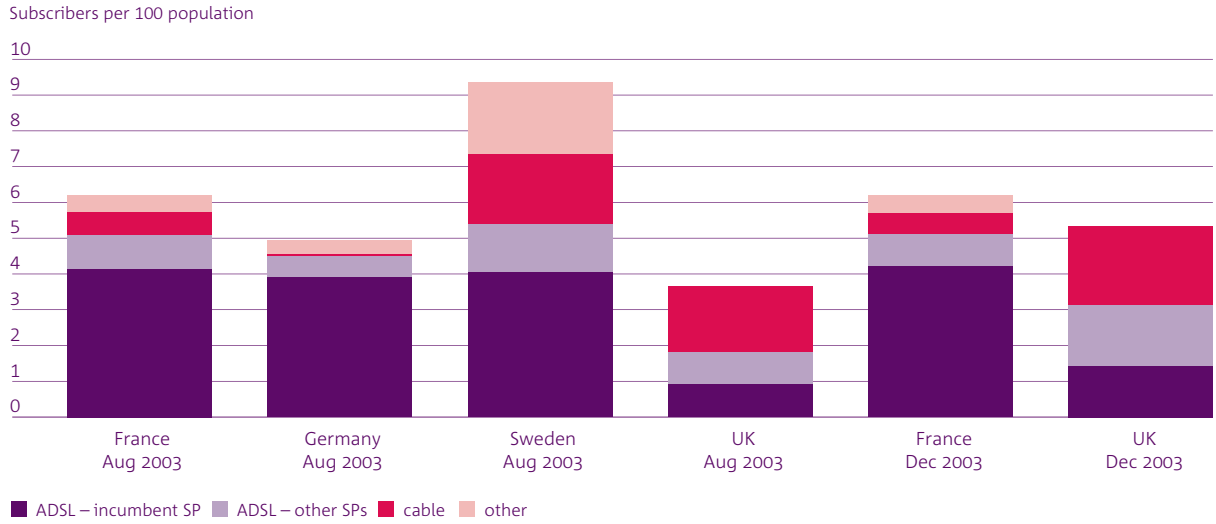


Figure 28: Incumbent operator's share of broadband connections[79]



78 Source: Oftel research, November 2003. Based on customer survey data.
79 Source: Oftel's benchmarking study of Internet access, August 2003.

Mobile services

H.74 The market for mobile (GSM and 3G) subscription and outgoing call services is much less concentrated than that for fixed services, and much of the mobile competition is at the infrastructural, and not just at the service provision level. Figure 29 shows the proportion of customers connected to each of the mobile networks. Ofcom estimates that roughly 50 per cent of the mobile market by revenue comes from residential customers, around 25 per cent from SMEs and around 25 per cent from corporates.

H.75 There are also competitors operating only at the service provision level. Network operators have recently acquired a number of independent service providers, such as Singlepoint. Offsetting this, other service providers such as Virgin Mobile, Carphone Warehouse's Fresh, and OneTel have entered the market. Some, such as Tesco, have entered the market quite recently. There are now around three million customers buying access from these service providers.

H.76 Though it is much less concentrated in market share than many fixed markets, the operation of mobile networks has high barriers to entry, and as a result the four firm retail concentration ratio is over 90 per cent. Nonetheless, as shown in Figure 30, the UK's mobile market is more evenly balanced at the infrastructure level than comparable European markets.

Corporate voice and data services

H.77 In general there is greater competition in the provision of telecoms access and services to large business consumers than in many other telecoms markets, reflecting their high level of spend. Ofcom estimates that this sector spends at least £10bn a year on voice and data services.

H.78 Leased lines services are an important service for large corporate customers, who value a high degree of control over their telecoms infrastructure. However, in many cases these services are sold to customers bundled together with a range of other corporate network services, such as Virtual Private Networks (VPN), Frame Relay, and value-added services like managed firewalls. As a result, data on market shares is hard to gather, and Ofcom collects less detailed data on this market.

H.79 Ofcom estimates that BT's market share remains high for basic corporate telephony services, but declines to below 40 per cent for circuits of more than 155Mb capacity. Overall, BT is thought to account for around half of the total corporate market. This is shown in Figure 31.

H.80 Oftel's research[80] also noted that around seven in ten large corporate consumers use multiple suppliers for telecoms services. Though five alternative fixed network operators (Altnet) identified in the survey[81] each had a presence in at least 18 per cent of large corporate businesses, BT had a presence in almost all (98 per cent).

H.81 At the level of access infrastructure, there is rather less competition. As noted above, much of the physical access connection to alternative provider networks is via BT's infrastructure. BT is required to provide particular forms of private circuits to other telecoms operators at regulated prices. In this way, the access part of the corporate network services supplied by BT's competitors often uses BT's infrastructure.

H.82 Nevertheless, in the access elements, there is some competition to BT from telecoms operators who have invested in metropolitan access or other broadband local networks. The extent of competition to BT from other fixed operators varies depending on precise location, and changes over time with the position of individual competitors and the changing nature of business requirements. Few Altnets are continuing to roll out their networks with the exception of building tails to particular customer sites, especially where the required bandwidth is very high.

H.83 There is more infrastructure competition to BT in the core network element of private circuits. However, BT still retains a high share, particularly on the less dense routes.

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80 Source: Oftel Large Business Panel, October 2003; results are based on a relatively small sample size (around 200).

81 Cable and Wireless, Energis, MCI, Thus, COLT were each found to have a presence in at least 18 per cent of the large corporates in the survey.

Figure 29: Mobile network share of subscribers[82]

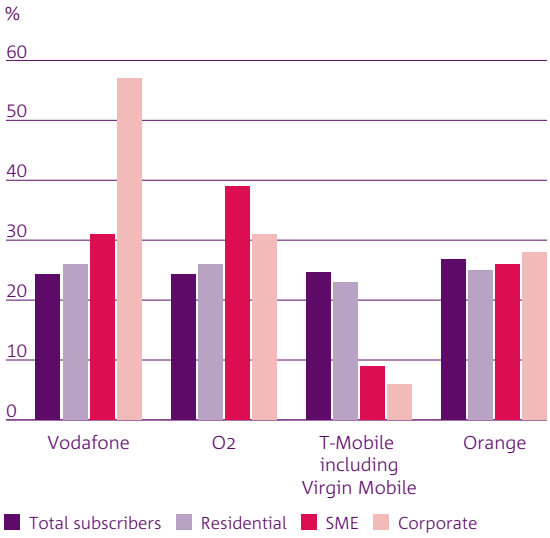


Figure 30: Comparison of mobile market shares in Europe (subscribers)[83]

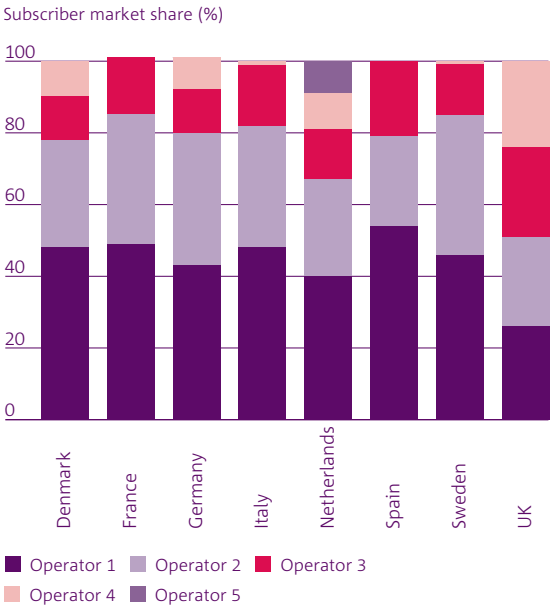
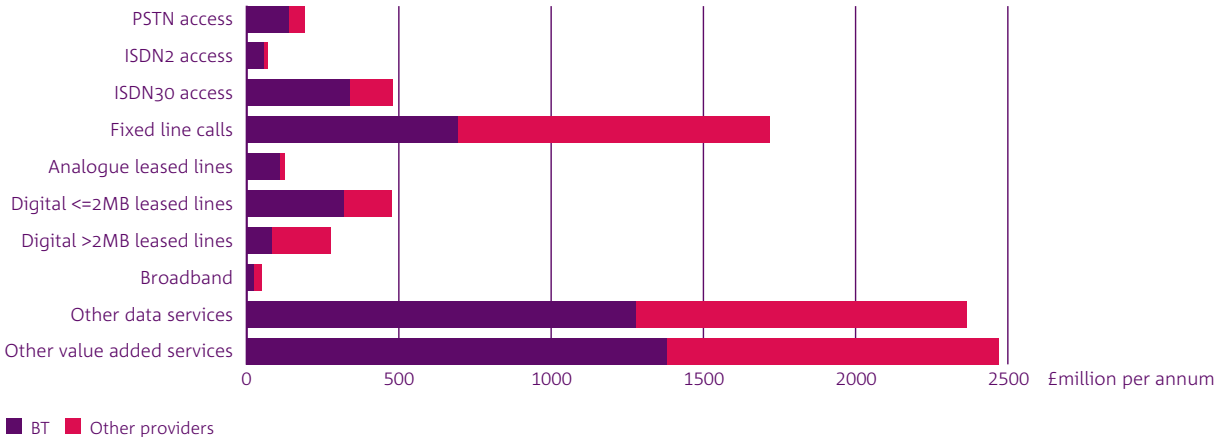


Figure 31: Share of large business telecoms revenues[84]



82 Source: Oftel research, November 2003.
83 Source: *Mobile Communications*, September 2003.
84 Source: Ofcom estimates, financial year 2002/03.

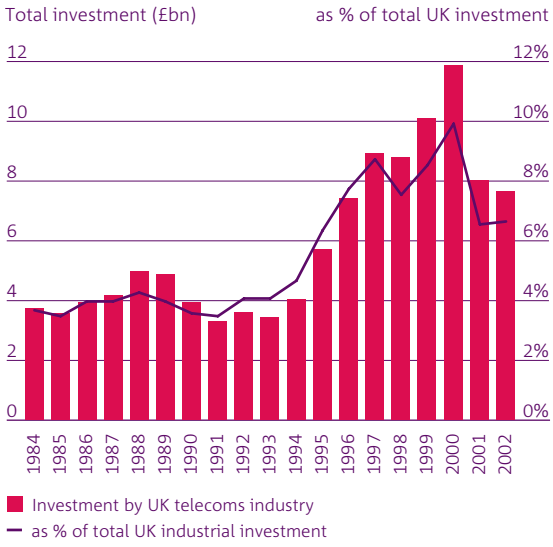
Innovation and investment

H.84 This section discusses how well the UK telecoms sector has made new products available to consumers, and the extent to which it has invested in making these products widely and rapidly available. Ofcom is not aware of any reputable studies currently available which seek to disaggregate investment by platform or type of operator. Our analysis is therefore a discursive review that does not seek to quantify actual levels of investment by category of operator, but looks at broad trends in investment in different parts of the market over time. It also considers what this has meant for innovation in the market – recognising that innovation is a very important output of a competitive market environment. This section is not intended to be a definitive account of investment patterns, nor an attempt to benchmark innovation against other countries.

Overall investment

H.85 Over the period since 1984, the UK has attracted high levels of investment in telecoms markets. At its height in 2000, annual telecoms investment stood at £11bn and accounted for over 10 per cent of total UK capital expenditure. Even with the slow-down following the fall in telecom stocks, annual capital expenditure was still almost £8bn in 2002, representing just over 7 per cent of all capital expenditure in the UK. Figure 32 shows annual telecoms investment since 1984. It is important to note that a significant proportion of this investment is made by BT.

Figure 32: Real investment by the UK telecoms industry (2002 prices)[85]



85 Source: Office of National Statistics.

The duopoly period

H.86 During the duopoly period, four major sources of investment can be identified. First, BT was undertaking the process of rolling out a digital network infrastructure, a process which was not fully completed until the mid-1990s. This was a major network investment at the time, and the retail price controls set by Oftel recognised the need for BT to complete these investments. Second, Mercury was required during the duopoly period to roll-out its own physical infrastructure, and this also necessitated significant investment. Third, Cellnet (in which BT had a majority stake) and Vodafone were rolling out their first-generation analogue mobile networks. Finally, there was investment in new equipment and services, such as value-added services and consumer premises equipment.

H.87 In terms of innovation, the introduction and development of mobile services (not just voice but also paging) was a major feature of this period. The liberalisation of the equipment market also led to many new devices, both for corporate and residential consumers, being placed on the market. Partly as a consequence of the investment made by BT in digital networks, a range of new value-added services was developed for the corporate sector, and this rate of development was stimulated by BT/Mercury competition in this sector. For residential consumers, innovation was more limited. Premium rate services were introduced to the market, and Mercury's indirect access telephony services used its 'blue button' phones.

H.88 The principal benefit of competition and regulation in this period was arguably not innovation, but improvements in quality. BT was encouraged to improve its service quality to match that of Mercury's new network.

Post-duopoly infrastructure-based entry

H.89 The decision to liberalise the market following the Duopoly Review created the conditions for a major increase both in the level of investment and the number and type of companies making this investment. Most significant were the investments made in new access infrastructure by the cable companies and by the two further newly licensed mobile networks.

H.90 Very little cable infrastructure had been built in the UK prior to the Duopoly Review, and it was the prospect of being able to offer voice telephony services alongside television which led to the growth spurt of cable networks between 1992-1997, by which time most of the cable infrastructure in place today had been completed. The investors in this wave of cable investment were predominantly US and Canadian cable or telecoms companies. The UK was considered an attractive investment opportunity. It had liberalised markets well ahead of mainland Europe and at a time when this was rare outside of North America. The regulatory regime was also considered to be conducive to such investments, partly because of the continued restriction on BT providing video entertainment services in its own right.

H.91 Equally remarkable was the investment in the two additional mobile networks, which made the UK almost unique in the existence of four complete national mobile networks. Again, the bulk of this investment was made between 1992 and 1997. The two new mobile networks were initially majority-owned and funded by the Hong Kong telco giant Hutchison Whampoa and by Cable & Wireless. Again, favourable regulation was seen as important to assist entry. One feature of this was the absence of regulation on these two providers to provide third- party access to service providers, which was maintained on the two established networks.

H.92 Other access infrastructure investment at this time included fixed wireless networks (for example, Millicom and Ionica). COLT was established and started investing in metropolitan fibre-based networks for business consumers. These developments marked a departure in that they were largely funded through capital raised on open markets, as opposed to investment from existing telcos in other territories.

H.93 The development of alternative access infrastructure appears to have been a significant stimulus to innovation. In mobile, there was significant product and service differentiation. For example, Orange differentiated itself at launch partly by offering per-second billing. Mercury offered innovative geographic and off-peak tariffs. The mobile market has since followed this initial wave of innovation with other developments such as the launch of pre-pay.

H.94 In the fixed market, cable companies adopted a variety of strategies to gain market share. Some focused on headline discounts to BT, whilst others focused on bundled tariffs combining TV, telephony and eventually internet. Ionica focused on value-added telephony features (such as call-waiting and call-minder services, and differential ring-tones). This may have acted as a stimulus to BT to launch similar services.

H.95 In the corporate sector, the development of rival access infrastructure of the kind provided by COLT, Worldcom, Cable & Wireless and others had a significant stimulus effect on the development of corporate managed networks and services.

Investment in long-distance, business-to-business and international segments

H.96 As the 1990s progressed, the investment in competing access networks was increasingly complemented by entry at other levels in the market.

H.97 The regulatory regime continued to differentiate between infrastructure and non-infrastructure operators, with only the former being eligible for cost-based interconnection. Therefore, most new entry involved constructing some level of physical infrastructure. However, this took a number of different forms. A number of overseas telcos built 'thin' UK businesses to exploit the partial liberalisation of international calls markets, because so-called International Simple Resale (ISR) operators could qualify for cost-based interconnect even if they only had a single switch in the UK. Only in a handful of cases (most notably Worldcom) did such ISR-based entry constitute a beachhead towards much more extensive business activities and extensive physical infrastructure roll-out.

H.98 An alternative form of entry was the exploitation by other utilities of their extensive private telecoms networks, ducts or rights of way, to build rival long- distance networks to that of BT. Examples of this included British Rail Telecom (BRT, later bought out by Racal and now part of Global Crossing); Scottish Telecom (now Thus, whose initial market entry used Scottish Power's extensive physical infrastructure); and Energis (which exploited the infrastructure of the National Grid). By exploiting newer transmission technologies, these operators had lower costs than BT on some services. Increasingly, they also exploited market opportunities created by Oftel regulation, notably in premium rate and national/local rate numbers.

H.99 This led to significant innovation in terms of the range and type of services offered to business and residential consumers. The revenue share formula between BT and the terminating operator introduced by Oftel for local and national rate services stimulated not only the development of a range of voice telephony services, but also the introduction of subscription-free dial-up internet access services.

H.100 With less substantial capital requirements than alternative access operators, these operators entering the market on the basis of alternative provision of business-to-business, international and long-distance services were able to make positive returns relatively quickly. As a result, a number of companies in the sector enjoyed high stock market valuations.

The 'boom and crash' period

H.101 Throughout the post-duopoly period, the evidence shows that BT continued to make high and stable profits and continued to invest in its UK businesses. In addition, BT invested in overseas markets. During the period when the market was at its peak, BT tried to consummate a global business strategy through a merger with MCI. This strategy was ultimately unsuccessful. Vodafone and Orange, on the other hand, successfully expanded beyond their core markets into other countries.

H.102 By 1997, the UK was experiencing very high levels of investment in the telecoms sector as a whole. The pattern of investment largely shifted from private sources (principally profitable businesses in other countries or sectors transferring capital into telecoms) to funding sourced from financial markets. A number of new entrants went 'public' in this phase. In addition, a new wave of consolidation in the cable sector was funded from US and European bond markets and debt financing. Cable also started to invest in digital TV and broadband technologies.

H.103 Increasingly telecoms companies emphasised the growth opportunities inherent in the rise of data services rather than voice, and in particular the predicted rise of the internet and related e-commerce business opportunities. The expected future size of the market led to a further wave of investment in additional fibre infrastructure, in terms of new fibre laid in metropolitan areas as well as further investment in long-distance and international fibre links.

H.104 As is well known, at its zenith this process led to a complete reversal of the normal financial order, with telecoms companies who had never made a profit or returned a dividend entering the FTSE 100. It was also during this period that the 3G auction led to significantly higher bids from the five successful companies than had been anticipated by the Government. With hindsight this reflected some of the same exuberance about future business prospects for data and video services.

H.105 This period resulted in a level of telecoms investment which, with the benefit of hindsight, would appear excessive. Large amounts of capital were ploughed into the sector, based on expectations of future demand that did not materialise in the timescale expected. As a result investment was wasted on surplus capacity and new ventures that failed to thrive.

H.106 The crash in telecoms, media and technology stocks in 2000 has been much discussed, and its causes extensively analysed. For our purpose, it is primarily of interest to understand how the crash affected the rate and type of investment in the market. Clearly, the effects of the crash were dramatic for a number of companies who were precipitated into financial restructuring as a result of the massive write down of asset values across the sector.

H.107 In some areas, the crash had less impact. For example, to date, there has been little exit from the market. This may reflect the fact that the assets are largely sunk, and continue to appear profitable on a forward-looking basis. Though cable companies have stopped building new infrastructure, this predated the crash by some considerable period, as noted above. Mobile companies have continued to roll-out new products, albeit that the advent of 3G services has perhaps been slower than was originally expected.

H.108 One significant victim of the crash appears to have been investment in new fixed wireless networks where they are heavily capital-intensive. For example, there was less interest than the Radiocommunications Agency expected for some of the spectrum it made available for new fixed wireless broadband networks.

New wave of investment in services

H.109 As discussed in Annex G, the period after the introduction of the EU telecoms liberalisation package in 1997 led to a switch in emphasis away from pure infrastructure competition. This in turn led to a significant increase in the range of opportunities for service provider-based competition in the market. The introduction of carrier pre-selection led to the entry of indirect access telephony suppliers. The introduction of a new wholesale line rental product in 2004 may also stimulate a shift in investment toward service-based rather than infrastructure-based competition. In the last few years, major retail companies or service organisations from other sectors, including Centrica, Carphone Warehouse, Virgin and Tesco, have moved into the telephony business. Service innovations include innovative call plans, bundling of fixed and mobile offerings, and of internet and residential telephony with other household 'utility' services. By the nature of service provision using others' networks, it is less easy to provide innovation in terms of technology-based service characteristics (e.g. bandwidth).

H.110 A similar process in relation to internet offerings has created a very significant ISP market opportunity, first in relation to narrowband services and later broadband services. Innovation in the realm of the internet can take a number of different forms. The market has moved rapidly through dial-up metered access services, to unmetered dial-up through to unmetered broadband services at a range of speeds. Innovation has also taken place at the service level in terms of service quality and the bundling of portal services and content.

H.111 On the other hand, many consider that the market structure has under-delivered certain forms of innovative services, for instance symmetrical as opposed to asymmetrical broadband services, a wider range of access speeds, and some form of metering or variable bandwidth. Noticeably, the forms of innovation which the market is said to be under-delivering tend to be those that rely on control of network elements.

Industry financial performance

H.112 The changes in the levels of prices, choice, innovation and other measures of consumer benefit have been accompanied by a very mixed financial performance by the UK telecoms industry in recent years. Assessing the performance of the telecoms industry is important to the Telecoms Review, because industry performance affects consumers and citizens in a number of ways. First, if regulation is designed on the expectation that competition will deliver certain benefits to consumers, then it is important for Ofcom to be sure that this competition is sustainable in the long run. Second, the profits that telecoms operators hope to make create an incentive for them to innovate and invest. Finally, telecoms regulation may be based on the assumption that where there is an

opportunity for operators or new entrants profitably to invest in a new opportunity, they will do so. But this expectation is crucially dependent on the availability of investment capital to the industry.

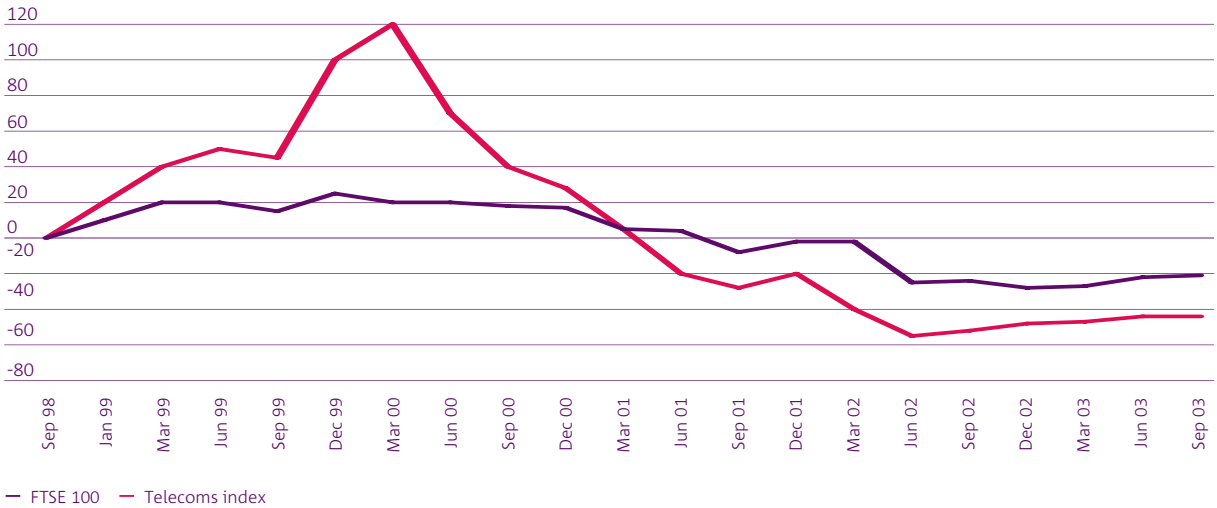
H.113 In the course of Phase 1 of the Telecoms Review, Ofcom has met with telecoms companies, equity analysts and financiers such as investment banks and venture capital funds, and has reviewed various commentators' reports on the performance of the sector. This research suggests the following conclusions, which we expand below:

- investment in the sector has been highly volatile;
- capital to the sector has gone from being abundant, to scarce, to selectively available;
- BT is profitable and cash-generative;
- many fixed alternative network operators ('Altnets') have performed weakly in recent years; and
- the established mobile operators are generally performing strongly, and the UK is prospectively one of the most competitive mobile markets in Europe.

Investment in the sector has been highly volatile

H.114 In common with telecoms markets worldwide, the UK telecoms sector experienced a period of very rapid expansion in the late 1990s. Both debt and equity capital were readily available to fund infrastructure roll-out, overseas expansion and investment in new ventures such as 3G. The result was high levels of debt among operators and emerging over-supply in many sectors of the market. Investors realised that asset prices had risen to a higher level than could be justified by future expected cash flow, and that a correction was in order. This led to a severe fall in investor confidence in the telecoms sector worldwide between 2001 and 2003. Figure 33 shows how telecoms stocks at first substantially outperformed, then underperformed, the FTSE 100 index between 1999 and 2003.

Figure 33: UK telecoms index compared to FTSE 100 performance[86]



86 Source: FT.com.

H.115 During this transition, investors changed the emphasis that they placed on the various metrics that they used to value telecoms companies, and most telecoms companies changed their corporate strategies in response. In the expansion phase, investors focused heavily on revenue growth and prospects for future revenue growth. As a result, many telecoms companies rolled out networks aggressively, and pursued strategies designed to deliver market share growth at the expense of short-term profitability. Following the collapse in stock prices, the focus of many investors changed. The new focus was on short-term profitability and cash generation through cost reduction and organic revenue growth. Citigroup noted in 2003 that, "with sluggish top-line growth or even decline, operators continued to focus on cost control and cash generation in 2003".[87] Telecoms operators have not been heavily rewarded by the market for the growth potential of new ventures, such as investment in new technologies or expansion into new market segments. Deutsche Bank commented in early 2004 that "pre-mature investment in technology may not pay off".[88] As a result, many telecoms operators have abandoned loss-making business development activities which were not yet cash positive. For example, Energis abandoned its European expansion plans, and Cable & Wireless has divested its US and certain other overseas operations.

Capital to the sector has gone from being abundant, to scarce, to selectively available

H.116 Rapidly falling share prices meant that equity capital became very expensive for most telecoms operators in 2001and 2002, because of the effect on the dilution of existing shareholders' equity of raising a given sum of money via equity finance. Many operators had also accumulated high levels of debt in the preceding years, which, combined with higher gearing as equity values fell, resulted in many operators' credit ratings deteriorating rapidly, as shown in Figure 34. Debt finance therefore became very expensive.

H.117 The sudden unavailability of capital had a number of impacts on telecoms operators in the UK and elsewhere between 2001 and 2003. These included:

- freezes on non-essential capital expenditure. As Morgan Stanley noted in July 2003, "Operators have completed their network roll-out and are focusing on improving network utilisation. Most suggest that over 75 per cent of their capex is incrementally customer or revenue generating."[89]
- divestment of non-essential assets. For example, BT sought to reduce its debt by divesting BT Cellnet, Yell, a number of overseas investments and much of its UK property portfolio.
- debt restructuring. Some UK operators (for example, ntl and Energis) effectively went into the hands of debt holders, leaving equity holders with little or nothing.

87 Source: Citigroup, *2003 Global Telecom Review*.
88 Source: Deutsche Bank, *Telecoms Primer* 2004.
89 Source: Morgan Stanley, *Telecommunication Services – UK Wireline*, July 2003.

H.118 While many operators have reduced or restructured their debts and have stronger balance sheets, the lack of capital availability has remained a feature of much of the market. For example, Credit Suisse First Boston estimates that there was a net outflow of capital of around €5bn from the European telecoms industry last year in the form of dividends and share buy-backs. Telecom Italia's strategy of investing in DSL in other European markets was received negatively by the market.[90]

H.119 We understand that the current situation can be characterised as a selective availability of capital. There are signs that debt finance, including high yield debt, may now be available for established players, with proven business models, who are rolling over debts or funding organic growth. But debt appears not to be flowing to new entrants or to be funding higher risk new ventures. There appears to be some appetite for such new ventures in equity markets where the ventures' Fundamentals are strong. For example, Iliad, an ISP and unbundled local loop operator in France, raised €94.5m in an Initial Public Offering (IPO) in January that valued it at €871m.[91]

Figure 34: Telecoms operator credit ratings[92]

	1999	2000	2001	2002	2003
BT	AA+/Stable	A/Neg	A-/Neg		A-/Stable
C&W		A/Stable	A/Neg	BBB+/Neg (Nov)	BB/Neg
COLT	B/Stable	B+/Stable	B+/Stable	B-/Stable (Nov)	
Energis	BB-/Stable	BB-/Stable	BB-/Stable	D (ratings withdrawn in Aug)	
mm02			BBB-/Stable		BBB-/Stable
ntl	B/Watch Pos	B+/Pos	B-/Neg	D (from CCC-) in April	
Telewest	BB-/Stable	BB-/Stable	BB-/Stable	CC then SD	
Vodafone		A/Stable	A/Stable		A/Stable

90 Source: CSFB.
91 Source: Reuters, January 2004.
92 Source: Standard & Poors.

BT is profitable and cash-generative

H.120 Figure 35 summarises BT's financial performance since 1998. It shows how BT's group revenues grew rapidly between 1998 and 2001, and then declined between 2001 and 2003. Its Earnings Before Interest, Tax, Depreciation and Amortisation (EBITDA) remained fairly constant through this period, though as revenues rose the EBITDA margin fell to 21 per cent in 2001 following a margin of over 35 per cent in the late 1990s. Through 2001, BT focused on cash generation and carried out a programme of debt reduction, including a rights issue in May 2001. In June 2003, BT stated[93] that its strategy was focused on defending its core activities and achieving profitable and organic revenue growth. By 2003, its EBITDA margin had recovered somewhat to nearly 29 per cent.

Many Altnets have performed weakly in recent years

H.121 Many companies in the fixed Altnet sector were particularly affected by the change in investor sentiment. Many had invested heavily in rolling out networks in the late 1990s. As discussed above, heavy debts and high capital constraints led some operators to restructure their debts.

H.122 Where Altnets have restructured their debts, they have emerged with stronger balance sheets and less immediate debt repayment schedules. In July 2003, Morgan Stanley commented that "all of the carriers have now completed their restructuring programmes with a significantly improved balance sheet and cost structure. Several suggested that, with their new financial and operating position, they are closer to efficient scale."[94] Many Altnets have indicated that their focus is on improving operating margins and improving cash generation through a combination of organic revenue growth, cost savings and freezing non-essential capital expenditure.

H.123 Though the operating performance of most Altnets is improving, their ability to return operating profits (even if the historic investment in the network is regarded as sunk) is mixed. Figure 36 shows the financial performance of some of the larger Altnets since 1998.

Figure 35: BT group financial performance, 1998 to 2003[95]

£ billion	1998	1999	2000	2001	2002	2003
Revenue	16.0	18.2	21.9	29.7	24.6	20.2
EBITDA	6.1	6.4	6.4	6.3	6.0	5.8
EBITDA margin (%)	37.8%	35.1%	29.4%	21.3%	24.3%	28.8%
Net profit	1.7	3.0	2.1	(1.8)	1.0	2.7

93 Source: BT press release, June 2003.
94 Source: Morgan Stanley, *Telecommunication Services – UK Wireline*, July 2003.
95 Source: Analysys.

Figure 36: Fixed Altnet financial performance, 1998 to 2003 (£ million)[96]

THUS

	1998	1999	2000	2001	2002	2003
Revenue	113	166	217	234	268	291
EBITDA	11	27	14	-21	3	27
EBITDA margin %	0	0	0	0	0	0
Net profit	n/d	-3	-57	-66	-104	-59

Energis

	1998	1999	2000	2001	2002	2003
Revenue	168	286	494	840	694	770
EBITDA	16	50	92	142	82	103
EBITDA margin %	0	0	0	0	0	0
Net profit	-50	-30	-41	-98	n/d	n/d

COLT (Global)

	1998	1999	2000	2001	2002	2003
Revenue	215	402	687	906	1030	1166
EBITDA	-5	-1	27	26	72	163
EBITDA margin %	0	0	0	0	0	0
Net profit	-56	-101	-117	-360	-718	-125

MCI (Global)

	1998	1999	2000	2001	2002	2003
Revenue	11333	23794	25057	22234	13451	
EBITDA	788	7846	8352	5934	n/d	
EBITDA margin %	0	0	0	0	n/d	
Net profit	-1711	2570	2660	2585	n/d	

Global Crossing (Global)

	1998	1999	2000	2001	2002	2003
Revenue	272	955	2429	2313	1966	
EBITDA	-12	n/d	-10	n/d	-187	
EBITDA margin %	0	n/d	0	n/d	0	
Net profit	-56	-45	-1070	-14150	412	

C&W (Global)

	1998	1999	2000	2001	2002	2003
Revenue	7000	7940	9200	8100	5910	4390
EBITDA	2390	2730	2390	1780	484	334
EBITDA margin %	0	0	0	0	0	0
Net profit	1290	910	3720	2630	-5030	-6530

C&W (UK)

	2003
Revenue	1728
EBITDA	110
Operating profit	-303

96 Source: Analysys. Notes: Data for COLT, MCI, Global Crossing and C&W is group financial performance, including operations outside the UK. C&W data, for the UK only, is available only for 2003. MCI and Global Crossing data has been converted from US dollars to pounds sterling using Purchasing power parity exchange rates.

H.124 As a result, many commentators predicted consolidation in the sector, and exit of some of the weaker players from the market. For example, as Kingston Communications noted in July 2002, in its memorandum to the Joint Committee of the draft Communications Bill,[97] "however, the future for the sector is not as secure as it could be. The overall downturn in market sentiment with respect to telecoms has meant that most 'altnets' have been unable to continue investment in their networks. The collapse of many 'dotcoms', and a general slackening of demand in the market, has led to a rapid slowing down of growth for many 'altnets'. This in turn has triggered a continuing wave of consolidation across the industry, with some business failures, as excess capacity has been squeezed out of the market."

H.125 To date, however, this trend has not been as extensive as many predicted. This might be because managements were focused on turning around their own businesses and not on acquisition and subsequent integration, or because owners of potential acquisition targets were reluctant to sell at the bottom of the market.

The established mobile operators are generally performing strongly, and the UK mobile market is prospectively one of the most competitive in Europe

H.126 Despite the high levels of infrastructure-based competition in the mobile sector, the four established network operators are profitable and cash positive. Figure 37 shows an estimate of the performance of the UK businesses of the four established mobile operators.

H.127 Oftel has calculated the return on capital employed (ROCE) of the four established operators, as shown in Figure 38. It reveals substantial variation across the sector, and solid returns on capital by Orange and Vodafone.

H.128 The UK mobile market is prospectively one of the most competitive in Europe. It has five network operators, and Oftel found that no operator has SMP in the market for calls and access. It also has emerging service provider competition from non-network based operators such as Virgin, Tesco, OneTel and BT.

97 Source: Kingston Communications response to the public consultation on the draft Communications Bill, July 2002

Figure 37: Incumbent mobile operators' financial performance, 1998 to 2003 (£ millions)[98]

Vodafone (UK)						
	1998	**1999**	**2000**	**2001**	**2002**	**2003**
Revenue	1700	2100	2950	3460	3760	4030
EBITDA	n/d	n/d	934	1070	1290	1540
EBITDA margin %	n/d	n/d	32%	31%	34%	38%
Net profit	564	643.2	n/d	n/d	n/d	n/d
Orange						
	1998	**1999**	**2000**	**2001**	**2002**	**2003**
Revenue	866	1717	3012	3820	4264	
EBITDA	n/d	272	543	916	1288	
EBITDA margin %	n/d	16%	18%	24%	30%	
Net profit	-70	26	n/d	n/d	n/d	
O_2 (UK)						
	1998	**1999**	**2000**	**2001**	**2002**	**2003**
Revenue	1090	1400	2200	3030	2760	3030
EBITDA	n/d	n/d	591	554	670	837
EBITDA margin %	n/d	n/d	27%	18%	24%	28%
Net profit	154	166	n/d	n/d	n/d	n/d
T-Mobile (UK)						
	1998	**1999**	**2000**	**2001**	**2002**	**2003**
Revenue	392	559	2060	2319	2803	
EBITDA	n/d	n/d	29	385	591	
EBITDA margin %	n/d	n/d	1%	17%	21%	
Net profit	-90	-125	n/d	n/d	n/d	

Figure 38: Return on Capital Employed of UK mobile network operators[99]

	1997	**1998**	**1999**	**2000**	**2001**	**2002**
Vodafone		92%	76%	53%	50%	45%
O2		20%	12%	9%	8%	9%
T-Mobile			-23%	-35%	-17%	not available
Orange	-7%	5%	5%	10%	18%	25%

98 Source: Analysys estimates. Orange and T-Mobile data converted from euros using purchasing power parity exchange rate.

99 Source: Oftel market review consultation document *Mobile access and call origination services market*, August 2003.

Annex I

Trends in consumer demand

Annex I

Trends in consumer demand

I.1 Understanding trends in consumer demand for telecoms services is very important for the Telecoms Review, for two reasons. First, the behaviour of consumers shapes the structure of the telecoms industry. For example, sustainability of competition in voice telephony depends upon consumers' propensity to switch suppliers if a cheaper or better alternative is presented to them. Second, information about what consumers value helps Ofcom to understand what a successful outcome for the telecoms sector might be. For example, if consumers care more about accessing new services than they do about prices, then this helps inform the preferred position on the trade-off between allocative, productive and dynamic efficiency discussed in Section 4 of the Phase 1 consultation document.

I.2 In Phase 1 of the Telecoms Review, Ofcom has drawn from existing Oftel market research and other secondary data sources (including findings from consumer behaviour analysts), and has also commissioned some preliminary research into the behaviour of telecoms consumers. This research has identified a number of trends in consumer demand, which are discussed in this annex. In Phase 2, we will be carrying out more detailed research to investigate these trends further. In the meantime, we are interested to hear the opinions and evidence of stakeholders on these and any other trends in consumer demand.

I.3 By 'consumer' Ofcom means any end user of telecoms. There are many different types of consumer that might be distinguished. For simplicity, we have divided consumers into three groups; residential customers, small and medium sized enterprises (SMEs), and large corporate customers. We have identified a number of trends for each of these categories of consumer. As Figure 39 shows, just under half of consumer spending on telecoms is by residential consumers, around a third of spending is by large corporate consumers, and the rest is by SMEs.

Figure 39: Consumer telecoms spending[100]

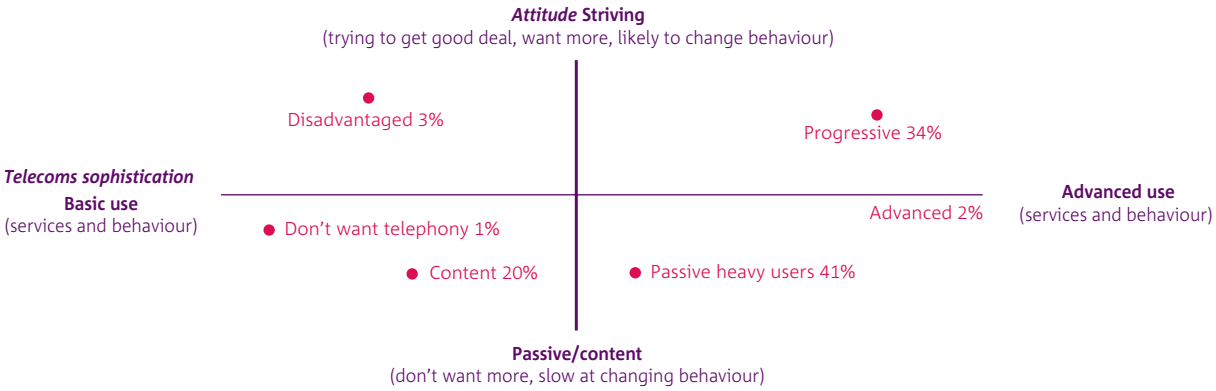
I.4 The principal trends that Ofcom's research has identified for each of these three groups of consumers are outlined below.

Residential consumers

I.5 As in other markets or categories, there are different types of residential telecoms consumers, with very different needs and attitudes to telecoms. For example, in research conducted by Oftel in 2001/02, residential consumers were segmented along the dimensions of (1) the degree of sophistication of the telecoms services that they used, and (2) how proactive their attitude was towards telecoms. The results are shown in Figure 40.

100 Ofcom market intelligence estimates. Figures are nominal.

Figure 40: Classification of residential telecoms consumers[101]



Summary of consumer profiles
Base: 8404 UK residential consumers, 2001/02

I.6 The research found that 34 per cent of residential consumers were 'progressive'. They consumed an above average mix of internet, mobile, digital TV and other technological services. Cost and quality were equally important to them, and they tended to want the best, rather than the cheapest deal. They tended to be younger to middle-aged, often families, and typically with slightly higher than average incomes. In contrast, 20 per cent of residential consumers were 'contented'. These consumers were basic and light telecoms users, typically having either a fixed or a mobile phone and had no interest in using anything else. They tended to be middle-aged or older, often living alone, and often living in urban areas with lower than average incomes. These consumers were typically unlikely to contemplate switching telecoms suppliers, either because they were satisfied with their telecoms service, or because they were light spenders and did not consider the savings to be worthwhile. Forty-one per cent of residential consumers were 'passive heavy users', meaning that they were fairly sophisticated in the services that they used, but they were unlikely to go to the effort of switching telecoms provider.

I.7 In recent years residential consumer choice, in terms of both services and suppliers, has increased dramatically. Partly as a consequence of this, the behaviour of residential consumers has become increasingly difficult to predict. Rather than consumers just responding to services marketed to them by operators, take-up of some telecoms services (such as text messaging and peer-to-peer file sharing) has been largely driven by consumers. In contrast, take-up of services such as WAP, which many expected to be popular, has been well below expectations.

101 Oftel research analysis, 2001/2002.

I.8 In spite of the variety of residential consumers, and the difficulty in predicting their behaviour, we have identified five trends in residential consumer demand from the research we have available so far. These are:

- time and energy are becoming as important as money;
- increasing requirements for connectivity any time, anywhere;
- increasingly personal use of telecoms;
- increasing demand for customisable, transparent bundles of services; and
- increasing demand for bandwidth.

Time and energy are becoming as important as money

I.9 Residential consumers use multiple 'currencies' in making decisions about what to do. They consider how much effort it will take to do something like choose a different telecoms supplier, as well as how much it will save them. Research conducted by the Henley Centre has shown that many people in their everyday lives balance time and energy against monetary gains.

I.10 This trend towards placing a high value on time and effort is accompanied by consumers experiencing an apparent 'information overload'. For example, the amount of entertainment content, non-solicited communications ('spam') and other information has increased substantially. The Henley Centre found that about half of consumers say they do not have the energy or time to use the information that they already have. This finding is also consistent with research published by Oftel, which showed that while consumers were aware that they could make some savings in telecoms expenditure by switching supplier, they chose not to do so because of the effort involved.[102] In telecoms, the right tariff for any one individual depends upon their pattern of usage, and there are many more tariff permutations than exist with utilities such as electricity and gas, and therefore finding the most suitable tariff takes more effort.

I.11 The trend towards valuing time and energy more highly is particularly important for two reasons:

- consumers might be less likely to switch between telecoms suppliers because of the effort involved in identifying the best offer and making the switch, even if by doing so they will save some money; and
- the cost of time and effort is a criterion in the choice of suppliers, as well as in the decision to switch. Consumers want to use suppliers who will provide a trouble-free service. Ofcom's focus groups found that consumers are increasingly frustrated by the customer service experience, citing queues, cost of calling, call menu systems and overseas centres.[103]

I.12 Research by the National Audit Office (NAO)[104] in summer 2002 supported these findings. It showed that consumers cared more about reliability and service than cost of telecoms, and many were unlikely to switch suppliers due to the effort involved. Figure 41 summarises the findings of this research.

I.13 This trend could imply a need for published, authenticated information about telecoms services, which includes measures of customer service performance, and therefore makes the switching decision easier. Oftel found that although two in three residential consumers were aware of having a choice of telephony suppliers, only a minority were aware of the Comparative Performance Indicators (CPIs) that telecoms companies publish.[105] The NAO[106] research supported this conclusion, and found that four in five consumers could not name any indirect access telephony suppliers.

Increasing requirements for connectivity any time, anywhere

I.14 Increasingly busy lifestyles and the ubiquity that mobile telecoms offers mean that consumers have increasing expectations of being able to access any aspect of their life at any time. For example, they wish to keep in touch with work life while at home, or home life while at work, using a variety of devices and networks. They expect these devices and networks to operate together in a seamless manner.[107]

102 *Measuring potential consumer savings*, Oftel, April 2003.
103 Source: Ofcom qualitative research, January 2004.
104 Source: *Helping consumers benefit from competition in telecommunications*, National Audit Office, July 2003.
105 Source : Oftel residential consumer research, November 2003.
106 Source: *Helping consumers benefit from competition in telecommunications*, National Audit Office, July 2003.
107 Source: Henley Centre.

Figure 41: Findings of the National Audit Office survey of residential consumers (September 2002)

Most people spend less than £100 per quarter on their fixed line telephone services

- 42% spend less than £50, 43% spend between £50 and £100 and 15% spend over £100.

Service is more important to people than cost

- Having a reliable service and having problems satisfactorily dealt with were 'essential' or 'very important' to nearly 90% of respondents.
- The convenience of contacting others, and others being able to contact you were 'essential' or 'very important' to over 80% of respondents.
- The ability to control expenditure, and the cost incurred each time others were called, were 'essential' or 'very important' to around 70% of respondents.

Poor service would motivate many people to change their telephone company

- About six in ten respondents said they would be 'highly likely' or 'fairly likely' to change the company providing their home fixed line telephone if they had problems making or receiving calls.
- Nearly two in ten said they were 'highly unlikely' to change, particularly retired people and those in social groups DE.

Savings would also motivate many people to change their telephone company, but even substantial savings would not motivate a substantial proportion of consumers to change

- 32% of consumers would be 'fairly' or 'highly' likely to change for a saving of 10%; 53% of consumers for a saving of 25%; and 68% for a saving of 40%.

In the last two years, most people have made no changes to their home telephone service

- nearly seven in ten respondents had made no changes to the way they buy their residential fixed line telephone service in the last two years. Only one in ten had changed or added to the companies that they use.

People said that making changes to telephone services has been easy in the last two years

Many people were not aware of indirect access suppliers

- Four in five respondents were not able to name a single indirect access supplier.

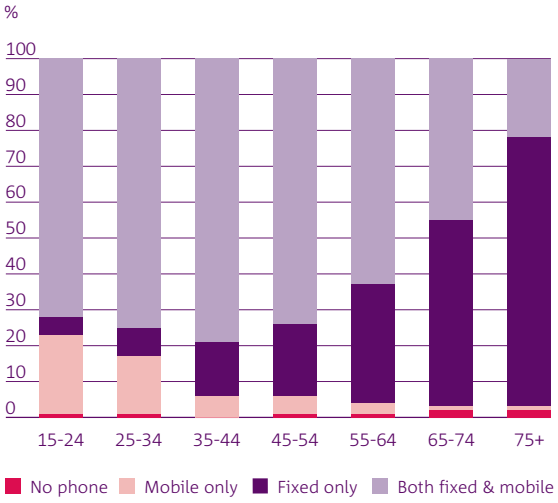
I.15 Consumers increasingly use SMS as an additional communication tool, as it offers the ability to communicate in previously 'inappropriate' situations, such as the office or lecture rooms. There also appears to be some demand for 'on the move' entertainment services and remote access to email and voice messaging.[108]

I.16 In 2002, the Henley Centre found that the majority of the population claim to be 'always reachable' via their mobiles. However, this masks substantial differences between consumers. As Figure 42 shows, many older consumers do not have a mobile phone. Among those that do, many still regard it as primarily for 'emergency' use.[109]

108 Source: Ofcom qualitative research, January 2004.

109 Source: Henley Centre research, *Planning for consumer change*, 2001.

Exhibit 42: Telephony penetration by age group[110]



I.17 This trend is important for two reasons. First, it implies a need for interoperability between networks and devices. Consumers will value a telecoms industry that delivers devices which work seamlessly across access networks. Second, it raises the prospect of a group of residential consumers, primarily older people, whose consumption of telecoms services is increasingly divergent to the mainstream. It is important that telecoms regulation takes account of the requirements of each of these increasingly diverse categories of consumer.

Increasingly personal use of telecoms

I.18 Consumption and purchase of telecoms services is increasingly personal, rather than being household or workplace-based.[111] At its simplest level, this is a function of increased mobile penetration – because mobile handsets are typically owned by individuals, not by households. However, there is also a trend towards consumers wanting a more personal experience from suppliers, and towards consumers wanting to put themselves more in control of editing, creating and personalising media content.

I.19 The personalised experience consumers want from suppliers encompasses all aspects of the supplier-consumer relationship – for example, the bundles of services consumers take, the user interface, the menus and address books, the tariffs they use and the layout of their bill.

I.20 There are a number of examples of the trend towards consumers wanting to put themselves more in control of personalising media content. The growth of ring tones is one example. Another is the rising demand for services, such as Lycos and Yahoo, which store personal preferences and deliver the right content or service to individuals at the right time. Self-scheduling and self-creation of digital content are also increasingly common. For example, digital camera penetration is growing very rapidly.

I.21 This trend is important because of the opportunities it creates for telecoms suppliers. On the positive side, it creates opportunities for innovative products around customisable services – for example, online storage of digital photos, or musical dial tones. On the negative side, it creates opportunities for suppliers to 'lock in' customers and discourage switching, because of the time and effort consumers would have to spend customising the service from a new supplier (for example, by entering names into a new address book in a mobile phone). Although an element of switching costs (for example, the time involved) is unavoidable, and operators' need to recover costs incurred in supplying the customer should be borne in mind, switching barriers should not be permitted to inhibit effective competition.

Increasing demand for customisable, transparent bundles of services

I.22 Ofcom's research suggests a tension in consumers' attitudes to bundles of services. On the one hand, they increasingly value the simplicity of having fewer supplier relationships, particularly where they would have to deal with multiple suppliers and potentially with 'buck-passing' between suppliers of related products when problems occur. On the other hand,

110 Source: Oftel research, 2003.
111 Henley Centre research, *Planning for consumer change*, 2001.

they want to be in control of content, supplier choice and cost.[112] Bundles of services often do not deliver this control because they make it hard for consumers to compare between suppliers, and because they sometimes oblige consumers to buy services they do not want as part of the bundle.

I.23 Residential consumers' purchase of different services (for example, television, internet and mobile) is often associated with different 'mental wallets'.[113] For example, Ofcom's focus groups found that bundling television and telecoms services is unnatural to many who do not intuitively 'link' the two services, though they may well buy such a package if they want both services. While some consumers responded to marketing of bundled fixed telecoms deals with multi-channel TV by switching from BT to cable operators,[114] this may have been driven more by a desire for cable rather than satellite TV as opposed to a desire for a bundled TV-telecoms package.

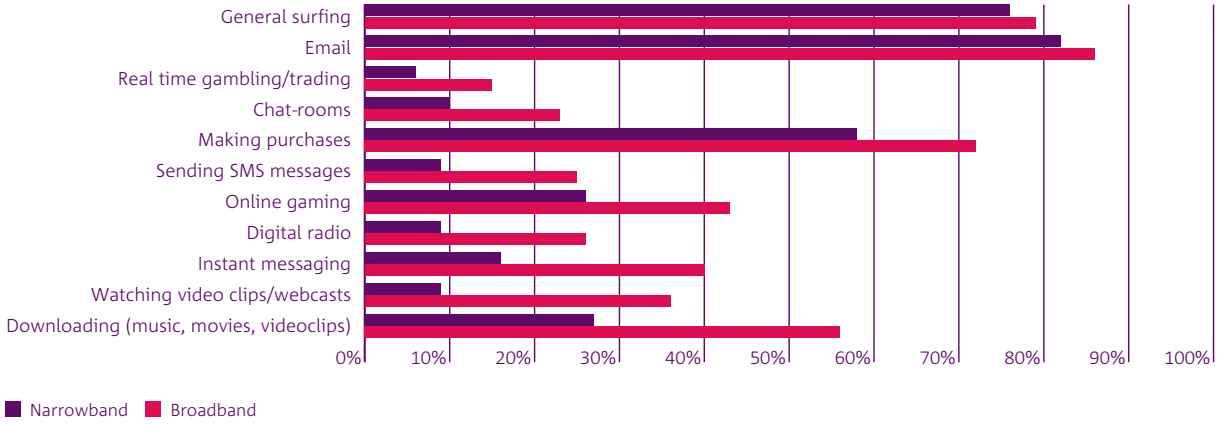
I.24 Many product bundles make the purchase decision more difficult, not easier, for consumers. Some residential consumers find comparison between suppliers difficult when tariffs are bundled, sometimes because suppliers bundle services in a complex way which makes their individual prices opaque. This difficulty in comparison makes the purchase decision complex for consumers, and may discourage switching between suppliers because of the extra time and effort involved.

I.25 This trend is important because of what it implies about what many residential consumers might like a well-functioning telecoms market to deliver. They might value the simplicity that bundles provide. But they might like bundles to be customisable (so that they included only the services that are desired, and none that are not), and to have minimum standards of clarity to enable comparison between different bundles.

Increasing demand for bandwidth

I.26 As discussed in Annex H, residential broadband penetration now stands at a fifth of homes with internet,[116] penetration has been increasing rapidly, and is yet to show signs of slowing. Oftel found that nine in ten broadband adopters had previously used a slower (narrowband) internet connection. Of these, eight in ten agreed that they were unhappy with their previous connection speed and that broadband offered the minimum speed they required.[117] As Figure 43 shows, residential consumers who have upgraded from narrowband to broadband tend to use many more on-line services, and in particular more 'bandwidth-hungry' applications.

Figure 43: Applications used, by connection type[117]



112 Source: Ofcom qualitative research, January 2004.
113 Source; Henley Centre, *Planning for consumer change*, 2003.
114 Source: Oftel Research, November 1995.
115 Source: Oftel Research, November 2003.
116 Source: Oftel residential consumer research, August 2003.
117 Source: Oftel residential research, August 2003.

I.27 However, it is important to bear in mind that around 50 per cent of residential consumers do not have any internet access at home at all. Of these, Oftel found that around two-thirds were not interested in getting it, mainly due to lack of interest, need or understanding. Interest in having the internet at home is strongly correlated with age group. As Figure 44 shows, current internet penetration and future interest is significantly lower among the over-55s, with the lack of easier home PC ownership a barrier for many. Therefore, increasing demand for bandwidth is by no means universal among residential consumers.

I.28 This is important because it implies that there is likely to be further divergence in residential consumers in the future. On the one hand, younger consumers with internet access may migrate to broadband and start using the internet in new ways. On the other hand, many older consumers may remain without any internet access at all. Regulation needs to consider the needs of both of these groups.

SMEs

I.29 SMEs make up just over a quarter of consumer telecoms spending. As Figure 45 shows, roughly half of their spending is on fixed telecoms, but this is declining both as a proportion of the total, and in absolute terms.

I.30 Ofcom has identified a number of trends in the SME market, based on earlier Oftel research. To some extent, the trends in behaviour of SME consumers are similar to those of residential ones. SMEs typically use the same set of services – fixed voice services, internet access and mobile. They similarly value time and effort highly, often because they have more productive ways of spending their time. The trends in SME consumer behaviour are:

- time and energy are becoming as important as money (as for residential consumers);
- desire for streamlined purchasing options;
- increasing requirements for connectivity any time, anywhere (as for residential consumers); and
- increasing demand for bandwidth (as for residential consumers).

I.31 Where these trends are substantially different to those for residential consumers, they are set out below.

Desire for streamlined purchasing options

I.32 Oftel's research[118] indicated that being able to source all telecoms services from a single supplier was an important requirement for many SMEs, with 82 per cent citing the importance of this in their purchase decision. Three-quarters claimed the availability of a single bundle for all required services was important in their choice of supplier. The results of this research are illustrated in Figure 46.

118 Source: Oftel SME research, November 2003.

Figure 44: Internet penetration by age group[119]

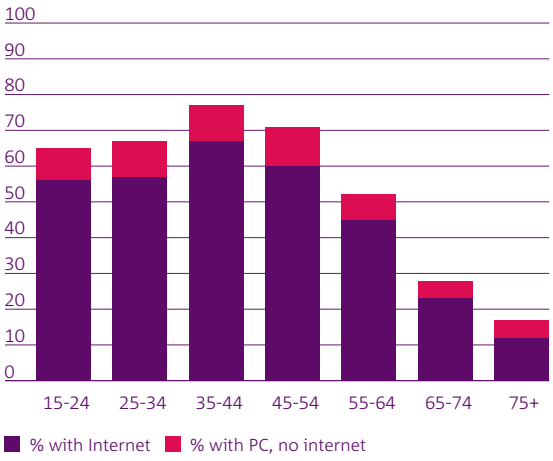


Figure 45: SME consumers' spend on telecoms[120]

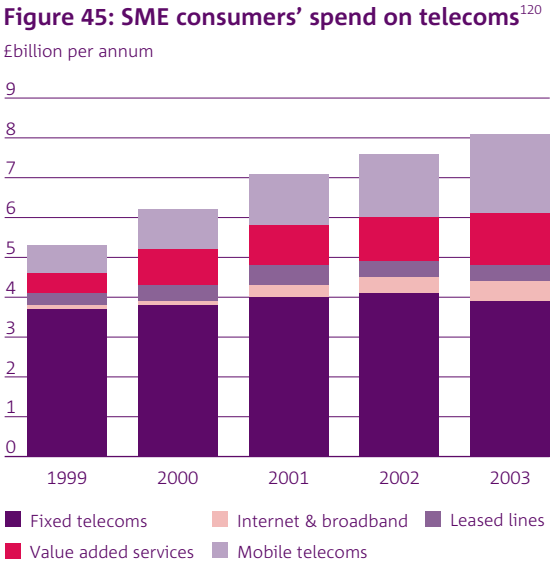
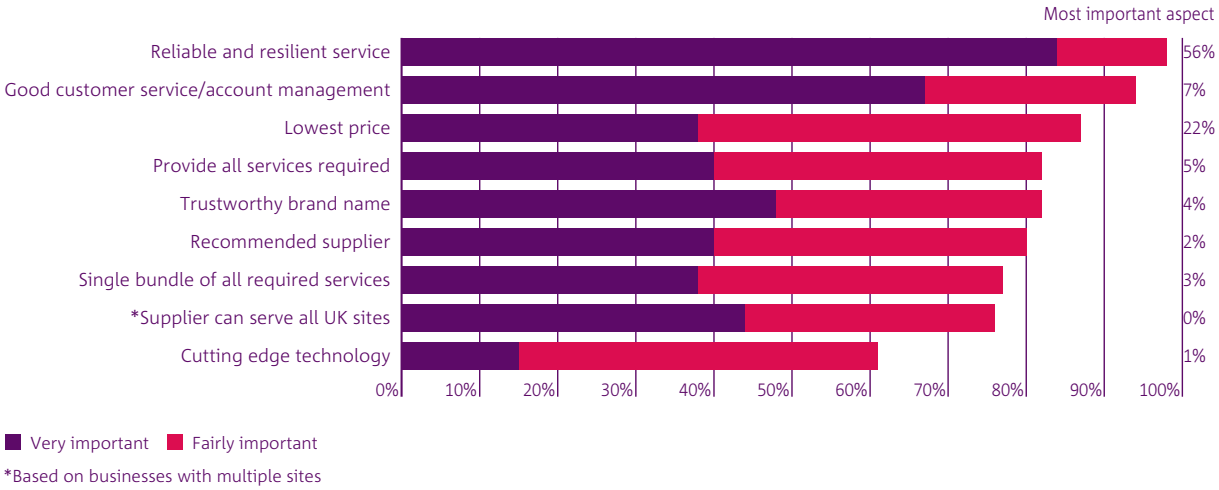


Figure 46: Importance of attributes when choosing a telecoms supplier[121]



*Based on businesses with multiple sites

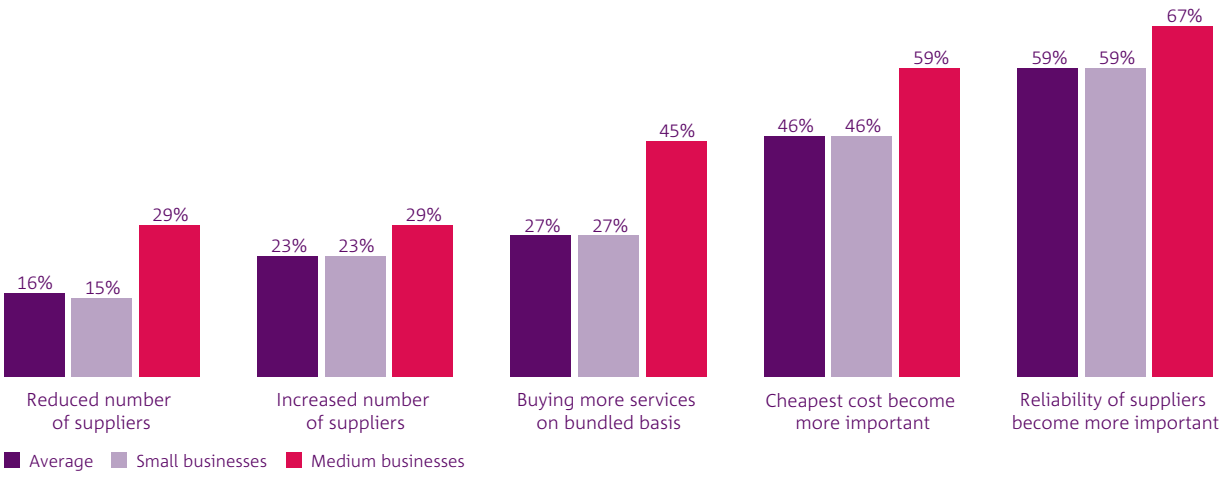
119 Source: Oftel residential research, November 2003.
120 Source: Ofcom market intelligence. Figures are nominal.
121 Source: Oftel SME research, November 2003.

I.33 That said, the same research found that slightly more SMEs had increased the number of suppliers they used than had reduced it. However, this is likely to be due to the impact of the greater range of telecoms services consumed over the last ten years. There are indications of businesses buying more services on a bundled basis, particularly among medium sized businesses. Forty-five per cent of medium sized businesses claimed to be buying more services in this way (see Figure 47).

I.34 This trend is important because it implies that in order to compete, suppliers need not only to be price competitive, reliable and offer good customer services, but for many customers they also need to be able to bundle together different products too. Therefore suppliers offering a single type of telecoms product (for example, internet access) may be at something of a disadvantage.

I.35 This trend may also decrease SMEs' propensity to switch between suppliers. As suppliers provide more services, the disruption caused by a change in supplier, and therefore the effort in making the change, is likely to be greater.

Figure 47: Changes in telecoms purchasing and decision-making in the past ten years[122]



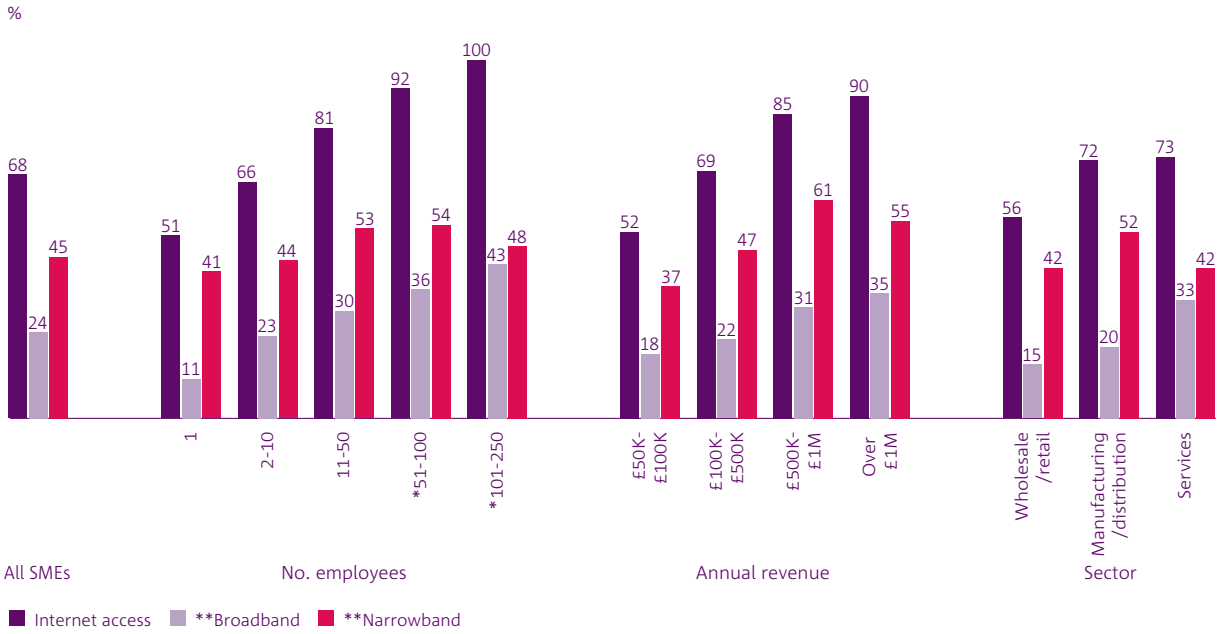
122 Source: Oftel SME research, November 2003.

Increasing demand for bandwidth

I.36 The internet has become an essential business tool for most SMEs. Sixty-eight per cent of SMEs are currently connected to the internet, with penetration higher amongst medium businesses (97 per cent) than small (67 per cent).[123]

I.37 Currently, a third of businesses with internet access claim to use broadband, with usage increasing according to business size, as shown in Figure 48. There is evidence that this is an ongoing trend. For example, one in five SMEs claim they are likely to consider switching to broadband at current prices.[124] As businesses have upgraded to broadband, business penetration of narrowband internet has fallen.

Figure 48: Internet, broadband and narrowband penetration among SMEs[125]



* Base sizes less than 100, so results should be treated as indicative

** Totals do not add up to Internet penetration as some businesses use more than one connection method, or another form of high speed access such as leased lines.

123 Source: Oftel SME research, November 2003.
124 Source: Oftel SME research, November 2003.
125 Source: Oftel SME research, August to November 2003.

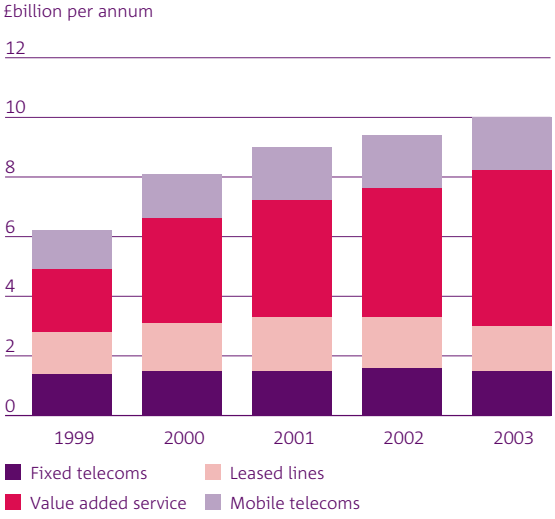
I.38 Connection speed is overwhelmingly the biggest influencing factor in SMEs' decisions to obtain broadband. In Oftel's research, this feature was mentioned by eight in ten (78 per cent) of SMEs using broadband that had upgraded from narrowband. Similarly, this aspect was also mentioned by six in ten SMEs using broadband that had not previously been connected.[126] Connection speed is also the reason most frequently given by businesses considering upgrading from narrowband.

I.39 This trend is important because it suggests that the internet is becoming an ever more important tool for SMEs, and that they are using it more as a result. Ability to access broadband, and the price and performance of the broadband connection, are likely to be increasingly important determinants of SMEs' competitiveness.

Large corporate consumers

I.40 Large corporate consumers have a very different mix of telecoms spending to residential and SME consumers. As Figure 49 shows, their spending is dominated by value-added services – tailored, bespoke network solutions that interface with the customers' IT systems.

Figure 49: Large business telecoms spend[127]



126 Source: Oftel SME research, November 2003.
127 Source: Ofcom market intelligence. Figures are nominal.

I.41 Ofcom's research indicates three key trends in large corporates' use of telecoms:

- increased complexity of telecoms requirements;
- purchasing from fewer suppliers; and
- new trends in IT causing demand for greater bandwidth.

Increased complexity of telecoms requirements

I.42 Telecoms provide the network infrastructure over which large corporates' increasingly complex IT systems run. Because networks need to be optimised for, and to interface with, these IT systems, large corporates increasingly do not have the network design or management skills in-house. Therefore, there is a trend towards purchasing bespoke managed network solutions from telecoms providers. This is reflected in the substantial increase in the spend on value-added services shown in Figure 49.

I.43 Because of this, the decision-making point in large corporate buyers is changing. Traditionally, voice telecoms services were purchased by companies like any other essential, but non-strategic resource. The purchase decision has traditionally been made by the procurement department based on considerations of price and quality, and it was relatively easy to switch suppliers if performance was poor. Due to the need to interface with IT systems, the whole telecoms purchase decision is increasingly made instead by Chief Information Officers (CIOs).

I.44 This trend towards increased complexity is important for a number of reasons. First, it is harder for corporate customers to switch suppliers. Bespoke systems designed for a particular company are expensive for rivals to replicate or to upgrade. Even if they can do so (for example, by taking advantage of a step change in technology), the disruption to large corporate consumers of a change in network supplier is immense. For some customers, it could take up to six months full-time work for a team to project manage such a change of supplier.

I.45 Second, corporates are selecting suppliers on more criteria than just price and quality. The capability of a particular telecoms company to offer a particular bespoke solution is often a more important criterion. A wide range of suppliers in the market is particularly important to large corporate customers where there are only a few suppliers capable of supplying the required solution.

I.46 Third, systems integrators provide much of the bespoke systems design to some large corporate customers, and buy network capacity from telecoms operators. These types of companies are a growing sector in the telecoms market, and represent a competitive threat to network-based telecoms companies, who typically earn very low margins on capacity they sell via such intermediaries.

Purchasing from fewer suppliers

I.47 Because of the increased complexity and complementarity inherent in the telecoms networks they are buying, many corporate consumers are seeking to reduce the number of telecoms suppliers that they rely upon. This is for a number of reasons. Problems can arise where different suppliers' networks interface with one another. Companies want to be able to go to one point of contact to diagnose and fix a problem in their networks, without having first to identify which supplier's network the problem originates in.

I.48 This trend is important because it creates a greater need for network reach on the part of suppliers of corporate telecoms. If an inability to reach all of a company's sites disqualifies a telecoms supplier from a particular contract, then suppliers with greater reach are likely to be rewarded, and suppliers with smaller networks are likely to find it harder to compete. Telecoms suppliers relying on others' networks to supply a solution may also be at a disadvantage, if customers perceive that their immediate supplier is not in complete control of quality and fault management.

New trends in IT causing demand for greater bandwidth

I.49 Meetings that Ofcom has had with IT suppliers and telecoms companies suggest a number of trends in the IT industry which are likely to feed a greater requirement for bandwidth between a business's sites. This is likely first to impact the large corporate sector.

I.50 The first trend is IT infrastructure consolidation by business consumers. Rather than having separate servers on individual sites, and linking them together, there is a trend towards a powerful server on one site, linked to other sites by high capacity networks. The second trend is outsourcing software management. Companies with complex and bespoke software solutions are increasingly outsourcing the hosting and/or management of those solutions to software companies. Whether the software is hosted off-site, or whether the software vendor needs access to the company's network, the result is an increase in the need for bandwidth. A possible future trend may be grid computing. Rather than having a single server, this technology would allow individual computers on multiple sites to act together like a single server.

I.51 The importance of all of these trends from the point of view of telecoms is that they are likely to result in substantially higher demand for bandwidth from corporate customers.

Annex J

Technology trends

Annex J

Technology trends

J.1 Many of the possible changes to the telecoms sector discussed in Section 5 of the Phase 1 consultation document are the result of technological change. This annex describes what Ofcom believes are likely to be the most significant technological changes in the period up to the end of the decade.

J.2 Technology trends can be considered at a number of different levels. There is an overarching technological trend towards increasing performance and reducing costs. This overarching trend implies a number of subordinate trends, each of which has particular implications for telecoms markets. Individual technologies and developments, for example the evolution from 2G to 3G mobile, represent a further level of detail.

J.3 This annex is focused on the overall direction of technological change and its key implications for markets. It is not focused at the level of individual technologies. Though individual technologies may result in fundamental, lasting changes, those new technologies are nonetheless likely to be manifestations of the more general trends discussed below.

Overarching direction of technological change: increasing performance and reducing costs

J.4 In almost all areas of IT and telecoms technology, there is a significant and persistent trend towards increasing performance and capability. Moore's Law[128] covering the increasing capability of silicon is well known, and increasing computer processing power and memory are manifestations of this. However, performance increases can also be seen to a greater or lesser extent in fibre-optic bandwidth, spectrum exploitation, compression technologies, display technology, power efficiency and battery performance. Many of these performance increases are due to increasing miniaturisation (more on a chip) and greater integration (fewer chips to achieve a given function). Alongside the trend towards increased performance, unit costs of these technologies have been dropping.

J.5 This overarching trend is important because increasing performance, in particular that driven by miniaturisation, makes possible types of terminal and service that could not previously have been achieved. It is therefore a major driver to innovation.

J.6 This trend is also important because of its impact on costs. Greater miniaturisation and integration is the main reason why apparatus and customer devices are becoming cheaper. Much network infrastructure also shows very strong scale economies, so up to a point increasing traffic volumes result in decreasing unit costs, which in turn can stimulate greater usage.

J.7 This overarching trend has a number of subordinate trends that have particular implications for telecoms markets. These are discussed in the remainder of this section, and are:

- analogue to digital;
- circuit-switched to packet-switched networks;
- fixed to mobile or mobility;
- tethered to tetherless;
- dial-up to 'always on';
- narrowband to broadband;
- telecom-specific to IT-generic;
- operator-centric standards to vendor-centric standards;
- asymmetric to symmetric; and
- centralised to distributed.

Analogue to digital

J.8 Networks and services are progressively becoming digital rather than analogue; i.e. signals are transmitted in the form of encoded bits of information which are then decoded by equipment connected to the network. For example, the core of the telephone network has been fully digital since 1998. The two analogue mobile networks have now closed. However, fixed telephony is still, on the whole,

128 In 1965 Gordon Moore, co-founder of Intel, observed that the number of transistors per square inch on integrated circuits had doubled every year since the integrated circuit was invented. Moore predicted that this trend would continue for the foreseeable future. In subsequent years, the pace slowed down a bit, but data density has doubled approximately every 18 months, and this is the current definition of Moore's Law, which Moore himself has blessed. Similar trends apply to processing speeds, storage densities and transmission bandwidths.

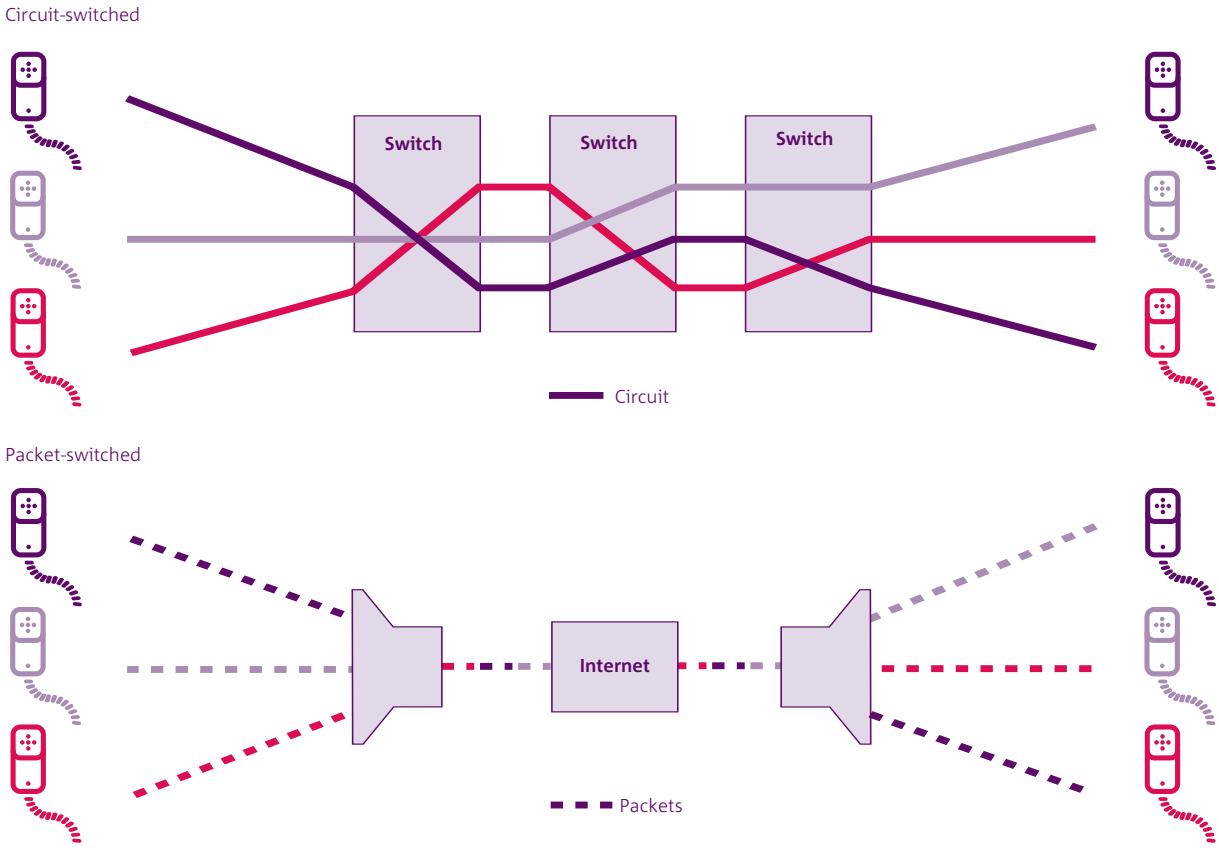
analogue at the point that it is delivered to the customer. In future, fixed telephony is likely increasingly to be digital at the point that it is delivered to the customer. The growth of broadband may prove to be the vehicle for this.

J.9 This trend is important because digital delivery allows a richer set of services to be offered to consumers. For example, SMS, MMS and e-mail are all available from a GSM phone as well as voice. As the fixed telephone network becomes digital all the way to the customer, a similarly rich set of services will be available over the fixed network. Digital presentation also allows a more integrated way of delivering services and often uses the available bandwidth more efficiently.

Circuit-switched to packet-switched networks

J.10 Telephony networks have for many years been circuit-switched. In a circuit-switched transmission, an end-to-end pathway (or 'circuit') is created through the network for the duration of a call. The growth of IP-based data services now makes packet transport increasingly the dominant transport mode. In a packet-switched transmission, the data to be sent is divided into many 'packets', each of which is routed individually over the network, and then reassembled by the reception equipment. This is shown in figure 50. Whereas now the internet is often accessed over a voice network, in future voice calls are likely to be delivered over packet networks.

Figure 50: Circuit-switched and packet-switched networks



J.11 This trend is important because packet networks are more efficient and less costly than circuit-switched networks. They may also allow new forms of supplier in the market; for example, voice providers who deliver services over a third party's IP network. Furthermore, packet-based networks offer an opportunity to carry a greater range of services over a single network. They can deliver both voice and data, and are used for both fixed and mobile services. Integrating Voice over IP and video services into the traditional PSTN does, however, raise some technical issues of end-to-end quality.

Fixed to mobile or mobility

J.12 The number of mobile connections has now exceeded the number of fixed telephone lines. This huge penetration of mobile phones has changed the entire telecoms landscape by providing an alternative commercially viable, near-ubiquitous infrastructure which provides telephony services. Additionally, consumers are demanding 'mobility' services to support their increasingly nomadic work and lifestyles. They require services that can be used 'on the pause' or by access from any available fixed line ('mobility').

J.13 This trend is fundamental to the shape of the whole telecoms market and the type of services that consumers are demanding. The residential mobile market has all the hallmarks of a truly consumer-driven market and has broken away from 'utility attitudes' towards the fixed telephone business.

Tethered to tetherless

J.14 Within homes and businesses, fixed services are increasingly being used over 'tetherless' (short range radio-based) systems, such as DECT, Bluetooth and WiFi. Tetherless television is a likely future development. Consumers value the freedom, flexibility and uncluttered nature of tetherless delivery.

J.15 This is important because it is likely to have a major impact on types of services which will be demanded and the devices used to access them. It may also have an impact on spectrum policy, for example because many people see Ultra Wide Band as the natural technology for tetherless television.

Dial-up to 'always on'

J.16 The market is moving from narrowband dial-up access to broadband 'always on' services. Much of the growth in today's broadband connections is for moderate amounts of bandwidth, such as 128kbit/s or 150kbit/s. A major attraction of broadband to these consumers could be the 'always on' characteristic as well as the greater bandwidth.

J.17 This is important because 'always on' stimulates the growth and development of more real-time services, such as instant messaging, where permanent connectivity enhances value. Studies also show that 'always on' customers spend more time online, and their usage is likely to continue to increase. As a result, the current 'unlimited use' broadband packages aimed at migrating customers from dial-up may not necessarily be sustainable in the long term. ISPs in future may need to find ways to contain or charge for the ever increasing volumes of data that result from 'always on' connectivity.

Narrowband to broadband

J.18 The present trend is for migration from narrowband data services to a range of broadband services. Narrowband services vary in speed according to the nature of the modem and connection used, but are (by definition) under 128kbit/s. Most current broadband deployment for residential and SME customers is in the range 128kbit/s to 2mbit/s. But in future broadband connection speed requirements might increase. There could be a virtuous circle of take-up as more broadband customers consume more broadband services and their expectations of throughput and responsiveness increase. At the same time, service providers may become more confident in providing more bandwidth-intensive content and

applications. In this way, the emergence of new types of visual services, such as time-shifted television and video on demand, could drive the demand for bandwidths closer to those currently provided by digital TV.

J.19 Were this demand for increased connection speed to come about, it would be important because greater bandwidth demands will affect the investment needed in networks and their relative economics. This could at some stage make connection to the home commercially viable via fibre or high bandwidth radio. If this occurs then the physical constraint that the access network puts on maximum bandwidth will disappear, and pressures will focus elsewhere in the network, for example on the scalability of content servers and the architecture of servers and caches. This may also impact on the viability of ISPs' flat rate tariffs and cause a shift towards volume or value-related tariffs.

Telecom-specific to IT-generic

J.20 The unit cost of telecoms devices is critically dependent on volumes. Equipment used in mass market private telecoms and IT systems has a cost advantage over the low volume, more specialised equipment traditionally procured by telecoms operators. This has led to the adaptation of technologies designed originally for LAN applications to use in wide-area networks. Prime examples are Ethernet services and WiFi. Similar effects could emerge in the production of software.

J.21 This convergence of IT and telecoms technologies is important because it will have a downward effect on network costs, and provide opportunities for operators capable of exploiting these technologies. It could lead to the decline of many traditional telecoms systems and architectures, such as ATM over SDH. Ethernet presentation to customers allows more 'plug'n'play', while WiFi will allow roaming between private and public 'hotspot' services. WiFi is also currently playing a role in widening the rural availability of broadband. The use of generic IT software in delivering telecom services could lower costs and accelerate time to market.

Operator-centric standards to vendor-centric standards

J.22 Traditionally, telecoms standards-making was dominated by the incumbent telephone operators working in formal standards bodies, such as the International Telecoms Union (ITU) and the European Technical Standards Institute (ETSI). In the present market, there are far more operators and service providers, and fewer global equipment manufacturers. These vendors have a clear interest in reducing product variants to create global scale, as the high cost of development and short product lives militate against being able to survive on a narrow national market. Therefore vendors have a greater interest, and therefore participate more, in harmonization and standards-making. In addition, standards are now far more likely to emerge from commercially driven 'consensus groups', including such bodies as the Internet Engineering Task Force (IETF), which may often be fast-tracked into formal standards bodies at a later stage.

J.23 This is important because it can affect what choices operators have in creating their own bespoke products and services. It tends to focus innovation on less standardised value-added services where the operator or service provider can develop or commission their own software development. Such services, especially at the early stages of market development, are unlikely to support interoperability with competitors, though this may emerge at a later stage when the benefits of first market entry have been exhausted.

Asymmetric to symmetric

J.24 Traditionally, telecoms networks have supported peer-to-peer communications, such as telephony, telex and email. Broadband was thought to be different and would be dominated by client-server architectures. As such networks were expected mainly to be used for delivery of centrally sourced services and content. These architectures tend to be asymmetric, with more content being delivered from the centre to the edge. In practice, however, broadband services are currently being used heavily for peer-to-peer file sharing and gaming. This implies a more symmetrical demand for bandwidth than is provided for with current ADSL and cable modem technologies.

J.25 If this trend continues, it could have a fundamental effect on the nature of network architecture and future investments. Peer-to-peer services will put the intelligence at the edge of the network using an increasing range of devices, such as set-top boxes, games boxes, PDAs as well as the traditional PC. The growth of peer-to-peer services could accelerate the penetration of broadband, as network externalities are greater than with client-server models.

Centralised to distributed

J.26 Because of the growth of symmetric applications, intelligence is growing at the edge of networks, as greater functionality can reside in increasingly capable peer-edge devices. Such edge devices may be either customer terminals or new forms of service provider node.

J.27 This is important because the location of intelligence in the network critically affects the way in which innovation occurs, how it is developed and who influences it. If intelligence grows at the edge, the demands on the network can be simpler. Instead of transport, control and management all being centralised and embedded in the network, these will separate into different 'layers'. The control or customer management functions could be provided either by the network operator, or by independent players on top of the network provider's facilities. This is likely to change present views on what is the natural boundary between wholesale and retail markets. It may also give greater power to consumers in terms of choice of services.