

## ***Measuring E-commerce: Developments in the UK***

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### **Abstract**

The Office for National Statistics (ONS) has a substantial programme of work to improve measurement of e-commerce and associated activities. This paper provides an overview of the work currently taking place and future plans. We are running two surveys of businesses – a general inquiry and a survey of ISPs, as well as adding internet questions to our large Annual Business Inquiry. Internet-related questions have been added to three household surveys and one survey of individuals to provide breakdowns of internet access by a range of household characteristics. Supporting this, a range of projects are also under way to improve measurement of the ICT sector supplying e-commerce equipment and expertise. Future plans include further analysis and cross-validation of survey results, and broader analysis of the impact of the internet on business and household activity.

### **1 Introduction**

The UK Office for National Statistics (ONS) has a range of activities in hand to measure the extent of e-commerce, the industries that supply goods and services for carrying out e-commerce, and the impact of e-commerce. This paper starts with an assessment of the economics of e-commerce. It goes on to describe the surveys and analysis currently carried out in ONS' business and social surveys, and provide some results. An overview is provided of future plans, followed by a concluding section.

### **2 Economics of e-commerce**

Trades conducted over the internet and paid for electronically differ from conventional trades in several respects. Most fundamentally, the internet offers considerable "network externalities": access becomes more valuable when others have it (as with telephones, or faxes).

On the demand side, buyers have lower search costs, but lose their anonymity – when they log in to a site where they have bought before the seller immediately has information on where they live and what they have previously bought. On the supply side, sellers become more anonymous in the sense that buyers are not physically visiting their premises, which means reputation becomes very important. But the cost of physically setting up a web site is far less than the cost of establishing one or more stores, which in theory means entry to the market is easier.

E-commerce can improve firm-level efficiency in a range of ways. Procurement costs can be reduced through administrative savings, lower search costs, and better supply chain management leading to a reduction in inventory levels. E-commerce can support better information flows within organisations and better demand forecasting, facilitating closer integration of production processes and lower stocks of work in progress. It may also reduce product development times.

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There can be significant savings in selling over the internet, as the internet can replace physical shops and more expensive product and promotion media. Firms can place product information on line, making it easier for customers to make their choice and providing help manuals to support after-sales performance. This should reduce the need for sales staff and after-sales service. On the retail side, some observers have suggested that the low usage of mail order shopping means that a large proportion of consumers may resist buying non-standard goods over the internet, but there may well be greater scope for sustained growth in business to business e-commerce.

E-commerce could potentially improve competition in a range of ways. The reduction in search costs makes it easier to compare products from a wide range of suppliers. The low cost of establishing a new web site should in principle make it easier to enter the market, and this threat of entry places pressure on incumbent firms to maintain efficiency. The relative ease of trading internationally through the internet should also increase competitive pressure through facilitating globalisation. The use of e-commerce is still in its early stages; in the longer term the internet's potential for reducing the constraints of space and time may deliver more radical change.

However, some features of e-commerce will tend to reduce competition. As noted above, the anonymity of the seller means reputation becomes much more important, which is likely to favour established brands and require heavy advertising for potential market entrants. E-commerce might also lead to greater price discrimination: as firms are able to gather more information about their customers, they can market and price products more closely to match the tastes of different market segments, and may also be able to tailor the products more closely to their needs. Lastly, there are great benefits to being the first provider of a new product, and this may also reduce competition.

E-commerce is also changing the labour market – the demand for computer-literate staff will increase with the growth in the use of e-commerce, but if firms replace physical outlets with web sales the need for retail sales staff will fall. It also broadens the scope for flexible. In their leisure time individuals with web access will benefit from much easier access to information and the facility to buy over the internet rather than needing to spend time visiting shops. However, this will tend to widen the divide between those who have internet access and those who don't.

### **3 Business surveys**

ONS' strategy for measuring e-commerce through business surveys has had four main elements:

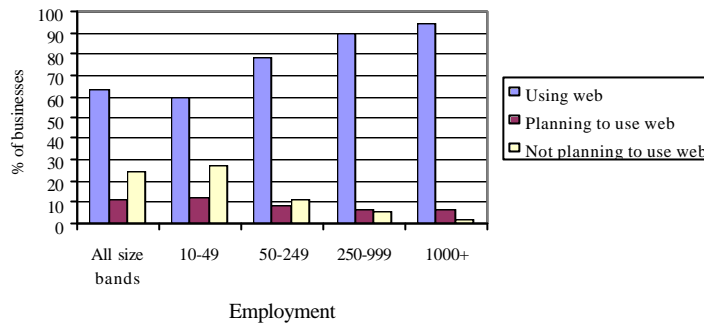
- a new annual survey devoted to e-commerce and related topics,
- a new monthly survey to Internet Service Providers, supplemented by an annual survey,
- questions on ONS' large Annual Business Inquiry, and
- specific examination of existing surveys.

We use the OECD's definitions of e-commerce. E-commerce is determined by the use of electronic networks to place an order, rather than the payment or delivery channels. The narrow definition simply covers the use of the internet to place orders, while the broad definition also includes the use of other computer mediated networks like EDI.

#### *Business E-commerce Inquiry*

In January 2001 the ONS launched a new "stand alone" annual survey of 9000 UK businesses asking about their use of the internet and e-commerce, and their attitudes to them. This was part of an EU initiative to produce comparable data for the EU countries. The results were published on 15 May 2001 (Williams, 2001). They showed that in 2000 92% of UK businesses used computers; when weighted by employment this figure rises to 98%. 63% had web access, with access increasing with size – 94% of firms with more than 1000 employees had web access (Chart 1). 61% of businesses had a web site, and a further 19% were planning to do so within a year.

Chart 1 - Web access



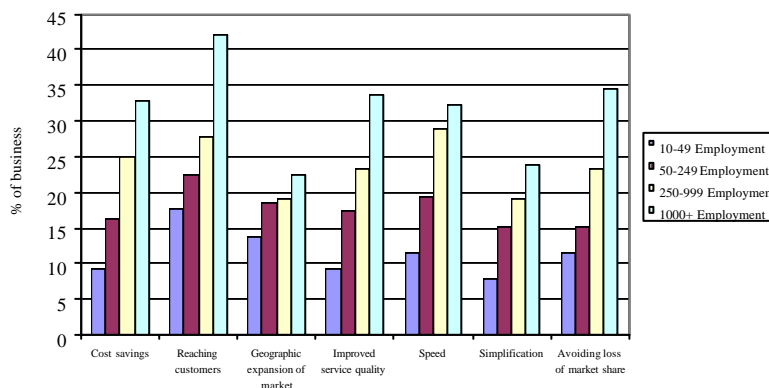
Internet sales were estimated as being worth nearly £60 billion, representing 2% of total sales, while sales via all electronic networks, including EDI, totalled £160 billion, or 5.8% of sales. 16% of companies used a computer-mediated network for sales, and a further 12% planned to do so in the next year. The financial sector was a big user of e-commerce; excluding the financial sector e-commerce was used for just 0.9% of sales. The insurance, air travel, and computing and office machinery manufacturing sectors carried out relatively high levels of internet sales – around 30 to 40% of sales are via electronic networks. Less than a fifth of internet sales were to households, with an estimated value of £10 billion; of this, £9 billion of sales were by the financial sector. The average length of time that businesses had used e-commerce for sales was only a few months, and still less than a year for the largest companies.

A third of companies used e-commerce for purchases, and a further 9% intended to use it in the next year. However, the value of internet purchases was estimated at £17 billion excluding the financial sector, slightly more than the value of sales excluding the financial sector, suggesting that the UK is a net importer over the internet. Purchases over all electronic networks was estimated at £118 billion excluding the financial sector, again higher than the value of sales. The average length of time that e-commerce had been used for placing orders was less than a year.

As the economics literature focuses on the potential economic benefits of e-commerce, it is particularly helpful to have survey responses on firms' perception of the benefits. The most common perceived benefit of selling over the internet was the potential to reach more customers, but far fewer smaller companies saw any benefits.

One in five respondents considered that a benefit of e-commerce was lower purchase costs, and one in four saw speed as a benefit; these levels rose to nearly one in two for the largest businesses.

Chart 2 - Benefits of selling through e-commerce



Firms were also asked about barriers to using the internet. The most significant barrier was the lack of security due to viruses and hackers – 64% of respondents said this was a barrier, rising to 80% for those with over 1000 employees. About half the firms thought the following were of at least some importance: cost of provision and access charges, lack of knowledge, no perceived benefits, lost working time through “surfing”, slow or unstable data communication.

#### *Survey of Internet Service Providers*

ONS initiated a monthly inquiry to 100 internet service providers (ISPs) in January 2000, modelled on the Australian ISP survey. The monthly inquiry has just 10 questions, asking about the number of subscribers, services provided, and technologies used to access the internet. This will be supplemented by a more detailed annual inquiry. Initially this was a voluntary survey, but response rates were low so it has been made compulsory, and publication held back until the results are more robust. Results are expected to be published in August 2001, as the UK “index of connectivity”.

#### *Annual Business Inquiry*

The Annual Business Inquiry has a sample size of 70,000, stratified by employment and industry. The 2000 inquiry included tick-boxes on e-commerce, asking whether the respondent carries out sales and purchases over the internet, and whether they have a web site. These could be used as filters for more detailed inquiries, as well as being of interest in their own right. The ABI includes a wide range of other questions and can be linked to other surveys, so will be able to provide rich information on the type of firms that use e-commerce.

#### *Work on Existing Surveys*

In May 2000 a review was carried out of all ONS’ business surveys and some of the social surveys to establish whether the effect of e-commerce was being satisfactorily addressed (Drew 2000). The broad conclusions of this review was that in general, statistical coverage of e-commerce transactions is no better nor worse than for any other types of transaction because inquiries to businesses operating in the UK aim to cover all UK-based output, irrespective of how it is sold. The main deficiencies in coverage are likely to relate to transactions involving non-UK suppliers of goods or services, particularly within the EU. This survey identified the need to ensure that new high technology firms are picked up in the business register early enough to ensure that they are appropriately represented in the sampling frame for statistical inquiries.

All ONS’ economic inquiries have therefore considered the potential impact of e-commerce. Particular efforts have been made to capture the effect on the retail price index (RPI), retail sales, and trade in services. The prices of products sold over the internet are collected and included in the RPI for specific products or services where the FES indicates that internet sales are significant. Retailers have been contacted to ensure they are including e-commerce in their returns on the value of sales, and care has been taken to ensure that e-commerce retailers are adequately represented in the retail sales inquiry during their recent rapid growth. For trade in services we are considering how to handle potential coverage problems, and will make specific references in the survey to digitizable products such as books and CDs once international agreement is reached on how they should be recorded.

#### **4 Household surveys**

ONS’ data collection strategy for the household surveys aims to provide a consistent and integrated picture of e-commerce as it relates to individuals and households, and more widely of e-society. It is designed to inform policy decisions – for example by identifying inequalities in internet access. Questions about the internet and e-commerce are being placed on four diverse surveys of households and individuals: the National Statistics “Omnibus” Survey, the Family Expenditure Survey (FES), the General

Household Survey (GHS), and the Time Use Survey (TUS). These provide information on who has access to the internet, what it is used for, frequency of use, and barriers to access. The surveys provide a good spread of information for analysing the characteristics of e-commerce. The same core set of questions are asked on the FES, GHS and TUS, to allow for cross-checking and for cross-cutting analyses. Results are published in ONS' quarterly "Internet Access" data release; the most recent publication was 26 June 2001.

#### *Omnibus survey*

The Omnibus Survey goes to individuals, with about 1,700 respondents. It is a multi-purpose survey developed by ONS for use by a range of bodies, run eight times a year. It provides information on age, sex, car ownership, marital status, educational attainment, gross personal income, employment status and sector. Questions relating to internet access and e-commerce have been included once a quarter since July 2000.

Results from the Omnibus Survey show that in April 2001 51% of adults in Britain had accessed the internet at some time. This proportion decreased steadily with age - 82% of 16 to 24 year olds had accessed the internet, as compared with 16% of those aged 65 or older. 71% of adults who had accessed the internet used it for e-mail and 73% to find information about goods or services, while 35% reported using it to buy or order goods or services – this represents 17% of the adults in Great Britain.

Adults who have accessed the Internet by purpose of Internet use (personal use only)		
Activities	January 2001	April 2001
<i>Per cent</i>		
Finding information about goods / services	67	73
Using e-mail	65	71
General browsing or surfing	54	61
Finding information related to education	28	38
Buying or ordering tickets / goods / services	30	35
Personal banking/financial/investment activities	23	25
Looking for work	18	18
Downloading software, including games	20	25
Using chat rooms or sites	13	17
Playing or downloading music	15	20
Using or accessing government / official services	18	20
Other things	5	4

Source - National Statistics Omnibus Survey - April 2001

Note: percentages do not add to 100 per cent as respondents may give more than one answer

A wide range of reasons were given for why respondents did not access the internet, and respondents could give more than one reason. Of those who didn't access the internet 45% were not interested, 20% said they did not have access to the internet, and 19% said they lacked the confidence or skills to do so. These results can also be analysed according to: sex, car ownership, marital status, educational attainment, gross personal income, employment status and sector.

#### *Family Expenditure Survey*

The Family Expenditure Survey (FES) collects detailed information on household spending patterns from a nationally representative achieved sample of about 7,000 households, partly from an expenditure diary kept for two weeks, and partly from a household interview. The interview covers regular payments such as insurance, and a number of "big ticket" items. The FES is an annual survey, although the sample design allows for quarterly information on household internet access to be produced.

Households have been asked whether they have access to the internet since April 1998, providing ONS' longest run of data on internet access. The percentage of households with access to the internet has risen from about 9% in the second quarter of 1998 to 37% in the first quarter of 2001. Levels of access depend very strongly on income – in 2000/01 71% of the top 10% of households by income had home access to the internet, compared with just 7% of the bottom 10%. The FES also provides information according to a range of social variables including region, type of household, and ethnic origin.

From April 2000 FES respondents were asked to record "Internet" in the column on the expenditure diary usually reserved for "Name of shop where bought". However, over the survey year it became apparent that respondents did this rather patchily. The main deficiency seems to have been where internet purchases were made from mainstream retailers, particularly supermarkets, where respondents have simply recorded the name of the supermarket. From April 2001 the instructions on the expenditure diary have been improved and it is hoped that more robust data will be available in Autumn 2002.

As part of the FES interview which asks about regular payments and "big ticket" items, respondents have been asked whether they ordered or purchased any of the specific items mentioned over the internet. Where there was more than one purchase this does not identify how many were bought over the internet, but will provide some guide as to the split between internet and other purchases.

#### *General Household Survey*

The General Household Survey (GHS) is an annual survey asking a range of general questions about the characteristics of households. The achieved sample size is about 8,000 respondent households. The range of variables which may be used for analysis are: location; income; recent moves; ethnic group; country of birth; ownership of consumer durables; and information about the household, e.g. how many people live there, their marital status, whether their accommodation is owned or rented. The GHS was revamped in 1999 and the "new" GHS went into the field in April 2000. Results will be available by the end of 2001.

#### *Time Use Survey*

The UK's first major Time Use Survey was carried out during 2000/01. It asks respondents to complete two diaries each recording all their activities over a 24 hour period. If they do record these in enough detail it should be possible to establish when and how they are using computers and the internet. The respondents also complete general questionnaires that will allow analysis of the data using the same household and consumer durables questions as the GHS, and provide detailed information on their receipt of help and services. The results are expected to be published in early 2002.

#### *Labour Force Survey*

The revision of the Standard Occupational Classification will help identify the impact of e-commerce and wider ICT developments on the labour market. In addition, the Labour Force Survey currently includes questions on teleworking and the use of a computer in this work – these questions will be adapted in line with forthcoming Eurostat recommendations. The survey also asks respondents if they use the internet or a CD ROM for learning purposes.

#### *Analysis of ISP subscribers*

These ONS surveys have been supplemented by a study by the UK Department of Trade and Industry and Paul Foley, from De Montfort University, which has analysed the post codes of ISP subscribers, both business and households, and related this to the household's socio-economic clustering. We will be able to relate this to household-based survey results.

## **5 ICT measurement**



The information and communications technologies sectors, producing computers and telecommunications hardware and services, supply the equipment and services for e-commerce. These fast-moving industries are particularly difficult to measure, but are significant elements of GDP. ONS' work programme covers all the main areas of interest: measurement of prices, investment and capital stock.

We have a collaborative programme of research into ICT prices bringing together staff working on retail prices, producer prices, and corporate services prices. The first stage is to test a range of quality adjustment techniques on computer prices. A price index is also being developed for computer services, drawing on a survey to measure the sales from the computer services industry by product.

The ONS recently published a sensitivity analysis examining the effect of different movements in ICT deflators on the National Accounts. This used double deflation for both the output measure of GDP – deflating outputs and inputs – and for the expenditure measure - deflating each element of expenditure and of imports (Vaze 2001). Compared with simply deflating output, double deflation reduced the effect of price changes by a factor of three.

The work on investment and capital includes the evaluation of expenditure on software investment, where it has been suggested that ONS is under-recording software spends, and disentangling ICT capital formation spends from plant and machinery.

## **6 Future plans**

On the business side, we plan to use the ABI results to provide a detailed assessment of the types of firms that access the internet. We will carry out further analysis of the “standalone” inquiry. We plan to look in rather more detail at the benefits of e-commerce. We will also do more cross-references, such as working out whether businesses with broadband are more likely to buy and sell over the internet, and whether firms with no internet access are more likely to have security concerns.

Results from the “standalone” inquiry can be compared with ABI findings to check their robustness, and the ABI can be used to analyse the characteristics of firms giving particular responses in the “standalone” inquiry. For example, we will investigate whether the firms engaging in e-commerce are experiencing relatively high levels of productivity growth, and whether there is an identifiable relationship between responses on the benefits of e-commerce and actual business performance. We could investigate whether the firms claiming that the internet enables them to reach more customers are actually experiencing a boost in sales, and whether those stating cost savings are seeing an overall reduction in costs. We will also investigate ways of analysing the nature of changes in competitive pressure – one avenue is through our work with academics on the dynamics of firms' births and deaths (Barnes and Haskell, 2001).

A lot of the issues of interest to economic policy makers are less precise than the usual questions asked in business surveys – for example, the organisational changes resulting from wider internet use, and changes in the nature of competition. We will be considering whether there are routes to get answers to these questions, perhaps through adding a section to the e-commerce inquiry which asks different questions over time, akin to the Omnibus survey for social statistics. These issues are best answered by considering the behaviour of cross-national market entities, rather than being limited to having data on their activities in a single country; so we will need to maintain close contact with other statistical offices on this initiative.

The social surveys also provide a rich source of information on the types of individuals and households that access the internet. The Time Use Survey will provide a useful supplement, particularly if it proves possible to establish the time spent on the internet. It is hoped that the FES can be developed to deliver robust results on internet purchases. The results from the three household surveys will be compared to check their robustness. Their harmonised questions will also be used to carry out cross-cutting assessment of the characteristics of households according to their use of the internet. The information on internet

purchases from the FES can be compared with business survey findings on the level of retail sales carried out through the internet, broken down by industrial sector.

More generally, we plan to investigate the impact of e-commerce on the labour market, looking at the changing nature of many jobs, changes in working patterns, and the implications for education and training. We also plan to research the impact on social exclusion of not having access to the internet, the usage of government services over the internet, and the impact of the internet on shopping patterns and prices. The current coverage of social surveys is felt to be satisfactory – we have no immediate plans to extend it.

Lastly, ONS has been commissioned by the British government’s “Office of the e-Envoy” to produce a database of comparative data on the extent of e-commerce in the UK and elsewhere. The aim of this work is to establish whether the UK has become the “best place in the world for e-commerce”, so we have been asked to investigate the scope for producing a single index encapsulating this aim.

ONS plans to produce a publication on e-commerce early in 2002, which will bring together the findings from business surveys and household surveys, linking it with work on ICT measurement, to produce a coherent picture of ICT and internet usage across the board.

## **7 Conclusions**

ONS has developed a wide range of information sources on e-commerce and internet use over the past 3½ years, spanning business and household surveys. These can tell us a lot about the type of individuals and businesses using the internet, and provide some information on their use for sales and purchases. More data will come on stream during coming months, and further analysis of the results is planned.

However, to go one step further and assess how the internet and e-commerce are changing individuals’ lives and the way firms operate, we need to draw on data from a broader range of sources, and consider more innovative questions. This will be the next stage in ONS’ programme of work on e-commerce.

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