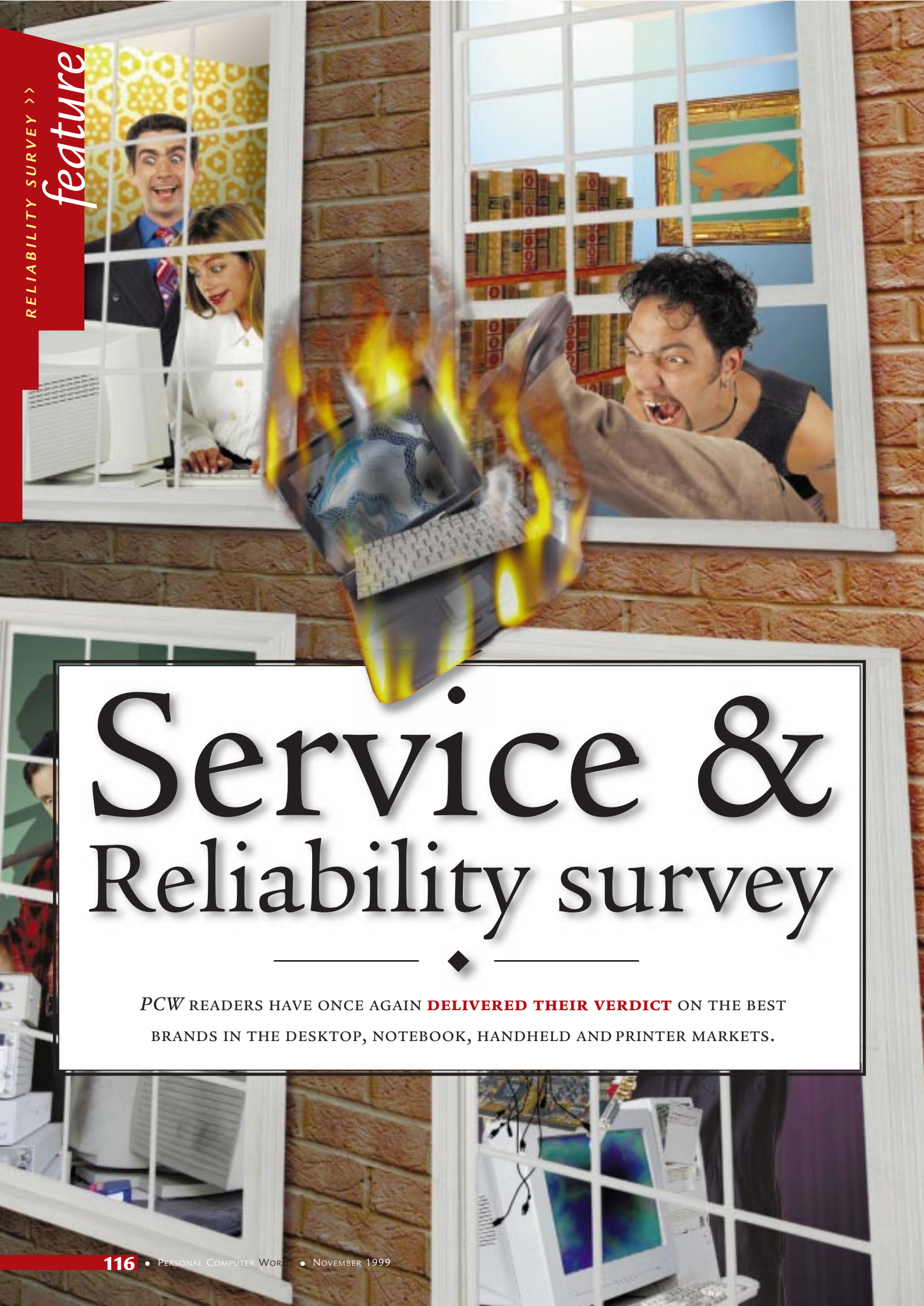


Service & Reliability survey

PCW READERS HAVE ONCE AGAIN **DELIVERED THEIR VERDICT** ON THE BEST BRANDS IN THE DESKTOP, NOTEBOOK, HANDHELD AND PRINTER MARKETS.

Buying a new PC is a nerve-wracking experience even for the most knowledgeable buyer. For every trouble-free purchase you hear about, it seems there's a tale of woe to match it. Not only are there all those different brands and models to choose from, but there are many other aspects of the purchase to consider.

Trustworthy advice is of paramount importance. As a potential buyer, you need to know whether a company has well-trained sales staff who will give you the right advice on your requirements, or whether they will give you the hard sell and try to push you into buying extras you don't really need.

Once you've chosen your make and model you need to know whether it will arrive when the company promises it will, and that everything will be complete, correct and in good working order. And as there's always a risk that problems will occur when you use your PC, you also need to know what the quality of the company's support staff is like. How knowledgeable are they? How easily do they diagnose problems? How good are their solutions likely to be?

However, in the long run these questions are less important than how reliable your PC is. If you use a PC for your business, any time that your machine is out of action means you also cannot work and potential revenue is lost. So it pays to buy from a firm that builds durable PCs.

To help you sort the wheat from the chaff, *PCW* presents its second annual independent service and reliability survey. To find out which companies *PCW* readers rate as the best, we polled the readers of our May issue, asking detailed questions on a raft of issues. We received 2,362 responses to this year's survey, a significant increase on last year's response. As with last year, we looked at desktops, notebooks, handheld PCs and printers.

In conjunction with market research firm Maritz Research, we have gathered information on the processor type, cost of purchase, what the PC is used for, warranties and extended warranties, the attitude of sales staff, reliability of the machine, and the helpfulness and efficiency of support staff. We've also gathered data on customer loyalty – how likely our readers would be to repurchase a brand or recommend it to friends and colleagues.

HALL OF **FAME**

Desktop PCs

Overall Reliability:
1999 Winner: Mesh
Commended: Dan, Dell

Repurchasing Brand:
1999 Winner: Dan
Commended: Mesh, Dell

Notebooks

Overall Reliability:
1999 Winner: Toshiba
Commended: IBM

Repurchasing Brand:
1999 Winner: Toshiba
Commended: IBM

Handhelds

Overall Reliability:
1999 Winner: Psion Series 3

Repurchasing Brand:
1999 Winner: 3Com (PalmPilot Pro)

▲HANDHELD WINNER: PSION 3

Printers

Overall Reliability:
1999 Winner: Epson
Commended: Hewlett-Packard

Repurchasing Brand:
1999 Winner: Hewlett-Packard
Commended: Brother

▲WINNER: MESH DESKTOP PCS

▲WINNER: EPSON PRINTER

▲WINNER: TOSHIBA NOTEBOOKS

Illustration by Steve Caplin

Contents

• *Research compiled by Maritz Research; Tel: 01628 895479*
• *Report compiled by Eira Hayward and Bobby Pickering*

Trends

So, first things first, where are the majority of you going to buy your PCs?

The competition between suppliers for customers is as strong as ever, but it seems that the superstores and high-street retailers are beginning to make slightly more of an impact on PC purchases. Our survey found that 19.7 per cent of you bought a desktop machine from a superstore or retailer this year, whereas last year the figure was only 17.6 per cent.

The direct and mail order channels are holding steady, however, as nearly two-thirds of you (61.5 per cent) bought your desktops direct or through mail order last year. This year the figure was just a little up on 1998 at 62.5 per cent.

There are, of course, an ever-growing number of retail outlets for PCs. Tiny and Time have already built up sizeable national chains, while direct sellers Evesham, Gateway and Mesh are busy developing theirs.

Most notably, only four per cent of our survey's respondents had purchased a PC through the Internet or by email.

With 17.2 million people in the UK now having access to the Internet (according to a recent report from Continental Research) and consumer confidence in purchasing goods online increasing all the time, this proportion should change dramatically in the next few years.

What are you buying? Most of our respondents had spent between £1,001 and £1,500 on their desktop PC and most had bought it within the last 12 months. The majority of desktop PCs were bought with a standard one-year warranty cover, although there were exceptions to this – more than 60 per cent of Evesham's buyers bought a two-year warranty as standard. Extended warranties are not a popular option, with only 12 per cent of our survey opting for extended cover.

On the whole, systems are getting more reliable, though this is POSSIBLY AT THE EXPENSE OF the actual delivery deadlines

Despite such a competitive market, there is evidence that some suppliers are letting delivery dates slip. This year, 48 per cent of our total sample were very satisfied that their PC arrived on time; last year's figure was 55.4 per cent. However, this year 5.9 per cent were very dissatisfied, compared to last year's 3.9 per cent.

Similarly, there are more problems with the completeness of the delivery compared to last year. This year 56 per cent were very satisfied that their order was complete and correct; the figure was 62.4 per cent in 1998.

The number of very dissatisfied customers has also crept up in the last 12 months: this year 5.5 per cent were very dissatisfied; last year the figure was just 2.9 per cent.

But it's not the big names, such as Dell, Gateway and Time, that are causing this dissatisfaction, but that large section of suppliers called 'Other'. These are smaller suppliers which, when competing in such a ferocious cut-throat market, end up claiming fulfilment options that they cannot maintain.

As far as the causes of technical and mechanical problems go, the same sorts of areas appear to plague users year after year.

Among those readers who experienced problems with their purchases, four per cent were plagued by PCs which were dead on arrival, compared to five per cent last year.

In other problem areas there was hardly any change in reliability, the exceptions to the rule being sound cards (down from 14 per cent to nine per cent) and hard drives (down from 20 per cent to 18 per cent).

Perhaps the most encouraging trend to emerge is that the proportion of users who experienced problems has declined dramatically since last year's survey: this year it is down to 27 per cent, instead of 45 per cent.

On the whole, systems do appear to be getting more reliable, though this is possibly at the expense of the actual delivery deadlines.

Methodology

As part of this survey, we have chosen the overall winners in the brand satisfaction stakes, after making allowances for the different numbers of respondents for each company. This has been done by calculating the average score across all brands and then showing readers' opinions about a specific brand as a comparison against this average score.

Our main Outline Charts (*see pages 121-130*) plot overall satisfaction with reliability, the likelihood to recommend, and the likelihood to repurchase for specific brands of PCs, notebooks, handheld computers and printers.

Each chart is split up into three coloured sections. The centre section contains all those brands which are considered to be similar overall to the average. The section on the right contains all those brands which are significantly better than the average and the section to the left contains all those brands which are significantly worse than the average brand.

The further to the right that a brand is found the better the readers feel about it in comparison to an average brand in general.

Similarly, the further to the left that a brand is found the less strongly the readers feel about it in

comparison to an average brand. Brands to the top right of the charts are the best in the opinions of the readers and those brands at the bottom left are the worst.

We have only plotted those brands for which there was enough data to provide a representative measure of readers' opinions. However, this has meant that some very well-known brand names, such as Panrix and Carrera, still did not register outside of our 'Other' category and so are not shown on our main charts.

If a company makes it onto the chart, even if it seems they performed badly, it is actually something of a recommendation in itself, as it indicates a market acceptance of that company.

Looking at some of the charts, it may seem as if Tiny, for example, is registering very badly, but it's important to remember that some of the companies in 'Other' could be doing far worse.

In addition, do bear in mind that some companies in the 'Other' category may have scored as well as – or better than – the overall winning brand.

Acting on feedback

Manufacturers take the results of this annual *PCW* survey seriously, and if they register higher levels of customer dissatisfaction than expected, they take that feedback into account.

Tiny Computer's PR manager, Jim Buchanan, said that the company was surprised and disappointed by the survey results, as it aims to provide a consistently high level of service to customers. The company has also invested heavily in service and support, and now operates one of the largest PC call centres in Europe.

'We have spent more than £500,000 in the last nine months improving our customer support telephone system, to double the number of calls we can take simultaneously,' he said.

'We have over 180 staff in our customer call centre, taking over 5,000 calls per day. Ninety per cent of these calls are solved the first time. Including field engineers, Tiny's after-sales support team numbers 300 – an increase of 46 per cent in 12 months.'

A lot of support involves unfamiliarity with PCs. Buchanan said: 'Seventy per cent of our customer service enquiries are from customers who have opened the box and do not know how to set up their computer.

'We understand this and we think it is our responsibility to help them get the best out of the product from first contact. This is why we have introduced a number of features to our systems that we believe lead the industry in ease of use for customers,' Buchanan argued.

He added that the vast majority of technical support calls concern software issues. 'These are industry-wide problems, which every vendor and manufacturer is experiencing. We pride ourselves on the service that we provide for our customers, including those "hand-holding" enquiries for novice users.'

Buchanan said that the company has set itself very high standards, and that it monitors and measures its performance against these on a daily basis.

'Although response times can vary according to time of year and the time of day, our response times are consistently good, with an average wait of one minute 12 seconds in July 1999 – a 66 per cent improvement over July 1998,' he said.

He also pointed out that a Sunday opening technical support line will be piloted by Tiny in the autumn.

If manufacturers in the *PCW* survey register higher levels of CUSTOMER DISSATISFACTION than expected, they do take that feedback seriously

Compaq also carries out constant monitoring of its service and support processes. The company's director for enterprise solutions and services, Gareth Cadwallader, said that problem areas and corrective actions are discussed at regular meetings of the company's UK management team.

'We try very hard to listen to our customers and, we believe, go to great lengths to help all of those customers who have genuine problems,' he added.

During 1999, Compaq has taken a number of actions to increase customer satisfaction with its products and services.

'Compared to the volume of products we ship each year – placed side-by-side they would stretch from London to Edinburgh – the number of returned units is remarkably low,' said Cadwallader.

'In response to this ever-growing volume of business, during the year we have significantly increased the number of staff dedicated to supporting customers, particularly on our warranty support line,' Cadwallader pointed out.

However, he added that the standard warranty may not be responsive enough for 'mission-critical' applications.

'We always urge any customers whose notebooks, desktops or servers are critical to their business to take out a Carepaq enhanced warranty,' he said.

The company has also set up a dedicated team at its Dublin call centre to help dissatisfied customers.

Section one:

Desktop PCs

We've selected some of the key areas of concern from the survey, which ranged over a variety of topics – from extended warranties to the specification of the machine purchased and the time taken to solve problems.

Quality of advice

Dan's sales staff were rated particularly highly, as were those at Mesh: 41 per cent said they were very satisfied with the helpfulness of the Mesh staff, and 56 per cent of Dan's customers were also very satisfied.

The performance of companies with a poor showing overall, such as Tiny, was reflected in this question: 15 per cent of Tiny's customers said they were dissatisfied with the company's sales staff, and only 20 per cent said they were very satisfied. Similarly, companies which scored well overall typically had over 65 per cent of their customers either satisfied or very satisfied with the quality of the advice. Eighty-four per cent of Dan customers were either satisfied or very satisfied that staff understood their needs, while 76 per cent of Mesh customers said the same.

Scoring badly here were those manufacturers with retail chains, Packard Bell and Tiny. Only 34 per cent of Packard Bell clients were happy with the level of advice, and only 35 per cent of Tiny customers felt they had received good advice.

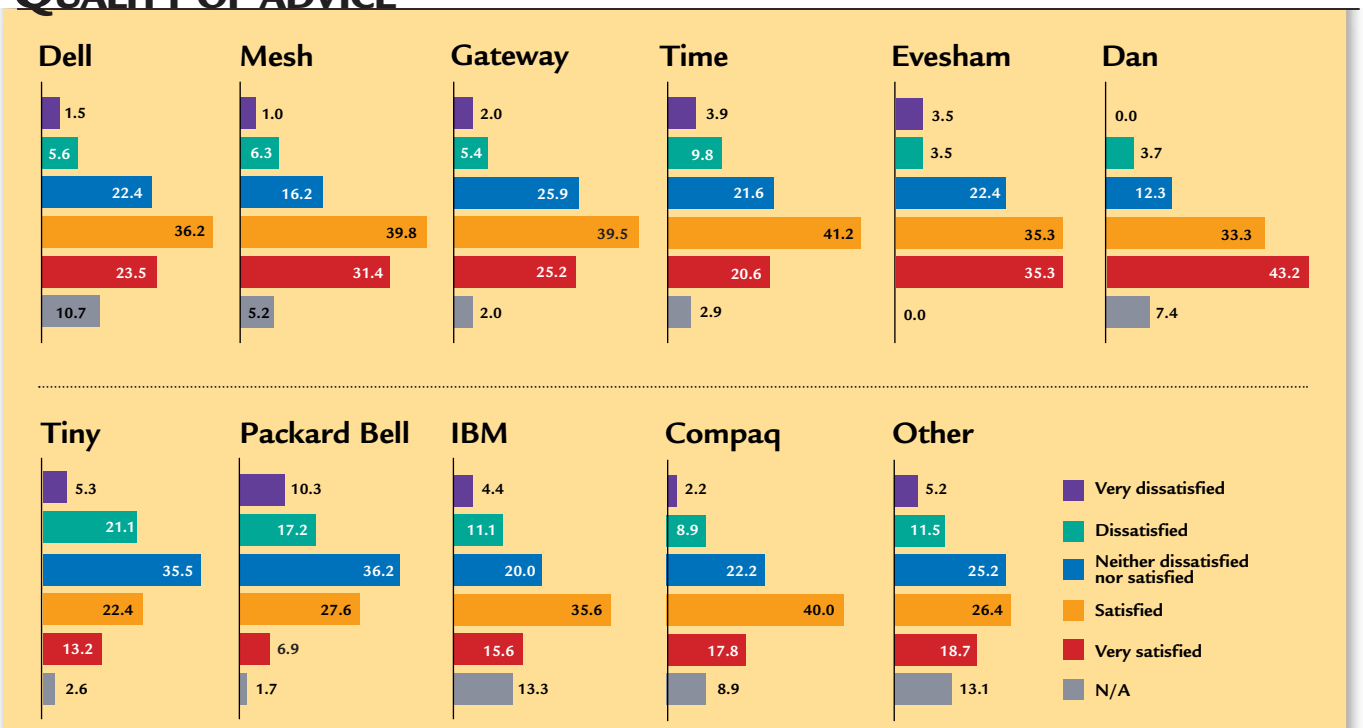
Delivery issues

A key component in satisfying customer needs is to ensure that an order arrives on the date that the supplier promises it will. Faring the worst for systems arriving on time was Gateway, with 18 per cent of customers saying they were either dissatisfied or very dissatisfied. Dan customers were a very happy crowd in contrast, with only one per cent saying they were unhappy about the system not arriving on time. As for correctness and completeness, Time scored especially well, with only two per cent of customers unhappy with their order, and 95 per cent either satisfied or very satisfied that their order was correct and complete.

Meanwhile, 72 per cent of Mesh customers were very satisfied everything was in working order when they received it *(see graphs on page 122)*. Also scoring well here were Time and Dan, each with 70 per cent of customers very satisfied. Compaq, which fared badly elsewhere in the survey, also performed well on this aspect, with 62 per cent of customers very satisfied that everything was in working order. However, IBM and Packard Bell scored badly here, with 44 and 53 per cent respectively.

▲ALL IN WORKING ORDER? MESH PCS SCORED HIGHLY

QUALITY OF ADVICE



EVERYTHING IN WORKING ORDER

Solutions and support

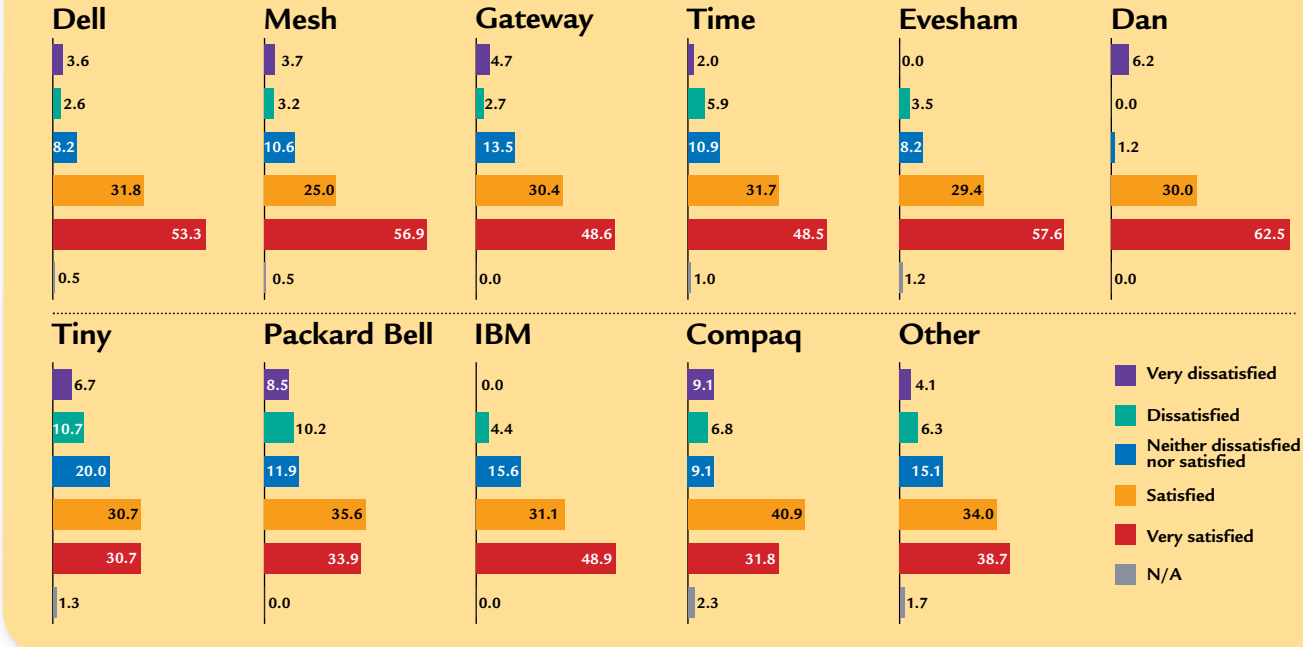
There seems to be no overriding pattern as to the helpfulness and efficiency of support staff – the time taken to solve a problem and the usefulness of suggested solutions rather appear to be down to the quality of the staff employed by a company and the training they are given.

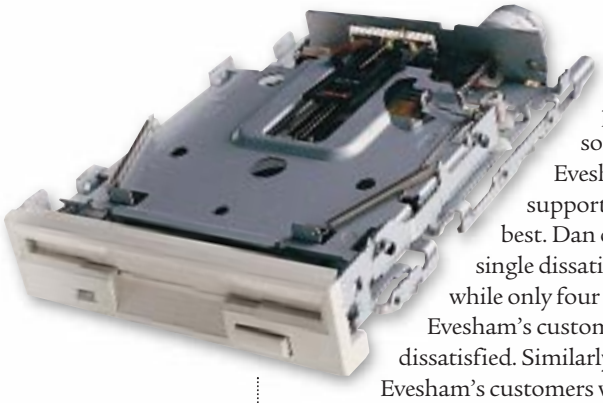
That said, companies which might be expected to have a big support infrastructure – like IBM and Compaq – fare pretty well: companies which rely on big retail channels generally come off less well. But here there is a big variation in the quality of support staff among direct suppliers.

Packard Bell's support staff fared the worst, with 35 per cent of customers dissatisfied with the manner of the company's support staff, whereas only 14 per cent of customers overall were dissatisfied. Evesham scored outstandingly well here – with a huge 59 per cent of customers very satisfied with the manner of the company's support staff, compared with an overall very satisfied rating of 22 per cent.

Evesham's support staff also solved problems quickly, with 45 per cent of customers very satisfied that their problems were solved efficiently, compared with an overall very satisfied figure of 17 per cent. None of Packard Bell's customers were very satisfied that their problems were solved quickly, and 56 per cent were dissatisfied with the time that it took.

THE OVERALL RELIABILITY OF THE PC



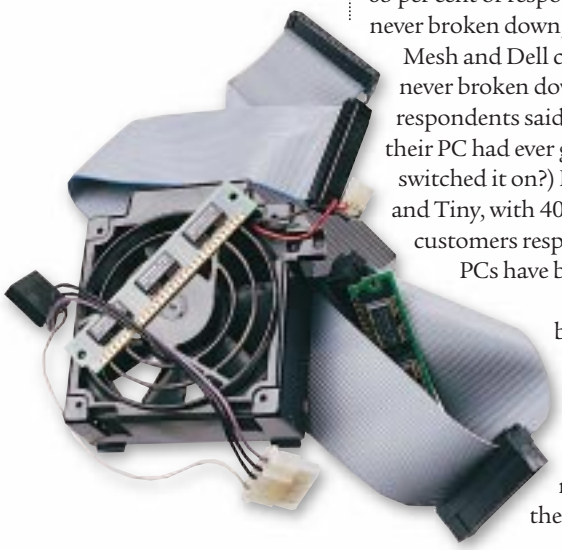


As for providing the solution itself, Evesham and Dan's support staff fared the best. Dan didn't register a single dissatisfied customer, while only four per cent of Evesham's customers were dissatisfied. Similarly, 50 per cent of Evesham's customers were very satisfied with the solution they were given, as were 40 per cent of Dan's customers. Time also scored highly in this area.

Breakdowns

Mesh, Dan and Dell desktops were the top scorers in our questions about reliability. Overall, 63 per cent of respondents said their PCs had never broken down, but nearly 75 per cent of Mesh and Dell customers said their PC had never broken down. (Bizarrely, six respondents said they didn't know whether their PC had ever gone down. Have they ever switched it on?) Less reliable were Gateway and Tiny, with 40 per cent and 43 per cent of customers respectively reporting that their PCs have broken down.

Time PCs were held to be the most problematic, with 19 per cent of customers encountering four or more problems in the last six months, which prevented them using their machine.

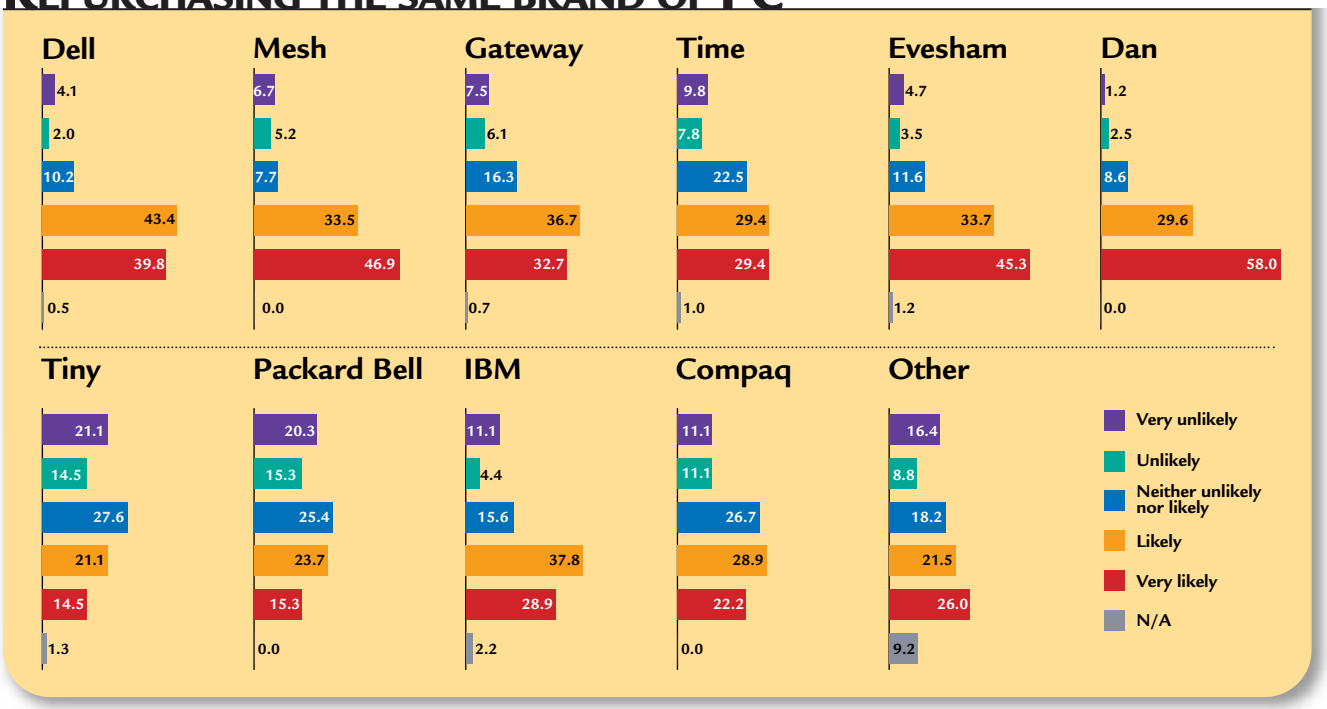


Overall reliability of PCs

There is a great variation in terms of how satisfied customers are with the reliability of their PC, although manufacturers which supply direct score especially well. At the top end of the scale are Mesh, Evesham and Dan, with 57 per cent, 58 per cent, and 62 per cent of customers respectively, saying they were very satisfied with the reliability of their PC (*see graphs on page 122*).

At the other end of the scale, only 31 per cent of Tiny's customers, and only 34 per cent of Packard Bell's customers said they were very satisfied with the reliability of their PC. However, this reflected the overall figure, as only 44 per cent of respondents – less than half of all buyers – claimed to be very satisfied with the reliability of their machine. The least disgruntled customers were buyers of Mesh, Evesham and Dan PCs, and the most disgruntled were buyers of Packard Bell and Tiny PCs.

Repurchasing the same brand of PC



Overall winners

Mesh is our overall winner this year for reliability, edging just ahead of last year's winner, Dan Technology, and runner-up, Dell. It is a notable achievement for a company that scored above average last year, but was not within the top five.

There are one or two themes that emerge clearly from this research. It's noticeable, for instance, that the top scorers are generally companies which sell direct, and companies that sell through a retail channel or resellers score less well. This is reflected in all areas of our survey – in our respondents' opinions about the sales staff they dealt with and the quality of the pre-sale advice they received, the sort of post-sale support they had when they ran into trouble and their opinions of the reliability of their PCs.

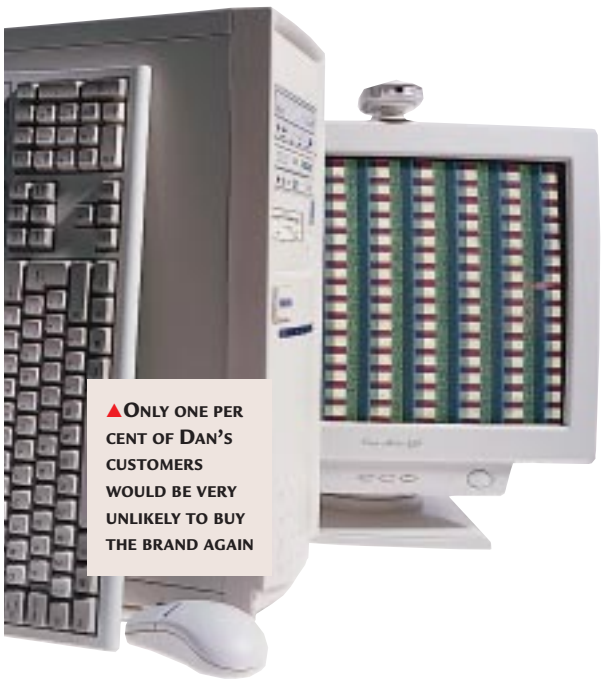
As our results show, it is well worth manufacturers putting in the effort to train their sales and support staff. Even when customers run into trouble, they will still feel good about a company and buy from it again if they feel their problem has been dealt with in a helpful, knowledgeable and efficient way.

Repurchasing

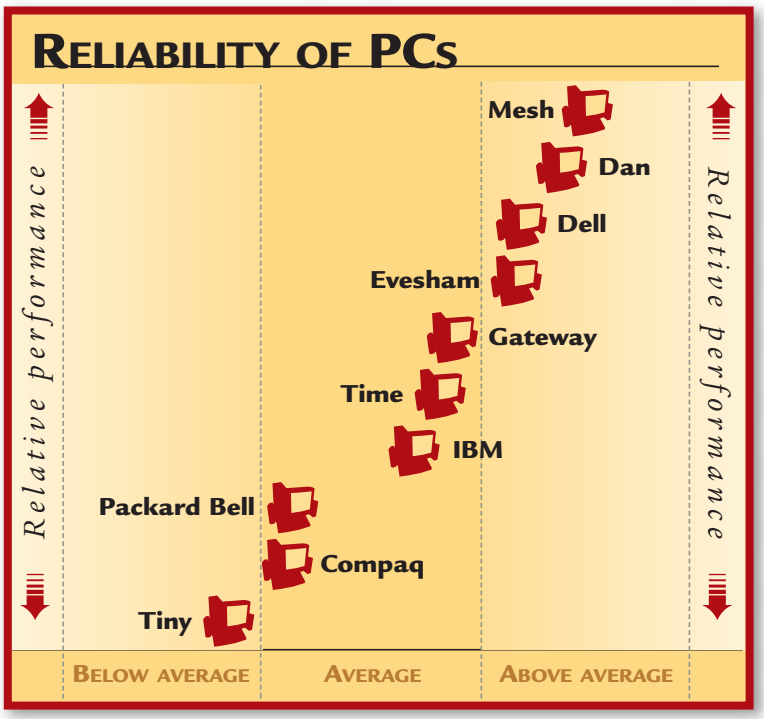
We asked respondents how likely they would be to purchase the same brand of PC again in the future. The key replies here are those at the very top and very bottom ends of the spectrum, those respondents who said they were very likely to buy the same brand again, and those who said they were very unlikely to buy the same brand again.

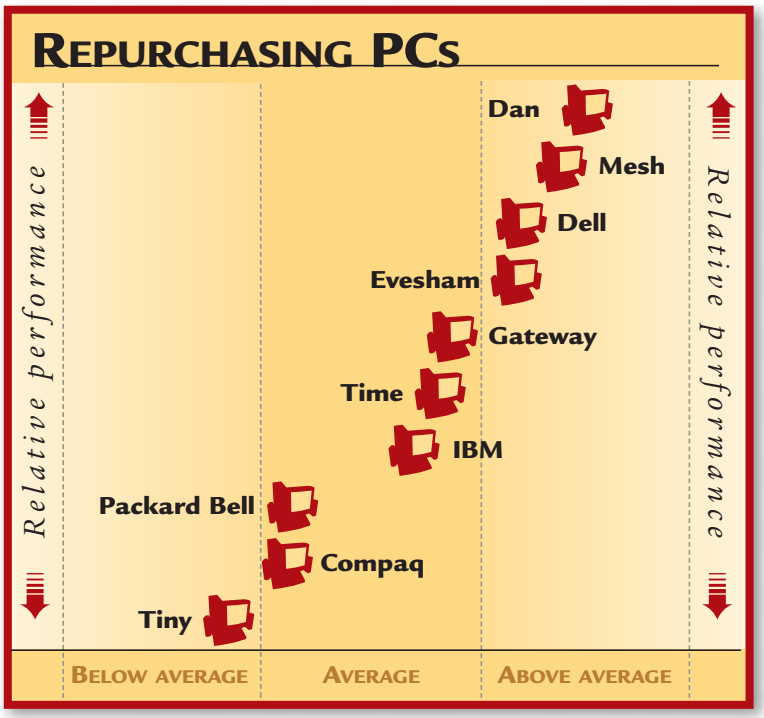
As shown by the graphs (*see opposite*), Dan, Mesh, Evesham and Dell customers were the most likely to repurchase. Fifty-eight per cent of Dan customers said they were very likely to buy the same brand again, compared with 47 per cent of Mesh customers, 45 per cent of Evesham customers and 40 per cent of Dell customers. Only 15 per cent of Tiny's customers and 15 per cent of Packard Bell's customers said they would be very likely to repurchase the same brand.

Only one per cent of Dan's customers said they would be very unlikely to buy the same brand again, compared with four per cent for Dell, five per cent for Evesham and seven per cent for Mesh. Twenty-one per cent of Tiny buyers and 20 per cent of Packard Bell buyers said they would be very unlikely to buy the same PC again.



▲ ONLY ONE PER CENT OF DAN'S CUSTOMERS WOULD BE VERY UNLIKELY TO BUY THE BRAND AGAIN





Section two:
Notebooks

▲TOSHIBA NOTEBOOKS HIT TOP SPOT

Toshiba continues to dominate the notebook market, and by far the majority of our respondents had bought Toshiba machines. It also remains the brand that all notebook manufacturers strive to compare themselves to, and this year – as in 1998 – Toshiba scored the highest in terms of reliability and likelihood to repurchase among the notebook suppliers.

Fifty-four per cent of our respondents bought their notebook PC through mail order or direct from the manufacturer, and 21 per cent bought from a superstore or high-street retailer. Only four per cent bought through email or the web. Perhaps unsurprisingly, a greater proportion of notebook buyers bought their machine for business and office use compared with desktop buyers (91 per cent compared with 75 per cent of desktop buyers). An even greater proportion said that they would be the sole user of the machine (70 per cent compared with 38 per cent of desktop buyers).

Compaq, which sells primarily through resellers and retailers, fared the worst in terms of our readers' opinions of the pre-sale advice they received. The Compaq channel had the greatest proportion of readers dissatisfied with the helpfulness of sales staff, and the quality of advice they received.

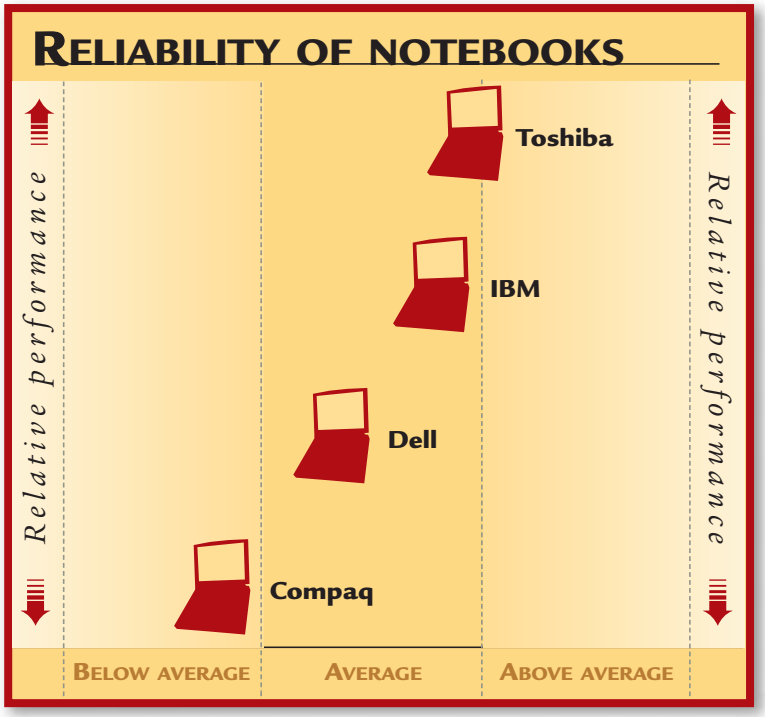
Just over 80 per cent of IBM users said their PCs had never broken down, compared with just over 70 per cent of Toshiba users and two-thirds of Dell and Compaq notebook users. The most common problem across all brands was that the PC froze or hung for a long time (in 26 per cent of cases), followed by the failure of a hard drive component and battery or power supply failure (each accounting for 23 per cent of the problems). Failure to boot up was also reported in 22 per cent of cases, and a problem with the display in 15 per cent of cases. Problems with cracked casings were also reported.

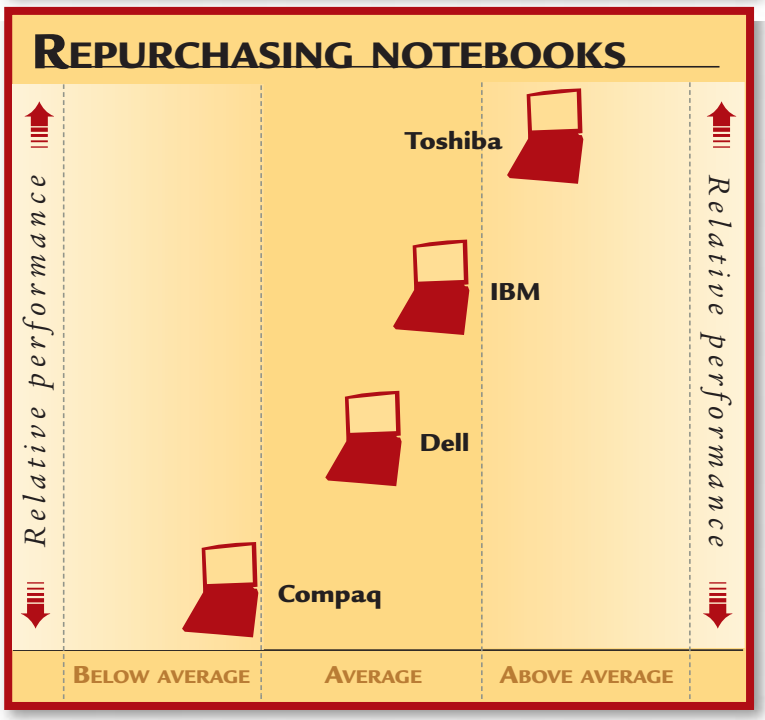
Notebook users are fairly satisfied with the reliability of their PCs, with nearly three-quarters either satisfied or very satisfied with their machine's reliability, and IBM and Toshiba customers being the most satisfied. Only 12 per cent of our survey said they were dissatisfied or very dissatisfied with reliability, with no single manufacturer scoring especially badly.

Toshiba and IBM were at the top of the pile when it came to repurchasing the same brand, with 46 per cent of Toshiba customers and 43 per cent of IBM customers saying they were very likely to buy their respective brands again.

Overall, less than 20 per cent of notebook users said they were unlikely or very unlikely to buy the same brand again.

In terms of recommending the brand to others, an impressive 47 per cent of Toshiba buyers said they would be very likely to recommend the company. Toshiba's closest rival here was IBM, with 39 per cent saying they would be very likely to recommend the brand. Overall, 33 per cent of notebook buyers would be likely to recommend their brand.



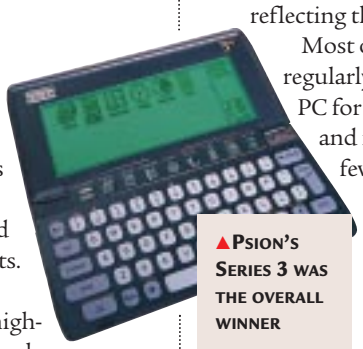


Section three:

Handhelds

The best-selling Psion Series 3 was the overall winner for handheld systems. However, this was a closely contested category, in which no one product received outstandingly good or bad results.

The majority (56 per cent) of handhelds were bought from a high-street retailer or superstore, and only 29 per cent were purchased by mail order, reflecting the commodity nature of PDAs.



▲ PSION'S SERIES 3 WAS THE OVERALL WINNER

Most of our respondents (71 per cent) regularly connect their handhelds to a PC for back-up, diary synchronisation, and file exchange, though relatively few users (13 per cent) connect their handheld to a PC for email or web access.

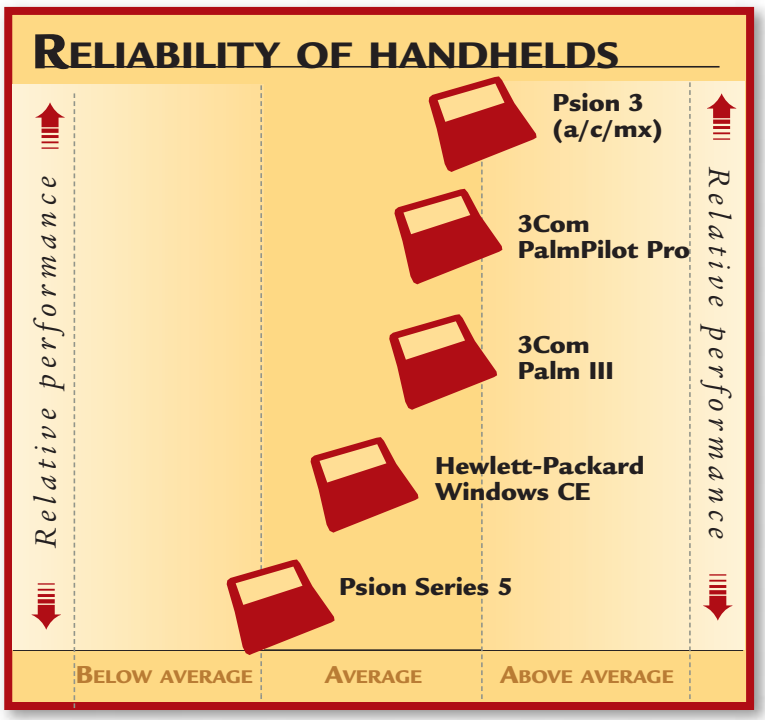
Pre-sales advice satisfaction levels were lower for handhelds than for desktops and notebooks, in a reflection perhaps of the non-specialist retailers where many of these handhelds were bought. Overall, 40 per cent of handheld buyers said they were either satisfied or very satisfied with sales staff helpfulness, and only 12 per cent were either dissatisfied or very dissatisfied. A third were happy that the sales staff understood their needs, and a third were either satisfied or very satisfied with the quality of the pre-sales advice.

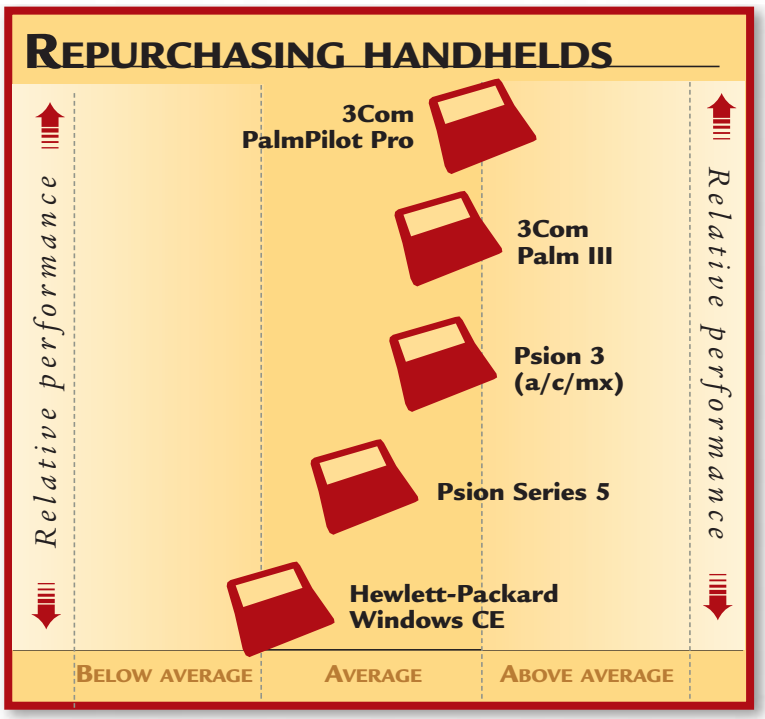
Screen display problems are the most commonly occurring problem for handheld users. The second most common problem is with the casing, followed by battery problems. Other problem areas include keyboards and data storage devices, such as removable flash cards.

No one manufacturer stood out as providing better or worse post sales support than its competitors.

Users of handhelds are generally pretty happy with their purchases in terms of reliability and are generally happy enough to want to repurchase the same brand in the future. Only five per cent were very dissatisfied, while 58 per cent overall said they were very satisfied with the reliability of their computer. Sixty-four per cent of Psion Series 3 customers were very satisfied, compared with 65 per cent of 3Com Palm III users and 50 per cent of Psion Series 5 users. The 3Com PalmPilot Pro came out top here, followed by the 3Com Palm III, and then the Psion Series 3. Hewlett-Packard users were the least likely to repurchase the same handheld brand in the future – with 11 per cent saying this was extremely unlikely. But none of the brands fared significantly badly, and all fell within the parameters that might be expected from our fictitious average brand.

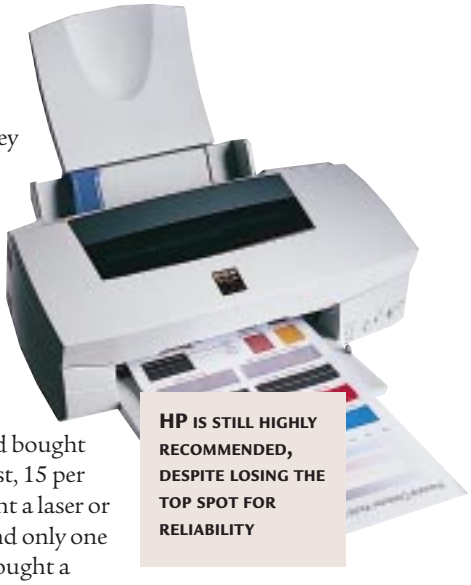
Again, all the brands mentioned by our respondents fared reasonably well, with none of them falling outside the parameters that would be expected. The 3Com PalmPilot Pro came out top for recommendations, with 64 per cent of users saying they would be very likely to recommend it to a friend or colleague. It was followed by the 3Com Palm III, Psion Series 3, and then the Psion Series 5. Only 38 per cent of Hewlett-Packard Windows CE users said they would be very likely to recommend it.





Section four:
Printers

In a close-run race, Hewlett-Packard lost the top spot this year in overall reliability to Epson for a number of reasons. Epson customers were marginally more satisfied about orders arriving on time and being complete and correct. Three quarters of Epson users said they were very satisfied that everything was in working order when they received it, compared with 72 per cent of Hewlett-Packard customers. Epson's customers also tended to be more satisfied with the support they received.



HP IS STILL HIGHLY RECOMMENDED, DESPITE LOSING THE TOP SPOT FOR RELIABILITY

Inkjet and bubblejet printers dominated our survey, with 82 per cent of respondents saying they had bought one. By contrast, 15 per cent had bought a laser or LED printer and only one per cent had bought a multifunction device, which combines printer, fax and photocopier. Most printers were bought from the high street or superstore (52 per cent), with 35 per cent purchased through mail order services or direct from the manufacturer.

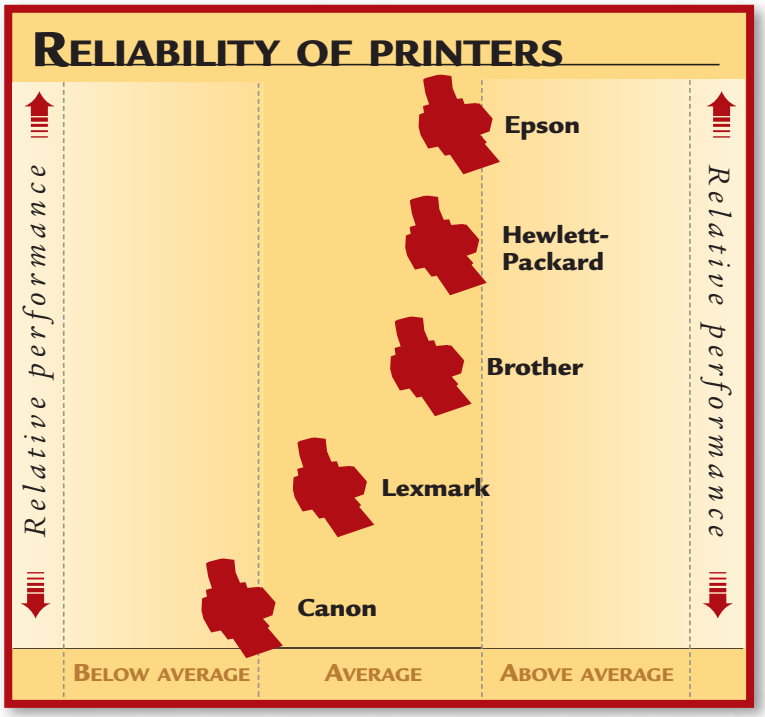
A surprisingly high 85 per cent overall said that their printer had never broken down, with Epson and Canon performing just better than the rest. The most common problem areas were paper jams and mis-feeds, followed by the print head or cartridge and toner or ink problems.

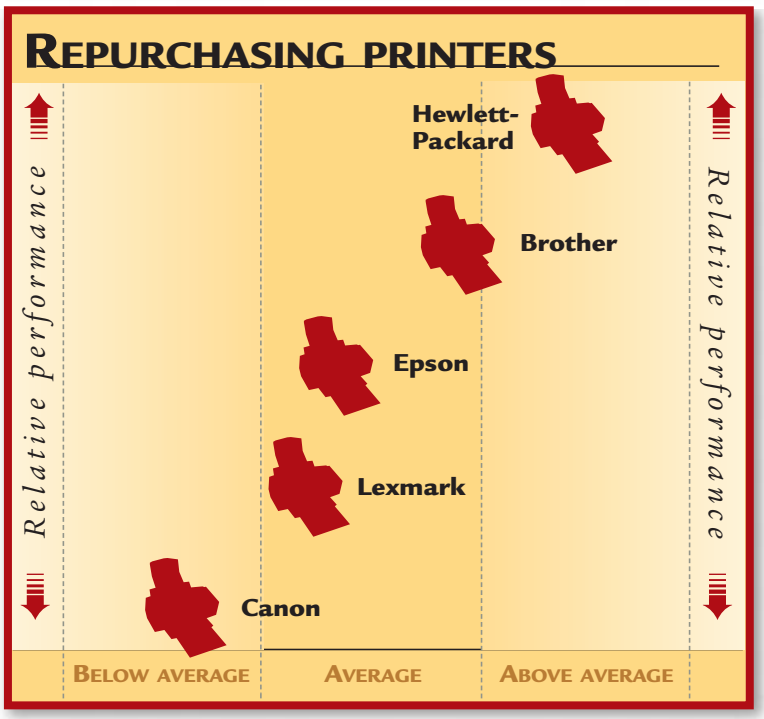
There were no huge differences in the satisfaction and dissatisfaction ratings for overall reliability between our printer brands. Fifty-four per cent of total respondents were very satisfied with the overall reliability of their printer, with Epson scoring the highest at 57 per cent, and Canon the lowest at 44 per cent. Similarly only five per cent of total respondents overall were very dissatisfied with the reliability of their printer, with no one brand standing out as performing worse than the others.

Hewlett-Packard customers are the most likely to repurchase the same brand in the future, and 54 per cent of them said they were very likely to buy HP again. Brother came in at second place, followed by Epson and Lexmark. Only Canon performed below the expectations of our average brand, with just 24 per cent of customers saying they would be very likely to repurchase the brand in the future.

Canon UK's marketing manager for bubble jet printers, Trevor Dodsworth, said the company was surprised by, and concerned about, the results of the survey. 'We welcome feedback to show us where we need to improve our performance,' he said. 'And we fully intend to act on this information to ensure enhanced customer satisfaction in future.'

Only Hewlett-Packard outperformed the expectations of an average brand when it came to recommending the brand to colleagues or friends. Fifty-seven per cent of respondents said they were very likely to recommend HP, compared with only 28 per cent of Canon customers, the worst performing brand in this category.





The colour of money

THE RIGHT COLOUR-PRINTING TECHNOLOGY FOR THE WORKPLACE IS NOT ONLY BECOMING MORE AFFORDABLE, BUT ALSO MORE DESIRABLE. ROGER GANN REPORTS.

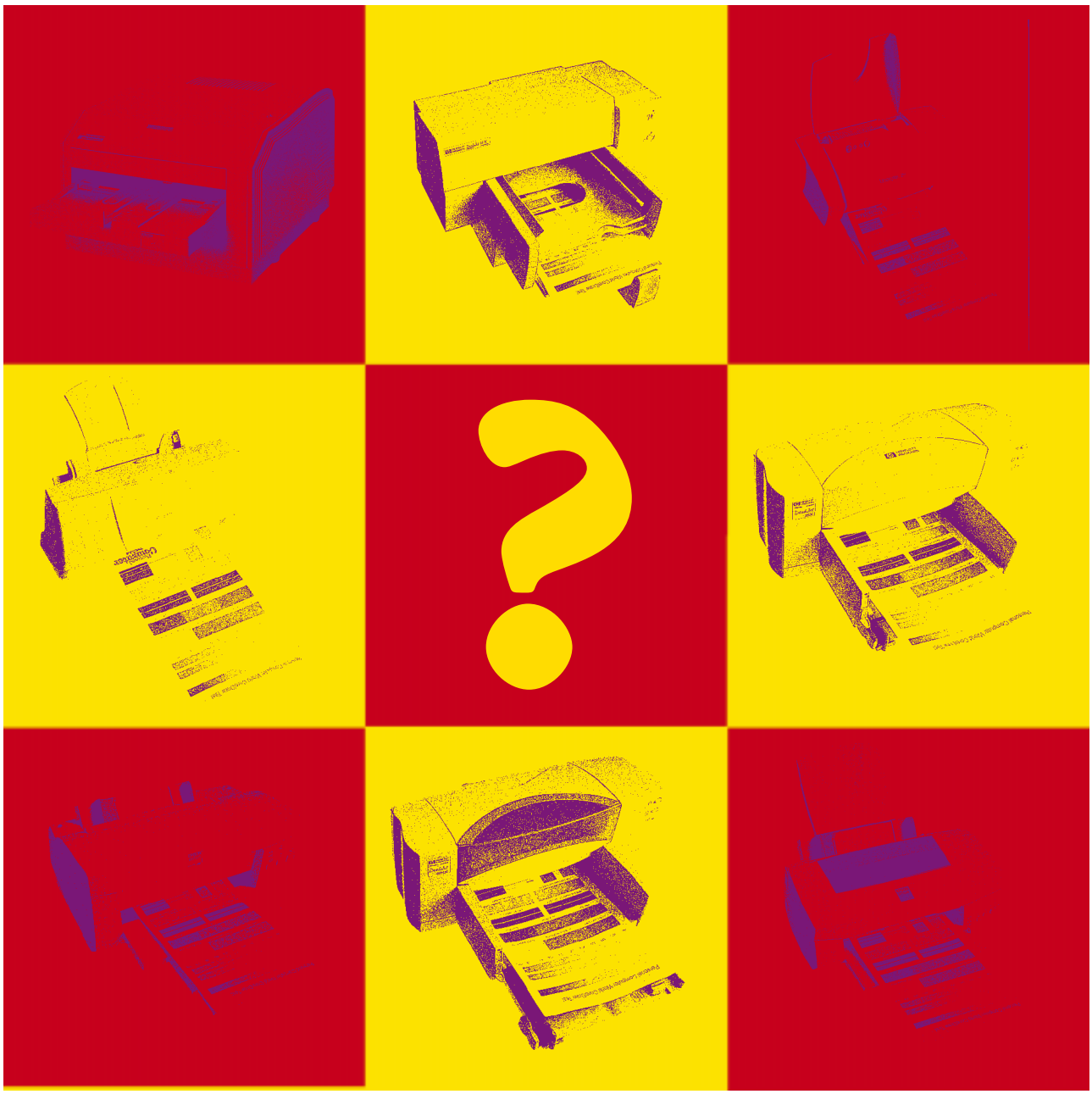


Illustration by Joe Presedo

While laser-quality monochrome output is still the standard in business, colour printing isn't far behind. Rather than sending jobs out to print or copy shops, users are beginning to demand in-house colour printing capabilities. Luckily, colour printing has never been more affordable. Early colour lasers cost £7,000, but today prices start at less than £1,000 and their output is much improved.

The same is true in all areas of the colour printer market. Today, you can pick up an inkjet printer for £100 (ex VAT) or less that can produce good photo-realistic images. But for an office environment, cheap inkjets can not offer the speed or duty cycles necessary.

Printer technology

All modern colour printers do essentially the same thing: they take cyan, magenta, yellow and black (CMYK – the K stands for keyline) inks and 'dither' them to produce the optical illusion of other colours. Dithering increases the graininess of an image, but sticking with solids produces banding, posterising and other artefacts. However, the four printers in this round-up use very different technologies to place colour on the page.

Colour laser printers use the same electro-photographic print technology as monochrome models. However, CMYK printing requires far more complicated print engines.

The four-colour image is split into separate components. The cyan image is painted onto a charged photo-conductor drum by a pulsing laser, which sweeps the drum. Points on the photo-conductive drum surface lose their charge when hit by the laser. The drum passes over the cyan toner cartridge, where toner particles are attracted to the charged points on its surface. Excess toner is discarded into a waste toner bottle. The drum then rolls against an image-transfer belt, which moves the cyan toner image to the belt. This process is repeated for the other three colours, each time adding a properly-aligned one-colour image to the belt. After the fourth pass, the belt contains a complete image. A sheet of paper is passed over a charged image-transfer roller, which moves the toner image from the belt to the paper.

A pair of heated fuser rollers are painted with oil by a coating roller. The paper passes through the rollers, where the toner melts and mixes with the fuser oil, which helps permanently fuse the image to the page. Residual toner is scraped from the transfer belt into a waste receptacle. This four-stage process accounts for the slow print speeds of colour laser printers – it can be one

The printers in action

HEWLETT-PACKARD DESKJET 970CXI

The DeskJet 970CXi has an add-on duplexing option as standard – a first for an HP inkjet printer at this price. Paper handling is above average too – the removable paper tray has a capacity of 150 sheets. The printer has no built-in networking capability, though a JetDirect add-on is an optional extra. The printer comes with both parallel and USB interfaces as standard. Installation is simple using USB. Calibration is a cinch as well – the printer has an optical sensor and can calibrate itself.

The colour-printing capabilities are impressive, perhaps the best we've seen thus far from an inkjet printer. Its ability to deliver solid colour, without any trace of banding at all, is remarkable. Text output is equally good – even the draft/economy mode was very acceptable. Print speeds were also good for an inkjet printer, especially on the Word document, although they slowed on the spreadsheet.
(For a full review of the HP DeskJet 970CXi see p95)

Price *£279 (£237.45 ex VAT)*
Contact *Hewlett-Packard 0990 474 747*
www.hp.com/uk

QMS COLORSCRIPT 330

QMS now ships two dye-sub printers, the ColorScript 310 and 330. We looked at the latter, which as an A3 printer is a large machine. It's a Pantone-certified pure PostScript device, with 128MB RAM and parallel, serial, LocalTalk, and SCSI ports, plus a 10Base-T network interface. The ColorScript 330 may seem a bit of a dinosaur with its 300 x 300dpi resolution, but this isn't an issue with dye-subs because the dots merge in continuous tones.

The ColorScript 330 predictably delivered gorgeous A3 colour proofs, on paper that closely resembled glossy photographic paper in look and feel. Grain was hard to discern, even with the aid of a magnifying glass. Curiously, some banding artefacts are visible in the normal-sized colour print, possibly due to screen-angle effects, which completely disappear when the same image is blown up to fill the A3 page. On the CorelDraw image, the default printer settings delivered solid colours that were a touch too light, compared to the other printers we looked at. It's no speed demon either – depending on the complexity of the image, you can wait up to 12 minutes for a print.

There is another catch – you consume the same amount of dye film whether you print a poster or a postage stamp.
Price *£4,112.50 (£3,500 ex VAT)*
Contact *QMS 01784 445 555*
www.qms.nl

Choosing the right printer

When choosing a printer, first look at the types of documents you want to print and in what quantity. Knowing the type of output you want is vital in choosing print quality as well. If you just want some colour to liven up the monthly reports and letterheads, then pretty much any colour printer will do. If your print volume is high, you'll want to put print speed at the top of the list, while those with lower-level demands may opt for a higher resolution or a less expensive unit. Next, decide what role colour plays in your output. Finally, consider combining a couple of affordable printing solutions (a monochrome laser and a colour inkjet, for example) to meet your needs.

Of the four colour printing technologies available, laser or solid ink technology is probably the best choice for networked colour printing. Both types of page printer typically have high duty cycles, provide good performance for colour printing, have excellent paper handling and are easy to network. Laser printers print in monochrome at two-to-three times the speed of colour and are generally faster than any of the other technologies. The main drawbacks are the number of user-replaceable components and the high initial cost.

Solid ink printers produce vivid colour – particularly on transparencies – and are gaining ground. However, they are still aimed at the graphic arts market.

Liquid inkjet printers are still most commonly used as personal colour printers. They are cheap and produce excellent output, particularly on special paper or transparencies. However, their sluggish performance and low duty cycles make them unsuitable for a multi-user environment. They also lack the range of interfaces, remote-administrative and buffering tools necessary to operate efficiently in a networked environment. They have modest duty cycles, but low-capacity ink cartridges and paper input trays need frequent replenishing. As a result, per-page printing costs are higher.

Dye sublimation printers are capable of delivering results that are virtually indistinguishable from high-quality colour photographs. This comes at a price, with both high acquisition and running costs, so these printers are not usually found in a typical office.

quarter of its mono page rate. The 12ppm (pages per minute) Lexmark Optra 1200, however, uses a slightly different process. An array of four LED heads enable the four toners to be applied in a single pass, making it one of the fastest colour page printers on the market.

Inkjet printers work in a completely different way. A fine jet of ink is sprayed on to the paper by a head that moves from side to side on a carriage as the paper passes. The most common method for controlling the ink flow is to heat the ink, creating a bubble that squirts out a small jet of ink when it bursts. Epson inkjets employ a piezo-electric device. This is a small piece of material that changes shape under electric current, opening and closing the jet with a precision that would otherwise be impossible. Because of the moving-head approach, inkjet printers are significantly slower than lasers. To work at high resolution, inkjets also require expensive treated paper to stop the ink diffusing. However, inkjets can handle a much wider range of materials than laser printers, printing as easily on card or fabric as on paper, because an inkjet does not require the media to run around a drum.

Solid ink printing is a bit of a misnomer. The printers don't use ink, except in a generic sense, and the ink isn't solid when they print. It goes in as a solid block of wax, but the printer melts it before it starts printing, then sprays it through nozzles like an inkjet printer. Unlike other printers, which apply ink directly to the paper, the revolutionary Tektronix Phaser 340 borrowed from the world of offset printing, by first spraying the wax on a drum, then transferring it

Network printing

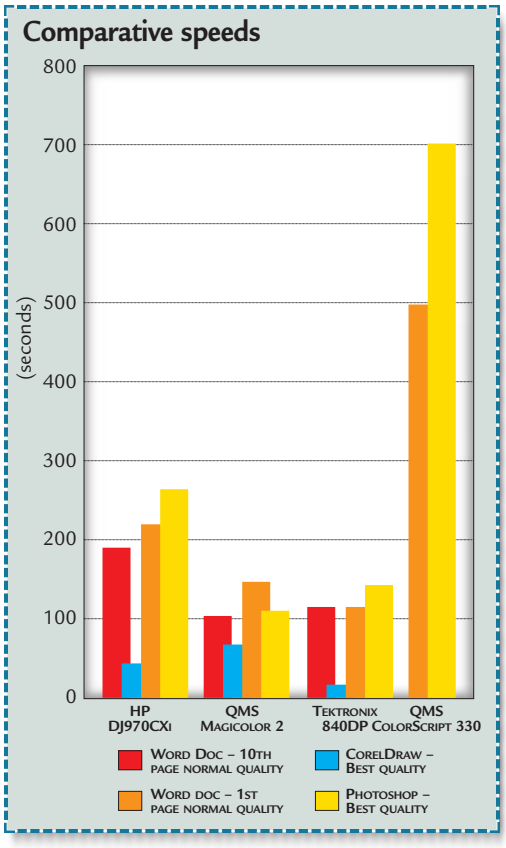
Network printing is relatively straightforward under most operating systems. Just as you can share disk drives, so printers can be just another shared network resource, making it easy for one printer to service a number of users. Under Windows 9x, providing that the File and Printer Sharing network service is installed, all you need to do is right click the printer icon to make a printer shared. You then install the printer driver software on another workstation on the network, (installing it as a network rather than a local printer) and browse to locate it on the network. Now, whenever that workstation prints, the job is sent over to the host workstation where it is spooled and printed out in due course. It can therefore be both cheap and easy to network a printer. However, the host PC must be running for other workstations to be able to send jobs to the shared printer and a very busy printer can slow down the host PC.

A superior way of networking is to install a network card in the printer (assuming it has a suitable expansion slot). This lets you site the printer anywhere on the network and makes the printer independent of any particular PC. But network cards for printers tend to be exorbitantly priced (10 times the price of a PC NIC is not uncommon) and they can be trickier to set up, especially if you're unfamiliar with the TCP/IP or IPX network protocols. For printers that lack I/O slots, you can get print-server boxes from about £100 (ex VAT), which perform much the same task.

As well as sharing, other benefits accrue from networking printers. Many high-end printers now feature a built-in web server, allowing users to inspect and configure a printer remotely, just using their web browser. As well as being able to issue warnings such as 'toner low' to users over the network, printers are increasingly featuring job-accounting facilities. These allow departmental or individual use to be tracked, to permit accurate back-charging of printing costs incurred – which is essential where costly colour printing is concerned.

to paper. This new design speeds up printing enough to make the Phaser 340 (and its successor, the 840) appropriate for mono as well as colour. It also solves a problem that the technology has with transparencies. Drops of liquid wax sprayed on a transparency dry in a semi-spherical shape, creating a lens effect, making it a poor choice for transparencies. The new design eliminates the problem by flattening the wax drops when they move from the drum to the transparency.

Dye sublimation uses four sheets of film for the ink colours. The ink is heated, transforming it from solid to gas, a vaporisation process known as sublimation. By heating it to different degrees, different quantities of ink are laid on the paper. The gaseous dye hits the paper in various levels of dye intensity. For example, a single dot may consist of 10 per cent cyan, 30 per cent magenta, and 25 per cent yellow dye, a trick the inkjet printer can't do. A dye sublimation printer makes a pass across the paper for each colour. This makes the process slow, and requires precise placement to ensure that the colours are perfectly aligned, but enables high resolution and a more solid colour appearance. This is the only technology available today that offers true photographic-quality output. You won't see dithering patterns, because thermal dye printers don't dither, they print with true continuous tones. On the downside, resolution seems stuck at 300dpi, which means text output is fairly poor.



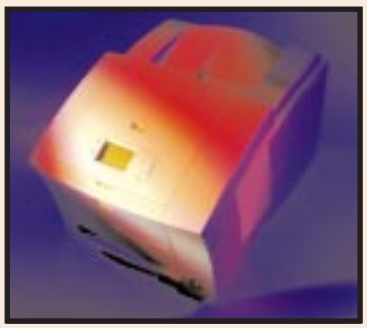
QMS Magicolor 2

Currently the cheapest colour laser printer on the market, the basic but good Magicolor 2 DeskLaser delivers a lot of bang for your buck. It's based on a Hitachi print engine that can deliver 600 x 600dpi resolution. More importantly, this entry-level colour laser printer comes with a 10Base-T 10Mbit/sec network interface as standard. Running costs are not the lowest on the market – the 10,000-page black toner cartridge costs £110, while the 6,0000-page colour toner cartridge costs £90 a pop. Still, they're easy enough to install.

The Magicolor 2 offers good output quality for business documents. Both graphics and text were suitably crisp; grey-scale and colour fills were solid and even; graphics offered bright, fully saturated colours; gradients in both graphics and photos changed gradually, with the merest hint of banding. One caveat: the driver software didn't detect the type of print job correctly, so when left on Auto, text print speeds were poor. Once set to mono, it delivered 15ppm. It was, however, pretty slow on the spreadsheet test, regardless. Print speeds also fluctuated between runs.

Price *£1,173.83 (£999 ex VAT)*
Contact *QMS 01784 445 555*
www.qms.nl

Tektronix Phaser 840DP



The Phaser 840 supersedes the 360 and offers all-round improvements: 10ppm vs 6ppm, 1,200 x 600dpi vs 600 x 400dpi and 64MB RAM vs 32MB RAM. The 840N is available for about £1,975 (ex VAT), while the full-duplexing 840DP costs £2,800 (ex VAT). As with its predecessor, black ink is free for the life of the printer. The printer is easy to network, using either IPX or TCP/IP and can be administered via a web browser. It's also easy to set up and maintain, using solid 'Colorstix' that drop into keyed receptacles under a top cover. A useful feature is its six-line LCD panel, which shows what the printer is doing and options available.

Its print quality is well suited for business users, with nicely saturated colours. Low-resolution output on plain paper was excellent for charts and graphs and passable for photographs and continuous-tone images. Note that the high-resolution/photographic mode requires extra memory and is available only on the Plus and Extended.

Output quality and speed depends on the mode being used, ranging from a simple fast colour (good for adding simple colour to printouts such as emails and memos), to a high-resolution mode, geared for photographic printouts. Output in Normal mode was good, while in Best mode it was very good. Text was also sharp and indistinguishable from most mono lasers, though not quite as sharp as HP's DeskJet 970CXi.

Price *£3,284.13 (£2,795 ex VAT)*
Contact *Tektronix 01628 403 300*
www.tektronix.co.uk

Photo samples

HP DeskJet 970CXi

QMS ColorScript 330

QMS Magicolor 2

Tektronix Phaser 840DP

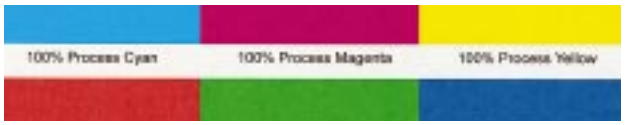
HP DeskJet 970CXi

QMS ColorScript 330

QMS Magicolor 2

Tektronix Phaser 840DP

CorelDraw samples



HP DeskJet 970CXi

QMS Magicolor 2

QMS ColorScript 330

Tektronix Phaser 840DP

Text samples

HP DeskJet 970CXi

We will be testing you with files from four popular applications. The first is this letter, indicating text quality, and doubling up as a test for average engine speed. Secondly we will use Excel to format a large spreadsheet onto a single A4

QMS Magicolor 2

We will be testing you with files from four popular applications. The first is this letter, indicating text quality, and doubling up as a test for average engine speed. Secondly we will use Excel to format a large spreadsheet onto a single A4 page - an

Tektronix Phaser 840DP

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