

Next-generation PCs

The personal computer is now 20 years old. In that time, our perception of what a PC is and what it should enable us to do has changed almost beyond recognition. Wendy Brewer and Simon Alveranga consider computing's evolution and ask industry insiders how they see desktop PCs developing



The grey box is dead; long live the universal computer – a device that isn't located at one point but at a myriad, accessible via your watch, ring or neural implant from anywhere in the world. A self-aware network grown atom by atom, crunching trillions of terabytes of information with petaflops (one thousand trillion calculations per second) of processing, delivered via cellular architecture, thinking in quantum logic and located within

everything from your toaster to the MoD's mainframe.

Sci-fi you cry. Well, frankly, yes, but this brief excursion is firmly rooted in science fact and serves a purpose. Conceptualising the future can help us to try and figure out where the good old personal computer may be heading.

What will our changing demands mean to the future of the PC? Indeed, will the PC as we know it even continue to exist? Over the next few pages we will transport

you into the not-to-distant future and ask some of the industry's main players their views on the future development of the humble PC.

What next?

The imminent demise of the PC has been predicted for years, but still it retains its place as the primary internet access device, the most popular tool for word processing and, disputably, the best in the value-for-money stakes as well. To all

intentions and purposes, the grey box that sits on our desk hasn't made any major advances aesthetically or design-wise since its initial introduction. We can now choose from a selection of sexy flat-panel screens and other funky peripherals, but the core product is the same.

Caroline Sceats, analyst at Forrester Research, admits it is difficult to predict precisely what the future has in store for the PC. She says the certainty of the PC's existence goes back to its architectural

premises – it's good at what it does. This, Sceats believes, is far more important to people than what it looks like.

However, other industry insiders disagree. Paul Waldren, technical consultant for mobile phone manufacturer Orange, believes design has become, and will continue to be, an important factor to consumers when buying new PCs. "Increasing trends towards the importance of design will see a major change in the PC as we know it," he commented.

Concept PCs, such as Intel and HP's combined Deep Forest machine, seem to indicate major advancements in the design of the PC. More importantly, manufacturers including Orange and LG Electronics agree that whatever the PC looks like it will definitely be accessible via countless devices.

In other words, sitting down at your desk to log in will be a thing of the past. You'll be able to switch on your watch/PDA (personal digital assistant) device, hook up



↑ Digital cameras like Sony's 5Mp (megapixel) DSC-F707 are closing in on the quality of film cameras

↓ Oled screens like this Kodak Display Products prototype (with a simulated image) will be thinner and brighter than LCDs and will use less power

your mobile phone or chat to the tiny voice-activated chip hidden in your car's steering wheel and be granted instant access to the information stored on your PC. Waldren thinks the PC will become invisible, in the sense that we will be so used to using it in so many different forms that we will almost forget we are using it.

Processor progress

Back in 1998 power PCs were running at around 450MHz. Today's PCs are more than four times as powerful, with Evesham's Evolution 2000 and Dell's Dimension 8200 both running at an

incredible 2GHz. But the problem with an increasingly computer-savvy nation is that we demand more and more. Once we were happy that our PC could perform simple calculations and point out our spelling mistakes, now we want it to think before we do. This comes down to the machine's core – the processor.

The processor has always defined the shape of the computer. In Eniac (electronic numerical integrator and computer), one of the first computers to be built, the processor consisted of 18,000 vacuum tubes. It weighed 80 tonnes and measured 8x100ft.

Modern silicon transistors helped bring the personal computer into existence, shrinking its size and cost, in turn allowing it to become integral to human life. In 1965 Intel co-founder Gordon Moore propounded the theory (known as Moore's Law) that the number of transistors per square inch on an integrated circuit would double approximately every year. But this process cannot continue indefinitely. Silicon chips can only be made so thin before integrity is lost and they can no longer effectively carry a current.

AMD's Richard Baker cites another possible problem with chips becoming too small. "The wavelength of light could become a problem because it would be too long for the miniscule distances involved in the ever-shrinking geometries of the computer. People have been theorising about using x-rays which have much shorter wavelengths."

An end to Moore's Law has been predicted for many years and, as always, manufacturers continue to find new ways of moving forward. It could be argued that Moore's Law sparked off the race within the chip sector for manufacturers to produce faster and faster chips. This, in turn, has led to the public's fascination with processing speed.

Five years ago, Baker says, the general public (not so much the business community) would define PC performance solely on processor speed. Now, however, people are becoming more aware of the integration of the system as a whole – its graphics card, memory and so on.

AMD has been searching for a new definition of PC performance rather than the traditional clock speed classification, which it feels is misleading. AMD's approach is to use its clock to its maximum potential, improving the performance of the machine.

Baker points to the next generation of AMD processors saying: "AMD wants to get more done per clock cycle, whereas Intel prefers to increase the amount of clock cycles. A 1.4GHz Pentium 4 would require 600MHz more to do the same job as the Athlon XP 1800 which runs at 1.5GHz." For now at least, however, Intel is sticking with speed as it believes this is what people want.

More multimedia

What will faster processors mean to consumers anyway? Bob Garret, Evesham's marketing director, highlights some of the advantages: "Games will become far more realistic and involving. More processing power also means that the PC can remove some of the complexity from programs, making them easier to use." He also notes: "Faster processing is displacing conventional technology around the home. For example, as processor speed increases it will facilitate DVD, video editing and digital photography. This could well herald the end of familiar technologies such as video, analogue photography and word processor."

Eventually we will see the processor in everything from light bulbs to watches. This will mean a truly connected world with all manner of devices communicating with each other. "Already people are creating



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Bob Garret, Evesham's marketing director

a hub, distributing information to portable devices around the home. "Technologies like 3G (third-generation) mobiles will not supplant the PC but work in tandem with it," he says. Garret agrees: "We will see the PC becoming the hub of the home." As the processor finds its way into more devices, the PC will prove invaluable as a means

of corralling this processing capability and creating powerful personal networks. LANs (local area networks) in their homes by using older PCs to act as servers. Eventually, with technologies like Bluetooth, the wireless network will become a reality as processors embedded within everything begin communicating with each other," Garret points out.

Intel spokesman Graham Palmer suggests this means the PC could become

Customised systems

Customised systems

Our demands don't just stop at design and processing power. According to a poll conducted by *PC Advisor*, we are putting more pressure on manufacturers to conform to our service needs as well. In fact, 18 percent of respondents put reliability and 13 percent aftersales support before technology.

← Toshiba's Portege 4000 is one of the first notebooks to integrate wireless networking

← MSN Messenger lets you collaborate on documents and hold audio and video conferences



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TIMELINE DEVELOPMENTS IN COMPUTING

| | |
|--------|---|
| 500BC | Abacus invented |
| 1780AD | Electricity discovered |
| 1854 | Boolean algebra developed |
| 1924 | IBM started |
| 1936 | First electronic calculator |
| 1939 | First digital computer |
| 1948 | Transistor invented |
| 1949 | Magnetic storage devices tested |
| 1950 | First commercial computer |
| 1954 | First operating system developed |
| 1958 | First electronic computers built |
| 1958 | Integrated circuit developed |
| 1959 | First packaged computer program sold |
| 1960 | Removable disks developed |
| 1963 | Graphics consoles developed |
| 1968 | Intel founded |
| 1969 | AMD founded |
| 1971 | Floppy disks introduced |
| 1971 | First personal computer built |
| 1971 | Intel 4004, first microprocessor, introduced |
| 1975 | Microsoft founded |
| 1977 | Apple Computers founded |
| 1977 | First LAN (local area network) created |
| 1982 | MS-DOS licensed |
| 1984 | Apple introduces the Macintosh |
| 1985 | Aldus Pagemaker, first DTP (desktop publishing) package, launched |
| 1989 | Intel announces 486 chip with 1.2 million transistors |
| 1989 | Worldwide computer use reaches 100 million |
| 1989 | First battery-powered notebook computer |
| 1990 | Windows 3.0 operating system launched |
| 1991 | Cern launches the first web server |
| 1992 | Windows 3.1 operating system launched |
| 1993 | Pentium processor launched |
| 1995 | The Vatican goes online |
| 1998 | Windows 98 |
| 2000 | Millennium bug threat |

Computer maker HP agrees support is more important than ever before. "People expect their machine to do what it says on the box, but they have no such guarantee from their manufacturer. Quite rightly, they are expecting more than just a sales outlet; they want a relationship," an HP spokesperson said.

Computer maker Tiny has also recognised the importance of aftersales support. It recently announced plans to completely overhaul its warranties package, enabling customers to create individual packages to suit their needs.

"People want a lot more from their services, especially second-time buyers who have become a lot more PC savvy, meaning their demands have increased. The more they know, the more they need to know," said Tiny's PR guru Alison Boswell. "We want to hang on to our customers. It's all about retaining our customer database and trying to make things clearer for our customers."

Portable possibilities

Forrester's Caroline Sceats is convinced these increasing demands show that, in the short term, the PC will remain the primary computing device for most people. Portable devices will not offer us the same richness as the PC for the foreseeable future. "The better devices get, the easier it will be to tailor them to our needs. But for business purposes, there's nothing available to challenge the PC. Can you imagine reading complex graphical data on your mobile phone?" she asked.

But what happens when portable devices – and the applications they rely on – become capable of performing tasks as proficiently as the PC? Sceats



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believes people will simply pick the device that's most apt for the job they want it to perform, but will turn back to their trusty PCs for more business-based applications such as spreadsheets and word processing.

Promised lands

We are used to being let down by overhyped, expensive services that fail to deliver, but perhaps we shouldn't dismiss them all.

• **Broadband BT** has been rolling out its broadband services for the last couple of years (albeit rather slowly and with much criticism from rival telephone operators and telco watchdog Ofcom). It promised always-on instant access to the internet but seems to have done little to improve the quality of the average person's mobile devices so far.

Accessible day or night for a set fee, broadband should make mobile devices more efficient by creating a more reliable, faster point of access. However, admissions of port throttling – slowing down or completely blocking connections for less profitable customers (in this case broadband users) – and the sheer expense of the services means take-up has been far slower than first predicted.

"ADSL costs £40 per month in the UK – well beyond the reach of most internet users. Loss of interest in BT's ADSL offering will also impact [on other suppliers]," said Andy Greenman, analyst at the Yankee Group. Even if broadband does take off, there is still no proof it will have a negative effect on the PC as it will improve the services offered by the PC as well as its mobile rivals.

• **Bluetooth** We were also promised great things from Bluetooth, a wireless standard for short distance communications designed to transmit signals between telephones, computers and other devices. But its impact has been fairly muted. Handheld PC maker Psion shelved its Bluetooth PDA and other Bluetooth connectivity devices in July this year due to a 'slower-than-anticipated establishment of a mass market'. And Orange's Waldren asks: "When was the last time you saw a Bluetooth device working properly?"

Ericsson is still championing the benefits of Bluetooth, though. Along with Sony, Ericsson launched the Bluetooth HBB-20, a credit card-sized hands-free unit that clips to your clothes and requires no wires. Perhaps, however, it's unfair to say Bluetooth has done nothing to improve wireless communications. Its incorporation into devices such as

Toshiba's 802 notebook, Palm's m525 PDA and plans for its inclusion in Compaq's new iPaq range, is slowly turning it into a universal application.

PC Advisor's deputy reviews editor Will Head thinks we should give Bluetooth a chance. Despite its lengthy development Head believes we won't see Bluetooth's real benefits until it is implemented in a number of devices. He compares it to today's infrared data ports: "You'd be hard pushed to buy a notebook without an IrDA port, but this was never a major feature – it was just there."

It will be this universal inclusion that will enable people to connect devices without even thinking about it. Again, its success seems dependent on the devices which support it. At the moment there are too few to make any serious impact on our computer use.

Although we don't want to be the last country to incorporate 3G, by the time we finally get it many initial bugs and glitches will have been wiped out

• **WAP (wireless application protocol)** A couple of years ago WAP promised to turn our mobile phones into mini PDAs and have us all connected up to the internet. In practise, users found it slow, extremely limited and found WAP-enabled devices small and fiddly to use.

• **3G telephony** We are waiting with bated breath for the launch of 3G technology, which again promises us new handsets on which we will be able to watch films and see the person we are talking to. Mobile phone operators have invested billions of pounds in 3G licences, trying to convince users that this new technology will be the best thing since sliced bread.

Time trials

Analysts aren't convinced 3G will pay off. "The mobile internet won't pay for 3G investments," says a report by Forrester

Research. Mobile operators are expecting the introduction of 3G to increase revenue per person by 25 percent; Forrester Research says this figure will be closer to 15 percent. If 3G is as much of a success as operators promise, it could have a serious impact on PC sales as mobile devices become more efficient.

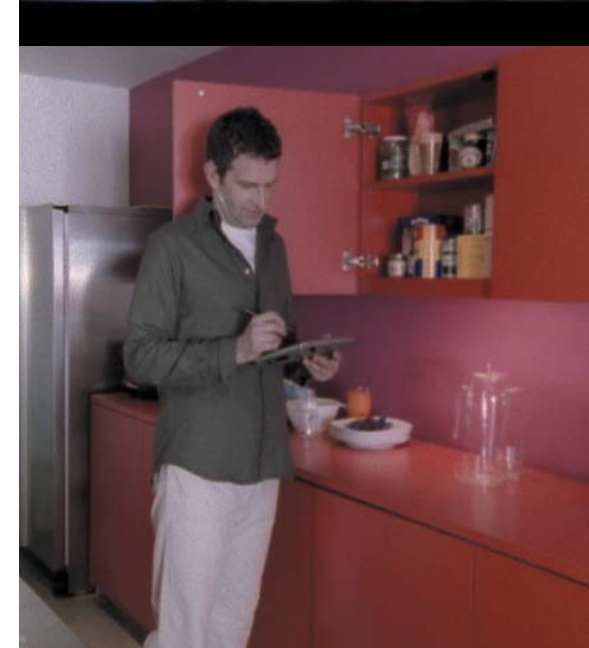
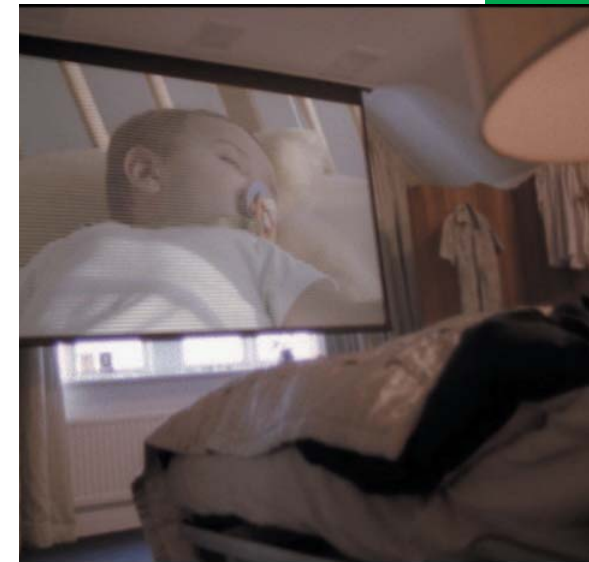
In September Japanese operator NTT DoCoMo made Tokyo the first city in the world to deploy 3G services. The service, known as Foma (freedom of mobile multimedia access), is currently limited to a 20-mile radius around central Tokyo, but the company has scheduled full rollout by next spring.

Analysts in the west are holding their breath to see how successful this highly anticipated service turns out to be. Whatever the results, it is unlikely the UK will see 3G rollout before the end of next year. However, this may not be such a bad thing. Although we don't want to be the last country to incorporate 3G, by the time we finally get it many initial bugs and glitches will have been wiped out. At first, high prices will limit the service to professionals, with monthly charges in Japan of around £45 a month and handset prices in the region of £375.

The industry expects 3G take-up to be fairly slow, "We experienced this with WAP, but once people got used to it they wanted more," said a BT Cellnet spokesman. "We believe this will be the same with 3G." NTT DoCoMo expects success to be slow, estimating that only one in 10 people will have a 3G phone in 10 years' time.

Manufacturers and operators are in a Catch 22 situation, dependent on each other's advancements for their own product's success. And despite the promises of mobile operators and the expectations from emerging services, we still haven't found anything yet that offers us the same diversity as our PC.

➤ *Manufacturers are predicting that in as little as 10 years time intelligent devices such as these will be commonplace in a lot of homes*



CONCEPT PCs

The Deep Forest PC was initially designed to show off the capabilities of Intel's Pentium 4 chip. But its design and dimensions, HP believes, are a fairly good indication of what future PCs will look like. Designed to look neat and friendly, but with the ability to blend into any business environment, the lunchbox-sized unit's space-saving design eliminates the need for a separate bulky tower. Unfortunately, it was only ever intended as a concept machine and won't be hitting high street shelves any time soon.



Intelligent homes

'The home of the future' is a familiar sci-fi term, conjuring up images of *The Jetsons*, a cartoon about a family living in a floating house, transported by flying cars and cared for by a robot nanny. LG Electronics and Orange have brought their take on the future into our reality, in the form of wire-free homes.

Internet-friendly devices are slowly creeping into our houses. IDTV is a digital service that enables a television to log what we regularly watch, predict our tastes and record TV shows without any previous communication from its owner. Little extras like fax and email telephones may also become as commonplace as home PCs.

But things aren't going to stop there. Orange believes evasive computing is the way of the future. It outlines an ordinary screen with hidden internet capabilities and an alarm system that can be controlled, timed and monitored remotely while we're at work or even out of the country. "Over the next 10 years people will have more technology in their homes," said Orange's Waldren.

What this means, according to the manufacturers, is more free time, no more late nights at the office and a home that responds to our busy lives. LG's Home device seems to blur the line between your abode and the office. In fact, there seems

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LG spokesperson

little need for an office as we could perform all tasks from the comfort of our living room. Network conferencing could be used for meetings and we could spend more time with our families.

LG has a plan should we need to leave the house, too. "Technology is expanding so dramatically that soon we will think nothing of communicating via tiny video-enabled chips installed in our glasses, for instance, or of our children's mini TV screen hidden in their pencil cases," the company's spokesperson said.

The technology is there to allow us to turn on our washing machine when we're out of the house and make sure all the lights are on when we're not there. But Orange recognises price is a problem at

the moment and that intelligent homes will not be 'universal' until they become more economically viable. This could be a major issue for at least another 10 years.

Point and click

Research has shown both LG and Orange that the success of these intelligent homes is about far more than price, "it's all about simplicity," said Orange's Waldren. According to Orange's findings, consumers are demanding ease of use. You don't want to have to come home and download instructions, follow complicated guidelines or deal with complex computer languages. You want to press a button and for it to be done. This is perhaps "one of the most important factors for users when buying a new device – complex devices won't last," analysts believe.

The applications that support these devices, however, must also be simple. Microsoft has honed in on this with the launch of its new operating system, Windows XP. Microsoft has given XP a friendly interface and made the updated OS easier to navigate.

Is there a danger, then, that we could become too reliant on our intelligent homes? That we'll no longer leave the house because we won't need to? That future generations won't know how to switch devices on manually or communicate face to face? The general consensus is that we need not worry.

"When devices no longer give us what we need, when we aren't getting back what we put in, we'll stop using them," said Forrester analyst Sceats. "We will use them purely for convenience and only for as long as we can see the benefit."

Despite dismal forecasts in PC sales and a downturn in the IT market as a whole, it doesn't look like the PC is about to disappear. When people talk about market saturation, what they really mean is boredom. Maybe soon we will all own a PC, but that doesn't mean we won't still be buying a bigger, brighter, better one.

Companies are starting to hit back against the economic downturn. Tiny recently announced it is doubling its number of retail outlets, while Time is focusing on built-to-order PCs recognising individuals' demands. Although its shape may change, in whatever form it exists the good old PC looks set to stay. ■

THE FUTURE'S BRIGHT

CONCEPTS

IBM's Personal Desktop is seen as a possible alternative to lugging your laptop around. Containing 1GB of memory to store information like your recent files, calendar info and dialup settings, this concept device is about the same size as a credit card and slots in to your computer, transporting your personal desktop settings wherever you go.

Also in development at IBM is the Quantum Computer, which operates on the principles of quantum mechanics. Whereas a normal bit of information can be on or off, one or zero, a qubit (quantum bit) is able to be both on and off simultaneously, effectively doubling the amount of information that a quantum computer can process. The technology is currently in its infancy with many hurdles to overcome, but if it progresses beyond the laboratory it could represent the biggest leap in computing since the integrated circuit.

Finally, one of the most exciting developments concerns Professor Warwick's 1998 experiment in which he placed an implant in his arm that communicated with a computer in the University of Reading campus. The device signalled sensors around the building, alerting them to his presence and turning lights, computers and even heaters on and off. It takes only a small leap of imagination to see how this technology could be used in the future, enabling direct communication with anything containing a microprocessor.