



FEATURE - PART 6

(R)evolution of Portable Audio: Play everything, do everything

It reigns supreme as the portable audio player of choice today, but as Darren Yates writes, the smartphone itself can trace its lineage back to another handheld computer that also wowed crowds.

Above: The new Apple iPhone 14 series – and it still plays music.

Below: HP's iPaq HW6910 combined PDA and phone a year before the iPhone hit the market (Image credit: Asim18, CC BY-SA 4.0).



It was the launch of a product the likes of which the world had never seen. Compact and lightweight, its selling point was a computer that fits into your pocket. It amazed all who saw it and launched a whole new class of portable computing. Of course, we're referring to the Tandy Electronics TRS-80 Pocket Computer and the year is 1980. Back then, computers still filled rooms and few of us had one at home. The idea that you could now run a computer on a couple of coin-batteries and slot it into your

pocket was science-fiction becoming science-fact (which is, no doubt, why Tandy Electronics signed up famed author Isaac Asimov to spruik the Pocket Computer in its ads). The launch of the Apple iPhone some 27 years later had an equally transforming effect, not just on digital audio, but portable computing as a whole. Yet while the iPhone had its roots in Tandy's 1980 Pocket Computer, its lineage can be followed closer to home in an equally-ambitious Apple device from the 1980s.

Cradling the Newton

If there's one product you could argue laid more of the foundations for our modern mobile world than any other, it's the Apple Newton. Work began on the device in 1987, but it would take another six long years before it would be ready for market, bringing with it new technologies.

First, the Newton starred a new Reduced-Instruction-Set-Computing (RISC) processor from a small British PC maker with big ideas called Acorn Computers. The chip was the ARM610, based on the original 'Acorn RISC Machine' CPU (Acorn would become phone-chip design giant

ARM). The idea was that bloated Complex-Instruction-Set-Computing (CISC) chips used in PCs weren't necessary and a lean RISC chip could deliver the performance required with much greater power-efficiency.

But second, the Newton featured a whole-screen monochrome LCD panel with touch capability and arguably its most innovative feature, handwriting recognition. It was modestly successful (both at handwriting recognition and sales), but after burning through more than US\$100million in development, it became one of the first casualties upon Steve Jobs' return to the company in 1997. Nevertheless, despite its overall lack of success, the Newton MessagePad sowed the seeds of technology that drives our everyday world today.

Palmtop PCs

It's another story for another time, but that 1980 TRS-80 Pocket Computer was actually a rebadged Sharp PC-1211, which itself was an amazing piece of engineering that pressed into service two four-bit CPUs and allowed users to code their own BASIC programs. Hewlett-Packard followed Tandy

Right: The Apple Newton MessagePad pioneered the all-screen handheld computer concept (Image credit: Rama, CC-BY-SA-2.0-FR).



Electronics in 1982 with its HP-75, as did Psion in 1984 with the Organiser I. But as portable computing devices of the time, they were fine for small simple programs, but not much else, let alone playing digital audio.

Continued improvements in CPU capabilities during the early-1990s led to a new-generation of 'Palmtop PCs', such as HP's little 95LX from 1991, plus others from Poqet and Sharp. These typically MSDOS-powered computers delivered dot-matrix screens, QWERTY keyboards and on-board software, making them more useful business tools – but still no audio. Most of these devices featured low-power 8086-class CPUs running at less than 10MHz – not enough to sustain data throughput for 16-bit sound.

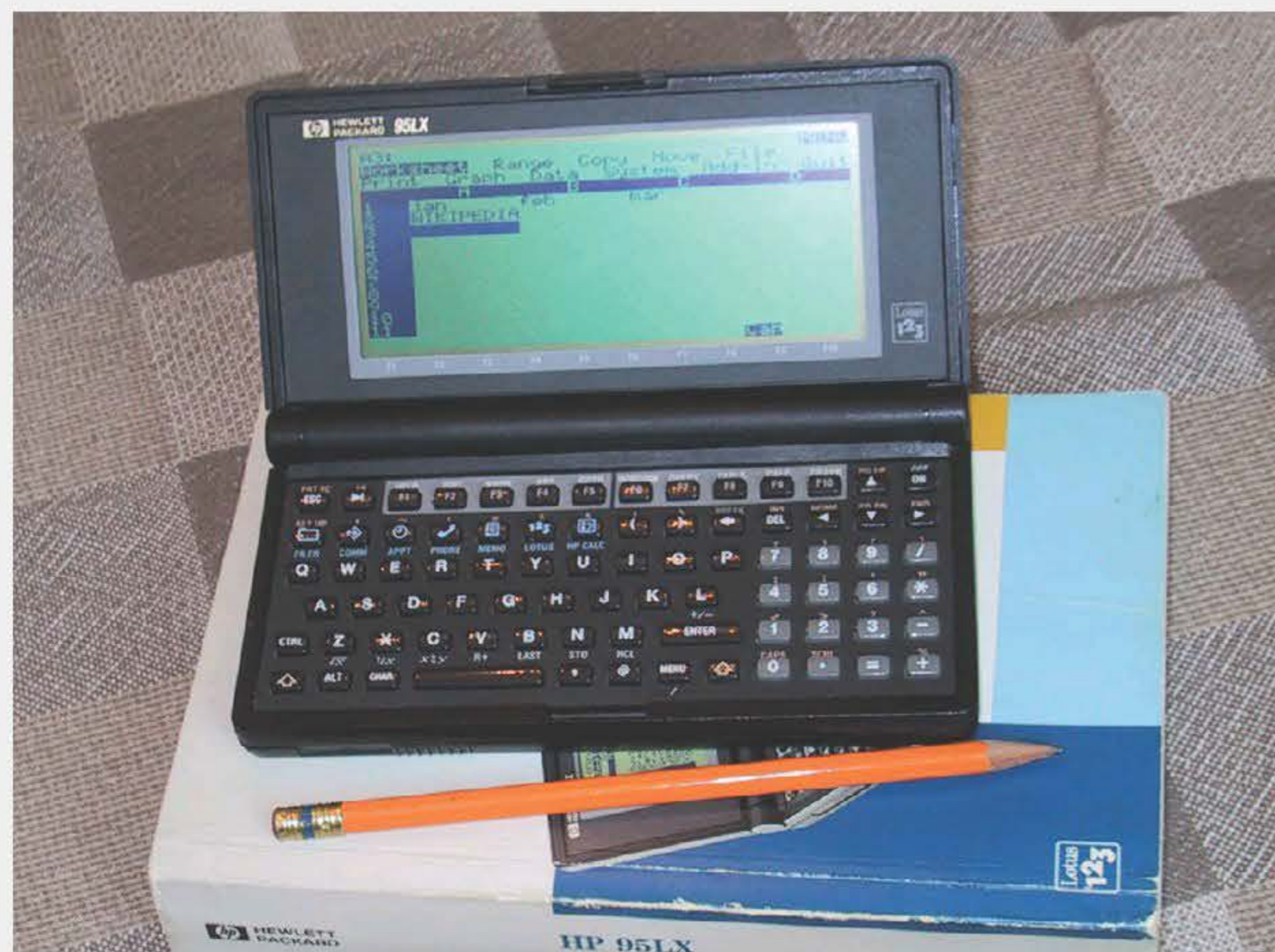
Toshiba Libretto

This lack of CPU processing power, in addition to on-board storage, were key roadblocks preventing early mobile devices offering digital audio. The desktop PC was the first consumer-grade computing device to receive 16-bit stereo sound, thanks to the arrival of Creative Labs' Sound Blaster 16 ISA sound card in 1992. That year, chip makers Intel and AMD were still in the trenches over various iterations of the 80486 CPU – Intel's famed Pentium processor was still a year away.

However, squeezing existing audio tech into a mobile device was still very optional – for example, DOS-based laptops of the era, such as the IBM ThinkPad 350 from 1993, didn't include audio at all.

It wasn't until the impending launch of Microsoft's Windows 95 operating system that laptop manufacturers accepted the growing scope of multimedia and new laptops began routinely featuring a 3.5mm stereo headphone socket. Considering the original CT1740 Sound Blaster 16 card itself was around 22cm long, shrinking the tech to fit was a fair effort in its own right.

Nevertheless, the early-1990s saw the emergence of the



Left: The HP95LX delivered a compact DOS-class computer – and a really big user manual.

'subnotebook' market and one of the smallest notebook PCs ever seen in Australia appeared in 1996 in the form of the Toshiba Libretto 50CT. Combining an Intel Pentium-75 CPU and Windows 95 OS, the 50CT wasn't that much larger than many of today's big-screen phones, measuring just 210 x 115 x 34mm. Yet it featured an 810MB hard drive and a smaller 2.5mm stereo headphones socket capable of 16-bit stereo sound. Unfortunately, compressed-audio playback options were limited (WinPlay3

was the only Windows app to then play MP3 files), so the space-hungry Pulse-Coded Modulation (PCM) format was the only practical option until 1997. Nevertheless, it highlighted just how small the technology was

with hardware manufacturers and rebuilt the platform, ditching the QWERTY keys and borrowing the touchscreen concept from the Apple Newton (and more recently, the hugely-successful PalmPilot).

Now dubbed 'PocketPC', it arrived in April 2000. PC maker Compaq was a key PocketPC partner, but the shock merger between Compaq and Hewlett-Packard in 2002 saw the Compaq brand retained for a short time, before being replaced with 'HP iPaq' branding. They were also affordable – my HP iPaq H1930 cost under \$400 and came with the one piece of software I used more than any other.

Windows Media Player

It had been available for Windows operating systems going right

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now becoming.

Microsoft's PocketPC

The year after the Libretto 50CT's arrival (and possibly in response to it), Microsoft launched its first mobile computing standard, dubbed the 'Handheld PC'. It also debuted a new mobile-focused operating system called Windows CE. Full-QWERTY keyboards and coloured LCD screens powered by new ARM-class CPUs also improved battery life considerably. HP's Jornada 720 was a fair example.

However, the Handheld PC still didn't take with the market. Nevertheless, Microsoft worked



Left: The Apple iPhone – what was the fuss all about?

Right: The HP Jornada 720 was a Windows CE handheld computer.



back to Windows 3.1, but one of the most important apps for digital audio in general, and the PocketPC in particular, was Windows Media Player. The combination of external storage availability (typically CompactFlash or SecureDigital flash cards) and now on-board MP3 and WMA audio-compression or 'codec' support meant that you could now listen to music while taking notes or doing other things on the device. The iPaq H1930 was my traveling oasis for a number of years – I could write story ideas as notes while listening to music on a device much smaller than a laptop, something I couldn't yet do with an iPod.

In that regard, Windows Media Player helped create a complete shift in mindset – for more than 100 years, listening to music was a function requiring a dedicated device. Now, it was just another app. Sure, Media Player wasn't the only app of its type (anyone still using Winamp?), but it was all but guaranteed to appear on every PocketPC device. In this case,

familiarity bred content.

But if there was a feature that tended to polarise users with most PocketPCs, it was the stylus-required touchscreen. The screen's touch technology was 'resistive', which meant it required considerable physical pressure to activate a particular spot and since the screens were also pretty small (and on-screen keyboards even smaller), a stylus was the only real solution.

By comparison, a genuine 'touch' screen required a more-sensitive 'capacitive' layer that used the capacitance effect of your finger against the screen's touch layer. This tech's day was still to come.

What are we waiting for?

However, as the 2000s progressed, more of us were carrying more than one device in our pockets – you had a mobile phone ('feature phone'), your MP3 player and increasingly, we were using PDAs (whether PocketPC, PalmPilot or whatever). It had become obvious that the killer product would be an easy-to-use

stylus-free PocketPC-style 'personal digital assistant' (PDA) that could play music and make phone calls. However, the barriers to overcome, though, were substantial.

Not least of which was limited battery power. Feature phones were everywhere, sure enough, but still required considerable electrical power to handle the phone's transceiver (transmitter/receiver) unit. Combining that into a 'smart' phone with CPU, storage, screen and the rest would take skill.

Another issue was the availability of a suitable CPU. On the whole, single/limited-function devices like mobile phones and MP3 players utilised at best resource-limited power-efficient microcontroller technology, rather than an expansive general-purpose high-performance CPU. However, that's exactly what was now required – and in 2005, CPUs that delivered decent performance on a bare sniff of electrons were still pretty thin on the ground.

Nevertheless, chip designer ARM had cut its teeth on the Apple Newton and over the last 20 years had slowly built up its CPU tech portfolio. In 2005, the company announced the first of its new Cortex-A CPU family, dubbed the 'Cortex A8'. Apple instead chose a Samsung version of the previous-generation ARM11 CPU core. Apple also underclocked the chip from its standard 620MHz to 412MHz to reduce power consumption. However today, the ARM Cortex-A series rules the world.

By the time Apple boss Steve Jobs pulled the iPhone out of his jeans-pocket on its announcement day of 9 January 2007, it was the nexus of multiple technology strands all reaching sufficient maturity at the right time – capacitive-LCD panels, mobile CPU design, flash storage capacity, Lithium-ion battery technology, internet connectivity, RAM chip capacity, chip fabrication methods. All of these technologies had to reach just the right level to make the iPhone a practical reality.

Smartphones and earphones

Today, the combination of smartphone and wireless earbuds is the uniform-of-choice of travellers around the world, whether it's walking to work, hitting the bus, the train or the plane. Audio quality is all but indistinguishable from the original live instruments and the idea of storing music locally on your

Below: The Sharp PC-1211 was the first programmable computer that fit into your pocket (Image credit: Denisfo, CC BY-SA 3.0).





device is 'so 2010s', particularly when streaming services can provide access to almost any song streamed via your phone-network provider.

Like the MP3 player and Walkman before it, look at an original first-generation iPhone today and it, too, with its tiny screen, has aged by today's standards. But in the 16 years since, not much has changed – phones are bigger, faster, run longer and do more, but the same basic building blocks are still there. Let's hope in another 40 years, future generations look back at how primitive it all is.

What goes around...

That said, today's smartphones do make it ridiculously simple to dial up and play almost any song ever written. But in losing much of the complexity of listening to our favourite music, we've also lost a fair bit of what I'd call the 'theatre' of playing recorded music. In much the same way the clash of rods and pistons and steam of a steam train captures the imagination of young and old alike, there's a bit of magic and anticipation involved when you pull out an LP, reel of tape or cassette, load it into what now looks like some weird retro-electromechanical time-machine, operate its controls and levers, watch it spin up and hear the dulcet tones of your favourite musicians emanate. But like the steam train, it's probably an idea that belongs to another time.

Over the last six issues, we've traced a potted history of portable audio – from the early days of luggable valve radios to carry-able reel-to-reel tape recorders, the invention of the compact cassette,

the compact disc, flash storage, iPod and iPhone.

Yet in the face of this rapid cascade of new tech, there have been recent reports of younger generations discovering technologies of generations past, including cassettes and digital cameras. Brush it off as just a case of

'early-onset nostalgia' if you like, but I reckon there's an innate desire in all of us to understand more of our technology, or to at least feel a little more in control of it.

Nevertheless, music helps us to react and feel, to forget and remember, as it has done since the dawn of time – and for 100 years come December this year, as we celebrate the centenary of broadcast radio in Australia, we've been using technology to do much the same.

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Next month... a new series

Next issue, we begin a brand-new series taking a uniquely-Australian look at one of the most glorious eras of computing - the golden 1970s-80s age of the 'home computer'. We'll rediscover some of our rich but almost-forgotten history, of a

time when Australia was a pioneer in home computing, before either Apple or Microsoft appeared on the scene. We'll cover some of the blockbuster computers of

the era that stormed the local market, but we'll focus on some of the lesser-known home-grown marvels that not only made an impact on Australian shores, but helped shape home computing in Australia. I can't wait for this series and I hope you can join me then. ■

Above left: More than 25 years on, the Toshiba Libretto is still one of the smallest PCs ever built (Image credit: Lorenzo Breda, CC BY-SA 3.0).

Above: The T-Mobile G1 (HTC Dream) launched Android to the world a year after the iPhone (Image credit: Michael Oryl, CC BY-SA 2.0).

Below: How do you squeeze this into a phone? Creative Labs' CT1740 Sound Blaster 16 sound card (Image credit: Darren Yates).

