Lecture 24. Constant Contact: from smoke signals to Wi-Fi, Part II

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Combining technologies in a smart way

In the last lecture we discussed the history of the telegraph, telephone, and radio and their impact on wireless communication. In this lecture we shall trace the development of 'smart' communication technologies as exemplified by the smartphone.

Popular culture classifies a device as 'smart' if its functionality is augmented with new features that are typically not associated with a generic version of such a device. A phone with Web browsing capability becomes 'smart' because an access to the Internet is not a necessary requirement for a gadget to be classified as a telephone. A car that can park by itself becomes 'smart' and so does a watch when augmented with, say, GPS, or a digital camera with WiFi networking capabilities.

Our present day communication devices became 'smart' by combining several technologies and applications into a single device, technologies that, in some cases, have been in development for decades. In fact, the smartphone can serve as a canonical example of a device that came to existence and popular use as a result of such a technological convergence. The smartphone brought together wireless communication, networking, computing, and a range of popular applications first available on devices such as pagers and personal digital assistants. This convergence has begun in the 1980s and has been rapidly advancing since then and continues to have a dramatic impact on our society.

The first step: making radio communication mobile and personal

Smart communication devices are "mobile" and personal. We have already seen how instrumental both of these features were to the social acceptance of hand-held calculators and hand-held game consoles. The "personal" designation of early microcomputers played a pivotal role in their introduction to our homes.

Radio, too, found its way into homes almost as soon as the technology matured enough to be of benefit to an individual. Radio sets became mobile and personal in the 1950s with the advent of the transistor (see Lecture 7).

Mobile communication devices require not only transmitters and receivers but also batteries to power them. In the early days of radio, all these components were large and heavy. Hence, to make a communication system mobile, it had to be installed on large mobile platforms such as cars or, in military applications, carried by soldiers.

In lecture 23, we have already seen early examples of 'mobile' communication devices used by the military – the *telegraph trains* used during the American Civil War. The first experiments with two-way, portable, wireless communication occurred possibly during WWI and the technology was applied on the large scale during WWII.

Fig. 1. An early military, portable, radio communication device. Source: Tim Rushby-Smith, Are you receiving me, December 15, 2010; http://www.timrushby-smith.com.

The first police car radios for two-way communication were installed in the 1920s. By 1930s, companies such as Motorola and General Electric installed radio equipment in police cars. For instance, Boston Police Department installed its first two-way radio equipment from General Electric in 1934. In 1947 Bell Canada offered mobile radiotelephones in Montreal and Toronto.

Fig. 2. "Patrolman and radio operator Walter Stick stands by one of the city's [Detroit] first radio-dispatched Police cars, a Ford Model T. Note the antennae on the roof." The quote and photograph from Kenneth S. Dobson, How Detroit police reinvented the wheel, *The Detroit News*, December 22, 2001, http://info.detnews.com/dn/history/police

Although the first experiments with "personal" car radio-phones took place in the second half of the 20th century (see Fig. 4), reliable car radio-phones were put into service in the second half of the 1940s, in response to the rapid growth of the American car and telephone industries in the postwar years.

The hardware constituting the car phone system was massive (heavy and large) and required a lot of power. As Michael Losse, one of the early users recollected,

> I remember an old IMTS unit I had installed in a small sports car. It was easy to tell when the mobile telephone was about to ring because the vehicle's headlights would dim ... [1]

Fig. 3. Possibly the earliest depiction of the car radio-phone. The cover of the August 1919 issue of the *Radio Amateur News*.

Fig. 4. Radio-phone in a private car, c. 1940s. Source: Steve Kovach, The 17 Most Important Moments In The 70-Year History Of The Cell Phone, *Business Insider*, Jan 23, 2013, http://www.businessinsider.com/the-evolution-of-the-cell-phone-2013-1

The large-scale use of "personal" (i.e. person-to-person) mobile communication devices that utilized radio waves came around WWII. These were *radiophones* and *walkie-takies*, first designed for marine, military, police, and ambulance use. One of such devices–the SCR536 "walkie-talkie"–was developed by Motorola.

Fig. 5. An early army hand-held "walkie-talkie" SCR536 used by the US Signal Corps during WWII. Source: Motorola M 11-235 manual; scanned by LuckyLouie.

The first portable radio-phones were large and heavy and lacked a long-life power source. After WWII, the walkie-talkies were introduced into the commercial market but it would not be until the technological breakthroughs in low power transmission and battery technologies when these devices would conquer the consumer electronic market.

Fig. 6. Actress Dorothy McGrath communicates using a "walkie-talkie" radio set while resting on a Los Angeles beach, c. 1947. Source: Los Angeles Daily News Negatives, UCLA Charles E. Young Research Library Department of Special Collections.

Fig. 7. Modern Walkie Talkies. Freetalker handhelds (top) and wrist watch version (bottom) manufactured by Shenzhen Freetalker Industry Co.,Ltd. (?) Source: unknown.

The major shift in personal wireless communication appeared in the 1970s with the introduction of the cell phone technology. As it is frequently the case, the principles of cell communication were worked out years before the technological advancement could make the conversion of the ideas into commercial products (in the 1940s, Bell Labs conducted research in cell telephony). Motorola was one of the earliest companies that commercialized cell phones (the first commercial cell phone call was made in 1983). Cell phone telephony arrived in Canada the following year.
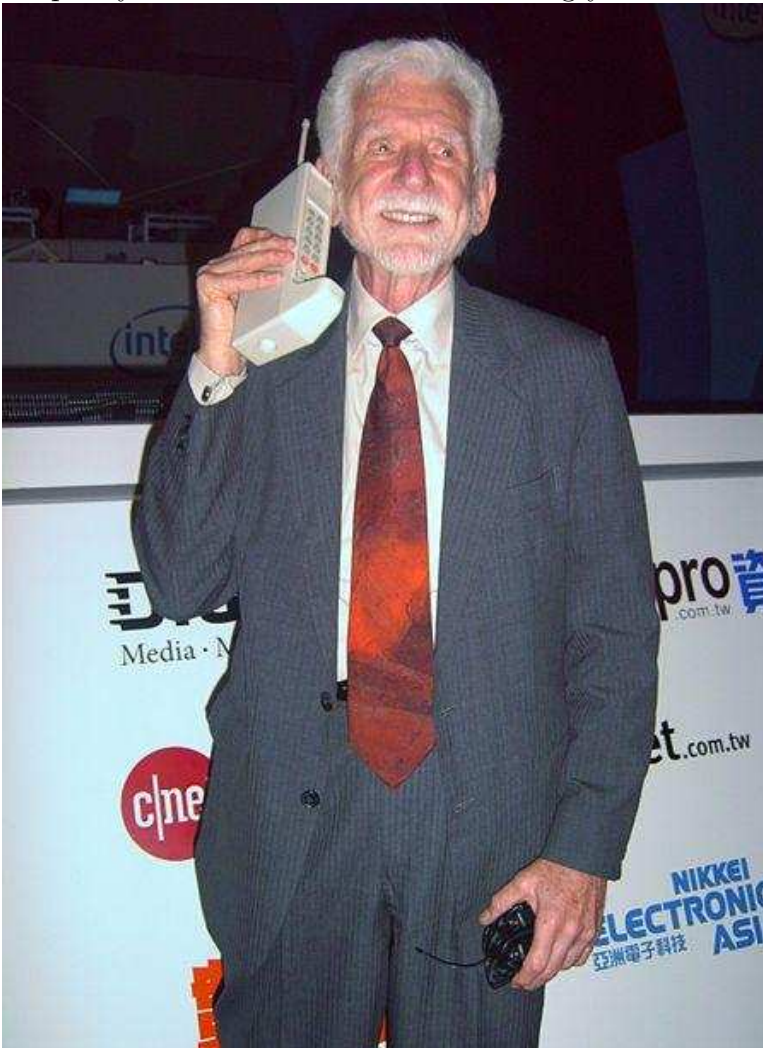

Fig. 8. Dr. Martin Cooper, the inventor of Motorola's first personal, handheld, cell phone, demonstrates his device in 2007. Source: photograph by Rico Shen.

The second step: making radio communication personal

Early radio-phones and walkie-talkies can be hardly classified as "personal". They were neither "pocket" nor "hand-held"; because of their large size and power requirements, they were installed mainly in cars.

A new device that overcame the size and power restrictions and could be classified as personal pocket communication device was conceived in the late 1940s and introduced into the commercial market in the 1960s. It was the *pager* – a wireless device that could send simple audible signals to notify the device's owner when someone was trying to contact him or her. Upon receiving such a notification, the owner could call the pager's service center which, in turn, would pass on the caller's message.

The pagers were intended for use by medical doctors and other individuals who required constant professional contact with other people, such as sales representatives and journalists.

Fig. 9. Pager with simple one-line display.
Source: http://mobihealthnews.com/12503/why-doctors-pagers-still-trump-smartphones

Bell Labs' Bellboy was possibly the earliest wireless pocket-sized pager. Thanks to the transistor technology it employed, it was not only small but also of low power consumption. The Bellboy was offered to the general public in 1962 when it was launched in Canada.

Fig. 10. Bell Labs' Bellboy, 1962. Source: Bell Canada Historical Collection, Bell Canada
http://www.mccord-museum.qc.ca/en/collection/artifacts/BELL-34452

Gradually, pagers became more sophisticated with new features and functionality added with every new product. They became (and still are) useful, popular, personal, and inexpensive forms of communication.

The first in the long chain of evolutionary steps was to introduce a on-line display. Instead of just sending an audio signal indicating the need to contact the pager operator/provider to receive an information, a tiny display could communicate a short message directly such as the name or a phone number of a person to contact. Clearly, on-line display was followed by multiple-line displays.

Fig. 11. Motorola pager with a simple one-line display.
Source: unknown

In 1995, Motorola introduced a new pager-gadget–the Tango–that, in addition to receiving messages could also send a few predefined responses such as "message received".

Fig. 12. Motorola Tango, 1995.
Source: 20 Moments In Motorola History, CRN, March 26, 2008.
http://www.crn.com/slide-shows/networking/206906014/20-moments-in-motorola-history.htm/pgno/0/8

The Tango was short-lived since it was not a fully two-way communication device and a much better gadget from a Canadian firm Research In Motion (RIM, now Blackberry)) appeared a few months later. It was the RIM Inter@ctive (or RIM-900, a.k.a. Bullfrog) – fully two-way communication device with a tiny keyboard for composing messages.

Fig. 13. RIM Inter@ctive, 1996. Source: unknown.

The RIM pager could send and receive short messages and e-mails. Other functions of the pager were sending faxes and texts to telephone answer machines (this feature allowed to convert a text message to an electronic voice and read it to a phone-based answering machine).

The RIM Inter@ctive was soon matched by other two-way pagers such as the SkyWriter (August 1997, SkyTel Corp.) and PageWriter (December 1997, Motorola).

Fig. 14. SkyWriter (August 1997, SkyTel Corp.) and PageWriter (December 1997, Motorola). The design of the PageWriter resembles that of the RIM 900. Source: *Business-Week Online: Daily Briefing*, December 31, 1998, and M. Katz, A 2-Way Pager That Links To the Net and to the World, *The New York Times on the Web*, Feb. 13, 1997.

These new-generation pagers offered not only the composing, sending, and receiving text messages but also a message management system including address books, inboxes, outboxes, drafts, and trashcans, in addition to scheduled message delivery and message forwarding. They could also be connected to computers for downloading and uploading information. Motorola celled its PageWriter 2000 pager a "smart pager".

The same year RIM announced the RIM 950 Wireless Handheld (released in 1998). In addition to Motorola PageWriter's functionality, the new RIM device provided many unique and/or improved features which made it a very popular choice among the customers (e.g., password protection, managing tasks and appointments, MemoPad and calculator (MemoPad was used for recording lists, notes, or other important information that the user wanted to store). The race was on.

Fig. 15. RIM 950, 1998. Source: unknown.

The Blackberry brand was launched on January 19, 1999 and, with the introduction and popularity of the new models, RIM had established itself as the industry leader.

Fig. 16. "Evolution" of Blackberry.

The third step: pocket computers and PDAs

Our present day smart communication devices are not collections of discrete devices sandwiched together into a common enclosure. They are programmable computers utilizing microprocessors capable of executing a variety of application programs. Were there any "small" hand-held computers on the market at the time when the first ideas of smart communication devices were shaping into consumer products? Yes, there were, already in the early 1980s.

The computing scene of the first half of the 1980s was dominated by the home and personal computing. However, new computing paradigms were formed in the background of the battle for the minds and hearts of computer users fought by the home and personal computer industries. Pocket computing was one of them.

Programmable pocket calculators were available on the consumer market already in the 1970s. The first of such devices was introduced by Hewlett-Packard in 1974. It was the HP-65 with some restricted programming capabilities. The company called it "the smallest programmable computer ever" and some even referred to it as "Personal Computer" (see [2]).
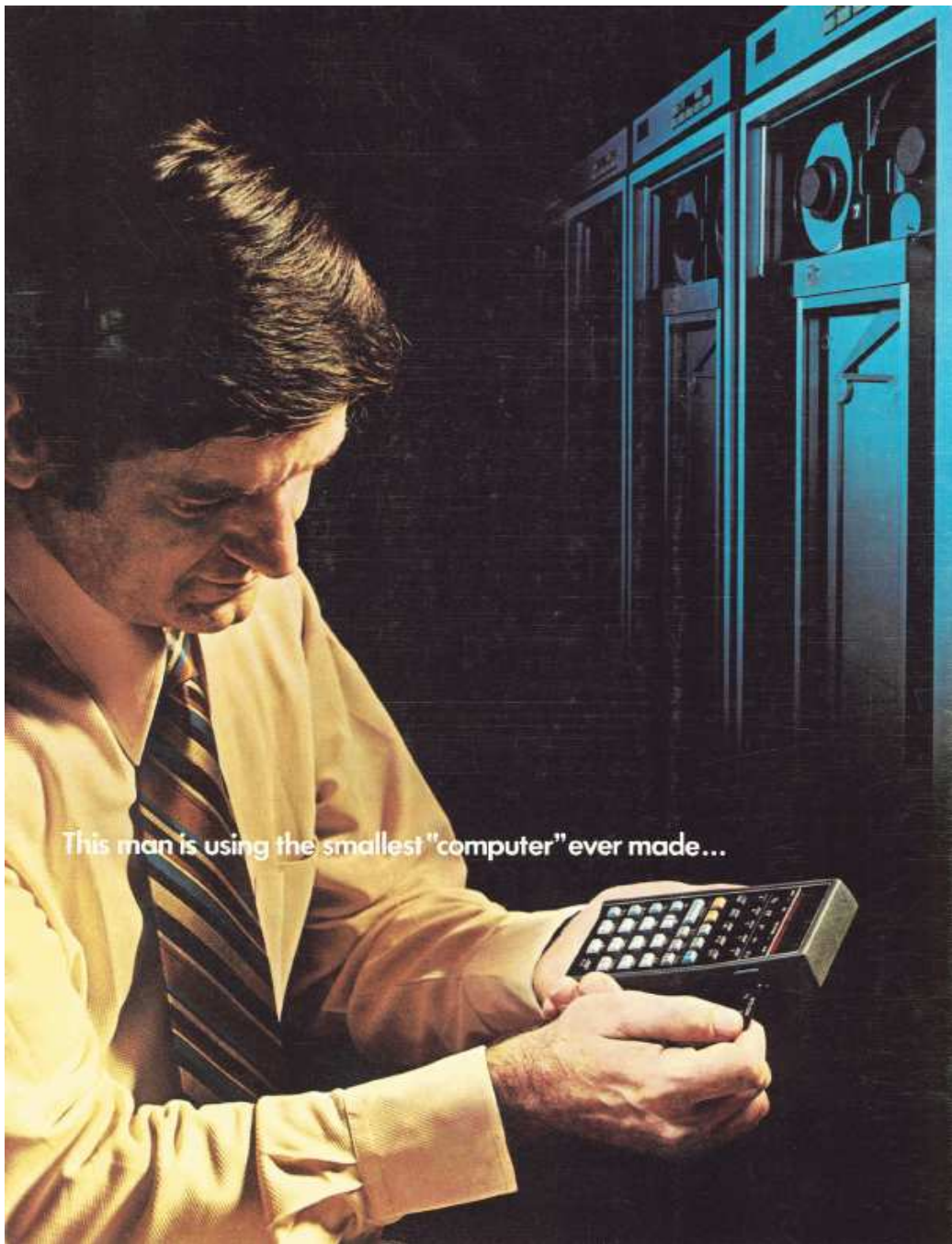
Fig. 17. The HP-65 – the smallest computer ever made. HP promotional brochure, 1974.

More able pocket computers (PCs) appeared in the early 1980s. They were battery powered hand-held devices that, typically, combined the functions of a rudimentary home computer with a scientific calculator. A one- or two-line display and a calculator-style keyboard was built-in.

Fig. 18. SHARP EL-5100 pocket computer (1984). Source: unknown.

In the 1980s, pocket computers such as the one depicted in Fig. 18 were manufactured all over the world. In the 1990s, these PCs were equipped with operating systems and could connect to the Internet. They offered home or office computer performance in a pocket-sized packaging that could fit in the palm of the user's hand. They were used mostly as traveling companions for keeping travelers connected. They were frequently equipped with a stylus for quick access to applications such as the Internet, e-mail, games and music. The popularity of these "miniature" personal computers has diminished in the first years of this century with the rise of the tablet computing but some manufacturers still design them (see Fig. 19.)

Fig. 19. Sony VAIO UX Micro PC (2006). Source: http://store.sony.com.

Combining a cellphone with a pocket computer to achieve multiple functionality would create a new market for "smart" communication devices. The IBM Simon Personal Communicator was, arguably, the first such a device. Following it's introduction at the Wireless World conference in November 1993 (the phone's prototype was shown a year earlier during COMDEX exhibition in Las Vegas; it was available in 1994 from Bellsouth), mobile phone industry commentators stressed that for the first time computer was introduced into a cellular phone ([3]). Simon's computing ability allowed the designers to combine cellphone communication with other functionality such as those provided by Personal Digital Assistants (or PDAs).

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Fig. 20. The IBM Simon Personal Communicator. Source: unknown.

Before we return to Simon and fully appreciate its novelty, let us switch the narrative to Personal Digital Assistants or PDAs. They started to appear in the early 1980s and were designed to provide multiple functions such as searchable address books and task managers, digital diaries and organizers, calendars and scheduling, alarm clocks and calculators. They were equipped with built-in displays and keyboards. The Casio PF-3000 Data Bank Super Memory-Computer (introduced in 1983) and Psion Organizer I, launched in 1984 by the British company Psion, can serve as examples.

In spite of its designation as a "computer", the Casio PF-3000 Data Bank supported only address book, data organization, and calculator functions.
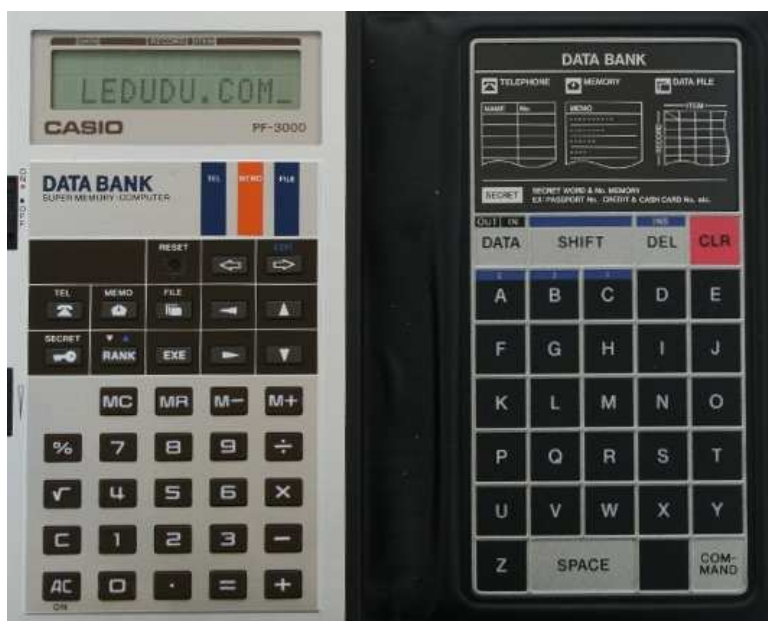

Fig. 21. The Casio PF-3000 Data Bank Super Memory-Computer, 1983.

On the other hand, Psion I was more than just a PDA. It was a data organizer and a calculator but also could execute several programs in the area of finance, science, and mathematics. It also had its own programming language that allowed to enter and execute rudimentary programs. It could be interfaced with peripherals (e.g. printers) and personal computers. That's why it was promoted as "the world's first practical pocket computer". That's why 'Pocket Computer' was explicitly etched on the case of the organizer (see [4]).

Fig. 22. Psion Organizer I, 1984. Source: http://archive.psion2.org/org2/psion1/index.html

In the 1980s and 1990s, PDAs were offered by manufacturers from all over the world including Casio, Dell, HP, JVC, NEC, Philips, Palm, Psion, Sharp, Sony, and Toshiba. They offered calendars, memo composing, scheduling, address books, alarms, clocks, password protection, computer connectivity, and so on.

Fig. 23. The Casio Digital Diary SF-8350R, 1994. It offered" phone book business cards, memo, secret memory area, schedule, graphic clock, world time calendar and calculator. Source: http://casio-pda.wikidot.com/sf-8350r

Another PDA that attracted much attention was Apple Newton MessagePad. The device was operated with a pen-stylus over a touch-screen. It offered information gathering and managing applications such as "Notes" editor (including handwritten material), a calculator, scheduler, contacts and calendar databases. A Newton user could send a fax or a message.
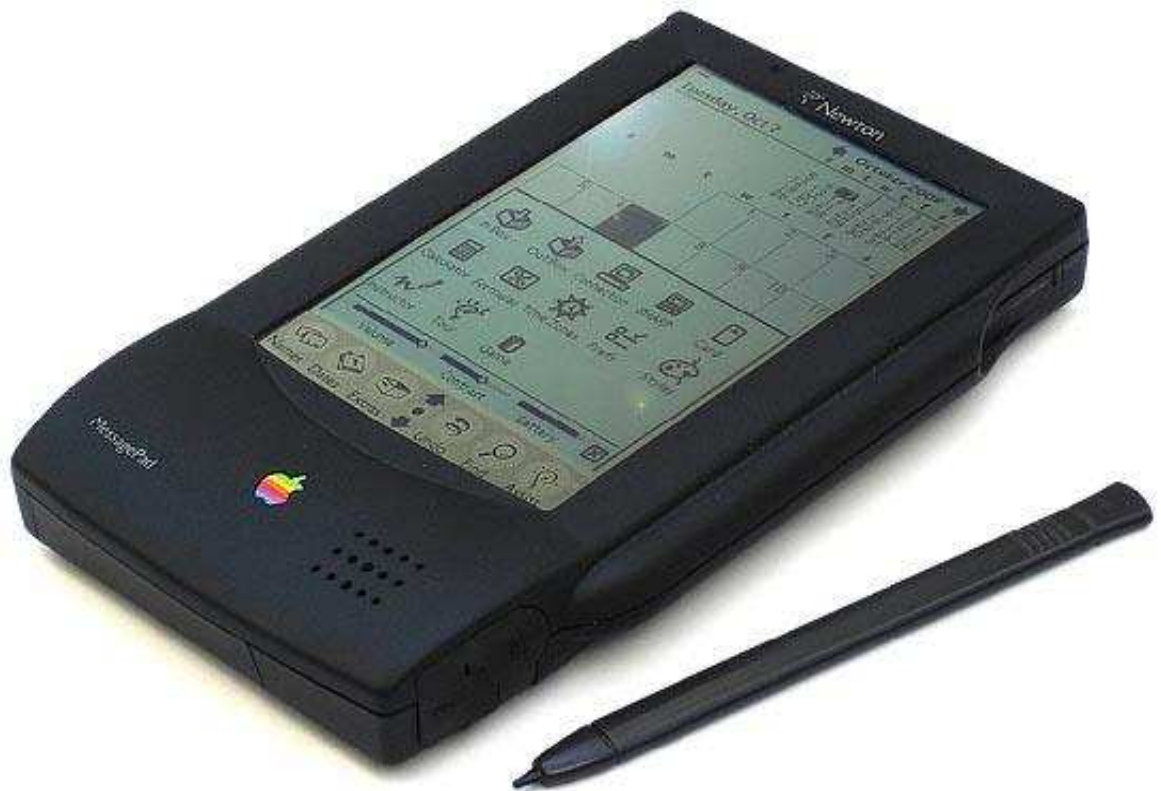

Fig. 24. The Apple Newton MessagePad. Source: http://oldcomputers.net/apple-newton.html

Since mid-1990s, marketing of PDAs frequently used the term "computer" not only to lure customers but also to stress the enhanced computer-like functionality such as the use of an operating system, connectivity to the Internet, the availability of productivity software such as text editors, spreadsheets, multimedia support. By 2000, PDAs have been subsumed by pocket-sized computers referred to as "pocket viewers" (e.g. Casio PV100), "personal entertainment organizers" (e.g. Sony CLI series of PDAs), and "pocket PCs" (e.g. Dell Pocket PC Axim X5 and Compaq H3600).

Fig. 25. Casio PV-S460 and PV-S660 pocket viewers, 2000. Functionality: world clock, calculator, currency converter, pocket sheet, expense, contacts, memo, calendar, schedule, to do, reminder alarm, games.
Source: http://casio-pda.wikidot.com/pv-s660

Fig. 26. Toshiba e310 Pocket PC, 2002. Source: unknown.

Putting it all together: smart communication devices

Since 1980s, the manufacturers of pagers, wireless handheld communicators, PDAs, electronic organizers, pocket viewers and PCs had experimented with combining of functionality and technologies. In the end, it would be the merger between the microcomputer technology, the Internet, and cellular communication that would result in the emergence of "smart" communication devices such as the smartphone and tablet.

We have already mentioned the Simon Personal Communicator. When introduced in 1993, it seemed that the designers got everything right as far as combining the functionality of PDAs, pagers, and cellphones was concerned: portability, personal designation, and multiple functionality including all sorts of dialing features, texting, mobile office, address book, calendar, calculator, fax, filer, mail, note pad, sketch pad, clock, and password protection. But, in the end, people were not buying Simons in quantities sufficient to maintain the product's presence on the market beyond 1995. Simon was

expensive, big, and heavy (in short, not exactly pocket-sized) and performing some of the tasks on the device were difficult (e.g. creating full-page fax messages or accessing some on-line services such as CompuServe).

Fig. 27. Intel celebrates the IBM Simon in 2014.

The idea represented by Simon was to good to be ignore for too long. In 1997, Stockholm (Sweden)-based Ericsson started to experiment with "smartphone" technology starting with the GS88 prototype and R380 product introduced in 2000. According to [5], the R380 was the first touch screen phone and could access the Web. By 2002, Ericsson smart phones could also play MP3 content, had video player, 3D graphics, Bluetooth, and digital camera.

On the North American continent, the smartphone market of the early 21st century was developing very fast. The RIM Blackberry line revolutionized first messaging, then secure e-mails and messaging for mobile phones and email-anywhere devices. Blackberries became de facto standard for business mobile communication; RIM was manufacturing them for most of the American carriers. The Blackberry 5000, 6000, and 7000-series smartphones were introduced in 2002 and 2003. The 7200 smartphone offered messaging, address book, calendar, tasks, memo and other personal information managing apps, phone functions, Web browsing, integration of email accounts. (see more at [6]). The Blackberry 7200 was a phone, a PDA, an email and messaging device, and a Web browser.

Fig. 28. The Blackberry 7200, RIM, 2003.

Apple joined the smartphone rush in 2007 by introducing the iPhone line
and quickly started to cut its share of the market. In just a few years, the
iPhones have become some of the most popular smartphones around the
world.

The iPhones, the Samsung Galaxies, Google phones and myriad other smart
phones operating under Android OS have established themselves as the top
communication and information accessing devices, productivity tools, social
interaction devices, multimedia and digital entertainment all-in-one gadgets.

Fig. 29. The Apple iPhone 4GS, 2007.

They all represent an extraordinary convergence of computer and information technologies. They redefined the principles of our social interactions and professional activities. They have become our constant and necessary companions.

But in spite of their vast utility and extraordinary industrial designs that make them irresistible gadgets, we must remember that all of these "smart" devices have their roots in a long chain of technologies and products from microcomputing, wireless communication, and networking to pagers, PDAs and pocket PCs.

Judging from the speed of advancement of the computer and communication technologies, (smartphone life span and, hence, technology transfer, is estimated at between 18 to 24 months, data after North America after Recon Analitics, 2011) we can expect the arrival of fundamentally new devices by the end of this decade.

Fig. 30. Source: myPhoneMD,
http://myphonemd.net/blog/2012/07/16/why-your-new-smartphone-is-already-obsolete

In the meantime, we have other urgent social problems to attend to, such as cellphone pollution and addiction, or the dangers of texting and driving.

Fig. 31. Cell phone pollution. Source: unknown.

References

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4 http://archive.psion2.org/org2/psion1/1_promo.htm

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6 http://www.mobiletechreview.com/BlackBerry_7280.htm