Theory of modern evolution

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A friend asked me the other day what generation of the computer industry I thought we were currently living in. It was an interesting question, mainly because of the assumptions contained within it.

The chief of these assumptions is that there is such a thing as generations of computing. This term was once widely used, but you rarely hear it now. Back in the 1980s (doesn't that now seem like a long time ago?) it was widely assumed and widely remarked that we were in the process of moving from the third to the fourth generation of computing.

The concept of computer generations has now fallen into disuse, but it has historical relevance, and is a useful way of thinking about some of the evolutionary changes that have occurred in information technology in the last few decades.

The first generation of computing began when electronic computing began, in the late 1940s and early 1950s. These early machines were developed largely for scientific purposes, and were programmed using "machine language", or the native zeroes and ones of digital computing. This sometimes involved hard wiring the computer's memory, using cables and plugs.

Machine language programming gradually moved to assembly language programming, in which the native machine code was replaced by simpler mnemonics for each computer instruction. At around the same time commercial applications became more widespread than scientific applications as people realised that the storage and retrieval capabilities of computers were at least as useful as their computational power. That ushered in the second generation, which ended sometime in the 1960s.

The third generation of computing began with the widespread use of commercial mainframes in the 1960s, and continued into the minicomputer era of the 1970s. The major distinguishing feature of this generation was the use of so-called "third generation languages" (3GLs), such as COBOL and Fortran and BASIC, to program computers.

3GLs used English language type instruction to make it much easy to program computers. Programming was still an arcane art, but one which became much easier to learn. In the third generation the usage of computers became widespread in business and government, and the computer industry became an important part of the economy. To be "in computers" was to be at the cutting edge of the commercial world.

The third generation came to an end in the early 1980s. There were two related distinguishing features of the fourth generation - the proliferation of personal computers, and the rise of networking hardware and software to connect PCs to mainframes and mainframes to each other.

This was very important. In the first three generations of computers, computers were rarely if ever connected to each other. The concept of networking did not exist. The ability of computers to share information with each other was one of the biggest changes in the history of computing, one whose consequences are still not fully apparent today.

During the 1980s a lot of publicity was given to a government sponsored initiative in Japan, which called itself the Fifth Generation Project. It seems strange now, but this move sent shockwaves through the West. There was a widespread fear that the Japanese computer industry, fuelled by the advances of the Fifth Generation Project, would overtake the west and ultimately dominate the world.

It didn't happen, of course. The Japanese computer industry is substantial, particularly in laptops and in the provision of larger computers to its home market, but it is a long way from being dominant. The US computer industry remains on top, by a very large margin.

The Fifth Generation Project was intended to combine advances in semiconductor technology, artificial intelligence (a real buzzword of the 80s, that one), improved user interfaces, and high bandwidth communications to develop a new type of supercomputer that would sweep all before it. It was all too hard, and the project failed. All it did was confirm the widespread belief that the Japanese are good at copying technology, but not at developing it.

If we are thinking in terms of generations of computers, the real fifth generation was the growth of the Internet in the 1990s. Some would claim that client/server computers in the early 1990s constituted the fifth generation, but that advance really only confirmed the technology of the fourth generation - of large and small computers working together and communicating relatively seamlessly with each other.

I believe we are still in the fifth, or Internet, generation. But I also believe we are about to enter the sixth generation, which we might call the embedded generation.

The Internet has been massively important, but it was and is no technological marvel. It is merely a really big and really cheap (and so far really slow) network that enables other things, like e-mail and e-commerce. It will, I'm sure, be seen by many in the future to have been an interim phase, which is perhaps why the "generation" terminology has disappeared from popular usage. It is becoming very difficult to tell when new technology waves hit.

But hit they do. The current mania for mobile phones and personal organisers and wireless messaging is the first manifestation of an age when computers will be ubiquitous and there capabilities ingrained into our lives. Just as we only notice the electricity or water supply when it is not there, so we will only notice the information utility when it breaks down or delivers inferior service.

This development is proceeding on many fronts. There are already fewer microprocessors in use in devices that we recognise as "computers" than there are in cars, washing machines, microwave ovens, mobile phones and the like. As interfaces move beyond screens and keyboards to voice recognition and embedded displays, the distinction between computer and non-computer will continue to shrink.

That will be a generational change, probably a more important one than any that have gone before it. Whether it is fifth or sixth or seventh generation is not the issue. The point is that it will happen, and it will change our lives immensely.

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