

## Chapter VII

# Smart Cards: The Next Generation

### SMART CARD TECHNOLOGY

#### Historical Overview

The history of the smart card begins as far back as 1968. By that time magnetic-stripe cards while not widespread, had been introduced into the market (Purdue, 2008). Momentum from these developments, together with advancements in microchip technology made the smart card a logical progression. Two German inventors, Jürgen Dethloff and Helmut Grötrup applied for a patent to incorporate an integrated circuit into an ID card (Rankl & Effing, 1997, p. 3). This was followed by a similar patent application by Japanese academic, Professor Kunitaka Arimura in 1970. Arimura was interested in incorporating “one or more integrated circuit chips for the generation of distinguishing signals” in a plastic card (Zoreda & Oton, 1994, p. 36). His patent focused on how to embed the actual micro circuitry (Lindley, 1997, p. 13).

#### Smart Cards in the 1970s

In 1971 Ted Hoff from the Intel Corporation also succeeded in assembling a computer on a tiny piece of silicon (Allen & Kutler, 1997, p. 2). McCrindle (1990, p. 9) made the observation that the evolution of the smart card was made possible through two parallel product developments- the microchip and the magnetic-stripe card- that merged into one product. However, it was not until 1974 that previous chip card discoveries were consolidated. Roland Moreno’s smart card patents and vision of an electronic bank manager triggered important advancements, particularly in France. In that year, Moreno successfully demonstrated his electronic payment product by simulating a transaction using an integrated circuit (IC) card. What followed for Moreno, and his company Innovatron, was a batch of patents among which was a stored-value application mounted on a ring which connected to an electronic device.

By the late 1970s the idea of a chip-in-a-card had made a big enough impression that large telecommunications firms were committing research funds towards the development of IC cards. In 1978 Siemens built a memory card around its SIKART chip which could function as an identification and transaction card. Despite early opposition to the new product it did not take long for other big players

to make significant contributions to its development. In 1979 Motorola supplied Bull with a microprocessor and memory chip for the CP8 card. In July of that year Bull CP8's two-chip card was publicly demonstrated in New York at American Express. French banks were convinced that the chip card was the way of the future and called a bid for tender by the seven top manufacturers at the time: CII-HB, Dassault, Flonic-Schlumberger, IBM, Philips, Transac and Thomson. Ten French banks with the support of the Posts Ministry created the Memory Card Group in order to launch a new payment system in France. Such was the publicity generated by the group that more banks began to join in 1981, afraid they would be left behind as the new technology was trialed in Blois, Caen and Lyon. Additionally, the US government awarded a tender to Philips to supply them with IC identification cards.

### Smart Cards in the 1980s

By 1983 smart cards were being trialed in the health sector to store vaccination records and to grant building access to hemodialysis patients. But it the French who recognized the potential of smart cards in the provision of telephony services. The first card payphones were installed by Flonic Schlumberger for France Telecom and were called Telecarte. By 1984 Norway had launched Telebank, Italy the Tellcard, and Germany the Eurocheque. A number of friendly alliances began between the large manufacturers who realized they could not achieve their goals in isolation. Bull signed an agreement with Motorola and Philips signed an agreement with Thomson. Meanwhile, MasterCard International and Visa International made their own plans for launching experimental applications in the United States. In 1986 Visa published the results of its collaborative trials with the Bank of America, the Royal Bank of Canada and the French CB group. The "...study show[ed] that the memory card [could] increase security and lower the costs of transactions" (Cardshow, 1996, p. 1). Visa quickly decided that the General Instrument Corporation Microelectronics Division would manufacture their smart cards. The two super smart card prototypes were supplied by Smart Card International and named Ulticard. In 1987 MasterCard decided to spend more time reviewing the card's potential and continued to conduct market research activities. Issues to do with chip card standardization between North America and Europe became increasingly important as more widespread diffusion occurred.

### Smart Cards in the 1990s

The 1990s was a period characterized by the 'microprocessor explosion'. Smart cards became a part of that new interest in wearable computing- computer power that was not only cheap and small, but was always with you (Cook, 1997, p. xi). The progress toward the idea of ubiquitous computing is quite difficult to fathom when one considers that the credit-card sized smart card possesses more computing power than the 1945 ENIAC computer which: "...weighed 30 tones, covered 1500 square feet of floor space, used over 17000 vacuum tubes... 70000 resistors, 10000 capacitors, 1500 relays, and 6000 manual switches, consumed 174000 W of power, and cost about \$500000" (Martin, 1995, p. 3f). Today's smart card user is capable of carrying a 'mental giant' in the palm of their hand. Smart cards can now be used as payment vehicles, access keys, information managers, marketing tools and customized delivery systems (Allen & Kutler, 1997, pp. 10-11).

Many large multinational companies have supported smart card technology because the benefits are manifold over other technologies. It was projected that by the year 2000, an estimated volume of smart-card related transactions would exceed twenty billion annually (Kaplan, 1996, p. 10). Michael Ugon, a

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