



The Taiwan Health Care Smart Card Project

The Taiwan health care smart card project is one of the largest health care smart card solutions in the world and the first of its kind in Taiwan, Republic of China. The total bid price for the project was US\$108 million, and contractors were requested to finish within 25 months of the start date, April 12, 2001. The smart card project infrastructure is integrated into the original paper-based health care system.

Project Background

The total population of Taiwan is now 22.5 million, and 96% of Taiwan citizens joined the National Health Insurance (NHI) program that was established 8 years ago. A total of 16,558 hospitals and clinics (90% of the total) registered in the NHI program, creating a service network for insured applicants nationwide. Taiwan had a strong IT foundation: the original paper-based health care system included 92% of contracted medical institutions with a computerization rate of at least 70% and public satisfaction levels of 71%.

The NHI program recognized revenue from insurance premiums of US\$8.3 billion in 2001. Total health expenditure is 5.5% of Taiwan's GDP.

Before the smart card was introduced, paper cards were used by the Bureau of National Health Insurance (BNHI) to audit patient information, then reimburse service providers monthly. The card is renewed after the patient uses medical services up to six times. Even though reporting and information handling is well run and maintained, the system has certain problems, such as identity fraud, excess false insurance premium claims from health care institutions, complex program vouchers, waste of resources due to high frequency of card replacement, and high losses due to discontinuity of insured applicants. To solve these problems, in April 2001 the Bureau of National Health Insurance (BNHI) issued 22 million smart health care cards using Java Card technology to Taiwanese citizens.

Project Implementation

The main contractor, the Smart Card Division of the Information System & Service Sector of TECO Electric & Machinery Co., Ltd. (TECO), integrated the original back-end database for the paper card system with the interface for the new smart card system. In the first year, they created specifications that met the requirements for hospitals and clinics, computer back-end needs, security rules, and networks. They also completed the system development required by the specifications. In the second year, TECO manufactured the cards, developed the required applets to be loaded on the cards, audited the information for all 22 million people, took photographs, issued cards to everyone, and installed card readers in 16,000 participating hospitals. They also tested and verified all processes. Currently about 70% of the hospitals are online. It is believed that the online rate will be almost complete by the end of 2003.

This project required multiple stages. The tasks for the main contractor included the following:

- Design and facilitate the execution of security policies.
- Allocate resources to design, manufacture, and distribute approximately 22.3 million smart cards and 300,000 reader security access module (SAM) cards.
- Install 20,000 free reader sets (one for each health institution in the pilot trial).
- Establish and manage a 150-seat call center for card use support.
- Develop a comprehensive computing network between BNHI headquarters and its branches and develop a medical virtual private network.

- Integrate a platform for information transmission between BNHI, hospitals with different health information systems, and medical institutions with different IT infrastructures.
- Manage 800 training courses for end users and hospitals nationwide.

Project Results

TECO and the other participating entities integrated the entire IT infrastructure of Taiwan's health industry and then integrated this new infrastructure with a secure smart card solution.

The NHI health care smart card (illustrated below) can be used for 5 to 7 years, making annual replacement unnecessary. The front side of the card includes the card's serial number and the cardholder's photo, name, ID number, and date of birth. People are not required to present an additional ID when they use the card for NHI health care services.



The smart card is a microcontroller-based card and has 32 kilobytes (KB) of memory, of which 22 KB will be used for four kinds of information:

- Personal information, including the card serial number, date of issue and cardholder's name, gender, date of birth, ID number, and picture.
- NHI-related information, including cardholder status, remarks for catastrophic diseases, number of visits and admissions, use of NHI health prevention programs, cardholder's premium records, accumulated medical expenditure records and amount of cost-sharing.
- Medical service information, including drug allergy history and long-term prescriptions of ambulatory care and certain medical treatments. This information is planned to be gradually added depending on how health care providers adapt to the system.
- Public health administration information (such as the cardholder's personal immunization chart and instructions for organ donation).

The Taiwanese government has reserved the other 10 KB of memory for future use.

Moving to the smart card system has resulted in the following changes:

- Hospitals and clinics upload electronic records daily to BNHI.
- After every six patient visits, card information is uploaded online for data analysis, audit, and authentication.
- The reimbursement process is faster.

Privacy and Security

BNHI has strong privacy and security requirements for the Taiwan health care smart card, including a defined privacy policy, multiple smart card security mechanisms to prevent counterfeiting and protect cardholder information, mechanisms to protect the security of information during transmission, practices to prevent computer viruses and a crisis management and response plan. The overall system architecture was designed to implement these policies, protecting the cardholder's private information while allowing access by authorized health care professionals. Key smart card security and privacy mechanisms are:

- High-grade card printing, comparable to payment cards.
- Encryption of information stored on the card.
- BNHI-issued SAM card for each smart card reader, with a strict authorization and mutual authentication process to access on-card data.
- Cardholder personal identification numbers (PINs) to protect on-card personal information.
- Plans for a health professional card that would be used to authorize health care provider access to medical information on the card.

Lessons Learned

To be successful, similar smart card projects must ensure physical, platform and application interoperability. The following items are important for successful project implementation:

- A comprehensive system security plan to guard the cardholder privacy.
- Certification of security control at each step.
- A comprehensive plan for managing the first issuance of the card, which must involve as few errors as possible to reduce cost.
- A comprehensive plan for the entire information system structure.
- An assessment of the efficiency of system operations.
- A marketing project plan.
- Integration testing and acceptance procedures.
- Card application development to ensure that the necessary card applications are available when needed.

The infrastructure development required to support the Taiwan health care smart card project is well underway. Starting July 1, 2003, both health care smart cards and paper cards are in use simultaneously in Taiwan. As of September 6, 2003, smart cards have been issued to 95% of the population of Taiwan and 70% of the hospitals and clinics are online and in operation for smart card usage. It is estimated that by January 2004, health care smart cards will be fully implemented and paper cards will be phased out. In the current (initial) stage, only name, date of birth, and national ID number are stored in the card.

This user profile was developed by the Smart Card Alliance Secure Personal Identification Task Force with the assistance of Yuh-Ning Chen, Ph.D., MartSoft Corporation, as part of the report, "HIPAA Compliance and Smart Cards: Solutions to Privacy and Security Requirements," available at http://www.smartcardalliance.org/alliance_activities/hipaa_report.cfm. For more information about how smart cards are used for secure identification applications, visit the Alliance web site at <http://www.smartcardalliance.org>.