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PLENARY MEETING

Brazil (Federative Republic of)

TECHNOLOGY TRANSFER: PUBLIC TELEPHONE SYSTEM USING INDUCTIVE CARDS

A positive experience among developing countries

Summary

The activities described in this paper fall within the context of Question 5/1 of Study Group 1 and respond to suggestions made by Japan within the framework of BDT to the effect that projects that facilitate interaction among developing countries should be encouraged.

The paper describes how the technology of Brazil's public telephone system using inductive cards was transferred to a province of the People's Republic of China in the period 1994-1996.

Background on the use of inductive technology for public telephones

Until the early 1990s, public telephones in Brazil were equipped with coin boxes accepting only tokens, since the high rate of inflation at the time made it impossible to use normal coins. Various factors, such as the high cost of collecting and distributing tokens, lack of an effective remote monitoring system, expense of maintaining telephones broken into by vandals for the tokens they contained, and the bringing into use worldwide of public telephone systems using magnetic cards and other technologies, led TELEBRAS, the company responsible for Brazil's telecommunication system, to study options for upgrading the country's public telephone system.

Having studied the basic requirements in respect of Brazil's public telephone services, bearing in mind the country's relatively large population, *the differences in purchasing power, with a large percentage of people at the lower end of the income scale, the variations in population density among the regions and the considerable distances between them*, and the range of technology available internationally, TELEBRAS concluded that conditions in Brazil called for an innovative approach with low operating costs (since Brazil's telephone charges, especially for public call boxes, were much lower than those in other countries), as well as effective protection against misuse and vandalism.

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This innovative approach was achieved by developing a telephone system based on the inductive reading of cards (a technological world first at the time), with each public telephone constituting a dedicated station forming part of a public network set up by several service providers and capable of functioning within a framework of low-capacity digital exchanges with a "friendly" remote monitoring system. When an inductive card is inserted into the reader forming part of the telephone set, the credits imprinted on the card are "burned" by electromagnetic induction without physical contact, thereby obviating the need for card traction and reading devices.

The system has proved efficient in Brazil, and there are now some 200 000 such public telephones nationwide, providing excellent technical, operational and financial results.

For the manufacture of the equipment and cards, TELEBRAS, as owner of the technology, issued licences to private companies in Brazil. These companies, well aware of the product's potential, and once they had consolidated it on the Brazilian market, began to look for market opportunities in other countries.

Exporting the technology

A unique opportunity for Brazil to export the technology took concrete form with the conclusion of agreements between 1994 and 1996 between TELEBRAS and the Brazilian manufacturers on the one hand and a provincial telecommunication service provider in the People's Republic of China on the other, constituting a joint undertaking between developing countries with the potential for participation by industry in the recipient country.

The undertaking comprised the following main steps:

- 1) licences issued to Brazilian manufacturers to transfer the technology;
- 2) establishment of a joint venture between Brazilian manufacturers and the provincial operator in China;
- 3) formulation of a stage-by-stage follow-up and technological development plan geared to specifications drawn up in the People's Republic of China.

Prospects for development of the technology outside Brazil

Our analysis of the development of public telephony inductive card technology outside Brazil is based on two assumptions: first, that in the coming decade public telephones will transcend their basic function and become an integral part of the *electronic transaction processing* platform that is emerging globally as part of the *Global Information Infrastructure*; and second, that each card will constitute a physical key to this platform, containing for this purpose functional elements such as codes for access to networks, personal data banks and lap-top computers, as well as providing access to the Global Information Infrastructure by means of readers incorporated in the telephones.

These are thus the lines along which inductive technology, initially used solely for public telephony with prepaid inductive cards, has been evolving; it can now be combined with other technologies on the same card - e.g. magnetic and "contact chip" - and work is now in hand to incorporate the new-generation "contactless chip" technology. With this prospect for the future, inductive technology has developed into a *technology of multifunctional hybrid substrata* whose range of functions (such as access to networks, personal databanks and local information processing) will be capable of transforming these substrata - and consequently the technology that underpins them - into one of the basic components of an electronic transaction system that will most likely form part of the Global Information Infrastructure.

Given this potential, inductive technology is beginning to make its mark outside Brazil, in particular through the technological and industrial partnership that stands to emerge from the above-mentioned agreements between Brazilian and Chinese entities.

Life cycle of the technology outside Brazil

It is recognized that outside Brazil, the life cycle of inductive technology and its transformation into a technology comprising multifunctional hybrid substrata comprises three separate phases.

First phase of the life cycle - Introduction

During the first phase of the life cycle of this technology and its counterpart development outside Brazil, specifically in China, the basic business framework was created by establishing the technical and legal arrangements required to propose a product that could be tried out within a given region and that would lend itself to the implementation of pilot projects. On the basis of that framework, a pilot experiment was thus set up in one of China's largest provinces, with public telephone units capable of incorporating both chip and inductive readers.

This stage involved identification of the differences which the system (including its management software) presented, vis-à-vis the specifications being drawn up in China. It also involved determining points requiring modification with a view to expansion based on the need to adapt the original inductive technology to the needs and requirements of a system in the course of being introduced in the other country.

Second phase of the life cycle - Growth

The second stage - growth - calls for steps to be taken to maximize market participation and offer additional goods and services at attractive prices while continuing with the aim to increase the technology's presence in the mass market. To this end, a pilot project was established with a schedule providing for the stage-by-stage introduction by the joint venture, with technological support from the TELEBRAS Research Centre, of a public telephone system using inductive and contact chip technology in the Chinese province.

Third phase of the life cycle - Maturity

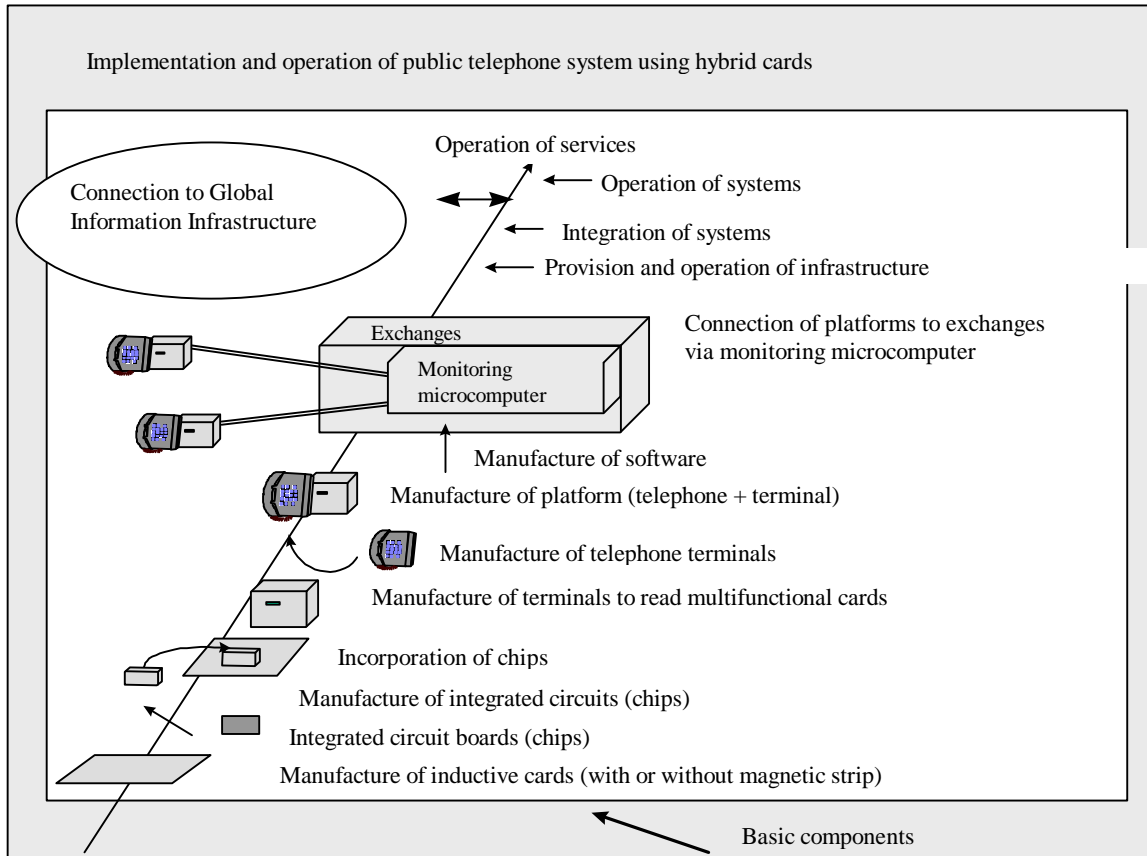
In the third phase - technological maturity - it can be foreseen that if the experiment in the Chinese province is satisfactory and the management software system and communication protocols can be rendered compatible with the Chinese specifications, the technology may be extended to other Chinese provinces and other countries.

This vision is based on the advantages and potential that hybrid card technology has now come to offer - for example, products using hybrid inductive-magnetic cards, hybrid inductive-contact chip cards, multifunctional cards, multifunctional readers and remote monitoring software at local, regional and international levels.

Opportunities for companies in developing countries

The potential of inductive technology and its spinoffs and the analysis of the current technology transfer experiment, as reported on in this article, show that inductive technology can offer major business opportunities to telecommunication operators and industrial companies in developing countries. This conclusion is based on the low initial cost of introducing and operating the public telephone system using inductive cards, combined with the possibility of creating opportunities for local participation in the system's development to incorporate other technologies and thus arrive at the multifunctional hybrid substrata.

This potential may be portrayed as a chain comprising the introduction and operation of telephone systems with multifunctional hybrid substrata, as shown in the figure below. Implementation and operation are viewed as including the production of cards and basic inputs, right up to physical introduction of the system and operation of the services it makes possible; it is also assumed that the necessary inputs - for example, components, equipment, software and management capacity - can be supplied by local enterprises or through partnerships between such enterprises and research and industrial centres in other regions or countries.



Conclusions

The international partnership reported on in this paper illustrates one way of overcoming the pattern of technological dependency on the part of developing countries vis-à-vis the industrially more advanced nations. More than that, it represents the replacement of that pattern by an "*interdependence option*", based on common requirements - the forerunner of joint international undertakings involving the various players in each country and hinging on innovative technology with specific advantages such as low cost of introduction and operation and high potential for future development and for the creation of opportunities for local industry, either alone or in partnership with industry in other developing countries.