

Chapter X

The Auto-ID Technology System

INTRODUCTION

This chapter analyses the findings from the case studies on bar codes, magnetic-stripe cards, smart cards, biometrics and RFID tags and transponders. Its main aim is to describe the auto-ID innovation process, especially the prevalence of patterns of migration, integration and convergence in auto-ID techniques and devices. Migration will be shown to have occurred in the transition between magnetic-stripe cards and smart cards, and the transition between bar codes and RFID transponders. Integration will be demonstrated through the example of auto-ID hybridization, especially on multi-technology cards, and the use of biometric minutiae on 2D bar codes. The third pattern to be described is that of convergence, as in the case of radio-frequency capable smart cards. The auto-ID selection environment will also be discussed from the perspective of the service provider who is increasingly facing pressure to choose the right auto-ID technique for a given application context.

WHO ARE THE AUTO-ID STAKEHOLDERS?

Having studied the cases of five auto-ID technologies and their respective networks, it can be seen that the interactions of stakeholders in the industry are paramount to the overall success of the innovation process. Indeed, auto-ID innovation is highly complex. The sheer number of stakeholders including private enterprise (technology and service providers), universities and consortia, government agencies (regulators and legislators), standards bodies, committees and other institutions (industry associations and forums), and end-users (consumers and employees) means that feedback to and from each stakeholder becomes integral in progressing an auto-ID application from conception to diffusion. It does therefore make sense to study auto-ID as a single technology system (TS). While Braco (1997, pp. 116-119) and Elliot and Loebbecke (1998) define lists of stakeholders for single auto-ID innovations, their definitions do not encapsulate all the stakeholders that are required to get a technique from invention to diffusion.

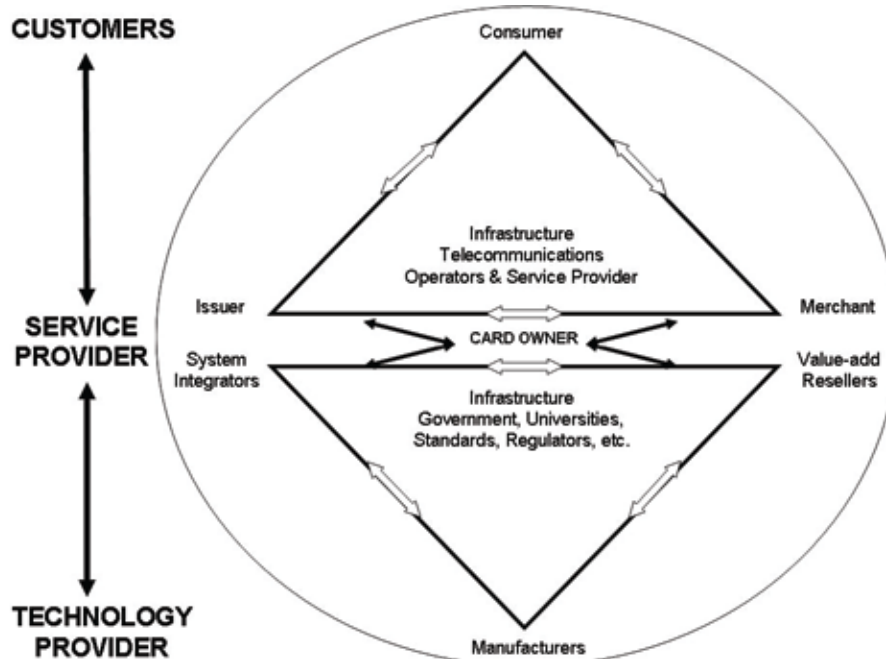
The stakeholders presented in the case studies can broadly be categorized into two groups, including those involved:

- i. In the invention, innovation and supply of auto-ID technological system components such as manufacturers, universities and government research bodies; and
- ii. In the provision of services that require customers to use auto-ID technological system components such as issuers, merchants and consumers.

The customer stakeholders include consumers, issuers and merchants; the technology provider stakeholders include manufacturers, system integrators and value-added resellers; and finally the service provider stakeholders, the owners of the operation, act to bring the two former groups together. Both the customers and technology providers have an infrastructure within which to operate. Customers use a physical infrastructure in the way of information technology and telecommunications (IT&T) to carry out transactions, and technology providers use a knowledge infrastructure that includes standards committees, university researchers, regulators and others. Essentially organizations are those entities that are consciously formed with an explicit purpose and institutions are those that are formed spontaneously to regulate interaction between people. The economic relationships that exist between organizations and institutions can be described as physical and knowledge infrastructures. The interplay between all these different stakeholders forms the technology system specific to auto-ID.

Noticeable in Figure 1 are the feedback loops inherent in the auto-ID innovation process. Without collaboration a given product innovation will not reach its potential and probably fade away to find a resting place in the mass of great ideas that were never realized. For example, if standards committees do not work with manufacturers to understand their requirements and learning experiences, then a default standard will most likely not be adhered. With each new major invention, a system is formed giving it the support and momentum it requires to follow a particular path. For instance, firms did not just happen to invent bar codes and then make commodity suppliers use them. There had to be some

Figure 1. Stakeholders in the auto-ID technology system. Innovation as a process of interactive learning.



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