CHAPTER 1

INTRODUCTION

1.1 WHAT IS RFID?

RFID is an acronym for radio frequency identification, which is a wireless communication technology that is used to uniquely identify tagged objects or people. It has many applications. Some present-day examples include:

- Supply chain crate and pallet tracking applications, such as those being used by Wal-Mart and the Department of Defense (DoD) and their suppliers
- Access control systems, such as keyless entry and employee identification devices
- Point-of-sale applications such as ExxonMobil's Speedpass
- Automatic toll collection systems, such as those increasingly found at the entrances to bridges, tunnels, and turnpikes
- Animal tracking devices, which have long been used in livestock management systems and are increasingly being used on pets
- Vehicle tracking and immobilizers
- Wrist and ankle bands for infant ID and security

The applications don't end there. In the coming years, new RFID applications will benefit a wide range of industries and government agencies in ways that no other technology has ever been able.

1.2   WHAT EXPLAINS THE CURRENT INTEREST IN RFID TECHNOLOGY?

RFID is rapidly becoming a cost-effective technology. This is in large part due to the efforts of Wal-Mart and DoD to incorporate RFID technology into their supply chains.

In 2003, with the aim of enabling pallet-level tracking of inventory, Wal-Mart issued an RFID mandate requiring its top 100 suppliers to begin tagging pallets and cases by January 1, 2005, with Electronic Product Code (EPC) labels. (EPC is the first worldwide RFID technology standard.) DoD quickly followed suit and issued the same mandate to its top 100 suppliers. Since then, Wal-Mart has expanded its mandate by requiring all of its key suppliers to begin tagging cases and pallets. This drive to incorporate RFID technology into their supply chains is motivated by the increased shipping, receiving, and stocking efficiency and the decreased costs of labor, storage, and product loss that pallet-level visibility of inventory can offer.

Wal-Mart and DoD are, respectively, the world's largest retailer and the world's largest supply chain operator. Due to the combined size of their operations, the RFID mandates are spurring growth in the RFID industry and bringing this emerging technology into the mainstream. The mandates are seen to have the following effects:

- To organize the RFID industry under a common technology standard, the lack of which has been a serious barrier to the industry's growth
- To establish a hard schedule for the rollout of RFID technology's largest application to date
- To create an economy of scale for RFID tags, the high price of which has been another serious barrier to the industry's growth

Supply chain and asset management applications are expected to dominate RFID industry growth over the next several years. While presently these applications only account for a small portion of all tag sales, by late 2007, supply chain and asset management applications will account for 70% of all tag sales.[1] As shown in Figure 1-1, the growth in total RFID transponder tags will have grown from 323 million units to 1,621 million units in just five years.

Wal-Mart and DoD alone cannot account for all the current interest in RFID technology, however. Given the following forecasts of industry growth, it becomes clear why RFID has begun to attract the notice of a wide range of industries and government agencies:

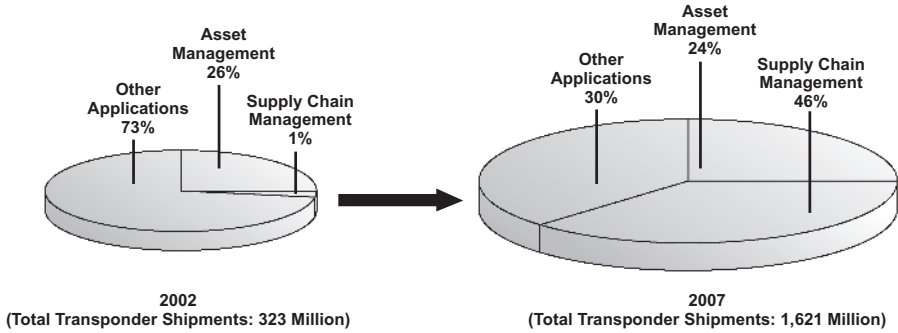[1] *RFID White Paper*, Allied Business Intelligence, 2002.

Figure 1-1 Total RFID Transponder Shipments, 2002 vs. 2007. Source: ABI Research.

- In the past 50 years, approximately 1.5 billion RFID tags have been sold worldwide. Sales for 2007 alone are expected to exceed 1 billion and as many as 1 trillion could be delivered by 2015.[2]
- Wal-Mart's top 100 suppliers alone could account for 1 billion tags sold annually.[3]
- Revenues for the RFID industry were expected to hit $7.5 billion by 2006.[4]
- Early adopters of RFID technology were able to lower supply chain costs by 3–5% and simultaneously increase revenue by 2–7% according to a study by AMR Research.[5]
- For the pharmaceutical industry alone, RFID-based solutions are predicted to save more than $8 billion by 2006.[6]
- In the retailing sector, item-level tagging could begin in as early as five years.[7]

In short, the use of RFID technology is expected to grow significantly in the next five years, and it is predicted that someday RFID tags will be as pervasive as bar codes.

[2] *RFID Explained*, Raghu Das, IDTechEx, 2004.
[3] *The Strategic Implications of Wal-Mart's RFID Mandate*, David Williams, *Directions Magazine* (www.directionsmag.com), July 2004.
[4] *Radio Frequency Identification (RFID)*, Accenture, 11/16/2001.
[5] *Supply Chain RFID: How It Works and Why It Pays*, Intermec.
[6] *Item-Level Visibility in the Pharmaceutical Supply Chain: A Comparison of HF and UHF RFID Technologies*, Philips Semiconductors *et al*, July 2004.
[7] *Item-Level Visibility in the Pharmaceutical Supply Chain: A Comparison of HF and UHF RFID Technologies*, Philips Semiconductors *et al*, July 2004.

1.3   GOALS OF THIS BOOK

This book provides a broad overview and guide to RFID technology and its application. It is an effort to do the initial "homework" for the reader interested in better understanding RFID tools. It is written to provide an introduction for business leaders, supply chain improvement advocates, and technologists to help them adopt RFID tools for their unique applications, and provide the basic information for better understanding RFID.

The book describes and addresses the following:

- How RFID works, how it's used, and who is using it.
- The history of RFID technology, the current state of the art, and where RFID is expected to be taken in the future.
- The role of middleware software to route data between the RFID network and the information technology (IT) systems within an organization.
- The use of RFID technology in both commercial and government applications.
- The role and value of RFID industry standards and the current regulatory compliance environment.
- The issues faced by the public and industry regarding the wide-scale deployment of RFID technology.