A Background to EPCglobal®

In 1999, a group of retailers and manufacturers identified the potential of radio frequency identification (RFID) to complement and perhaps eventually supercede the barcode. It recognised, however, that the lack of global industry-driven standards meant that many RFID applications and solutions were developed as closed and proprietary systems. This limited the widespread adoption of RFID due to the high cost and incompatibility of the systems.

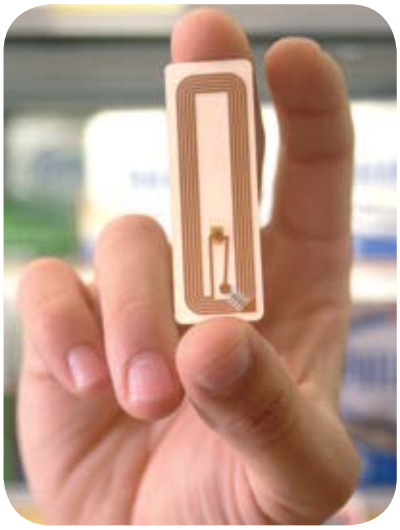


Photo: © METRO AG

This group chose to fund research, initially by the Massachusetts Institute of Technology (MIT) and subsequently by six other universities - two in Europe (Cambridge and St Gallen), one in Australia (Adelaide) and three in Asia (Fudan, China, Keio, Japan, ICU Korea) - collectively known as the Auto-ID Centre. The challenge for these universities was to develop globally applicable and economically viable standards for RFID usage in the supply chain. This research was ultimately sponsored by 103 European, US and Asian companies, from the consumer manufacturing, retail, pharmaceutical, engineering, telecommunications, IT software and hardware sectors, along with the standards organisations GS1 and GS1 US. Sponsors included both large companies as well as start-ups and SMEs.

By 2003, the research carried out by the Auto-ID Centre had resulted in a set of solutions based on a uniquely numbered low-cost tag and a network similar to the Internet holding relevant supply chain data. This included detailed specifications for:

1. **The EPC™ numbering scheme**
2. **Proposals for the Network components**
3. **Passive tags and readers**

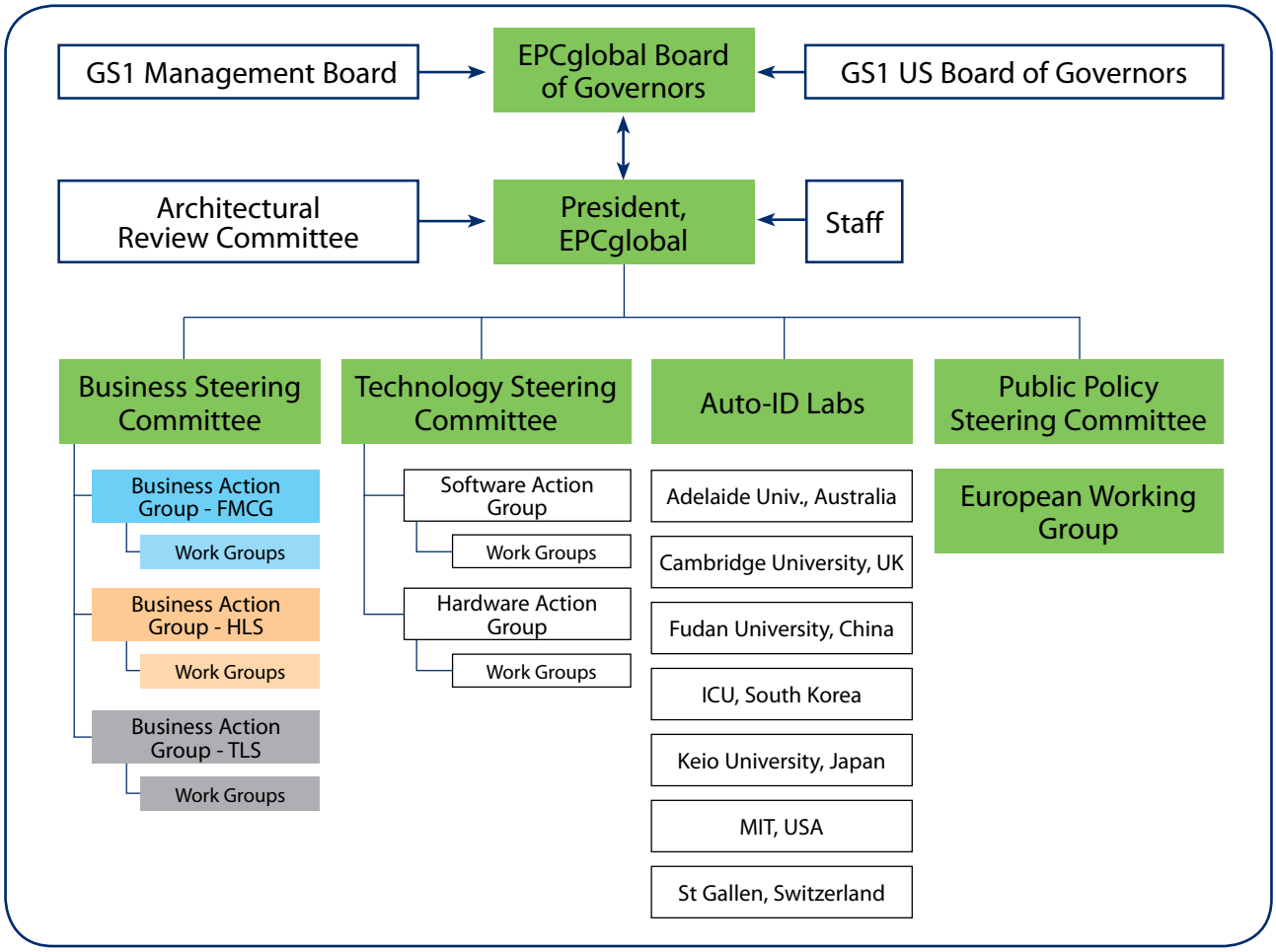
As a result of the work done by the Auto ID Centre, EPCglobal® Inc was formed in 2003 as a not-for-profit joint venture between the standards organisations GS1 and GS1 US with the task of building on the work of the Auto-ID Centre and driving global adoption of EPC technology by establishing open, voluntary standards for the EPCglobal Network™.

The importance of open, non-proprietary standards is a key element in ensuring its successful development across borders worldwide. An additional important facet of the structure of EPCglobal is the Royalty-free nature of the standards development process to ensure low-cost accessibility to the technology.

Since its inception, EPCglobal has ratified standards for Generation 2 tags and for software interface components, The Generation 2 standard has been designed and developed specifically to take into account Global telecommunications requirements. EPCglobal also works with international bodies including the International Organisation for Standardisation (ISO).

Organisational Structure

EPCglobal® Inc is a joint-venture between GS1 and GS1 US



• **EPCglobal Board of Governors** – Representatives from GS1 US, GS1 Member Organisations, the Auto-ID labs and end users from both public and private sectors. Responsible to GS1 and GS1 US.

• **EPCglobal President** – Responsible to the EPCglobal Board of Governors and CEO of GS1.

• **EPCglobal Staff** – Work collaboratively with multi-industry representatives to facilitate the development and recommendation of technical standards, managing public policy, marketing and communications and administration.

• **Architecture Review Committee (ARC)** – Standing committee reporting to the EPCglobal President that helps to evaluate and prioritise requirements affecting the overall EPCglobal Reference Architecture. May serve as a technical resource to the EPCglobal Board of Governors.

• **Business Steering Committee (BSC)** – Steering committee for all Business Action Groups and Working Groups addressing end user requirements and adoption activities.

• **Action Groups** – Provide the business and technical perspective to support the standards development process. The Business Action Group identifies business needs, gathers business requirements, and develops consensus based on best practices. The Technical Action Group facilitates the development of technical standards, based on business requirements.

• **Working Groups** – Are the primary means by which the Action Groups conduct their business. A Working Group is composed of a subset of Action Group members (possibly including members from multiple Action Groups), which convenes to carry out a specific task as chartered by an Action Group.

• **Technology Steering Committee (TSC)** – Steering committee for all Action Groups working on software, hardware or technical activities.

• **Auto-ID Labs** – Academic entity transitioned from the Auto-ID Centre and currently headquartered at the Massachusetts Institute of Technology (MIT), chartered to research and develop the EPCglobal Network™ and applications along with a global network of six other research universities around the world:

- University of Adelaide in Australia;
- University of Cambridge in the United Kingdom;
- Fudan University in Shanghai, China;
- ICU, in Daejeon, South Korea
- Keio University in Tokyo, Japan;
- MIT, Cambridge, in USA
- University of St. Gallen in Switzerland.

• **Public Policy Steering Committee (PPSC)** – Steering committee for all Action Groups and Working Groups general public policy issues (e.g. privacy).

• **PPSC European Working Group** – represents European interests and addresses policy considerations specific to the European context and particularly to public policy matters being formulated by the European Commission. Other regional PPSC Working Groups will be formed.

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Facts About EPC Technology

What is the Electronic Product Code (EPC™)?
The Electronic Product Code (EPC) is a unique number that is used to identify a specific item in the supply chain. The EPC is stored on a radio frequency identification (RFID) tag, which combines a silicon chip and an antenna. Once the EPC is retrieved from the tag, it can be associated with dynamic data held in a secured database such as where an item originated or the date of its production. Much like a Global Trade Item Number (GTIN) or Vehicle Identification Number (VIN), the EPC is the key that unlocks the power of the information systems that are part of the EPCglobal Network™.

Photo: © METRO AG

What is the EPCglobal Network™?

The EPCglobal Network™ is a set of technologies that enables immediate, automatic identification of items in the supply chain, anywhere in the world. Importantly, the Network allows trading partners to exchange such information about the goods they ship among themselves. In that way, the EPCglobal Network makes organisations more effective by uncovering inefficiencies or reducing such eternal issues as counterfeiting, internal theft, and other drains on productivity and profitability.

What are the components of the EPCglobal Network?

The EPCglobal Network consists of several components that are designed to work together to give maximum visibility to a supply chain. The components are made up of the Electronic Product Code (EPC), tags, readers, and software that helps all of the pieces communicate in a common "language."

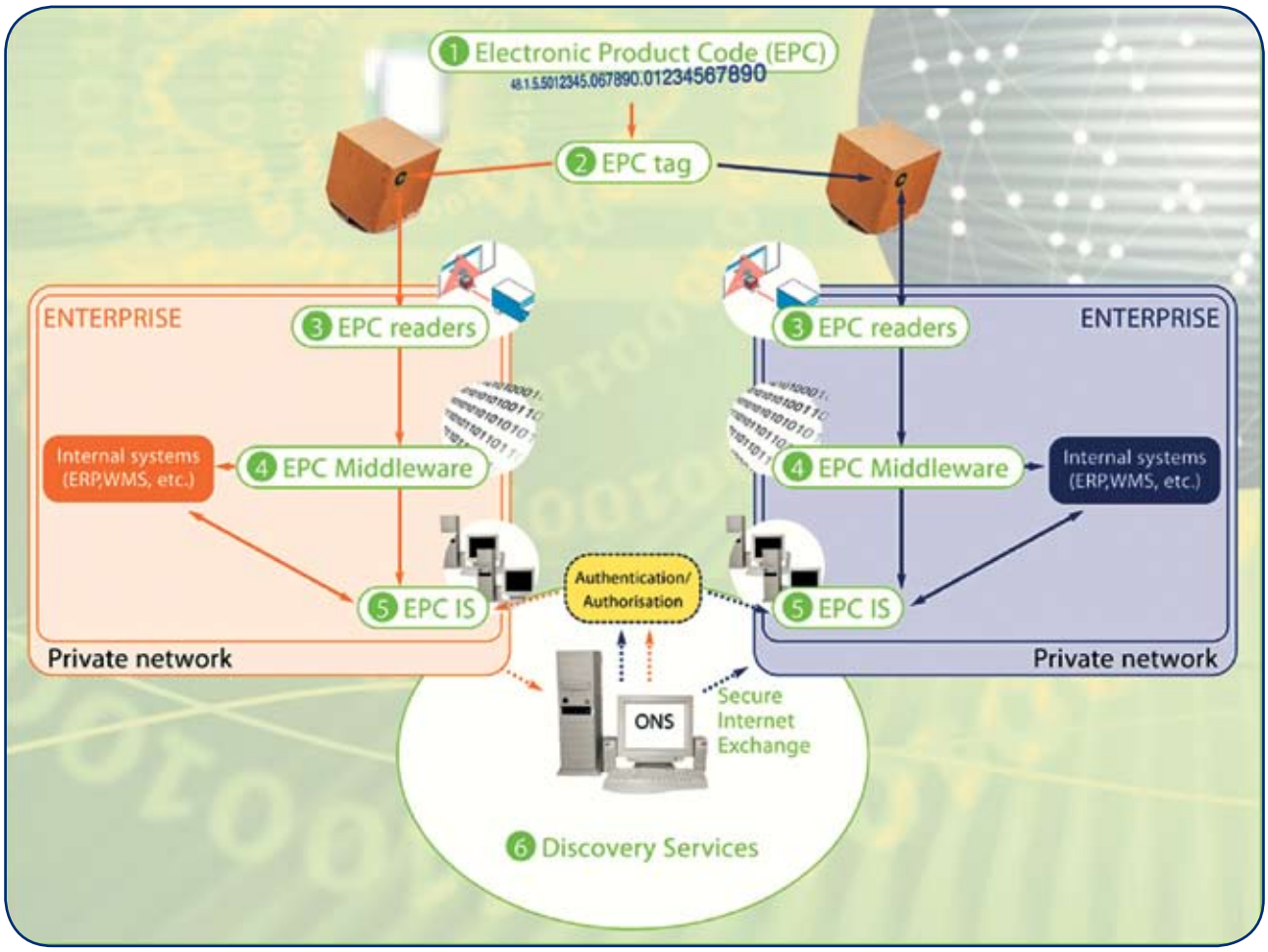
The EPC sits on a tag comprised of a silicon chip connected to an antenna, which is physically attached to an item, a case of items, or a pallet of cases of items. The tag "communicates" its unique number to a reader through radio frequency. The reader then passes the number to a computer that accesses the Object Name Service (ONS). The ONS tells the computer systems where to locate information on the secure network about the object carrying an EPC, including, for example, when the item was produced, and where.

EPC Information Services provide a common set of data elements, a common language for communication, and a set of defined messages for trading partners to use for storing, accessing, and communicating data on objects moving in the supply chain. The key to these information services is the EPC held in the RFID tag on each object. EPC-IS Middleware is a software technology that acts as the central nervous system of the EPCglobal Network. The EPC-IS Middleware manages and moves information in a way that does not overload existing corporate and public networks.

How does the EPCglobal Network deliver value?

The technology helps businesses minimise extra costs from their internal operations, from such issues as internal theft, out-of-stocks, counterfeiting, and other issues that plague them. This in turn drives down the cost of doing business, which helps businesses succeed while applying downward pressure on consumer prices.

How the EPCglobal® Network™ Works



The EPCglobal Network uses radio frequency identification (RFID) technology to enable true visibility of information about items throughout the supply chain.

1. Electronic Product Code (EPC™)

The EPC is a globally unique serial number that identifies an item in the supply chain. This allows enquiries to be made about a single instance of an item wherever it is within the supply chain.

2. EPC tag

Tags are RFID devices that consist of a microchip and an antenna attached to a substrate. The unique EPC for an item is stored on this tag, which is physically attached to the item.

3. EPC readers

An EPC reader is a device that reads the EPC from the EPC tag using radio waves. EPC readers are placed at points in the supply chain that make the most sense to track the movement of items.

4. EPC Middleware

EPC Middleware is a software technology that provides alerts, and manages the basic read information for communication to the EPC Information Services and companies existing information systems.

5. EPC Information Services (EPC IS)

EPC Information Services enables users to exchange EPC-related data with trading partners through the EPCglobal Network™.

6. Discovery Services

Discovery Services is a suite of services that enables users to find data related to a specific EPC and to request access to that data.

Benefits of EPC for Consumers and Business

Consumers are placed to enjoy a number of immediate advantages from EPC in the form of improved shelf stocking (fewer shortages, expired or mis-stocked products), and greater reliability in terms of quality, safety and supply chain security.

Photo: © METRO AG

Further advantages, as item-level tagging becomes a widespread reality, include improved traceability of products, product recall capacity, product authentication, intelligent recycling and aiding in the efficient administration of consumer guarantees. These factors, when combined, will result in downward pressure on prices for consumers while increasing overall consumer protection.

One area which stands to be improved with the use of new technologies is the fight against counterfeit goods. Some forms of counterfeiting carry with them great risk for consumers, including the production of fake pharmaceutical products. Recent reports have estimated that nearly $39 billion, or 11 percent of global pharmaceutical commerce were counterfeit in 2005[1]. EPC technology will help to provide higher levels of product authentication.

As the technology becomes more ubiquitous, so will the advantages for consumers. The experience of the bar code is formative in helping to quantify the potential impact of EPC for consumers and the retail sector. It is estimated that in the grocery sector in the United States, in the 25 years from the first commercial use of the barcode, there were annual savings of $17 billion for manufacturers, retailers and consumers. Furthermore, the bar code had an important role to play in the fact that the average number of different products stocked by a US grocery store grew from 9,000 to over 30,000 between 1974 and 1997[2] offering more choice to consumers. While it is evidently not possible to directly extrapolate these US-specific figures to a European or global context, they do nonetheless provide an indication of the benefits that have been accrued from the deployment of this technology for both consumers and business.

[1] Center for Medicines in the Public Interest (CMPI) report released 13 September 2005
[2] '25 years behind bars', Alan L. Haberman, Harvard University Press, 2001

Preventing counterfeit

In terms of RFID use in a broader sense, there are clear consumer safety advantages from reducing counterfeiting as previously highlighted (i.e.: drugs, toys, cigarettes, digital media and many others). However, while counterfeit drugs constitute a considerable health risk for consumers, counterfeit goods of any kind are also not good for the health of the economy. The European Commission[3] has estimated that counterfeiting costs the EU € 1.5 billion and is responsible for 200,000 lost jobs per year in Europe (or never created) due to lost sales.

The World Customs Organization estimates that counterfeiting accounts for 5% to 7% of global merchandise trade. This is equivalent to lost sales of as much as $512 billion last year alone. A global problem such as counterfeit requires global solutions. Solutions enabled by RFID technology are seen by authorities as a deterrent to crime as the increased visibility of stolen goods diminishes their black market value. Goods can be instantly identified at any point in the supply chain as authentic or counterfeit with the use of RFID.

Photo: © METRO AG

As the ability to better manage supply chains increases with the use of RFID, so does the need to consider this technology as a response to counterfeit. The latest figures from the European Commission point to a startling upward trend as the number of counterfeit objects seized by European customs officers increased tenfold from 1998 to 2004, according to the European Commission[4]. This is a rise of over 1000% in the number of objects seized by EU Member State Customs Officials between 1998 and 2004.

Benefits of EPC for business

Seen from the perspective of the companies using EPC, the improved business to business management of the supply chain will continue to help increasing productivity (by minimising waste, increasing the speed and accuracy of supply and reducing stock levels), quality (transporting the right products at the right time, in the right quantity to the right place), asset management, transport utilisation, theft reduction (including customer-selected optional benefits such as recovery of stolen goods, proof of ownership) and counterfeit detection.

[3] European Commission, Taxation and Customs Union website
http://europa.eu.int/comm/taxation_customs/customs/customs_controls/counterfeit_piracy/combating/index_en.htm

[4] European Commission MEMO/05/364 and Press release IP/05/1247, both 11 October 2005
http://europa.eu.int/rapid/pressReleasesAction.do?reference=MEMO/05/364&format=HTML&aged=0&language=en&guiLanguage=en
http://europa.eu.int/rapid/pressReleasesAction.do?reference=IP/05/1247&format=HTML&aged=0&language=EN&guiLanguage=fr

EPCglobal® and ISO

The International Organisation for Standardisation (ISO) is a network of national standards institutes from 146 countries. GS1 participates in ISO as a Class A liaison to SC31. GS1 Member Organisations also participate in various subcommittees, and, in some cases, as the national representatives of their countries.

Photo: © METRO AG

GS1 and GS1 US have a long-standing working relationship with ISO. GS1 US participates in ISO through the American National Standards Institute (ANSI) and as secretariat for its Joint Technical Committee's (JTC1) Subcommittee 31 (SC31). Over the past seven years, a variety of bar codes including EAN/UPC have been offered to go through the ISO process and have achieved International Standard (IS) status.

EPCglobal® Inc, a joint venture of GS1 and GS1 US, is chartered to develop global technical standards for the Electronic Product Code (EPC™) and the EPCglobal Network™. EPCglobal works with other standard organisations, such as the ISO, to promote its standards to the broader international community. While the standards development processes of EPCglobal and ISO differ, there are essential similarities in their respective formal directives and procedures that assure due process and valid, defensible consensus. ISO and EPCglobal complement one another with their shared goal to develop global standards and methodologies. The Class-1 Generation-2 UHF RFID Protocol for Communications at 860 MHz – 960 MHz was ratified by the EPCglobal Board of Governors in December 2004. It was submitted to the ISO process in January 2005 and it will become available as ISO/IEC 18000-6 part C.

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EPCglobal® Public Policy Steering Committee

To allow the Electronic Product Code (EPC™) to realise its potential for consumer, retailer and supplier benefits, it is important to address privacy concerns prompted by the current state of the technology while establishing principles for dealing with its evolution and implementation.

Photo: © METRO AG

EPCglobal® Inc and representatives of various industry sectors that are implementing RFID and EPC technology have formed the EPCglobal Public Policy Steering Committee (PPSC) to foster open dialogue with key audiences around public policy and other important areas relative to EPC technology and the EPCglobal Network™. The PPSC reports to the Board of Governors of EPCglobal Inc.

Guiding Global Public Policy

The PPSC and its working groups consist of representatives of industries and trade associations worldwide including healthcare, technology, food, consumer products, retail, and others. The PPSC will work closely with committee members to address public policy matters and inform industry leaders, consumers, and legislators about the benefits of EPC technology.

In response to the interest in public policy related issues, the Europe Working Group was formed to address issues such as The Lisbon Agenda/Competitiveness, Privacy and Security, Waste and Environment and Health and Science. Additional PPSC Working Groups include: the Public Policy Working Group, the Communications Working Group, and the U.S. Government Relations Working Group. Working Groups for other regions are planned.

Guidelines

Accordingly, the members of EPCglobal have recommended guidelines for use by all companies engaged in the large-scale deployment of EPC. Because EPC is an emerging technology in an early development stage, usage guidelines supplementing or modifying those already available will evolve as applications are developed and implemented. For example, if developments in the technology or its use provide consumers added flexibility in controlling EPC tags or record personal consumer information beyond that provided by conventional bar code technology, changes to notices required to consumers or to the Guidelines themselves may be appropriate.

These guidelines will be administered by EPCglobal and the EPCglobal Public Policy Steering Committee. The PPSC will monitor the proper use of these guidelines and be responsible for updating them as further developments occur in technology, new applications and enhanced benefits. These developments will provide even more choices to both consumers and companies on the use of EPC tags.

EPCglobal works closely with its Board of Governors and the Public Policy Steering Committee, which provides independent expert guidance on many issues including the development of safeguards around the EPCglobal Network™ and the development of guiding principles around technology usage, such as Privacy Guidelines. EPCglobal subscribers have an opportunity to get involved and benefit from interaction with both of these bodies.

EPCglobal® Guidelines on EPC for Consumer Products

The purpose of these Guidelines is to provide a responsible basis for the use of Electronic Product Code (EPC™) technology for consumer items. Under the auspices of EPCglobal® Inc, these Guidelines have been followed since January 1, 2005 and will continue to evolve as advances in EPC and its applications are made and consumer research is conducted. As EPC evolves, so too will new issues. EPC participants are committed to addressing these issues and engaging in a dialogue about them with interested parties.

1. Consumer Notice

Consumers will be given clear notice of the presence of EPC on products or their packaging and will be informed of the use of EPC technology. This notice will be given through the use of an EPC logo or identifier on the products or packaging.

2. Consumer Choice

Consumers will be informed of the choices that are available to discard or remove or in the future disable EPC tags from the products they acquire. It is anticipated that for most products, the EPC tags would be part of disposable packaging or would be otherwise discardable. EPCglobal, among other supporters of the technology, is committed to finding additional efficient, cost effective and reliable alternatives to further enable customer choice.

3. Consumer Education

Consumers will have the opportunity easily to obtain accurate information about EPC and its applications, as well as information about advances in the technology. Companies using EPC tags at the consumer level will cooperate in appropriate ways to familiarise consumers with the EPC logo and to help consumers understand the technology and its benefits. EPCglobal would also act as a forum for both companies and consumers to learn of and address any uses of EPC technology in a manner inconsistent with these Guidelines.

4. Record Use, Retention and Security

The Electronic Product Code does not contain, collect or store any personally identifiable information. As with conventional barcode technology, data which is associated with EPC will be collected, used, maintained, stored and protected by the EPCglobal member companies in compliance with applicable laws. Companies will publish, in compliance with all applicable laws, information on their policies regarding the retention, use and protection of any personally identifiable information associated with EPC use.