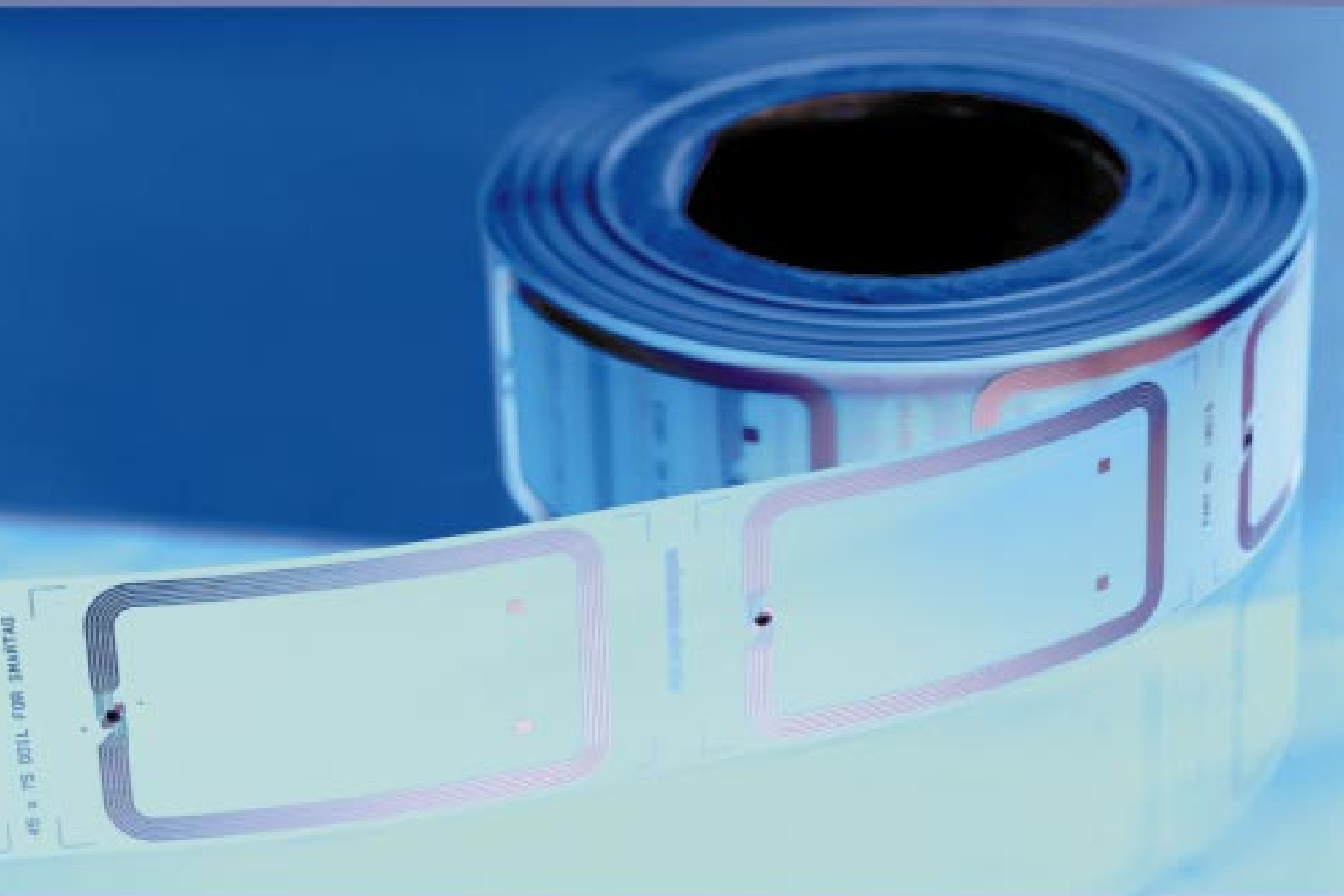


Global Commerce Initiative EPC Roadmap

Executive Brief



Published in association with IBM

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Foreword

Radio frequency identification (RFID) is a technology that has been around for more than half a century. In the last few years, however, its tremendous potential has begun being harnessed to deliver new century solutions to the way manufacturers and retailers do business in the food and consumer packaged goods industry. In particular, the benefits to end consumers are also being realised by enabling improved on shelf availability and providing the capability to enhance the shopping experience.

Enormous progress is being made on the commercial applications of this technology that make the entire industry supply chain visible, efficient, and collaborative. However, some challenges and barriers to a broad implementation of RFID still exist. Some companies are leading the way with the technology applications and pilot testing of RFID tags attached to items, cases, and pallets. The lessons learned from these early adopters acknowledge these challenges and barriers, but they also point to benefits already proven in these piloted tests and to those benefits alluded to by the tremendous promise of this initiative.

This roadmap outlines both the technology and process initiatives that have the power to revolutionise our industry. It outlines the status of standards and details the results of early trials and their areas of concentration. By putting all the issues surrounding RFID and their implications to companies and to the industry into one report, we hope to encourage your company to consider adoption of a standards-compliant implementation of RFID.

Why EPC roadmap and not RFID roadmap? The Global Commerce Initiative (GCI) Executive Board strongly recommends the implementation of RFID technology based on open, global standards. The Auto-ID Center worked for several years on a concept for RFID and the Electronic Product Code or EPC, which is the key identifier and content of the RFID tag. The establishment of a new organisation, EPCglobal, was approved in September 2003 as a joint venture of EAN International and the Uniform Code Council to support the industry with open, voluntary standards for this new initiative. GCI wants to promote the practical application of the Electronic Product Code, and, therefore, we have named this roadmap accordingly.

The roadmap seeks to answer five key questions at a high level:

1. What is the EPC, and what is the vision behind it?
2. What current progress is being made with EPC development, and what are the issues we need to act upon to make the EPC vision a reality?
3. What are the key application scenarios, and what are the compelling reasons to act now?
4. What does a company implementation roadmap look like?
5. What can the industry jointly do to remove the barriers for a broad industry adoption?

The full implementation of the EPC vision will take some time. If we do not get the ground work right and implement the standards across the industry now, we will hinder wider implementation efforts before they have even begun. This also will prevent companies from gaining the full benefits the EPC can bring.

GCI is convinced that both manufacturers and retailers will benefit from the adoption of global voluntary EPC standards aimed at transforming and streamlining the industry supply chain. We do not want to repeat the mistakes of the past. We therefore encourage you and your company to support the emerging standards and the work being driven through EPCglobal.

Let's make it work!

Antony Burgmans
Unilever

Zygmunt Mierdorf
METRO Group

Co-Chairmen of the Global Commerce Initiative
November 2003

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In order to make the roadmap as practical and applicable to as many different countries as possible, study analysts had conversations with a number of industry representatives from around the globe. We wish to thank these companies for their willingness to share their insights:

Alien Technology™ Corporation	Kraft Foods International
Auto-ID Center	Lawson Inc.
Carrefour	LION Corporation
CHEP™	Loblaw Companies Ltd.
The Coca-Cola Company	L'Oréal
Dairy Farmers	Matrics, Inc.
Dixons Group PLC	Marks and Spencer
EAN International	METRO Group
Eastman Kodak Company	Nestlé SA
EPCglobal	Philips
The Gillette Company	The Procter & Gamble Company
Goodman Fielder Limited	Royal Ahold
Integrated Product Intelligence Ltd.	Sara Lee Corporation
Johnson & Johnson	Target
Kirin Brewery of America	Tesco
Kimberly-Clark Corporation	Uniform Code Council, Inc. (UCC)
	Unilever Best Foods
	Wal-Mart Stores, Inc.
	Woolworths (Australia)

With the new EPC™ Network, computers will be able to “see” physical objects, allowing many items automatically throughout the supply chain. This technology will revolutionize the way we sell and buy products. Here’s how it works:

1.

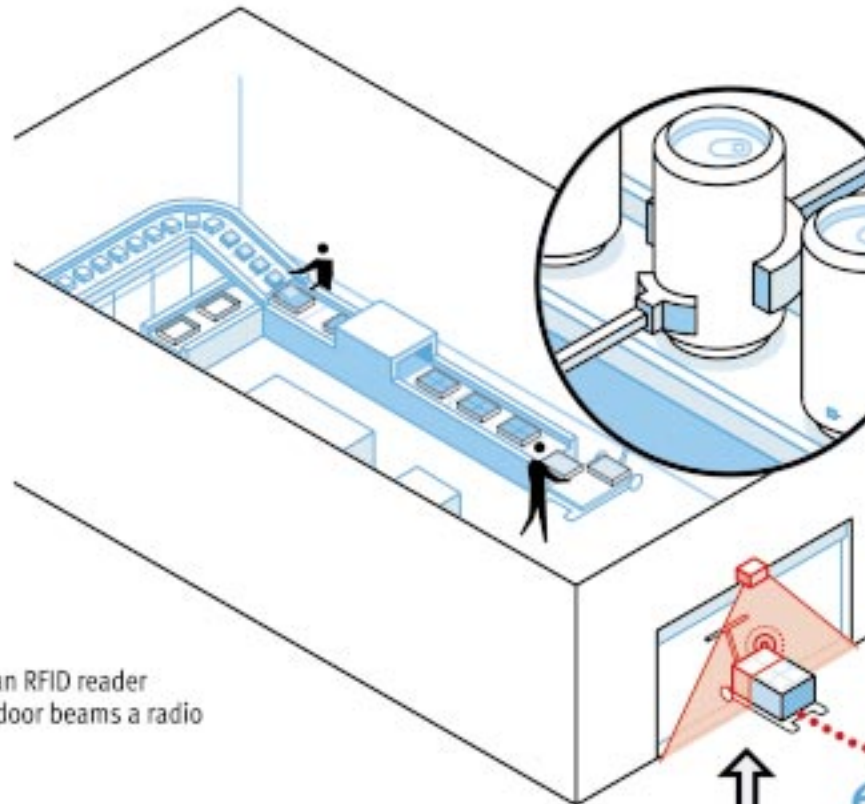
Each item contains a tiny microchip which includes a radio antenna and a unique identifier, called an Electronic Product Code (EPC™). This Radio Frequency Identification (RFID) tag costs about five cents to make.

2.

The item can now be automatically and cost-effectively identified, counted and tracked. Cases and pallets can also carry their own unique tags.

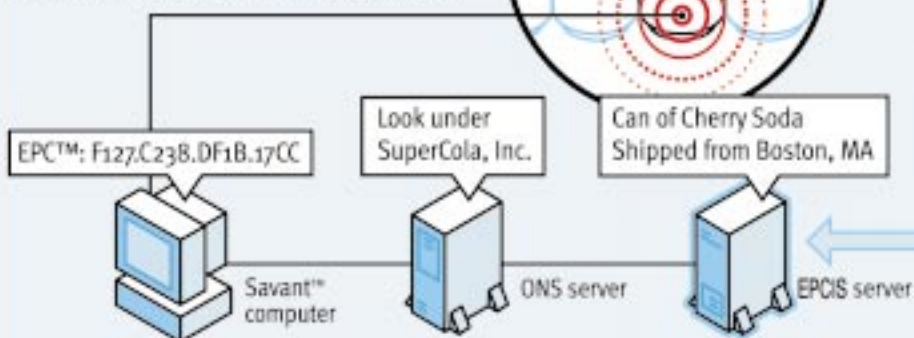
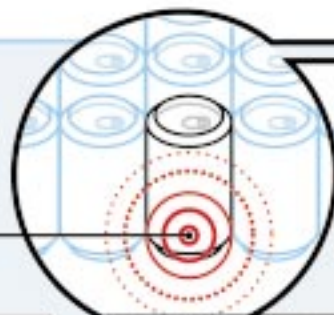
3.

As pallets leave the manufacturer, an RFID reader positioned above the loading dock door beams a radio wave that “wakes up” the tags.



4A.

The tags broadcast their individual EPCs™ to the reader, which rapidly switches them on and off in sequence, until all are read.



4B.

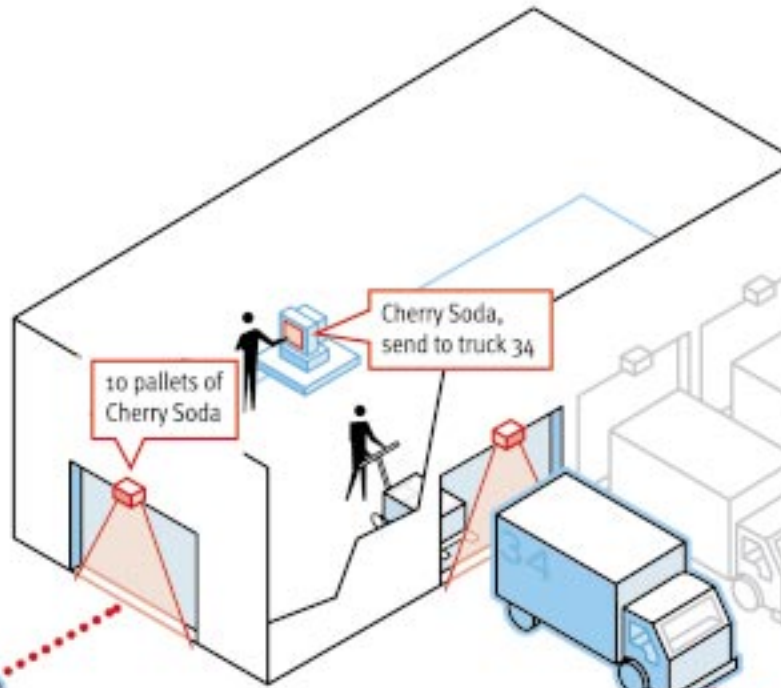
The reader sends the EPCs™ to a computer running software called Savant™. Savant™ sends the EPC™ over the internet to an Object Name Service (ONS) database, which produces an address. The ONS matches the EPC™ to another server, which has comprehensive information about the product.

4C.

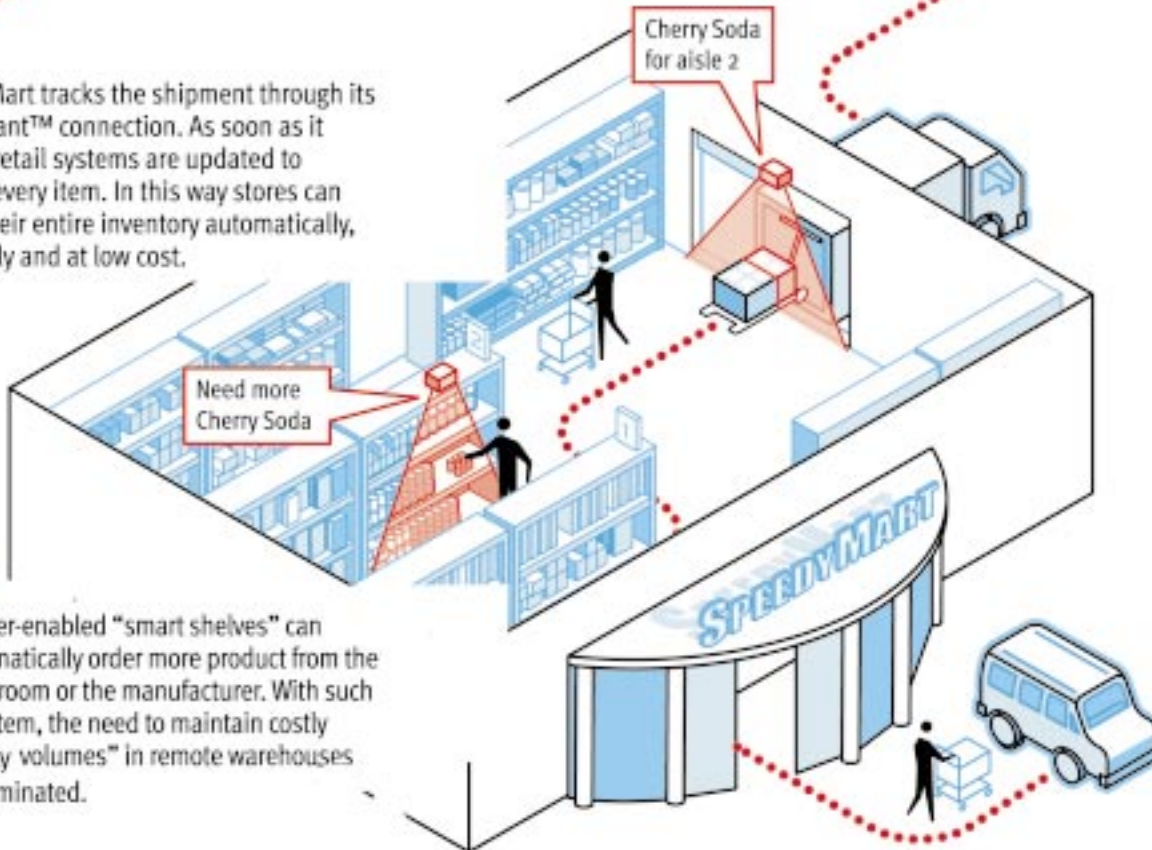
This server uses PML (Physical Markup Language) to store data about manufacturers’ products. Because it knows the location of the reader sending the query, it knows where the product was made. If an incident involving a defect or tampering arises, the source of the problem can be tracked and the products can be recalled.

Manufacturers to track and trace
the manufacture,

5. If the unloading area contains an RFID reader, there's no need to open packages and examine their contents. Savant[™] provides a cargo list, and the pallet is quickly routed to the appropriate truck.



6. SpeedyMart tracks the shipment through its own Savant[™] connection. As soon as it arrives, retail systems are updated to include every item. In this way stores can locate their entire inventory automatically, accurately and at low cost.

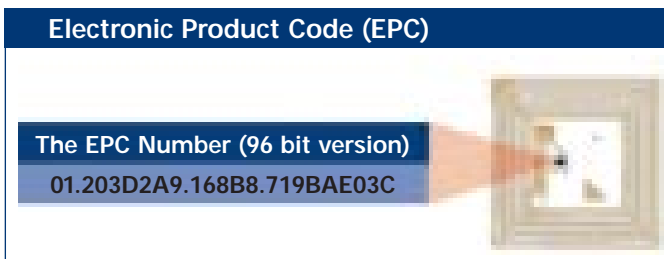


7. Reader-enabled "smart shelves" can automatically order more product from the back room or the manufacturer. With such a system, the need to maintain costly "safety volumes" in remote warehouses is eliminated.

Introduction to the EPC Roadmap

Much has been written of late about how RFID is going to revolutionise supply chain operations in this first decade of the 21st century. And it's not all media hype. Little doubt exists in the minds of most industry leaders that harnessing this technology and using the resulting applications and processes will have an impact even more far-reaching than the introduction of the Universal Product Code (U.P.C.) and retail scanning a quarter of a century ago.

The Electronic Product Code (EPC) has been called the “next generation bar code” or “radio bar code,” but it is much more than that. The EPC is a coding scheme developed by the Auto-ID Center that can uniquely identify any individual item — whether that object is a consumer item, case, pallet, logistics asset, or virtually anything else. Instead of being printed on a paper label as with today's bar-coding system, this number is inserted into an electronic tag that can be detected with radio waves. This provides the ability to locate or track products throughout the supply chain, and to “read” these EPCs extremely quickly, at a distance, and out of direct line-of-sight.



Several events have occurred recently that, when combined, suggest that this technology is now ready for wider adoption:

- Agreement of a common numbering standard — the EPC code to identify objects uniquely.
- Transition of previous research and development efforts (largely done through the Auto-ID Center initiative) into a new organisation, EPCglobal, which will now commercialise and administer this network of numbers and continue the development of open and voluntary standards.
- Field trials and pilots are growing in numbers, and substantial increases are expected over the next two years.
- Results from trials of item-level tagging show that the benefits are considerable. However, a number of issues — especially that of consumer privacy — still need to be resolved before mass adoption of this tagging level.
- Technology (tags and readers plus early versions of the integration technology) is considered to be nearly ready for wider adoption at market-acceptable prices.
- Expected convergence of radio frequency and power regulations will allow cost-effective usage of this technology.

Key Study Conclusions

- A critical mass of manufacturers and retailers have conducted trials with this technology and are now preparing for wider adoption.
- Each company should consider adopting the EPC vision now. A growing degree of enthusiasm is taking place in the industry worldwide as would-be practitioners are seeing the successful results of the trials and pilots. The significant value of the trials has also convinced early adopters to continue their EPC journey.
- Competitor activity and requests from important trading partners are expected to accelerate the implementation of the EPC vision across the globe. Thus, it is essential to understand the implications for your business as early as possible.
- The adoption of an EPC network plan/pilot between trading partners offers the opportunity to achieve supply chain convergence between suppliers and retailers.
- Inevitably, the progress achieved so far has been driven by large multi-national organisations. However, an important aspect of the EPC vision is that the technology will eventually be available in every local independent store or small supplier, much as bar codes and scanners are today.
- The main benefits to a company and to the industry are through process change. The technology is simply an enabler. Significant benefits exist from applying the EPC vision within an organisational structure of an individual company. However, there are significantly higher benefits from end-to-end supply chain collaboration between trading partners across the entire industry.
- Enough of the critical enablers are in place to test the EPC network now. Also in place are the open voluntary global standards, market-ready technology, and a willingness to move adoption forward across the industry.
- EPC implementation should be thought of as a step-by-step process — not a big-bang approach.

The EPC Network & Vision

The EPC network is based on the following principles:

- Inexpensive tags and readers that conform to standards.
- Minimum information stored on the tag. Under the pure EPC vision, the only information stored on the tag would be the EPC number.
- The use of software — called a savant — as a connecting layer between the reader and applications to filter the EPC data and pass on only appropriate product movement information to application systems.
- Information related to each object securely stored on a public network with the appropriate security controls. It can be accessed through an object naming service (ONS) that points to a computer, where the information about the object is held. The EPC information service (EPCIS) on that computer provides a description of the product in the physical markup language (PML).
- Interoperable tags and readers based on an open, global standards-based system, ensuring that any EPC-compliant tag can be read by any EPC-compatible reader, and that a tag applied in one country can work in another country.

The EPC Vision

Numerous business applications for RFID adoption currently are under consideration or being field tested by companies around the world. While there are many ideas on how the EPC vision enables performance improvement, the leading adopters have a common set of priority applications used primarily on implementations and piloting trials at the pallet and case levels. These applications include:

- **Shrink Reduction in the Supply Chain** — Industry estimates shrink levels to be approximately 2 percent of sales worldwide. Today retailers are tagging pallets, dollies, cases, and trays to track these units internally within their own supply chains. IBM business case analysis shows that the use of RFID can improve shrink for the average retailer by 25 percent at the case level and up to 40 percent at the item level.
- **Improving On-Shelf Availability** — Often-quoted industry studies note that 30 percent of out-of-stocks occur on a store shelf although a supply

The EPC Vision

Imagine a world in which every object can be sensed as it moves and can trigger a response that can be interpreted and acted on at great speed and without human intervention.

Now apply this vision to the real world and imagine an environment in which every object in the consumer products supply chain can be tracked through this sense-and-response mechanism.

Think of the possibilities ...

- Visualise a warehouse where perishables do not perish, where theft is fully detectable, where systems exactly match physical inventory counts, where transfers with trading partners are automated and precise.
- Think of an affordable solution for millions of small independent stores to manage their business in a totally different way. From inventory management and sales to replenishment and theft-control — everything in their stores can be controlled and managed.
- Imagine total product visibility, transparency and a supply chain built on real-time, on-demand information, and then think of the associated impact on your asset management and working capital.
- Envisage a store where your product is on the shelf every time consumers reach for it, where shelf-replenishment is triggered automatically, and theft is fully detectable.
- Consider a perfect demand-driven and networked economy synchronising activities across the supply chain from point-of-purchase all the way back through raw-material procurement.
- Contemplate a world where you could sell one, replenish one. Better yet, where you could sell one, make one.

of the product is located somewhere within that store. This opportunity is often called the single largest potential benefit area from RFID for both manufacturers and retailers. The current focus in on-shelf availability is pilot testing the ability to improve retail in-store replenishment by providing visibility to case-level inventory in the backroom.

- **Eliminating Shipping & Receiving Errors** — The elimination of errors in shipping and receiving requires joint participation from a supplier and a retailer, and involves case-level tracking and sharing of EPC information of shipments from both trading partners.
- **Productivity & Labour Efficiencies** — Both suppliers and retailers are testing RFID non-line-of-sight improvements over existing bar-coded ID systems in data entry and processing to improve product velocity.
- **Tracking High-Value Maintenance, Repair & Operations (MRO)** — For tracking items such as spare parts, this opportunity is available to both trading partners, but typically the manufacturers' conversion assets will increase the requirement for MRO tracking. Trials are focusing on tagging repairable or high-value spare parts to improve stock visibility at a lower labour cost.
- **Asset Tracking** — Within vertically integrated supply chains, piloted trials in asset tracking are prevalent in the produce, beverage, and food categories. They involve tagging of returnable containers such as trays, containers, pallets, or kegs. These trials typically test enhancing first-in, first-out compliance (for perishables) or reducing asset loss (for beer kegs and pallets).
- **Tracking Speciality Orders** — Some multi-category and do-it-yourself retailers have tested item-level tracking of customer speciality orders. This will help improve customer services by tracking custom merchandise often mixed in with regular merchandise and "lost."

Other Applications Also Being Considered

- **Increasing Home Delivery & Direct Store Delivery (DSD) Accuracy** — Tagging at the item, tray, container, or box level to ensure the right products are loaded and delivered by the right vehicles.

EPC Business Application Conclusions

The EPC vision is about moving products in the supply chain to reduce time, costs, and waste in the industry — all of which will result in fresher, more secure and possibly cheaper products for the consumer. Detailed interviews for this survey revealed, however, that the RFID technology has a multitude of potential uses.

This research found different business cases driving varied applications in EPC adoption among the early practitioners. However, a number of elements did stand out as those driving the processes and applications for the future. They include:

- Business process change within a company is essential. The technology is only the enabler. It is not a business solution on its own.
- Data and information-sharing across company boundaries can drive significant benefits for both manufacturer and retailer trading partners. The EPC network vision provides a framework and the mechanism to make this data-sharing a reality, but implementing in a consistent manner across trading relationships requires more work on industry standards through the EPCglobal organisation.
- The primary focus of early adopters is in pallet- and case-level tagging. Many companies believe that a greater level of benefits can be achieved through just case-level tagging.
- Item-level tagging has some incremental benefits. However, numerous issues must be addressed before consumer-unit tagging can be considered on a broader scale.

- **Enhancing the Shopping Experience** — The METRO Future Store Initiative has begun trials on the integration of RFID tags into store loyalty cards. It is expected that, as item-level tagging in stores increases, a three-way association of product, store, and customer will be made providing the consumer with a range of benefits via digital shopping-assistance devices.
- **Authenticating Product and Expiration Dates** — Trials are underway within retail pharmacy and pharmaceutical supply chains to use RFID as a way to test product authenticity. Expiration dates could also be checked to ensure product safety and proper usage.

Enabling the Vision

Consistent Global Identification

Today, when a container cannot be identified, it is necessary for each product in a shipment to be unpacked, scanned individually with all the product characteristics checked and entered by hand into some form of local system. The amount of extra work is huge. Many countries already use EAN•UCC numbering systems for identifying items, logistics units, or assets. These include the Global Trade Item Number (GTIN), Universal Product Code (U.P.C.), Serial Shipping Container Code (SSCC), etc. It is vitally important that methods for integrating these numbers within the EPC are agreed upon, so there is no conflict between the standards.

Synchronisation of Data

Much has been written about the benefits of global data synchronisation and of the ability for every participant in the supply chain to have accurate and timely information about the goods flowing through that supply chain. Given the emergence of standards for data messaging, the provision for a global registry, and the emergence of interoperable data pools, the push for data synchronisation worldwide is gaining momentum. The question has been raised whether the EPC network vision will detract in any way from this movement toward global data synchronisation. The answer is a resounding no.

The two initiatives complement each other as integral parts of the industry's drive to cut costs, boost efficiency and better serve the consumer. In

fact, some of the benefits from the emerging EPC network cannot be realised if supply chain partners do not synchronise master data.

Tags & Readers

Recently, tags and readers have been launched that provide the interoperability between devices made by different manufacturers that was not present before.

There are two classes of wireless tags — class 0 and class 1 — widely available today. Work is currently underway to define a unified protocol that incorporates the best features of both classes of tags and also allows a single reader to read tags of either class. Both are now available for testing by companies, and early adopters note that selecting standards-compliant equipment is the best guarantee against technology becoming obsolete.

Radio Frequency Harmonisation

RFID systems must operate in "free air" areas of the wireless communications spectrum across national borders. Presently, there is no harmonisation of the regulations for radio communications on a global basis. However, work is ongoing with a number of governments and standards and licensing organisations to gain agreements that allow for a single set of tags to operate at slightly different frequencies around the world.

Commercial Versions of the Savant, ONS, EPCIS

Today's reality is that there is not a complete set of commercial versions of these products that are truly interoperable or "plug and play." Many vendors have a version of each, and these have been used in the trials so far.

- The Auto-ID Center produced an open source version of savant, which has been modified a number of times by systems integrators, often in conjunction with early adopters to allow pilots. The technology works and can be used in testing. Savants will form the interfaces to enterprise application packages, such as supply chain management software. Providers of application software will need to build a standard way of getting EPC information in and out of their systems.
- An ONS is an essential component of the EPC vision and is based on the structure of a domain

name service (DNS). EPCglobal currently has a request for proposal underway to establish an ONS service by the end of 2003.

- The EPC information service (EPCIS) and the physical markup language (PML) are key components of the EPC network and are a standard means of delivering information. The development of open, voluntary standards for both is necessary.
- The view of many in the industry is that the components of ONS and EPCIS are not essential to get started for implementation, but would be provided in the longer term as components of the overall vision.

Data Management

A number of issues related to data management must be addressed, including:

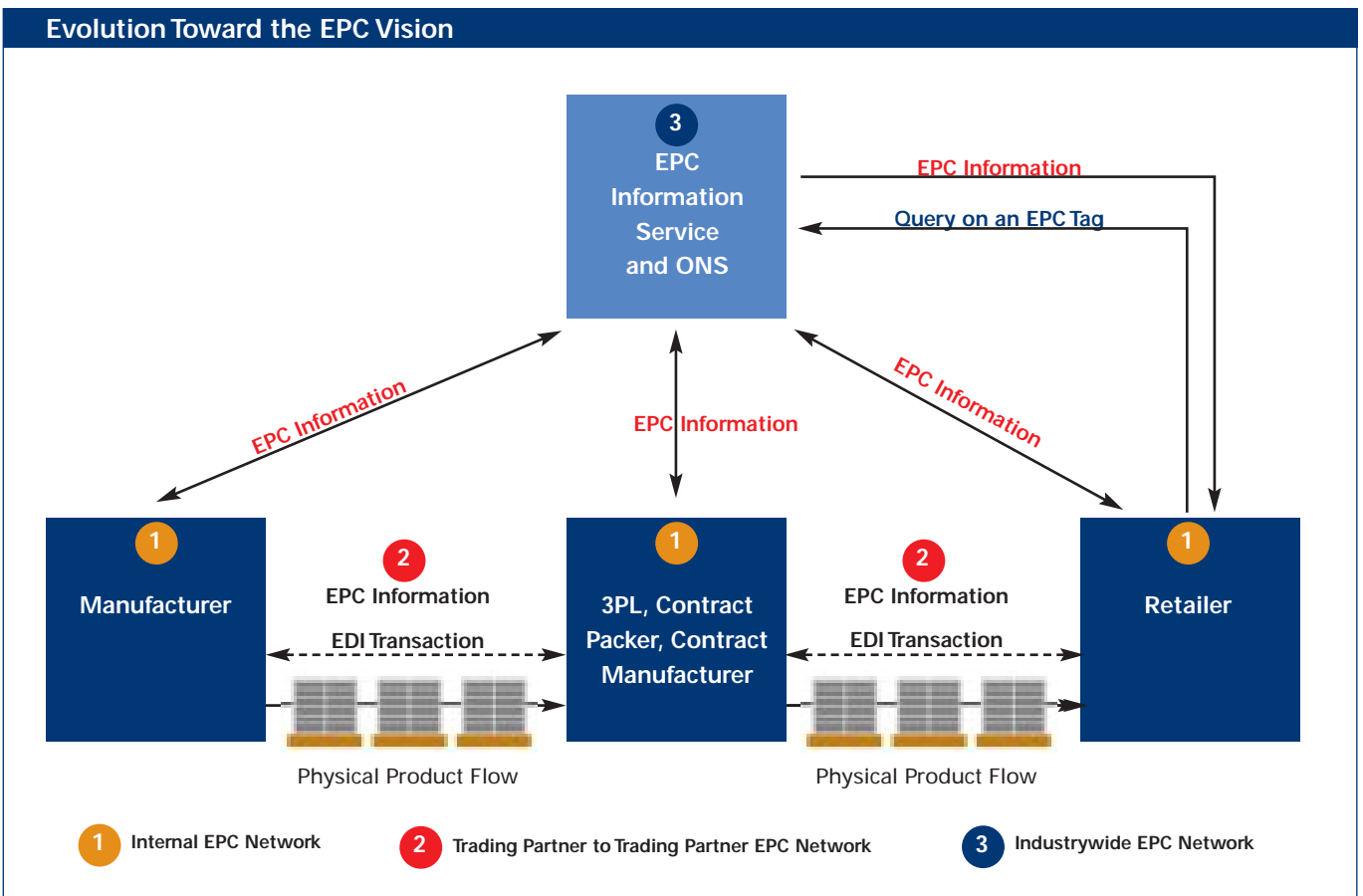
- How does a company deal with these much larger volumes of data? EPC adoption will drive up the volume of data companies need to

process by a significant amount. As the level of tagging (pallet, case and eventually item) increases so will the data processing requirements.

- How does a company share this data and communicate with trading partners? How will data flow evolve between trading partners, and how should this evolve as the EPC network becomes more mature? In addition to managing larger volumes of data, companies need to consider management policies for data ownership, confidentiality, and security, as well as data retention and archiving.

Sharing Data With Trading Partners

One critical part of the EPC vision is sharing data with trading partners (see diagram below). The transition to a new way of doing business and a new way of sharing information may not be easy. However, the tremendous benefits promised by the EPC vision — and those already being proved in the pilot tests taking place today across the globe —



Source: IBM Business Consulting Services

are assuring companies that the next generation of partnering is well worth the effort. The three levels of EPC data-sharing maturity include:

1. Internal EPC Network

For EPC adoption each company will require an internal EPC infrastructure. This approach is currently in use by companies in operational trials.

2. Trading Partner-to-Trading Partner EPC Network

While there are benefits in applying this concept within a company, a significantly higher rate can be found in applying this concept in an end-to-end supply chain. With this level comes the requirement to share EPC data among trading partners and service providers, such as third-party logistics providers. Two essential pre-requisites are:

- The use of voluntary, open standards.
- A standard message format and method for exchanging data. Data may be duplicated at different points in the total supply chain, holding it closer to the point of use. Each trading partner may wish to hold a copy of the data. This model is expected to be in operation by 2004.

3. Industry EPC Network

Eventually, any company will be able to plug into an industrywide EPC network. Requests for information about an object will go into the network and the information returned may come from multiple data sources in multiple enterprises. This example is the ultimate EPC network vision. The journey to this level, however, will take a number of years.

Public Policy Issues

As has been the case with almost all other technologies through the years, consumer advocates are concerned about the potential for misuse of RFID tags. However, the area of primary consumer interest — item-level tagging — is not expected to be adopted in the mass market for several years.

Since its founding, the Auto-ID Center has actively sought the views of consumers, government officials, and public policy experts on the privacy issues inherent in implementing the new technology. The Auto-ID Center's successor,

EPCglobal, working together with its industry sponsors, have developed a set of principles to guide the implementation of the EPC. These principles are intended to assist companies address the implementation issues in a manner that respects the privacy of consumers, as well as their own business needs and processes.

Broad industry agreement to a basic set of privacy guidelines was achieved at the Auto-ID Center's final Board of Overseers meeting in Japan at the end of October 2003. These guidelines will help steer the future use and deployment of EPC technology and are intended as complements to existing legislation and regulation in the various nations and regions of the globe. The principles are based on a belief that consumer acceptance of EPC is crucial to the full adoption of the technology and the ability of consumers, business, and society as a whole to realise its full benefits.

EPCglobal will be responsible for updating these guidelines which will evolve as further developments in technology and its deployment occur.

Enabling The Vision Conclusions

Further developments are still required in the areas of standards, technology, regulatory constraints, and communications before the EPC vision can be brought to full realisation on a large scale.

- However, when talking about fulfilment of the promises and benefits of RFID it is no longer a question of "if" but rather a question of "when."
- There is not a single element of the EPC vision today that is insurmountable.
- An action agenda for the industry, found in this report, gives some indications of how this vision can be achieved.
- There is no reason for companies to wait. They can begin to pilot the EPC network concepts today.

Lessons Learned by Early Adopters

Early adopters stress that RFID technology is an *enabler* — not a *solution* in itself. For companies to be successful with trials and implementations, business process change is absolutely essential.

The competitive advantage will come from (1) determining where and how to apply the technology to achieve business value, and (2) creating new business processes that are RFID-enabled to achieve concrete operational improvements.

Companies will achieve different benefits with EPC adoption. Many of these will vary by product category, supply chain processing (full pallet vs. case or item processing), and current opportunities for improvement (e.g., is shrink an important issue in this company?).

To explore RFID's potential and benefits, early adopters have been conducting trials, both within their own organisations and with trading partners. Early practitioners agree the benefit potential increases significantly when trading partners adopt the EPC network technology across the entire supply chain.

The diagram below highlights the principal benefit areas that most manufacturers and retailers are targeting in their EPC adoption plans.

A general perception exists that greater benefits accrue to the retailer than to the manufacturer with this initiative, especially if the manufacturers are asked to absorb the total cost of the tags. This perception is due in part to the belief that retailers will more easily generate scale through their system than their supplier partners. Both partners need to engage in fact-based dialogues when discussing deployment options and benefit sharing to ensure a win-win scenario.

Consumer unit-level tagging has the potential for higher benefits, e.g., reductions in out-of-stock and improvements to the overall consumer shopping experience. However, costs also increase significantly with unit tagging. Given current technology prices, item-level tagging may be

Key Benefits From Business Initiatives				
Factory	Finished Goods Warehouse	Distribution Centre	In-Store Handling	Store-Shelf
				
<ul style="list-style-type: none"> Plant Inventory Accuracy (Finished Goods). Automatic and Verified Shipment Data Reported to Finance and Inventory Systems. 	<ul style="list-style-type: none"> Reduced Labour Costs in Receiving, Putaway, Picking, and Shipping. Proof of Ownership During Transit. Reduction in Reverse Logistics>Returns and Claims. Improved Goods Transfer and Payment Process. Improved Service Levels Through Reduced Out-of-Stock. 	<ul style="list-style-type: none"> Improved Efficiencies in Receiving and Payment for Receivables. Reduction in Labour Costs. Reduction in Reverse Logistics>Returns. Reduction in Inventory. Reduction in Obsolescence. 	<ul style="list-style-type: none"> Inventory Reduction (Backroom, Lower Obsolescence). Better Visibility of Back Room and On-Shelf Inventory. Decreased Theft. Improved On-Shelf Availability and Reduction in Out-of-Stock (Improved Replenishment). Store Labour Productivity Improvement. Reduced Defensive Merchandising Leading to Improved Sales. 	

Source: IBM Business Consulting Services

reserved for high-cost and high-margin products until tag costs drop significantly. Also, issues centred around public policy concerns need to be addressed before this level of tagging can be considered for larger-scale adoption.

Early adopters are demonstrating in field trials around the globe that tagging at the pallet, case, and logistics-asset level is feasible today. However, for future trials to be scaled and to include multiple trading partners and for the EPC initiative itself ultimately to be successful, a common standards-based approach is essential. The EPC vision and the work done by EPCglobal in conjunction with EAN•UCC currently represent the best hope of achieving this.

Today, there is an EPC momentum building. A number of early adopters — both retail and consumer packaged goods manufacturers — intend to move beyond operational trials to broader implementation with multiple trading partners. Others have publicly announced plans to begin on their EPC journey in the near future.

EPC pioneers tell those starting on this journey that it is an endeavour made up of a number of small iterative steps. No roadmap can point to a single route or only one avenue to reach the company's destination of achieving the full EPC vision. Each company needs to find its own route.

Early Adopters — In Their Own Words:

"It's not about the technology — the technology is simply the enabler. It's about the vision. When every item in the supply chain has a unique identity, the supply chain efficiencies are limitless and 'perfect retail' is a real possibility."

Jamshed Dubash, Technology Director, The Gillette Company

"You need to pilot test the EPC network to identify where the benefits are. 'Launch and learn,' then develop your business case."

Dick Cantwell, Vice President, The Gillette Company

"The use of RFID technologies and a common EPC support our move towards the realisation of 'radio bar codes.' These bar codes help us improve the overall productivity of our supply chain and help us improve the availability of products for our customers."

John F. Clarke, Director, Group Technology and Architecture, Tesco

"RFID enables us to have the full visibility of the items, cases, and pallets in the entire collaborative supply chain. This information can easily be joined with our supply chain partners. Using RFID, we can increase efficiency and reduce costs across the entire process chain."

Dr. Gerd Wolfram, Project Manager, METRO Group Future Store Initiative

"Creating the right migration path for current EAN•UCC system users will aid the implementation of the EPC network in the consumer goods sector"

Peter Jordan, Director IS Strategic Projects, Kraft Foods International

"In Unilever, we see RFID technology and the use of EPC impact our total supply chain. More than ever before, we need total alignment across our logistics, our customer interaction, and our technology to maximise the value of this breakthrough technology. That is the challenge we face, and we have taken up the gauntlet."

Nigel Bagley, GCI Programme Manager, Unilever

"Technological superiority is not just about image. It's about constantly optimising business processes and systems, and is one of the important ways of guaranteeing future business success. Solutions that are sustainable worldwide can only be delivered if everyone works together. That's why we're working together with 40 business partners from the consumer goods and IT industry as part of the METRO Group Future Store Initiative."

Zygmunt Mierdorf, Member, Executive Board, METRO Group

"How are we getting ready? We've formed a dedicated, centralised department to deliver EPC technology and facilitate implementation. We link to all company operations through a cross-functional core team. A senior management steering committee 'champions' adoption and removes obstacles. We have our CEO's full support"

Dick Cantwell, Vice President, The Gillette Company

A Company EPC Roadmap

The EPC adoption roadmap is based on four phases derived from the insights and first-hand experiences of the early adopters. These four phases are learn, experiment, evaluate, and adopt.

Today, most companies are moving along the EPC adoption journey and are at the first phase of *learn*. Some companies are moving quickly into the *experiment* phase. A few are in the *evaluate* phase and are characterised as the early adopters. Finally, only a small group is publicly committed to the *adopt* phase.

The expectation, however, based on company comments from varied parts of the globe is that a rather large push toward adoption of RFID technology and pilot testing is expected over the next two years.

Learn

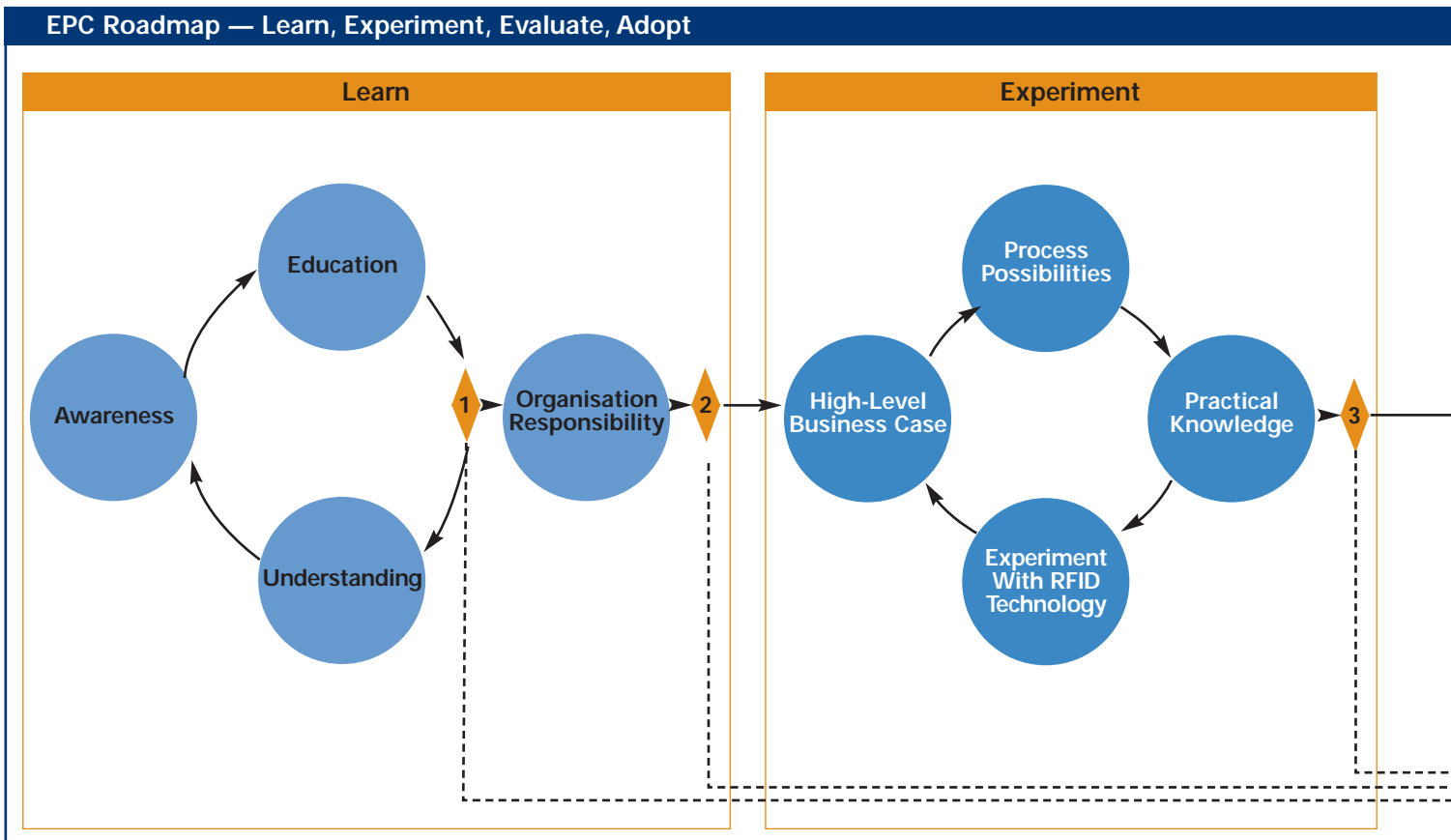
The first step consists of a series of activities from which the organisation builds up its knowledge about the EPC vision. Many companies have a few individuals who have some understanding of RFID technology and this potential. At some stage during this process, one individual is given the responsibility to become the RFID company champion. The key turning point in this phase is

when that person realises that, in order to move forward, he or she will need to transform the theory into practical knowledge.

Experiment

Practical learning is essential to understand the capabilities of this technology and its business process possibilities. Companies in this phase say that it is all about business process and getting comfortable with the available technology through experimentation.

The key learning from these practical experiments with the technology is that they give far better insights to the benefits available than a substantive



paper-based business case exercise. The next key turning point is reached when experiments prove successful and the company decides the technology is suitable to deploy to scalable pilots. This phase ends with senior management approval to proceed with targeted, operational trials.

However, other responses could result. Some companies may decide there are more important initiatives on which to focus. Or they could opt for a minimum deployment plan that meets the basic requirements of important trading partners but does not move toward wider adoption.

Evaluate

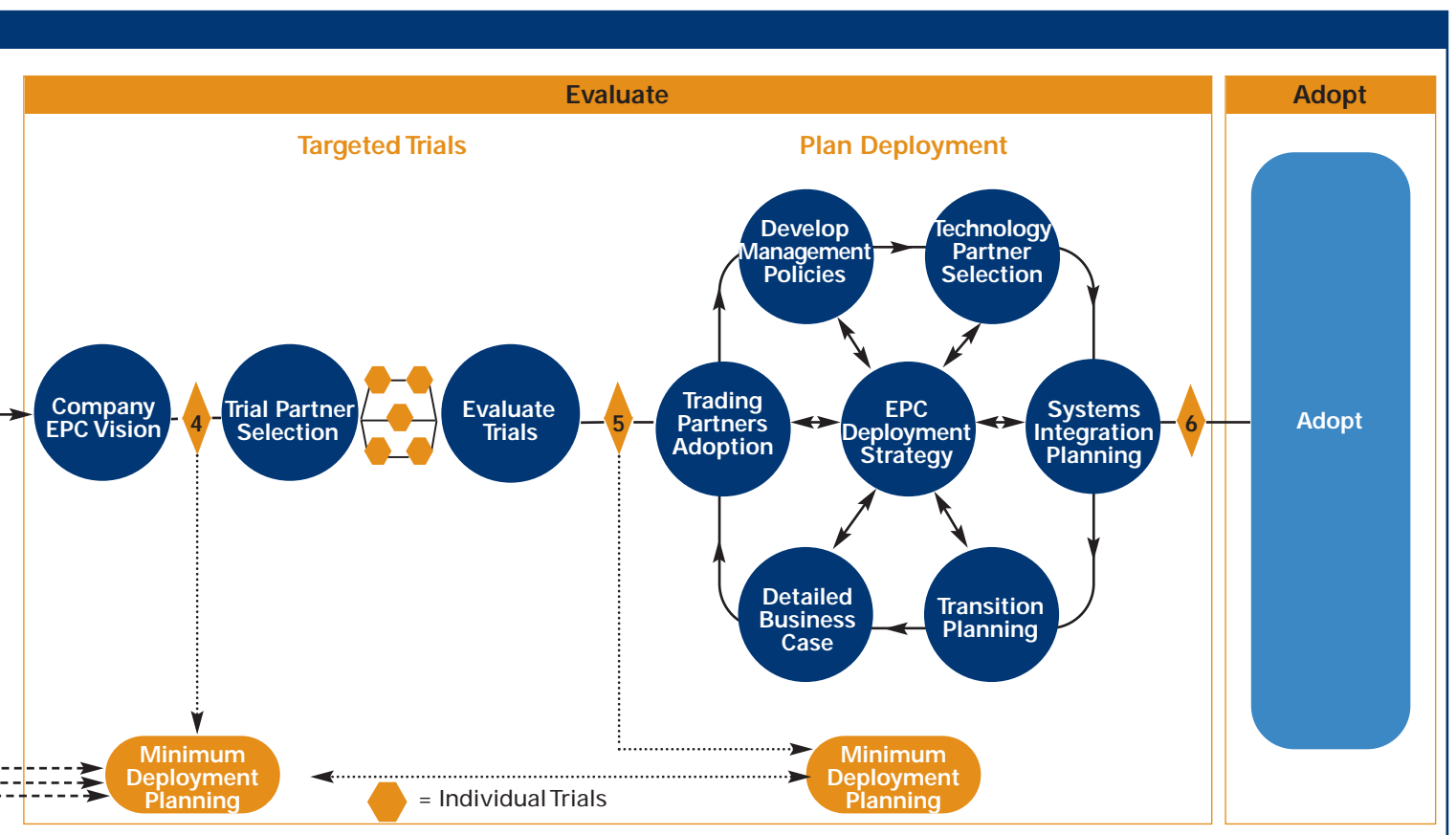
At this point, the company has decided to conduct operational trials. A company EPC vision is developed, and the priority business applications are identified for the trials, together with agreement for the necessary funding.

If the trials prove that the integrated technology and process changes are successful, then a decision is made to move to a broader adoption. This phase concludes with a detailed EPC deployment strategy as preparation for the final phase of *adopt*.

The alternative approach is the minimum deployment strategy described above. However, the leading EPC practitioners believe that this alternative is not viable in the long run. The minimum approach requires companies to absorb the costs of tagging but provides no incremental benefit from shared information and process change with trading partners.

Adopt

Very few companies have gone from operational trials to larger-scale deployment, although a few have intentions to do so. Today, this is uncharted territory. However, an evolutionary approach is expected as deployments are involving increased



levels of complexity. Many of the leaders plan to move to the adopt phase in the next two to three years as a series of small steps starting with operational trials that can be scaled and then institutionalised.

Action Plan for Adoption

Although RFID is being used around the world today in a wide variety of tracking, inventory, and payment systems, the current focus in the food and consumer packaged goods industry is in supply chain and logistics applications. Some actions are needed in the areas of standards, technology, regulatory constraints, and communications before the EPC vision can be brought to full realisation on

a large scale. However, as stated before, when referring to RFID implementation, the industry is no longer talking about “*if*” but rather “*when*.”

Today there is not one element of the EPC vision that is insurmountable. An action plan for the industry (found in the next section) gives some indications of how this vision can be achieved.

However, there is no reason for companies to wait. They could begin to pilot the EPC network concepts today. The company action plan in this section describes the short-term actions that a company could take while setting off on the route towards EPC adoption.

Recommended Company Roadmap — Short-Term Actions

1. Formalise the learning process. Assign a senior executive and mobilise a cross-functional team to learn more about the technology and its possible applications.
2. Participate in EPCglobal. Become actively involved with setting the industry standards by participating in the various action committees. This also provides an opportunity to share ideas and learn from industry peers.
3. Develop your own preliminary vision. Identify how the EPC vision could address your own business issues. Begin to formulate a vision for how your company may apply the technology and change its business processes to gain real value.
4. Conduct a business case analysis. Before making any significant business investments, conduct at least a high-level business case analysis to identify your own value proposition and to understand the cost and benefit drivers plus process changes required for your business. A fact-based analysis will provide the right framework for making investment decisions and can be refined as you progress along the roadmap.
5. Communicate with your trading partners. Actively investigate where your trading partners are along the adoption roadmap so you can prepare appropriately.
6. Initiate some controlled pilots or trials. Get out of the conference room and start learning by doing. Trials will help identify new opportunity areas and provide a practical grounding around what is technically feasible at this time. Trials also provide an opportunity to refine the business case and deployment plans based on practical lessons.

Source: IBM Business Consulting Services

Industry Action Plan

Global manufacturers and retailers are moving forward with RFID adoptions and field testing in increasing numbers and in a multitude of supply chain areas.

What actions are needed by the industry and its varied organisations to encourage this adoption, to facilitate further testing of RFID technologies?

Some critical actions are highlighted in the chart in this section — actions that need to be taken before the end of the first quarter of 2004. Industry assumptions are that a number of companies are now prepared for the end of 2004, when a much wider scale of adoption is expected.

- The need for EPC standards-compliant software and middleware that is truly interoperable and available commercially at affordable prices.
- The need for a framework for addressing public policy/privacy issues.

Action on four critical enablers stand out from the rest, including:

- The need for a usable radio frequency spectrum around the globe.
- The need for interoperable, EPC-compliant tags and readers at a market-acceptable cost.

The company and industry action plans — coupled with the EPC technology network and the EPC vision — have the power to revolutionise the industry and bring improved product availability and enhanced shopping experiences to consumers around the world.

Industry EPC Roadmap

Action Plan	Responsible
1. Communications and Marketing Large-scale adoption of the EPC vision requires that more companies understand the concept behind the vision — its technology and the business benefits for manufacturers, retailers, and third-party companies. This wider adoption should be promoted by developing and publishing consistent marketing and communications materials to increase the awareness of EPC in the industry.	Standards Bodies Trade Associations Industry
2. Sharing Best Practices A limited number of manufacturers and retailers are conducting field trials with the available technology and have developed considerable knowledge to date. These insights and experiences should be shared with others who are not so far along on the EPC journey or with those who have yet to begin the journey. A best practice group for knowledge and experience sharing should be established for this purpose.	Industry
3. Wider-Scale Adoption Wider-scale adoption of the EPC vision will also require other companies to participate. Encourage third-party logistics providers, contract manufacturers, contract packers, and packaging suppliers to develop approaches for adopting and implementing the EPC network to service the future tagging requirements of manufacturers and retailers.	Industry
4. Supporting Open Standards A common and open standards-based approach is required for the development of the EPC vision technology architecture. This can be achieved by getting a critical mass of important retailers and manufacturers to announce their support for an open and standards-based development approach. Communication should be planned with clarity on the points of commonality, focusing on messages to give confidence that there is a recommended way forward.	Industry Trade Associations

Continued on the next page.

Industry EPC Roadmap (continued)	
Action Plan	Responsible
<p>5. Migration Path for EAN•UCC Numbering System There will be a period of time as existing identification schemes (e.g., GTIN) migrate to EPC. To facilitate this move and allow the use of both schemes as transition occurs, the industry should agree and develop an industry standard for the inclusion of GTIN in the EPC number. In addition, other EAN•UCC standards require definition for migration into the EPC numbering system.</p>	Standards Bodies
<p>6. Integration of PML With EAN•UCC System Develop agreed-upon EPCIS and PML specifications integrated with the EAN•UCC Global Data Dictionary.</p>	Standard Bodies
<p>7. EPC Application Scenarios The implementation roadmap to move pilot trials from the four walls of a company to collaboration with trading partners is complex. Data management structures should be agreed upon and infrastructures established. For example: application scenarios should be defined for the location-to-location delivery process, and as such an EPC scenario goes outside the four walls of one company, shows how advance ship notices (ASNs) will be sent, how the EPC numbers will be communicated between trading partners, who will own and hold what data, and what levels of data security and integration are required?</p>	Standards Bodies Industry
<p>8. Tag Specifications The technical development, enhanced functionality, and innovation in the various types of tags are progressing within the industry. As a result, tag specifications should be provided that are open standards-compliant, interoperable and upwardly compatible, as new versions are designed. Manufacturers should be encouraged to develop products that meet the latest specification of these criteria.</p>	Standards Bodies Industry Hardware Providers
<p>9. Reader Specifications In tandem with tags, reader specifications also should be developed that are open standards-compliant, interoperable, and upwardly compatible. Manufacturers should be encouraged to develop products that meet the latest specification of these criteria.</p>	Standards Bodies Industry Hardware Providers
<p>10. Harmonisation of Radio Frequency Clarity of the regulations' harmonisation process is required across the industry, and details on what has been already agreed upon should be published. Statements from regulatory groups, e.g., International Organization for Standardization (ISO), European Telecommunications Standards Institute (ETSI) etc., should be obtained to help define what information should be given to CEOs so they can help to influence government and regulatory bodies in this harmonisation process.</p>	Standards Bodies Industry
<p>11. EPC Software The EPC network is the infrastructure for the adoption of the EPC vision, with the principle building blocks of the savant software, ONS and EPCIS as components of this infrastructure. Technology vendors should be encouraged to provide open standards-based products that work with savant and standard application program interface.</p>	Industry Software Providers
<p>12. Quality Assurance & Compliance The availability, performance, and efficiency of tag and reader equipment need to match — if not exceed — currently available technological solutions. Quality assurance and certification should be encouraged from tag and reader suppliers on their products' compliance with technical specifications, including robustness, reliability, read distances, read rates, etc.</p>	Industry Hardware Providers
<p>13. Public Policy Agree on public policy issues and privacy statements and commit to implementing these.</p>	Trade Associations Standards Bodies Industry

About the Global Commerce Initiative (GCI)

The Global Commerce Initiative is a voluntary body created in October 1999 to improve the performance of the international supply chain for consumer goods through the collaborative development and endorsement of recommended standards and key business processes. GCI operates through an executive board composed of senior representatives of more than 45 companies drawn equally from manufacturing and retailing that do business across continents or via global supply chains. It operates under the sponsorship of eight existing organisations representing the interests of one million businesses, large and small. For more information on the Global Commerce Initiative and the GCI EPC Working Group, please visit www.gci-net.org or contact:

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