

Connect the Dots



February 2004

*Harnessing Collaborative
Technologies to Deliver
Better Value to Consumers*



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Executive Summary

BACKGROUND

Data synchronization is moving forward but much remains to be done, both in the United States and globally. Companies must continue to drive implementation of data standards, item registry, and data synchronization. This must remain a top priority even as new collaboration-enabling technologies, such as Radio Frequency Identification (RFID) and the Electronic Product Code (EPC), begin to take center stage. Without Global Data Synchronization (GDS), the future of collaborative technologies, including EPC, is uncertain.

To address the connections between GDS and EPC, the Industry Affairs Council of the Grocery Manufacturers Association (GMA), along with the Food Marketing Institute (FMI), and National Association of Chain Drug Stores (NACDS) engaged A.T. Kearney (ATK) and Kurt Salmon Associates (KSA) to perform industry research and publish the findings. The result is this action plan to “Connect the Dots.”

FINDINGS

Interviews with more than 100 executives from more than 80 organizations revealed that the stairway model for electronic collaboration published by the GMA/FMI Trading Partner Alliance in 2002 remains a valid model. Additionally, it is broadly accepted that the three foundational steps built through GDS must be completed to realize the full benefits of electronic collaboration. The findings regarding GDS were consistent:

- 1. THERE IS BROAD CONSENSUS THAT GDS, USING UCCNET AS THE SINGLE GLOBAL REGISTRY, IS THE RIGHT PATH FORWARD.** However, many elements of GDS are only now beginning to take shape, including direct store delivery (DSD), and perishable, private label, and extended attributes, such as price, promotion, and image.
- 2. MAJOR BENEFITS WILL ONLY BE REALIZED WITH BROAD TRADING PARTNER PARTICIPATION.** Savings by any one company will depend on its ability to encourage its trading partners (customers or suppliers) to be part of the collaborative solution — the so-called “network effect.”
- 3. WHILE MANY COMPANIES HAVE SUBSCRIBED TO UCCNET, LESS THAN 1% OF GLOBAL SALES INVOLVE REGISTERED AND SYNCHRONIZED PRODUCTS.** Companies must continue data synchronization efforts through UCCnet and actually publish and subscribe to data on the GLOBALregistry. The metric should be changed from simply counting the number of subscribers to UCCnet, to tracking the sales volume transacted.

EPC holds the promise of building upon EAN.UCC barcode technology. By shifting from graphic-based to electronic codes, EPC will create dramatic cost savings, while revolutionizing the way trading partners interact. The findings regarding EPC were consistent with the state of technology and reflected a strong interest and commitment to implementing RFID.

- 1. THE EPC CODE SHOULD BE ADOPTED AS THE GLOBAL STANDARD FOR ELECTRONIC PRODUCT IDENTIFICATION.** Numerous consumer packaged goods (CPG) manufacturers and retailers are piloting EPC. To date, the pilots have strongly confirmed the promise of EPC and, while media coverage has created some misperceptions about the timing and cost of certain EPC applications, it is clear from our interviews and research that EPC is coming quickly and its impact will be profound.

The gap between the leaders and the followers, with respect to data synchronization, is widening.

2. PALLET- AND CASE-LEVEL APPLICATIONS OF EPC WILL BE WIDESPREAD WITHIN THREE YEARS.

EPC adoption rates will vary by company and product type. Product characteristics, such as item cost, out-of-stock sensitivity, and safety assurance, will cause some products to shift to EPC earlier than others.

3. MAXIMIZING THE BENEFITS OF EPC WILL REQUIRE THE STRONG FOUNDATION OF GDS. EPC fits naturally on the electronic collaboration stairway and requires the initial steps leading to trading partner data synchronization. It is imperative for the industry to ensure the time and capital investment in EPC does not diminish the strong commitment to move forward with GDS.

The last finding on EPC is critical, as this study indeed confirmed the “connection between the dots.”

1. GDS IS STILL THE NO. 1 PRIORITY. GDS early adopters are just now beginning to realize the benefits of synchronizing data. While the benefits are significant, these companies found that time and investment is required to clean up internal systems and re-engineer processes to exploit GDS.

2. GDS IS FOUNDATIONAL TO EPC. Companies must pay the price of GDS implementation before the collaborative benefits of EPC can be realized. Without GDS, EPC technology represents nothing more than a more expensive barcode.

3. COMPANIES SHOULD BEGIN EXPLORING THE EPC POSSIBILITY NOW. Regardless of business type, companies must start defining a business case for EPC. As with those companies that have implemented GDS, moving forward with EPC will put additional demands on resources and infrastructure. New standardization challenges put a premium on industry collaboration and project coordination.

RECOMMENDATIONS

Connecting the dots to achieve promised benefits requires individual company and industry-wide action. This report provides detailed action plans for companies, standards bodies, industry organizations, and solution providers. Recommendations are summarized as follows:

Manufacturers, Retailers, and Third-Party Service Providers

1. COMMIT TO THE GLOBAL DATA SYNCHRONIZATION VISION AND DEFINE A SYSTEMS PLAN FOR IMPLEMENTATION.

- Evaluate and establish timing for subscribing to UCCnet.
- Evaluate master item data storage and plan architecture for the future.
- Identify and prioritize categories for implementation.

An updated recommended timetable for GDS implementation for North American companies is presented in this report:

- Subscribe to UCCnet by February 2004.
- Register warehouse Global Trade Item Numbers (GTINs) by February 2004.
- Define extended attribute standards by June 2004.
- Complete registration of DSD, perishable, and private label GTINs by February 2004.

Companies with timetables, communication plans, training commitments, and capital expenditure budgets will capture the benefits of EPC.

GDS must remain a top priority because it is critical to the future of electronic collaboration.

2. CLEANSE DATA AND SECURE PARTNER AGREEMENTS.

- Determine and implement required data remediation and cleansing.
- Set outsourcing strategy and if applicable, select partners: integration, data pool/catalog, messaging.
- Coordinate rollout with trading partners along product categories and lines of business.

3. ADOPT ENHANCED METRICS FOR MEASURING GDS AND INCLUDE ON CORPORATE SCORECARD.

- What percent of my data is ready to be loaded to or from UCCnet?
- What percent of my data is loaded into my data pool?
- By supplier, what percent of the items carried is available through the registry?
- What percent of my sales volume is based on synchronized item data?

4. FORM A CROSS-FUNCTIONAL EPC CORE TEAM.

- RFID and EPC may touch every aspect of the organization; include all appropriate functions.
 - Manufacturing, packaging, transportation, distribution
 - Merchandising, store operations, loss prevention, store planning/construction
 - Sales, customer service
 - Marketing, finance, inventory planning, IT

5. ASSESS THE ATTRACTIVENESS OF EPC APPLICATIONS.

- Identify value chain pain points that can be relieved.
- Evaluate various applications' attractiveness based on cost effectiveness (tags and infrastructure) and payback, ease of implementation, and organization readiness.

6. DEVELOP EPC BUSINESS CASES AND PILOTS (INCLUDING TRAINING AND BUDGETS).

- Pilots afford companies the opportunity to assess true benefits and costs.
- Business cases should be updated with pilot results to reflect experience and learning.
- Recognize the importance of education in ensuring benefits are fully realized.

7. INVENTORY AND EVALUATE EXISTING WIRELESS SYSTEMS FOR POTENTIAL INTERFERENCE PROBLEMS.

- RFID systems require careful planning to avoid interference.
- Companies must plan to encounter issues to resolve.

8. JOIN EPCGLOBAL.

- Share in the wealth of knowledge as it develops.
- Participate in setting the direction for future developments.

Industry Associations and Standards Bodies

1. PROMOTE ENHANCED GDS METRICS.

- Incorporate proposed scorecard metrics into surveys, studies, and other industry work.

2. ENSURE "IN PROCESS" STANDARDS ARE FINALIZED AND IMPLEMENTED (E.G., PRICE/PROMOTIONS, DSD, PRIVATE LABEL, AND OTHERS).

- Standards must be developed in a timely fashion to support industry movements and adoption.
- Industry segments awaiting extended attributes and additional business models are ready. Organize their involvement and energy to push standards forward.

3. ACCELERATE STANDARDS DEVELOPMENT FOR ADDITIONAL PRODUCT AREAS NOT YET SUPPORTED.

- Today's diversified retailers and mass merchants need a system that works across all product lines.

4. ENCOURAGE EXCHANGES, EAN MEMBER ORGANIZATIONS, AND COUNTRY AND DATA CATALOGS TO EMBRACE THE GDS VISION.

- Continue to clarify and define the role of industry bodies in the GDS and EPC networks.

5. ENDORSE EPC AS THE GLOBAL RFID STANDARD.

- The industry needs one standard to ensure the lowest-cost, globally accepted solution.

6. DEVELOP A RESPONSE TO CONSUMER PRIVACY AND SAFETY CONCERNS ABOUT EPC.

- Aggressively publicize development work on privacy options.
- Communicate realistic and valued eventual at-home benefits.

7. AGGRESSIVELY PROMOTE THE CONCEPT OF OPEN STANDARDS FOR RFID.

- Specifically, frequency protocols and product identification and current critical standards.

Solution Providers**1. ENSURE GDS OFFERINGS ARE FOCUSED AND EASY TO UNDERSTAND.**

- Companies will embrace GDS only when they understand the complete solution and each party's role.

2. EMBRACE GDS VISION WITH OPEN, NON-PROPRIETARY SOLUTIONS.

- Resist the temptation to differentiate through nonstandard solutions.

3. FOCUS ON CUSTOMER REQUIREMENTS AND CONSUMER BENEFITS.**4. ACCEPT GDS AS A COMPLEMENT, NOT A COMPETITIVE THREAT, TO EPC SOLUTIONS.**

- Implementing EPC without synchronization of the underlying data will limit the payback value of EPC.

5. EMBRACE THE CONCEPT OF OPEN STANDARDS AND JOIN EPCGLOBAL.

- Join industry leaders in moving EPC into high-value commercial use in a standard, open manner.

Harnessing Collaborative Technologies to Deliver Better Value to Consumers

I. BACKGROUND

The June 2002 President/CEO Forum at the GMA Executive Conference proved to be an important turning point in the history of electronic collaboration. Prior to that date, subscription to the UCCnet GLOBALregistry™ — the service designed to act as the world's global registry of item-level data — remained sluggish. Established in late 1999, UCCnet had attracted only 89 subscribers in its first 18 months. Industry leaders feared that nearly three years of effort and roughly \$1 billion of investment was in danger of being misspent.

A call to action was sounded by the GMA-FMI Trading Partner Alliance (TPA). Adopting the recommendations of A.T. Kearney (ATK), which had interviewed a range of industry leaders, the TPA challenged consumer packaged goods (CPG) manufacturers and retailers to:

- Confirm their companies' commitment to Global Data Synchronization (GDS) by setting target dates for internal adoption.
- Endorse UCCnet GLOBALregistry™ as the global registry for item-level information and demonstrate that commitment through subscription.
- Prepare internal systems and begin synchronizing data.
- Encourage broader industry participation by supporting groups such as Global Commerce Initiative (GCI) and EAN.UCC's Global Standards Management Process (GSMP).

The results of this call to action have been impressive. UCCnet subscriptions doubled in less than 90 days and have continued to grow. By early June 2003 UCCnet had nearly 600 subscribers and ended the year with more than 2,000 subscribers. Despite this surge in subscriptions:

- Retailers accounted for less than 5% of subscribers.
- Very few subscribers had moved beyond "signing the check," with very little data remediation, item registration, and active synchronization with trading partners.
- Subscriptions outside North America are lagging dramatically.
- Important industry verticals like pharmaceutical have not become significantly involved.
- Key elements of the GDS framework (e.g., direct store delivery (DSD), perishables, and private label) and extended attributes for warehouse items (e.g., price and image synchronization) have yet to be fully defined.

In addition to these key activities required to realize the significant benefits of GDS, the past 18 months have seen the CPG industry begin serious preparations for integration of Electronic Product Code (EPC) and Radio Frequency Identification (RFID) into supply chain operations. The combination of GDS and EPC will fuel a new era of electronic collaboration, revolutionizing the way trading partners conduct business.

There are significant challenges in terms of prioritizing investments required to build the foundations that will support these efforts. As a result, the sponsoring organizations commissioned a study to "Connect the Dots" for members, developing a roadmap to guide their GDS and EPC implementation. ATK and Kurt Salmon Associates (KSA) were commissioned to complete a comprehensive evaluation of the status of GDS and EPC, investigating the connections between the two initiatives and outlining the imperatives for companies seeking to establish new trading relationships based on the foundation of electronic collaboration.

The ATK/KSA team interviewed more than 100 executives, spanning 80 U.S.-based and international retailers, manufacturers, industry organizations, and service providers. These discussions revealed various levels of understanding of the connection between GDS and EPC, and of the benefits that can be realized through the development of a comprehensive and integrated approach to electronic collaboration.

GLOBAL DATA SYNCHRONIZATION (GDS)

While many executives understand the intrinsic value synchronized data will bring to their businesses, some still question the magnitude of dollar benefit that can be achieved by implementing GDS. The benefit of GDS has been proven in a series of case studies produced by ATK for the GMA-FMI Trading Partner Alliance, published in June 2003, featuring three leading retailers and three leading manufacturers. Once broad industry adoption of GDS occurs, companies that commit to improving internal processes will see real monetary benefits — roughly \$1 million for every \$1 billion in sales.

Since the 2003 GMA Executive Conference, UCCnet subscriptions have surpassed 2,000. UCCnet has released Version 2.2, which incorporates key changes, including adherence to global interoperability standards for GDS, support for extended attributes for various business lines, and support for additional business models, including DSD, distributor/wholesaler, and private label. Additionally, EAN, UCC, and GCI have announced a joint working group for DSD standards. Active industry support for GDS and UCCnet has increased, particularly in grocery retail, with industry leaders such as Ahold, Shaw's, Wal-Mart, and Wegmans requiring registration of products by the end of 2005.

ELECTRONIC PRODUCT CODE (EPC)

In addition to a strong industry focus on moving the GDS agenda forward, the study identified an increased concentration by retailers and manufacturers on EPC technology. It is clear that EPC is coming quickly and that its impact will be profound. Executives attending the 2003 GMA Executive Conference discussed the importance of putting in place the correct groundwork and standards for EPC, including the prerequisite for a strong foundation represented by GDS. Under the leadership of the Auto-ID Center, numerous industry participants have begun to prove the commercial viability and benefit of EPC technology through focused piloting of EPC applications across the CPG supply chain.

Since the conference, important progress has continued with EPC as well:

- Wal-Mart delivered the much-anticipated message that it will require its top suppliers to tag pallets and cases in 2005, and all suppliers to tag them in 2006.
- The U.S. Department of Defense (DOD) revealed a plan to require EPC-tagged pallets and cases in 2005.
- The Uniform Code Council (UCC) and EAN International teamed to unveil EPCglobal, which will set standards for EPCs and the EPC Network and will work within the GSMP for setting standards.
- Vendors continued to focus on creating a low-cost solution for the industry (e.g., SmartCode's touted low-cost solution, Toppan's short-range tags at low prices, MeadWestvaco/Tesco's use of antennas in smart shelves to lower cost, and Tagsys' tiny tags).

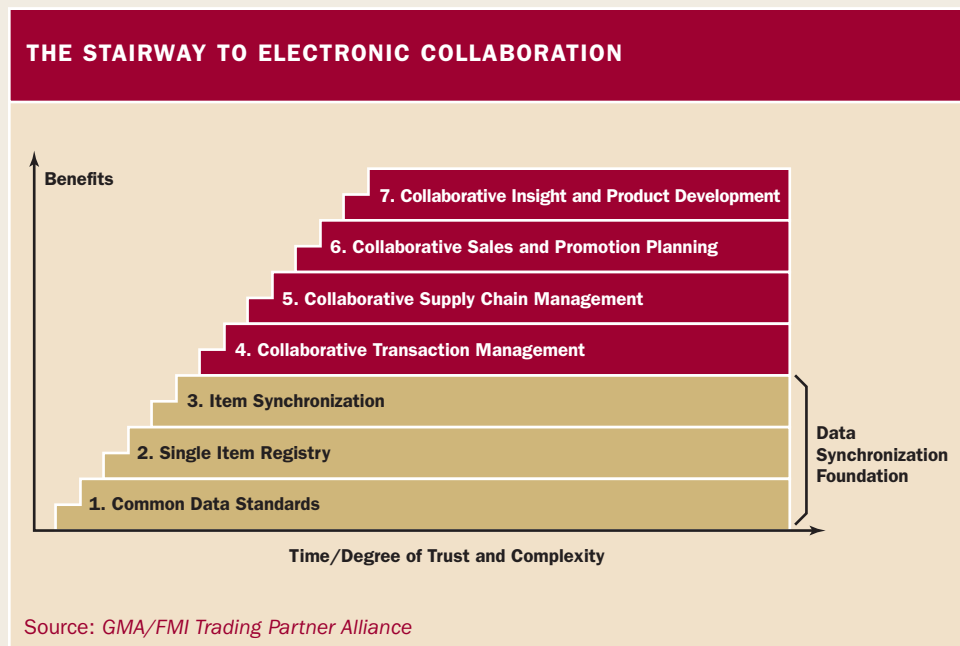
Once broad industry adoption of GDS occurs, companies that commit to improving internal processes will see real monetary benefits — roughly \$1 million for every \$1 billion in sales.

- Metro AG opened a “Store of the Future” concept store to test RFID and other technologies.
- Various warehouse management systems (WMS) providers, including Manhattan Associates, Red Prairie, and Provia announced RFID capabilities.
- Governments announced potential RFID applications for increased accountability and tracking, including tracking SARS-exposed doctors, passports, and soldiers.
- Japan is helping to encourage global adoption of Ultra High Frequency (UHF) tags for supply chain tracking by allocating 950 to 956 MHz for RFID.

However, consumer privacy concerns continue to develop. Benetton attempted to clear up the confusion regarding its RFID testing, noting that it has not stopped testing due to consumer privacy issues. Meanwhile, consumer advocacy groups continue to push for measures to protect consumer privacy worldwide.

ELECTRONIC COLLABORATION

The CPG industry has broadly recognized the following seven-step process as describing the activities required to realize the tremendous potential of electronic collaboration. This “stairway” was originally presented at the 2002 GMA Executive Conference to describe the steps companies must take to implement a strategy for GDS.



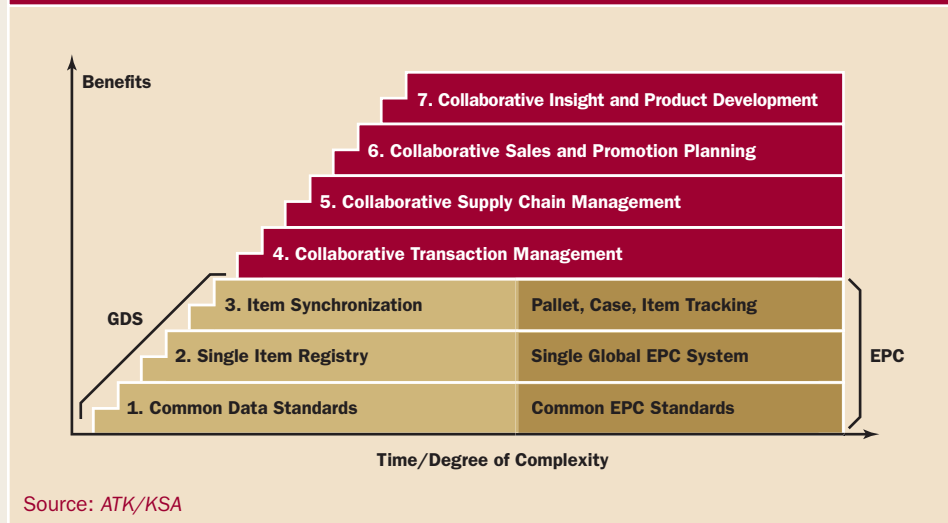
Data synchronization is the first foundational step on the path to electronic collaboration. The “Data Sync First” concept is accepted by most suppliers and retailers in the grocery industry, and the industry is reinforcing data synchronization’s significance by focusing resources toward its completion. Why is data synchronization so foundational to electronic collaboration success? The answer lies in the old saying: “Garbage in, garbage out.” Electronic collaboration without data synchronization could be translated as: “Garbage in faster, garbage out faster.” In many cases, faster even than companies could react and catch the mistakes.

The stair-step diagram shows GDS as the foundational action that must be taken to ensure industry-wide electronic collaboration success. Each step plays a key role in providing efficient, accurate exchange of electronic data.

- **INDUSTRY-WIDE DATA AND COMMUNICATION STANDARDS:** Without standard data formats, classification schemas, and information-exchange protocols, suppliers and customers will need to maintain multiple data formats and systems to communicate with different partners. The required time and resources to deal with lack of standards will only diminish the benefits of electronic collaboration, and the excess cost will increase as electronic collaboration expands.
- **USE OF A SINGLE ITEM REGISTRY:** The single item registry provides a unique identification to each electronically traded product.
- **INTEROPERABLE CATALOGS LINKED BY SYNCHRONIZATION ENGINES:** Because item characteristics change, all trading partner item information will also need to change. To ensure that item information can be altered and updated efficiently and error-free in a timely fashion, electronic synchronization is crucial.

The study found that the “stairway” model can be modified to identify how EPC “fits” into the process of defining and deploying an overall approach to electronic collaboration. The study confirmed the strong requirement for the foundational elements of GDS to be in place before the significant benefits of EPC technology can be realized.

THE STAIRWAY TO ELECTRONIC COLLABORATION PARALLEL PATHS FOR GDS AND EPC



While it is generally accepted in the grocery industry that data synchronization is foundational to electronic collaboration, it is not as widely recognized as a foundation to other technologies, such as RFID and EPC. The following sections demonstrate that data synchronization is a foundational step for *all* trading communication, including EPC. EPC can be thought of as having the same basic foundational steps as GDS: standardize, create a single global system

for tracking, and move forward with the technology. As such, it is shown in the diagram above as akin to GDS steps 1, 2, and 3.

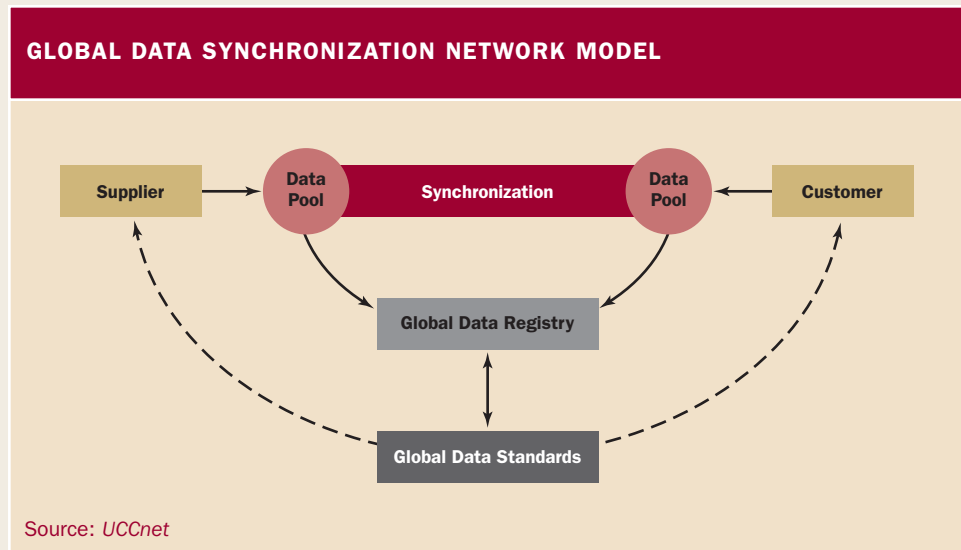
It is often stated that electronic collaboration without data synchronization will merely accelerate the exchange of bad data between trading partners. Similarly, collaborative EPC implementation without data synchronization will have the same result across the value chain.

II. GLOBAL DATA SYNCHRONIZATION (GDS)

GDS Status

The framework of the GDS Network was documented in 2002 in the GMA-FMI Trading Partner Alliance's "Action Plan to Accelerate Trading Partner Collaboration." The model describes the basic foundation for GDS, including:

- The need for globally accepted conventions for data definition.
- A globally accepted registry for all items.
- A flexible set of principles guiding the exchange of synchronized data between trading partners.



Driving the acceptance of this model, UCCnet has been widely embraced as the data registry of choice in North America, with more than 2,000 subscribers. Support outside North America has been slower to emerge, which can be attributed to two factors:

1. Some EAN data pools continue to promote distinct solutions that are inconsistent with the GDS vision and
2. UCCnet's initial focus has been on developing the network in North America and promoting adoption, leaving few resources for overseas development.

Recognizing the importance of broad international adoption, the leaders of EAN International, UCC, and GCI issued a joint statement in May 2003 urging GCI board members (primarily those outside North America) to:

- Embrace UCCnet as the GLOBALregistry.
- Identify which data pool they wish to use as a “home data pool” for connecting to UCCnet’s GLOBALregistry.
- Ensure that their chosen data pool complies with the GDS vision and all relevant interoperability protocols.

GDS Call to Action: Real Value

The benefits of GDS have been largely proven by a pioneering group of U.S.-based manufacturers and retailers who have implemented programs supporting the synchronization and exchange of data across their shared operations. The benefits of GDS have been well documented in a June 2003 ATK study (see Data Synchronization Proof of Concept: Case Studies from Leading Manufacturers and Retailers, available from GMA or FMI).

SUMMARY OF BENEFITS

Manufacturers

- 3% to 5% reduction in shelf out-of-stocks.
- Two-week reduction in speed-to-market for new items (i.e., 14 extra days’ sales of faster-moving items).
- 7% to 13% reduction in salesforce time spent communicating basic item information to customers, following up, resolving queries, etc.
- Reduction in call center and website queries regarding basic item information.
- 5% to 10% reduction in salesforce and accounting time spent dealing with invoice disputes.
- Reduction in invoice write-offs incurred as a result of data discrepancies.
- Elimination of basic item data errors, currently found in up to 8% of total purchase orders.
- 0.2% to 0.7% reduction in outbound logistics costs.
- 0.5% reduction in inventory.

Retailers

- 3% to 5% reduction in shelf out-of-stocks.
- Two-week reduction in speed-to-market for new items (i.e., 14 extra days’ sales of faster-moving items).
- 10,000 to 30,000 hours saved in store labor costs resulting from shelf-tag and scan errors.
- 5,000 to 10,000 hours saved in merchandizing and data entry time dealing with new item introductions and updates.
- 1,000 to 2,000 hours saved in finance time dealing with invoice disputes related to basic item information.
- Reduction in invoice auditor fees.
- 0.5% to 1% reduction in inbound freight costs.
- 1,000 to 2,000 hours saved in warehouse and DSD time dealing with item discrepancies.
- 1% reduction in inventory.

For the three manufacturers in the case study, total benefits are in the range of \$1 million additional earnings for every \$1 billion of sales. For the three retailers, total benefits are in

the range of \$500,000 additional earnings for every \$1 billion of sales. Given these proven benefits, the question relative to GDS is how to get started, not whether it is the right thing to do.

In recent years, many companies have cited confusion about the status and role of private exchanges as cause for deferring implementation of GDS. This can no longer be used as an excuse to delay action. After a lengthy transition period, Transora and WorldWide Retail Exchange (WWRE) have publicly committed to achieving interoperability by the end of 2003.

Rather than trying to be all things to all people, the exchanges now appear to recognize that it is in their collective interest to minimize overlap in their offerings. GlobalNetXchange, for example, elected to use Transora's synchronization engine instead of creating its own. In summary, the companies with the greatest experience implementing GDS offer the following advice:

- Recognize that GDS is a business issue, not an "IT project."
- Assign a dedicated champion (B2B leader) and secure executive-level sponsorship.
- Rigorously analyze process and systems change requirements in each functional area,
- Do not defer complexities as they arise.
- Do not underestimate the amount of internal work required (both data cleansing and process re-engineering).
- Define clear success metrics (financial and efficiency based).
- Leverage the expertise of UCCnet and experienced trading partners.
- Keep item master source data on your side of the firewall.
- Prioritize your rollout and start with key categories, trading partners.

III. ELECTRONIC PRODUCT CODE (EPC)

EPC Overview

The EPC developed out of research efforts at the Auto-ID Center as part of a migration path for companies to move from bar code identification to identification via RFID. Key attributes of the EPC are its ability to identify individual items through a serial number, and its ability to be read without line of sight. Current proposed EPC standards incorporate the Global Trade Item Number (GTIN®) family standards. The EPC is designed to be used at all levels of item groupings (i.e., pallet, case, item) and for all types of objects. The tag is "activated" by a reader that broadcasts radio waves and receives the transmitted EPC from the RFID tag. The reader then provides the code to connected computer systems, just as bar-code readers do today.

The general structure of the EPC consists of a fixed length header followed by a series of numbers whose structure and function are completely determined by the header value. The total length can be either 64 or 96 bits. The current EPC specification includes a generic Universal Identification number, as well as the capability for a set of Domain Identification codes that accommodate existing numbering systems. EPC Version 1.0 includes the Universal Identifier along with one Domain Identification type that encodes the EAN.UCC GTIN.

In addition to a header, Universal Identifiers are composed of three-bit partitions: the Domain Manager (e.g., manufacturer), the Object Class (e.g., type of product or SKU), and

the Serial Number. This code does not support the GTIN, but follows the initial format envisioned for the EPC.

The currently defined Domain Identifier encompassing the GTIN is composed of four-bit partitions following the header: the Object Type, a Company Prefix, an Item Reference, and the Serial Number. The 96-bit type also contains a fifth partition to establish the divide between a Company Prefix and Item Reference.

Along with the EPC, the Auto-ID Center has developed standards for an accompanying network, which will provide access to product information stored throughout the supply chain. The components of this network are Savant, Object Naming Service (ONS), and Physical Markup Language (PML). The Auto-ID Center has developed standards for each of these components, along with the tags and readers, and this work will be continued by the Auto-ID Labs. The various components of the complete EPC solution and their functions can be summarized as:

- **TAG** – Microchip containing the EPC
- **ANTENNA** – Provides for transmission, and possibly reception, of RF signals
- **READER** – Hardware device to receive code from the tag and activate passive tags
- **SAVANT** – Message handling and distribution
- **OBJECT NAMING SERVICE** – Directs requests to distributed servers
- **PHYSICAL MARKUP LANGUAGE** – eXtensible Markup Language (XML) standard for representing extended data

Value and Benefits of EPC

The underlying characteristics of EPC that bring the enormous potential benefit to supply chains are unique object tracking through embedded serial numbers and the capability to read without a line-of-sight requirement.

The value promised from EPC implementations evolves from these characteristics. The unique object tracking capability can be applied at the pallet, case, and item level — wherever a serial number is defined. This ability to track specific items or groups of items enables significant improvements in supply chain visibility and inventory management. The ability to read the tag in non-line-of-sight situations increases accuracy and decreases labor costs.

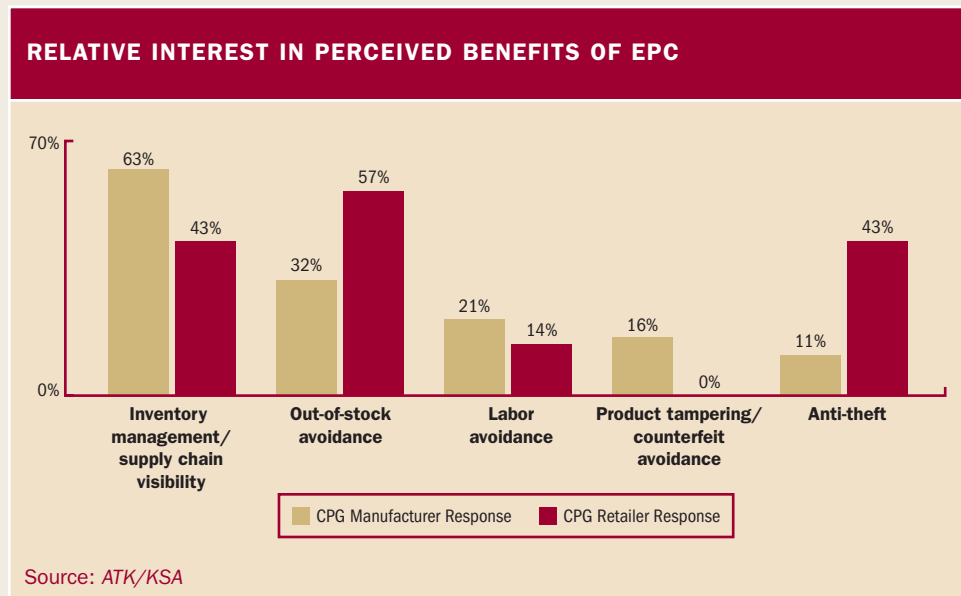
Implementation of RFID to track products throughout the supply chain will have enormous impact and benefits for all participants. Survey results indicated strong interest in improving inventory management, with the most cited change being improved supply chain visibility brought about by EPC. Almost two-thirds of surveyed manufacturers cited this as an expected benefit of EPC deployment.

The second leading benefit cited by CPG manufacturers was avoiding out-of-stock occurrence. Incidentally, this is the leading benefit cited by most retailers, and is largely a result of fractured supply chain visibility. Fortunately, EPC can address many of the supply chain issues that result in out-of-stocks, including:

- Ordering accuracy (correct item, size, color, etc.)
- Order picking and fulfillment accuracy

- Locating product in warehouse and backroom
- Shipment tracking
- Product diversion

Additional expected benefits of EPC within the supply chain included labor avoidance, detecting shrink, and avoiding counterfeit. The diagram below illustrates the relative indicated interest of manufacturers and retailers for each of these perceived benefits.



Receiving at the warehouse and store are very labor-intensive operations; a significant amount of effort is required to address problems resulting from inaccurate information. The improved accuracy of orders and order fulfillment brought about by GDS and EPC can redeploy labor currently required for activities such as:

- **RECEIVING** – reduction or removal of labor in counting received items, registering receipt of items
- **INVENTORY TRACKING** – reduction or removal of cycle counts
- **REPLENISHMENT DECISIONS** – automatically triggered replenishments, no manual intervention required
- **SHIPPING** – automatic registering of loaded items onto shipments
- **SECURITY TAG APPLICATION** – RFID tag (replacement of a barcode tag) on a garment could be dually used as a security tag in stores
- **RETURNS** – automatic determination of where an item was purchased
- **REFURBISHMENT** – reduction or removal of labor in determining the destination of refurbished items, as an RFID tag (unlike a paper barcode) can survive wet and other harsh conditions

In addition to the cross-supply-chain benefits of reducing out-of-stocks and labor, every participant in the supply chain will realize some value unique to their position in the chain.

Benefits for Manufacturers

- Asset location (equipment, transports, reusable containers, materials)
- Improved reading by automated routing equipment
- Minimized spoilage
- Product recall identification and management
- Counterfeit control
- Accurate product shipping

Benefits for Retailers

- Specific product location
- Accurate product receiving
- Eliminated “assumed receipt” practices
- Controlled theft (case and item)
- Freshness/perishability monitoring (item level)
- Reduced checkout labor (item level)
- Returns validation and processing (item level)

In-Store Benefits for Consumers

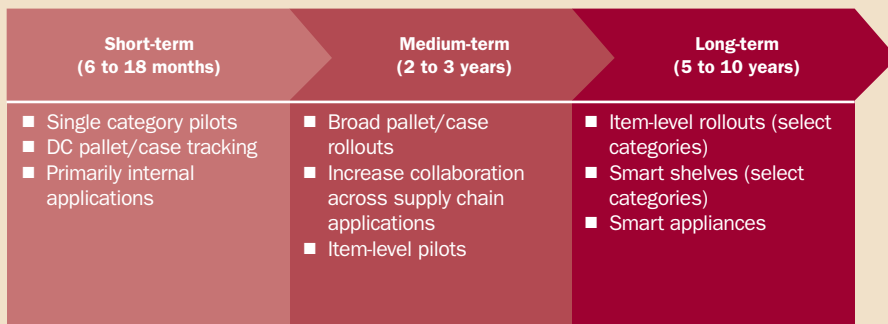
- Improved product availability
- Reduced checkout time (item level)

Projected Adoption Timelines

EPC applications will be implemented at different rates. The adoption timeline will consider many factors, including:

- Technology status, including readers and network components
- Item attributes, everything from cost to propensity for theft
- Packaging requirements
- Business model and cost structure
- Supply chain structure

TECHNOLOGY ADOPTION TIMELINE

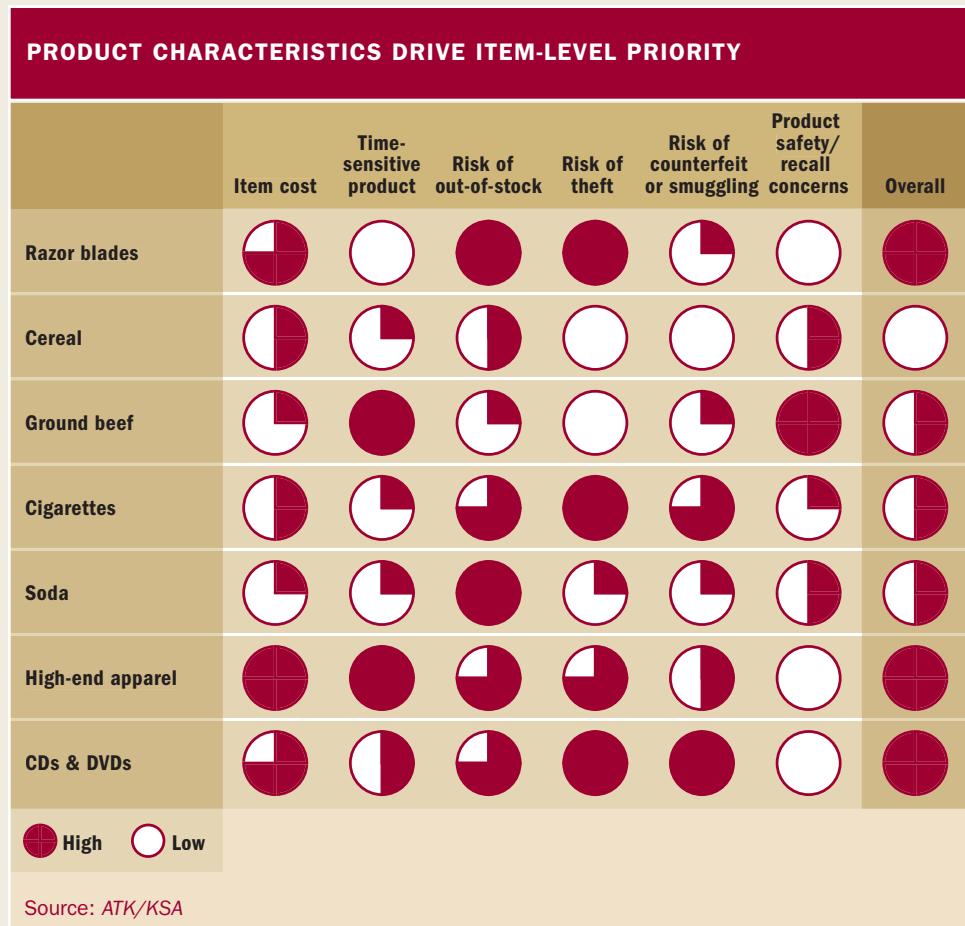


Source: ATK/KSA

These factors will impact specific company, and possibly specific product line, implementations. It is difficult to predict exactly how implementations will proceed. It is, however, generally accepted that the initial full-scale applications will occur at the pallet/case level. At this time, it appears that applications will be broadly rolled out over a significant time period ranging from six months to more than 10 years.

Even though it will be simpler to deploy applications internally or within closed-loop systems, such as reusable totes, standards should still be evaluated. Certainly some suppliers have justified deploying a system ahead of standards development; however, broad rollouts must consider evolving standards to avoid possible future incompatibilities or one-off applications. As the ability for trading partners to support and maintain one set of true data improves, the deployment of EPC across the supply chain will become more beneficial. The cost justification is more palatable when considering the full benefit and savings from EPC, which as shown, is only available with GDS implemented.

Through this study, suppliers and retailers provided thoughts on some of the characteristics that would drive item-level adoption of EPC. Overall, it was clear that every organization needs to evaluate its individual product lines and accompanying pain points to determine the correct strategy and timeline for item-level adoption.



EPC Challenges

As with any developing technology, EPC faces some initial challenges that must be addressed for successful global adoption. To ensure equipment and tag compatibility across the global supply chain, two areas require unified global standards: interface between tag and reader (air interface) and product identification data format.

Incompatible air interfaces are proposed by the International Organization for Standardization (ISO) and the Auto-ID Center. With EAN.UCC involvement in EPCglobal, we would expect to see a close working relationship between these two groups to resolve this issue. Hopefully, many of the corporate sponsors have learned the lesson of incompatible standards from the deployment of Electronic Article Surveillance (EAS) systems and will lead EPCglobal to support a compatible global standard. Developing air interface standards must incorporate and overcome the challenges of electromagnetic interference.

Product identification seems to be on track to incorporate one global standard. Current EPC standards endorse the existing GTIN family structure and are receiving broad acceptance in the industry. There is still work to be done to ensure the EPC product identifier is accepted globally; however, UCC is demonstrating a commitment to ensure this happens.

Another significant challenge for EPC is consumer privacy. Though privacy concerns were not a focus of this study, developments during the study illustrate the importance of the industry successfully addressing these concerns. Ignoring these concerns could prevent the industry from realizing significant expected benefits from EPC.

IV. CONNECTING THE DOTS: GDS AND EPC

As progress in EPC implementation proceeds, it is important to remember the foundation required to attain true EPC benefit: GDS. While RFID technology, coupled with EPC, can provide more detailed, accurate, and frequent data messages, these messages are not useful unless the data they transmit is correct. For example, a liter of cola making its way through the supply chain may generate many useful event messages along the way; but these messages won't help much if they are for a case of cola cans instead. In short, without clean, synchronized data, RFID and EPC technology will just enable faster transactions of the wrong information.

While it's true that there are certain scenarios in which actual data synchronization with trading partners is not required for EPC use (such as in-house manufacturing shipping to company-owned distribution and stores), the data cleansing activity that precedes data synchronization is universally required. Most surveyed companies noted that their own internal data cleansing was the most challenging effort associated with data synchronization. This was often due to the fact that companies themselves were not internally synchronized; their different departments or global regions had different product information or attributes. To attain the key benefits from RFID tags with EPC, information must be tracked throughout the supply chain, inter-departmentally, and throughout the world. To successfully use this information, the shared data must be compatible.

Because of the relatively high investment required for RFID and EPC deployment, the risks associated with going forward with RFID and EPC use without clean, synchronized data between trade points are high. Risks include:

- **LACK OF LABOR REDUCTION:** If human intervention is still required to validate EPC information, labor will not be reduced to an optimum level. In fact, labor requirements could even intensify to deal with the increased volume of incorrect data.
- **INCREASED DATA MAINTENANCE COSTS:** In the case that trading partners are attempting to use EPC information to track product without having synchronized their data, they may need to map different product information from one format to another to make use of the information.
- **INACCURATE REPLENISHMENT/NO REDUCTION OF OUT-OF-STOCK:** If supplier and retailer data is not synchronized, incorrect product may land on the shelf, or required replenishments may be missed, even when product is available in the backroom.
- **INACCURATE PRICING:** If a system identifies a product incorrectly, the wrong price could be associated with it. If this is not addressed, the product could be priced incorrectly on the shelf.
- **POTENTIAL FOR INCREASED TRANSACTION MANAGEMENT COSTS:** Inconsistent data formats traded between partners for EPC use may require increased handling in everyday communications, including purchase orders and receiving of goods.

The biggest risk in moving forward with an RFID/EPC implementation without data cleansing and synchronization is an inferior implementation.

The biggest risk in moving forward with an RFID/EPC implementation without data cleansing and synchronization is an inferior implementation. If the EPC implementation fails to yield the expected benefits, it may seem that EPC is either too hard to tackle or not worth the effort. Multiple implementations of this sort may give the industry a false impression that EPC implementation failures are due to EPC issues, rather than underlying data synchronization issues. The industry as a whole must ensure that, when dealing internally and with trading partners, data synchronization is on the agenda any time EPC is discussed.

Recommended Action Plans

Completing the rollout of GDS and preparing for EPC implementation requires attention and action across the industry, including suppliers, retailers, third-party service providers, standards bodies, industry associations, and solution providers. Though there is not one set of prescriptive actions that applies across industries, or even across companies with differing strategies within an industry, there are a few fundamental activities that organizations should be taking. This section presents the recommended action plans based on research results from leading companies and organizations. Since the action steps differ slightly by type of industry player, action plans are presented accordingly.

GDS ACTION PLAN

RETAILERS, MANUFACTURERS, WHOLESALERS, DISTRIBUTORS, THIRD-PARTY PROVIDERS

Action Step	Tasks
Evaluate and set timing for subscribing to UCCnet.	<ul style="list-style-type: none">■ Joining UCCnet is a key step in accomplishing GDS goals. You may be ready to join now, or you may need to align with a partner to assess the timing of the benefits of joining.
Evaluate master item data storage and plan architecture for the future.	<ul style="list-style-type: none">■ Determine how many different data stores contain item data. Determine the source for this information. If necessary, design a desired architecture with one “catalog” or data store feeding information to other systems. Develop the plan for implementing the required architecture and system changes.
Identify and prioritize categories for implementation.	<ul style="list-style-type: none">■ A typical GDS plan implements items incrementally across categories. Companies should evaluate the state of the internal data and possible required remediation. Additionally, this action may require coordination with key trading partners to determine highly desirable or required categories of items to implement first.
Determine and implement required data remediation.	<ul style="list-style-type: none">■ Even without synchronizing data with trading partners, companies reported extensive value and benefits internally from better structured and clean item data. This activity will impact timelines and the ability to implement GDS and it consistently requires more effort than is typically estimated.
Set outsourcing strategy and, if applicable, select partners — integration, data pool/catalog, messaging.	<ul style="list-style-type: none">■ Inherent in the GDS strategy must be an evaluation of options to build or buy the required functionality. This evaluation should include current GDS network and standards, as well as the direction of global standards and the roles envisioned for all industry components.
Adopt enhanced metrics for measuring GDS and include on corporate scorecard.	<ul style="list-style-type: none">■ Enhance metrics to include accountability questions such as:<ul style="list-style-type: none">– “What percent of my data is ready to be loaded to or from UCCnet?”– “What percent of my data is loaded into my data pool?”– “By supplier, what percent of the items carried are available through the registry?”– “What percent of my sales volume is based on synchronized item data?”

EPC ACTION PLAN

RETAILERS, MANUFACTURERS, WHOLESALERS, DISTRIBUTORS, THIRD-PARTY PROVIDERS

Action Step

Tasks

Form a cross-functional EPC core team.

- RFID technology and the EPC code will touch every aspect of the organization. Key contributors to the EPC implementation effort can include the following functional areas for reasons noted below.
 - **MANUFACTURING:** Tags will likely be applied during the manufacturing process. The tag application and cost must be incorporated into manufacturing operations. Additionally, the information initially stored in the RFID tag should be written according to the requirements of the rest of the value chain.
 - **TRANSPORTATION:** If the EPC is to provide better overall supply chain visibility, the transportation network will need to use tags correctly to update the supply chain monitoring system at critical points. Additionally, if transportation is to be held liable for any inaccurate shipments due to EPC information, it will need to understand how the tag information is used and how it affects the transportation network.
 - **DISTRIBUTION:** As benefits within the distribution network are key for most companies considering EPC use, distribution must be heavily involved in determining which applications of the EPC will be most beneficial, including which data carried in the EPC is most useful.
 - **PACKAGING:** Incorporating RFID tags into product packaging, at all levels, will be critical for companies deploying RFID/EPC.
 - **INFORMATION TECHNOLOGY:** RFID and EPC implementation requires systems development and support. Work will be required in areas such as database selection, capacity planning, interface creation, data summarization, and item data management tools.
 - **STORE OPERATIONS:** The EPC code can have a significant impact on store operations, from learning to use the system for accurate receiving, backroom storage, and shelf replenishment, to the eventual use of smart shelves for theft deterrence and no-scan checkout.
 - **MERCHANDISING:** It is crucial to determine where EPC tags will be applied to merchandise, which merchandise they will be applied to, and how the tags may be perceived by customers. Additionally, options for alternate uses for RFID tags, such as security sensors or temperature monitors, should be considered.
 - **SALES:** Sales personnel can be a source of great ideas for using the enhanced information available through EPC use. Additionally, suppliers in particular will benefit from sales personnel focusing on sales rather than addressing product identification and invoicing issues.
 - **HUMAN RESOURCES:** Two key components of realizing the full potential with this implementation are proper training and change management. HR should be involved early to communicate and understand the impact of these changes on corporate policy and regulations.

EPC ACTION PLAN (CONTINUED)

RETAILERS, MANUFACTURERS, WHOLESALERS, DISTRIBUTORS, THIRD-PARTY PROVIDERS

Action Step	Tasks
Identify internal pain points.	<ul style="list-style-type: none"> ■ To target the best value for EPC use, internal “pain points” in the value chain should be identified. A pain point can be an aspect of the value chain that has excessive labor cost, involves redundant processes, produces inaccurate results, or causes customer complaints. The EPC rollout should target areas in the value chain in which it will bring the most benefit to the company as a whole.
Assess attractiveness of EPC applications.	<ul style="list-style-type: none"> ■ The EPC can be used for many applications; which applications are most attractive depends on the company implementing the technology. For example, while individual item tagging may reduce shrink and enable better store replenishment, many companies’ item prices are too low to justify an incremental tag cost per item. For others, reduction of item theft may yield a significant payback. ■ Attractiveness of EPC applications will depend largely on the pain points identified in the previous step, as these points are where the biggest room for improvement lies. EPC application considerations should take into account cost effectiveness and payback, ease of implementation and use, and organization readiness.
Develop business cases and small pilots, including training commitments and expenditure budgets.	<ul style="list-style-type: none"> ■ EPC implementation will require different approaches depending on the company implementing and the application being used. There is no better approach than hands-on experience and training to prepare the organization for EPC use. By piloting EPC use throughout the organization, the company will learn where the biggest benefits lie, what preparations need to be made prior to rollout, obstacles, and realistic expectations. There is much to learn about EPC through case studies of other companies, but no experience comes close to a pilot in educating an organization. ■ Once pilots have been executed, the next step is to volume test the process. Case studies to date indicate that scaling a pilot process to high-volume use could require significant process adjustments.
Inventory and evaluate existing wireless systems for potential interference problems.	<ul style="list-style-type: none"> ■ RFID technology will require adjustment for use in your company’s environment. Other wireless systems and item compositions may affect the accuracy of EPC readings. ■ Determine existing limitations, which of those can be overcome, and what the performance expectations are for feasible use.
Join EPCglobal.	<ul style="list-style-type: none"> ■ EPCglobal is the home of standard-issued EPC codes. The EPC code is designed to ultimately be used to identify every product in every industry, and is purposely versatile in its use. Auto-ID Center members have been implementing EPC in field tests and in their own organizations, and they have wisdom to share. Common methods for overcoming obstacles, reducing implementation time and cost, and best practices and learnings can be found through the members of the Auto-ID Center and EPCglobal.

GDS ACTION PLAN
STANDARDS BODIES, INDUSTRY ASSOCIATIONS

Action Step	Tasks
Promote enhanced metrics.	<ul style="list-style-type: none"> ■ Industry associations can help work across company and industry boundaries to ensure member companies are on track for implementing GDS. Promotional activities such as surveys and studies should focus on the scorecard-type metrics proposed for industry participants.
Ensure “in process” standards are finalized and implemented (e.g., price/promotions, DSD, private label, and others).	<ul style="list-style-type: none"> ■ The industry’s ability and willingness to cooperate and work within global standards is impacted by the timeliness and applicability of those standards. Segments of the industry that will benefit from standards for extended attributes and other business models indicate a willingness to “get on board” once those standards are in place and tested.
Accelerate standards development for additional product areas not yet supported.	<ul style="list-style-type: none"> ■ Though it is recognized as a daunting task, standards must be developed to reach across all product segments offered by today’s retailers. Even a modern “grocery” store offers pharmaceuticals, greeting cards, magazines, videos, and music, all of which require extensions to current standards. A mass merchant is faced with even more unsupported product lines. Directions must be announced and activity clearly displayed to avoid retailer claims of unsupported product lines to justify their lack of participation in GDS initiatives.
Influence exchanges to embrace GDS vision.	<ul style="list-style-type: none"> ■ Industry exchanges currently cause some confusion in the marketplace with a wide array of product and service offerings. Additionally, their role in the GDS vision is not clear. Exchanges require a business plan to stay effective; standards must reflect the role of exchanges in the global vision.

EPC ACTION PLAN STANDARDS BODIES, INDUSTRY ASSOCIATIONS

Action Step	Tasks
Endorse EPC as the dominant global RFID standard.	<ul style="list-style-type: none"> ■ The EPC code has been tested by the Auto-ID Center extensively, and has been designed with a long-term versatility vision. To enable accelerated RFID adoption and avoid confusion between global trading partners, a single standard of product identification must be agreed upon. Additionally, accepting a single standard for RFID application will enable lower-cost RFID software and equipment due to volume benefits. Endorsing the EPC as the global RFID standard will ensure that RFID can be adopted at a faster, more accurate, and less costly pace. ■ The EPC can be endorsed as the accepted global standard through every press release and meeting in which RFID is mentioned. Additionally, the world can be influenced to use EPC standards if key companies agree to engage in pilots and RFID-based trade only with those embracing EPC.
Develop response to consumer privacy and safety concerns.	<ul style="list-style-type: none"> ■ To avoid a “stall” in RFID implementation progress in the CPG industry, consumer privacy issues must be addressed. The RFID consumer privacy topic has received significant press in recent months. To address consumer groups’ concerns, education must be provided. Functionality such as “tag-killing” exists to address consumer privacy issues and the realities around these processes must be communicated clearly. Additionally, it is important for consumer groups to understand what information is and is not contained within an EPC. ■ Communicating the eventual at-home benefits of the EPC to consumers will also help ease some concerns. As they gain a greater understanding of uses such as at-home-pantry inventory lists, item recalls, and smart appliances, consumers will view the EPC in a more positive light.
Aggressively promote concept of open standards.	<ul style="list-style-type: none"> ■ Standards bodies must develop and agree on global, open standards in two critical areas: air interface (frequency and communication protocol) and product identification.

GDS ACTION PLAN EXCHANGES, SOLUTION PROVIDERS

Action Step	Tasks
Ensure offerings are focused and easy to understand.	<ul style="list-style-type: none"> ■ GDS entities that bring solutions to the market must resist the temptation to “over complicate” while trying to gain competitive advantage. By simplifying service offerings and stating clear roles in the process, exchanges and solution providers can impact companies’ willingness to make timely decisions and move forward.
Embrace GDS vision with open, non-proprietary solutions.	<ul style="list-style-type: none"> ■ Certainly every business needs to differentiate to remain competitive; however, racing ahead or outside of standards is not in the industry’s best interest. Providers must consider the long-term fate of most companies that have attempted this strategy and remain committed to providing open solutions that adhere to and complement the GDS vision.
Focus on customer requirements and consumer benefits.	<ul style="list-style-type: none"> ■ Remaining focused on meeting customers’ expectations and eventual benefit for the consumer will enhance long-term viability and success.

EPC ACTION PLAN SOLUTION PROVIDERS

Action Step	Tasks
Accept GDS as a complement, not a competitive threat, to EPC solutions.	<ul style="list-style-type: none"> It is in solution providers' best interest that initial EPC implementations run as smoothly as possible and that their clients make significant strides in data synchronization with trading partners. Piloting EPC applications without internal and external data synchronization could mask underlying issues resulting from bad data transfer as a problem with EPC implementation. Inaccurate data will cause EPC implementations to be more costly, longer, and more stressful. A client that has invested in GDS will be a better candidate for EPC use, as the data it trades via EPC will be clean and standardized.
Embrace concept of open standards.	<ul style="list-style-type: none"> As standards are developed, solution providers must embrace and implement them, ensuring cross-solution compatibility.
Join EPCglobal.	<ul style="list-style-type: none"> Embracing EPC standards will enable solution providers to deliver higher-volume outputs of RFID equipment and software, thus lowering the cost of RFID implementation and increasing the pool of clientele that can afford RFID. Additionally, time that would have been spent customizing products to various non-EPC standards can be spent on value-added differentiation in supplier products. Auto-ID Center members have taken an industry-leading role in RFID deployment, are some of the most influential industry players, and are transitioning to support EPCglobal's goal of commercializing the center's technology. Their learnings, opinions, and desires for RFID use are communicated throughout the industry. It is to solution providers' benefit that they understand fully how their products can best meet these needs.

As the industry pushes forward with RFID, we must ensure the foundation for this collaborative technology is in place.

V. CONCLUSION

The ATK/KSA "Connect the Dots" study was conducted in March through June of 2003. When the study commenced, RFID was a topic discussed frequently at tradeshows and other industry events, riding high on the announcement that a major supplier had signed an agreement to purchase millions of tags. By the end of the study, newspapers and nightly news broadcasts were carrying the story that a major retailer had announced a requirement for RFID tag use by 2005, while canceling an item-level RFID pilot, and that another major retailer had opened a store outfitted with RFID technology. RFID awareness has certainly increased with mainstream consumers and industry participants. With this increased visibility, it becomes more critical that the industry prepare appropriately for the road ahead by anticipating speed bumps and dangerous curves now, as well as planning what entrance and exit ramps will be used.

One of the major findings of this study was that there is indeed a connection between GDS and EPC/RFID. Though some "closed-loop" applications can succeed without GDS, EPC technology is primarily about sharing more information more effectively and more economically. Data synchronization ensures that this information is accurate. In many ways, reading an EPC is quite different than scanning a barcode; however, if the data passed by either method is not found in the system or points to incorrect data, the efficiencies promised

by the technology will not be realized. As the industry pushes forward with RFID, we must ensure the foundation for this collaborative technology is in place.

GDS had made significant progress in the last 12 to 18 months. The considerable increase in companies embracing GDS and the increased focus and commitment to make this a global data standard are great strides forward for the industry. A substantial amount of work remains, however, to achieve full implementation. Solid evidence of tangible benefits of implementing GDS now exists for both retailers and suppliers. Membership counts are critical metrics, but companies must commit to using this foundational technology and implement the action steps derived from organizations succeeding in GDS as outlined in this report. Shifting focus from foundational GDS to EPC will negatively affect the expected results of electronic collaboration.

While data synchronization requires attention, it is not appropriate or wise to ignore EPC. Now is the time to establish an EPC strategy. Industry participants should have teams in place to evaluate EPC applications and benefits, determine pilot strategies, track the progress of related projects (e.g., GDS), and educate others in the organization. Having an EPC strategy now will greatly ease the burden of budgeting for future years, establishing both capital costs and operational efficiencies.

The industry continues to have an opportunity to implement the path to electronic collaboration and reap the benefits true collaboration can bring. The timeline for industry action presented here is representative of the industry as a whole. Some organizations will work ahead of this schedule as leaders, implementing and testing new technologies. Collaborative technologies such as GDS and EPC require the industry as a whole to move forward to realize the promised benefits — the network effect.

Organizations must be mindful of not lagging too far behind. As the gap widens, a company's ability to collaborate with trading partners will be negatively impacted. Competitive advantages, which can be gained through more effective inventory tracking throughout the supply chain and the ability to launch new products quickly, will be lost. Indeed, complete channels of business may be unavailable as GDS and EPC capabilities become a prerequisite for conducting business.

Collaborative technologies such as GDS and EPC require the industry as a whole to move forward to realize the promised benefits — the network effect.

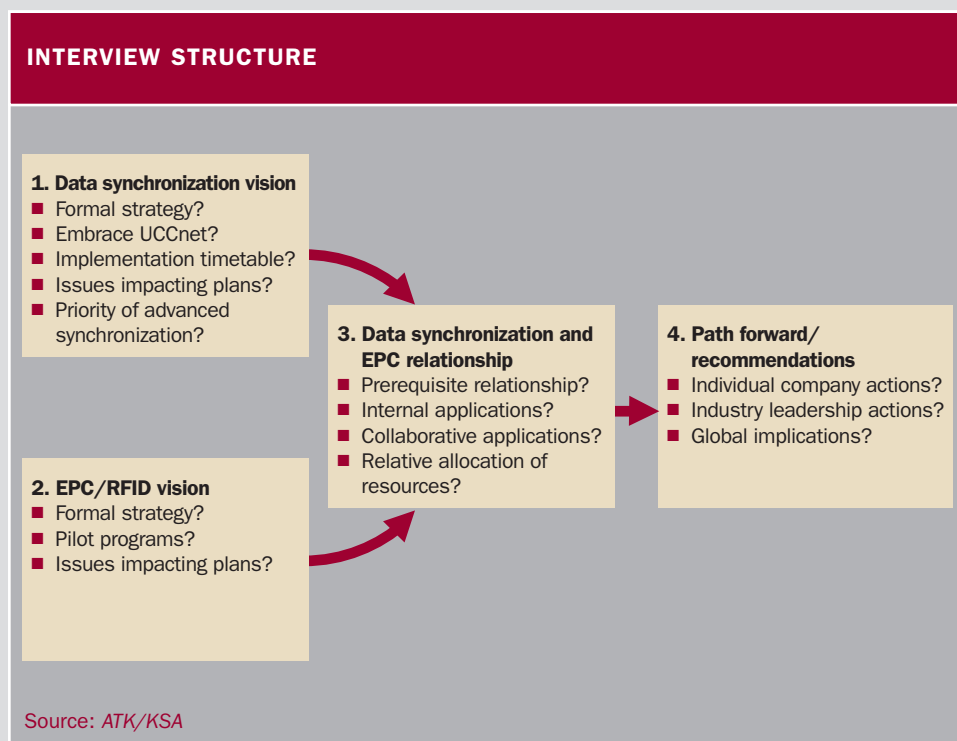
Appendix A: Summary of Interview Findings

INTRODUCTION

Obtaining industry executives' views was imperative to understanding the current industry perspective on data synchronization and RFID/EPC technology. To accomplish this goal, the ATK/KSA team conducted interviews with 127 executives at 80 organizations. The interviews focused on perceived benefits and barriers, timelines, and connections between the data synchronization and EPC initiatives.

Interviews were largely focused at the CEO, CIO, and senior vice president levels in the grocery industry to obtain a strategic perspective. Various types of organizations were represented, including manufacturers, retailers, knowledge partners, solution providers, and standards bodies.

Interviews were conducted in four parts and contained both open-ended and measurable questions. At times, interview focus was entirely on certain sections, depending on the relevance to the interviewees.



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I. DATA SYNCHRONIZATION VISION

The first agenda item during the interviews was to establish where data synchronization fit within the organizations' priorities.

■ FORMAL STRATEGY

- **MANUFACTURERS:** Most manufacturers interviewed were already engaged in data synchronization activities with at least some of their trading partners. Of those manufacturers not engaged in data synchronization activities, most had data synchronization in their plans for the next year. Manufacturers overall expressed that they saw the benefit for

basic item data synchronization within their own organizations. Whether or not advanced data synchronization (price, promotion, images) was in their plans was mixed.

- **RETAILERS:** Most CPG retailers interviewed recognized the need for data synchronization, however, most of them also expressed that the real value to them would only come with advanced data synchronization.

■ EMBRACE UCCNET

- Subscribing to UCCnet was, in general, viewed as a required step. There is some confusion surrounding the right time to sign up with regard to cost and realized benefits.
- Most interviewed endorsed using UCCnet standards, although many expressed frustration around functionality that is not yet complete, including DSD and global use.

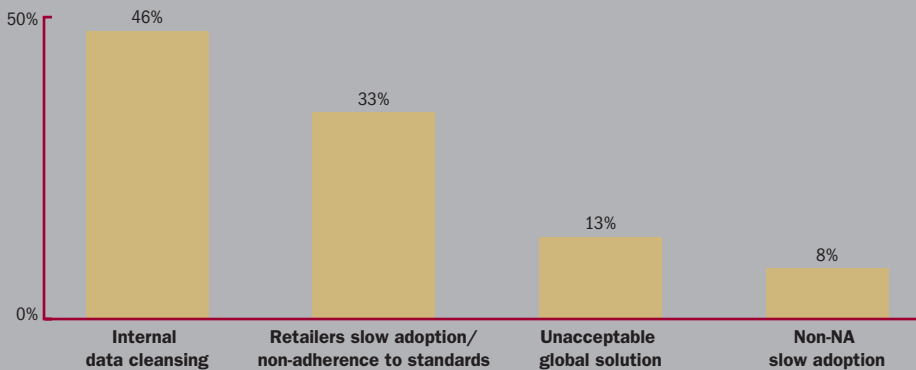
■ IMPLEMENTATION TIMETABLE

- Most CPG manufacturers and retailers interviewed were either currently engaged in data synchronization activities or planned to be by the end of the calendar year.

■ ISSUES IMPACTING PLANS

- **MANUFACTURERS:** The most commonly cited barrier to data synchronization by manufacturers was internal data cleansing (46%). However, they also noted that this was a beneficial activity for their internal operations. One-third of those interviewed considered retailers' slow adoption of data synchronization to be the biggest impediment to progress. The next most commonly cited issues were a currently unacceptable global solution for data synchronization, and an issue with non-North American adoption of data synchronization.

MAJOR BARRIERS TO DATA SYNCHRONIZATION ADOPTION CPG MANUFACTURERS RESPONSE, %

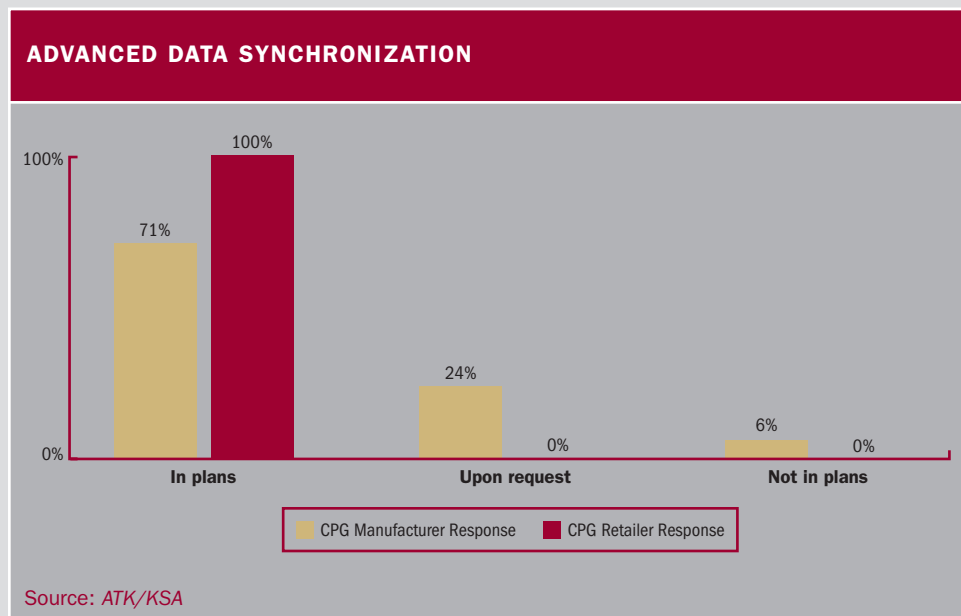


Source: ATK/KSA

- **RETAILERS:** Most retailers did not cite internal data cleansing as their main obstacle (only one of seven interviewed on the topic mentioned data cleansing); resource availability to work on the effort and internal priorities were cited more often than with manufacturers. However, most of the retailers interviewed did not cite obstacles to implementation as vehemently as the manufacturers did. This is possibly due to the fact that retailers, as a whole, began data synchronization adoption later than manufacturers did and therefore, obstacles to successful adoption are not yet clear.

■ **PRIORITY OF ADVANCED DATA SYNCHRONIZATION**

- **MANUFACTURERS:** Most manufacturers noted that this activity was beneficial to their internal operations and that the priority was to conduct internal data cleansing to implement data synchronization. Still, 30% of manufacturers indicated advanced data synchronization implementation was not specifically planned.
- **RETAILERS:** Most retailers cited that advanced data synchronization was required to get any significant benefit from data synchronization; all of them noted that advanced data synchronization was in their future plans. Price and promotion were the most often mentioned attributes with anticipated benefits.



II. **EPC/RFID VISION**

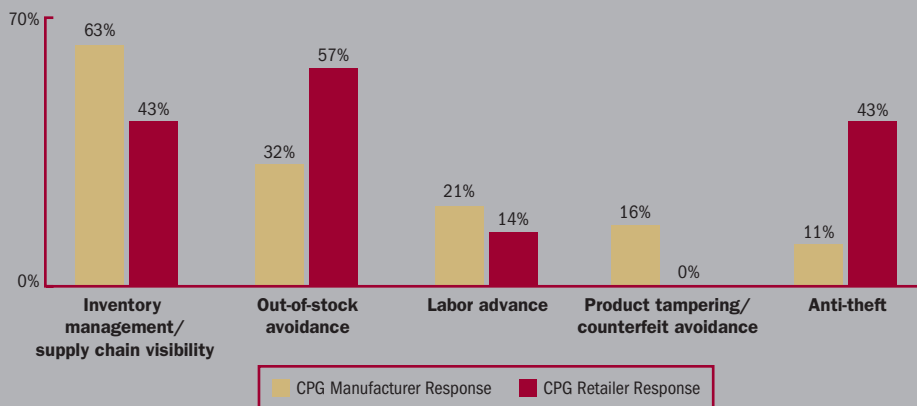
Once the organizations' positions on data synchronization were established, their positions on EPC/RFID technologies were determined.

■ **FORMAL STRATEGY**

- **MANUFACTURERS:** Most manufacturers interviewed were keeping an eye on RFID and EPC technology at the time. Most noted that, if required by trading partners, they would comply with EPC tagging. They also noted that they either had dedicated or would soon dedicate one or more resources to understanding the business case for RFID in the future, although most had not yet looked at the business case.
- Most manufacturers expected benefits of RFID to come from internal applications first. They anticipated beginning with tagging at the pallet and case levels; most did not expect to go to item-level tagging within the near future. This is likely due to the fact that, in the CPG industry, items do not tend to be high cost per unit. It is therefore harder to make the cost of RFID tags easily justifiable.

- **RETAILERS:** Most retailers interviewed were keeping an eye on RFID and EPC technology. Some retailers indicated that they intended to use tags on some level within the next 24 months. Top benefits expected from RFID included out-of-stock avoidance and anti-theft.

MOST-CITED PERCEIVED BENEFITS FROM RFID/EPC



Source: ATK/KSA

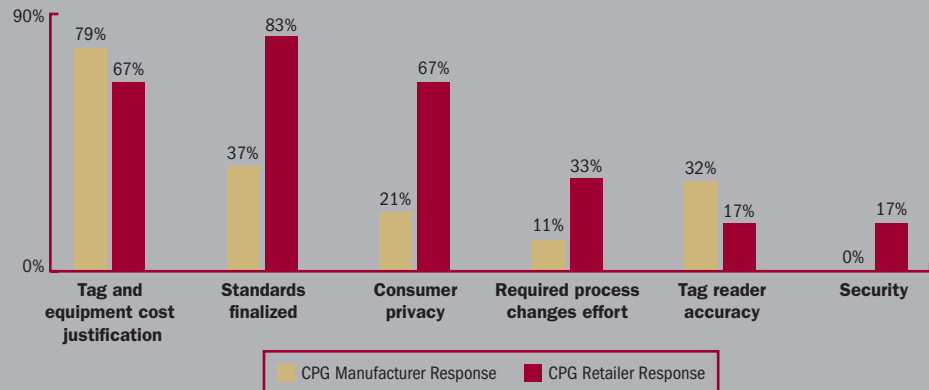
■ PILOT PROGRAMS

- Most pilot programs and field tests noted were occurring in conjunction with the Auto-ID Center.
- Most manufacturers were not involved in field tests or pilots; less than 20% of companies reported active involvement.

■ ISSUES IMPACTING PLANS

- **MANUFACTURERS:** Most manufacturers were concerned about the cost of implementing RFID and EPC technology. This was logical given that they were focused on item-level implementation. Considering the cost of most grocery goods could make item-level tagging costs prohibitive for many items at current tag rates. The second most mentioned concern was that global standards for RFID and EPC be agreed upon; this was viewed as a critical factor in enabling technology cost reductions.
- **RETAILERS:** RFID/EPC implementation cost was a major issue cited by retailers, as were concerns about global standards. Retailers were more sensitive to the consumer privacy issue than manufacturers were.

MAJOR BARRIERS EXPECTED TO RFID/EPC ADOPTION



Source: ATK/KSA

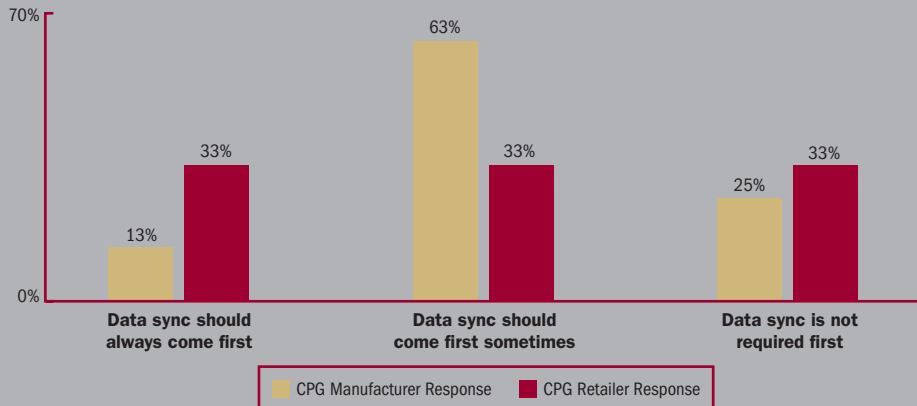
III. DATA SYNCHRONIZATION AND EPC RELATIONSHIP

Once the organizations' positions on data synchronization and EPC were determined, the perceived connection between the two technologies was explored.

■ PREREQUISITE RELATIONSHIP?

- When asked whether or not data synchronization was a prerequisite to RFID/EPC implementation, there was a mixed bag of answers. Those organizations only familiar with data synchronization or RFID tended to see the initiatives more separately than those that had a solid understanding of the benefits of both technologies. Additionally, there seemed to be confusion in the industry about what the potential issues were if RFID/EPC implementation proceeded without data synchronization. This was evident regardless of the organization's position on the connection between the two.
- Companies tended to understand that there were applications that could proceed with EPC without data synchronization; those internal applications could theoretically be implemented with some benefit and without syncing with trading partners. Concerns were expressed among retailers and manufacturers about collaborative benefits being realized due to the "trust" issue surrounding who actually maintains the Item Master data. If this hurdle could be overcome, collaborative EPC technology was generally seen as a potential benefit.
- Seventy-five percent of manufacturers indicated that data synchronization should come before EPC either some or all of the time, depending on the type of implementation. Only 25% of manufacturers did not see a connection between the sequence of implementation of data synchronization and EPC.
- Retailers were evenly split across the board: one-third thought data synchronization should always come before EPC, one-third thought it sometimes should, and one-third did not think it was necessary in any situation.

SHOULD DATA SYNCHRONIZATION COME BEFORE RFID/EPC IMPLEMENTATION?



Source: ATK/KSA

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IV. PATH FORWARD/RECOMMENDATIONS

To capture the industry leadership's thoughts on where the industry should be heading in the future, the last area of the interview explored executives' recommendations for the path forward. The questions were open-ended, and certain themes arose in the executives' feedback.

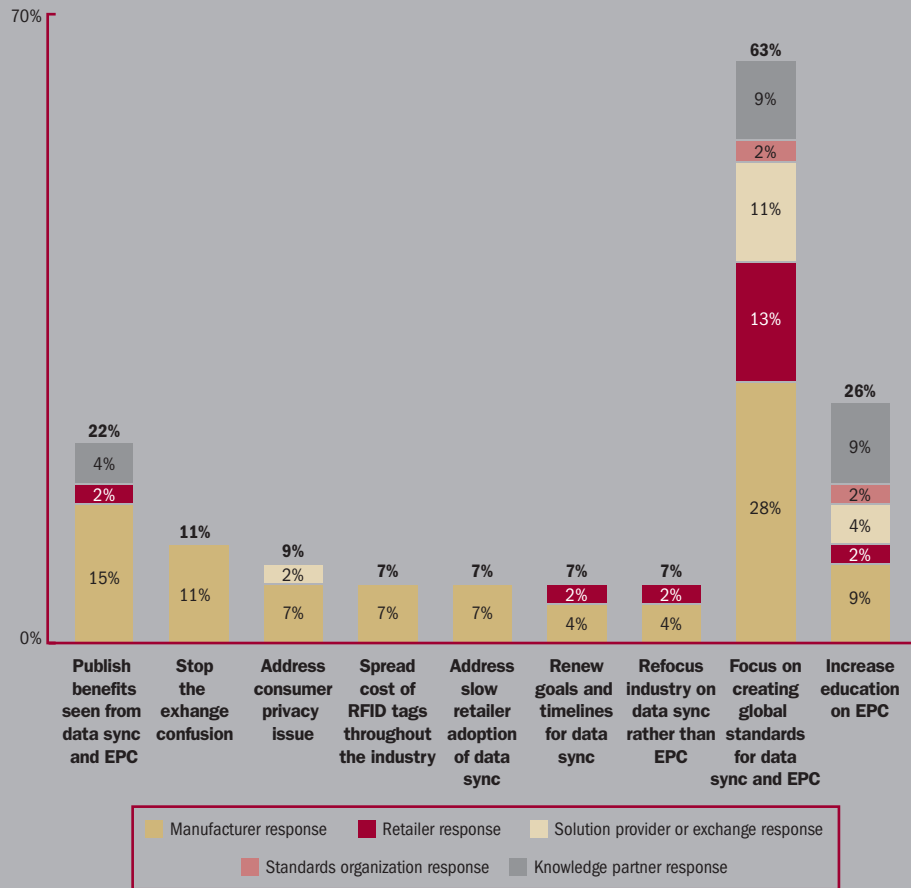
■ INDIVIDUAL COMPANY ACTIONS

- In general, solution providers recommended that companies sink their teeth further into data synchronization and RFID. This is also true for standards bodies and knowledge partners. Recommendations from manufacturers and retailers tended to be the same. In general, the overall industry perspective is "get involved — if you are involved, get more involved."

■ INDUSTRY LEADERSHIP ACTIONS

- The most mentioned recommended industry action by far was to focus on global standards for both RFID and data synchronization (63% of those polled). The second most commonly mentioned needs were increasing industry education on EPC (26%) and making public the benefits seen from data synchronization and EPC/RFID (22%).
- Other commonly mentioned requests (less than 10%) were to "stop the exchange confusion" with data synchronization, address consumer privacy issues, determine how RFID tag cost will be spread across the industry, address the slow retailer adoption of data synchronization, renew the goals and timeline for data synchronization, and re-focus the industry on data synchronization as opposed to EPC.

PATH FORWARD: INDUSTRY RECOMMENDATIONS



Source: ATK/KSA

■ GLOBAL IMPLICATIONS

- Fifty-four percent of those interviewed on the subject commented that global standards for both data synchronization and RFID should be an industry priority going forward.
- Consistently, concerns were raised that the industry talked about this initiative being global, but that little was really being done to implement that vision.
- One-hundred percent of those companies with international experience noted the confusion and concern surrounding roles and compatibility among various solution providers (e.g., catalog providers).

Appendix B: Interview Questionnaire

EXECUTIVE INTERVIEW GUIDE: INDUSTRY PARTICIPANTS

Thank you for agreeing to participate in this study.

The GMA's Industry Affairs Council (IAC) has tasked A.T. Kearney (ATK) and Kurt Salmon Associates (KSA) with exploring the state of industry progress with data synchronization and Electronic Product Code (EPC)/Radio Frequency Identification (RFID) technology with an eye to understanding:

- The status of the industry in adopting and implementing global standards and protocols around data synchronization.
- The status of the industry in preparing to leverage emerging EPC/RFID technologies across supply chain operations.
- The need for a strong foundation of data synchronization as a prerequisite for maximizing the benefit of EPC/RFID.

WHAT IS EPC? Electronic Product Code is part of a system being developed and tested through the MIT Auto-ID Center using RFID to identify items. Typically, a RFID reader communicates with a tag (affixed to a product) which holds digital information in a microchip. These tags would supplement or replace barcode labels on products and transmit unique product information, such as the EPC. Unlike barcode readers, an RFID reader does not require "line-of-sight" access. The EPC system being developed by MIT Auto-ID Center is viewed as an emerging technology which is expected by many to significantly improve supply chain visibility and efficiency, among other benefits.

We are interested in hearing firsthand about your experiences to date, benefits that have been identified, and impediments that have emerged as your company has begun exploring both initiatives.

We will be speaking to a broad group of manufacturers, retailers, Internet exchanges, industry associations, standards bodies, vendors, and knowledge partners, and will be reporting our findings at GMA's Executive Conference at the Greenbrier in June.

This interview includes four parts:

- I. Your vision and experience with data synchronization
- II. Your vision and experience with EPC/(RFID)
- III. Your views on the relationship between data synchronization and EPC/RFID, including the business case for investment
- IV. Your thoughts on how the industry should be moving forward in the implementation of both initiatives

The questions contained in this document are intended as thought starters, which will be used as the basis for a 60-minute telephonic interview facilitated by the ATK/KSA team. They are provided to allow you to prepare thoughts in advance of the call.

PART I: DATA SYNCHRONIZATION

1. Has your company **RECOGNIZED THE NEED** to synchronize data with your trading partners?
 - If so, what is your company's strategy for standardizing the exchange of data with your trading partners?

- Have you planned (or do you plan) to embrace UCCnet as the standard for registering of catalog data?
 - If not, do you plan to use a different system? (please specify)
2. What data synchronization activities have you completed?
 - Have you subscribed to UCCnet?
 - Have begun registering data on the registry? If so, what percent of SKUs (manufacturers only)?
 - Have you begun synchronizing data with trading partners? If so, what percent? What is your **TIMETABLE** for completing the remaining steps?
 3. What internal and/or external **ISSUES** are impacting your ability to realize your plans for data synchronization?
 4. Do you have plans for synchronization **BEYOND BASIC ITEM DATA** (e.g., images, price, regulatory)? Do you view these activities as taking a higher priority than exploring EPC/RFID technologies?

PART II: EPC/RFID

5. What have you heard about RFID and EPC technologies? What is your understanding of the application of these technologies in the consumer goods and retail industries?
6. Has your company started **ACTIVELY PLANNING** for integration of EPC/RFID technology in your organization? Which EPC/RFID applications do you see as the **PRIORITIES** for your company in the short term? Long term?
 - Supply chain visibility, tracking, and control
 - Distribution center operations
 - Diversion/theft control
 - Store-level replenishment
 - Consumer and supply chain payment
 - Store-level promotions and pricing
 - Product quality — aging, recall
 - Consumer information and appliance applications

If you have active plans for implementing EPC/RFID applications, what is your projected timeline for completing the following activities?

 - Planning, evaluating, investigating business opportunities
 - Piloting (if so, with whom?)
 - Rolling out to broader part of your organization
7. What internal or industry-wide issues are impeding the broad application of EPC/RFID?
 - Physics/technology
 - Standards
 - Proven value proposition
 - Regulatory
 - Cost/compatibility with existing systems
 - Processes/labor changes
 - Mandates from key trading partners
 - Other?

PART III: RELATIONSHIP BETWEEN DATA SYNCHRONIZATION AND EPC/RFID

8. Do you view data synchronization as a **NECESSARY PRECURSOR** to EPC/RFID adoption? Please explain.
9. Can you think of any internal (as opposed to collaborative) EPC/RFID applications within your company that could **SUCCEED WITHOUT DATA SYNCHRONIZATION?**
10. What benefits do you expect from **INTERNAL APPLICATIONS** (non-collaborative) of EPC/RFID?
 - Have you developed formal business cases?
 - Have you performed pilots? If so, what were the results?
11. What benefits do you expect from **COLLABORATIVE APPLICATIONS** of EPC/RFID requiring data synchronization?
 - Have you developed formal business cases?
 - Have you performed pilots? If so, what were the results?
12. What are your plans for the **RELATIVE ALLOCATION OF RESOURCES** to the implementation of data synchronization, EPC/RFID, and other initiatives over the next three years?

PART IV: PATH FORWARD/RECOMMENDATIONS

13. What do you think needs to be done at the individual company level to gain the maximum benefit from both data synchronization and EPC/RFID?
14. What would you recommend industry leadership do to ensure the greatest benefit is realized from both initiatives?
 - Supporting technology development
 - Establishing clear governance structures
 - Establishing common standards
 - Demonstrating proof of concept/business case
15. From an organizational perspective, which entities do you believe should lead and/or participate in these initiatives going forward?
 - Standards bodies
 - Technology developers
 - Industry associations
 - Exchanges
16. How important is it to include global organizations in developing the solution at an early stage?

Appendix C: Glossary of Terms

TERM	DEFINITION
Country Catalog	GTIN and/or GLN catalog administered by an EAN Member Organization. Commonly referred to as Country Data Pools.
Country Data Pools	See Country Catalog.
EAN	See EAN International.
EAN Code	See European Article Number.
EAN International	EAN International, based in Brussels, Belgium, is an organization of EAN Member Organizations that jointly manages the EAN.UCC System with the UCC, including administering bar code standards in many parts of the world.
ECCnet	ECCnet is a not-for-profit subsidiary service of the Electronic Commerce Council of Canada providing a secure, online, single source of Master Data product information that provides standardized item data continuously synchronized with trading partners. The Electronic Commerce Council of Canada (ECCC) is a member-based, not-for-profit organization that facilitates electronic commerce initiatives and processes through the development of globally aligned, nonproprietary standards that increase the competitiveness of Canadian member companies at home and around the world.
Electronic Product Code (EPC)	The Auto-ID Center's coding scheme that will identify an item's manufacturer, product category, and unique serial number.
European Article Number	An eight- or 13-digit code originally used by companies outside North America to uniquely identify themselves and their products worldwide. See EAN/UCC-8 and EAN/UCC-13.
eXtensible Markup Language (XML)	XML is a markup language for defining, validating, and sharing documents containing structured information. XML provides a file format for representing data, a schema for distinguishing and describing data structures, and a mechanism for extending and annotating HTML. Unlike HTML, with XML, tags can be designed for specific purposes. (XML is the standards format that will be used in exchanging information to and from UCCnet. Since XML is a critical and fundamental aspect of UCCnet, trading partners should begin to become familiar with XML early in the UCCnet implementation process.)
GLN	Shorthand term for the EAN.UCC Global Location Number using the EAN/UCC-13 Data Structure to identify physical, functional, or legal entities. See Global Location Number.

TERM	DEFINITION
Global Location Number (GLN)	A 13-digit data structure to identify physical, functional, or legal entities. The Global Location Number uniquely identifies each location in a Trading Partner's Enterprise. Supply-Side trading partner locations generally include corporate HQ, regional offices, warehouses, plants and distribution centers. demand-side (retail) trading partner locations generally include corporate HQ, divisional offices, stores, and distribution centers.
Global Trade Item Number (GTIN)	An umbrella term used to describe the entire family of EAN/UCC data structures for trade items (products and services) identification. The family of data structures include: EAN/UCC-8, UCC-12, EAN/UCC-13, and EAN/UCC-14. Products at every level of product configuration (consumer selling unit, case level, inner pack level, pallet, shipper, etc.) require a unique GTIN. In addition to manufacturer and product category, GTIN also includes shipping, weight, and other information. The EPC is designed to provide continuity with GTIN. GTIN is a new term, not a standards change.
GTIN	Shorthand term for the EAN.UCC Global Trade Item Number. A GTIN may use the EAN/UCC-8, UCC-12, EAN/UCC-13, or EAN/UCC-14 Data Structure. See Global Trade Item Number.
Line-of-sight technology	Technology that requires an item to be "seen" to be automatically identified by a machine. Barcodes and optical character recognition are two line-of-sight technologies.
Object Name Service (ONS)	An Auto-ID Center designed system for looking up unique Electronic Product Codes and pointing computers to information about the item associated with the code. ONS is similar to the Domain Name System, which points computers to sites on the Internet.
Physical Markup Language (PML)	An Auto-ID Center designed method of describing products in a way computers can understand. PML is based on the widely accepted eXtensible Markup Language used to share data over the Internet in a format all computers can use.
PML Server	A dedicated computer that will respond to requests for Physical Markup Language (PML) files related to individual Electronic Product Codes. The manufacturer of the item may maintain the PML files and server.
Radio Frequency Identification (RFID)	A method of identifying unique items using radio waves. The big advantage over barcode technology is that lasers must see a barcode to read it. Radio waves do not require line of sight and can pass through materials such as cardboard and plastic.
Savant	Distributed network software that manages and moves data related to Electronic Product Codes.

TERM	DEFINITION
UCCnet	UCCnet is a universal foundation for industry standards-based electronic commerce. It provides foundational product registry services, enabling the synchronization of item and location information among trading partners, trade exchanges, solution partners, and national data pools. In addition, UCCnet facilitates interoperability among these groups by providing companies visibility to a wide range of information and resources. UCCnet leverages the legacy of the Uniform Code Council (UCC), an organization that establishes and promotes global standards for product identification and related electronic communications. From trading partners to solution providers and business-to-business Internet marketplaces, users are able to form collaborative trading relationships based on industry standards and synchronized compliant data through UCCnet.
Uniform Code Council (UCC)	The nonprofit organization that oversees the Uniform Product Code, the barcode standard used in North America.
Uniform Code Council, Inc. (UCC)	The Uniform Code Council (UCC), based in the United States, is a membership organization that jointly manages the EAN.UCC System with EAN International. The UCC administers the EAN.UCC System, including the Uniform Product Code (UPC), in the United States and Canada.
Universal Product Code (UPC)	The barcode standard used in North America, administered by the Uniform Code Council.
XML	See eXtensible Markup Language.

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