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AUTO-ID CENTER

IBM BUSINESS CONSULTING SERVICES

Applying Auto-ID to Reduce Losses Associated with Shrink

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ABSTRACT

Imagine an environment where your product is on the store shelf each and every time consumers reach for it. Imagine an environment where perishables don't perish, where theft is fully detectable, where your systems exactly match physical inventory counts, and where transfers with trading partners are automated and precise. Imagine product visibility, transparency and a supply chain built on real time demand and supply information – imagine the impact on your inventory and working capital. Image the impact of the barcode some 25 years ago. Now imagine the impact of Auto-ID.

Auto-ID represents a truly transformational technology with the ability to revolutionize the face of the supply chain, retail operations and consumer-facing processes. It has the potential to drive enormous shareholder return benefits across a breadth of key metrics including revenue growth, operating margin, working capital and capital expenditures. Just imagine the possibilities…

IBM Business Consulting Services, in conjunction with the Auto-ID Center, has worked with over 25 leading players in the consumer goods and retail sectors to develop a series of white papers around this exciting and emerging technology. Our research is based on current leading practices, making the value proposition all the more compelling. IBM Business Consulting Services has now published four Auto-ID White papers.

June 2002
- Applying Auto-ID within the Distribution Center; and
- Applying Auto-ID to Improve Availability at the Retail Shelf.

November 2002
- Applying Auto-ID to Reduce Losses Associated with Shrink; and
- Applying Auto-ID to Reduce Losses Associated with Product Obsolescence.

We encourage you to read our Auto-ID Prelude prior to diving into our series of white papers. The Prelude provides a compelling business case discussion for the adoption of the Auto-ID system across the consumer goods and retail value chain. The Prelude addresses important issues around adoption and migration paths. The individual white papers illustrate the impact of the Auto-ID system on specific pain points faced by companies today. We are confident that you will be excited about this development and urge you to consider the transformational opportunities of Auto-ID in your own organization, as well as with your trading partners.

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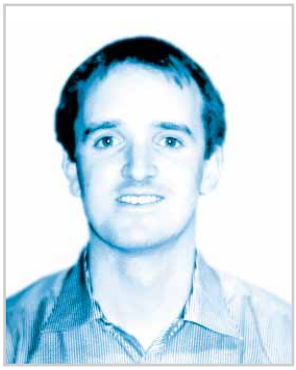
Biographies



Keith Alexander
Consultant

Keith Alexander, Consultant, IBM Business Consulting Services has over 6 years of international consulting experience in North America, South America and Europe. Keith works with clients in assessing the impact of supply chain technologies on business operations and shareholder value. He has worked for clients in the Consumer & Industrial Products and Utilities Industries. His key areas of focus include: supply chain strategy, emerging technologies, corporate strategy and performance improvement. Keith received a B.Sc. in Management from Aston Business School (UK), and an M.A. in Organizational Theory from Keele University (UK).

Tig Gilliam
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Kathryn Gramling, Consultant, IBM Business Consulting Services has over 14 years of experience and specializes in retail and consumer packaged goods marketing strategies, including B2B strategies, B2C marketing mix, consumer trends research, global retail trends analysis, and eRetailing. Most recently Kathryn has played a leadership in the Collaborative Value Chain practice helping clients with their B2B strategy and eMarkets participation go-to-market approach. She earned a Bachelor of Arts degree in Government from the College of William and Mary and a Master of Business Administration degree, with a concentration in International Marketing, from The American Graduate School of International Management, Thunderbird.

IBM BUSINESS CONSULTING SERVICES

Applying Auto-ID to Reduce Losses Associated with Shrink

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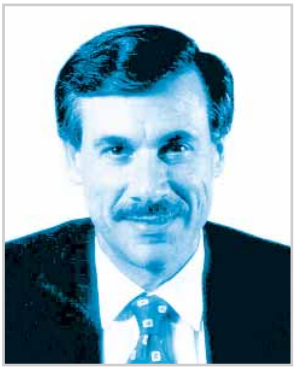
Chris Grubelic, Consultant, IBM Business Consulting Services brings over 10 years of business experience including strategy assessment, finance and marketing activities targeted at increasing shareholder value. Chris has worked with clients in Consumer & Industrial Products and Telecommunications Industries. His key areas of focus include business case development, benefits realization and shareholder value realization. Chris received a B.S. in Economics from University of Zagreb, Croatia, and a MBA in Strategy from the University of Chicago.



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Herb Kleinberger, Consultant, IBM Business Consulting Services has over 18 years of experience in process and technology strategy consulting. Specializing in retail business process improvement, Herb works with clients to evaluate and transform their operations to improve customer service and profitability – focusing on supply chain management, performance measurement merchandise planning and distribution and the buying process in retail companies. Herb earned B.A. in Computer Science from the State University of New York, and a MBA from the Wharton School.

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Stephen Leng, Consultant, IBM Business Consulting Services has spent 20 years working in the Retail Industry, both in Europe and the Americas. He has held senior positions with a leading UK retailer in both supply and demand chain management, and for the last five years has led a number of retail projects in operational and corporate strategy, process improvement and systems implementation. Stephen has an MBA in Strategy, a postgraduate diploma in Marketing and a Dual Honors degree in Philosophy and Politics.

IBM BUSINESS CONSULTING SERVICES

Applying Auto-ID to Reduce Losses Associated with Shrink

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Chris Sheedy
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Chris Sheedy, Consultant, IBM Business Consulting Services has over 12 years of experience focusing primarily on the application of technology to improve business processes. Chris has worked primarily with clients in the consumer packaged goods and high tech industries. Chris received a B.S. in Business Logistics from Penn State University and an MBA in Management & Strategy and Information Management from The Kellogg School of Management at Northwestern University.

IBM BUSINESS CONSULTING SERVICES

Applying Auto-ID to Reduce Losses Associated with Shrink

Contents

AUTO-ID PRELUDE

Auto-ID: Raising the Bar (code)

Sell one, replenish one, sell one, replenish one…

Or better yet, sell one, make one. That is the ideal value chain vision: synchronize activities across the chain from point-of-purchase all the way back through raw material delivery and, in doing so, achieve a perfect demand driven and networked economy.

How can we achieve this vision? It starts with synchronizing trading partner operations, aligning goals and demand signals, and creating a truly intelligent value chain where information visibility is achieved through common accepted standards.

Enter Auto-ID: a collaborative effort, driven by some of the world's leading consumer goods and retail companies, academic institutions, systems integrators and technology hardware providers, to create a unified product identification and tracking system that will benefit and, indeed, transform the entire value chain just as the Universal Product Code (UPC) bar code did 25 years ago.

The vision provides consumer goods and retail companies with the opportunity to transform their supply chain and consumer facing activities and, in so doing, reach the next level of commercial performance and shareholder value.

The vision is clear. But questions remain, including "How will Auto-ID enable the components of this vision? … What form will it take? … What is the value proposition? … When might this happen?"

IBM Business Consulting Services has been working closely with the Auto-ID Center to study what the adoption of Auto-ID technology will look like. Based on our analysis, we believe that the adoption of Auto-ID is close at hand and that the business case behind it is exciting and compelling. Our findings and recommendations are based on extensive research including interviews and workshops with more than 25 major industry participants.

In the course of our research, IBM Business Consulting Services has driven the business case for commercial adoption of Auto-ID to a new level by analyzing value-chain-wide costs and benefits at the pallet-level, case-level and item-level. Our "base case" research is based on the Auto-ID Center's current tag cost assumptions, and a fully compliant network using the Auto-ID Center's recommendations around the Electronic Product Code (EPC)™, Object Naming Service (ONS) and Physical Mark-up Language (PML). Our analysis articulates how adoption curves differ significantly by product categories, and that the business case for low priced items, such as a can of soup, is very different than that of higher priced items, such as consumer electronics.

IBM Business Consulting Services generic value chain model includes seven product categories: **1. Apparel; 2. Grocery; 3. Consumer Electronics; 4. Health & Beauty; 5. Music & Video; 6. Pharmacy; and 7. Toys.** Items are then sold through a Supercenter retailer.

Our price points within these seven product categories carry the range from $1.75 for the average grocery shopping basket item, to $130.00 for the average consumer electronics item. Our strategic conclusion from this analysis is clear:

IBM Business Consulting Services business case analysis suggests a compelling near term business case for pallet and case-level adoption for most product categories, and item level adoption for higher value product categories.

Moreover, our analysis is based on research that included work sessions with a large number of the world's leading manufacturing and retail companies for the different product categories. In this context, a compelling value proposition is all the more credible.

In the subsequent sections of the Auto-ID Prelude, we will introduce:

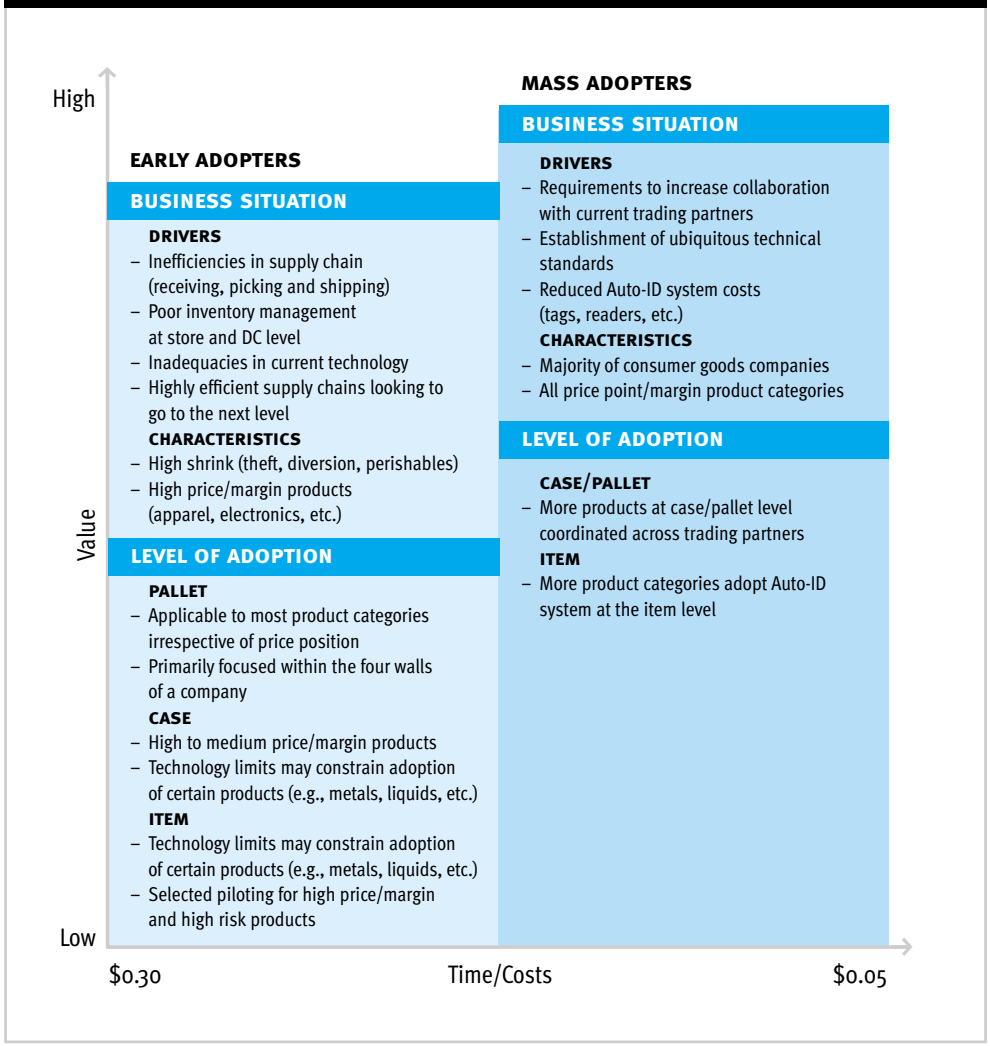
- **IBM Business Consulting Services proposed adoption path for Auto-ID technology**
- **The Business Case for Auto-ID**
- **The IBM Business Consulting Services Auto-ID White Paper Series**

The Auto-ID Adoption Path

Tag costs constitute the majority of the Auto-ID system implementation costs, and therefore are the dominant variable when reviewing business cases for adoption. Price points, product characteristics, current business performance, current infrastructure and physical attributes of products all are contributing factors to determining the time and scope of adoption. See Figure 1.

Figure 1

A PROPOSED AUTO-ID ADOPTION PATH



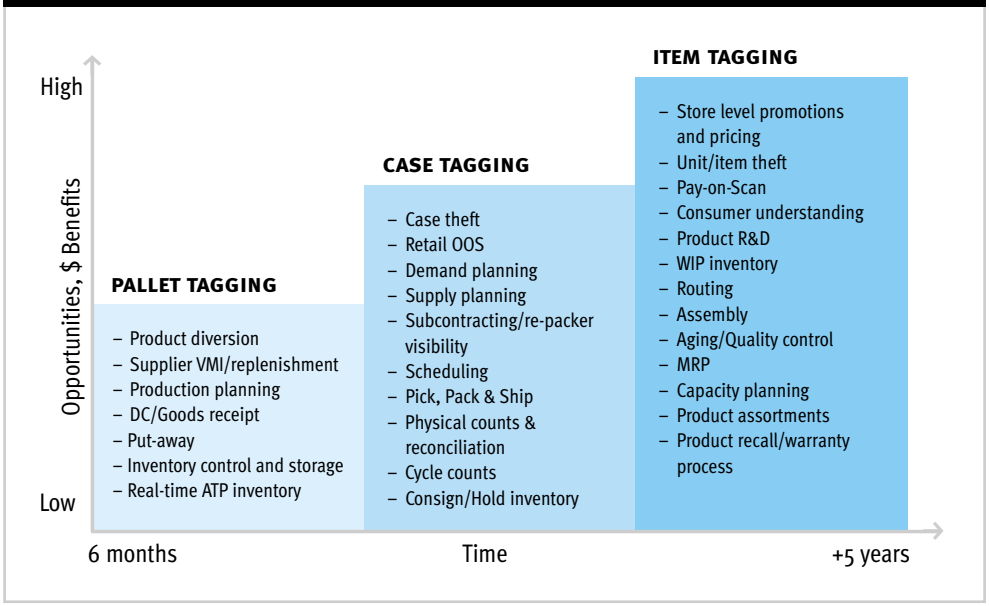
We have identified key company drivers and characteristics that lend themselves to various adoption strategies. In general, early adopters will tend to be those that can improve supply chain efficiency and inventory management by implementing Auto-ID at the pallet and case level within the four walls of their organization. Mass adoption will be driven by reducing tag costs, adoption of ubiquitous technology standards, and by an environment that fosters collaboration and information sharing.

For some companies, existing supply chain inefficiencies may lead to early item-level adoption by piloting certain high-margin and high-risk products. On the other hand, some companies will wait for the establishment of a ubiquitous technical standard and lower technology costs before choosing to adopt the Auto-ID system.

The benefits of the Auto-ID system will increase significantly as companies transition from pallet, to case, to item-level tagging, and increase the degree of collaboration and sharing with trading partners. Figure 2 introduces the associated opportunities and relative benefits realized across the value chain by moving towards a more granular level of tagging.

Figure 2

BENEFITS ACCRUED AT DIFFERENT LEVELS OF TAGGING

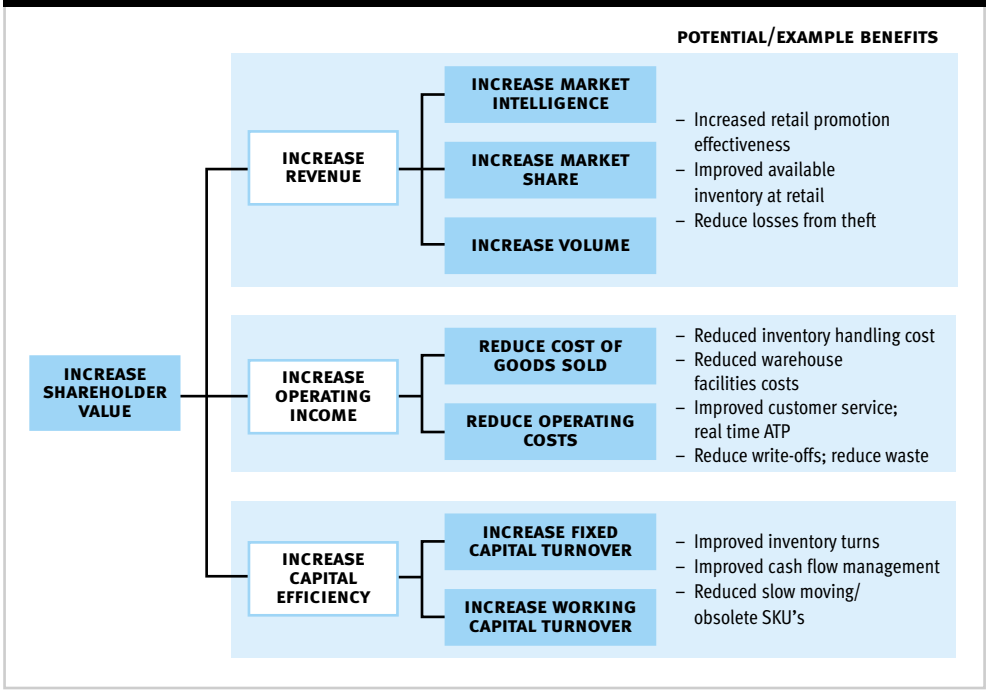


The Business Case for Auto-ID

The Auto-ID system is transformational to industries and key participants and can drive people, process and technological improvements that will positively impact overall shareholder value. The Auto-ID system can have tangible impacts on key shareholder value levers as shown in Figure 3.

Figure 3

THE IMPACT OF AUTO-ID ON SHAREHOLDER VALUE



In developing our business case for the Auto-ID system, we have utilized a four-phased framework. This framework leverages our experiences in developing emerging technology business cases for clients in the consumer goods and retail industries. The Four-Phased Framework is as follows:

Phase 1: Define Objectives
Overall objectives for Auto-ID were defined and categorized. During this phase, we identified the existing "pain points" in the value chain and their impact on both financial and non-financial measures.

Phase 2: Develop Preliminary Model
In order to develop a point of view around the feasibility of an Auto-ID business case, a hypothetical manufacturer-retailer system was set up to reflect the various flows of products in the different categories from manufacturer through to the consumer (at point of sale). Industry benchmarks, IBM Business Consulting Services surveys such as the Industry Week-Census of Manufacturers Survey, interviews with participant companies, IBM Business Consulting Services experience and insight, and other published information were used to arrive at the characteristics of the hypothetical system, which included manufacturer plants, manufacturer DC's, retailer DC's and retailer stores.

This type of system allowed us to identify and quantify the impact of various Auto-ID benefit areas and to understand the impact of Auto-ID on the system as a whole for the different product categories. At the same time, this analysis methodology allowed us to protect individual data provided by participant companies. Our model does not represent any particular company or companies. Instead, it represents scenarios that most readers will find relevant, to some degree, to their business.

Phase 3: Validate Assumptions
After the system was set up, possible benefit areas were identified and quantified through research. Where quantification was not possible, benefits were categorized as intangible benefits. We expect that these intangible benefits make the case for Auto-ID even more compelling.

The cost assumptions were derived from data provided by the Auto-ID Center. The majority of the costs are associated with the variable cost of the tags, while reader systems contribute to a high percentage of the fixed cost. The Auto-ID costs were developed based on conversations with numerous technology providers coupled with assumptions regarding the degree of adoption. It is assumed that if the adoption curve shifts significantly there will be a corresponding change in the cost estimates.

Phase 4: Develop Business Case

Based on the costs and benefits identified, Net Present Values (NPV's) were calculated to examine the feasibility of Auto-ID. Because Auto-ID is a new technology, the NPV was calculated out only on a seven-year period (rather than a longer period) and no perpetual value number was assumed. A discount rate of 12% was used. In calculating the NPV at the case level, an accrual of benefits was assumed at an increasing rate, with only 50% of the benefits being assumed in Year 1, 75% in Year 2, and 100% from Year 3 onwards. At the item level, the rate of assumption of benefits was 25% in Year 1, 50% in Year 2, 75% in Year 3 and 100% from Year 4 onwards. Similarly, one-time implementation costs were split up, with 70% of the costs being allocated in Year 1 and 30% in Year 2.

Table 1

LEVEL OF TAGGING	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7
PALLET	50%	75%	100%	100%	100%	100%	100%
CASE	50%	75%	100%	100%	100%	100%	100%
ITEM	25%	50%	75%	100%	100%	100%	100%

The IBM Business Consulting Services White Paper series does not constitute an Auto-ID business case for any one company. Benefits and costs are presented at the "system level", i.e., the value chain level. We conducted our analysis for generalized consumer products value chain systems with the following broad characteristics:

Table 2: Value Chain System Characteristics By Product Category

1. **Grocery**
2. **Apparel**
3. **Consumer Electronics**
4. **Health & Beauty**
5. **Music & Video**
6. **Pharmacy**
7. **Toys**

	1	2	3	4	5	6	7
ITEMS	8,000MM	667MM	65MM	726MM	259MM	312MM	363MM
MFG PLANTS	4	3	3	3	4	4	4
MFG DCS	10	4	3	5	4	5	4
RETAIL DCS	4	25	25	25	25	25	25
RETAIL STORES	800	800	800	800	800	800	800
AVG PRICE	$1.75	$14.00	$130.00	$9.00	$18.00	$26.91	$18.00

Our original value chain for grocery[1] was used to create other value chains for six additional product categories. Grocery sales on a retail level were compared to sales for those other product categories. From those sales levels and average price points we determined number of items manufactured and sold in the value chains. Additionally, we used those sales levels to determine the number of plants and distribution centres in each particular value chain.

[1] Please see IBM Business Consulting Services Auto-ID White Papers, June 2002.

The split of sales in our retail store (carrying all seven product categories) is shown in Table 3.

Table 3

SALES BREAKDOWN IN A LARGE SUPERCENTER	
Grocery	24.2%
Apparel	16.1%
Consumer Electronics	14.5%
Health & Beauty	11.3%
Music & Video	8.1%
Pharmacy	14.5%
Toys	11.3%
TOTAL	**100.0%**

While there are applications and considerations for suppliers to manufacturers, the focus of our first four papers is on trading relationships between manufacturers and retailers.

Based on the above value chain, our analysis indicates compelling propositions across all seven product categories for case-level tagging. For all the product categories, with exception for grocery, our analysis show compelling propositions for item-level tagging as well. See Table 4.

Table 4: (figures in $ millions, NPV over seven year period)

1. Grocery
2. Apparel
3. Consumer Electronics
4. Health & Beauty
5. Music & Video
6. Pharmacy
7. Toys

ADOPTION LEVEL		1	2	3	4	5	6	7
BEST CASE	PALLET	4.5	8.0	(33.2)	(14.3)	(48.0)	(2.9)	(14.9)
	CASE	789.0	731.4	–	519.4	235.3	645.8	521.8
	ITEM	583.3	1,039.4	801.4	675.5	540.6	890.8	772.5
BASE CASE	PALLET	(1.4)	6.8	(33.9)	(14.6)	(48.0)	(3.0)	(15.6)
	CASE	575.0	718.6	–	510.6	234.4	643.7	511.8
	ITEM	(1,212.6)	808.6	779.3	427.5	453.4	785.2	644.9

The Base Case assumptions refer to the Auto-ID Center's tag cost estimates (30 cents in 2003, 20 cents in 2004, 10 cents in 2005, and 5 cents thereafter. Our Best Case analysis follows more aggressive tag cost estimates as quoted by industry players for large volume users (7.5 cents in 2003, 5 cents in 2004 and 2 cents thereafter).

The numbers above (in $MM) are a result of NPV analyses across separate product categories, aggregating all benefits and costs, over a 7-year period. We have assumed that pallet and case level adoption occur in 2003 for all product categories, while item-level adoption occurs in 2004 for all product categories except for grocery (adoption starts in 2005).

The business propositions for item-level, case-level, and pallet-level tagging varies across the product categories. For example, our analysis shows that item-level tagging is more applicable to higher value/high margin goods. On the other hand, given the tag-price assumptions in the above scenarios, at 30 cents a tag in 2003 (Auto-ID Center base case assumptions), it is not surprising that item-level tagging is not viable for our "generalized" grocery supply chain with an average retail price of $1.75.

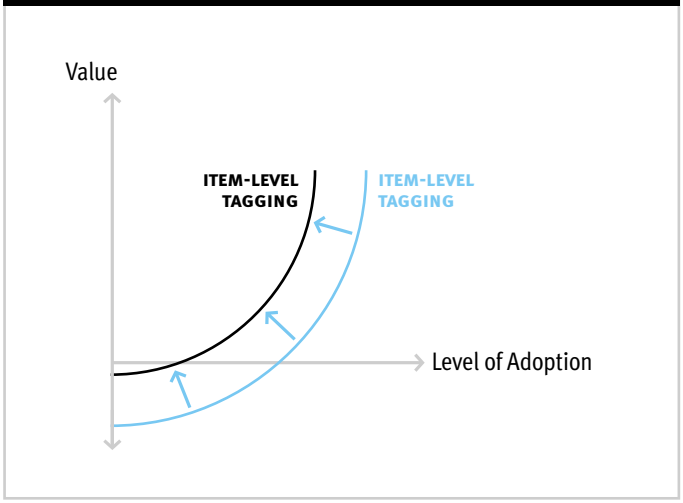
However, that does not preclude the consideration of item-level tagging items that are of higher value to the participants in the grocery supply chain, such as high-price products, high-risk categories, and promotional categories. As the tag costs drop, so the range of consumer goods that would have a positive return at item-level tagging, will widen. Tag prices will depend on the level of adoption and advancements made in tag-manufacturing and labelling technology.

The story changes for higher price/higher margin products such as electronics, apparel and expensive consumer durables. For these product categories, not only does case-level tagging become even more compelling, but a business case for item-level tagging becomes viable – even at current tag price points. See Figure 4 below.

Figure 4:

Key:
- Low Price/Low Margin
- Higher Price/Higher Margin

PRODUCT VALUE & ITEM LEVEL VIABILITY OF AUTO-ID TAGGING



The Auto-ID Prelude provides an overview of the impact of the Auto-ID system on the consumer goods and retail value chains. IBM Business Consulting Services is further collaborating with the Auto-ID Center to develop a series of white papers that explore the business opportunities that Auto-ID presents in addressing tangible pain points within the consumer goods and retail value chains. The first four papers in this series are:

June 2002
- Focus on Retail: Improving Product Availability on the Retail Shelf; and
- Focus on the Supply Chain: Applying Auto-ID within the Distribution Center.

November 2002
- Applying Auto-ID to Reduce Losses Associated with Product Obsolescence
- Applying Auto-ID to Managing Shrink from Manufacturing to Point of Sale

Assumptions in developing the business case and the NPV analysis

In developing these white papers, IBM Business Consulting Services makes a number of generalized assumptions about Auto-ID technology adoption and implementation:

– High adoption rates will reduce tag and reader prices over the next decade. Our cost models have been developed using Auto-ID cost estimates for tags and readers outlined in the table below. Changes in the estimates below can have a significant impact to the business case. To that point, we have supplemented base case analysis with "best case" tag cost assumptions in addition to what you see in Table 5 below. These more aggressive assumptions are based on tag costs of 7.5 cents in 2003, 5 cents in 2004 and 2 cents thereafter.

Table 5

	2002	2003	2004	2005	2006
Industry tag sales (millions of units)	200	300	700	3,000	15,000
Tag price to highest volume users	0.40	0.30	0.20	0.10	0.05
Industry reader sales (million units)	0.1	0.2	0.5	1	2
Reader electronics price to volume users	$500	$250	$150	$100	$70

– The papers have been developed with a view towards implementing an Auto-ID compliant system including utilization of EPC™, ONS and PML standards. The case will vary considerably for the implementation of proprietary RFID technology.

– The papers have assumed that the technology will work as envisioned by the Auto-ID Center and will provide the accuracy rates and the reliability necessary for wide spread adoption.
  – Standards such as EPC™, ONS and PML will be developed and adopted
  – Compatibility among different technology components will be achieved, including the ability to support multiple tag and reader formats and frequencies.
  – Technology will be operated and adopted globally

– Our business case analysis including the NPV analysis in Table 1, specifically applies to the hypothetical supply chain system illustrated in Figure 1 and includes the following assumptions:
  – 100% tagging compliance across the system for each level of adoption
  – The cost components incorporated in the analysis include tag costs, reader systems cost, infrastructure costs, basic application integration costs, maintenance and support costs and overhead costs
  – The benefits and the tag costs have been applied on a system-wide basis – i.e., value-chain wide.
  – The benefits have been quantified assuming system-wide adoption and open data/information sharing.

ACKNOWLEDGEMENT

IBM Business Consulting Services would like to thank the Auto-ID Center and the many companies that contributed to this paper. In particular, we would like to extend special thanks to the following companies whose involvement and insight was instrumental in helping us to shape our point of view.

End User Participants
A&P, Blockbuster, Circuit City, Coca-Cola, CVS/Pharmacy, Federated Department Stores, Gillette, Home Depot, Imperial Tobacco, Intel, JC Penney, Johnson & Johnson, Kroger, Molson, Philips Semiconductors, Procter & Gamble, Staples, Target, Limitedbrands, Unilever, Wal*Mart

Technology Vendor Participants
The following vendors have provided IBM Business Consulting Services with technology insights over the past months that have contributed to our paper: Alien Technologies, Checkpoint Systems, Display Edge, Escort Memory Systems, Intel, Intermec, Matrics, Philips Semiconductors, RAFSEC, RF Saw, SAP, Sensormatic, Sun Microsystems, Symbol, and ThingMagic.

We would like to point out that all proprietary information produced through conversations, workshops and data gathering with participant companies remains confidential to those companies and IBM Business Consulting Services. IBM Business Consulting Services has used these insights only to verify our own knowledge or publicly available information. In a small number of cases, data was blinded and ranged to prohibit the reader from linking any specific data to any specific participant. Figures quoted in this paper therefore refer to:

- IBM Business Consulting Services own consumer goods and retail knowledge experience including benchmarking studies and engagements with a wide range of clients over a number of years;
- Publicly available information sources; or
- The hypothetical value chain model we created to articulate the costs and benefits of implementing an Auto-ID solution.

1. INTRODUCTION – THE CHALLENGE

The objective of this paper is to examine the state of shrink in the Consumer Goods and Retail industries (across a broad range of product categories) and to present a position on how Auto-ID technology can better manage and, in some cases, eliminate shrink in the supply chain. The prospect of a ubiquitous radio-frequency based product tracking technology fundamentally challenges our understanding of shrink. Most strikingly, it provides us with the capability to measure shrink accurately for the first time ever. That foundation then allows us to revise the (often) peripheral roles that loss prevention/asset management departments play within today's organizational structures. Furthermore, in addition to the traditional levers that companies use to improve performance, those of revenue uplift and cost reduction, Auto-ID technology provides organizations with a third way to improve margins, **cost avoidance**. In seeking to integrate dedicated anti-theft technologies with dynamic inventory tracking capabilities, the Auto-ID solution must be considered in a wider context than today's shrink reduction environment. Companies that implement Auto-ID can benefit from real-time inventory visibility, improved data integrity, reduced inventory levels, improved service levels, improved on-shelf availability, reduced distribution costs, enhanced returns management, improved promotions management, and many other benefit categories.

Shrink losses are defined as losses through theft, process failures, paper shrink and fraud.

2. SUMMARY OF KEY FINDINGS

Despite the compelling potential of Auto-ID technologies, IBM Business Consulting Services aims to take a pragmatic view of adoption by seeking to determine the realistic impact of near to medium term implementations across different product categories. We have based our research upon the following product categories: grocery, apparel, consumer electronics, toys, music & video, health & beauty and pharmacy. In our generic value chain model, these seven distinct supply chains feed into a hypothetical Supercenter retailer.

The analysis that follows shows a range of key findings:

- Shrink research can be viewed largely as a "data desert" and this contributes to the difficulty shrink practitioners experience when getting their issues reviewed at a strategic level.
- Despite this, it is clear that manufacturers tend to suffer process & administrative sources of shrink, whereas retailers suffer both "paper shrink" (retailer terminology for process & administrative failures) and "actual shrink" (external theft, internal theft and fraud).
- Auto-ID represents a compelling opportunity to enable accuracy in shrink monitoring for the first time ever.
- The data integrity that comes with an Auto-ID implementation will require loss prevention asset protection departments to play a more strategic role in organizations moving forward.
- Auto-ID solutions for manufacturers start to accrue significant benefits at the pallet and case level, whereas retailers need item-level tracking in order to reduce their key shrink pain points.
- The benefits case for many categories are compelling – including the higher priced items such as consumer electronics, apparel pharmacy, health & beauty and music & video.

Key Benefits Case Results

- Manufacturers in our analysis suffer shrink losses (primarily process & administrative failures) of 0.22% – 0.73% of revenues (depending on the product category). Our analysis estimates that an Auto-ID implementation at the case level could reduce these losses by two-thirds.
- Our Supercenter Retailer suffers shrink losses of 1.75% of revenues (external theft, internal theft, supplier fraud and paper shrink). Our analysis estimates that an Auto-ID implementation at the case and item levels could reduce these losses by (on average across the 7 product categories analysed) 47%. For our Supercenter retailer with sales of $58 billion, this equates to a net profit saving of approximately $46 Million across the organizations, or $58,000 per store.

- While the shrink reduction benefits of Auto-ID are compelling in nature, we recognize that organizations are unlikely to implement pallet, case or item level solutions based solely on this pain point alone. Therefore we focus on describing the incremental costs and benefits associated with shrink reduction, building upon a host of other opportunities that the same integrated technology promises to address. As such, we have reviewed and updated our overall "system-wide" business case results in our Prelude section.

The focus of this paper will not extend to obsolescence, an additional category of shrink. A separate study has been dedicated to understanding how Auto-ID can be used to better manage obsolescence.

3. THE SHRINK ISSUE

Consumer Goods Manufacturers and Retailers today invest millions of dollars to detect and prevent losses stemming from theft and shrink of varying forms. While solutions such as EAS, tighter compliance procedures and increased inventory management labor at the DC and store-level have had some impact on capping shrink losses, the problem continues to be a $33.1 billion dollar issue for US retailers,

a €28.9 billion issue for European retailers, a $A942 million problem for Australasian retailers, and Canadian retailers lose approximately $4.5 million every single day. Staggering losses. Theft alone equates to approximately 1.78% of annual turnover. And no, shrink should not be regarded as a "cost of doing business". This pain point represents a major drain on profitability and one that manufacturers and retailers need urgently to address more effectively, particularly during today's difficult economic climate.

Source: Annual Retail Shrink Survey – Trax Software

"Shrink continues to be the source of major loss for the Supermarket industry, costing the average store [annually] 2.26% of store sales for a total of $363,642 [per store] in 2000. Assuming an average net profit of 1.1% and a Shrink rate of 2.26%, for every $1.10 a company makes in net profit, that company has already lost $2.26 to 'unknown shrink'. Recognizing that every dollar of shrink that is saved results in a 100% contribution to bottom-line profits, can make shrink recovery a company's #1 profit source."

Top-line shrink numbers are sufficient to make any organization sit up and take notice; however, the most alarming fact is that there probably isn't a single organization out there that knows the true impact of shrink. Why? Because shrink research is based on survey data, and these provide anecdotal results rather than real supply chain data. Beck (2002) correctly referred to the Shrink environment as a "Data Desert". The research organizations and universities performing this analysis only have the survey method at their disposal. For today's consumer goods and retail organizations to collate accurate shrink information, they would have to embark upon unsustainable work-studies that would suffer inaccuracies due to the scale of the required activity (i.e., labor monitoring plus counting all inventory at every point in the supply chain from finished good to Point of Sale).

"Auto-ID will enable organizations to calculate actual shrink for the first time ever"

In fact, the most important and most basic proposition that Auto-ID has to offer shrink reduction is the capture of shrink information based on real-time inventory visibility for the first time ever.

3.1. Defining Shrink

Recent work completed by the Efficient Consumer Response (ECR) group and the Europe Shrink Committee has developed a definition of shrink that has received relatively broad acceptance. The ECR Shrink Committee defines the constituents of shrink as supplier fraud, internal theft, external theft and process (and administrative) failures (see Figure 5).

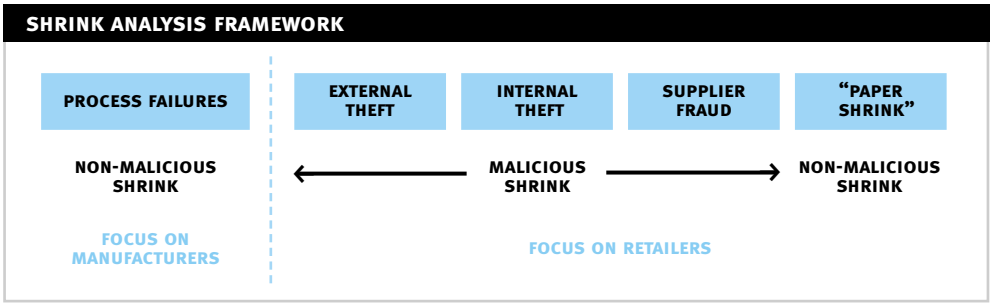
Figure 5

The first category of shrink (process failures) is considered unintentional or non-malicious in nature, while the remaining three categories (external theft, internal theft and supplier fraud) are considered malicious in nature. We will use this generally accepted definition throughout our paper.

To further simplify our analysis, shrink data suggests **process failures are primarily a manufacturer issue**, whereas **external theft, internal theft, supplier fraud and paper shrink are more prevalent** for retailers. Our analysis will focus primarily on this split (see Figure 6 Shrink Analysis Framework).

The key amendment to this definition is that retailers also suffer "Paper Shrink" (process and administrative failures by their terminology), so we have included this in our shrink analysis framework.

Figure 6



3.2. Understanding Shrink ... Estimating the Cost of Shrink Globally

USA

Every year, the University of Florida's Department of Sociology and the Center for Studies in Criminology and Law conducts a study on shrink in retail. The study, National Retail Security Survey (NRSS), is primarily sponsored by Sensormatic and is one of the most comprehensive studies on the subject matter in the United States. Each year the NRSS receives anonymous responses from 120 retail companies representing 20 different retail markets. The list of participants represents the entire retail industry but does not include restaurants, bars, motor vehicles dealers, auto service stations, direct catalogue sales outlets and Internet e-tailers.

According to the NRSS annual survey, the average shrink rate was 1.80% of total annual sales in 2001. This rate is significantly higher than 2000 at 1.69% but not the highest over the last 10 years. The average shrink rate over the past decade has been about 1.80%. Assuming an annual sales base of $1.8 trillion, the cost of shrink for sectors conducted in the NRSS study equates to approximately $33.2 billion.

Europe

The Efficient Consumer Response (ECR) group sponsors an annual study on shrink for Western European countries. In 2001, research sponsored by ECR Europe on behalf of the Fast Moving Consumer Goods sector (FMCG) estimates that the annual shrink rate for European countries was 1.75%. This equates to approximately €14.4 billion based on annual sales of €824.4 billion.

Australasia

Similar studies in the countries that make up the Australasian region, which includes Australia and New Zealand, have shown that the average shrink rate was 1.73% of annual sales of $A54.45 billion. It is worth noting that, in a 2000 study conducted by the Australian Institute of Criminology, the annual shrink rate was 2.26% for Australia alone.

Table 6: Summary of Global Retail Shrink Statistics 2001

* Sales and shrink data in billions of local currency ($US, €EU, A$)

RETAIL SHRINKAGE BY COUNTRY/REGION			
COUNTRY/REGION	**SALES***	**SHRINK RATE**	**SHRINK LOSS***
US	1,845	1.80%	33.2
Europe	824	1.75%	14.4
Australasia	54	1.73%	0.9

3.3. Defining the Categories of Shrink Across The Supply Chain ... The Pain Points

Where does shrink occur across the supply chain? In this section we will highlight the categories of shrink across the supply chain, review shrink related data and how it pertains to the various supply chain constituents, and illustrate the impact of shrink across the supply chain.

Table 7 provides a consolidation of key shrink data provided by European and US sources. As previously discussed, this collection of data represents a snapshot of the most viable shrink data available today from existing academic and research sources. However, as it is based largely on secondary data and anecdotal sources, it must therefore be treated with some degree of caution.

Table 7:
Hollinger, R. & Davis, J. (2001) National Retail Security Survey

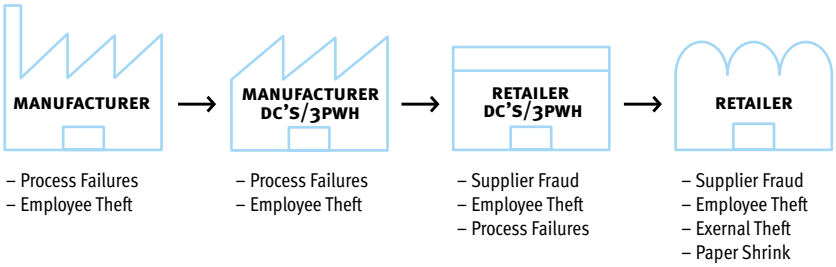
Beck, A. & Bilby, C. (2001) Shrinkage in Europe, A Survey of Stock Loss in the Fast Moving Consumer Goods Sector, Brussels: ECR Europe

SECTOR	SEVERITY	CATEGORIES	COST				THREATS	SOLUTION
			USA	USA	EU	EU		
MANUFACT.	Malicious	External Internal			$0.39 $0.39	11% 11%	Collusion Theft of Stock Grazing Collusion	Procedures Technology Equipment Routines People
		Supplier Fraud			$0.00	0%		
MANUFACT.	Non-Malicious	Process Errors			$2.73	78%	Incorrect Invoice Incorrect Pricing Damages	Procedures
RETAILER	Malicious	External	$10.23	30.8%	$5.34	37%	Shoplifting Returns Grazing Till Snatching	Procedures Routines Technology Design/Layout
		Internal	$15.24	45.9%	$3.46	24%	Stock Theft Grazing Collusion Theft of Cash	People Procedures Technology Equipment
		Supplier Fraud	$1.70	5.1%	$1.73	12%	Phantom Delivery Invoice Error Returns Incorrect Delivery	Technology Procedures
RETAILER	Non-Malicious	Paper Shrink	$5.81	17.5%	$3.90	27%	Price Reductions Pricing Errors Scanning Errors Master File Errors Incorrect Inv Check	Procedures Technology People

Figure 7 is a high level representation of a typical supply chain from manufacturer to retailer. We have highlighted the primary causes of shrink for each participant in the supply chain based on the data in Table 7. More detailed descriptions of each of the four constituents of shrink can be found in Appendix A.

Figure 7

TYPICAL SUPPLY CHAIN FROM MANUFACTURER TO RETAILER



4. MANAGING THE PROBLEM

Consumer goods manufacturers and retailers have used a range of people, process and technology techniques and solutions to reduce the impact of shrink, some of which are listed below:

MANUFACTURERS

- Fencing off pick/pack areas
- Double verifications of shipments at staging area
- Sample unpacking and reloading of trucks to reduce overages
- Security personnel and CCTV within the DC
- Defensively merchandised shelf and rack designs – even lock and key
- EAS tagging

RETAILERS

- EAS tagging of high risk items
- Store security personnel
- Back-room store CCTV and alarmed doors
- Receipts required as proof of purchase for returns
- Defensive merchandising
- Profiling
- Heightened awareness around key times of the day
- Checkout surveillance

The facets of shrink and the complexities of controlling its causes have resulted in disjointed and inconsistent compliance to standards set by organizations within their distribution and retail store operations. Implementers of EAS, for example, report that, while the technology performed well in the early stages of adoption, its effectiveness has decreased over time due to two primary effects:

- First, employee turnover in the store is such that as training procedures slip, so the compliance in working with the technology also slips.
- Second, EAS "pollution" can arise, where tags that have not been deactivated cause alarms to be triggered in other stores using the same technology.

We recognize that an Auto-ID solution may suffer compliance weaknesses as well, and that the degree of those issues will only become apparent with further investigation and pilot-testing; however, the fact remains that an "intelligent" real-time inventory tracking systems provides advantages in terms of its integration of benefits across multiple benefit categories, implies that shrink reduction opportunities over the longer term will be promoted.

Appendix B summarizes key loss prevention technologies.

4.1. Meeting the Challenges – How Auto-ID Will Address the Shrink Problem

Auto-ID technology provides a technological "intelligence" capability to help take shrink reduction to the next level and, in doing so, create fundamental value to retailers and manufacturers alike. With careful planning and technology selection, Auto-ID can:

- Eliminate returns fraud for item-tagged products;
- Locate sources, quantities and timings of theft losses across the supply chain;
- Inform the organization on how and where to deploy loss prevention/asset management resources;
- Significantly reduce billing disputes between manufacturers and retailers; and
- Reduce the costs of administering disputes and fixing inaccuracies.

Table 8 summarizes the potential impact of Auto-ID technology upon the five key elements of shrink. This section will take each element of shrink in turn and discuss applicable Auto-ID solutions to remedy the pain points.

Our analysis begins with a discussion of how Auto-ID can mitigate the process and administrative failures encountered primarily by manufacturers:

- **Focus on the Manufacturer: Applying Auto-ID to Reduce Process Failures**

We then turn our attention to focus on shrink issues associated with retailers – i.e., external and internal theft, supplier fraud and paper shrink:

- **Focus on the Retailer: Applying Auto-ID to Reduce External Theft, Internal Theft, Supplier Fraud and Paper Shrink**

Of course, there are many exceptions to the rule. For example, many manufacturers suffer actual theft, and many retailers suffer process failures. We will discuss these exceptions as we go through our analysis, especially where product category is a key driver.

Table 8

MANUFACTURER'S SHRINK		
TYPE OF SHRINK	**CURRENT PROBLEM – SHRINK PAIN POINTS**	**HOW AUTO-ID ADDRESSES THE PAIN POINTS**
PROCESS FAILURES	Unintentional delivery errors	Ability to verify actual quantities through readers would detect unintentional quantity errors immediately
	Improper accounting of returns	Ability to track all returns and automate the administration of credits would reduce this type of shrink
	Incorrect inventory audits and on hand adjustments	Ability to maintain perpetual inventory on hand data integrity would minimize these types of process failures
	Intracompany and interdepartment transfers	Ability to automate product transfers from point to point and ensure proper crediting and billing to each party in the transaction will minimize these types of process failures

Continuation of Table 8

RETAILER'S SHRINK		
TYPE OF SHRINK	**CURRENT PROBLEM – SHRINK PAIN POINTS**	**HOW AUTO-ID ADDRESSES THE PAIN POINTS**
EXTERNAL THEFT	Shoplifting	Item-level tagging with a smart shelf/smart rack that is linked to digital cameras and PDAs to protect against sweeping Item-level tagging tied to detection at the door for product that has not been recorded as a sale – with reduced failures to deactivate
	Fraudulent returns	Ability to determine status of the product (purchased or not purchased) at the customer service desk will eliminate the majority of returns fraud (only at item level)
	Burglary	Ability to trace product at flea markets back to stores that were burglarized (again, mostly at item level, although discoveries of contraband in warehouses may lead to case level identification)
INTERNAL THEFT	Product theft	Ability to detect product leaving the store that has not been recorded as sold
	Collusion with customers	All product would be read as it passes through the point of sale zone
	Collusion with vendors	Automated reading of DSD quantities and items prevent intentional product or credit discrepancies
SUPPLIER FRAUD	Phantom Delivery	Ability to automate verification of invoices to product received would eliminate this vendor fraud
	Invoice Errors	Ability to match quantities received to quantities billed real time would provide the ability to detect and resolve this type of issue
	Returns	Ability to read all product removed for credit and capture quantities through readers would detect this type of fraud
	Over/Under Delivery	Ability to verify actual quantities through readers would detect this type of supplier fraud immediately
PAPER SHRINK	Pricing Errors	Ability to automate price file downloads to retail stores will help reduce the need for in-store price verification
	Scanning Errors	Item-level tagging will eliminate scanning errors through automated checkouts
	Unrecorded Returns	Returns will be recorded more accurately as the item-tagging information will already exist in the master files
	Incorrect Store Physical Inventory	Ability to verify actual quantities through shelf or hand-held readers will help to reduce incorrect inventory counts during periodic physicals

Shrink will never be completely eliminated. However, with the right people, processes and Auto-ID applications in place, it can be managed to lower, more acceptable, levels. Leading edge thieves may discover ways to circumvent the latest technologies, but Auto-ID represents an opportunity for manufacturers and retailers to raise that challenge to the next level and, in the process, deter the next layer of "opportunist" thieves. And, of course, it is critical to remember that the same technology also provides practitioners with integrated supply chain product tracking capabilities with the myriad of additional benefit categories that are accrued.

5. FOCUS ON THE MANUFACTURER: APPLYING AUTO-ID TO REDUCE PROCESS FAILURES

Process (and administrative) failures constitute 78% of manufacturer's shrink losses. During the course of our work sessions many participants estimated the problem to be much higher (up to 95%). This was because they had focused on reducing internal theft (with some success); however they did not have confidence that they could reduce process and administrative losses, at a reasonable cost (i.e., without "throwing people at the problem").

However, other manufacturers cautioned that the losses associated with internal and external theft are by no means eradicated. They cite hijacked trucks, pilferage, "grey market" diversion, and 3PL drivers bartering with delivery personnel at retail destinations as all contribution to actual losses.

5.1. The Pain Points

Table 9

TYPE OF SHRINK	CURRENT PROBLEM – SHRINK PAIN POINTS	HOW AUTO-ID ADDRESSES THE PAIN POINTS
PROCESS FAILURES	Unintentional delivery errors	Ability to verify actual quantities through readers would detect unintentional quantity errors immediately
	Improper accounting of returns	Ability to track all returns and automate the administration of credits would reduce this type of shrink
	Incorrect inventory audits and on hand adjustments	Ability to maintain perpetual inventory on hand data integrity would minimize these types of process failures
	Intracompany and interdepartment transfers	Ability to automate product transfers from point to point and ensure proper crediting and billing to each party in the transaction will minimize these types of process failures

5.2. Current Techniques and Technologies

Unintentional delivery errors
These errors often are not immediately detected by the receiving location. Processes to check deliveries against the paperwork highlight shortages when applied; however typically the labour and throughput costs are excessive. Overages are usually never reported and are the cause for significant process shrink among some manufacturers who participated in our study.

Improper accounting of returns
Today, the accounting of returns is a highly labour and paperwork intensive activity, conducted infrequently and therefore causes inventory issues across the value chain.

Incorrect inventory audits and on hand adjustments
Optical (bar-code) technology is the most common technology used to keep track of inventory and perform inventory audits. However, the line-of-sight requirement makes this a labour intensive and slow activity.

Intracompany transfers and interdepartment transfers
Again, optical technologies and transfer processes are used to keep track of inventory that is transferred between locations; however, the accuracy is dependent on the diligence of employees.

5.3. Auto-ID Solution for Process Failures

Unintentional delivery errors
In the Auto-ID environment, deliveries are recorded automatically at the dock door when leaving the manufacturer. This will allow a quick check of exactly what inventory is being shipped and will highlight any overages or discrepancies in the order quantities. At the receiving point, the same process provides documentation of received goods to serve as verification. Because of the audit trail, any losses in transit will be discovered. Accurate documentation of shipments will reduce the potential for issues regarding proof of delivery/receipt between the manufacturing and receiving locations.

Improper accounting of returns
All items that are returned to the manufacturer are documented at the retail location. When the returns arrive back at the manufacturer, the accuracy can be checked against the original documents to ensure accuracy and to highlight any pilferage en route to the manufacturer.

Incorrect inventory audits and on hand adjustments
With the automatic records kept in Auto-ID, the process of incorrect inventory audits and adjustments is no longer a factor. Accurate inventories can be pulled at any time, as often as need with the assurance of accurate information.

Intracompany transfers and interdepartment transfers
The transfer process will still require employee intervention but the shipment will be accurately accounted for when leaving the location. Employee process errors will diminish because the transferred merchandise will be accurately accounted for at the shipping location and again at the receiving location.

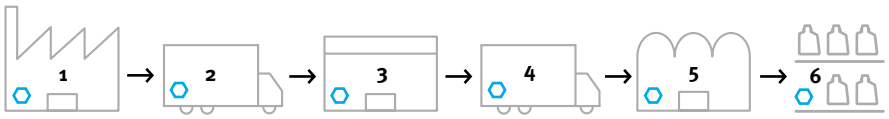
Figure 8 illustrates product flow from the Manufacturer DC to the Store Shelf, and highlights the advantages of implementing an Auto-ID solution to reducing process and administrative sources of shrink.

Figure 8:

1. Manufacturer DC
2. Ship to Retail DC
3. Retail DC
4. Ship to Store
5. Store Backroom
6. Store Shelf

Key:
⬡ Reader

PRODUCT FLOW FROM MANUFACTURER TO STORE SHELF



	1	2	3	4	5	6
TRADITIONAL SHRINK PROCESS FAILURES	– Paper Errors – Burglary – Dated Products	– Product Diversion – Fraudulent Invoicing – Phantom Del. – Pricing Errors – Wrong Item Delivery – Over Shipment – Under Shipment	– Paper Errors – Pricing Errors – Product Location – Incorrect Inv. Checks – Returns Error	– Invoicing Errors – Pricing Errors – Shipping Errors – Phantom Del. – Over Shipment – Under Shipment	– Pricing Errors – Receiving Errors – Returns Processing	– Pricing Errors – Returns Processing
AUTO-ID IMPACTS	– Reduction in Paper Errors – Increase Visibility to Code-Dated Items	– Monitor Product Movement Through Supply Chain – Improve Invoice Accuracy – Reduce Pricing Errors – Monitor Over/ Under Shipments	– Reduce Paper Errors – Improve Pricing Accuracy – Improve Picking Accuracy – Improve Labor Efficiency – Reduce Labor Cost – Improve DC Throughput – Improve Returns Accuracy	– Reduce Invoice Errors – Reduce Shipping Errors – Reduce Phantom Deliveries – Reduce Over/ Under Shipments	– Reduce Pricing Errors – Monitor Receiving – Reduce Receiving Errors – Reduce Pricing Errors	– Reduce Checkout Price Verification Requests – Improve Returns Processing

5.4. Benefits of Auto-ID

The process failures in the manufacturing area of the supply chain are primarily related to the accuracy of shipments made to the DCs and retail locations. Current barcode and manual verification processes suffer some inaccuracies in logging the process of shipping goods from one location to another. Auto-ID technology promises the ability to track inventory accurately at the pallet, case and, when necessary, at the item level to ensure that shipments are accounted for throughout the supply chain.

The benefits that a manufacturer will realize in the Auto-ID environment will vary by product category and are dependent upon the level of Auto-ID tagging used (at the pallet, case and/or item level). In some cases we believe the maximum benefits in the near term will be realized by implementing tagging only at the case level. In other situations, however, our analysis shows that very little benefit will be accrued unless item-level tagging is used. The following benefits table illustrates IBM Business Consulting Services analysis around appropriate implementations for individual product categories. These tables provide the foundation for our benefit calculations.

Table 10 outlines the level of tagging required to accrue benefits across the range of product categories included in our research. Our business case analysis work will reflect aggregations of all these benefits. As is evident from the table, our analysis implies that item level tracking will only be feasible for the highest priced goods in the near term.

Table 10

PAIN POINTS	PRODUCT CATEGORY	AUTO-ID APPLICATION		
		PALLET	CASE	ITEM
UNINTENTIONAL DELIVERY ERRORS	Grocery	●	●	
	Apparel	●	●	
	Consumer Electronics	●	●	
	Pharmacy	●	●	
	Music & Video	●	●	
	Toys	●	●	
	Health & Beauty	●	●	
IMPROPER ACCOUNTING OF RETURNS	Grocery	●	●	
	Apparel	●	●	
	Consumer Electronics	●	●	
	Pharmacy	●	●	
	Music & Video	●	●	
	Toys	●	●	
	Health & Beauty	●	●	
INCORRECT INVENTORY AUDITS AND ON HAND ADJUSTMENTS	Grocery	●	●	
	Apparel	●	●	●
	Consumer Electronics	●	●	●
	Pharmacy	●	●	●
	Music & Video	●	●	●
	Toys	●	●	●
	Health & Beauty	●	●	●
INTRA COMPANY AND INTER DEPARTMENT TRANSFERS	Grocery	●	●	
	Apparel	●	●	●
	Consumer Electronics	●	●	●
	Pharmacy	●	●	
	Music & Video	●	●	
	Toys	●	●	
	Health & Beauty	●	●	

Unintentional delivery errors

Manufacturers generally ship to the DC or directly to the retailer by the pallet or case. Auto-ID tracking of these shipments will accurately account for deliveries made to the DC and retailer. Any discrepancies will be highlighted immediately and resolved to maintain accurate inventories throughout the supply chain. Accuracy improvements will be accrued from the reading of all cases on pallets. While the "aggregation method" has been proposed as an alternative to meeting this business requirement, we are not convinced that case aggregation is sustainable moving forward, even in the short term.

RFID technology is available today (albeit at a slightly higher price point per tag) from vendors who have demonstrated reliability for case level reading without requiring case aggregation; this is the case for most product characteristics.

Improper accounting of returns and deliveries
Accounting for returns to the manufacturer is often a questionable process and is a source of mistrust between the involved parties. Without accurate shipping documents, the manufacturer is reliant on the receiving party to account for mis-shipments and damaged products. With Auto-ID at the pallet and case levels, all shipments can be tracked accurately and credit for returns given appropriately.

Incorrect inventory audits and on hand adjustments
Inventory audits traditionally are a very manual process and vulnerable to human error. On-hand adjustments to inventory numbers are only as accurate as the person counting the inventory and making the adjustments. In the Auto-ID environment, inventories are real time and require few audits and adjustments to update inventories. For all product categories, except grocery, item-level tagging will give the greatest benefits in this area. The relatively high number of SKUs in a grocery environment makes item-tagging cost prohibitive in the near term for the majority of grocery items. Only high end and known high shrink items will be tagged for the grocery industry in the near term.

Intracompany and interdepartment transfers
Intracompany transfers generally take place from DC to DC or between the DC and retail store. Currently, transfers can be difficult to track and account for because systems are not adequate or the transfer process to keep track of the inventory is very manual and/or time-consuming. This causes employees to avoid transferring products to the location where maximum sales are and therefore has a negative impact on the sales for both locations. The Auto-ID solution at the pallet and case levels will facilitate tracking of the inventory. Upon transfer, merchandise will be reassigned to the appropriate store allowing accounting systems so that costs can be allocated accordingly.

One of the marketing challenges is anticipating sales and getting the right product in the right location to maximize sales. Sales are often lost because the right product is not at the right store when the customer is ready to purchase. Pallet and case level tagging will improve utilization of inventory and help to increase overall sales by making the transfer process easier thereby encouraging employees to execute the desired transfers. With Auto-ID at the item level in the apparel and electronics product categories, marketing personnel can get an accurate view of inventory and move merchandise to regions where the product is selling to maximize profits. For example, due to weather shifts, swimsuits have a shorter selling season in New York City than in Miami. Stores in New York can, at the end of the New York swimsuit season, ship remaining inventory to Miami where the swimsuits can still be sold at full price as opposed to being marked down to below cost to clear room for fall merchandise. Increased sales will result when the transfer and tracking process has been simplified by using Auto-ID at the item level.

5.5. Auto-ID Solution for Manufacturer's Theft Losses: Recoveries from the "Grey Market:

While of secondary importance to process & administrative failures, manufacturers do suffer actual theft losses caused by internal and external sources. A key benefit of Auto-ID tagging will come in the traceability of recovered items, for example items that make it through to the "grey market". Company representatives, or law-enforcement, will be able to use hand-held devices to quickly verify the origins of products and establish their point of diversion.

6. FOCUS ON THE RETAILER: APPLYING AUTO-ID TO REDUCE EXTERNAL THEFT, INTERNAL THEFT, SUPPLIER FRAUD & PAPER SHRINK

EXTERNAL THEFT

6.1. The Pain Points

Table 11

RETAILER'S SHRINK		
TYPE OF SHRINK	**CURRENT PROBLEM – SHRINK PAIN POINTS**	**HOW AUTO-ID ADDRESSES THE PAIN POINTS**
EXTERNAL THEFT	Shoplifting	Item-level tagging with a smart shelf/smart rack that is linked to digital cameras and PDAs to protect against sweeping Item-level tagging tied to detection at the door for product that has not been recorded as a sale – with reduced failures to deactivate
	Fraudulent returns	Ability to determine status of the product (purchased or not purchased) at the customer service desk will eliminate the majority of returns fraud (only at item level)
	Burglary	Ability to trace product at flea markets back to stores that were burglarized (again, mostly at item level, although discoveries of contraband in warehouses may lead to case level identification)

6.2. Current Techniques and Technologies

There are a number of current techniques and technologies that have been widely implemented to counter external theft, with varying degrees of success.

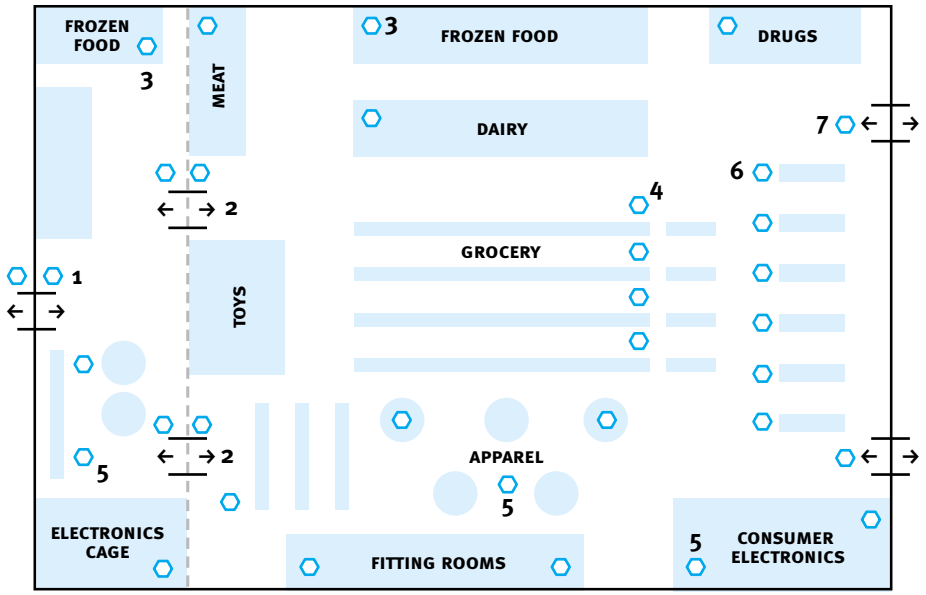
Shoplifting
EAS systems, closed circuit TVs, and anti-theft displays are the most effective technologies in use to detect shoplifters. However, some of the participants in this study, as well as other clients of IBM Business Consulting Services, have reported that EAS effectiveness is reduced over time unless a focus is maintained on training. Additional loss prevention techniques include designing the store layout to eliminate blind spots, positioning security personnel at exits and using store detectives.

Returns fraud
Prevention processes typically do not extend beyond asking for proof-of-purchase. This, however, has the obvious disadvantage in that you cannot relate the specific item to that receipt. Some of the consumer electronics providers have gone an extra step in associating the receipt with the barcode and serial number on the item.

Burglary
Security alarms are the most prevalent method of burglary detection since this act is generally committed after store hours. Upon entry to a facility, an alarm, either audible or silent, is activated and law enforcement is notified.

Figure 9

THE COMPLETE AUTO-ID SOLUTION



1, 7 – EXTERIOR DOOR READERS

How it works...
- Reads item and case tags upon entry or exit through any exterior door

Benefit
- Alerts triggered when unsold inventory passes by readers
- Incremental deterrent

Result
- Recording of stolen/short shipped inventory
- Increased accuracy of ingress/egress monitoring

2 – STOREROOM DOOR READERS

How it works...
- Reads case tags as product is moved from the backroom to the sales floor
- Updates backroom and "available for sale" inventory quantities

Benefit
- Real-time visibility of stock on floor
- Isolates inside theft (backroom) from outside theft on the sales floor

Result
- Deterrent to internal theft
- More visibility to external theft
- Less wasted loss prevention efforts

3 – READERS INTEGRATED WITH ENVIRONMENTAL CONTROLS

How it works...
- Integrates with Environmental Controls to track compliance for temperature-sensitive products

Benefit
- Real-time theft alerts
- Tracking stolen items & when stolen product will not register a "unsold"

Result
- "Smart" POS/EAS gives loss prevention information required for handling situation
- No EAS pollution

4 – DEFENSIVE SMART SHELVES

How it works...
- Perpetually monitors items and "watches" for sweeps or other suspect movements of product

Benefit
- Moves items previously defensively merchandised back to shelf
- Theft deterred by smart display
- Protects high value/high risk products

Result
- Notification to loss prevention if product moves suddenly
- Enhanced perpetual on-shelf inventory
- Increased sales of high value categories

5 – ITEM TRACKING READERS

How it works...
- Real-time visibility at the item level enables management inventory levels on shelf
- Reds SKU information to locate items that are out of place

Benefit
- Improves product availability by reducing out-of-stock when inventory is in backroom
- Ability to locate inventory misplaced in-store

Result
- Enhanced perpetual on-shelf inv.
- Reduces cycle time to restock when a shelf inventory levels drop below specified levels
- Increase product availability and reduce product obsolescence by making sure products are where customers will look for them

6 – POS INTEGRATION/READERS

How it works...
- Integrates with POS to track when an EPC™ tagged item is sold
- Allows "sold" item past perimeter readers, alerts loss prevention to unsold product leaving the store

Benefit
- Real-time theft alerts
- Tracking stolen items and when stolen
- No EAS pollution: other retailers product will not register as "unsold"

Result
- "Smart" POS/EAS gives loss prevention information required for handling situation
- No EAS pollution

6.3. Auto-ID Solution for External Theft

Shoplifting
Opportunities to detect shoplifting are greatly enhanced with Auto-ID implementation at the item level. Since the status of a purchased product is updated immediately, stolen items will set off exit door alarms and provide immediate confidence to security personnel and management that the article is not registered as "purchased". As item-level tagging at grocery will follow a slower adoption curve, the loss prevention benefit of the technology will be accrued at a slower rate.

Returns fraud
Since the status of purchased products is updated in the Auto-ID tracking system (again, for products tagged at the item level), items that are being returned that have not been purchased will be automatically segregated. This will have a significant impact on reducing returns fraud for those categories where item-level tagging is adopted.

Burglary
Realistically, Auto-ID as a solution for burglary becomes effective only after the crime has taken place. It will assist law enforcement in identifying the current location of items to facilitate the recovery of stolen merchandise. This may require that law enforcement is equipped with readers to help this process. Merchandise confiscated on the black market can returned to the appropriate location as well. Police and other governmental bodies have warehouses filled with enormous amounts of recovered merchandise contraband that they cannot trace back to the rightful owners.

Figure 9 illustrates the complete Auto-ID solution from monitors in the store backroom to automatic-checkout and exit security. The solution is presented within the Supercenter environment.

6.4. Benefits of Auto-ID

The benefits that a retailer will realize in the Auto-ID environment will vary by product category and is dependent upon the level of Auto-ID tagging used. Auto-ID tagging can be implemented at the pallet, case and/or item levels. In some cases, the maximum benefits are realized by implementing only at the case level and in other situations, very little benefit will be realized unless item-level tagging is used. The following benefits table (Table 12) depicts what level of Auto-ID tagging will ensure maximum benefit for the pain points in each type of shrink.

Shoplifting
When Smart Shelves are used in the Auto-ID environment and linked with surveillance cameras, the detection of shoplifters is greatly enhanced. When a predetermined quantity of an item is swept from the smart shelf, loss prevention personnel are alerted and can then check if that customer paid for the items. This solution requires item-level tagging to be effective. At the item level, the tags will also trigger alarms at the exit of the store if all items have not been paid for and "deactivated". From our studies and experience in implementing loss prevention solutions with vendor partners, it is surprising the amount of theft where the perpetrator steals some items and simultaneously pays for other items (the stolen items are hidden from view and not offered for scanning at checkout). An Auto-ID solution would prohibit this capability, particularly if implemented with an automatic checkout facility (all items will be unavoidably read).

Table 12

PAIN POINTS	PRODUCT CATEGORY	AUTO-ID APPLICATION		
		PALLET	CASE	ITEM
SHOPLIFTING	Grocery	●	●	
	Apparel	●	●	●
	Consumer Electronics	●	●	●
	Pharmacy	●	●	●
	Music & Video	●	●	●
	Toys	●	●	●
	Health & Beauty	●	●	●
FRAUDULENT RETURNS	Grocery	●	●	
	Apparel	●	●	●
	Consumer Electronics	●	●	●
	Pharmacy	●	●	●
	Music & Video	●	●	●
	Toys	●	●	●
	Health & Beauty	●	●	●
BURGLARY	Grocery	●	●	
	Apparel	●	●	●
	Consumer Electronics	●	●	●
	Pharmacy	●	●	●
	Music & Video	●	●	●
	Toys	●	●	●
	Health & Beauty	●	●	●

Fraudulent returns

Auto-ID tagging at the item level will eliminate the ability of a thief to return stolen merchandise for cash of credit and save retailers millions in fraudulent outlays. Currently, there is no way to determine if a person is returning stolen property. In the Auto-ID environment, the status of an item is updated all the way through the purchase at the cash register. When an item has not been purchased and updated as such in the system, the returns employee is aware immediately and can follow loss prevention procedures to confiscate the merchandise and/or challenge the customer.

Burglary

After a burglary, all items that were stolen, and tagged at the item level, can be specifically accounted for using Auto-ID. Upon recovery, law enforcement can easily identify with mobile readers where the stolen merchandise should be returned. Item-level tagging can also assist in tracking licensed product to ensure authenticity. This will facilitate the identification of vendors selling goods on the black market so that they can be prosecuted to the full extent of the law.

7. INTERNAL THEFT

7.1. The Pain Points

Table 13

RETAILER'S SHRINK		
TYPE OF SHRINK	**CURRENT PROBLEM – SHRINK PAIN POINTS**	**HOW AUTO-ID ADDRESSES THE PAIN POINTS**
INTERNAL THEFT	Product theft	Ability to detect product leaving the store that has not been recorded as sold
	Collusion with customers	All product would be read as it passes through the point of sale zone
	Collusion with vendors	Automated reading of DSD quantities and items prevent intentional product or credit discrepancies

7.2. Current Techniques and Technologies

The traditional approaches to managing employee theft focuses on using available EAS technology, closed-circuit TV and manpower to combat the problem. These solutions have proven ineffective in many instances as employees will first assimilate, learn, and then find ways to circumvent the systems. In addition, the turnover in personnel across the supply chain presents an additional challenge for loss prevention departments. Because of high turnover, it is sometimes difficult to develop and sustain an effective loss prevention program countering internal theft losses.

Implementing an Auto-ID based solution will help loss prevention reduce internal theft by tracking products through the manufacturing facility, in-transit between facilities, to the DC, into the store backroom store, onto sales floor, through the POS, and out of the store.

7.3. Auto-ID Solution for Internal Theft

Auto-ID will address internal theft for both the manufacturer and retailer, although it is recognized that the problem is probably more prevalent within the retailer's distribution and store operations.

Auto-ID has the potential to provide management and loss prevention teams with more timely information to react proactively to internal thefts.

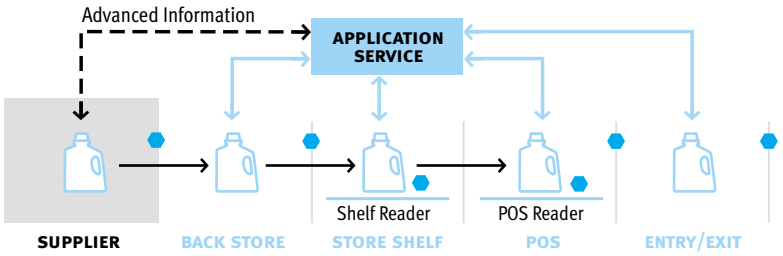
Product Theft

By source tagging cases and items, management will be able to isolate high shrink items and develop and implement solutions that will help reduce shrink caused by employee theft. In retail distribution centers for example, readers read both the cases and items as they're being packed and stored and a record of the location and quantity is stored for further use. As cases are removed for processing, readers again read and track the movement through to the next point in the process. If items are removed and not returned or moved to a location without the proper clearance, warning signals are sent to the warehouse supervisors who would then investigate the movement. Our analysis reveals that the incremental deterrence offered by case and item level tagging can have a significant impact on internal theft. Auto-ID technologies will work particularly well in operations with discreet work areas – for example, secured break-pack areas. However, while a DC or back store can position readers to track products moving through

Figure 10: The theft prevention process flow from supplier through to POS and store exit.

Key:
- Reader
- Supplier
- Store
- Tagged Item
- Advanced information sent to customer, Includes UPC codes, Tag Ids, Shipment Information, Etc.

THEFT PREVENTION HIGH-LEVEL PROCESS FLOW



	SUPPLIER	STORE			
		BACK STORE	SHELF	POS	ENTRY/EXIT
KEY ACTIVITIES	– Supplier tags items – Sends advance notice to customer	– Reader reads tags – Verifies receiving accuracy – Updates inventory information	– Out-of-Stock Algorithm – Manage perpetual inventory at shelf – Sweep algorithm to manage theft	– Updates inventory statues – Items read via reader in check-out lane – Update to indicate item is legitimately sold	– Triggers alarm for items leaving the store without sale
TECHNOLOGY REQUIREMENTS	– Source Tagging – Advance notification capabilities – Linking UPS codes with unique Tag Ids (e.g. EPC™)	– Door Readers – Application logic: – Manage perpetual inventory – Track actual vs. expected receipts	– Door Readers – Application logic: – Manage perpetual inventory – Track actual vs. expected receipts	– Short range – Application logic: – Perpetual inventory – Link UPS codes to Item Code – Anticipated vs. sold items	– Door readers readers – Alarms – Application logic: – Unsold item triggers alarm

unauthorized entry or exit points, they will find it more difficult to differentiate between authorized and unauthorized movements through high volume portals – for example, dock doors. This will provide a key challenge for vendors, and the solution may involve using employee RFID bracelets to track not only product movements, but also the individual that moved the product (especially in product environments with high internal theft loss).

Collusion with Customers and Vendors

Internal collusion is another area where Auto-ID may prove beneficial for the organization. At one retail distribution center for example, the on-hand inventory for several brands of cigarettes was never accurately captured for a period of six months. While this distribution center was equipped with all the currently available technology and loss prevention techniques, such as closed circuit TV surveillance, limited access and an extensive audit program, it was later discovered that the loss prevention associate was colluding with internal third shift supervisors. In the current environment, this type of internal theft may take months to detect and in some cases may require outside resources to investigate and prosecute. With Auto-ID's source tagging and product tracking capabilities, these types of incidents may be detected earlier thereby reducing levels of internal shrink.

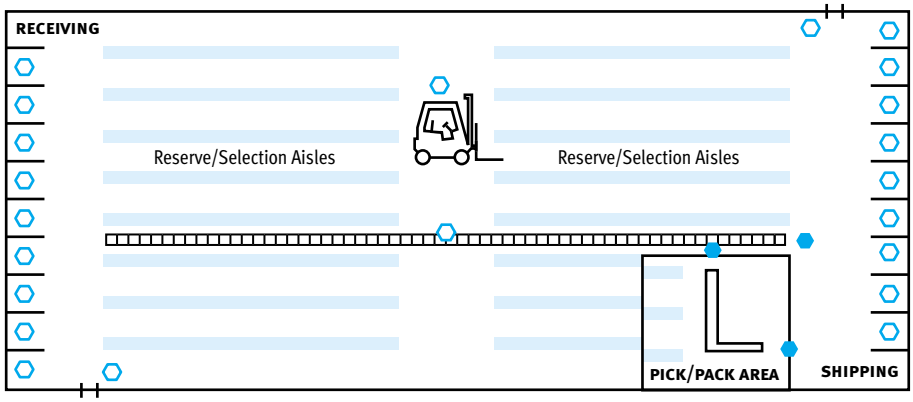
At the Distribution Center…

Auto-ID tracking at the case and item level will provide the ability to detect movement of high value products throughout the DC. It will also provide real-time, on-hand verification of inventory as frequently as that data is required and queried. Specific product categories may be identified and monitored

based on their historical shrink levels with exception reporting Readers could be programmed to report deviations outside designated areas with warning signals sent to the appropriate levels of manage. An invisible fence within the DC would detect and record any deviations from the normal processes to aid in loss prevention management.

Figure 11:

CASE AND ITEM-LEVEL TRACKING IN THE DC



Exterior Door Reader
Pick/Pack Reader

EXTERIOR DOOR READER
How it works...
- Reads item and case tags as product is moved on/off the truck and into the DC or passes through a pedestrian exit
- Validates quantities against ASN and logs cases and product which enter/exit DC

Benefit
- Thefts deterred by readers covering all entry/exit points

Result
- Deterrent effect
- Recording of stolen/short shipped inventory
- Increased accuracy of ingress/egress monitoring

PICK/PACK READER
How it works...
- Reads case/item tags as product enters pick/pack location
- Disassociates item from cases and reassociates to totes upon exit

Benefit
- Ensures accounting for product movement in/through break-pack area
- Tracks inventory within pick/pack area

Result
- Tracking of less than case product
- Handles association of items to totes/cases
- Higher pick/inventory accuracy

The implementation of an Auto-ID solution, as the diagram illustrates, will help DC loss prevention teams "lock" into areas of high shrink and develop programs to monitor and reduce the cost of the problem. Note that, as products are received and progress through the DC, the opportunities to collude are minimized. Readers monitor the receiving process at the receiving docks, standard entrances and exits, flow lanes and shipping docks. Rack, shelves, picking lanes and storage areas will also contain readers to continuously monitor the movement of products. With the technology, early detection is now possible; with early detection, effective strategies could be put in place to prevent the final act of stealing or colluding with other employees. PDA devices used in conjunction with closed-circuit TV will help to monitor the activities as they occur for high risk products even without the employee's knowledge.

At the Store ...

The monitoring does not end with the shipment to the retail store backroom. Readers will also have to be placed at entrances and exits throughout the backroom to monitor receipts. As products are delivered, the system will monitor and record the activity. If products pass back and forth with vendors or delivery personnel at the time of receipt, accountability will be noted. This makes it easier to track the last point of hand off and help pinpoint how the product was stolen. With that knowledge, loss prevention experts will be better equipped to develop effective programs.

As products make it way to the sales floor (only for products tagged at the item level) and to the customer, monitoring continues to the point of checkout. Shelf or strategically placed readers used in conjunction with both EAS and closed-circuit TV will help track the movement of products throughout the store. If items are not checked at the register, a common form of customer collusion, one or all three applications will detect the unrecorded activity. Accountability will now be established and, because of Auto-ID's read, record, tracking and notification capabilities, loss prevention can react more quickly and establish targeted programs to deter or eliminate such activities.

Figure 6 in the external theft discussion is also applicable for internal theft planning, as it shows the tracking of product from receipt at the store backroom to POS and exits.

7.4. Benefits of Auto-ID

There are a range of benefits to be derived from the application of Auto-ID tags to help reduce internal theft. Tags may be applied at the pallet, case or item level to help reduce direct employee product theft, employee collusion with customers and employee collusion with vendors. Table 14 summarizes the pain points as they relate to internal theft by product/industry categories.

Table 14

PAIN POINTS	PRODUCT CATEGORY	AUTO-ID APPLICATION		
		PALLET	CASE	ITEM
PRODUCT THEFT	Grocery	●	●	
	Apparel	●	●	●
	Consumer Electronics	●	●	●
	Pharmacy	●	●	●
	Music & Video	●	●	●
	Toys	●	●	●
	Health & Beauty	●	●	●
COLLUSION WITH CUSTOMER AND VENDORS	Grocery	●	●	
	Apparel	●	●	
	Consumer Electronics	●	●	●
	Pharmacy	●	●	●
	Music & Video	●	●	
	Toys	●	●	
	Health & Beauty	●	●	●

8. SUPPLIER FRAUD

8.1. The Pain Points

Table 15

TYPE OF SHRINK	CURRENT PROBLEM – SHRINK PAIN POINTS	HOW AUTO-ID ADDRESSES THE PAIN POINTS
SUPPLIER FRAUD	Phantom Delivery	Ability to automate verification of invoices to product received would eliminate this vendor fraud
	Invoice Errors	Ability to match quantities received to quantities billed real time would provide the ability to detect and resolve this type of issue
	Returns	Ability to read all product removed for credit and capture quantities through readers would detect this type of fraud
	Over/Under Delivery	Ability to verify actual quantities through readers would detect this type of supplier fraud immediately

8.2. Current Techniques and Technologies

Capabilities in current technology have made it possible to track items between shipping points. Most global product delivery companies like Federal Express are equipped with the tools to monitor products as they pass between the points of the supply chain (e.g., manufacturer to third party warehouse or retailer warehouse). However, small manufacturers and third party suppliers who rely on their own delivery agents are not equipped to provide such sophisticated tracking mechanisms. As a result, phantom deliveries, shipping errors and subsequent invoicing errors plague the industry creating anxieties between trading partners and significant amounts of finger pointing. With an Auto-ID solution, the tracking capabilities and accountability handoff will be more accurate and remove one of the traditional barriers to better relationships between trading partners.

8.3. Auto-ID Solution for Supplier Fraud

The benefits afforded by pallet, case and item-level tagging have been explained in detail in earlier discussions for Internal and External theft as well as process failures in manufacturing. Significant benefits will also be accrued to the industry if an Auto-ID solution is implemented to combat supplier fraud.

Phantom Deliveries
The tracking capabilities will help to reduce phantom deliveries since each delivery will be tracked back to a receiving location with quantities cross-referenced for balancing purposes. No longer will delivery personnel or suppliers be able to say that the item was "left" in the backroom. Accountability will be established and deliveries verified as the product passes through receiving docks or backrooms. The date and time of delivery will be recorded as well as the quantity delivered. Real-time reconciliation will occur as receiving data will be cross-referenced with shipping data and the process of accounting for missing stock begins immediately. Credits for under-shipments and/or debits for over-shipments may commence immediately, which will benefit both trading partners in the long run.

Invoice Errors
By tagging pallets, cases or items, products will be accurately identified. Proper identification makes it possible to develop better accountability and invoice more accurately. The monitoring capabilities afforded by Auto-ID will ensure that the right item is packed and shipped to the right location with the proper documentation. Invoicing errors will be minimized since the proper quantities will be automatically recorded for both the supplier as well as the retailer. This will minimize the levels of over and under-shipments occurring today.

Returns
The process of returns will be properly accounted for with an Auto-ID solution. At the time of consolidation, the store will be able to scan every item back to a returns log because each item is tagged. As the product reverses its way through the supply chain, points of accountability are recorded at each hand-off. If further consolidation is required, information is stored and passed back to the supplier. There are numerous other advantages that Auto-ID presents with returns. Most importantly, Auto-ID will prevent illegal sales of products by delivery personnel while the product is in-transit.

DSD Applications
Although not clearly categorized in any existing shrink research, DSD remains an issue for retailers as some delivery agents have easy access to products, unrelated to their business, in retail stores. What is most important to note is that this classification of theft is difficult to detect using current systems and technology unless closely monitored. Vendors and delivery agents generally have easy access to other products and are seldom monitored as they come and go. With Auto-ID item-level tagging, however,

this form of shrink can be closely monitored and the right type of loss prevention program may be implemented to reduce losses.

Auto-ID tagging provides a more efficient way to monitor the activities of all products. As high-risk products leave shelves, they may be monitored as they pass through entrances and exits. While vendors and delivery agents will continue to have free access to stores, the monitoring process will prevent theft created by shelf sweeps of expensive items into bags, crates or boxes. With the monitoring capabilities at the store level, item-level tracking of DSD product being received will be achieved. Store on-hand values will be adjusted to reflect correct quantities and provide accurate inventory for better projections. Credits would also be noted as items pass through exits or scanned with hand-held devices prior to the agent leaving. This capability would help to minimize shrink due to supplier theft, collusion, and administrative errors in the receiving process.

Many DSD distributors manage the staging, loading and delivery of product and focus on maintaining inventory accuracy. They want to provide exceptional customer service to their retail customers, however, the industry is plagued with examples of supplier theft and collusion complicated and concealed by administrative shrink issues. There is often a great deal of time spent by both manufacturers and retailers to manage those types of risks. Case and item level applications of Auto-ID would provide the ability for DSD firms to track what was loaded on to trucks at the start of the day, track what product was removed at each delivery, and match those quantities to what was read as received at each store location. We recognize that many DSD operators manage this process today, although the verification effort is laborious. The same process would happen in reverse to handle credits that were picked up at the retailer and returned to the distribution center. Product that was removed from the retailer would be captured at the back door scanner and then captured as it was loaded onto the truck. This ability to monitor real-time and throughout the daily route would dramatically reduce the opportunity for delivery errors and credit errors to occur, theft to go undetected and the opportunity for collusion between drivers and store personnel would be all but eliminated.

8.4. Benefits of Auto-ID

There are many benefits to be derived from the implementation of an Auto-ID solution to prevent supplier fraud in the areas of phantom delivery, invoice errors and returns (see Table 16). Phantom delivery when closely monitored may be completely eliminated, invoice errors may be reduced and returns fraud may be easier to detect and prevent.

Table 16

PAIN POINTS	PRODUCT CATEGORY	AUTO-ID APPLICATION		
		PALLET	CASE	ITEM
PHANTOM DELIVERY	Grocery	●	●	
	Apparel	●	●	●
	Consumer Electronics	●	●	●
	Pharmacy	●	●	●
	Music & Video	●	●	●
	Toys	●	●	●
	Health & Beauty	●	●	●

Continuation of Table 16

PAIN POINTS	PRODUCT CATEGORY	AUTO-ID APPLICATION		
		PALLET	CASE	ITEM
INVOICE ERRORS (INCLUDING OVER/UNDER DELIVERY)	Grocery	●	●	
	Apparel	●	●	
	Consumer Electronics	●	●	
	Pharmacy	●	●	
	Music & Video	●	●	
	Toys	●	●	
	Health & Beauty	●	●	
RETURNS	Grocery	●	●	
	Apparel	●	●	●
	Consumer Electronics	●	●	●
	Pharmacy	●	●	●
	Music & Video	●	●	●
	Toys	●	●	●
	Health & Beauty	●	●	●

9. PAPER SHRINK

Paper shrink also accounts for a considerable amount of shrink in the retail environment. Most retailers attribute the third largest shrink value to administrative or process failures and in some cases, the value of paper shrink is as large as external or internal theft. Paper shrink in retail comes in the form of unrecorded returns, scanning errors at checkout, promotions errors, incorrect price reductions, and inaccurate inventory checks.

9.1. The Pain Points

Table 17

TYPE OF SHRINK	CURRENT PROBLEM – SHRINK PAIN POINTS	HOW AUTO-ID ADDRESSES THE PAIN POINTS
PAPER SHRINK	Pricing Errors (Regular and Promotion)	Ability to automate price file downloads to retail stores will help reduce the need for in-store price verification
	Scanning Errors	Item-level tagging will eliminate scanning errors through automated checkouts
	Unrecorded Returns	Returns will be recorded more accurately as the item-tagging information will already exist in the master files
	Incorrect Store Physical Inventory	Ability to verify actual quantities through shelf or hand-held readers will help to reduce incorrect inventory counts during periodic physicals

9.2. Current Techniques and Technologies

New capabilities in price management and price tracking have increased the accuracy of pricing items. Promotional pricing errors are being minimized with new software that allows for better item master file management. New devices are constantly being introduced to the marketplace to also improve the accuracy of scanning both on shelves as well as at POS terminals. Wal*Mart along with other large multi-category retailers such as Meijer have all tested and introduced self-checkout counters. The reliability of new scanning devices at the POS terminal has made this possible. Some retailers are now using handheld RF scanning devices to conduct in-store physical inventories as well as warehouse counts. Although these new devices are being used by, large, multi-category retailers, reliability and data accuracy remains an issue. With an Auto-ID solution, the item-tagging feature will serve to enhance the tracking and recording capabilities and ensure that accurate information is being passed through all points of the supply chain.

9.3. Auto-ID Solution for Paper Shrink

The benefits afforded by pallet, case and item-level tagging for process failures was discussed earlier for the manufacturer. Downstream benefits will also accrue more to the retailer from case and item-tagging.

Pricing Errors
By tagging items, pricing errors will be reduced if not eliminated. When each item is tagged, the suggested retail price will be maintained as it passes through various points on the retailer side of the supply chain. Master files will contain the correct price during regular or promotional selling. Promotional price changes will be sent down to stores and as the item passes through the POS system, the correct pricing will appear, consistently. The retail experience of waiting in line while the cashier summons price verification assistance from the shoe or department because the price was removed due to multiple handling will no longer exist as the tag will contain the price history for the item. Item-tagging will reduce the error of recording the incorrect price or manually placing an assumed price tag on the item because of the effort required to do a price look-up. Auto-ID tagging will now make it possible to run blanket 50%-off promotions or advertise clearance without manually tagging each item. We would envisage consumers would use hand-held devices to conduct price checks (perhaps fitted on their shopping carts), or use fixed mounted price-check devices such as are in use today.

Scanning Errors
Scanning errors are a documented problem for retailers. Warehouse scanning errors can cause the wrong item to be sent to the wrong store. There is usually a significant cost for this error. Mis-shipped products generally become markdowns of the receiving store. Returning mis-shipped products to the warehouse because of scanning errors also can also be a costly experience for retailers. At the store level, scanning errors usually occur at the point of receiving or at the POS. Un-scanned items at the point of receipt creates an inventory short and may cause over replenishment or allocations as the system does not recognize the on-hand values appropriately. Un-scanned items become unintentional theft at the POS counter or add to the administrative “nightmare” at the time of inventory count. The monitoring and tracking capabilities provided by Auto-ID will ensure that at all times items being received and sold are scanned correctly.

Unrecorded Returns
The process of returns will be properly accounted for with an Auto-ID solution for the retailer. At the time of the return to the store, the receiving store will be able to automatically identify the product as one that was either originally sold at that location or a store within the chain. The Auto-ID solution will not only prevent stolen items from being returned to the store but will help store associates become more compliant with the returns process. The returned item will be scanned upon re-entering the store by readers and re-activated by the store associated with the correct price tag. Store associates will need only use the available hand-held device to validate pricing if the item is being returned to the shelf for resale. If the product is being returned

to the supplier, the correct information already exists and points of accountability are recorded at each hand-off, making it more difficult to steal or misplace the item as it flows through the reverse supply chain.

Incorrect Store Physical Inventory

The process of taking physical inventory at both the retailer DC and store becomes easier with an Auto-ID solution. Readers will scan items in both the back room and store selling area based on the designed solution. Physical counts will be done at the "push of a button" and the accuracy with which this is done will provide assurance that what was counted is really owned. No more long hours and days to perform quarterly or annual physicals. The need to hire manual counters will be reduced if not eliminated. With the correct level of supervision, physical inventory will be centered upon the frequency of the count rather than the length of time and manpower required to execute the process. In addition, the error rate will be significantly reduced with Auto-ID.

9.4. Benefits of Auto-ID

There are many benefits to be derived from the implementation of an Auto-ID solution to help reduce the incidents of paper shrink for the retailer (see Table 18).

Table 18

PAIN POINTS	PRODUCT CATEGORY	AUTO-ID APPLICATION		
		PALLET	CASE	ITEM
PRICING ERRORS	Grocery	●	●	
	Apparel	●	●	●
	Consumer Electronics	●	●	●
	Pharmacy	●	●	●
	Music & Video	●	●	●
	Toys	●	●	●
	Health & Beauty	●	●	●
SCANNING ERRORS	Grocery	●	●	
	Apparel	●	●	●
	Consumer Electronics	●	●	●
	Pharmacy	●	●	●
	Music & Video	●	●	●
	Toys	●	●	●
	Health & Beauty	●	●	●
UNRECORDED RETURNS	Grocery	●	●	
	Apparel	●	●	●
	Consumer Electronics	●	●	●
	Pharmacy	●	●	●
	Music & Video	●	●	●
	Toys	●	●	●
	Health & Beauty	●	●	●
INCORRECT STORE PHYSICAL ERRORS	Grocery	●	●	
	Apparel	●	●	●
	Consumer Electronics	●	●	●
	Pharmacy	●	●	●
	Music & Video	●	●	●
	Toys	●	●	●
	Health & Beauty	●	●	●

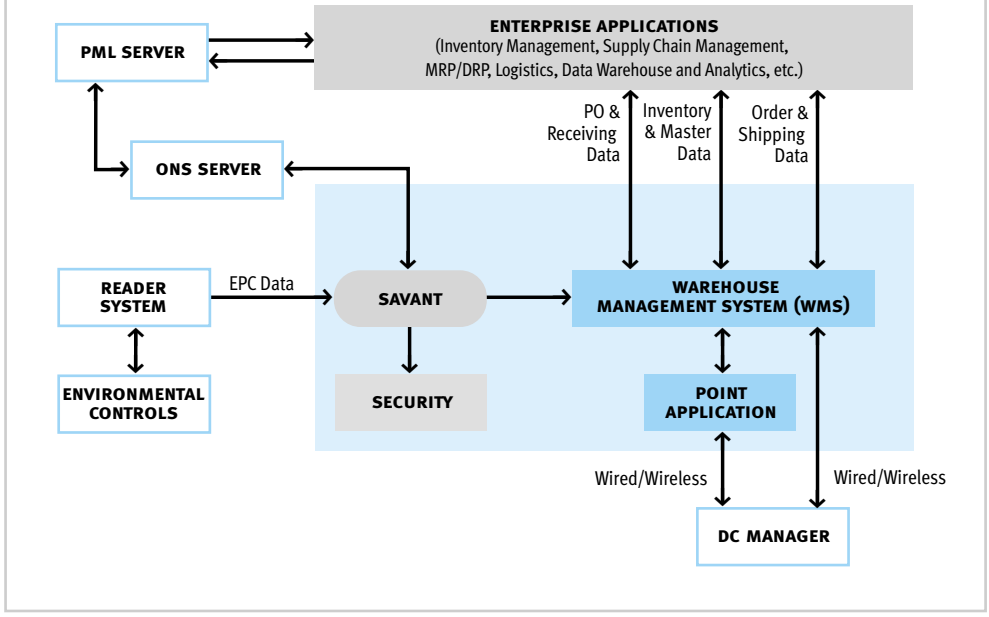
10. TECHNOLOGY INSIGHT

This analysis follows the technology insights provided in the previous two IBM Business Consulting Services Auto-ID white papers, **Focus on Retail:Applying Auto-ID to Improve Product Availability at the Retail Shelf** and **Focus on Supply Chain: Applying Auto-ID within the Distribution Center**. While touching on many of the same technology considerations, the technology insights and cost assumptions in this paper focus on the incremental requirements for a shrink in an environment where Auto-ID solutions for product availability and distribution Center have been implemented.

Implementation at the DC (following on from the blueprint featured in Figure 8 earlier)
True benefits of the Auto-ID system can only be obtained if there is tight integration between the Savant™ and the other applications within the DC. Modifications of existing systems and development of new logic and functionality will be necessary. Additionally, integration with security and other monitoring systems will have to be developed. Figure 12 below depicts the Auto-ID conceptual applications environment in a DC setting.

Figure 12

CONCEPTUAL APPLICATIONS ENVIRONMENT – DC



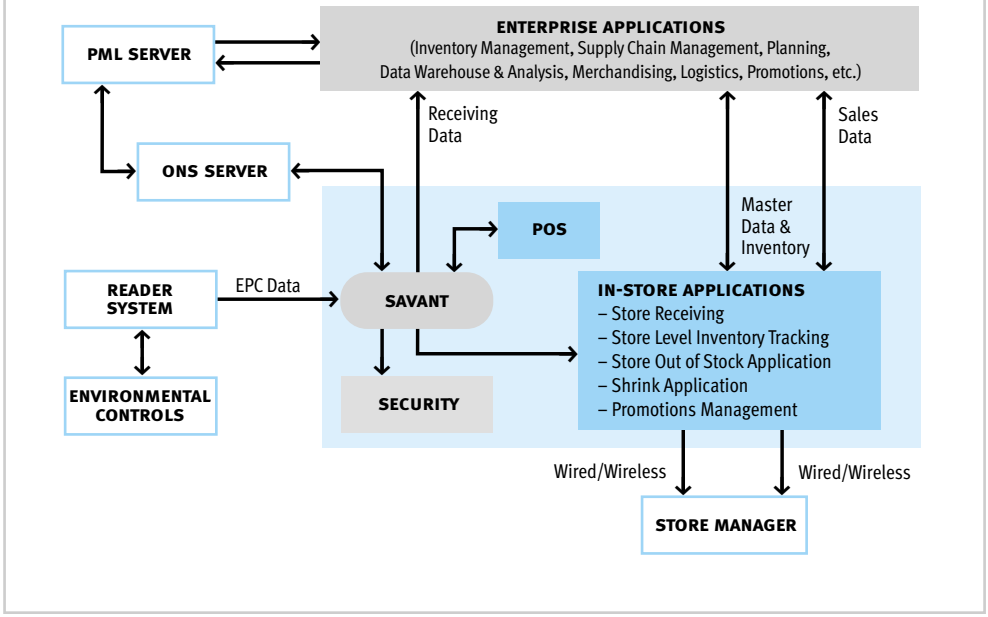
Implementation at the Retail Store (following on from the blueprints featured in Figure 9)
Managing shrink at an item level in a store will require a more complex network of reader-systems infrastructure to enable reading of individual items on shelves, at display counters, and at the doors. Figure 9 (shown earlier in this paper) depicts how shrink can be managed using item-level tagging in a retail store with the deployment of the appropriate reader infrastructure. Auto-ID can monitor and reduce theft at retail through perimeter monitoring, defensive smart shelves, and POS integration. To facilitate perimeter monitoring, door readers can be tied to store alarm and surveillance systems so that they can be triggered when an item leaves the store without being registered in the POS system. However, in this case, incremental investments need to be made to integrate perimeter monitoring systems and logic to track shelf sweeps and large inventory movements.

True benefits of the Auto-ID environment can be obtained only if there is tight integration between the Savant™ and other applications within the enterprise. Availability of very near real-time POS data will be necessary for integrating the door readers with store alarm and surveillance systems to prevent the triggering of false security alarms. Tracking sales at the item level will enable customer service to determine whether or not an item being returned was purchased from that store. This will both reduce instances of return fraud as well as improve customer service by allowing customers to buy at one store and return at another. Modifications to existing systems and the development of new in-store applications will have to be made to support store receiving, inventory tracking, out of stock, shrink and obsolescence applications. Figure 13 below depicts the conceptual applications environment.

From a technology viewpoint, implementing Auto-ID to minimize shrinkage will require manufacturers and retailers to assess their current technology assets, and to develop a migration and investment plan to move to the new environment. Each DC/store will need to carefully design requirements related to reader systems, assess incremental storage and data mining needs, and enhance existing software applications to pave the way for the Auto-ID implementation.

Figure 13

CONCEPTUAL APPLICATIONS ENVIRONMENT – STORE



11. MANAGING CHANGE: IMPLEMENTING EMERGING TECHNOLOGY IN YOUR ORGANIZATION

Integrating Auto-ID technology into an existing operation has fundamental challenges to ensure successful realization of potential benefits. It has been documented that nine out of ten technology implementations fail due to lack of attention to change management and organizational issues. Failures have been attributed to lack of communication, competing for resources, functional boundaries, and employee resistance. Implementing the Auto-ID solution will also be faced with similar challenges but with proactive planning and use of change management skills, all of these obstacles can be overcome. In our view the key challenges are:

Challenge 1: Re-evaluating the role of the loss prevention/asset management department in your organization
Challenge 2: Harnessing the power of real time data within current operations
Challenge 3: Readjusting resources to take advantage of the savings
Challenge 4: Employee and customer relations
Challenge 5: Re-engineering operations
Challenge 6: Integration of multiple technologies

Challenge 1

Re-evaluating the role of the loss prevention/asset management department in your organization
Using Auto-ID will not only allow an organization to calculate accurate shrink numbers real-time, but it will also identify areas of vulnerability so that loss prevention strategies can be modified to reduce shrink. Today, loss prevention departments are primarily focused on external shrink at the retail level, which is generally customer theft. Because there is little accurate information available, most loss prevention departments are forced to be reactive. Currently, loss prevention departments do not have a strategic focus and have been lulled into thinking that shrink is a part of daily life in retail. The most popular deterrent to external shrink is an EAS system. Time and money are spent on creating a physical presence and implementing visible systems to serve as a deterrent to thieves.

Auto-ID will give the loss prevention department more information to strategically develop security plans. Instead of focusing on tactical strategies to decrease shrink at retail, loss prevention management can develop strategic plans throughout the supply chain. Loss prevention departments can share information and work together to manage the stores, distribution centers and manufacturing plants instead of working in location silos to reduce shrink. With the new information provided by Auto-ID, loss prevention management can focus on developing processes to combine the system, employees and facilities into a cohesive, integrated environment.

Challenge 2

Harnessing the power of real time data within current operations
In the Auto-ID environment, loss prevention has detailed information about the movement of product in a facility and throughout the supply chain. The loss prevention department is armed with detailed information on items that have left the building without being paid for and, upon apprehension of a suspect, can look for specific items that have been stolen. The new information will also aid in successfully prosecuting criminals when caught with stolen merchandise. This will send a clear message to would-be thieves about the increased probability of getting caught and prosecuted for stealing merchandise, resulting in a decrease in external shrink.

Challenge 3

Readjusting resources to take advantage of the savings
The budgets of a loss prevention department will change in the Auto-ID environment. Savings in funds designated for loss prevention can be redirected in other areas due to savings in personnel, and physical deterrents. Fewer loss prevention personnel will be needed because it will not be necessary to hire security to watch high crime areas and to stand watch at exits. Security infrastructure costs to install two- way mirrors and dedicated areas above the sales floor to watch would-be thieves will decrease. EAS detection devices systems will no longer be needed at restrooms and at the entrances of high margin item departments. Examples of specific areas of savings include:

- Reduced labor spent on auditing and verification activities at each hand-off in the supply chain (checking product quantities in and out and manual verification);
- Reduced labor spent researching and disputing invoice errors throughout the supply chain (between manufacturer and retailer);

- Reduced labor spent in loss prevention on reactive tasks (head count versus combination of technology and exception reporting to pinpoint areas of concern);
- Reduced loss of materials and products (average value per incident);
- Increased sales due to improved in-stock position (average time a product is out of stock due to theft before it is detected and corrected); and
- Reduced liability from confronting perpetrators and risk of lawsuits or liability.

Challenge 4

Employee and customer relations

There are several benefits that will enhance the relationship between customers and loss prevention personnel in an Auto-ID monitored environment. Using Auto-ID should decrease the number of misreads by the EAS system, a current cause of embarrassment for customers and employees. In particular, ubiquitous EPC™ adoption reduces "EAS pollution" caused by tags that were never deactivated. Items tracked by Auto-ID are released from inventory after payment is made which therefore decreases the opportunity for security misreads as the customer exits the location. The controversial profiling of customers can be eliminated with the assurance that all customers will be caught without targeting customers with similar characteristics.

Customers will have better access to items that no longer have to be kept behind counters to thwart theft. Today, customers are often inconvenienced because many fast moving, high priced items such as razors and batteries are placed behind counters in an effort to decrease theft. With Auto-ID, high-risk items can be put out on shelves for customer access freely. Customer relations are enhanced because loss prevention staffs are no longer watching customers as they shop, but instead monitoring the system in place.

Challenge 5

Re-engineering operations

To get the greatest benefit from the Auto-ID system, all employees must be trained on what the system does, the type of information available, and how to use the new information. Information accuracy is still subject to errors when employees are not following proper procedures. The Auto-ID system uses information at checkout to update inventory status. Cashiers must be trained to scan items individually instead of scanning one item and hitting a multiple button to ensure inventory numbers remain accurate.

Customer fraud is difficult for loss prevention management to accurately track because it is hard to prove that a person did not purchase an item. If for example, a customer tries to return an item that was previously stolen, the system will alert personnel that the item was not previously paid for and the cash-back transaction is voided. Procedures must be developed and employees trained on appropriate responses for handling situations like returns fraud.

Process failures will virtually disappear with the use an Auto-ID system. Items will be tracked upon entry to the backroom and as the product moves throughout the store until purchase. Inventory counts will be more accurate and can be viewed at any time desired by management. Prices on the shelf can be kept up to date with price changes due to promotions, obsolescence, etc. so that sales are booked at the right price.

Challenge 6

Integration of multiple technologies

Implementing Auto-ID will be a major change and, in some cases, an organization may choose to make the transition in stages. Case-level tagging will certainly improve the inventory tracking of products and have an affect on process failures. Real-time counts of inventories will provide a better picture of where the shrink is occurring but it will still require loss prevention management to have reactive systems in place to catch item level thievery. For example, EAS systems will still be needed to detect unpaid for items passing through exit doors. Similarly, in a case-level tagging environment, exit doors will still need detection systems to alert security personnel.

Implementing Auto-ID will require developing new solutions and processes while still utilizing existing processes and technologies. Organizational change issues must be carefully considered in order to be successful. The recommended approach is to first develop and test the new processes in a laboratory store to help identify and address any issues and challenges. Once specific management programs are proven effective in the lab environment, they can be prototyped and rolled out to the appropriate manufacturing sights, distribution centres, and retail store locations.

Piloting various Auto-ID applications, beginning with the manufacturer through to the retail store, can provide benefits in the near term and better prepare organizations for migration to a wider Auto-ID application in the future. Creating the proper blend of technology, process and people skills can be fine-tuned through isolated piloting in specific high-risk categories.

The marriage of technology, process and personnel will help to reduce process failures, internal and external theft occurrences and provide manufacturing management and store management loss prevention personnel with the ability to proactively detect and react to all types of shrink activity. Once an Auto-ID program is in place, process failure issues would be minimized and both internal and external thieves would be very aware of their risk of detection.

12. THE AUTO-ID BENEFITS CASE FOR SHRINK

12.1. Approach

The IBM Business Consulting Services White Paper series does not constitute an Auto-ID business case for any one company. Benefits and costs are presented at the "system level", or valuechain level. We conducted our analysis for a generalized consumer products value chain system with the following broad characteristics (see Table 19):

Table 19

1. Grocery
2. Apparel
3. Consumer Electronics
4. Health & Beauty
5. Music & Video
6. Pharmacy
7. Toys

	1	2	3	4	5	6	7
PALLETS	5,714	1,235	718	323	54	78	605
CASES	400,000	22,222	–	16,132	1,620	3,902	18,148
ITEM	8,000 M	667 M	65 M	726 M	259 M	312 M	363 M
MFG PLANTS	4	3	3	3	4	4	4
MFG DCS	10	4	3	5	4	5	4
RETAIL DCS	25	25	25	25	25	25	25
RETAIL STORES	800	800	800	800	800	800	800
AVG PRICE	$1.75	$14.00	$130.00	$9.00	$18.00	$26.91	$18.00

Developing your own strategy, migration path and business case must reflect the specific characteristics of your value chain, products, current performance and capabilities, as well as overall business objectives.

The business case for the application of Auto-ID to improve shrink references the volume and value assumptions made for the overall supply chain. These high level assumptions are then augmented by more detailed assumptions covering store costs, industry research concerning shrink, and assumed rates of sales loss due to shrink.

To quantify the benefits of Auto-ID application on shrink, each of the pain points was given a relative value (defined by its individual impact on shrink). For each value, the potential positive impact of Auto-ID application was estimated and expressed as a percentage. From this, a total positive impact was generated in terms of improved sales and gross margin. The impacts of shrink (as percent of revenue) for the manufacturers and retailer in our model are provided in Appendix D.

The business case was developed at the pallet, case and item level to provide insight into the likely adoption path. However, it is worth stating here that the assumption of lost sales due to shrink was taken as 1–2% (although some studies have suggested in could be as high as 3%).

It should be noted that a conservative approach was also taken in estimating impact, and that actual benefits may be significantly higher. Benefits were developed for sales improvements in product categories caused by improvement in shrink rates, expressed as an increase in revenue. Benefits were calculated for all product categories in the manufacturing and retail segments of the supply chain.

12.2. Benefits Summary

Shown below in Table 20 are the anticipated benefits from implementing Auto-ID at the case and item levels.

Table 20: Total Value Chain

ANTICIPATED BENEFITS AT THE CASE & ITEM LEVEL IN $000'S		
	CASE-READING	ITEM-READING
Grocery	$90,646	$86,556
Apparel	$100,338	$99,379
Consumer Electronics	–	$50,495
Pharmacy	$71,846	$75,024
Music and Video	$25,203	$24,810
Toys	$57,189	$55,187
Health and Beauty	$58,156	$55,241

Case level benefits do not include pallet level benefits. We articulate benefits at a case and item level because we believe few end users will consider an implementation restricted only to pallet tracking. Though introduced in the Prelude section, here is a reminder of the sales split in the retail store by product category (Table 21):

Table 21: Supercenter

SALES BREAKDOWN IN A LARGE SUPERCENTER	
Grocery	24.2%
Apparel	16.1%
Consumer Electronics	14.5%
Pharmacy	14.5%
Music and Video	8.1%
Toys	11.3%
Health and Beauty	11.3%
TOTAL	**100%**

Finally, it should be noted that we have taken a realistic view of the implementation roll-out at pallet, case and item level (starting 2003). Our figures reflect pallet and case-level implementation in Year 1, item-level implementation for apparel, consumer electronics, pharmacy, music & video, toys and health & beauty in year 2, and item-level implementation for grocery in year 3.

Benefits from implementing at item level are in the same range as benefits from implementing at case level, reflecting the differences that cause shrink to occur. Namely, shrink at the manufacturer is primarily caused by process and administrative failures, and that impact is visible at case level. On the other hand, shrink at the retailer is primarily caused by theft, and that impact is visible at item level.

The actual impact on shrink will vary from retailer to retailer, category to category, and geography to geography. However, using the model we have created, an opportunity clearly exists to reduce lost sales due to shrink which, given the lack of progress over the last 10 years, will represent a dramatic improvement over current practices.

12.3. Costs Summary

The costs of deployment are shown below in Table 22. The costs exclude the cost of the tags, which are absorbed at the first place of use, typically the manufacturer. Furthermore, these costs are incremental to implementation costs covered in our initial white papers (see Product Availability and Distribution White Papers). In this case, incremental costs cover additional interfaces and new application logic to track shrink as well as additional security hardware and hand-held devices.

Realistically, few organizations will consider implementing Auto-ID based on shrink reduction alone. Therefore, it is important to consider these incremental costs and benefits in the wider context of the range of impacts of this truly integrated technology offering promises (see Prelude section).

Table 22

INCREMENTAL COST OF DEPLOYMENT IN $000'S				
COST COMPONENTS	**INDIVIDUAL STORE**		**SYSTEMWIDE**	
	Case-reading	Item-reading	Case-reading	Item-reading
TOTAL	$78	$150	$9,678	$16,150
Cost per store (amortized cost)	$12	$20	–	–

Manufacturer Benefits

Participants in our interviews from the manufacturing segment of the supply chain cited process failures as the primary shrink category affecting their operations. They were less concerned about external theft, internal theft and supplier fraud. This could be a factor of not being able to quantify these types of shrink, however we based our manufacturing analysis on process failures on this feedback. It should be noted that implementing Auto-ID at the manufacturing facility would have the added benefit of decreasing internal shrink. See Table 23.

Table 23:
Manufacturer Benefit

ANTICIPATED BENEFITS AT THE CASE & ITEM LEVEL IN $000'S		
	CASE-READING	ITEM-READING
Grocery	$30,093	$2,074
Apparel	$33,442	$1,827
Consumer Electronics	–	$9,521
Pharmacy	$25,558	$1,432
Music and Video	$8,359	$468
Toys	$16,920	$948
Health and Beauty	$17,886	$1,002

As manufacturers primarily deal with cases and pallets, it is expected that the large portion of the benefit from Auto-ID implementation will be derived at the case level.

The exception to this is a manufacturer in the Consumer Electronics product category – most of the items in this category are not packed into cases – i.e., they are stacked individually onto a pallet (e.g., VCRs, DVDs, TV sets). Thus, manufacturers in the Consumer Electronics category derive benefit from shrink reduction on an item level.

Retail Benefits

The type of shrink that has the greatest impact on the retailer is internal and external theft, followed by process failures. Our analysis has shown that process failures occur primarily at retailer's distribution center, whereas theft is prevalent at the retail store. Those facts are demonstrated in Table 19 below, where the anticipated benefits are aggregated on a retailer level.

Table 24:
Retailer Benefit

ANTICIPATED BENEFITS AT THE CASE & ITEM LEVEL IN $000'S		
	CASE-READING	ITEM-READING
Grocery	$60,553	$84,482
Apparel	$66,897	$97,552
Consumer Electronics	–	$40,974
Pharmacy	$46,288	$73,592
Music and Video	$16,844	$24,341
Toys	$40,270	$54,239
Health and Beauty	$40,270	$54,239
TOTAL BENEFIT	**$271,121**	**$429,418**

Our research has shown that internal and external theft is responsible for 70–80% of shrink at a retail store, depending on a product category. Thus, an improvement in internal and external theft reduction in a retail store is responsible for higher benefits accrual at item-level adoption.

On the other hand, process failures have the highest incidences for shrink at the retailer's distribution center. Therefore, reduction in process failures is the main factor in anticipated benefits at case level.

The only product category with benefits that are significantly lower on both levels of adoption is music and video. That fact is due primarily to current levels of theft protection and to availability of those items through different channels where theft occurrences may be higher.

12.4. Other Benefits of Auto-ID

The quantifiable benefits of deploying an Auto-ID capability within the supply chain have been the primary focus of this paper. However, what is harder to quantify in the Auto-ID environment is the potential impact on the performance of the organization. These are traditionally classified under the heading of "soft benefits", but, in reality, the benefits of Auto-ID are far more transformational in nature.

At one level, the increased accuracy, visibility and integrity of data available will allow the retailer to fundamentally reengineer how the store is organized, redefine margin resource priorities, and set new measures of performance. For example, in terms of shrink, store resources could be focused on managing availability, responding to system driven alerts of impending shrink, proactively launching promotion activity, developing strategic loss prevention plans and reviewing the effectiveness of margin allocation.

These peripheral benefits can only help the retailer to build and retain consumer loyalty. Consumers today are smarter and more selective in their shopping habits. Factors such as price and shopping experience will influence consumers' preferences when deciding where to spend their money. Research has shown that consumers will not shop in retail locations were product availability is unstable and they feel loss prevention personnel are constantly watching them shop. For a retailer, these are consumers that they need not lose once an Auto-ID capability is deployed. Indeed, superior shrink reduction will become a competitive advantage and help to drive sales growth for those retailers who embrace this new capability.

Additionally, such technology supports the reduction of defensive merchandising, and even allows the introduction (or re-introduction) of high risk SKUs into stores that suffer high rates of theft. This will enhance the consumer shopping experience and uplift sales revenues.

The benefits of Auto-ID can be realized throughout the entire supply chain. For example, greater real-time visibility of product movement within the supply chain can help both the retailer and manufacturer to better understand the root causes of shrink issues. Communications and working relationships will be enhanced because of the increased accuracy of inventory information. Together, they can jointly design new processes to support improved product flow and increase the benefit for the all segments of the supply chain.

APPENDIX A

A1. Process Failures/Paper Shrink

Process failures constitute upwards of 78% of consumer goods manufacturers' shrink losses. Indeed many of the manufacturer participants in our study stated that they believed "process failures" to constitute almost all of their shrink losses, as they had focused on reducing internal theft to a minimum. However, those same manufacturers were at pains to point out that this did not diminish the seriousness or size of the shrink problem caused by process and administrative failures!

Retailers ranked process failures as the third largest source of shrink within their operations. In 2001, the ECR survey found that for retailers, administrative failures account for 27% annual shrink. During the same period, the NRSS survey reported shrink in the US of 17.5% while in the Australasia process or administrative shrink accounted for over 18% of annual shrink. In Canada, process failure accounted for 21% of annual shrink in 2000.

Table 25:
Source: 2001 National Retail Security Survey 11.

PROCESS FAILURE	
PROCESS FAILURES CATEGORIES (US)	**PERCENT**
Books/magazines	35.0%
Jewelry	31.3%
Cards/novelties	25.8%
Home Centers/hardware	23.0%
Children's Apparel	22.5%

So why are process failures such an issue? In a recent workshop on Radio Frequency Identification (RFID) and shrinkage conducted by ECR Europe, several key elements were identified as the cause of process failures within the Distribution Center (DC) and the Retail Store. These reasons include:

- **Delivery errors:** wrong products being delivered to the wrong place and poor recording of transfers between DCs and stores create delivery type errors.
- **Pricing and invoicing errors:** incorrect pricing and invoicing of product, either below the planned price or incorrectly discounted in connection with product promotions.
- **Scanning errors:** staff incorrectly scanning products on the racks or shelves causing errors in the inventory; checkout staff forgetting to scan products; or, incorrectly entering the product identification code.
- **Returns:** products legitimately returned by customers may not be correctly recorded.
- **Master file errors:** Incorrect entry of product information on master files can lead to an incorrect inventory values in the system.
- **Incorrect inventory checks:** store or DC personnel miscounting product in the either location will easily create instance of poor inventory count and valuation.
- **Intracompany transfers:** incorrect misplacement of products as they move through the supply chain or different parts of the organization results in the poor accounting of inventory
- **Product promotion errors:** sales of products at promotional prices unintentionally will certainly cause shrinkage or incorrectly applying multi-buy discounts

A2. External Theft

Estimates of external theft range from 21% to 42% of total shrink.

- ECR Europe (2001) attributes 37% of total shrink to either shoplifting, returning stolen goods, grazing, till snatches or burglary;
- The NRSS (2001) reports approximately 30.8% or $10.23 billion of inventory shrinkage was caused by external theft, in spite of the fact that increased emphasis has been placed on introducing security measures to reduce or eliminate the problem;
- Estimates for Australasia report external shrink at 23%, the lowest in reported studies; and,
- Canada compares more closely with Europe reporting external shrink at 40%.

Source: Center for Retail Research 2000

Shoplifters Hit Parade! Ten Most Frequently Stolen Items

1. Gillette razor blades
2. Alcohol (mostly 'pouring quality' for sale to pubs): Scotch such as Jameson, Teachers, Bells, Grants, Jack Daniels and Jim Beam; Vodka and Bacardi
3. Toiletries (including Oil of Olay and Lynx), cosmetics, fine fragrances
4. Clothing and lingerie
5. Batteries (mainly Duracell)
6. DVDs, CDs (particularly Rap and dance music) and computer games
7. Pills, vitamins, contraceptives and pregnancy testers
8. Electric toothbrushes, Braun gas cylinders
9. Instant coffee (Nescafe)
10. Steak and packs of meat

There are four primary types of external theft:

Shoplifting
Removing items from the store without paying for them (typically in bags, under clothing or hidden in strollers). In the past, some retailers, primarily department and discount stores, restricted customers from entering stores with bags and strollers. Although effective, this practice was seen to be too intrusive and over time was abandoned because of customer sensitivity.

Returns fraud
There are a myriad of ways in which perpetrators receive cash or credit fraudulently. From returning stolen goods for cash; to using a receipt from a legitimately purchase item for a cash refund on an identical product only seconds previously pick up from the rack/shelf. Even more blatant, fraudsters pick products from the rack/shelf and simply walk up to the customer service or returns counter and demand a cash or credit refund. In many cases, a receipt showing proof of purchase is not required. Retailers have tried to tighten controls to reduce returns fraud, but the problem persists, largely because there is no proven proof of purchase link between the receipt (if proffered) and the product.

Burglary
A more serious offense, burglary is generally committed with forceful entry and removing goods or cash.

Some of the key causes of external theft involve collusion with employees, where employees and customers conspire to defeat existing loss prevention technologies and techniques.

Manufacturer participants in our study reported suffering external theft to a lesser degree (only 11%), although for some product categories theft by a contractor or carrier from company premises is most likely a more serious issue.

A3. Internal Theft

Internal theft (committed by employees) accounts for 34% to 62% of total shrinkage at the retail level, depending on the study you review. Despite the obvious seriousness of this source of shrink, organizations focus their efforts and resource primarily on external theft. There are several reasons for this:

1. First, a lack of reliable, timely and detailed data on stock loss makes it difficult to detect the size and sources of internal theft.
2. Second, organizations may find it hard to accept that their employees are negatively impacting their bottom line, and are therefore reluctant to take action. There is also often a perceived risk of impacting staff morale.
3. Third, internal crimes are usually more difficult to detect and investigate, and employees have insider knowledge and can therefore implement less traceable theft actions.

The NRSS reports that internal theft in the US accounts for $15.23 billion of annual retail sales or 45.9% of annual shrinkage for 2001. This remains the largest percent value of shrink in the US over recent years. Comparatively, ECR Europe reported internal theft as the second largest contributing factor at 24% while studies conducted by Australasia reported internal theft as the single largest contributing factor to annual shrink at 54%, the highest reported statistics in any shrink research.

Some specific types of internal theft include:

Theft of Stock
This involves the staff taking goods from the premises by either hiding it in their bags or person or intentionally placing the item outside the building for collection later.

Collusion or Sweethearting
A very common form of internal theft, collusion occurs when the member of staff works with customers to steal products. The staff member usually is in the position as a security person or operates the cash register. During collusion incident, the staff may not scan the item or the security person may intentionally ignore the offense as it occurs. Collusion may also occur when stolen items are being returned to the store.

Manufacturer participants in our study reported suffering internal theft to a lesser degree (only 11%).

A4. Supplier Fraud

Supplier fraud may be defined as losses due to suppliers or their agents deliberately delivering fewer goods than companies are then invoiced for. Key ways in which this form of shrink takes place:

Phantom Delivery, Invoice Errors, Return, Over/Under Delivery and Quality/Weight of Items.

Losses due to supplier fraud represent the smallest slice of the shrink pie. In 2001, suppliers stealing merchandise while in the store stocking shelves represents 5.9% (based on the NRSS study). Conversely, supplier fraud in Europe accounted for 12% of total shrink loss according to ECR Europe studies. Supplier fraud accounted for 5% and 8% in Australasia and Canada, respectively.

Conversely, during our research with leading consumer goods companies, the problem of over-delivery appeared more than once. Clearly this is the opposite of supplier fraud, and it caused by time-pressured or cautious shipping personnel “erring on the side of caution” by overaging shipments to ensure important retail customers are kept happy. In many cases, of course, the retailer is not acknowledging receipt of the additional products, and simply readjusts their inventory levels to account for their good fortune. The cost to the manufacturer can be considerable.

APPENDIX B

B1. Solutions to Reducing Stock Loss

PROCEDURES AND ROUTINES

- Annual stock loss awareness campaigns
- Damaged goods resale controls
- Hot product identification
- Security newsletters, employees exit searches
- Random till cash checks

EQUIPMENT AND TECHNOLOGY

- Active/passive CCTV
- Automated ordering processes
- E.A.S (hard/soft tagging)
- Secure lockers for employees
- Specialist anti-theft display equipment

PEOPLE AND PROCESSES

- Anonymous phone lines
- Employee integrity cards
- External stock audit functions
- Store detectives
- Employee awareness and training

DESIGN AND LAYOUT

- Appropriate product location strategies
- Designing-out blind spots
- Employee entry/exit access control
- Single direction product flow
- Supply chain and logistics network design

APPENDIX C

C1. The Auto-ID Implementation

To implement the Auto-ID technology, consideration must be given to the change management and organizational issues. There is no single factor that ensures a smooth Auto-ID implementation due to the fact that all organizations are different. The current environment at each organization should be assessed and an implementation strategy developed specifically to meet the particular needs of the organization and the business benefits they are driving to accrue. There are, however, some basic activities that experience tells us must occur for employees to accept change and to make a smooth transition from the existing to the new environment.

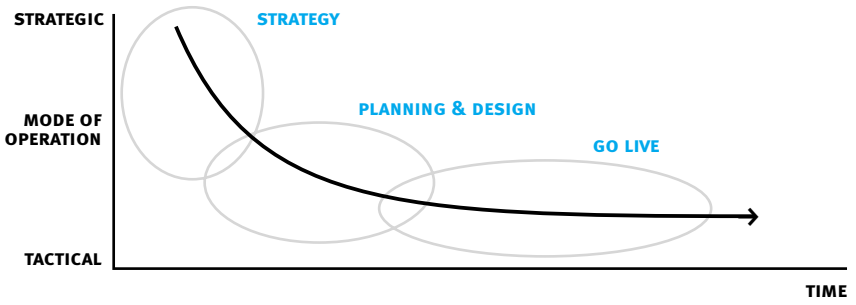
Research has shown that nine out of ten technology implementations fail due to lack of attention to change management and organizational issues. Failures have been attributed to lack of communication, competing for resources, functional boundaries, and employee resistance. With the appropriate planning and use of change management skills, these obstacles can be overcome. Successful implementations involve employees in the change effort, have quality communications, provide sufficient training, and use internal champions to ensure success.

When implementing an effective change program, activities become increasingly ‘tactical’ as the program approaches “go-live”. Note that as change activities become more tactical, resource requirements typically increase as we move through the delivery lifecycle.

Initially the change strategy is developed for the implementation. This involves conducting an assessment of the current organization that includes change history, leadership skills, communications, stakeholder, organization readiness assessments. The result of these various assessments will determine the resources available, barriers to change, and areas needing skills building activities.

Figure 14

EFFECTIVE CHANGE PROGRAM



Once the assessments are complete, the planning and design of the change strategy can be developed to meet the individual needs of the organization. The communication plan is developed and started immediately. Frequent communication to all levels of the organization is essential to foster a comfort level with the new system. The Auto-ID technology may give some employees the feeling that they are constantly being watched while they are working. Including all levels of the organization in the planning and implementation can mitigate this risk. Communication messages should ensure employees that the Auto-ID technology actual eliminates the need to watch employees while they work.

Stakeholders are identified across the organization and their thoughts about the impact of the new technology are determined. Activities are planned for each stakeholder group to increase support for the implementation where needed.

The organization structure is analyzed to pinpoint areas that may require job redesign and new skill sets. New processes put in place as the result of the Auto-ID technology may dictate that employees acquire new skills to perform effectively in the new environment. Job descriptions will be updated to include activities that support the Auto-ID system. Performance measurements will also have to be adjusted in the new environment that is proactive instead of reactive. Employees whose primary performance measurements included detecting persons in the act of stealing merchandise can be refocused. They can now be measured on monitoring the system and proactively resolving loss prevention issues. This will enhance the level of security positions in the marketplace by alleviating some of the risk involved when apprehending criminals.

New processes developed in the Auto-ID system may also require that employees perform new skills. Where new skills are needed, a training program should be developed to ensure all impacted employees learn required skills. Schedules should allow for minimal impact to on-going operations at the facility. Time should be allotted for absences and additional training where needed. Courses should be developed and scheduled to ensure that all employees have mastered the necessary skills by the Auto-ID implementation go live date.

Throughout the implementation, the barriers initially identified in the assessment phase are monitored. Activities developed to mitigate barriers are tracked to ensure that barriers are eliminated. Feedback mechanisms are put in place to assess the effectiveness of activities and to discover any new barriers or issues that may arise so that they can be dealt with proactively. This is an iterative process that ensures activities are focused on the goal to have a successful Auto-ID implementation.

It is important to understanding that implementing Auto-ID will be a major change and in some cases an organization may choose to make the transition in stages. Case-level tagging will certainly improve the inventory tracking of products and have an effect on the process failures. Real-time counts of inventories or specific items will provide a better picture of where the shrink is occurring but it will still force loss prevention management to have reactive systems in place to catch item level thievery. EAS systems will still be temporarily needed to detect unpaid for items passing through exit doors. The level of internal theft when case level Auto-ID is implemented is not much different than when legacy systems are in place. Exit doors will still need detection systems to alert security personnel.

A favorable transition solution would be to implement item-level tagging on high risk/high dollar items. This will provide the benefit of full coverage for the tagged items and eliminate the vulnerable areas of case level tags only. The first items tagged will serve as the pilot for the implementation. Any loopholes in the processes to get the items in the store and track will be highlighted with the few items. Processes can be developed to eliminate loopholes before more products are added to the Auto-ID system. This solution also allows an organization to keep existing systems in place in tandem with the Auto-ID technology. With both systems in place, employees can readily see the benefits and limitations of both systems and gain a comfort level with the Auto-ID system prior to the removal of legacy systems.

APPENDIX D

Sales in millions of dollars

1. Grocery
2. Apparel
3. Consumer Electronics
4. Pharmacy
5. Music & Video
6. Toys
7. Health & Beauty
8. Large multi-category

	MANUFACTURER							RETAILER
	1	2	3	4	5	6	7	8
ANNUAL SALES	$10,360	$7,000	$6,552	$6,678	$3,640	$4,573	$4,835	$57,867
GROSS MARGIN	40.0%	35.0%	32.0%	84.0%	35.0%	45.0%	58.0%	24.6%
AVERAGE SHRINK RATES	0.45%	0.73%	0.22%	0.60%	0.36%	0.58%	0.58%	1.75%

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