UPPING THE ANTE: USING RFID AS A COMPETITIVE WEAPON TO FIGHT SHOPLIFTING AND IMPROVE BUSINESS INTELLIGENCE

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ABSTRACT

This paper explores how RFID (radio frequency identification) technology can be employed to fight the ever-growing shoplifting problem, estimated to cost the world's retailers almost $100 billion annually. The paper provides an overview of RFID technology. We then analyze how RFID is beginning to see utilization in-store not just for security, but as a vehicle to improve inventory management and business intelligence as well. This paper demonstrates that RFID is poised to usher in a whole new direction in the fight against retail shrinkage, and we discuss what this visibility will mean for their companies, their employees, and their customers.

KEYWORDS

Shoplifting, Retail Security, Loss Prevention, RFID (radio frequency identification) technology, Organized Retail Crime, Business Intelligence

1. INTRODUCTION

Shrinkage. While the "man on the street" might more closely identify the term with laundry and the plots of several Disney movies, shrinkage is no laughing matter in the retail industry. From an accounting perspective, shrinkage can be defined as the difference between what a retailer believes it has in inventory - what is on the books - and what is actually in inventory [1]. It is the unaccounted for loss of retail goods, springing from a variety of causes, including:

- Internal theft by employees,
- External theft (shoplifting) by customers,
- Administrative errors, and
- Vendor fraud [2].

While the latter two sources are undoubtedly important and account for substantial dollar losses, they pale in comparison – both on in terms of scale and frequency – to the theft issue [3].

The fact that both customers and employees steal is a persistent – and costly – headache for retailers of every size, from megastores like Wal-Mart and Target to your "Mom and Pop" local drug or grocery store. Indeed, large retail chains spend great sums in the area of loss prevention to counteract both internal and external thieves. And overall, the impact is substantial, as

shoplifting is a persistent operational and legal difficulty that retailers must deal with [4]. In fact, Mark R. Doyle, President of Jack L. Hayes International, a leading retail loss prevention consulting firm, recently commented on the issue, stating: "The seriousness of retail theft is a much greater problem than many people realize. The theft losses experienced by retailers are driving consumer prices higher, hurting our economy, and even forcing some retailers to close stores or go out of business" [5]. In the U.S., studies consistently show that retail theft causes losses of between $35 and $40 billion annually [6]. Yet, retail theft is in all actuality a global problem on a massive scale. In fact, according to a recent study from the Center for Retail Research, the world's retailers lose almost $100 billion annually to theft [7]!

2. SHOPLIFTING 101

The "five finger discount" has become an all-too accepted part of the American lexicon. In recent years, we've seen celebrities, politicians, sports stars caught in the act of shoplifting items of little real value, but with embarrassing and grainy store surveillance footage showing-up on the cable networks and YouTube - often with career-devastating consequences. All too often however, shoplifting is an all too pedestrian crime, being based on opportunity and the individual nature of the perpetrator [8]. It may also serve as the outward manifestation of a person's deeper demons. In fact, the vast majority of "traditional" shoplifting is carried out either by those with psychological problems (typically kleptomania issues, as well as depression and low self-esteem) and/or those with need for money (drug, alcohol, and gambling addiction being a prime motivator) [9]. Research from the anti-shoplifting education group, Shoplifters Alternative (SA), shows that such habitual, non-professional shoplifters make-up approximately a quarter of all shoplifters. However, their impact is quite significant, due to the sheer frequency of their stealing. In fact, the SA study showed that such "frequent stealers" may account for as much as 85% of the dollar losses from shoplifting [10]!

Shoplifting problems are not uniform across the retail sector. Indeed, as can be seen in Table 1, while the overall retail theft rate is approximately 1.5% of retail sales, the actual loss rates vary greatly across retail segments [11].

3. THE ECONOMICS OF SHOPLIFTING

At present, there are two major developments that are poised to significantly raise the profile of the shoplifting problem for retailers. First, shoplifting is fast-shifting from being predominantly a crime of opportunity carried-out by individuals to the focus of criminal enterprises with the rise of what is being called Organized Retail Crime (ORC). According to the Federal Bureau of Investigation, organized retail crime accounts for as much as $30 billion in retail losses annually, including not just shoplifting, but other nefarious activities including credit card theft, extortion, and loan fraud [12]. These organized shopping gangs exact far more economic damage on retailers than traditional shoplifters (swiping a CD or a dress) or an economically-motivated shoplifter (stealing food or drug items for personal or family use) [13]. In fact, while the typical shoplifting case perpetrated by an individual averages a loss to the retailer of just over a hundred dollars, according to National Retail Federation, the average loss from each ORC shoplifting case is over $7,000 [14]! There have been numerous crackdowns on ORC rings that have been caught with millions of dollars worth of goods. A raid earlier this year in Florida of a storage facility used by a single ORC enterprise uncovered a stash of stolen retail items valued at between $60 and $100 million [15]!

ORC enterprises commonly make use of teams of trained shoplifters that steal large quantities of items – often hitting several stores in a single day - that can be sold both offline (through street sales, flea markets, pawn shops, swap meets, and even through nefarious wholesalers reselling stolen goods to other retailers) and online (through eBay and other auction sites, as

Table 1. Shrinkage Levels Across Various Product/Store Categories.

Item/Store Type	Percentage
Cards, gifts, floral, and novelty	4.70%
Books and magazines	3.71%
Accessories	3.36%
Crafts and hobbies	2.25%
Supermarket and grocery	2.24%
Men's and women's apparel	1.92%
Women's apparel	1.84%
Auto parts and accessories	1.81%
Discount merchandise chains	1.65%
Drug stores	1.58%
Average shrinkage rate in retail	1.57%
Home center, hardware, lumber, and garden	1.54 %
Department stores	1.45%
Children's apparel	1.44%
Sporting goods and recreation products	1.34%
Convenience stores	1.17%
Entertainment, media, games, video, and music	1.15%
Shoes	1.05%
Liquor, wine, and beer	1.00%
Warehouse clubs	0.78%
Office supply and stationery	0.69%
Household furnishings and housewares	0.68%
Optical	0.54%
Consumer electronics, computers, and appliances	0.53%
Jewelry and watches	0.28%
Furniture	0.22%

well as specialty websites) for quick returns that are often used to fund further organized crime or even terrorist activities [16]. In addition to targeting easily resold name-brand clothing and personal consumer electronics items [17], ORC gangs frequently hit pharmacies and supermarkets for high-demand items, such as over-the-counter medications, pain relievers, teeth whiteners, diabetic test strips, infant formula, hair restoration formulas and shaving products, where some retailers targeted by ORC operations report loss rates as high as 25 percent of sales on specific product categories [18]! This has led public health officials to become quite concerned that ORC could lead to significant health issues, as items that can easily spoil if not maintained in a temperature-controlled environment, such as baby formula and over-the-counter medicines, are being resold to often unsuspecting consumers who think they have found a "good deal" [19].

The second cause for the rise in shoplifting is the fact that people are struggling to cope with rising prices and a sluggish economy. Indeed, in the wake of the economic slowdown, retailers are reporting a rise in casual shoplifting [20]. This means that not only are retailers nationwide

reporting a rise in so-called economically-motivated shoplifting of "staples" (food, drug, and clothing items) [21, 22], there is a growing market ready to buy the ill-gotten goods being sold by ORC enterprises [14]. Overall, retail loss data for the most recent year available (2008) show a marked increase in both internal and external theft in the wake of the recession [23]. Thus, the criminal and economic trends are intertwining, making leading retailers quite concerned that we may see an accelerating shoplifting problem across the retail landscape.

4. THE "ARMS RACE" IN LOSS PREVENTION

Preventing shoplifting is clearly an unfortunate, but very real "arms race" between retailers and the people – customers, employees and pure thieves – who enter their premises. Over the years, the addition of anti-theft technologies, including closed-circuit television cameras, electronic article surveillance (EAS), and point-of-sale monitoring systems has aided retailers in not just preventing thefts from occurring, but establishing an evidentiary record that makes it easier for them to recoup restitution and effect successful prosecutions. This technological battle between retailers and perpetrators has produced some success, as the overall shoplifting rate and loss amounts have seen some decrease in recent years in the United States [1]. One of the leading academic experts on shoplifting, Dr. Richard Hollinger [11], a criminologist at the University of Florida, believes quite simply that the firms that are willing to commit the most resources to combating shoplifting "will be those that have the best chance to win the growing war against retail crime."

Yet, with retailers suffering substantial economic pain as a consequence of the slowing economy and lowered consumer spending, chains have been cutting back in many ways. Planned store expansions and capital spending on various items – including technology - have been slashed, as well as personnel, leading to less sales staff on the retail floor [24, 25]. With fewer clerks walking the store, there are more "dead zones" – unobserved areas – providing even greater opportunities for individual and conspiratorial shoplifting to occur [26]. Preference Research, an independent research firm, recently issued its *Loss Prevention Budget Trends Report* [27], which showed that cutting loss prevention budgets could be an especially troublesome strategic move in a down economy. Their research showed a significant correlation between reduced spending on loss prevention efforts and increased levels of retail theft.

Certainly, most elements of loss prevention spending – such as security cameras, monitoring, EAS tagging, and personnel - are readily identifiable as expenditures specifically tied to preventing the occurrence of retail theft [23]. The ROI of such investments can only be judged by their effectiveness in curbing both external and internal theft. However, this is not the case with an emerging application of RFID (radio frequency identification) technology as a supplement to – or even replacement for – traditional electronic article surveillance, due to the myriad benefits and possibilities brought about by RFID.

5. RFID (RADIO FREQUENCY IDENTIFICATION TECHNOLOGY)

RFID is being introduced across a variety of industries to better identify and control individual items, ranging from health care applications [28, 29] to the food service and gaming industries [30]. Major retailers, such as Wal-Mart and Target in the U.S. and Metro and TESCO in Europe are making major investments in RFID technology, believing that this is the future of retail inventory control, supplanting the venerable bar code method of item identification [31, 32].

Conceptually, these technologies are quite similar; both bar codes and RFID are automatic identification technologies intended to provide rapid and reliable item identification and tracking capabilities. The primary difference between the two technologies is the way in which they "read" objects. With bar coding, the reading device scans a printed label with optical laser or imaging technology. However, with RFID, the reading device scans, or interrogates, a small electronic tag or label, using radio frequency signals. The specific differences between bar code technology and RFID are summarized in Table 2. There are five primary advantages that RFID has over bar codes. These are:

1. Each RFID tag can have a unique code that ultimately allows every tagged item to be individually accounted for,

2. RFID allows for information to be read by radio waves from a tag, without requiring line of sight scanning or human intervention,

3. RFID allows for virtually simultaneous and instantaneous reading of multiple tags,

4. RFID tags can hold far greater amounts of information, which can be updated, and

5. RFID tags are far more durable [33].

Table 2. RFID and Bar Codes Compared.

Bar Code Technology	RFID Technology
• Bar Codes require line of sight to be read	• RFID tags can be read or updated without line of sight
• Bar Codes can only be read individually	• Multiple RFID tags can be read simultaneously
• Bar Codes cannot be read if they become dirty or damaged	• RFID tags are able to cope with harsh and dirty environments
• Bar Codes must be visible to be logged	• RFID tags are ultra thin and can be printed on a label, and they can be read even when concealed within an item
• Bar Codes can only identify the type of item	• RFID tags can identify a specific item
• Bar Code information cannot be updated	• Electronic information can be over-written repeatedly on RFID tags
• Bar Codes must be manually tracked for item identification, making human error an issue	• RFID tags can be automatically tracked, eliminating human error

6. RFID AS AN ITEM SURVEILLANCE TOOL

Today, there is already excitement about the prospects for RFID to be applied at the item level in retailing. In both Europe and the United States, we are seeing exciting in-store applications in bookstores [34], pharmacies [35], electronics retailing [36], and grocery stores [37], bringing about new possibilities in customer service, business intelligence and inventory management. Now, RFID is poised to become the latest weapon for retailers to deploy in this arms race against shoplifting, especially in light of the increasingly aggressive and sophisticated threat coming from the organized retail crime element. In essence, while electronic article surveillance

has become the retail industry standard for anti-theft technology, RFID presents a new weapon – perhaps the nuclear option – to both provide retailers with better business intelligence on what is in store – and what has left the store through shoplifting – and to perhaps help deter retail theft in the first place. With RFID positioned to become an anti-theft device as well, this presents retailers with an important additional business benefit from item-level tagging that will help bolster the ROI equation for RFID deployment in the retail enterprise [38]. In time, if RFID can replicate the function served by EAS on retail items, this could eliminate any need for items to be tagged with both types of tags, further aiding the push for RFID tagging.

There are already pilots and experiments underway to test the effectiveness of so-called "dual function" RFID tags that simultaneously serve both as item-level identifiers anti-theft devices. The latter capabilities utilize bits of memory on specially designed RFID tags to replicate the function of EAS tags that can be turned "on" or "off" to indicate if an item has been purchased or not, and as such, can be properly removed from the store. Both Checkpoint (based in Thorofare, New Jersey) and UPM Raflatac (based in Helsinki, Finland) have begun offering EPC (Electronic Product Code) Gen 2 RFID tags incorporating traditional EAS functionality [39]. UPM Raflatac's tags have been field tested by Northland, an Austrian retailer of outdoor sports apparel and equipment. Northland recently conducted a pilot at its store in Graz, Austria, tagging approximately 1600 items – comprising the entire stock of items available at the store, with the exception of low-value accessories items – with the combination tags from UPM Raflatac [40].

Likewise, the Information Technology Research Center (ITRC) at the University of Arkansas recently released the results of tests it conducted on the effectiveness of such RFID dual function tags in simulated shoplifting scenarios. While conducted in the laboratory facility of the ITRC's RFID Research Center, the tests closely mimicked "real world" shoplifting, gauging whether or not RFID tags could approach the read rates of traditional EAS tags when a shoplifter wore an item, shielded the item with their body, or went running past the surveillance point [41]. The Arkansas researchers also tested the ability of as many as fifty RFID tags to be accurately read on a variety of apparel items, both in standard shopping bags and in "booster bags" (bags used by shoplifters that are lined with aluminum foil to make the items held inside undetectable by anti-theft surveillance systems at store exits). Each of the various scenarios was run thirty times, using both traditional, hard-form EAS tags and RFID labels. In many instances, the ITRC tests found that RFID labels performed as well as EAS tags. Even in ostensibly the most challenging test, when a tester placed 50 RFID-tagged items in the booster bag, RFID tags were read 77% of the time [41].

7. ANALYSIS

Both the applied and academic study of RFID functioning has EAS acknowledged that while some retailers may want to continue EAS tagging, feeling the need for 100% accuracy, RFID brings item-level surveillance to a new level. This is because unlike traditional EAS, which only alerts store personnel that shoplifting has occurred, RFID gives retailers the ability to know exactly when a theft took place and what items were taken. The specificity of theft information can enable retailers to use this improved visibility to not only update their inventory more accurately to replace stolen items more quickly (lessening out-of-stocks and potential lost sales and customer ill-will), but to perhaps spot trends in both internal and external theft more rapidly to enable better and more effective loss prevention strategies. The specificity afforded by RFID-based item surveillance data can also be used to enable law enforcement to better prosecute shoplifting cases, as specific items stolen on specific days can be more easily tied to specific perpetrators.

The research conducted to date points to the fact that challenges remain to the effective use of RFID in this capacity, such as designing RFID interrogators in narrow read ranges so as to not capture tags on items in the store that are not being stolen and taken through the exit doors, where EAS surveillance is typically stationed. However, with RFID surveillance in place, potential shoplifters could be spotted more easily in the store itself, when activities take place that are indicative of preceding an actual theft, such as attempting to remove a tag or gathering too many of one item, as is commonly done by the ORC theft rings as they seek out mass quantities of easily sold goods.

Thus, we may see a whole new direction in the fight against shrinkage in retail as RFID begins to be used more at the item level for improved visibility, inventory control – and electronic article surveillance. With no anticipated abatement in sight in the problem of both external and internal theft for retailers [42], the ROI for greater visibility and control is simple (even if the financing of such efforts may be constrained by the current economic slowdown). As Bill Hardgrave, Director of the University of Arkansas' RFID Research Center recently observed: "If retailers got visibility into even just 75 percent of stolen items—that is, knowing what was stolen, where and when—that would make the cost of deploying the technology worth it" [38]. In doing so, RFID could serve as significant deterrent to the "growth industry" that shoplifting has become today.

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