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Electronic Article Surveillance: management learning in curbing theft

Joshua Bamfield

Introduction

Electronic article surveillance (EAS) - colloquially known as 'tagging' - involves the use of a relatively simple group of radio frequency technologies by retailers to prevent merchandise from being stolen from shops. The use of EAS is growing rapidly in the UK, especially amongst department stores and shops selling clothing, do-it-yourself (DIY) products, and recorded music, although a 1991 EAS survey showed that use of EAS in British clothing and department stores lagged behind that of comparable retailers in France and northern Europe (Bamfield, 1992). Thirty per cent of respondents to the National Survey of Retail Theft and Security (Bamfield, 1994) claimed to use EAS systems in their stores. Although EAS is relatively expensive, it has been taken up quickly by smaller retailers, particularly in clothing and fashion stores. This is very different from the spread of electronic point of sale devices (EPoS) which were first used by large companies and later trickled down to smaller ones (Jones, 1992).

Recent developments which have enhanced the importance of EAS include new technologies and smaller more precisely manufactured tags. However, there is anecdotal evidence of widespread scepticism amongst retail security managers about the practical effectiveness of EAS systems, and the claims that are made for the newer technologies. The 1991 EAS survey (Bamfield, 1992) showed that almost one-fifth of all UK EAS installations were unsatisfactory. Yet very little research has been carried out into the technical background to EAS and the effectiveness of different systems.

Methodology

This article examines in detail the experience of a single retailer which has made increased use of EAS since 1991. Clothesco Ltd (not its true name) is a variety chain retailer with 20 stores in the North of England and the Midlands. Its stores have suffered high rates of theft. Many branches also faced incivilities and aggressive behaviour from customers which sometimes led to physical attacks upon staff. The circumstances which led to the introduction of a new EAS system in several Clothesco stores are considered. Significantly, four of the company's shops were already equipped with an EAS system which had proved to have little impact on theft from shops. The rationale for Clothesco's trying EAS again - the *second time around* - is considered, and an explanation is offered of why the use of a different EAS system in conjunction with security guards has reduced'both theft and violence in stores.

It is not assumed that this retailer is typical of others. Rather that consideration of the company's two separate attempts to introduce an effective EAS system may reveal issues relating to objectives, investment decision-making and system implementation which have a wider relevance to other companies considering adopting EAS.

Information has been collected from the firm's records, from interviews with head office staff and branch managers of four stores. Data from a long-term research project, including a survey of larger users, have also been used. The main areas studied are: the situation which gave rise to the EAS requirement, the objectives which were set for the new EAS system, the security decisions made to attain those objectives, and the subsequent performance of EAS and non-EAS stores.

The company and situation described are intended as an example of EAS adoption and use and not to illustrate either correct or incorrect handling of a management issue. The firm wishes to remain anonymous and therefore certain details have been changed to protect its identity. The analysis is not intended to show whether EAS is, generally, effective or ineffective, but to examine how it can be used. The conclusions are, therefore, limited in scope, but are consistent with other surveys. Finally, the main focus here is customer theft (shoplifting), although it is acknowledged that EAS could be used to inhibit staff theft.

Electronic Article Surveillance

Electronic article surveillance (EAS) is based on the use of electronic tags or markers attached to items of merchandise. When the items are taken past detection devices, an alarm is sounded unless the tags have been deactivated or removed.

EAS can work in two ways, for detection or deterrence. Used for detection, an EAS system will maximise the number of thieves discovered and apprehended. As a deterrent EAS will induce shoplifters not to steal or drive them away to steal from other shops which are less well-protected. It can be seen that evaluating an EAS system must depend on the objective set for it, whether detection or deterrence. EAS systems that are primarily intended to detect shoplifters will be assessed by the numbers caught. EAS systems used to deter will, of course, not catch anyone at all if they prove to be 1O0 per cent effective in changing the behaviour of shop thieves. Most retailers use EAS as a deterrent. Situational approaches to crime reduction (for example, Cornish and Clarke, 1986) suggest that policy should be based on reducing the opportunities for crime as well as increasing the risk of detection. EAS can be regarded as target hardening (Clarke and Mayhew, 1980), especially when used in conjunction with other security measures (for example, CCTV or security guards), as well as a device for increasing the likelihood of detection.

The effect of EAS may be to displace crime (Clarke and Mayhew, 1980) to less protected stores, or to untagged goods in the same store. Installing an EAS system which may work primarily by displacing crime to other shops, may well cause concern to the retailer. However, it is difficult to do more than regret this possible result, because the effect is uncertain, external and dispersed widely. So it is unlikely to have an impact upon the final investment decision.

The ability of an EAS system to deter shoplifters will depend on several factors including the psychology of the individual shoplifter, the quality of the system, and the type of response made by the store when someone is detected by EAS. The psychology of thieves is likely to vary so that they will respond differently to a given stimulus. The Home Centre Institute of the USA has evidence that whilst 75 per cent of 'daily shoppers' are deterred by EAS, this is only true for 15 per cent of 'misfits' (not defined] and 10 per cent of professional thieves (cited in Bamfield, 1992). Many thieves will be deterred simply by the risk of being detected by EAS. Foi other shoplifters, EAS will only work if shops take some action. If we define the quality of an EAS system in terms of the 'pick-rate' (the proportion of EAS tags identified when passing through the detection field) and

robustness (the ability of tags or other parts of the system to resist attack or tampering and to be invulnerable to countermeasures), then it seems likely that quality will influence shoplifters' behaviour. The strength (or perceived strength) of staff response to EAS alarms (ranging from indifference to challenging or detaining potential thieves) is also likely to affect shoplifter behaviour.

After considering these factors, some shoplifters may be deterred by any EAS system; but other more skilled or more daring thieves will be much more resistant to change in their criminal behaviour.

Component parts of Electronic Article Surveillance systems

EAS systems consist of three parts, electronic tags, radio antennae, and a control unit. Electronic tags, or targets, are fixed to merchandise by security pins, lanyards, or adhesives, and set off an alarm when they come within range of the detector antennae. The means used to secure the tags is extremely important, as weaknesses here will undermine the effectiveness of the whole system. The hard tag (most common in clothing and textiles) is a large plastic wafer about 4 inches long: soft tags are the size of a credit card and paper tags are semi-flexible devices, some of which are as small as the standard grocery price ticket or a small length of fuse wire.

EAS antennae (or detector gates) placed at the checkout or at (or above) the exit transmit and receive radio signals, detecting the tag when it comes within range. Depending upon the system used, tags will be detected either because they introduce a specific radio frequency (and pulse rate) into the detection field or the presence of the tag will change the field itself. The EAS detector gates are linked to a control unit: this monitors and controls the operation of the antennae and corrects certain errors. Newer units use microprocessors. Smaller installations will have the control unit mounted within one of the gates.

The rate of technical innovation in EAS has been relatively high in recent years. The main systems available are now based upon:

1 Radio frequencies (RF)
2 Microwave or ultra-high frequencies (UHF)
3 Electromagnetic (EM) field
4 Acoustic magnetic (AM) field

Recent years have seen, not only the introduction of newer technologies such as EM and AM, but the use of new specialist alloys, the precision

manufacturing of tags so that miniature tags will respond to the same signal 95 per cent of the time, and the use of multiple signals and frequency splitting to provide a series of checks for tags within the field - assisted by complex algorithms in control units to distinguish between tags and other metal objects. Taken in conjunction with microprocessor and software control-of-system units, these developments have enhanced the effectiveness of modern EAS systems. However, EAS systems are rarely 100 per cent effective in modern retail stores. In addition to any limitations of the EAS equipment itself, a retail store can provide a very hostile environment for EAS devices owing to the existence of other magnetic fields emitted by a range of electrical equipment used by stores.

Clothesco Limited: the case study

Clothesco Ltd was set up in 1991 as a new retail format with 20 stores operating in the family discount/value sector of the clothing and textile market. Its parent company was a major high street multiple retailer, Matrix Stores PLC. Clothesco sold clothing for men, women and children, textiles (including bedding), footwear, fashion jewellery, toys, video/music and games, and had a standard inventory of 30,000 lines.

The stores were comparatively large (the average sales area was 8,342 square feet), all located near the centre of high streets in secondary shopping centres, usually in the lower-income areas of large towns and cities. The stores were laid out on 'free form' lines, with two main cash-and-wrap points, shelving and hangers round the walls to display garments, and a considerable number of different types of display units and garment racks arranged at angles on the sales floor itself. The width of the store and the small number of sales staff created 'blind spots' making it comparatively easy for shoplifters to conceal goods. All stores had only one entrance, consisting of up to six sets of double doors, usually 25 feet to 35 feet wide.

Every branch had an average of five full-time members of staff (including the manager) and ten to fifteen part-time or casual staff. The number of part-timers might double in periods of peak seasonal demand. The company employed a total of 121 full-time staff (including administrative staff) and around 260 part-time or casual staff, although numbers varied depending on the time of the year.

The parent company, Matrix Stores, delegated all authority apart from major investment decisions to two senior executives, the general manager and the operations manager. Both were promoted from within Matrix Stores. There was a range of strategic, marketing and operational issues facing Clothesco

at the time of incorporation. Together, the stores in the new chain were marginally profitable but had suffered neglect by Matrix Stores in favour of its larger units established in better locations. Partly as a result, the turnover of managers was high (30 per cent a year), with newly arrived managers soon moving on to better opportunities in Matrix Stores, or leaving the group altogether.

The main security issues at Clothesco

At incorporation, there were thought to be three major security issues at Clothesco. These were:

- *High rate of theft.* The average rate of inventory shrinkage was over 3 per cent of sales compared with a sector average for 1993 of 1.92 per cent and was rising. Seven of the 20 stores had a shrinkage rate of over 4 per cent and one store's shrinkage was 10 per cent of sales. 'Shrinkage' is a standard measure of stock loss as a result of theft, administrative error and waste.
- *Poor store environment.* In all stores there was a disturbing atmosphere, characterised by a significant number of aggressive customers, ostentatious shoplifting, and drunken persons entering the store unchecked and creating a disturbance.
- *Violence towards staff.* The poor store environment led to repeated actual or threatened violence. In half the stores there was at least one incident of violence or aggression every day. In the first year, one-third of branch managers were physically attacked and beaten. Shoplifters and others would occasionally display knives. Not surprisingly, staff were reluctant to challenge suspected shoplifters.

The two senior executives of the new chain felt that a failure to confront and overcome the problem of violence might undermine the viability of the chain as a whole.

Security in Clothesco had previously been provided by the central security department of Matrix Stores. Regional security managers worked with store managers and district store managers, using store detectives in all stores, and providing staff and management training in security awareness. There was limited use of EAS. Four stores had installed EAS systems and one had an inktag system. None of these systems was shown to have had a significant effect upon the shrinkage levels of the outlets where they were installed, although there had been some reduction in the level of hostility and violence in them.

The chain was too small to justify the employment of a specialist security manager, the operations manager being primarily responsible for security. Store detectives were employed full-time in sixteen stores. In 1993 the organisation introduced a new EAS system and piloted it in four stores for six months.

Shrinkage at Clothesco

In Clothesco, as in most retail firms, stock was transferred to branches at retail selling price. The difference between actual sales + net stock compared with the previous period, and the book level of sales + stock (i.e. what sales + stock should have been based upon transfers to the branch) is termed shrinkage. An acceptable level of shrinkage in Clothesco was 1.5 per cent of sales, which was the average rate for Matrix Stores. However, all Clothesco outlets had shrinkage rates exceeding 3 per cent of sales.

Administrative error and waste were thought to account for 20 per cent to 25 per cent of shrinkage. Administrative error could result from goods being incorrectly priced or invoiced and from delivery miscounts, credit note errors and other mistakes which were usually relatively small. Waste could occur when goods were damaged or soiled by being handled by customers, merchandise might be taken out of packets (and not be saleable or returnable), or display garments might fade and become unsaleable.

In 1992-3 2,200 thieves had been apprehended by Clothesco of whom 20 had been staff. The value of the goods found on thieves represented only 2 per cent of the company's total shrinkage losses for that period. No breakdown of theft into staff theft, shoplifting and theft by suppliers was available, but Clothesco management's perception was that theft by customers was the main source of loss. There was little evidence of staff theft (most apprehended staff thieves were found to be stealing garments costing an average of £65.37).

Customer theft was thought to be around 70 per cent of the total theft. Total losses in 1992/3 could therefore be broken down as follows:

Total shrinkage	£3.532 million
Administrative error/waste	£0.706-£0.883 million
Derived theft level [1]	£2.649-£2.826 million

[1] Derived theft = total shrinkage - administrative error/waste.

EAS at Clothesco: first version

At its formation, there were five stores within the Clothesco chain with tagging systems. Four had an EAS system and one had an inktag system.

The EAS system consisted of radio frequency devices (first developed around 1981) using passive tags, around 10 cm in diameter. The effect of EAS was not significant. Compared with other stores, shrinkage fell in EAS outlets by 7.5 per cent over the 1990-2 period, which was too small a fall to justify the costs of the systems. The original EAS system was not investigated as part of this study, but it had several problems, including a low detection rate and a high false-alarm rate. The low detection rate was confirmed not only by a very small fall in shrinkage, but by a steady decline in the number of tags held by the store. The implication was that thieves could walk through the detector gates with tagged items without the alarm being sounded. The tags could be screened - for example by being held in the hand or under the armpit - and some thieves were able to detach the tags, by using either a magnet or a device to force the security pin out of its socket in the tag. Shop staff routinely found discarded tags on the floor or in pockets of other garments.

In spite of these problems, there was no evidence that staff had lost confidence in the system or that procedures for tagging were not being followed. Staff pointed out that since the introduction of EAS there had been some fall in violence and ostentatious shoplifting, which they associated with the existence of EAS.

Inktags are made of a clear plastic and contain one or more glass phials of ink. There are no electronics or alarms, but if the garment is stolen the ink stains the garment when the tags are removed. The success of this system depends upon the quality of the tag securing clip. The Clothesco store found that these tags were not a deterrent. They could be removed by thieves within the store or frozen in a commercial refrigerator, enabling the tags to be detached without staining the merchandise. Inktags apparently had little effect upon shrinkage in the store with the system.

Thus the experience of EAS and Inktag systems by stores within the Clothesco group indicated that inktags were ineffective whilst EAS systems had only a marginal effect upon shrinkage but a more significant effect upon the general security environment of the store.

The EAS investment decision

A reduction in the levels of violence in and theft from shops was strategically important for Clothesco. After attempting to improve the situation for twelve months by better security procedures and by using shop detectives in three more stores, in 1993 the organisation decided to attempt something more radical.

The textbook approach to making major investment decisions, consisting of a well-ordered series of analytical steps, is summarised by Minzberg (1976). Applying this approach to EAS suggests a sequence of: security audit (an analysis of current shrinkage and theft patterns), assessment of all available options, development of the design requirements of the solution (on the basis of current and future retail needs), estimate of the full costs of EAS systems including the hidden or indirect costs (for example, loss of sales if part of sales area is taken up with EAS detector gates), piloting the chosen system, assessment of results of the pilot, making the decision to go ahead, followed by a phased implementation of the chosen system.

The final decision is made as a result of measuring the net flows of revenues (mainly cost-savings for EAS) and expenses over time using one or more appraisal techniques (see Dyson and Berry, 1984).

However, Clothesco did not follow this procedure. The company's search for options was limited to EAS. Moreover, within the EAS field, a full information search does not seem to have been carried out. It was limited to three major EAS firms with advice being taken from Matrix Stores. A full shrinkage audit was not conducted.

The company's chosen solution was to use EAS in combination with security guards placed at the store exit. The management felt that a security guard at the front of each EAS-protected store would protect the only exit, approaching and apprehending people who might have stolen merchandise when the EAS alarm sounded. It was felt that guards on their own would not be effective in apprehending shoplifters, although they could prevent much of the bad behaviour in stores. The company also felt that an EAS system on its own would be ignored by many shoplifters. However, for the deployment of guards to be effective, the stores needed a technically efficient EAS system with a high 'pick-rate' (detecting 'virtually all' tags) and a low false alarm-rate. Otherwise guards would lose confidence in the system — as would actual or potential thieves. Therefore, Clothesco decided that the best way to drive thieves away from their stores was to use EAS to detect people trying to shoplift and guards to apprehend them.

Although the number of options the company examined was small, the Clothesco business operations were particularly suited to their preferred solution. Clothesco's merchandise lines were mainly soft goods (easy to tag with the more efficient hard tags). Shoes, jewellery, recorded music, games and tights are much more difficult to tag. The firm's stores suffered very high levels of theft, justifying expensive systems if these could reduce losses to more normal levels. The store layout also facilitated the use of EAS: the stores had only one exit, whilst the open-plan layout of the store also gave shoplifters less opportunity to take tags off merchandise. The company had good administrative procedures and was relatively good about providing training: thus the company had the capability to ensure that goods were tagged correctly and that EAS procedures were being carried out.

Clothesco therefore had every reason for believing that their organisation was well-placed to make a success of EAS, as long as a high-quality system could be found.

Choosing a new EAS System

Information on the best EAS system was sought in discussion with the main suppliers of EAS and advice was taken from Matrix Stores. EAS suppliers naturally flatter their products: there is no agreed means of comparing the performance of EAS systems. It proved difficult to weigh up the information provided by EAS companies which made the consistent advice from Matrix Stores about the technically 'best' system very influential. Effectively, the EAS decision was based on the advice of Matrix - the company which had chosen Clothesco's existing EAS system.

The advice received from Matrix Stores was that the existing EAS system was now outdated: a new electromagnetic system from a large EAS supplier was considered to meet Clothesco's specifications most closely. It was however expensive. Electromagnetic systems were at one time the 'cheap and cheerful' end of EAS, with a low 'pick-rate' and a high rate of false alarms (many household metal products being detected as tags). The system chosen was used on a proprietary tag alloy (not found in any other goods) which responded to an alternating magnetic field around the detection gates in a very precise way. Error-checking procedures were carried out automatically by the system to ensure that changes in the magnetic field were caused only by the tag (thus minimising false alarms.)

Electromagnetic systems can be used with hard as well as paper tags, so the EM technology could protect virtually the whole Clothesco range, from anoraks to music cassettes. However, the detection field is relatively narrow

(about one metre, compared with 1.5 to 1.95 metres for radio frequency systems) so that detection gates have to be set close together. Clothesco decided to go ahead with a pilot system.

The decision-making process

The approach to making investment decisions adopted by Clothesco is not as uncommon as it might seem. Minzberg (1976) has shown that the rational model is an unsatisfactory guide to how managers take decisions faced with a range of pressures, limited data, and lack of awareness of likely outcomes. The use of heuristics such as shrinkage, and the limited search for solutions in this case are examples of bounded rationality (for example, Lindblom, 1959; Quinn 1980), and are not necessarily prejudicial in a situation where the decision-maker does not understand the technical characteristics of different systems. A less expensive system might have worked almost as well for Clothesco, providing a much better return on their expenditure. The search for the 'best' EAS system was understandable in the organisational context as well as being a focusing device for making any decision at all about security. The decision-making process was not the identification and assessment of a range of alternative solutions, but a search for an authority to provide guidance on the 'best' system available.

While the search was limited, the decision was characterised by several risk-reduction strategies, including the use of Matrix Stores as an authority. The EAS system selected was widely used by other retailers, so that any teething problems would be minimised. The system was fully compatible with current store procedures and organisation as well as having a relative advantage over the alternatives (regarded by Rogers (1987) as a key influence in adopting an innovation). The whole system from detector gates to individual tags was leased so that it was financed from revenue (requiring a lower level of authorisation than a capital outlay), and moreover, the lease could be ended after three years, enabling Clothesco to switch to a better system if one emerged during that time.

Implementation of the new EAS system

It was felt that the new EAS system would be much more successful if the stores involved were enthusiastic. The choice of stores to receive EAS was based on the quality of 'bids' from the branch managers indicating how they intended to implement the system. Clothesco were anxious to ensure that branch managers 'owned' their EAS system: they were made personally responsible for its results, measured in shrinkage reductions. Training and

staff motivation were the responsibility of the branch manager concerned in conjunction with the EAS supplier, not of senior executives or a project manager.

The new electromagnetic system was piloted in four stores for six months. A line of detector gates was installed inside each shop, one metre from the entrance. With only one entrance, all thieves would have to leave by passing through these gates. In addition, if any shopper entered the store with tagged non-deactivated merchandise from another store or objects that might be recognised by the EAS system as tags, the alarm would sound when he/she entered the store, allowing the necessary action to be taken without causing embarrassment to the customer.

In all, 90 per cent of merchandise in the store was tagged, the exception being goods worth less than £5 and 'hard' goods such as music cassettes. Hard tags were used throughout - these worked better and were a visual deterrent. Any product line selected for tagging was tagged completely.

Each EAS store had a contract security guard stationed at the entrance, instructed to close in on any person at the barrier when the EAS alarm sounded. The guard did not assume that a theft had occurred, but asked customers whether they had anything which they had forgotten to pay for. Security guards were also advised to watch out for foil-lined bags, including freezer bags, and for customers going past the gates with goods held at a certain angle from the horizontal. Foil-lined bags might interfere with the signal and the gates did not detect through 360 degrees. The security guard also provided a check on store violence and aggression against staff.

Results of the new EAS system

After a six-month trial, the new EAS system showed that it reduced theft, although not all stores had benefited equally. The results (August 1993-January 1994 against the same period ending in January 1993) are shown below.

Table 1 shows that a sales weighted average fall of 28.3 per cent was achieved in the four stores (compared with the same period in the previous year), whilst a control store, Store Z, suffered a slight increase in shrinkage. Store Z was very similar in location, size and turnover to Store B.

Whilst two EAS stores achieved reductions in shrinkage of 40 per cent or more, Store C's reduction was only 22 per cent, and Store D's shrinkage had actually increased. The managers of Stores A and B were two of the best in the company, judged in terms of meeting their performance objectives on a

Table 1. EAS-linked reduction in store shrinkage six months 1993/4

	Shrinkage rate (Per cent)
Store A	-44
Store B	-40
Store C	-22
Store D	+5
Weighted Average	-28.3
Store Z[1]	+3.6

range of criteria from profitability to merchandising. Significantly, Stores A and B were known to be particularly effective in training their staff. At a later date, four of Store D's staff were arrested for complicity in organised theft from Clothesco, which may explain the apparently poor performance of Store D's EAS system. Moreover, sales in A and B had increased by 0.4 per cent more than those of the group as a whole.

The general level of violence and aggression in the four stores fell considerably. The reason for the reduction in violence and aggression was probably a combination of the success of EAS in diverting many shoplifters elsewhere and the presence of security guards. Further benefits from the new policy came when the company discontinued the use of store detectives in EAS stores.

Data on shoplifter arrests were not kept, but after an initial increase in the EAS stores because of shoplifter ignorance or attempts to test out the system, shoplifter apprehensions fell to an average of one per week in each EAS store, compared with six per week in Store Z. Similarly, a comparison of EPoS data (recording actual sales) with inventory deliveries to stores, indicated a strong displacement effect as theft of non-tagged merchandise such as socks increased to an average of 15 per cent of inventory at retail prices in stores with EAS.

The costs of tagging goods proved to be much more than originally predicted, and were the equivalent of employing a full-time member of staff for 52 weeks. It was difficult to tag goods on the sales floor itself (staff would be called away), so it was decided to tag merchandise in the stockroom. One apparent result of this was that many goods were tagged at

[1] Store Z is a control store.

the bottom of sleeves or at the bottom of the garment (the most easily accessible region when a box of goods is dealt with) rather than in the middle of the product. This is not recommended because it may make theft a little easier.

Unlike their original system, Clothesco's electromagnetic system was able to detect tags hidden in briefcases, concealed under armpits, and carried in metal baskets. The evidence suggested that thieves found it difficult to attack or tamper with the tags - very few discarded tags were found around the store.

Like many retailers, Clothesco sold recorded music by displaying empty sleeves and cassette cases, the contents of which were only given to the customer in exchange for payment. The use of EAS paper tags has been advocated for this style of merchandising, and Clothesco ran an experiment in one store after three months of using only hard tags. The idea was to allow the cassettes and CDs themselves to be openly displayed for sale, saving time and increasing staff productivity. However, the experiment was a fiasco. Clothesco tried displaying EAS tagged cassettes and CDs and cassettes in special EAS holders for one day only. They found that thieves used a variety of instruments including ball-point pens and screwdrivers to force open the special holders and to tear off .the EAS tags. No further use of paper tags was attempted.

Some preliminary calculations of the financial effectiveness of the system are given in Table 2. For the group of stores as a whole, the financial savings (by cost reduction) from EAS comfortably exceeded the costs for the four stores taken together. This is, unfortunately, only based on the first six months of the system, although that should be long enough to compensate for any halo effect (the initial period in which shrinkage can fall rapidly until thieves have learned how to circumvent the system - usually less than three months). Across the four stores an annual return on costs of 52.1 per cent was achieved. This return covers the annual costs of the new EAS system as well as of the contract security guards.

There is no evidence that these figures were an accident or resulted from other factors. No stores in the group had recorded such falls in shrinkage before, not even the stores run by the same managers. However, it may be true that the results measured the effects in these four EAS stores of an enhanced awareness and concern about shrinkage and theft on the part of managers and staff as well as the effects of EAS and the security guards. Changes in layout and merchandising to inhibit theft had been made in all stores and were therefore unlikely to have had a particularly strong effect in EAS stores only. The introduction of EAS and guards seem to be the most

plausible explanation. Nevertheless, this study relates to only one retail business: universal conclusions obviously cannot be drawn from it.

Table 2. Financial costs and benefits of EAS in four stores

	Savings (£)	Costs per annum (£)
Equipment costs: Cost of detector devices, tags and other equipment		50,500*
Tagging costs: Cost of 4 full-time equivalent staff		48,000†
Detagging costs: employment of extra staff during peak periods		2,700
Guarding costs (52 weeks)		75,000
Fall in shrinkage (compared with previous year)	206,024	
Reduced store detective costs	32,000	
Reduced handling costs (fewer goods need to be put on shopfloor to produce £X sales)	30,000	
Totals	268,024	176,200
Net surplus of benefits over costs		
Savings	289,864	
Costs	-176,200	
Surplus	**113,664‡**	

* lease † including on-costs ‡ 52.1 per cent on-costs

Issues and conclusion

How similar is this result to those carried out elsewhere? There have been virtually no specialist studies of EAS, but general surveys of retail theft in Britain and the USA indicate that EAS is regarded by its users as an extremely important means of preventing theft (for example, Ernst and Young, 1992; Touche Ross, 1989), which is relatively under-used in relation to its perceived effectiveness (Touche Ross, 1989).

The EAS study (Bamfield, 1992) of 92 retailers with 7,172 stores confirmed this, with 40.4 per cent of users agreeing that EAS had lived up to their expectations. There was a lack, however, of very strong support for EAS,

with 42.3 per cent stating that EAS had lived up to their expectations 'only to some extent'. A significant minority of users had problems, with 19.2 per cent believing they would never get their money back. However, for 26.9 per cent the EAS investment had been repaid via shrinkage reductions within twelve months and for 51 per cent in two years or less.

This suggests that retailer dissatisfaction with EAS may result from two problems. First, there may be a large number of non-performing EAS systems, and, second, EAS may never work as well as hoped, thus creating a degree of dissatisfaction even in companies that value their EAS highly. The Clothesco experience illustrates both these features.

The experience of Clothesco indicates that EAS is not a product but a process whose management needs to be learned. The presence in the same organisation of both good and bad EAS systems probably reflects two factors, technical and managerial.

Technical The performance of EAS systems will vary depending on the supplier and on the age of the system. The fact that EAS systems tend to look the same may conceal major improvements in operational standards achieved by one system compared with one five years older. In addition, a system may be more suited to one location or style of retail operation than another.

Managerial A clear strategy for the use of EAS is needed, particularly in large stores, and this strategy has to be implemented effectively. In Clothesco, one explanation for the different results gained by stores with the new EAS system is, simply, the quality of management.

Clarke and Staunton (1989) show that innovation is not a single event or item; it should not be equated with equipment, but is critically dependent upon knowledge and operational procedures. Clothesco's experience of EPoS and EAS led it to conclude that the new system would be more likely to succeed if branch managers felt a sense of ownership. The best managers tended to go over first to EAS and gained the highest shrinkage reductions. This implies that as the EAS system is implemented across the organisation the gains made per store will decline. The task for Clothesco senior management is to develop the ability to support branch managers so that good results will be achieved wherever EAS is installed. Loveridge (1990) underlines the critical importance of the management learning process in realising the potential gains of an innovation.

This applies for example to the use of paper tags. Paper tags can obviously not be as securely attached to products as hard tags and, in the Clothesco environment, success with paper tags would need to be based on rethinking the layout, staffing and methods of operation for recorded music to reduce the vulnerability of tags.

Some EAS systems are discreet, with the gates either hidden completely or blending in with the store's decor. This was not the Clothesco approach. The company wished to deter potential thieves. The narrow detector gates at the entrance, the presence of the security guard at the front of the store, large EAS tags hanging on all garments, and notices on the walls about EAS were all intended to advertise the system to shoplifters and so change the behaviour of thieves. There were about four so-called 'false alarms' each day resulting from shoppers going to the front of the store to look at a colour in daylight, or turning around from a rack and inadvertently setting off the alarm. These false alarms also reminded customers that there was an EAS system, kept the security guard alert, and demonstrated that action would be taken when the alarm sounded. There was very little evidence of crime displacement to other stores in the group and no one knew whether the rate of shop theft suffered by surrounding stores had increased. There was clear evidence, however, of increased theft of non-tagged items, suggesting that either these should be tagged or displays should be changed to reduce the likelihood of theft.

The EAS decision had been based on the presumption that customer theft was Clothesco's key problem. However, the company found that Store D's losses were also due to staff theft. It was only when the deviant results of Store D against other EAS stores were investigated that evidence of heavy staff theft came to light. When an EAS system performs poorly, this is usually taken to be due to a fault of the system. However, with Clothesco, poorly performing EAS systems were a symptom either of bad management, or of a different form of security problem, or both. In all cases a proper security audit ought to be the forerunner of security policy.

EAS is still a relatively new technology: a commercial system was first developed in 1966. Although EAS can have major effects upon shrinkage levels, as the Clothesco example demonstrates, it is not yet a radically new system involving what Loveridge (1990) calls a new operational logic which will alter the way retailers run their businesses. Management has to learn lessons, as has been seen, for EAS to be effective, but a move to EAS is made easier because of its compatibility with existing retail systems. The next generation of tags may require a more radical approach from retailers as they are likely to involve intelligent tags which can be traced or tracked, tags applied at source which can be switched on and off as the products

move down the distribution and sales channel in addition to ever more complex standard EAS tags. In the future, improved control over the movement of goods through the distribution system, the need to switch tags on and off, and the ability to read/write data in the tags may have as profound an effect upon the operations of retail businesses as did EPoS in the 1980s and early 1990s, intensifying time-based competition (Stalk and Hout, 1991). There are already several projects in the USA and Europe designed to bring this change into effect.

Whether retail firms with expertise in the use of current EAS and information systems will have an advantage over other companies in the exploitation of these newer systems remains to be seen.

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