Home Office Research Study 292

Assessing the impact of CCTV

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Home Office Research Studies

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Foreword

This study represents a major advance in our knowledge about CCTV. No previous research has examined in such detail the issues faced in ensuring effective operation of CCTV systems. The authors have undertaken a painstaking analysis of the effectiveness of systems, both with respect to the impact on crime as recorded by the police and wider measures based on victimisation rates, fear of crime and other information collected via local surveys. The authors have demonstrated that while CCTV can be a powerful tool in combating crime, it has to be recognised that the contexts in which CCTV systems operate are very variable, as are the systems themselves. CCTV can appear to be a simple measure to implement, but this is far from being the case in reality. This report, together with its associated reports, provides invaluable information to assist in developing the full potential of CCTV systems.

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Acknowledgements

Contents

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All the following worked in a variety of research roles during the period of the evaluation and made a major contribution to the project:

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Executive summary

Aims and Methods

This report evaluates 13 Closed Circuit Television Camera (CCTV) projects (comprising 14 separate systems) implemented in a range of contexts, including town centres, city centres, car parks, hospitals and residential areas. The projects were funded under Phase 2 of the Home Office CCTV Initiative. The research covered a number of different aspects:

- Police recorded crime statistics were used to measure changes in levels of crime in the intervention areas and in comparable control areas before and after the CCTV systems were installed. Where appropriate, changes in crime patterns in the surrounding areas were also assessed, in order to measure any displacement or diffusion of benefit effects.

- Public attitude surveys were conducted in 12 areas to assess changes in public perceptions of CCTV in the intervention areas and comparable control areas before and after the installation of CCTV. These included residential in-home surveys and town/city centre in-street surveys.

- Researchers identified other crime reduction initiatives operating within the intervention and control areas, so that it could be assessed to what extent these offered alternative explanations for changes in crime levels.

- Information was gathered on the process by which the project designers chose CCTV, and account was taken of the extent to which CCTV was evaluated as a means of addressing local problems.

- The technical specification and design as well as the process of implementing and installing the CCTV systems were examined.

- Control room operations, including working relationships with external agencies such as the police, and control room management were assessed.

- The economic impact of each CCTV system was assessed.

The main objective of the crime data analysis was to measure the impact of the CCTV projects on crime and fear of crime. For the analysis a quasi-experimental model was adopted and the aim was as far as possible to achieve Level 3 of the Maryland Scientific Methods Scale (Sherman *et al.* 2002). This requires a measurement of change in the incidence of crime before and after the installation of CCTV in both an intervention area (referred to henceforward as the 'target area'), and a control area. Furthermore, the analysis aimed to measure change for a significant length of time following implementation. The crime data analysis suffered, however, from implementation delays and failures, the lack of a suitable control, and limited access to data, which in some cases rendered it less robust than planned.

Impact on crime

● All the systems had the broad objective of reducing crime. Out of the 13 systems[1] evaluated six showed a relatively substantial reduction in crime in the target area compared with the control area, but only two showed a statistically significant reduction relative to the control, and in one of these cases the change could be explained by the presence of confounding variables. Crime increased in seven areas but this could not be attributed to CCTV. The findings in these seven areas were inconclusive as a range of variables could account for the changes in crime levels, including fluctuations in crime rates caused by seasonal, divisional and national trends and additional initiatives.

● A number of quantifiable aspects of systems, which could have explained the impact measured were investigated and it was found that certain *types of system* were more effective than others:

- Systems installed in a mixed category of areas (e.g. car parks, a hospital and various other areas covered by one system) displayed the most encouraging results in terms of reduction in crime, particularly in car parks.

- Town centre and residential systems showed varied results, with crime going down in some areas and up in others.

- Residential redeployable schemes appeared to show no long-term reduction in crime levels. However, the cameras were dealing with short-term problems, which require sensitive measures to detect the impact of the cameras.

1   No police recorded crime statistics were available for Westcap Estate, hence crime levels were analysed for 13 of the 14 systems.

- Certain *types of offence* were affected more than others:

  - Impulsive crimes (e.g. alcohol-related crimes) were less likely to be reduced than premeditated crime (e.g. theft of motor vehicles).

  - Violence against the person rose and theft of motor vehicles fell in the target areas in accordance with national trends in recorded crime.

- Some *system attributes* had more effect than others:

  - Camera coverage was positively correlated (r = 0.51) to effect size. However, this was not statistically significant (p<.05)[2].

  - Increased camera density (numbers of cameras installed per unit area) was related to effect size only where the number of cameras installed in an area had not reached saturation point.

  - There are indications that CCTV is more effective in sites with limited and controlled access points, such as entrances and exits to the area.

- Spatial displacement was not common but did occur:

  - One system showed evidence of displacement of overall crime into the surrounding area.

  - Another showed displacement of burglary into the surrounding area.

  - Another showed displacement of vehicle crime into the gaps in coverage between cameras.

  - None of the factors outlined above determine exactly how well a system will work, but they can work together to reduce crime.

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2   Unless stated otherwise, the statistical significance level used throughout the report is p<.05

Public attitudes to CCTV following implementation

- Public attitude surveys were carried out before and after the installation of CCTV in 12 different areas: nine residential estates and three city/town centres. The surveys covered five main issues:

Awareness of cameras

- Individuals were usually aware of cameras in their area; levels of awareness ranged from 61 to 97 per cent and were highest in small residential areas. Public awareness of CCTV increased as the number of cameras per unit area increased; r = 0.32 (not statistically significant).

Worry about being a victim of crime

- Members of the public worried less about becoming victims of crime in the intervention area following the installation of CCTV, but this was statistically significant in only three areas. Worry about being affected by crime declined significantly more than in the control area in just two areas.

- Changes in worry about crime did not appear to be affected by type of area.

- Respondents who were aware of the cameras actually worried more often about becoming a victim of crime than those who were unaware of them. Knowing that cameras were installed in an area did not necessarily lead to a reinforced feeling of security among respondents.

Feelings of safety

- Feelings of safety increased in all but one of the areas surveyed following CCTV installation. In three areas the increase in feelings of safety was greater than in the control area. However, none of the results was statistically significant.

Reported victimisation

- Eight schemes led to a reduction in the percentage of respondents who reported having been victims of crime after, compared with before, the installation of CCTV. Four of these eight recorded a larger reduction in victimisation than the control. However, none of the data were statistically significant.

- In six residential areas the number of reported incidents increased or decreased in line with changes in recorded crime levels generally, so tending to confirm the reliability of the recorded crime data.

- Victimisation did not appear to be affected by the type of area the CCTV system was installed in.

- Worry about being a victim of crime declined in seven areas in step with a reduction in reported victimisation. This suggests that worry about being a victim of crime was directly related to crime levels, rather than the mere presence of the cameras.

Changes in behaviour

- Respondents rarely changed their behaviour following the installation of CCTV: across the areas surveyed only from two to seven per cent visited places they had previously avoided. This is substantially fewer than the 15 per cent of pre-implementation respondents who thought that CCTV would encourage them to visit places they avoided.

- The presence of CCTV did not discourage people from visiting places. Only one per cent of respondents said they avoided places once CCTV had been installed.

Support for CCTV

- The proportion of respondents happy or very happy about having cameras in their area declined in nine areas following their installation; in five of these the reduction was statistically significant. However, the level of support of CCTV remained high at over 70 per cent of the sample in all but one area.

- Concerns regarding the implication for civil liberties decreased slightly following the implementation of CCTV. Whereas 17 per cent of respondents expressed such concern prior to its installation, this declined from two to seven percentage points post CCTV installation.

Perceived effectiveness of CCTV

- In residential areas, the proportion of those who perceived the impact of CCTV to be positive decreased following its installation in all the areas surveyed:

- Respondents were less likely to think that people reported more incidents to the police once CCTV was installed, although in all cases over a third of respondents thought that this was the case.

- They were less likely to think that the police responded more quickly to incidents following CCTV installation, although the proportion of respondents who thought that this occurred varied from 12 per cent to 60 per cent.

- They were less likely to think that crime had got lower following installation of CCTV, although 27 to 70 per cent thought that it had.

What factors influence CCTV's operation?

● The characteristics that determine whether a CCTV system meets its objectives fall under five headings: scheme objectives, management, density, camera coverage and positioning, technical characteristics and operation of the control room. It was not possible to identify a link between the outcomes and the characteristics identified because the key characteristics had a bearing in various degrees on all the areas surveyed, and the presence of any one characteristic was not linked to an outcome. The key characteristics are discussed below:

Project objectives

● Many projects did not have clear objectives. Partly this reflected an uncritical view that CCTV was 'a good thing' and that specific objectives were unnecessary. It also typified a lack of understanding of what effects CCTV could achieve and the types of problems it was best suited to alleviate.

● Installation of CCTV created demands by neighbouring town centres to 'catch-up' with systems of their own. The claimed successes of existing projects reinforced these demands and relieved planners of the need to consider other alternatives.

● The existence of funding for CCTV created pressure to bid for it, often in the absence of reliable intelligence indicating where CCTV would be likely to have most effect. Where statistics were gathered, they were sometimes inexpertly produced or were even distorted, having being compiled to support a bid.

Management

- A scheme must be properly managed and this requires access to technical expertise, full engagement of end-users and the appointment of a suitable project manager.

- Many schemes relied too heavily on technical consultants whose work was not scrutinised, largely because no one had the qualification to question what was being done. Since a consultant was dispensed with in many cases, planners were unable to challenge the technical sales pitches of equipment suppliers.

- Some systems failed to engage properly with end-users, most notably the police. This might be as a result of a loss of interest in the system and reluctance to use the evidence supplied by the cameras. The police could also be reluctant to supply intelligence, which would be helpful in the monitoring process.

- A willing project manager was sometimes difficult to find – only five out of the 13 schemes appointed a manager with previous CCTV experience. Lack of interest and lack of knowledge on the part of project managers compromised the ability of schemes to meet their objectives.

Density, camera coverage and positioning

- As a result of the lack of guidance on how many cameras to bid for, the number and density of cameras varied widely between schemes. However, systems with a high density of cameras did not necessarily produce a greater reduction in crime.

- Similarly, the level of camera coverage varied. Too little coverage tends to prevent efforts to track offenders for detective and evidential purposes. Camera coverage is linked to camera positioning and needs to take account of the nature of the area to be monitored and the objectives of the CCTV system.

- Only seven of the 13 projects had a structured procedure for deciding the positioning of cameras. Police intelligence was invaluable when positioning decisions were taken, as (for extensions to existing schemes) was the input of the operators who were to monitor them. Operators sometimes found that the cameras were not positioned in the best way to enable them to perform the tasks that were set for them. Many errors in the positioning of cameras arose from over-reliance on the technical manager to the exclusion of other parties.

Technical characteristics

- The type of camera used and the way that it was mounted influenced whether a system was useful for live monitoring, for providing good quality retrospective evidence, for deterring would-be offenders, for reassuring the public, or for a combination of these. The systems used two types of camera, static or pan, tilt and zoom (PTZ), and these were either box or dome mounted.

- Designers preferred PTZ cameras, which were more likely to be monitored as operators could control their field of vision and therefore found them more interesting to operate. To ensure adequate coverage of an area required many PTZ cameras with overlapping fields of vision, which is an expensive option.

- A further advantage of PTZ cameras is that they can be seen to move, so they are better at reassuring the public. Whether they deter and detect crime is open to question; some cameras were programmed to 'auto-tour' an area and there was a consensus among operators and managers that offenders were unlikely to be deterred for long by such a set-up. Cameras on auto-tour also caused frustration when those reviewing recorded images found that the cameras had only recorded part of an incident before being trained somewhere else by the pre-programming.

- Some cameras were unable to cope with artificial lighting in the hours of darkness. Residential areas in particular often had inappropriate levels and types of lighting, which led to the cameras being regarded primarily as a deterrent and a reassurance to residents.

- The evaluation took place during a period when many system designers were switching from analogue to digital recording methods. Control rooms using digital technology often lacked confidence that they would obtain the full advantages that should accrue from faster searching and recording capabilities.

Operation of the control room

- Control room operation was an important determinant of a CCTV system's ability to detect crime. The monitoring schedule is certainly an issue here: six of the 13 control rooms were staffed for less than 24 hours a day.

- The control rooms relied on intelligence and communication from the public about incidents in progress in order to direct surveillance. In practice, levels of incoming and outgoing communication were low.

● The presence of a one-way or two-way police radio in the control room was found to be beneficial, enabling operators to locate incidents at least as quickly as did police officers, and to observe police intervention.

● Another form of communication was the retail/pub radio schemes, which accounted for the reporting and observation of significant numbers of incidents.

● Outward communication from the control room was assisted in some cases by the ability to patch images through to monitors in police CAD rooms and other locations within the police station.

Overall
● The use of CCTV needs to be supported by a strategy outlining the objectives of the system and how these will be fulfilled. This needs to take account of local crime problems and prevention measures already in place.

1.   CCTV in perspective

The CCTV initiative was set up under the Home Office Crime Reduction Programme announced in 1998, and £170 million was made available for funding of a total of 684 CCTV projects. These have been installed in a wide range of locations, including car parks, town and city centres, and residential areas. This report sets out the main conclusions of a process and impact[3] evaluation of 13[4] out of the 352 CCTV projects set up under Round Two of the initiative, and aims to show whether CCTV was effective in those cases.

This chapter defines CCTV and reviews previous research work on the subject. It moves on to discuss the effectiveness of CCTV judged by some key criteria, which points to the conclusion that as far as CCTV is concerned the jury is still out. The review identifies some gaps in research and this leads on to a discussion of the methodology employed for the present study.

What is CCTV?

Closed Circuit Television Cameras (CCTV) have become an important crime prevention and security measure. Cameras collect images, which are transferred to a monitor-recording device of some sort, where they are available to be watched, reviewed and/or stored. CCTV is a situational measure that enables a locale to be kept under surveillance remotely. This makes it possible for the police, and other law and regulatory agencies such as private security, to respond to incidents when alerted, and to have information about what to look for when they arrive. The storing of images means that post-incident analysis helpful to an investigation can be facilitated. However, there are many different types of CCTV systems and they have different capacities to meet a variety of objectives.

Despite the tendency within the criminological literature to discuss CCTV as if it were a single measure, CCTV systems can differ quite markedly. Cameras can be static (focusing on a single view), or can pan, tilt and zoom (moved by operators, or placed on 'tours' to survey a succession of scenes); they can be fixed (permanently installed in one location);

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3   Process evaluation includes CCTV project design issues, control room operations and project management. Impact is evaluated through police recorded statistics, public attitude surveys and an economical assessment of each project.
4   Originally, 17 projects were chosen for evaluation; however, four projects were not implemented within the evaluation timetable.

redeployable (moved around power points within an area), or mobile (placed in vehicles and transported to where they are needed); they can transmit analogue or digital images, via cable or wireless links. The images can be recorded in different ways with different implications for quality. The many methods of storing and manipulating images have different implications as regards the type and speed of monitoring that can be carried out. The availability of specialised uses, such as number plate and facial recognition, has generated yet more potential applications of this flexible technology.

CCTV systems may embody several of these technical features. There are a number of points that need to be highlighted here. First, the technical specification of a system may well impact on its effectiveness; this is a topic that has received little attention from criminological evaluators. Second, this is emerging technology, and assessments at any particular point in time need to take account of this. Third, technical considerations are an important element in the evaluation of systems. This does not mean that those evaluating CCTV need to be technical experts, but technical expertise does need to be consulted. In particular, it is crucial to clarify that the technical specification is consistent with the objectives set.

However, the technology is only one part of a CCTV system. No system can work without a control room, and there is wide variation in the way that these operate. They can be monitored full-time or for a limited number of hours a week, and by a dedicated operator or by one who has other duties besides CCTV monitoring. Staffing levels vary greatly, and so do the types of areas surveyed, including town centres, residential areas and car parks. There are also a range of control room cultures, management styles, and methods of communicating with the police. All of these factors, and others[5], influence the way the control room operates.

Many systems also incorporate the installation, or improvement, of street lighting in their design and often such improvements are made at the same time as the cameras are installed. These are then treated as part of the scheme design rather than as confounding factors.

What do we know about the impact of CCTV?

There is a growing amount of literature on CCTV, which includes several CCTV magazines for professionals, and academic studies examining different aspects of CCTV (e.g. Gill, 2003; McCahill, 2002; Norris and Armstrong, 1999; Norris, *et al.* 1998). These studies add substantially to our understanding of how CCTV works, but none of them sets out to

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5   For example, Evett, C. and Wood, J. (2004): Designing a Control Room. *CCTV Image*. Spring pp24-25.

tackle the issue of effectiveness. Much of the public interest has been on the threat that CCTV poses to civil liberties, and concerns about 'big brother', and on understanding the role of surveillance more broadly[6].

However, the question of the effectiveness of CCTV has not been entirely ignored. Researchers have discussed the effects of CCTV in different environments. The problem for policy purposes, as summaries of these have shown (NACRO, 2002; Phillips, 1999; Welsh and Farrington, 2002) is that sometimes the effect is positive, sometimes negative, and sometimes neutral. Cost-effectiveness has been largely ignored. Moreover, we know little about why the impact appears so variable; there are no studies that have incorporated process and impact evaluations, presented findings in a way that enables the causes of success and failure to be articulated, or point out the lessons to be drawn. In the past, those who have funded research have set other priorities.

Nevertheless, the evaluations that have been undertaken have provided important insights (see Newburn and Hayman, 2002). Some of the salient findings are summarised here against some of the key objectives of CCTV.

Does CCTV reduce crime?

There is evidence that CCTV is more effective in some contexts than others, and certainly more effective against some types of crime than others. Generally speaking, property crimes seem more susceptible to the impact of CCTV (e.g. Brown, 1995) especially thefts from and of vehicles (e.g. Skinns, 1998; Tilley, 1993), while personal crimes such as assault are less likely to be influenced (Deismann, 2003). Welsh and Farrington's (2002) review found that CCTV had no effect on crimes of violence, but a significant impact on vehicle crime.

A comprehensive review of the effect of CCTV on crime rates has been undertaken by Welsh and Farrington (2002). They reviewed 22 studies that met the minimum acceptable standards of the Campbell Collaboration (see, Farrington, 1997; Welsh and Farrington, 2002). Specifically, this lays down that studies must meet Level 3 of the Maryland Scientific Methods Scale (Sherman *et al.* 2002) and this requires a measurement of the incidence of crime before and after the installation of CCTV, in both a target and control area. Welsh and Farrington concluded that 11 showed a desirable effect on crime, five an undesirable effect, that no clear evidence of effect was apparent in another five, and that in one case it

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6   Clearly, an assessment of the attitudes towards the threat posed by CCTV to civil liberties may be informed by a better understanding about its effectiveness, including its cost-effectiveness.

was not possible to tell. The meta-analysis added the detail that of the 18 studies included, half showed a desirable effect and half did not.

The location and focus of the scheme were found to be important. Studies of the city centre and public housing[7] (a somewhat strange merging of contexts) showed that CCTV had a small overall positive effect; approximately two per cent better in experimental areas than in control areas. On public transportation there was again a mixed message; overall there was a reduction in crime in experimental areas, but it was not significant, and of the four studies, one found no effect and another an undesirable effect. In car parks the findings were clearer; CCTV had a statistically significant effect, in that there was a 41 per cent reduction in vehicle crimes, although in all the studies other measures, such as street lighting, were in operation alongside CCTV. However, Welsh and Farrington (2002:45) offer qualifications of the tempting, but simplistic, conclusion that CCTV works better in car parks:

> …the success of the CCTV schemes in car parks was limited to a reduction in vehicle crimes (the only crime type measured) and all five schemes included other interventions, such as improved street lighting and notices about CCTV cameras. Conversely, the evaluations of CCTV schemes in city centres and public housing measured a much larger range of crime types and the schemes did not involve, with one exception, other interventions. These CCTV schemes, and those focused on public transport, had only a small effect on crime. Could it be that a package of interventions focused on a specific crime type is what made the CCTV-led schemes in car parks effective?

Given what is known about the effectiveness of situational measures (see Ekblom, 1992), the answer to their question is almost certainly 'yes'. And Welsh and Farrington's (2002) work is not without its critics, not least given its focus on a narrow range of studies, which ignores qualitative work. Be that the case, the review of previous work does not offer conclusive evidence that CCTV on its own impacts positively on crime levels.

Does CCTV reduce the fear of crime?

This question is foremost in the minds of policy makers, but 'fear of crime' has a range of possible definitions (Farrall *et al.* 2000). While some studies define it in terms of 'feelings of safety' (see Hale, 1996), others are concerned with 'worry about being a victim of crime'

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7   The 'public housing' schemes referred to here involve cameras being located *inside* and *on* buildings, monitoring the buildings themselves, rather than the area, as is the case with the present report.

(see Hale, 1996; Furstenburg, 1971). However, neither definition is perfect. Whilst feelings of safety can be influenced by a range of different factors, many of which are unaffected by crime, levels of worry are highly subjective and 'worry' can mean different things to different individuals.

More recent studies measuring public attitudes towards CCTV have been concerned mainly with public 'feelings of safety', but here too the findings are mixed. While some studies have concluded that CCTV does make people feel safer (Sarno *et al.*, 1999), this is not necessarily the whole story. Ditton (2000) found that one of the main impacts was making those who already feel safe, feel even safer. Moreover, relatively low percentages say they would use public areas more as a consequence of feeling safer; 22 per cent after dark and eight per cent during the day in Bennett and Gelsthorpe's (1996) study, and 15 per cent in both Ditton's (2000) and Spriggs *et al.*'s (2005) work. But these results were not tested after the event.

In any event, in order to feel safe, people need to notice the cameras, and it seems that many do not (Ditton, 2002; Dixon *et al.* (forthcoming); Honess and Charman, 1992). Also, there is some evidence that a belief in the value of cameras in increasing feelings of safety is linked to generally positive views about CCTV (e.g. Spriggs *et al.*, 2005).

Does CCTV deter crime?

Phillips (1999) underlined the need to demonstrate the deterrent effect of CCTV by publicising the risk it poses to offenders. But what do offenders think? Short and Ditton (1998) found some scope for optimism, in that some offenders said they were deterred and others resorted to less serious offences. Evidence from Gill and Loveday (2003) suggests that, in general, offenders take a blasé attitude to appearing in court and do not perceive CCTV to be a serious problem. The one optimistic sign is that those who had been caught on camera were significantly more likely to view CCTV as a threat. Perhaps as more are caught on CCTV, and as offenders become aware of this, the threat it is seen to pose will increase. Understanding whether this will stop them offending or influence their behaviour in some other way must await further research.

Does CCTV help in catching and prosecuting offenders?

Early concerns that CCTV might become a substitute for police officers (Honess and Charman, 1992) do not appear to have been realised; indeed the public appear to favour

more police on the beat rather than CCTV when given a choice (Bennett and Gelsthorpe, 1996). Also, when police officers are asked about their views of CCTV they are very positive (Gerrard, 1999; Gill and Hemming, 2004; Levesley and Martin, 2005). Yet there is some evidence that this enthusiasm is not always matched by the officers' actions. Norris and McCahill (2003) noted that operators were not always native speakers and this limited the extent to which they could communicate with the police. And there have been practical difficulties in using images in court: both police and the parties involved in the prosecution of offenders are suffering from information overload. With over four million cameras (Norris and McCahill, 2003) processing information, this represents a real challenge for the future.

Does CCTV displace crime?

Displacement has long been the Achilles heel of situational measures, and CCTV is no exception (see Armstrong and Giulianotti, 1998). It is, however, unclear whether or not CCTV displaces crime (Brown, 1995; Ditton and Short, 1999; Wilson and Sutton, 2003). There is evidence that CCTV does displace offences, but this does not always mean that its effects overall have been negative (Burrows, 1979; Skinns, 1998). Commonly, there will be displacement of some crimes and not others. For example, Chainey (1999) found no displacement for street robberies, but there was displacement of motor vehicle crime. Recently, Flight *et al.* (2003) found minimal displacement.

Putting effectiveness in perspective

The one easy conclusion to derive from this review is that studies of CCTV have not been definitive about whether CCTV works and this is the case even though different criteria may be used to assess effectiveness. But there is a further problem in that the research points to possible successes and failures without explaining why these may have occurred.

This topic has not been ignored; research on mechanisms has adopted a scientific realism approach, rather than a quasi-experimental one[8]. The focus is on explaining how 'mechanisms,' such as CCTV, work in 'contexts' suffering particular problems such as high crime levels to produce 'outcomes', such as greater feelings of safety or fewer offences (see Pawson and Tilley, 1997). Knowing how CCTV works is vital for developing 'transferable lessons' that enable good practice in one area to be repeated in another.

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8   Full details of the methodology are given in Appendix A, and in the Technical Annex to this report (Gill *et al.*, 2005c).

The mechanism, that is the process by which CCTV could and does bring about change, has been discussed in several studies. Listed below are a number of mechanisms, devised by Tilley (1993), which seek to explain how CCTV may work:

- Caught in the act – CCTV could reduce crime by increasing the likelihood that present offenders will be caught, stopped, removed, punished and therefore deterred.

- You've been framed – CCTV could reduce crime by deterring potential offenders who will not want to be observed by CCTV operators or have evidence against them captured on camera[9].

- Nosy parker – a reduction could take place because more natural surveillance is encouraged as more people use the area covered by CCTV. This may deter offenders who fear an increased risk of apprehension.

- Effective deployment – CCTV may facilitate the effective deployment of security staff and police officers to locations where suspicious behaviour is occurring. Their presence may deter offenders, or may mean they are caught in the act.

- Publicity (general) – this may assist in deterring offenders.

- Publicity (specific) – CCTV cameras and signs show people are taking crime seriously, and thus offenders may be deterred.

- Time for crime – CCTV may have less of an impact on crimes that can be done quickly as opposed to those that take a longer time, as offenders assume that they will have enough time to avoid the cameras, or to escape from police officers and security staff.

- Memory jogging – publicity about CCTV encourages potential victims to be more security conscious and to take precautionary measures.

- Appeal to the cautious – those who are more security-minded use the areas with CCTV, driving out the more careless who may be vulnerable to crime elsewhere.

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9 An extension to this mechanism; police, door staff and shop assistants were observed indicating the presence of CCTV to potential troublemakers, thus deterring them from committing an offence.

Gill and Turbin (1998; 1999; and see Sarno *et al.* 1999) have suggested other mechanisms:

- CCTV may give third parties (shop staff, members of the public, householders) more confidence to challenge offenders, thereby preventing or deterring them.

- By viewing CCTV monitors, police and others may be able to more effectively pinpoint trouble spots, times, activities etc., and anticipate/remove crime catalysts.

However, as the authors note, CCTV may not always operate positively. Gill and Turbin (1999) have identified a number of negative effects that CCTV could have:

- Officials' (police etc.) and third parties' vigilance may decrease as they begin to rely on CCTV, creating both additional possibilities for crime and reducing the benefits of vigilance.

- CCTV may reduce natural surveillance as fewer people use the area, because they dislike the idea of being watched.

What studies have shown is that CCTV was successful on some criteria and unsuccessful on others. It is therefore important to understand the many potential benefits of CCTV when considering effectiveness. Understanding the different aims of CCTV, and the mechanisms by which those aims are to be realised, provides a theory of how CCTV should work, and a hypothesis for the evaluation. Even this, though, is complicated. Objectives are not always clearly set, and they may change over time (Ditton *et al.* 1999). Moreover, precisely because CCTV systems differ, and contexts can be enormously complicated, comparing the findings of one study with those of another requires close attention to detail, which frequently does not appear in evaluation reports.

There is one other aspect of CCTV that is important in any discussion about impact, and that is the cost-effectiveness of CCTV. For policy purposes, the ultimate test of a positive impact is whether it can be reproduced at a cost-effective price. This is another topic where there is a crucial gap in knowledge.

Conclusion

Research on the effectiveness of CCTV has painted a somewhat confusing picture. There are plenty of studies showing successes, but plenty highlighting failures too. The most robust studies, according to the criteria deemed acceptable according to the Campbell Collaboration, compound the confusion. While CCTV in some locations, and car parks are the best example, show some success, it is typically introduced alongside other measures. No single study appears to have included a process and impact evaluation taking account of the various objectives and seeking to develop transferable lessons for good practice. Moreover, residential areas have received scant coverage and there is little knowledge about whether CCTV works there.

This study

The present evaluation can only fill some of the gaps highlighted above. The work was impeded by implementation delays and failures, which in some cases led to schemes being dropped from the evaluation, and lack of access to data, which in some cases rendered the analyses less robust than had been hoped. In the presentation of findings that follows, important findings and trends that emerge from those schemes where the data allowed a more rigorous analysis are highlighted.

The findings were derived from a process and impact evaluation of 13 CCTV projects that received money under Phase 2 of the CCTV Initiative. These systems were installed across a range of sites including town centres, city centres, car parks and residential areas, and others, which incorporate diversity of a different kind, including an industrial estate, a park, arterial roads and hospitals. Some of the findings relating to the process evaluation have been published already (Gill *et al.* 2003; Smith *et al.* 2003), but this is the first time the findings on impact have been made available. Specifically, this study incorporates the following elements:

- A quasi-experimental and realist approach incorporating a cost-effectiveness evaluation. It measured the impact of CCTV on levels of recorded crime and fear of crime, and identified the mechanisms, which explain this impact.

- A measurement of changes in levels of crime and fear of crime in the intervention area and a comparable control, before and after the CCTV system had been installed[10].

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10 Systems were often installed over a period of several months, varying from one to, in one extreme case, eight months. The two-year pre-intervention period was measured retrospectively from the point at which the first pole was installed, whereas the two-year post-implementation period was measured from the point at which the first camera was connected to the control room and monitored.

Control areas were selected because of their similar socio-demographic and geographical characteristics and crime problems.

- Time series analysis was conducted on the crime data to account for fluctuations in crime levels over time. It measured changes in crime levels during two years prior to and two years following installation of CCTV where the timescale of the evaluation allowed[11].

- Where appropriate any changes in crime in a buffer area were assessed, in order to measure any displacement or diffusion of benefits.

- The identification of other interventions being carried out within the target area and control areas, so that any confounding factors could be accounted for.

- The process that led to the choice of CCTV, and the extent to which CCTV was evaluated as a solution to local problems.

- The evolution of the aims and objectives of projects tracing any changes that occurred over the course of time.

- The management of CCTV schemes.

- The technical specification and design of the CCTV system and any complications that arose.

- The process of implementing and installing the CCTV systems.

- The control room operations, including the work of operators and the management approaches to overseeing their work.

- The costs of the schemes.

Outline of report

Chapter 2 presents a description of the projects that were evaluated and highlights the range of different contexts of systems, including their type and size.

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11 Eight out of the 14 projects under evaluation.

Chapter 3 describes the impact of CCTV on crime, disorder and fear of crime. Chapter 4 evaluates the characteristics of CCTV schemes that can facilitate a project meeting, or not meeting, its objectives. The key characteristics can be grouped under five headings: system objectives, management of the projects, density, coverage and positioning of cameras, technical characteristics, and control room operation.

Chapter 5 presents a financial assessment, identifying the outputs of each project and comparing these with the inputs invested in each. It outlines the potential costs and benefits of CCTV before detailing the actual cost of each system. It then suggests whether the CCTV systems were cost-effective.

Chapter 6 assesses what has been learnt about the effectiveness of CCTV. It outlines the circumstances in which it appears to have worked, or not worked, and the impact that particular characteristics of CCTV systems have.

2. Setting the scene: location of CCTV systems

This chapter describes the CCTV projects that were assessed and begins by explaining how they were chosen. As will be shown, the projects varied considerably and were installed in a range of different settings. The characteristics of the areas in which they were installed are discussed and the chief characteristics of the systems themselves are described.

Selection of CCTV projects

The Home Office selected 17 projects[12] for in-depth evaluation, chosen from a sample of over 300 funded in Phase 2 of the Crime Reduction Programme. The research team were not involved in the selection of the projects, but were advised that three main criteria guided the selection. First, the Home Office wanted to include a mix of projects, with a particular emphasis on those installed in residential areas, since these were relatively new and had received little attention in previous evaluations. But this was to be balanced by the inclusion of systems in a range of other areas to include town and city centres. Second, officials chose projects that could be easily evaluated as they promised to provide sufficiently detailed data to facilitate the research. Third, some projects were selected because they were of particular significance, either because they received substantial funding, or because they were in areas with a reputation for high levels of crime. It is therefore important to emphasise that the choice of projects was not random, and it cannot be claimed that they are in any way typical.

In the event, only 13 of the initial 17 projects were implemented within the evaluation timetable, one of which involved the installation of cameras in two separate town centres showing radically different crime patterns. In total, therefore, 14 systems[13] were installed and these are the subjects of this report. Table 2.1 below summarises the main characteristics of each system in the sample; from this it is clear that they varied considerably.

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12 Where a project is a CCTV installation programme outlined in one Home Office bid.
13 Where a CCTV system is a discrete group of cameras operating within a target area.

Table 2.1:   Main characteristics of each scheme[14]

Project	Where CCTV cameras were located	Characteristics of the area	Main offences that CCTV is aimed at reducing	Type of system	New system or extension of existing one	Number of CCTV cameras installed as part of project
City outskirts	Mixed: residential, park, light industrial, hospital (Midlands)	Deprived Housing: flats, terraced Tenure: privately owned and rented, local authority rented	Vehicle crime; drug use and dealing; prostitution; commercial burglary; theft; robbery	Fixed	Extension	47
London Hawkeye	Car parks	City outskirts, mixture affluent and deprived	Vehicle crime	Fixed	New	646 (of which 556 evaluated)
City Hospital	Hospital	Deprived	Vehicle crime; violence and assault	Fixed	Extension	67 (of which 9 evaluated)
South City	City centre, (south of England)	Mixture of deprived and affluent	Retail crime; vehicle crime; alcohol related violence; robbery; assault; drug use and abuse	Fixed	Extension	51
Shire Town	Town centre, (Midlands)	Ex-mining	Retail crime; vehicle crime; alcohol related	Fixed	New	12
Market Town	Town centre, (Midlands)	Affluent market town	Retail crime; vehicle crime; alcohol related	Fixed	Extension	2 (plus 7 linked pre-existing)
Borough Town	Town centre (Northern Borough)	Small town centre, surrounded by residential area	Retail/commercial crime; alcohol related offences; criminal damage	Fixed	Extension	40 new cameras on 8 columns

14 The name of each project (with the exception of Hawkeye) has been changed to protect its identity. Hawkeye has a number of distinguishing features, which make it easy to identify.

Project	Where CCTV cameras were located	Characteristics of the area	Main offences that CCTV is aimed at reducing	Type of system	New system or extension of existing one	Number of CCTV cameras installed as part of project
Northern Estate	Residential (North England)	Deprived Housing: flats; Tenure: local authority	Criminal damage, vehicle crime, burglary, juvenile disorder	Fixed	New	11
Westcap Estate	Residential (West London)	Deprived Housing: flats, terraced Tenure: local authority	Fear of crime	Fixed	Extension	12
Eastcap Estate	Residential (Kent)	Deprived Housing: terraced Tenure: local authority rented	Burglary, criminal damage, vehicle crime, community disorder	Fixed	New	12
Dual Estate	2 residential, 1 main road (Kent)	Deprived Housing: semi-detached, flats Tenure: local authority Some shops	Anti-social behaviour, harassment	Fixed	New	14
Southcap Estate	Residential (South London)	Deprived Housing: flats Tenure: local authority	Robbery; burglary; drug dealing and using; prostitution; graffiti; vehicle crime	Fixed	Extension	148
Borough	Residential (Kent Borough)	Borough-wide Mixed affluence	Anti-social behaviour	Rede-ploy-able	New	8 cameras on any lamp-post
Deploy Estate	3 Residential 1 station 1 shopping area (Kent)	Deprived Housing: flats, semi-detached housing Tenure: rented HA	Vehicle crime; burglary; criminal damage; fly-tipping; disorder	Rede-ploy-able	New	11

Seven of the final sample were located in residential areas, reflecting the Home Office's particular wish to assess the effectiveness of CCTV in these places. In addition, three systems were installed in urban centres, one in a city centre, one in and around a hospital, one in 60 car parks spread across London, and another in a range of different areas including a residential area, a park, an industrial area and a hospital. Moreover, some parts of systems covered other types of areas, such as shopping precincts, a station and a main road. The areas were located in different parts of England, including the North East, the North West, the Midlands and the South West, but half of the residential systems were in the London and Kent conurbations.

Area characteristics

The residential areas in the sample were similar in at least some respects. They were all urban, being situated within a mile or two of town or city centres. Generally, they were deprived relative to their surroundings, in wards which were in the top ten per cent of the most deprived in the UK[15]. Thus, residential areas tended to consist of social housing, and there was an abundance of flats, although the sample also included estates, or parts of towns, with a high proportion of semi-detached and terraced properties.

However, the areas presented a disparate range of crime and disorder problems. Most residential areas suffered from low-level crime and disorder such as anti-social behaviour, juvenile disorder and criminal damage, and these are commonly associated with areas of deprivation (compare for instance Simmons and Dodd, 2003). However, whilst three projects presented *only* these problems, others commonly suffered from more serious offences such as drug use and abuse, shop theft, burglary and vehicle crime. One area (Southcap Estate) suffered from a range of more serious crimes, such as assault and robbery, in addition to having what was considered a serious drugs problem. These distinguished it from all other residential areas.

The town and city centres shared fewer characteristics, but presented similar crime and disorder problems. The areas varied in size from a couple of streets to a mile square; they were located throughout England and included shire, metropolitan and borough centres; and they varied from a city centre of high deprivation to a relatively affluent market town. All the town and city centres suffered from shoplifting during the day and alcohol-related violence at night, as well as a high rate of vehicle crime. In the city centre, there was a high proportion of other offences such as robbery, theft, assault and drug-use/supply.

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15 Index of Multiple Deprivation 2000; http://www.neighbourhood.statistics.gov.uk

One scheme (Hawkeye) consisted of 60 car parks, varying in size from 20 to 300 spaces. They were attached to the public transport system north of London and were spread across a wide area, stretching from the outskirts of the city centre to 20 miles north. While some car parks were situated within relatively affluent areas, others were not. Certainly the vehicle crime rates for the car parks varied considerably: one or two suffered from high rates of vehicle-related crime but the majority experienced extremely low levels. Four suffered over 100 vehicle-related incidents in the year prior to installation of CCTV, whilst 25 suffered fewer than ten incidents a year.

The size of the systems

The sample comprised systems of a range of sizes. Seven of the 14 systems consisted of between eight and 18 cameras, of which five were installed in residential areas. Four systems of between 40 and 70 cameras were installed across different types of area. Two systems were much bigger than the rest. In one residential area, with more serious crime problems, 175 cameras were installed, and the London car park system consisted of 600 cameras installed in 60 car parks.

Fixed or redeployable systems?

The sample consisted mostly of fixed systems, where individual cameras could not be moved from one location to another. Only two systems were redeployable, and these differed markedly in their level of flexibility. In one system, the cameras could be installed on any of a fixed number of poles in residential areas, a shopping precinct and a station. In the other system, the cameras could be installed on lamp-posts. These were installed in residential areas, along main roads and outside pubs and amenities.

New systems/additions to old systems?

Seven of the projects extended existing CCTV systems whilst others were installed in areas with no experience of this measure. The system extensions included all but one of the town or city centre schemes, as well as two installed in residential areas. All the entirely new systems were installed in residential areas, except the 600-camera car park system.

Summary

The CCTV systems differed markedly both in terms of type and location. This offered the opportunity to assess the importance of context in examining the impact of the systems. The findings are discussed in Chapter 3.

3.
Does CCTV work?
Its impact on crime and the fear of crime

This chapter assesses the impact of CCTV on crime, disorder and the fear of crime. It also aims to measure the extent to which the specific objectives of individual CCTV systems have been met. It explores some of the mechanisms that enabled certain CCTV systems to have an impact, and the factors that prevented others from doing so.

The section headed *Impact on crime* measures the change in police recorded crime across all the systems covered by the present study, following the installation of CCTV. It identifies the systems showing a reduction or an increase in all relevant crime and, where appropriate, it explores whether these changes could be attributed to the CCTV system rather than other factors. Where the changes can be attributed to the CCTV system it identifies the mechanisms by which the system is likely to have achieved this outcome.

The impact of CCTV on particular types of offence is then discussed. This is important for at least two reasons. First, random fluctuations in individual crimes could cancel out the impact of CCTV. Second, previous studies have shown that CCTV systems can influence the recorded levels of different offences in a number of ways. The changes in crime patterns across all the systems are measured before changes in individual cases are identified and the mechanisms behind these explored.

Finally, the section assesses the impact of a range of (quantitative) variables such as the level of camera coverage and the types of camera.

The section headed *Public attitudes to CCTV following its installation* investigates the impact of CCTV on public perceptions by reference to the findings of a public attitude survey carried out in nine residential and three town or city centres[15] prior to and then after the installation of CCTV. It reports on awareness of CCTV in each area, assessing its impact on fear of crime, on behaviour, and on levels of support for CCTV.

The final section summarises the main findings that emerge from the study.

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15 The public attitude survey included a project which was subsequently excluded from the evaluation. Cameras were installed in this area but significant delays to implementation meant that a full evaluation could not be conducted within the research period.

Analysis of data

The main objective of the crime data analysis was to measure the particular impact of the CCTV projects on a variety of outcomes. Police crime statistics and public attitudes to CCTV were examined in a number of ways. The exact methodology used is described in an on-line report (see Gill *et al.* 2005c).

A quasi-experimental model of evaluation was used with the aim of achieving where possible Level 3 of the Maryland Scientific Methods Scale (Sherman *et al.* 2002), which requires a measurement of change of crime both before and after the installation of CCTV in both a target and control area. Furthermore, it aimed to measure change for a significant length of time following implementation.

In practice, the achievement of Level 3 was constrained by the difficulty of identifying a suitable control for each target area and the unavailability or poor quality of police crime data. Moreover, many projects were slow to come into operation. Table 3.1 examines the quality of data used in the analysis, highlighting the projects for which a suitable control area was identified, the number of months for which crime data were available after implementation, whether a public attitude survey was conducted in the area, and the precision of the disaggregated crime data supplied by the police. Projects are ordered according to the quality of data available and the length of the follow-up period. It can be seen that seven projects had a comparable control, achieving Level 3 of the Maryland Scientific Methods Scale (Sherman *et al.* 2002); one of these had only four months of data following full implementation. Six of the seven control areas were within the same police division as the target area and one was located in another police force. Where no control could be identified, crime rates were compared with those in the division[17]. Surveys were carried out in ten[18] projects, covering 12 target areas.

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17   However, the results in this study give little indication that a control area provides a better comparison than the division. In two systems for which both control and divisional data were available within the same police force division (Eastcap and Northern Estate) analysis was carried out to assess the impact of the choice of control on the interpretation of the results, particularly the relative effect size ratio between the control and the target areas. Little detectable difference in impact was found. In Eastcap Estate, the relative effect size comparing a control area with the target, was 1.03 as against 0.9 comparing the division with the target, and the corresponding confidence intervals were 0.62-1.44 and 0.71-1.09 respectively. In Northern Estate the relative effect size, comparing a control area with the target, was 1.34 as against 1.23 comparing the division with the target, with corresponding confidence intervals of 0.78-1.90 and 0.89-1.57 respectively. Further, subsequent examination of trends in crime data indicated that in some instances the division was a better control than a control area, as crime trends in the division more closely matched those in the intervention (or target) area than those in the control area.

18   A public attitude survey was conducted in North City even though it was not subject to a full evaluation.

Table 3.1:   Quality of data

Scheme	Type of area	Crime data available			Post-implemen-tation period (months)	Survey (target)	Survey (control)	Crime data location precision
		Target	Control	Division				
Eastcap Estate	Residential	Yes	Yes	Yes	24	Yes	Yes	1m
Dual Estate	Residential	Yes	Yes	No	23	Yes	Yes	1m
Northern Estate	Residential	Yes	Yes	No	15	Yes	Yes	1m
Deploy Estate	Residential/ Redeployable	Yes	Yes	No	15	Yes	Yes	1m
Borough Town	Town centre	Yes	Yes	No	22	No	No	1m
Shire Town	Town centre	Yes	No	Yes	12	Yes	Yes	100m
Market Town	Town centre	Yes	Yes	Yes	12	No	No	100m
South City	City/Town centre	Yes	No	Yes	14	Yes	No	1m, 10m, Postcode
North City	City/Town centre	N/A	N/A	N/A	N/A	Yes	No	N/A
City Outskirts	Other (Hybrid)	Yes	No	Yes	14	Yes	No	Postcode
City Hospital	Other (Hospital)	Yes	No	Yes	6	No	No	100m
Borough	Residential/ redeployable	Yes	No	Yes	23	No	No	1m
Hawkeye	Car park	Yes	No	N/A	15	No	No	N/A
Southcap Estate	Residential	Yes	Yes	No	4	Yes	Yes	50m
Westcap Estate	Residential	No	No	No	N/A	Yes	Yes	N/A

Impact on crime

In practice, identifying crime patterns posed a challenge since there were 14 individual CCTV systems and they impacted in very different ways. This inevitably complicated the interpretation of findings since the authors were faced with the task of identifying and reporting coherently on the main patterns, whilst keeping in view the nuances of each system's operation. This chapter represents a compromise between the two, and detailed findings on each individual system can be found in an on-line report '*The Impact of CCTV: Fourteen Case Studies*' (Gill *et*

al. 2005b). In addition more detailed information on South City, Hawkeye and Northern Estate can be found in online reports (Gill *et al.* 2005e, Gill *et al.* 2005f and Gill *et al.* 2005g respectively). These reports have been produced to provide additional insights for CCTV systems located in a city centres, car parks and residential areas.

All systems had the overall objective of reducing crime, and the following results reflect the changes in the aggregate level of all relevant offences, i.e. those the majority of which could be affected by the implementation of CCTV. For example, offences such as theft and violence against the person that generally occur within a public place were included, while those that occur in private, such as theft in a dwelling, were not (see Appendix B for a full list of Home Office offences used). However, there are a number of aspects which must be taken into account.

Changes in all relevant crime
The first task is to measure the absolute change in crime for each system following the installation of CCTV. A summary of findings is provided in Table 3.2. The table identifies a number of features for each system, including the type of area (residential, town centre or other), and the type of comparison area used. It shows the absolute and percentage change in the level of crime in both the target and control area before and after CCTV was installed. In most cases crime levels in the 12 months prior to installation were compared with levels for the 12 months following the systems' 'live date'[19]. In two cases (City Hospital and Southcap Estate), only six months post-implementation data were available at the time of the analysis.

The relative effect size column compares the change in recorded crime levels in a target area with that in the control to provide a relative measure of the difference between the two. Where this is greater than one, there was either a greater *reduction* in recorded crime levels in the target area relative to the control, or a smaller *increase* in the target relative to the control, so that in effect the relative crime levels in the target area are lower than the crime levels in the control. The larger the number, the greater the difference between the two. For instance, the relative effect size of 1.38 in City Outskirts demonstrates that the reduction in recorded crime in the target area was large compared with that in the control. Conversely, when the relative effect size is less than one, there is a greater *increase* in the target area relative to the control, or a smaller *reduction* in the target area compared with the control, so that the relative crime levels in the target area are greater than those in the control. The

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19 Where the live date is the point at which some cameras in the system send images to the control room, which are then monitored.

smaller the number the greater the difference. Whether or not the difference between the target and the control is statistically significant depends on the width of the confidence intervals (see Gill *et al.* 2004c).

In the table, systems are listed according to the type of area in which they were installed, with those with the greatest impact on recorded crime being listed first in each category. It can be seen that the percentage reduction in recorded crime levels in Hawkeye was substantially greater than that in all other areas (73 per cent). In the absence of a suitable control for the Hawkeye system, the changes in vehicle crime were compared with the changes in British Transport Police (BTP) recorded vehicle crime for England (excluding London Underground) and these showed a statistically significant reduction.

This reduction can be explained in part by the type of system and the type of crime analysed. The cameras were installed exclusively in car parks in order to reduce vehicle crime, and the analysis was concerned with vehicle crime only. Previous studies have shown CCTV to be particularly effective against these types of crime in car parks. In contrast, for all other systems the percentage change in all relevant crimes was measured, including those which are showing a downward national trend (e.g. burglary) (see Crime Statistics in England and Wales 2004[20]) as well as those showing an increase (e.g. violence against the person). Cumulatively these could cancel each other out.

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20 Based upon the summary of recorded crime data from 1898 to 2002/3 and Crime in England and Wales 2003/4. Available from http://www.homeoffice.gov.uk/rds/recordedcrime1.html

Table 3.2: Changes in recorded crime in each CCTV system

Scheme	Type	Control[21]	Crime in target (Before)	Crime in target (After)	Crime Change in target (%)	Crime in control (Before)	Crime in control (After)	Crime Change in control (%)	Relative effect size	Confidence interval
City Outskirts	Hybrid	Division	1,526	1,098	–28	37,838	37,594	–1	1.38*	1.14-1.62
Hawkeye	Car park	England figures	794	214	–73	12,590	11,335	–10	3.34*	2.86-3.91
City Hospital***	Hospital	Division	18	12	–33	5,202	4,889	–6	1.4	0 3.4
South City	Town centre	Division	5,106	4,584	–10	77,530	68,432	–12	0.98	0.83-1.13
Shire Town	Town centre	Division	352	338	–4	19,052	19,701	3	1.08	0.82-1.33
Market Town	Town centre	Division	245	290	18	19,052	19,701	3	0.87	0.68-1.07
Borough Town	Town centre	Control	334	335	0.3	549	619	13	1.12	0.82-1.43
Northern Estate	Residential	Control	112	101	–10	73	88	21	1.34	0.79-1.89
Eastcap Estate	Residential	Control	450	460	2	130	137	5	1.03	0.62-1.44
Dual Estate	Residential	Control	799	834	4	464	378	–19	0.78**	0.59-0.97
Southcap Estate***	Residential	Control	160	182	14	529	458	–13	0.76	0.51-1.01
Borough	Residential/redeployable	Division	257	444	73	8,250	9,225	12	0.65**	0.53-0.76
Deploy Estate	Residential/redeployable	Control	760	917	21	534	548	3	0.85	0.63-1.07

* Crime decreased statistically significantly more in the target than its control area.
** Crime decreased statistically significantly more in the control than the target.
*** Based on six months post-implementation data.

21 The type of control could have influenced the effect size and confidence intervals. Both divisional and control area data were available for two areas (Eastcap Estate and Northern Estate) and the relative effect sizes and confidence intervals were calculated comparing both division and target and control and target areas. However, these had showed no appreciable impact. For Eastcap Estate the relative effect size and confidence intervals were 0.90 and 0.71-1.09 respectively. In Northern Estate these were 1.23 and 0.89-1.57 respectively.

Figure 3.1 presents the relative effect size ratios outlined in Table 3.2, along with their corresponding confidence intervals. The vertical line highlights the range within which we can be 95 per cent confident the true value of the relative effect size lies. In general, the confidence intervals are relatively compact, the clear exception being City Hospital where the confidence interval ranges from a low of zero to a high of 3.4, suggesting the results should be treated with caution (as it reflects the relatively small number of crimes in the target area). Only in City Outskirts and Hawkeye does the whole of the line lie above one, allowing us to be reasonably confident that crime has declined more in the target than the control beyond that expected from random variation. For every other scheme, the effect size would not be judged to be significantly different from 1 (i.e. no effect) at the five per cent statistical significance level.

The cluster around the relative effect figure of 1 (excluding Hawkeye) is precisely what would be expected if CCTV had no crime reduction effect and these effect sizes (including those individually significant) were due to random errors of the size shown by the confidence intervals in the graph.

Figure 3.1:   Relative effect ratio and corresponding confidence interval
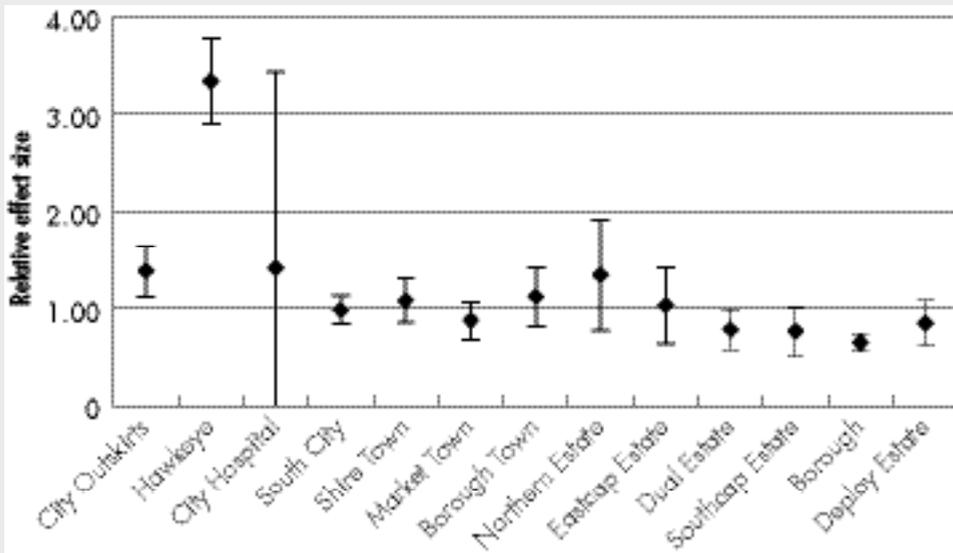
In addition to examining each system individually, a meta-analysis of all systems combined was conducted (again excluding Hawkeye[22], which clearly stood apart from other schemes in its impact and nature). Meta-analysis essentially synthesises the

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22 Hawkeye was excluded from this analysis because it is different from all other systems. It concentrates only on vehicle crime whereas all relevant offences were available for the other projects.

available information about a topic in order to arrive at a single summary estimate. In the present case the analysis was carried out to determine whether there was a significant reduction in crime following installation of the CCTV projects. Two estimates were made: the unweighted mean effect and the inverse variance weighted mean effect. These two estimates provide different estimates of the likely effect the CCTV projects had on crime rates.

The unweighted mean effect, the best estimate of the overall effect of CCTV if different amounts of crime reduction were expected in different sites was 1.02 with an associated 95 per cent confidence interval of +/− 0.14, implying there was no significant overall effect on crime.

If, on the other hand we assume that CCTV had the same effect in each system, masked only by the differences in variation, a better measure of overall effect size is provided by the inverse variance weighted mean (see, Egger *et al.* 1995; Lipsey and Wilson, 2001). The estimated value of this was 0.88 with associated 95 per cent confidence limits of +/− 0.06. These results suggest that there was an overall *increase* in recorded crime following installation of CCTV. However, these results are skewed by one (redeployable) system (Borough), which showed a significant increase in crime in the intervention period. This is inconsistent with the assumption of the same effect across sites. There are also doubts about the estimated error for this system, and when this particular system was excluded from the calculations, the overall effect size was 0.96 with +/− 0.08 95 per cent confidence limits, again suggesting that there was no overall effect on crime.

Patterns of change

From the above analyses the following patterns emerge.

Reduction in recorded crime

Out of the 13 systems analysed[23], six showed a reduction in all relevant crime: City Outskirts, Hawkeye, Northern Estate, City Hospital, South City and Shire Town. All except South City had a relative effect size greater than one and therefore showed a greater reduction in the target than the control area, suggesting that CCTV could have played a role in reducing crime in these areas. However, only two (City Outskirts and Hawkeye) performed statistically significantly better than their respective control areas following the introduction of CCTV.

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23 Although included in the initial evaluation programme, no police recorded crime statistics were available for Westcap Estate.

Two other possible explanations for the changes in crime levels can be ruled out: first, that they reflect crime trends, which began before the CCTV systems were installed and, second, that they are attributable to confounding factors.

Prevailing crime trends
Figure 3.2 shows the level of crime mapped against the car parks in the Hawkeye system which were live at any one time. It shows a steady decrease in crime as car parks became live, suggesting that in this system the reduction in vehicle crime could be attributed to the installation of CCTV.

Figure 3.2:   *Changes in crime levels against number of car parks with CCTV.*
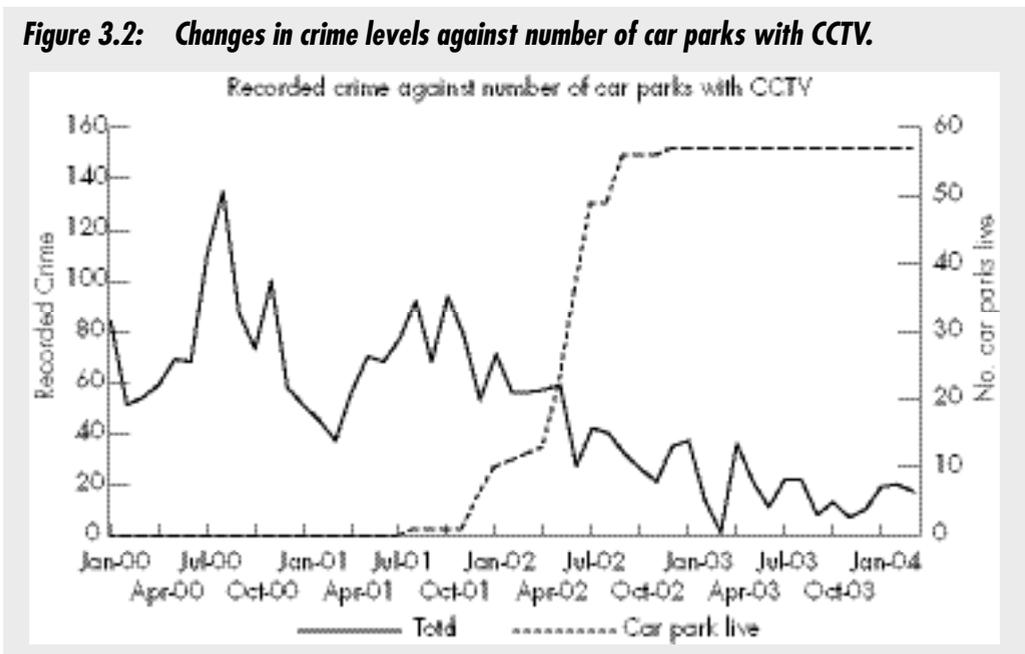
However, as shown in Figure 3.3, a different story emerges for the City Outskirts system. Figure 3.3 shows the recorded crime trends in the target area relative to the division and the buffer area, also displaying the date of installation of camera poles and the live date of the system. Six months before poles were erected in the target area, the entire division experienced a large increase in crime, coinciding with the introduction of new Home Office counting rules[24] Three months before the poles were erected crime levels began to decline

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24 The pattern of crime changes in the relevant police force precludes the adjustment of crime levels to take into account changes in counting rules (Simmons et al, 2003).

across the division, but in the target area the downward trend accelerated markedly after the poles were erected. By the time the cameras went fully live, crime levels in the target area had fallen below their pre-peak levels, though on the general reducing trend of pre-peak values, whereas in the buffer area and the division as a whole crime levels remained high. The figures also show that crime in the target area remained on a pronounced downward trend right to the end of the analysis period, whereas in the whole division rates appeared to have stabilised.

Figure 3.3:   Comparison of crime trends in target, buffer and division
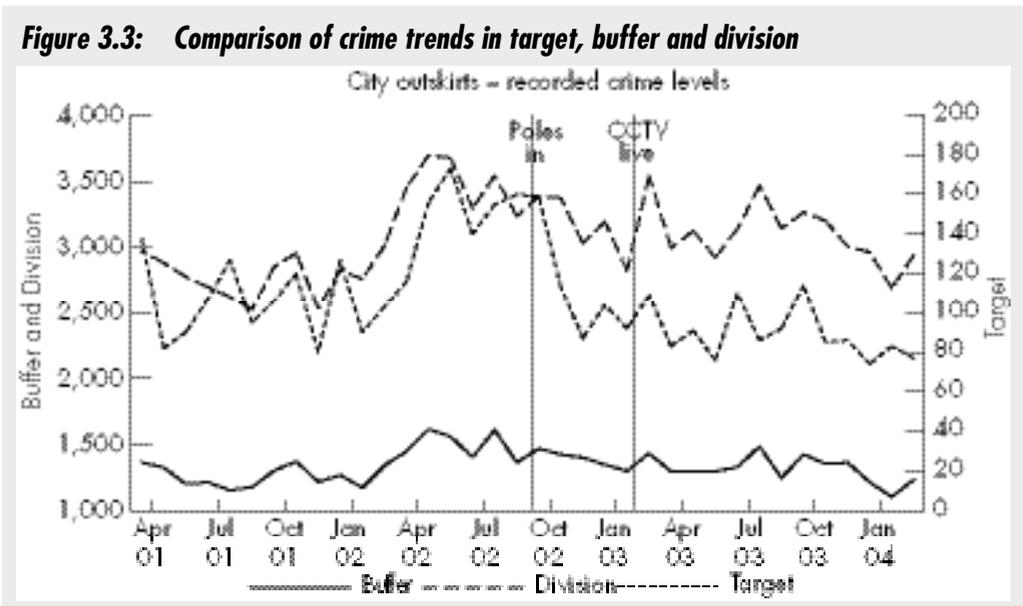
The above suggests that the decrease in crime could be attributed to the process of installing CCTV. However, closer scrutiny of the time series trends suggest that the 'significant' change in crime levels should be treated with caution. There was a large increase in recorded crime in the target area in the year preceding CCTV installation and the level reverted to its earlier trend at the end of the series. Furthermore, divisional crime began to fall before the introduction of CCTV, whereas crime in the target area fell somewhat later, indicating that the large effect size is not necessarily attributable to CCTV.

Confounding factors
In Hawkeye the main confounding factors such as improvements to security and repairs to fencing were implemented once the CCTV system was fully installed and the level of crime

was already low. However, in City Outskirts a number of factors could have accounted for the 28 per cent reduction in overall crime. The new CCTV system was supported by improvements in lighting in November 2002, which coincided with the reduction in crime levels. A further two potential confounding factors,- major renovation works to the arboretum (March 2003) and the establishment of a visual communication link between the control room and the police (April 2003), occurred immediately after the system went live. However, by this time crime levels were already levelling out, and CCTV may still be credited with the earlier positive effect.

Conclusions

CCTV can definitely be said to have reduced overall levels of recorded crime in only one system, Hawkeye, and this is worthy of further scrutiny. First, there were large discrepancies in the severity of the crime problems across the 58 car parks evaluated. Some suffered virtually no crime even before CCTV was installed, while others suffered a high level. Therefore, the car parks were divided into high[25], medium[26] or low risk[27] categories according to the seriousness of the crime problem before CCTV was installed. Table 3.3 below shows the change in each category of car park.

Table 3.3: *Changes in vehicle crime in high, medium and low risk car parks.*

Type of car park	Target absolute change	Target change (%)	Control absolute change	Control change (%)	Is this significant	Relative effect size	Confidence intervals
High risk	555-111	−80	12,590-11,335	−10	Yes	4.5	3.65-5.55
Medium risk	190-72	−62	12,590-11,335	−10	Yes	2.38	1.8-3.14
Low risk	49-31	−37	12,590-11,335	−10	No	1.42	0.9-2.25

The reduction in vehicle crime was greater (80 per cent) for those car parks that had the highest ratio of crimes per parking space before the cameras were installed, and this was statistically significant. These tended to be the larger car parks, which suffered greater absolute levels of crime.

Medium and low-risk car parks showed smaller, but nevertheless marked decreases (62 per cent and 37 per cent respectively). However, in low-risk car parks this was not significant. These tended to comprise fewer spaces and suffered low absolute levels of crime prior to

25 0.24-1.48 offences per space in the year preceding CCTV installation
26 0.8-0.23 crimes per space in the year preceding CCTV installation
27 0-0.7crimes per space in the year preceding CCTV installation.

installation. Hence a 37 per cent reduction in crime represents a decrease from only 49 to 31 offences in a year across all 21 low-risk car parks.

In terms of the mechanisms by which this system operated, it is likely that it worked through a mixture of detection and deterrence. Many offences were detected by the provision of photographic evidence about (known) prolific offenders to the police, leading to their arrest and prosecution. Interviews with vehicle squad police officers indicated that a few offenders were responsible for several offences and the new CCTV system provided additional evidence, which allowed multiple offences to be attributed to one offender, thus increasing the detection rate.

Control room records showed that during the period of the evaluation 14 pieces of evidence per month were provided to the police, which related to a significant proportion of the 44[28] crimes per month committed in the car parks. Interviews with police suggested that the majority of images were of good enough quality to be helpful. Further evidence for the use of CCTV footage to increase the detection of crime was provided by the police detection rate for criminal offences, which increased from nine per cent in 2001-2002 to 27 per cent in 2003-2004[29].

However, the detection effect can account for only a proportion of the total reduction in crime. The operators were keen, but there were not many screens for viewing images from all the cameras and, since car parks were not that busy, viewing them was routine and even boring. It is likely, therefore, that the system also worked through deterrence. The cameras were of box design and were clearly visible, and there was clear signage at the entrance to each car park. Furthermore, there was 95-100 per cent coverage of the car parks and it would be apparent to would-be offenders that they could not easily avoid the cameras' gaze.

Increase in crime
The remaining seven target areas all experienced an increase in crime ranging from 0.3 – 73 per cent (Market Town, Borough Town, Eastcap Estate, Dual Estate, Southcap Estate and Borough), and in five of these (Market Town, Dual Estate, Southcap Estate, Borough and Deploy Estate) the relative effect size was less than one indicating that the increase in the target area was greater than that in the control. This suggests that CCTV could possibly have *increased* recorded crime in these areas; and this could have resulted from an increase in reporting. For instance, the presence of CCTV could have prompted more individuals to report crime to the police, or alternatively the police could have become more aware of crime in the areas in which CCTV was installed.

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28 Based on pre-installation figures.
29 Statistics provided to the fieldworker.

However, none of these results was incompatible with the view that the differences had been wholly due to chance variation. In only one of these target areas (Borough) was the increase statistically significant. However, in this scheme crime rose in both the buffer and target areas in the 12 months following the intervention and then fell back to the pre-intervention values. This is likely to be due to a change unconnected to CCTV.

Aspects that could be linked with changes in recorded crime levels

As described below there are a number of characteristics which could be linked to reductions in crime.

Type of CCTV system

The first characteristic of CCTV systems which could be linked to an overall change in recorded crime levels was the location of the system. Those installed in areas which were neither town nor city centres nor residential areas witnessed the greatest percentage reduction in crime. This may have been influenced by the accessibility of the areas. For example, the majority of car parks within the Hawkeye system and the City Hospital site were surrounded by physical boundaries. Access points to these sites were therefore generally easily controlled and even more so after the introduction of CCTV, whereas town centres and residential streets provide open access.

Residential systems recorded varying results; in only one was there actually a (non-significant) reduction in crime; in another the increase was smaller than in the comparison area. For the remaining four, including both redeployable schemes, the percentage increase in crime was greater than in the comparison area.

None of the town centre systems showed a statistically significant difference in the target area relative to the control, although Market Town showed a larger increase in the target area than the control.

To summarise, those schemes installed in areas which were neither residential nor town or city centres showed a greater reduction in crime, whereas the effects of CCTV in residential or town or city centre areas varied. Redeployable schemes showed no reduction in long-term crime levels. However, both redeployable schemes were intended to address short-term crime problems, so this is less surprising.

Camera layout and types

It is possible that the relative effect size is related to the characteristics of the camera systems. Table 3.4 gives details of the numbers of cameras within each target area as well as camera density and camera coverage.

Table 3.4: **Camera details of each system**

System	Type	No. of evaluated cameras	Camera density (cameras/km²)	Percentage of target area covered by cameras (camera coverage)
City Outskirts	Hybrid	47	64	68
Hawkeye	Car Park	556	N/A	95-100 *
City Hospital	Hospital	9	67	76
South City	Town centre	51	73	72
Shire Town	Town centre	12	94	76
Market Town	Town centre	9	93	34
Borough Town	Town centre	40	325	70
Northern Estate	Residential	11	127	87
Eastcap Estate	Residential	10	29	29
Dual Estate	Residential	10	11	9
Southcap Estate	Residential	148	184	73
Areas C and D	Residential	40	253	88
Borough	Residential/ Redeployable	8	N/A	N/A
Deploy Estate	Residential/ Redeployable	11 (on 19 poles)	25 **	34 **

* Based on information obtained from system installers.
** Calculated on maximum coverage, assuming a camera on each pole. At any one time camera coverage will be less than the maximum.

Camera density is calculated by dividing the number of cameras within the target area by its size. Results are given as cameras per square kilometre. The camera coverage area is the area that can theoretically be seen by the cameras, technically known as the camera's viewshed (see Gill *et al.* 2005c to see how this is calculated). Results are given as a percentage of the target area which can be seen by the cameras.

Assessment of camera coverage showed that those systems with a large coverage tended to reduce crime more than those with smaller coverage. A positive correlation of 0.51 between camera coverage and effect size was found. This however was not significant[30].

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30 A two-tailed Pearson Correlation was used. All projects were included except for Borough, which was omitted owing to the nature of the system. CCTV was installed in a spasmodic fashion as a reaction to crime hotspot areas, whereas all other systems had a designated target area. It was therefore not possible to obtain a reliable camera coverage measure for Borough.

No such effect was noted for camera density when all systems were included in the analysis (correlation of –0.06). However, two systems (Southcap Estate and Borough Town) had particularly high densities and small effect sizes, and when these were removed from the analysis there was a (non-significant) correlation of 0.51. This suggests that there is a generally positive relationship between density and crime reduction, but that the installation of large numbers of cameras provides no additional benefit. Numbers of cameras are not as important as their being strategically placed so as to view as much of the intended target area as possible.

Attempts to measure the effect of static cameras on recorded crime levels relative to pan, tilt and zoom (PTZ) cameras were inconclusive. Only one system (Hawkeye) used static cameras exclusively, and although this area showed a huge decrease in recorded crime following installation of CCTV, unlike other systems it measured only vehicle crime. The cameras were installed in enclosed car parks, and provided almost 100 per cent coverage. All of these factors could account for the change in the level of crime. One other system (Borough Town) combined static and pan tilt and zoom cameras and this showed a marginal increase in crime following installation of CCTV.

The above analysis used all relevant offences as indicators of performance. It is entirely possible that this catch-all categorisation hides some important impacts on individual crime types. Consequently, data on the individual offences was analysed separately.

Impact on different types of offence
It has been shown that the CCTV schemes produced no overall effect on all relevant crime viewed collectively; however it is possible that they impacted upon a particular type of offence, and this section examines that possibility.

Table 3.5 below summarises how the incidence of particular types of offence changed in the target area as compared with their respective control areas after the implementation of CCTV. Only those schemes where a relative effect size could be calculated (i.e. no zero figure for offences in the before or after period in either the target or control areas) were included; furthermore, Hawkeye was excluded from this analysis because only vehicle offences were recorded and the data included offences that were not included within the vehicle crime category of the other schemes[31].

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31 Hawkeye vehicle offences include criminal damage to vehicles which are part of the criminal damage crime type category of the other schemes.

Table 3.5: **Summary of the effect on each crime type since the installation of CCTV across all schemes**

Effect on crime since CCTV installed	Burglary	Criminal damage	Public order	Violence against the person	Vehicle crime	*Theft from vehicle*	*Theft of vehicle*	Shoplifting	Other theft
Reduced (statistically significant)	3	3	0	1	3	3	2	0	1
Reduced (non-statistically significant)	3	3	3	3	3	2	6	4	4
Increased (statistically significant)	1	3	1	0	1	0	1	2	1
Increased (non-statistically significant)	5	2	6	7	5	6	3	3	5
Relative effect size	1.03	0.97	0.85	1.02	1.05	0.96	1.20	0.87	1.01
Confidence intervals[32]	0.79-1.35	0.73-1.28	0.67-1.08	0.94-1.12	0.81-1.35	0.72-1.28	0.88-1.63	0.65-1.18	0.75-1.36

Significance (p< .05)
Other theft refers to all theft not included within shoplifting and vehicle crime.

Taking burglary as an example, six schemes experienced a reduction that was greater than the reduction within their respective control areas, although this reduction was statistically significant in only three cases. A further six schemes experienced an increase in the rate of burglary relative to the control, although only in one was the difference statistically significant.

For each crime type, overall effect sizes across all schemes were calculated, again using the inverse variance weighted mean. Given the effectiveness of CCTV in reducing crime in Hawkeye vehicle crime could be expected to display a similar trend across all schemes. However, there appears to have been little effect on vehicle crime insofar as the estimated

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32 These confidence intervals have been estimated using the standard formula for the variance of the relative effect size based on the natural logarithm. No adjustment for overdispersion was made since the variance / mean ratio across all the major crime categories and locations was 1.4, and this was not too different from the expected Poisson figure of 1.0.

effect size was 1.05. Investigating this further it is interesting to note that theft of motor vehicles and theft from motor vehicles (which together make up the vehicle crime category) displayed different patterns. The respective effect sizes indicate that theft of a motor vehicle displayed the greatest reductions in the number of offences compared with their control areas. Public order offences displayed the least welcome results. However, none of the offence types showed a statistically significant change overall. There is thus little evidence that CCTV reduces any of the relevant individual types of crime, at least judging by police data.

From the summary figures in Table 3.5 some general trends are evident. Those offences that are often considered impulsive and influenced by alcohol, for example public order and violence against the person (VAP), were seen to increase in number more in the target areas than in their respective control areas. Public order offences increased in six out of ten relevant schemes, while VAP rose in seven out of 11 relevant schemes. However, most of these changes were not statistically significant compared with the control. This could be attributed to the small numbers in each crime category, but equally these changes in crime could be more indicative of a national upward trend in recorded violent crime (see Crime Statistics in England and Wales 2004[33]) than any effect of the CCTV systems. Table 3.5 also indicates that theft of motor vehicles showed a reduction in the majority of schemes. However, it was statistically significant in only two cases. Again, these results reflect those for crime in England and Wales, which have shown a reduction in Theft of a Motor vehicle (TOMV) since 1999[34].

Changes in individual crime types in specific project areas
Whilst the above draws on the findings relating to all the systems studied for this report, the following highlights the changes in crime (albeit small) in individual areas which allow us to determine what effect CCTV might have had in specific circumstances.

Vehicle crime
Seven systems showed a fall in vehicle crime (including Hawkeye), and in two of these the change was statistically significant (City Outskirts and Hawkeye). Table 3.6 shows the relevant changes in vehicle crimes across systems. The changes in Hawkeye could be attributed to the CCTV system as there were no significant confounding factors occurring at the same time. So to some extent could those in Eastcap Estate, Deploy Estate and Market Town, although the small numbers mean that any changes could be attributed to natural variance in crime figures so any conclusions should be drawn with caution.

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33 Based upon the summary of recorded crime data from 1898 to 2002/3 and Crime in England and Wales 2003/4. Available from http://www.homeoffice.gov.uk/rds/recordedcrime1.html
34 Op cit.

However, the declines in City Outskirts, City Hospital and South City could be attributed to confounding factors occurring in the area as well as random variation in the case of South City and City Hospital.

Table 3.6: *Changes in vehicle crime one year following installation of CCTV*

	Absolute change	Target change (%)	Control absolute change	Control change (%)	Is this significant	Relative effect size	Confidence limits
High risk	555-111	–80	12,590-11,335	–10	Yes	4.5	3.65-5.55
City Outskirts	279-126	–55	6,993-6,412	–8	Yes	2.03	1.35-2.73
Hawkeye	794-214	–73	12,590-11,335	–10	Yes	3.34	2.86-3.91
City Hospital*	12-3	–75	1,201-1,486	24	N/A	N/A	N/A
South City	1,641-972	– 41	17,825-12,912	–27	No	1.22	0.84-1.64
Market Town	15-11	–27	4,072-3,827	–6	N/A	N/A	N/A
Eastcap Estate	77-69	–10	27-29	7	No	1.2	0.26-2.14
Deploy Estate	164-152	–7	107-95	–11	No	0.96	0.58-1.33

* Based on six months post-implementation data.
NA: Relative effect size not measured because of small numbers (n < 30 in target in either before or after periods).

In the City Hospital scheme vehicle crime declined by 75 per cent (from 12 to 3 offences) in the six months after the cameras were installed. Although these are extremely small figures they account for most of the reduction in total crime in City Hospital (from 18 to 12 offences overall). However, it is unlikely that any relevant impact was produced by the cameras alone. CCTV was erected alongside a new perimeter fence and improved lighting, and the combined effect could have acted as an effective deterrence to offenders. The fencing limited easy access to the site. Cameras were pole-mounted at each gate and were highly visible, and lighting levels improved across the greater part of the site.

The reduction in crime could be attributed to other factors, as would be suggested by the fact that a downward trend in crime levels began before CCTV was installed (see Gill *et al.* 2005b). Local police conducted two high-profile operations consisting of the distribution of leaflets and posters warning people of the dangers of vehicle crime. This began in March 2002, which was before the peak in crime, but gathered momentum. In May 2003 the police mounted another high-visibility operation, which could have produced the peak.

Similarly in City Outskirts, during a peak in crime levels, changes in parking regulations reduced the number of potential target vehicles and consequently the opportunities for vehicle crime. In South City this change could mainly be attributed to a reduction in vehicle offences in car parks not covered by the cameras under evaluation.

Northern Estate – decline in burglary
In the Northern Estate target area burglary declined by 47 per cent (whereas the control experienced a 100 per cent increase), and although the low numbers make a time series analysis of burglary unreliable, unlike total crime, this reduction occurred following the installation of CCTV and remained low in comparison with general crime, which gradually increased once the cameras were installed. The reduction in burglary accounted for the decline in the total number of police recorded crimes, which went down from 112 in the year before CCTV was installed to 101 in the year following. This suggests that, although CCTV had no overall effect on crime, it influenced burglary, which was one of its main objectives.

Increases in police recorded violence against the person and public order
Public order offences and violence against the person (often alcohol-related) increased in three out of the four urban centre systems. The majority of changes in levels of public order offences and violence were similar to or less than the changes in the control. However, two urban centre systems (South City and Market Town) experienced large increases in alcohol-related crime, which could be attributed to an increase in reporting through control rooms. Table 3.7 below outlines the change in relevant crime in these two systems.

Table 3.7:   Changes in public order and violence against the person one year following installation of CCTV

Place	Offence	Target absolute change	Target change (%)	Control absolute change	Control change (%)	Is this significant	Relative effect size	Confidence limits
South City	Public order offences	58-95	64	163-200	23	No	0.75	0.4-1.10
Market Town	Public order	15-36	140	86-105	22	Yes	0.51	0.07-0.95
Market Town	Violence against person	47-75	60	2,660-3,588	35	No	0.85	0.46-1.23

In both areas the control room operators paid particular attention to the bars and clubs at night. In South City two other factors could account for the increase in public order offences. First, a police officer stationed in the control room on Friday and Saturday nights was able to generate a more rapid police response to incidents. The operators and police officers were able to work together with officers in the target area, particularly at busy weekend periods between 8pm and 4am. The police also had access to the digitally stored images at their station and were able to download images to help them identify and apprehend offenders, particularly those committing assault, robbery, and public order offences. However, no similar increase was noted for violence against the person in South City as might have been expected. One possible explanation for this is police recording practices; violent incidents arising out of night-time revelry might be recorded as public order incidents rather than violence against the person.

Increases in police-recorded shoplifting in urban centres
Police-recorded shoplifting increased in three out of the four urban centres under evaluation (see Table 3.8) and two of these (South City and Shire Town) could be attributed in part to increased reporting of incidents. Both control rooms used Retail Radio extensively, which enabled operators to track offenders around the shopping area, so affording the police an opportunity to make an arrest. However, neither of the changes was statistically significant (and in fact one matches the control exactly), so these might equally be attributed to random changes in crime patterns.

Table 3.8: ***Increases in police-recorded shoplifting one year following installation of CCTV***

Place	Absolute change	Target change (%)	Control absolute change	Control change (%)	Is this significant	Relative effect size	Confidence limits
South City	119—148	24	3,431–3,561	4	No	0.83	0.44–1.23
Shire Town	69–87	26	823–848	3	No	0.82	0.25–1.38
Borough Town	80–90	13	129–64	–50	Yes	0.44	0.2–0.68

In the one area where there was a statistically significant increase in shoplifting (Borough Town) it is unlikely that this can be attributed to increased reporting, as local businesses[35] had little awareness of the cameras, and a lack of active monitoring meant that the police were not being directed to more offences. It is more likely to be the result of the newly introduced Retail Radio system within the control area, which was causing displacement of shoplifting offences into the target area.

35 A sample of 25 local businesses were interviewed following the installation of CCTV to assess their perception of the system; see Stakeholder Survey in Methodology Appendix A.

Declines in shoplifting – Area B (Dual Estate)
Shoplifting decreased by 59 per cent in one area (Area B in Dual Estate) but this was not statistically significant. This could possibly be due to the concentration of cameras around the shopping area at the centre of the estate, which acted as a deterrent. There was no Retail Radio system in the area.

Table 3.9:	**Decreases in police-recorded shoplifting one year following installation of CCTV**						
	Absolute change	**Target change (%)**	**Control absolute change**	**Control change (%)**	**Is this significant**	**Relative effect size**	**Confidence limits**
Shoplifting	39–16	–59	2–4	100	No	4.88	–4.37–14.12

Small-scale drugs operations
In two systems (City Outskirts and South City) there is limited evidence to suggest that CCTV assisted in special drugs operations. In South City there was a small increase in drug offences (from 16 to 34), which could be linked to two police operations directed at drug offenders in the target area. In City Outskirts there was no overall change in the level of drugs offences (the number of offences went from 44 in the year before CCTV was installed to 45 in the year following). However, the closure of a major drugs den in the target area could have been counterbalanced by a number of police-run operations involving the CCTV cameras during the evaluation period.

Table 3.10:	**Changes in police-recorded drug offences one year following installation of CCTV**						
Place	**Target absolute change**	**Target change (%)**	**Division absolute change**	**Division change (%)**	**Is this significant?**	**Relative effect size**	**Confidence limits**
South City	16–34	113	700–964	38	No	0.65	0.18–1.12
City Outskirts	44–45	2	799–730	–9	No	0.89	0.42–1.36

Change in pattern of crime

Diffusion of benefits and displacement of crime are often associated with the installation of CCTV (see, Armstrong and Giulianotti, 1998). These phenomena have been considered within this evaluation using Geographical information Systems (GIS) and time series analysis in those target areas where either overall crime, or a particular type of offence decreased.

For the analysis, the buffer zone was taken in its entirety and changes in crime levels in this location were compared with those in the target area. The buffer zone (that is the area surrounding the target; see Gill *et al.* 2005c for information on how these zones were defined) was also split into smaller areas to investigate the extent of crime movement (see Figure 3.4.)

Figure 3.4: **Schematic diagram demonstrating how the buffer zone has been treated during small-scale analysis.**
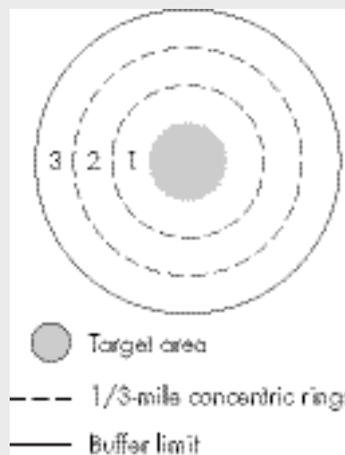
Out of the six target areas that experienced an overall reduction in crime, whether statistically significant or not, only one displayed any movement of crime into the buffer zone. Hawkeye could not be included within this analysis because the necessary disaggregated crime data were not available. Relevant findings are summarised in Table 3.11 below.

Table 3.11:   Summary of displacement

Scheme	Offence affected	Area A	Area B	Percentage change in Area A (absolute change)	Percentage change in Area B (absolute change)	Crime pattern change
City Outskirts	Total relevant crime	Target	Ring 1	−28 (−428)	−9.3 (−569)	Diffusion of benefits
City Outskirts	Total relevant crime	Target	Ring 2	−28 (−428)	6.8 (302)	Spatial displacement
Northern Estate	Burglary	Target	Ring 1	−47 (13)	11 (13)	Spatial displacement
Eastcap Estate	Vehicle Crime	Within 100m of CCTV	Rest of target	−38(23)	94 (15)	Internal spatial displacement
Borough Town	Total relevant crime	Within 100m of CCTV	Rest of target	−25 (−44)	29 (46)	Internal spatial displacement

The City Outskirts target area experienced a 28 per cent (428 crimes) reduction in overall crime, while within the buffer zone crime fell by four per cent (634 crimes). However, taking the buffer as a series of 1/3-mile concentric rings around the target perimeter, a different pattern emerges. In Ring 1 overall crime decreased by 9.3 per cent (569 crimes), whilst an increase of 6.8 per cent (302 crimes) occurred in Ring 2. All areas outside this experienced a 6 per cent decrease in crime levels. The divisional crime levels remained relatively stable during the same period, showing a one per cent reduction, indicating that different processes were at play within these areas. The decrease in Ring 1 may indicate diffusion of benefits from the target area to the immediate surrounding area, while the increase in Ring 2 may be due to displacement. However, a number of additional crime reduction initiatives were taking place within the areas under investigation and these could have reduced recorded crime levels in the inner buffer area, and also displaced crime into the outer buffer independently of the CCTV system. Therefore, the increase in Ring 2 cannot be solely attributed to displacement caused by the implementation of CCTV.

Geographical displacement was also examined for those offence types that declined dramatically within the target area. Only one witnessed possible displacement effects, namely burglary in Northern Estate.

Northern Estate displayed a 47 per cent (13 crimes) decrease in burglary. Over the same period the one-mile radius buffer zone also experienced a two per cent (17) decrease. Again, when the buffer zone was divided into 1/3-mile concentric rings, burglary rates in Ring 1 increased by 11 per cent (13 crimes), while Rings 2 and 3 increased by one per cent (2 crimes) and decreased by ten per cent (32) respectively. It is suggested that the increase in burglary seen in ring 1 can be attributed to the implementation of CCTV within the target area.

In addition to looking for geographical displacement from the target area into surrounding locations, where possible small-area displacement was investigated within the target areas themselves. This was achieved by comparing the area within 100 metres of the CCTV cameras with the area within the target but outside of this distance. Such analysis was based upon the assumption that the geographical areas were not homogeneous and that therefore smaller-scale changes in crime patterns may have been taking place, which were lost in the broader area analysis.

Such small-scale analysis of the target areas revealed that crime could be displaced within the target area itself. In Eastcap Estate the greater part of the decline in crime levels occurred within the vicinity of the cameras (up to 100 metres from the cameras). In comparison, outside of this area but still in the target area, the level of most types of offence increased. Vehicle crime in particular saw a decrease of 38 per cent (23 cases) around the cameras compared with a 94 per cent (15 crimes) increase outside this area. This indicates displacement from where the cameras can see to where they cannot on a smaller scale than is usually considered, a phenomenon that could be called 'internal spatial displacement'. This was also observed to a lesser extent in Borough Town.

There are two reasons why internal displacement may not have been observed in other schemes. First, most had a high level of camera coverage leaving little space between the cameras and, second, the inadequacy of the available crime data. Such analysis requires the provision of data which is accurate to the nearest one metre, but this was not provided for all projects.

In summary, geographical displacement occurred infrequently in the evaluated projects. Two of the three cases of such displacement were attributed solely to the installation of CCTV, as no other confounding factors were present. There was one possible case of diffusion of benefits, but it could also be explained by the effect of confounding factors present in the area.

Figure 3.5:   Change detection map
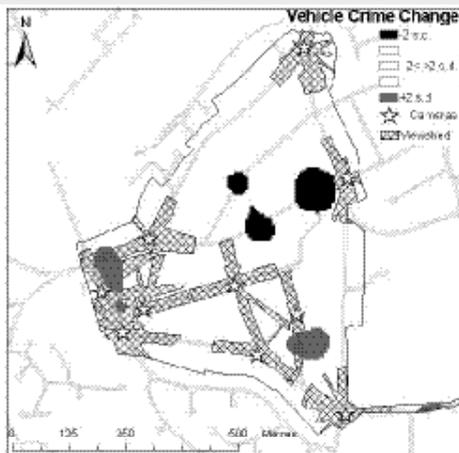
(see Gill *et al.* 2005c) showing only those areas that have experienced a change in crime over two standard deviations from the mean change in crime between the before and after periods. This highlights those areas where change has been most significant. +2sd indicates areas where crime has decreased and −2sd those areas experiencing an increase in crime. This shows the trend in Eastcap Estate's target area of particularly vehicle crime being displaced away from the camera to those areas that cannot be monitored by CCTV.

Summary

The above results indicate that the CCTV schemes that have been assessed had little overall effect on crime levels. Even where changes have been noted, with the exception of those relating to car parks, very few are larger than could be due to chance alone and all could in fact represent either chance variation or confounding factors. Where crime levels went up it is not reasonable to conclude that CCTV had a negative impact.

However, there are some characteristics of CCTV systems which appear to influence crime levels. Those systems providing a high level of coverage appear to show a greater reduction in crime than those that do not, and the effect is increased where the area covered by the cameras is enclosed.

Impact on public attitudes

This section summarises the results of public attitude surveys carried out in 12 different areas covered by all or part of the CCTV systems under evaluation, before and after the CCTV systems were installed. These include nine residential areas and three city/town centres. While 11 of these areas were subject to a full evaluation, one (North City), where cameras were installed during the evaluation period and therefore would have been observed by the public, did not achieve stability[36] and therefore could not be fully evaluated.

36 The system underwent a number of technical changes after it became operational, and the control room underwent a number of alterations to monitoring practice. This meant that the system did not achieve full stability within the evaluation's required timeframe.

The surveys were designed to assess the extent to which one of the CCTV systems' main objectives, namely reducing fear of crime, had been achieved across all areas. They also measured whether the introduction of CCTV in an area changed public opinion; for instance, whether public support for CCTV declined once they had experience of it. This is particularly significant in residential areas where the large-scale installation of CCTV cameras is a relatively new trend.

The surveys tested the following hypotheses:

1. CCTV reduces worry about being a victim of crime.
2. CCTV increases feelings of safety.
3. CCTV reduces reported victimisation levels.
4. CCTV encourages individuals to venture into areas that they previously avoided during the day and at night.

Table 3.12 reveals the sample size of each survey conducted pre- and post-implementation.

Table 3.12: Survey sample sizes pre- and post-implementation

| | Pre-implementation survey sample size | | Post-implementation survey sample size | |
	Target area	Control area	Target area	Control area
City Outskirts	382	N/A	421	N/A
North City	593	N/A	600	N/A
South City	640	N/A	625	N/A
Shire Town	442	426	422	425
Northern Estate	172	215	168	242
Westcap Estate	352	249	347	234
Eastcap Estate	265	267	236	214
Dual Estate:				
Area A	114		110	
Area B	401	417	408	399
Southcap Estate	421	410	399	414
Deploy Estate:				
Area E	324		302	
Area F	321	305	301	311
Total	**4,427**	**2,099**	**4,339**	**2,239**

NA: No control area was surveyed.

The surveys intended to measure changes in five different aspects: fear of crime; impact on respondents' behaviour; reported victimisation; support for CCTV; and awareness and public understanding of how the CCTV system works.

Public awareness of CCTV

If people's fear of crime as a result of the installation of CCTV, or their opinion about CCTV based on experience of it, are to change, they must first be aware that it has been installed. Table 3.13 below shows the levels of awareness amongst the respondents in each survey and the means by which they became aware of the presence of CCTV. Generally, individuals in all areas were aware of the cameras, although the proportion of respondents from one scheme to another who were aware of them varied considerably (ranging from 61 per cent to 97 per cent).

The highest level of awareness was measured in small residential estates, ranging from 61 per cent (Area F) to 97 per cent (Area A). This increased as the number of cameras per unit area increased (Area F had a density of 26 cameras per km_ and Area A one of 173 cameras per km_). Overall, there was shown to be a positive correlation (0.32) between awareness levels and camera density, although it was non-significant. There was also a difference between town and city centres; awareness levels in North City and South City were almost equal (around 64 per cent), which were both ten percentage points lower than in Shire Town (74 per cent). This suggests that there is less awareness of CCTV in large city centre areas where perhaps the cameras add little to the large amounts of street furniture already present.

Table 3.13: **Levels of awareness of the presence of CCTV**

	Aware of CCTV cameras?	How became aware?		
		Most popular answer	2nd most popular answer	3rd most popular answer
City Outskirts (containing a residential area)	72.9%	Saw the cameras (63.3%)	Saw the poles (28.5%)	Word of mouth (17.4%)
North City	63.8%	Saw the cameras (66.0%)	Word of mouth (18.8%)	Saw signs (13.1%)
South City	64.8%	Saw the cameras (61.9%)	Word of mouth (17.5%)	Other way (17%)
Shire Town	73.9%	Saw the cameras (68.6%)	Local press (30.1%)	Word of mouth (12.9%)
Northern Estate	94.6%	Saw the cameras (86.2%)	Saw the poles (46.5%)	Word of mouth (28.3%)
Westcap Estate	71.8%	Saw the cameras (74.2%)	Saw the poles (29%)	Saw signs (9.3%)
Eastcap Estate	96.2%	Saw the cameras (85.0%)	Saw the poles (13.7%)	Word of mouth (9.7%)
Dual Estate (containing two discrete residential areas)				
Area A	97.3%	Saw the cameras (91.3%)	Word of mouth (8.7%)	Other way (3.8%)
Area B	82.8%	Saw the cameras (90.5%)	Local press (7.7%)	Word of mouth (7.1%)
Southcap Estate	69.2%	Saw the cameras (80.4%)	Local newsletter (34.2%)	Word of mouth (12.4%)
Deploy Estate (surveys carried out in two discrete residential areas)				
Area E	61.3%	Saw the cameras (60%)	Saw the poles (27%)	Saw signs (8.6%)
Area F	60.5%	Saw the cameras (79%)	Saw the poles (29.8%)	Local newsletter/ word of mouth (5%)

Fear of crime

A reduction in fear of crime was a key objective of all the projects. In order to determine whether CCTV played a part in reducing levels of fear of crime, the survey explored the following two aspects:

- people's worry about being a victim of crime in the area in which CCTV was installed.

- people's feelings of safety in the area in which CCTV was installed.

Each of these aspects will be discussed separately.

Worry about being a victim of crime in the target area
Table 3.14 shows the levels of worry about being a victim of crime before and after the installation of CCTV[37], as well as comparing levels of worry in the target and control area (relative effect size).

The table reveals that in all areas surveyed there was a reduction in worry about being a victim of crime in the area in which CCTV was installed. However, in only four areas (Area B, Area E, Southcap Estate, and Westcap Estate) was this reduction higher than that in the control area (i.e. the relative effect size was greater than one) (NB, South City and North City had no control area). Area B and Westcap Estate revealed significantly larger reductions in worry about crime than their respective control areas.

There are no noticeable differences in levels of worry about being a victim of crime across the different types of area; the town/city centres experienced similar reductions to the residential areas.

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37 It should be noted that the post-implementation surveys were conducted approximately 14-20 months after the pre-implementation surveys, which means that seasonal changes may have had an impact on fear of crime levels. However, this was unavoidable, as it was necessary to conduct the pre-implementation survey before the installation of the poles, and in most cases the system did not become live for many months following the installation. Therefore, in order to conduct the post-implementation survey 12-months after the system went 'live', there often had to be a longer period between surveys.

Table 3.14: **'Worry about being a victim of crime in the target area' before and after the CCTV installation**

Scheme	Percentage & (N) 'Worried about crime'		Percentage point change		Relative effect size
	before	after	in 'Worry about crime'		
City Outskirts	35 (129)	20 (83)	−14		
South City	9 (57)	4 (21)	−6	(day)	No control
	24 (145)	17 (95)	−8	(night)	
North City	8 (45)	4 (22)	−4	(day)	
	18 (88)	13 (64)	−5	(night)	No control
Shire Town	8 (37)	5 (22)	−3	(day)	N too small
	33 (220)	21 (236)	−12	(night)	0.80
Northern Estate	26 (43)	23 (38)	−3		0.98
Westcap Estate	**35 (122)**	**28 93)**	**−8**		**1.70***
Dual Estate:					
Area A	20 23)	10 (11)	−10		N too small
Area B	**35 (137)**	**26 (105)**	**−9**		**1.60***
Southcap Estate	**33 (137)**	**31 (121)**	**−2**		**1.04**
Deploy Estate:					
Area E	**33 (106)**	**30 (89)**	**−3**		**1.05**
Area F	28 (89)	27 (82)	−0.4		0.95

* Significance (p< .05).
Figures in bold are from schemes where the target performed better than the control.

The next stage of the analysis was to test whether the cameras were the main factors that contributed to the significant reduction in worry about crime in Area B and Westcap Estate. In order to do that, worry about crime levels were compared with awareness of the presence of cameras. The hypothesis was that cameras could be considered successful in tackling fear of crime if those who were aware of the cameras worried less about crime than those who were unaware.

The results seem to contradict this view. Those respondents who were aware of the cameras actually worried more often about crime than those who were not. The differences were of 19 per cent in Westcap Estate, and ten per cent in Area B. These findings suggest, therefore, that the presence of CCTV in an area actually increases worry about crime, possibly because the assumed need for CCTV to be installed makes the area seem more problematic than the respondents had previously thought. It is also possible that those who were aware of the cameras were more security conscious than those who were not, but the

figures prove that knowing that cameras have been installed in an area does not necessarily lead to a reduction in the numbers who are worried about becoming a victim of crime.

Feelings of safety

Although the measurement of 'worry about being a victim of crime' in the target area specifically addresses the impact of crime on *worry*, it is a problematic term as it means different things to different people (Hale, 1996). More recent and prominent studies investigating the impact of CCTV have favoured the measure of 'feelings of safety'. An analysis of this measure allows a direct comparison with results recorded in previous research (Sarno *et al.* 1999). The term 'feelings of safety', however, does not specifically focus on crime, as safety levels can be dependent on a number of other social factors such as health, road safety and disorder. Table 3.15 shows the levels of feelings of safety before and after the installation of CCTV, as well as a comparison between the target and control area.

Table 3.15: Feelings of safety before and after installation of CCTV

Scheme	Percentage and (numbers) feeling fairly/very safe		Percentage point change in 'feelings of safety'	Relative effect size
	before	after		
City Outskirts	58 (233)	74 (307)	+16	No control
North City	81 (478)	87 (520)	+6	No control
South City	79 (577)	82 (581)	+2	No control
Shire Town	**90 (394)**	**96 (403)**	**+6 (day)**	**1.00**
	52 (169)	**57 (169)**	**+5 (night)**	**1.02**
Northern Estate	**70 (119)**	**78 (131)**	**+8**	**1.00**
Westcap Estate	74 (262)	76 (264)	+2	0.79
Eastcap Estate	78 (207)	84 (197)	+6	0.92
Dual Estate:				
Area A	75 (85)	89 (94)	+14	0.84
Area B	73 (290)	79 (321)	+6	0.84
Southcap Estate	62 (259)	65 (259)	+3	0.88
Deploy Estate:				
Area E	**71 (230)**	**71 (213)**	**+0**	**1.07**
Area F	74 (236)	72 (216)	– 2	1.08

* Significance (p< .05)
  Figures in bold are from schemes where the target performed better than the control

The table reveals that feelings of safety increased in all areas surveyed except for one (Area F). In just three areas, the increase in feelings of safety was higher than that in the control (Northern Estate, Area E and Shire Town); however, the differences between the target and control were non-significant. These findings support those of Sarno *et al.* (1999) in their evaluation of CCTV in Southwark Town Centre. They found that almost two-thirds of respondents who were aware of the cameras said they felt safer as a result of CCTV; 90 per cent indicated feeling safer during the day, whilst this went down to 45 per cent during the night.

As with worry about being a victim of crime, there was no difference in levels of feelings of safety across the different types of area. Town/city centres experienced increases in feelings of safety similar to those for the residential areas.

Reported victimisation
In the course of the pre- and post-implementation surveys the respondents were asked whether they had been victims of various types of incident[38] in the previous 12 months[39]. Following on from the previous section, these reported victimisation levels could be used to clarify whether or not there was a connection between victimisation and fear of crime. Previous studies have shown a relationship between the two (Spriggs *et al.* 2005) in the sense that fear of crime declined as levels of reported victimisation decreased.

The possible relationship between reported victimisation[40] and fear of crime following the installation of CCTV was analysed; Table 3.16 below shows the change in worry about being a victim of crime and the change in the number of victims.

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38 Pestered, insulted or harassed; harassed by young people in the street; harassed by drunken disorderly individuals; harassed by people using or dealing in drugs; assaulted; robbed; car stolen or broken into; burgled; harassed due to skin colour or ethnic origin; property damaged or vandalised.
39 For projects, which were implemented late (all town centre systems and Southcap Estate), the year period overlaps with part of the pre-implementation stage.
40 Figures come from the surveys not the police crime data.

Table 3.16:   Comparison between change in worry about crime and proportion of respondents victimised following the installation of CCTV

Scheme	Percentage point change in proportion of respondents victimised[41]	Percentage point change in worry about crime	
City Outskirts	0.1	−14	
South City	−12	−8	(after dark)
Shire Town	−4	−10	(after dark)
Northern Estate	−0.7	−3	
Westcap Estate	−10	−8	
Eastcap Estate	−4	Not applicable	
Dual Estate			
Area A	−22	−10	
Area B	−2	−9	
Southcap Estate	7	−2	
Deploy Estate			
Area E	0.7	−3	
Area F	6	−0.4	

It was found that, generally, those areas where worry about being a victim of crime declined tended to experience larger reductions in the proportion of individuals who reported being victimised. For example, Westcap Estate saw an eight per cent reduction in worry about crime, and a ten per cent reduction in the number of reported victims. In seven of the surveyed areas, worry about being a victim of crime declined alongside a reduction in the number of reported victims.

Southcap Estate, however, experienced the opposite: worry about being a victim of crime went down by 2 per cent and reported victimisation increased by four per cent. A possible explanation for this is that although there was an increase in reported victimisation, this was an increase of just four crimes, which is a negligible figure considering the size of the sample (approximately 400). Also, Southcap Estate's recorded crime data were flawed on many levels[42], which brings into question the accuracy of this comparison.

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41 These figures demonstrate the percentage change in the number of victims reporting having been victimised before and after the installation of CCTV.

42 Owing to late implementation, just six months' post-implementation crime data was used. Also, this included crimes from within just one-third of the target area. The survey, on the other hand, was conducted across the entire target area.

The relationship in the post-implementation responses between reported victimisation and worry about being a victim of crime was measured[43]. The results revealed a significant relationship (<.01) in all nine residential areas in the sense that those who were victimised were more likely to be worried about being a victim of crime than those who were not victimised. Similar patterns were found in the town/city centres; however, the relationship was not significant. This finding suggests that worry about being a victim of crime is directly related to victimisation levels on the estate, rather than the mere presence of the cameras.

The change in the number of victims after the installation of CCTV (see Table 3.15) revealed large variations across the areas but no discernible pattern according to the type of area, or crime category.

A further analysis of reported victimisation levels revealed that eight schemes experienced a reduction in the percentage of respondents who reported having been victims of crime after the installation of CCTV. Substantial percentage reductions were recorded for Area A (–22), South City (–14), and Westcap Estate (–10).

Of these eight, four had a larger reduction in victimisation than the control (Area A, Westcap Estate, Northern Estate, and Shire Town), but in none of the four was the difference statistically significant[44]. Two areas, South City and North City, did not have a control.

Levels of victimisation can also be measured in terms of the actual number of incidents before and after the installation of CCTV, rather than the number of victims. This measure enables a more reliable comparison to be made with recorded crime, as it takes into account total victimisation levels. Table 3.17 shows the comparison between the percentage change in recorded crime and the percentage change in victimisations.

Table 3.16 shows whether an increase or decrease in recorded crime was in line with a change in the number of reported victimisations. To make possible a reliable comparison, it was necessary to use only the figures for those crime categories in the reported victimisations that were also included in the recorded crime data. As a result, the five categories of harassment were excluded from the measure. The town/city centre surveys did not include a measure of victimisation, so they are not included in the table.

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43 Using the Pearson's Chi Square Test.
44 The lack of statistical significance could be due to the small numbers of reported victimisations in the majority of projects.

Table 3.17: Comparison between percentage point change in recorded crime and percentage point change in quantity of reported incidents

Project	Percentage point change in police recorded crime data	Percentage point change in quantity of reported incidents (excluding harassment[45])	Percentage change in reported harassment
City Outskirts	–28	–24	12
Northern Estate	–10	–22	13
Eastcap Estate	2	+21	–8
Westcap Estate	N/A	–34	–1
Dual Estate:			
Area A	–32	–66	–4
Area B	+8	–35	18
Southcap Estate	14	+18	1
Deploy Estate:			
Area E	+57	–33	9
Area F	+4	+18	11

The findings reveal that the change in the number of reported incidents (excluding harassment) is consistent with the change in recorded crime in the majority of schemes. Where there was a reduction in recorded crime, there was also a reduction in the number of reported incidents, and vice versa, thus verifying the reliability of the recorded crime data. However, there were two exceptions: Areas B and E. Area B saw a reduction in the quantity of reported incidents (excluding harassment), but an increase in reported crime, which could be the result of increased reporting to the police, as in Area E.

Changes in behaviour (impact of CCTV on respondents' actions)
It is also possible that respondents would have changed their behaviour or routines once CCTV was installed. Respondents were asked in the pre-implementation survey whether they would go into areas that they currently avoided if CCTV was installed. In the post-implementation survey, they were then asked whether they had gone into areas they previously avoided now that CCTV had been installed. Table 3.18 shows the percentage difference between anticipated and actual behaviour before and after the installation of CCTV.

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45   i.e. those experiencing any of the types of harassment outlined in footnote 35 above.

The proportion of respondents who visited places they had previously avoided following CCTV installation ranged from just two per cent to seven per cent. This contrasts markedly with the percentage of respondents interviewed before CCTV was installed who thought that they would visit places that they avoided once CCTV was installed. On average, 15 per cent of pre-implementation respondents thought CCTV would allow them to visit places they avoided, with figures ranging from six per cent to 23 per cent for individual projects.

Table 3.18:   Avoidance behaviour before and after CCTV installation

	I would go/*have gone* into areas that I don't/*didn't go* into now/*before*[46]		I would/*did* stop going into areas that I go/*went* into now/*before*	
	Before	**After**	**Before**	**After**
City Outskirts	23%	3.3%	0.5% **	0.7% **
North City	N/A	61.9%	N/A	N/A
South City	N/A	17.1%	N/A	N/A
Shire Town	N/A	34.5%	N/A	N/A
Northern Estate	12.6% *	3.2% *	0.0%	0.0%
Westcap Estate	13.9% *	7.1% *	0.6%	0.0%
Eastcap Estate	10.4% *	2.2% *	1.9% **	0.9% **
Dual Estate:				
Area A	6.4% **	2.2% **	1.1% **	0% **
Area B	20.1% *	2.1% *	0.3% **	0.6% **
Southcap Estate	15.1% *	7.4% *	0% **	0.4% **
Deploy Estate:				
Area E	14.3% *	5.4% *	0.3% **	0% **
Area F	8.1% *	1.7% *	0%	0%

*   significance (p<.01)
** Fischer's test used

The differences between the town and city centre schemes in this respect were quite marked. While just 17 per cent of South City respondents reported that CCTV made a difference to the places they visited in the city centre, the figures in North City and Shire Town were 62 per cent and 35 per cent respectively.

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46 For South City, Shire Town and North City the statement read – 'CCTV makes a difference to where I walk or drive in town/city centre'. Therefore, the 'after' column indicates the percentage of respondents (of those that were aware of the presence of cameras) who agreed with this statement.

The most plausible explanation for why CCTV in South City failed to encourage many more individuals into areas, which they previously avoided is that, even when CCTV was installed they were not necessarily in a position to alter their behaviour or routines. The majority of places visited by individuals were on the way to places that they routinely visited, such as shops or workplaces.

On the other hand, respondents were not discouraged from visiting places because CCTV cameras were installed there. Only one per cent of the respondents said that they avoided places now that CCTV cameras were installed.

On the whole, these findings suggest that there is no connection between worries about being a victim of crime and avoidance behaviour. They also indicate that respondents believed CCTV would have an impact on their avoidance behaviour (encouraging them to visit places they previously avoided), but in practice this rarely occurred.

Support for CCTV

It was found that, generally, the proportion of respondents happy or very happy about the presence of CCTV cameras declined over the evaluation period, although it remained quite high and robust with results ranging from 69 per cent to 96 per cent (see Table 3.19). The most dramatic change was witnessed in Area A, with a significant reduction in support for CCTV from 89 per cent to 69 per cent. Considering that individuals did not significantly change their behaviour once the cameras were installed, even though they believed they would and that support for CCTV declined, it would appear that the idea of CCTV was far more appealing in theory than it proved in practice.

Table 3.19: Support for CCTV pre- and post-implementation

	Very/fairly happy about CCTV		% Difference
	Before	After	
City Outskirts	93.5%	90.8%	–2.7
North City	95.8%	95.7%	–0.1
South City	78.5%	81.2%	2.7
Shire Town	93% **	79.7% **	–10.6
Northern Estate	79% *	77% *	–2
Westcap Estate	88.0%	78.5%	–9.5
Eastcap Estate	80.4% **	72% **	–8.4
Dual Estate:			
Area A	89.2% **	68.9% **	–20.3
Area B	95.2%	92.9%	–2.3
Southcap Estate	93.0%	91.6%	–1.4
Deploy Estate:			
Area E	96% **	88.5% **	–7.5
Area F	95% *	89.8% *	–6.2

*   Significance (p<.05).
** Significance (p<.01).

Civil liberties

The questionnaires explored the issue of civil liberties and the degree to which respondents felt that CCTV was an invasion of privacy. This is a long-standing issue connected with the use of surveillance systems. With the exception of Deploy Estate and Southcap Estate, concerns about privacy weakened slightly after the installation of the cameras (the previous figures were also small) ranging from two per cent to seven per cent. This seems to indicate that residents did not consider the cameras to be as intrusive once they were installed as they had previously thought. It is important to mention, however, that the number of respondents who were concerned about this issue was low even before the system was implemented; the largest percentage was in Southcap Estate (23 per cent), but in general ranged from 12 per cent to 19 per cent.

The issue of civil liberties does not, therefore, explain the reduction in support for CCTV, as levels of concern over privacy, which were low before the installation of CCTV, remained low afterwards.

Perceived impact of CCTV

The residential survey[47] respondents showed general disillusionment with the effectiveness of the cameras. The percentage of people agreeing with statements claiming positive effects from the cameras[48] decreased substantially in comparison with the pre-survey figures (see Table 3.20). The table reveals that across all areas, and in response to all three statements, there was a reduction in the perceived effectiveness of CCTV. This was particularly evident in relation to the statement 'with CCTV, the level of crime has got lower'; there was a 12 per cent to 55 per cent drop in the proportion of respondents who agreed with this statement after CCTV was installed.

Table 3.20: Percentage point change in perceived effectiveness of CCTV after installation

	People would report/have reported more incidents		With CCTV… Police would respond/have responded more quickly		Level of crime would get/has got lower	
	Before	After	Before	After	Before	After
City Outskirts	72.1	58.8	60.2 *	34.8 *	78.1 *	48.6 *
Northern Estate	81.4	65.9	79.7 *	59.7 *	81.7 *	69.7 *
Westcap Estate	69.7	53.1	59.2 **	48.4 **	81.4 *	55.1 *
Dual Estate:						
Area A	67 *	33.9 *	41.4 *	11.7 *	77.9 *	44.3 *
Area B	66 *	36 *	55.6 *	20.2 *	81.2 *	27.1 *
Southcap Estate	70	58.5	57	47.7	79.7 *	65.8 *
Deploy Estate:						
Area E	57.8	46.7	42.5 *	29.1 *	80 *	40.8 *
Area F	69.6 *	44.2 *	52.4 *	26.6 *	78.9 *	35 *

* Significance (p <.01).
** Significance (p<.05).

While it must be emphasised that there was a reduction in the perceived effectiveness of CCTV across the board, some respondents demonstrated a residual faith in CCTV.

Again there was no evidence that those schemes securing the greatest reduction in worry about crime saw lesser reductions in the perceived impact of CCTV, which suggests that levels of worry about being a victim of crime were not dependent on whether or not an individual perceived this measure to be effective.

47 Only the residential surveys included this set of questions.
48 'people have reported more incidents'; 'police have responded more quickly'; 'crime has got lower'.

However, it does begin to explain why there was a reduction in support for CCTV in the majority of areas. In those areas where there were marked reductions in support for CCTV (Area A and Westcap Estate), there were also notable reductions in the perceived effectiveness of CCTV (for example, a 33 per cent and 26 per cent reduction in respondents believing that CCTV would lower crime in Area A and Westcap Estate). However, where there were less significant reductions in support for CCTV (Southcap Estate), there were lesser reductions in the perceived effectiveness of CCTV (just 14 per cent fewer respondents believed CCTV would reduce crime).

Summary

Although there is some evidence that there was a reduction in fear of crime following the installation of CCTV, there is little to suggest that this is attributable to CCTV. It is more likely to have been a reflection of the reduction in the level of reported victimisation within the areas. CCTV certainly has not led to a measurable change in avoidance behaviour.

Furthermore, it has become evident that following the introduction of CCTV, support for its use decreased. This was shown not to be the result of concern over issues relating to civil liberties and privacy, but there is a suggestion that support has declined in step with reductions in people's perceptions of the camera's effectiveness; fewer respondents believed the cameras would reduce crime.

Main findings

The following draws together the main findings from the previous two sections, summarising the impact on crime levels, public perceptions of CCTV, and the mechanisms by which CCTV has operated.

Impact on crime levels

All systems aimed to reduce crime, yet this study suggests that CCTV has generally failed to achieve this. Although police-recorded crime has decreased in six out of the 13 systems for which data were available, in only three cases might this decrease be attributable to CCTV, and in only two areas was there a significant decrease compared with the control.

Certain general trends appear to have emerged, although the lack of statistically significant results and the small sample sizes render these findings merely suggestive. CCTV appears to

impact differently on different types of crime, supporting the findings of earlier studies (see Welsh and Farrington, 2002; Brown, 1995). In some cases premeditated, or more planned, offences, such as burglary, vehicle crime, criminal damage and theft decreased in most areas during the evaluation period, while more spontaneous offences, such as violence against the person and public order offences did not.

Vehicle crime decreased most following CCTV installation, declining in seven systems at rates from seven per cent to 75 per cent. This could be attributed partly to the nature of the areas covered by CCTV. In the evaluated systems the greatest reductions occurred in car parks, which were closed environments with a limited number of entrances and exits, and where CCTV could be trained on these; this supports the findings of Tilley's (1993) study of car parks. The size of the reduction could also be attributed to the nature of vehicle crime, which produces quick but small gains, and where offenders are more likely to make an assessment that the level of risk is too great compared with the gain once CCTV is installed (see, Clarke and Felson, 1993).

Some crime types showed an increase following CCTV installation. This sometimes indicated that the presence of CCTV had brought a greater number of crimes to the attention of the police and thus represented a success. Recorded rates of shoplifting increased in four out of the five urban centre areas and in three of these the CCTV control room worked with Retail Radio link initiatives, allowing operators to liaise with local shops and so facilitating the reporting and arrest of shoplifters.

However, such factors could not explain increases in violence against the person. Although this offence increased in four areas, the patterns of change varied, and in general followed national crime trends (taking into account Home Office Counting Rules).

Increases in overall crime levels in residential areas could be attributed to residents reporting more crime in the belief that CCTV would corroborate their story. In two areas the recorded crime levels rose relative to reported victimisation, as would be expected if this had occurred. However, this evidence has to be tempered by the finding of the public attitude survey that members of the public predominantly disagreed with the statement that 'with CCTV installed, people report more incidents'.

It is commonly believed that CCTV merely displaces crime, but there was little evidence of geographical displacement across the projects, supporting the findings of Flight (2003). Where three projects showed possible displacement, only two of these could be attributed to the presence of CCTV (rather than confounding factors).

Public perceptions

'To reduce fear of crime' was a stated aim of the majority of projects under evaluation. Findings from the public attitude survey suggest there is little evidence that CCTV achieved this. Fear of crime decreased in all 12 areas surveyed, yet only four showed a larger reduction than the control area. CCTV was found to have played no part in reducing fear of crime; indeed those who were aware of the cameras admitted higher levels of fear of crime than those who were unaware of them. The reduction in fear levels was more likely to be the result of less crime, reflected in reduced reported victimisation and reduced recorded crime.

Generally, public support for CCTV decreased after implementation by as much as 20 per cent, yet it still remained high in the majority of cases. The reduction in support was found not to be the reflection of increased concern about privacy and civil liberties, as this remained at a low rate following the installation of the cameras. It would seem that support for CCTV was reduced because the public became more realistic about its capabilities; for example, the number of individuals who believed CCTV would lower crime went down substantially post-implementation.

Mechanisms

In the few cases where CCTV appears to have reduced crime, or particular crime categories, this has been brought about through a number of key mechanisms. As CCTV shows the largest impact on premeditated or planned crime, the strongest mechanism appears to be deterrence.

While an assessment of the police use of images was outside the remit of the research, there were not many identified cases of possible detection brought about through the transfer of information between control room operators and the police. Where this was most noticeable was in the handling of shoplifting offences in urban centres. Another system appears to have been used in dealing with alcohol-related offences such as public order, and this came about through a good partnership between CCTV control rooms, the police, and other agencies, particularly Retail and Pub Radio.

In only one system, Hawkeye (which was mainly designed to deal with vehicle crime), could a connection be drawn between increased detection by retrospective provision of evidence and a reduction in crime. Over 82 per cent of offences committed across the area were detected through the provision of CCTV evidence.

Clearly, the mechanisms through which a system works depend on the characteristics of the system and the circumstances in which it is installed. These are complex and clear patterns across schemes and are not easy to identify. A number of characteristics of CCTV systems were investigated during this research, including camera density and coverage. Generally, as coverage of a target area increased so did the reduction in crime. Surprisingly however, those areas with a high camera density were no more likely to act as a deterrent than those with lower density.

What should be made of the findings?

The most obvious conclusion to be drawn from the analysis in this chapter is that CCTV is an ineffective tool if the aim is to reduce overall crime rates and make people feel safer. The CCTV systems installed in 14 areas mostly failed to reduce crime (with a single exception), mostly failed to allay public fear of crime (with three exceptions) and the vast majority of specific aims set for the various CCTV schemes were not achieved. Despite all this we are reluctant to draw the simple conclusion that it failed.

The dynamics of crime prevention measures are notoriously complex, but those of CCTV systems are perhaps the most difficult to unravel. So far we have examined the mechanisms by which it was hoped that CCTV might reduce specific types of crime, allay fear of crime and improve reporting to the police. At least two of these goals (reduced crime and increased reporting) are in conflict. However, more importantly, it is not CCTV itself that can achieve these objectives, but rather the people who plan, implement, manage and operate the systems.

The relationship of this chapter to the next is perhaps best illustrated by a sporting analogy. When the odds-on favourite fails to win the Derby, the post-race analysis focuses on both horse and rider. Was the horse simply not as good as had been supposed, or did the jockey ride a poor race? This chapter has concluded that CCTV has failed to meet expectations: the horse has flopped. The next chapter assesses what sort of ride it was given.

4. What influences CCTV's operation?

The previous chapter has shown that CCTV has worked in some areas to a limited extent but has broadly failed to impact on recorded crime. This can be attributed in part to the design and operation of each CCTV system. The characteristics of a system that determine whether it is likely to have a chance of success can be grouped under five headings:

- System objectives

- Management of the project

- Density, camera coverage and positioning of cameras

- Technical characteristics of the CCTV system

- Control room operation

This chapter discusses how the characteristics of the CCTV projects being assessed influenced their capacity to meet their objectives. It can be seen that, whilst some projects were set up so that they met certain objectives some of the time, none achieved all of them.

System objectives

Like all crime prevention initiatives, CCTV needs to be implemented with clear objectives in mind. Apart from providing a yardstick against which to judge a scheme, a statement of objectives inspires confidence that the planners understood what CCTV could achieve, how the system might achieve its aims and in what contexts. Many of the schemes being assessed did not have clearly stated objectives, for a number of reasons.

First, CCTV was credited with the well-reported arrests of the murderers of James Bulger in 1993, and later of the Brixton nail-bomber in 1999, leading to a universal assumption that CCTV was 'a good thing'. This lessened the need for project planners to demand evidence to support the claims made for CCTV. There was also little need to think about whether CCTV was the best measure to address the particular problems in the area where it was to be applied. One project manager stated: *I'm all for* [more cameras]; *it builds the system up*

doesn't it? If I had my way I'd have cameras everywhere, 'cause they're good. The Home Office endorsement of CCTV further diminished the need for planners to be seen to assess CCTV critically, as one of many possible crime reduction initiatives.

Where CCTV was already in place, its perceived success led to a demand for more of the same. Six of the 14 evaluated systems (see Appendix D) were modernisations or expansions of existing systems. One of them used the claimed success of CCTV in a town centre to support expansion into the adjacent residential area:

> *The Home Office bid means two new areas of the Borough will reap the benefits of CCTV camera coverage, which has proven to help reduce crime and the fear of crime in and around the town centre.*
>
> (Council News Website, August 2001)

Within local authority areas, the presence of CCTV in one town centre led to pressure to install it in others, and one local authority had a stated policy of installing CCTV in all its town centres.

Funding applications were often characterised by objectives set in vague terms, such as '*to reduce crime and disorder*' or to '*detect and deter criminals*' (Smith *et al.* 2003), although some were more specific; CCTV will '*increase police deployments and response*' or '*deter the travelling criminal*' and '*increase the opportunities for the detection and prosecution of offences*' (see Table 4.1).

Practical difficulties, which might arise in the achievement of stated objectives, were rarely considered, it being generally assumed that everyone would cooperate to make CCTV work. Thus local authorities might set as an objective for CCTV an improvement in the deployment of police officers without regard to whether the police would be likely to cooperate with the CCTV scheme. Good relationships between agencies responsible for crime control were taken for granted, partly because of the provisions of the Crime and Disorder Act 1998. In some cases previous difficulties in communication between the police and the local authority were ignored (see Gill *et al.* 2005a).

Second, the availability of funding led to a perceived obligation on local authorities to bid for schemes intended to benefit their residents and businesses, whether or not there was an identified need. A senior community safety team member in one partnership wrote:

> *The Borough did not have any strategic plan as to the need for any more CCTV. Similarly, no areas within the Borough had been prioritised as being suitable for CCTV.*

Consequently, the Home Office funding stream was seen primarily as a funding opportunity not to be missed, rather than being an opportunity to address identified need.

Others doubted that CCTV was the most effective way of spending the available funds:

Other measures, far cheaper, could have been better. For example, target hardening the ground floor flats, providing door entry systems, gating off the estate and providing improved lighting. I don't know how clear the aims were defined but the money involved (from the Home Office) made it difficult to refuse...I guess it was effectively 'Take the money now or lose it'.

(Housing manager)

Bidding for funding allowed local authorities to demonstrate to residents that they were addressing local fear of crime; ten of the 13 projects set the reduction in fear of crime as the main objective (see Appendix D). Funding for CCTV also assisted four local authorities to obtain money from other sources such as Single Regeneration Budgets, which required matched funding (see Appendix D). In three areas, CCTV was expected to assist in gaining status awards, such as Secure Car Park status (see Appendix D).

Such generic reasons for installing CCTV may have led project designers to conclude that installation was virtually an end in itself; hence such vaguely stated objectives as to '*reduce crime and disorder and the fear of crime*'. Although three sets of project planners assumed that the well-publicised successes attributable to CCTV would reassure the public, they did not give much thought to how precisely this would be achieved, or to defining what aspects of system design would need to be in place to achieve it.

Third, bidders faced a number of constraints, which hampered their ability to propose schemes for the most needy areas. Eight projects were able to access crime statistics for the precise intervention area including all those that showed a reduction in crime, and a further two obtained them for part of the intervention area, but in other cases lack of time to make the bid, limited availability of crime statistics and the lack of expertise of those producing them led to target areas being identified by local reputation or police statistics for areas larger than the target area (see Table 4.2).

Where figures were obtained, they were provided to support the funding application rather than for their objective value. This suggests that little has changed since, in 1991, the Morgan Report complained that problem identification was 'opportunistic and haphazard' (Home Office, 1991: 21). As a consequence of such shortcomings, at least one project

resulted in CCTV being installed in areas where crime was in fact low; and other city/town centres where CCTV was installed, may also have had low crime rates[49].

In summary, objectives were poorly formulated because planners had so much faith in CCTV's efficacy that they saw little need to justify its installation, and there was little incentive for them to consider precisely what effect CCTV might have. This was true of all systems including those which recorded an impact on crime. Although the project planners in these cases were clear about the nature of the problems to be addressed, and had some conception of how the system might be set up so as to address them, nevertheless they relied on a number of assumptions, such as the support of another agency. In all cases, objectives emerged as the systems became operational and were in practice determined by such factors as the management of the CCTV systems, the ways in which camera locations were selected, technical factors and control room operations. Each of these factors will be discussed in turn.

Management

Aspects of the management of CCTV systems affected their design and operation throughout the bidding and implementation process, continuing into full operation.

Usually a team was specially formed to install the cameras, and its composition influenced the implementation process (see Gill *et al.* 2003). Three key team characteristics determined whether the CCTV systems were designed to meet their objectives. Whilst the systems were on the whole reasonably well designed and implemented, nine had minor flaws, which could be attributed to the decisions or actions of those installing the system, and in four cases design problems impacted significantly on the way the system operated (see Appendix D). The key characteristics were:

- Access to appropriate technical expertise

- Full engagement of end-users

- Suitability of project manager

Understandably, public service employees often lacked the desirable level of knowledge of complex and rapidly changing CCTV technology. Ten out of the 13 teams contracted in the

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49 Crime rates were classified as low if they were below the national average for England and Wales for all crime categories. The average in each area was calculated by setting the number of offences against population. Given the low residential populations in town and city centres, this measure does not accurately reflect the relative crime levels in these areas.

services of a technical consultant (see Appendix D). The consultants were given different roles within the project teams and in some projects took on the role of coordinating the implementation process. In five cases, the consultants contributed to the design of technically sound systems, with well-positioned and appropriate cameras, and control rooms providing good-quality evidence. These included two systems, which brought a reduction in crime (Hawkeye and City Outskirts). However, no system was perfect, and it was sometimes a matter of chance whether or not a sufficient proportion of the system worked effectively.

There were a number of reasons why the systems designed by consultancies had flaws. There was evidence of over-reliance on the consultants' expertise and a lack of communication between the consultant and the system users. Consultants provided cheaper equipment in order to reduce costs without explaining the implications sufficiently. For example, cheaper cameras could not be placed on auto-tour as the mechanisms wore out, which meant that members of the public would be less likely to see them moving. This reduced the impact of projects whose primary objective was to reassure the public or deter offenders. A number of systems experienced problems with cameras being positioned too close to buildings or to bright lights, or amongst foliage (see Appendix D). These problems were often attributed to the technical consultant, but could also be caused by a lack of communication between consultants and other project members, combined with a tendency to carry out system planning during the day, in winter, or at other times when potential obstacles are not visible. In one case, the council used a consultant they had used for several years, rather than putting the contract out to a Best Value review, and he had become complacent. He failed to investigate the lighting levels in a residential area despite being briefed to do so; consequently night-time images were virtually useless.

The four teams who did not employ a consultant were able to install their systems more quickly (as there were fewer people to liaise with). However, they were more exposed to the sales skills of suppliers, and there were fewer checks on equipment choice. One of the systems was redeployable and used state-of-the-art technology. While it had many good points, it was virtually useless for live monitoring and had a number of flaws in its recording capacity. It was therefore used primarily for reassuring residents by providing a physical presence. Whilst this meets the main objective of this system it was a relatively expensive solution. Another installed too strong lighting, causing strobing of night-time images, which considerably reduced quality. Although this system produced a reduction in crime, it operated by deterrence and had a poor capacity to detect crime at night.

The individuals who implemented CCTV systems were often not those involved in its day-to-day operation. To reach full potential, the end-users should be actively engaged in the implementation

process in order to ensure ongoing cooperation. Five systems where this was not done experienced difficulties initially (see Table 4.1) and failed to bring a reduction in crime. The main end-users of most systems were the police and there were examples of a lack of strategic planning with the police leading to difficulties in system operation. One redeployable system was unable to obtain police information, which would have enabled cameras to be placed in hotspots. In the case of one urban centre system, the police took little interest in the CCTV system and were initially slow to get involved in the operational procedures of the control room.

In all cases, the key end-users (for example, police and other local authority departments) were consulted at the planning stage, but were reluctant to become involved for a range of reasons, including differing strategic and financial priorities, a concern that the new CCTV system would increase workload or place a strain on already stretched financial resources, or (as in one residential area) anxiety that it would create demand for further CCTV, for which there was no available funding. The following case study illustrates the problems that can arise when there is lack of engagement.

Case study (City Hospital)

The local police force had identified a hospital as a vehicle crime hotspot, and CCTV was installed in the main car parks. An objective of the system was to improve patient and staff safety by providing an immediate response following an incident. The hospital system would be monitored by the local authority, which would also respond to help-point activations. The system was initiated by a police officer who subsequently retired, forcing the hospital trust to become the project managers. However, the Trust relied on the police to provide CCTV expertise and it was also necessary to set up data-sharing protocols between the hospital trust, police and the local authority. However, neither the local authority nor the police provided the necessary support at crucial times in the implementation process. The responsibility for the CCTV fell to a number of different departments in the local authority and the hospital was not able to engage the appropriate personnel. The police CCTV representative had a number of other pressing concerns and was not able to prioritise the hospital CCTV system. Consequently, there were severe delays in establishing the protocols for information exchange and in resolving implementation problems. These difficulties were not resolved within the evaluation timetable, so that the system could only be evaluated as a possible deterrence to crime.

It was the project manager's role to ensure that a fully functional CCTV system was installed, and all except one of the evaluated projects achieved this. A number of key characteristics of an effective project management role were identified.

The project manager must be identifiable and accessible, which seems self-evident, but three projects failed in this respect (see Table 4.1). The following quotation is from a project where no one was identified as a key contact:

When I first joined there was no key person to contact for CCTV – it felt like it was passed from person to person. There's no day-to-day manager and it causes real issues. As a Community Development Worker for the area I'd get queries from residents and I wouldn't know who to call. Simple things took a lot longer because there was no direct line of communication. I think that could have been better if it had been planned from the start.

The projects failed to appoint a willing manager for two main reasons. No one agency wished to take responsibility for CCTV installation because of the personal and financial burden that this would place on it. In addition, CCTV fell outside the core activities of the managing departments and so there was no obvious manager. As a result, the management task was foisted onto people who had other duties and who were quite likely to have little interest in CCTV. Consequently, the projects either failed to complete implementation properly or remained directionless even after coming into operation, as illustrated in the following case study.

Case study (Westcap Estate)

A ten-camera system was installed in a high-density residential area primarily because funding was available, but also to reassure the public. There was a lack of strategic direction to the project and the objectives were poorly defined. Rather than being chosen as the best candidate, the project manager was chosen because there was no alternative. His full-time role as a parks police inspector limited the time he devoted to the project to a maximum of ten hours per week. He was not enthusiastic about the role, which was not even officially written into his contract ('I have a contract, where nowhere does it mention CCTV – it's cheap to give me a job on top of a job'), and merely did the best he could in the circumstances. A colleague felt strongly that these arrangements had had a negative impact on the management of CCTV generally in the Borough:

The fundamental problem with CCTV is that no-one has got ownership of it. X deals with project management, but he doesn't want it. He got lumbered with CCTV and he doesn't really have enough expertise or knowledge, but does enough to keep it just above water. He's not interested in it and he would drop it if he could.

There was no real interest in the way that the completed CCTV system was used, and operators commented: '*There's no conception of what we do, but we're here and the system works*'. By 'works' the operator meant that cameras usually worked and the images they captured were usually displayed on the monitors, and that what was seen by the cameras was then recorded onto tapes. However, there was a strong sense that the system was not being used to its full potential: it '*does work, but only by default*'.

Only five project managers out of the 13 had expertise in CCTV (see Table 4.1) and where this was lacking the construction of the system could be affected. Those without such expertise were unable to question or challenge their consultants. One installed cameras which could not auto-tour, so that the public did not perceive the system as operational. Two faulty installations were signed off as complete and working correctly, partly because the project manager lacked the technical expertise to understand the significance of the faults. The incorrect sign--off led to a delay in rectifying the faults, which compromised effectiveness. Paradoxically, one of these systems (City Outskirts) showed a reduction in crime. However, the non-functional cameras were less frequently used.

Table 4.1: **Project objectives and implementation/management characteristics held by each project**

| System | System objectives | Implementation/management issues | | |
	Address clearly defined crime problems	Skilled project manager employed	Project manager had expertise about CCTV	End users (police) engaged during implementation
City Outskirts	Yes	Yes	No	Yes
Hawkeye	Yes	Yes	No	Yes
City Hospital	Yes	No	No	No
South City	Yes	Yes	Yes	Partially
Market and Shire Towns	Yes	Yes	No	Yes
Borough Town	Yes	Yes	Yes	Yes
Northern Estate	Yes	Yes	Yes	Yes
Westcap Estate	No	No	No	No
Eastcap Estate	Yes	Yes	Yes	Yes
Dual Estate	No	Yes	No	No
Southcap Estate	Yes	No	No	No
Borough	No	Yes	Yes	Yes
Deploy Estate	Yes	Yes	No	No

Density, camera coverage and positioning

Three factors potentially impacting on the effectiveness of the systems were the density (number of cameras per unit area), the camera coverage (the amount of area that the cameras can see) and the positioning of cameras. Clearly all three are related.

The density varied widely from scheme to scheme. Eight to 12 camera systems covered areas, which varied in geographical size from one or two streets to an entire estate, or even several estates. Similarly, the number of cameras installed in town or city centres ranged from nine to 51.

One of the main implications of using more cameras is that they cost more to purchase and install. Partnerships bid for varying numbers of cameras from a small system of eight cameras up to the largest, consisting of more than 600. These systems were installed in areas of varying sizes. Whilst capital cost was not the greatest concern for projects bidding for Home Office funding, it is clear that they wanted bids to appear 'sensible' so as to maximise the chances of success, and no written Home Office guidance was provided as to what was a sensible level. One partnership felt confident enough to bid for funds to install 154 cameras in a residential area with approximately 3,100 properties. In contrast, a 14-camera system was installed to cover two residential areas and a main road, and one of these residential areas contained only five cameras covering approximately 1,700 properties.

The statistical analysis showed a complex relationship between camera density and reduction of crime in the target area (see Chapter 3, Section A,). Whilst it is generally true that the greater the number of cameras, the greater the reduction in crime, it is possible to install too many cameras in a small area so that the effect of some is reduced virtually to nil. This occurred in Areas C and D of Southcap Estate (with a density of 253 cameras per km^2), and Borough Town (325 cameras per km^2).

The above can arise because the level of overlap between cameras becomes too great to be useful. It is of far more significance that the cameras have the largest possible camera coverage, which is brought about through careful system design. Camera coverage was shown to be important for deterring offenders. Obviously, if the camera can see them then they can see the camera and where it is pointing. There was evidence from the present study to suggest that offenders were aware of the cameras' focus, which supports the findings of earlier studies (Gill and Loveday, 2003). From control room studies it could be seen that known individuals tried to hide behind street furniture to avoid the cameras' gaze; in focus groups both members of the public and offenders stated that offenders were aware of the cameras.

The effectiveness of the camera coverage is attributable not least to the positioning of the cameras. Clearly, cameras have to be able to observe a target area to detect crime and gather evidence. If cameras were poorly positioned or covered too small an area then operators could undertake only partial monitoring and could not track offenders from one area to another. A number of factors influenced the extent to which camera coverage and positioning helped systems to meet their objectives and these are discussed below.

The achievement of objectives depends on proper monitoring. For reasons identified in the control room section below, operators monitored busy urban centres at the expense of quieter urban centres and residential areas. Cameras in quieter areas were mainly used to provide retrospective evidence of crime in hotspots, rather than being used to track individuals in live monitoring. Three residential areas had blanket coverage, while the remaining residential systems covered the main crime hotspot areas identified by the police (see Table 4.2).

The danger in covering only hotspot areas is displacement of crime, and this occurred in the case of two residential systems, which showed a reduction of crime (Northern and Eastcap Estates). This was pointed to as a possibility in another residential area where isolated cameras were used to target anti-social behaviour:

> One of my concerns…is that [the camera] might push them round our way, as it's watching everything they do round there they might start to come round our bit of the street. And I have noticed that we are starting to get these, I mean my nickname for them is White-hats, these young thugs and that. They are passing through a lot and I am thinking why are they passing through, they come up [place] and go right back round to where you had come from, and it's to avoid the cameras and that is the flipside they push them round to other areas.
> (Resident of an estate where a single redeployable camera had been installed)

In contrast to quieter areas, busy urban centres were more constantly monitored, so producing substantially more live incidents. In such areas it was important that cameras overlapped, so that there was continuity of footage from one camera to another.

Whether or not a level of coverage was sufficient for a given area also depended on the objectives of the system. For example, extensive and inter-linking coverage was more necessary in urban centres where the objectives of the systems required operators to pursue offenders in order to direct shop security, pub security staff and police to targets (see control room section below). In residential areas, where the objectives were predominantly to

reassure the public, the number and position of cameras were much less of an issue as long as some coverage was provided. Many of the crime problems (such as anti-social behaviour, burglary and criminal damage) could be resolved by the use of retrospective evidence. Where the system was intended to address particular offences it was necessary to cover the main crime hotspot(s), and this was largely achieved.

Although the main objective of urban centre systems was to track offenders, the urban centres being assessed for this report presented a number of features that limited the camera coverage. Brown (1995 p: 11, see also Sarno *et al.* 1999) highlighted the fact that Newcastle City Centre was 'conducive to camera surveillance', as 'the streets are wide and relatively straight, there are few subways and few obstacles that block the cameras' view'. In the three urban areas under evaluation, cameras covered main streets only, and not side streets and alleyways. These areas did not lend themselves to comprehensive CCTV coverage, as they did not contain long straight boulevard-style streets. The failure to provide blanket coverage in urban centres, where the objectives were to pursue shoplifters or alcohol-related offenders and alert police and/or security staff to their location, caused difficulties, as these quotations from CCTV operators demonstrate:

> *Occasionally, where you may well have seen something [referring to an offence being committed] and a person runs down a side-street and you lose them, they don't come out where you expect. It can be very annoying, witness something, then they are gone.*

> *There are a number of areas where you can lose people. You would be talking a very large number of cameras to cover all the roads. It covered all the major roads, it's just the little windy streets.*

The quotations allude to the fact that blanket coverage of areas with many small alleys would probably be prohibitively expensive; and in some cases loss of targets was not a significant problem, as these quotations from operators demonstrate:

> *Most of it* [referring to target area] *is covered well enough and I don't generally have problems tracking people.*

> *The busy streets are covered, but not all streets, you could argue for a camera on every street. The important streets are covered and that's what we need to track targets.*

Consultation with parties with knowledge of crime problems and anticipation of likely future problems is important for decisions about the placing of cameras, but only seven of the 13 projects were found to have gone through a structured consultation process. Those that did typically collated information about crime patterns and positioned the cameras to cover areas where crime was most prevalent (see Table 4.2). The following case study provides a more detailed account of how thorough consultation was conducted:

Case Study (South City)

Two members of the 'project team': the crime and disorder coordinator and the police sergeant, as well as a technical consultant, toured the target area inspecting the proposed camera locations. The sergeant provided crime figures on a street-by-street basis and these were used to identify precise camera positions and fields of view. The partnership sent the plan of the proposed camera locations to local beat officers for review. As a result of this consultation, minor alterations were made and three extra cameras were added.

Another project team found after consultation on camera positioning that it could address problems that had not initially been recognised:

> Two cameras were added to the system on the outskirts…the (technical consultant) identified the need to provide coverage of the shops, as well as the entrance to the industrial area…this means that the system can be easily extended if further funding becomes available.
>
> (CCTV project manager)

Over-reliance on the technical manager, to the neglect of other parties, was a key issue underlying many positioning errors. In one residential area, consultation had been conducted, but the technical consultant was given the final decision on positioning, which in hindsight was criticised by the project manager:

> The positioning is really not great…For example, camera No X. - there's three walls there, we could have had a fixed camera there instead…Cameras Y and Z are covering very similar territory. P has blurred images – it's sited very high.

In another example, the technical manager largely conducted the design. Poor appreciation of the problems and locations in the area resulted in the absence of cameras on the most notoriously problematic street. This was not realised until a year after the scheme's

installation. So operators were prevented from monitoring this street. Nonetheless the system acted as a minor deterrent, probably because two CCTV cameras were placed at each end of the street and offenders were unaware of the coverage they afforded.

Operators commonly complained that they were not consulted and there were flaws in camera positioning, which reduced the effectiveness of the system. A CCTV operator who worked on a town centre system and needed to track individuals stated:

> …if we could have seen this system before it went in we would have moved some of the cameras as there are a lot of gaps in the system…don't think that the people they had to place the cameras are that clever – especially Camera 2, which should have been in the middle on a 360.

The operators in this control room experienced difficulties in pursuing offenders because the cameras were poorly linked up. Although operators were commenting with hindsight and a lack of awareness of the compromises that had had to be made (such as cost and obstacles to positioning), such consultations could have improved the system design.

Compromises were also made where project managers had to obtain consent from other departments or agencies whose own objectives or resources could be affected by a camera's position. These included parks and planning and conservation departments. There were instances where the best location for the camera would have been where a tree stood or where a tree would need regular pruning for the camera to work effectively. Understandably, parks and conservation departments were reluctant to remove trees for this purpose; but they were also reluctant to commit to regular pruning, and project planners often discovered this reluctance too late.

Finally, as described in the report[50] 'Lessons for Implementation', system designers had to take into account the location of underground obstacles such as mains pipes for gas, electricity and water when planning camera locations. Obstructions above ground, such as buildings, street furniture, high-sided vehicles using the area, festival decorations such as flags and lights, and tree foliage were often not given due weight, especially the last mentioned, because camera locations were often decided in winter when tree foliage was at its least obstructive.

Whilst the impact of these was not huge, they reduced the systems' overall capacity to monitor or to deter offenders.

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50 Gill et al. (2003): Early findings on scheme implementation, Home Office Development and Practice Report, 7.

Table 4.2: Camera coverage, density and positioning against characteristics of each project

Project	Availability of data for the target area*	Camera Coverage (% Target Area)	Density (per Km²)	Coverage adequate to meet objectives/type of coverage
City Outskirts	Police statistics, target area	68	64	Yes/blanket coverage problem areas, Good Tracking
Hawkeye	Police statistics, target area	95-100**	N/A	Yes/blanket coverage, all car parks.
City Hospital	Police statistics, target area	67	76	Yes/crime hotspots
South City	Police statistics, target area	72	73	Yes/crime hotspots, limited tracking
Shire Town	Police statistics, half of target areas	76	94	Partially/crime hotspots, limited tracking
Market Town	Police statistics, half of target areas	34	93	Partially/crime hotspots, limited tracking
Borough Town	Police statistics, target area	70	325	Yes/crime hotspots
Northern Estate	Police statistics, target area	87	127	Yes/blanket coverage
Westcap Estate	Police knowledge of hotspot areas	N/A	N/A	Yes/crime hotspots
Eastcap Estate	Police statistics, target area	29	29	Partially/blanket coverage main streets, one gap in coverage
Dual Estate	Police statistics, part of target area	9	10	Partially/crime hotspots, limited tracking
Southcap Estate	Police statistics, target area	73	184	Yes/blanket coverage
Borough	Police Knowledge of hotspot areas	N/A	N/A	Yes/crime hotspots
Deploy Estate	Crime and disorder audit	34	25	Partially/crime hotspots

*   The most appropriate form of data available to each project to assess the crime and disorder problems in the target area.
** Based on information obtained from system installers.
NA Not applicable.

Technical characteristics of the system

This section describes how the technical characteristics of CCTV systems influenced their operation. Although a detailed technical analysis is outside the scope of this report, the evaluation identified three technical aspects, which had a significant impact on the systems' ability to meet a range of objectives.

The type of camera used and the way that it was mounted influenced whether the system could be used more effectively for live monitoring, for providing good-quality retrospective evidence, for deterring would-be offenders, for reassuring the public, or for a combination of these. The systems used two types of camera, static or pan tilt and zoom (PTZ), and these were either box- or dome-mounted.

Static cameras were most useful for providing good quality evidence. They pointed in one direction and had a fixed focal length, and so they could be placed to provide comprehensive coverage of an area. However, it was important to place them so that the recordings across the whole area were capable of providing evidential-quality images (see Aldridge, 1994). Static cameras were used exclusively in the car park system included in the evaluation and this used the Rotakin test[51] (Aldridge, 1989) to set the appropriate camera coverage. The scheme also covered entrances and exits, providing records of car registration numbers. This system had a significant impact on vehicle crime, providing a high proportion of images to the police for use as evidence, as well as deterring offenders.

Static cameras were unlikely to be monitored live, first, because they were boring to monitor, as operators could not interact with the system and, second, because there was often a higher camera to wall monitor ratio, limiting the number of cameras that could be displayed and reducing the ability of operators to spot an incident. There were between 13 and 17 static cameras to one wall-monitor, in contrast to PTZ camera systems, which normally had a ratio of between two and five cameras to one wall-monitor[52]. In three control rooms, during a total of over 108 hours of monitoring, only 17 incidents were spotted live on the static cameras, compared with an average of over 100 live incidents spotted in control rooms using PTZ cameras over a 48-hour period.

Designers preferred PTZ cameras, which could be controlled by operators tracking offenders. They were better for live monitoring and for providing evidence of incidents

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51 The Rotakin Method is a test used to ensure that anything within view of the camera will be of sufficient size to make possible at least the detection of a target.

52 One of the evaluated systems using PTZ cameras had a camera to monitor ratio of 17 to 1; however, this was an exception to the norm.

spotted as operators could zoom onto a subject to obtain a better-quality picture. However, police and operators relied heavily on retrospective recording and here PTZ cameras had several disadvantages. They could point in only one direction at a time, so that incidents occurring outside the immediate field of vision of the camera were not recorded. To overcome this, cameras overlapped so that each area was monitored by more than one camera, but this was costly.

CCTV systems were also designed to reassure the public and to deter offenders; both aims being better met by cameras that can be seen to move. PTZ cameras can be set to tour automatically, changing direction every few seconds. Seven systems routinely used this facility, four of which were intended to reassure the public (see Appendix D). Unsurprisingly, however, members of the public and offenders also became wise to their automatic movement. The public were less likely to be reassured and offenders were able to predict the direction of cameras and avoid their gaze, as was reported by residents of an area covered by a redeployable camera intended to reassure the public. As one operator commented, it is unlikely that offenders would be fooled for long by programmed movement.

The automatic tour facility also helped each camera to record images from a larger area, increasing the amount of evidence available. However, the evaluation revealed examples of cameras on automatic tour recording part of an incident before moving away at a vital moment.

Seven systems were unable to fully adapt to night-time lighting levels, which affected both monitoring and the quality of recorded images (see Table 4.3). This was caused by a range of issues including inappropriate levels of street lighting, cameras incapable of adapting to low lighting levels (for instance by switching from colour to monochrome), and cameras being placed too close to strong light sources. In two of the three town centres, cameras were adversely affected by the neon lighting of the very premises that they were supposed to be observing (see Appendix D). Four out of the seven residential area systems suffered from inappropriate lighting levels around cameras, which could not be adjusted, and two of the night-time images were so dark as to be virtually useless (see Appendix D). Consequently, at night the CCTV systems acted only as a deterrent or to reassure the public. More often the difficulties involved strobing or glare on the images and lack of focus or blurring while the cameras were in motion.

Case study (Eastcap Estate)
Ten cameras were installed in a small residential estate alongside improved lighting aimed at increasing the quality of the recorded images. The cameras were placed too close to the lights so that the images strobed or glared at night. An operator reported an occasion when he was following a couple up a hill. The man stopped while his girlfriend carried on walking. The operator followed the female, but panned the camera back down the hill to check what her partner was up to. He was unable to locate him, and panned back to the female, by which time her partner was with her again. He reports that he must have panned right past him, but because of the blurring of the moving camera image, had been unable to spot anything.

Project managers and consultants should have assessed the level of lighting and the camera specifications in the process of designing the CCTV system; but this was not always done. Those designing one scheme recognised the need for improved lighting, but no financial resources were available. In two cases the consultant failed to correct low lighting levels sufficiently. In another, cheap cameras were chosen to reduce the cost of the system. In two systems cameras could be switched to monochrome, but operators either forgot to switch them or preferred colour images.

Systems used different recording equipment and settings, which affected the quality and availability of evidence. The evaluation took place at a turning point in the development of recording technology. While six of the evaluated systems recorded images on the more traditional analogue S-VHS tape, six recorded digital images on a computer hard drive, one of which also backed up the recordings on digital tape. One system used both media (see Table 4.3). Each medium had its advantages and disadvantages:

● Digital systems could be searched more quickly than analogue systems, saving on police time spent looking for evidence. The average search time on one digital system under evaluation was 18 minutes compared with 40 minutes on an analogue system.

● Images on digital hard drive maintained their quality, whereas an analogue tape wore out with use.

● Digital systems had a finite storage capacity and had to strike a balance between the number of images stored and their quality, but all the digital systems under evaluation were able to store images for 31 days with no noticeable loss of image quality. Analogue systems were restricted only by tape volume.

● Operators and control room managers lacked knowledge of digital technology in the case of two systems, which compromised their effectiveness. In one, the hard drive was recording images for more than 31 days before automatically overwriting, but there was insufficient understanding of recording settings to adjust this. Operators also lacked confidence or sufficient training in using the new technology to carry out searches.

All the control rooms stored images from all cameras for 24 hours a day, seven days a week. Control rooms saved on storage space by recording the images from several cameras onto one piece of equipment, taking an image from each camera sequentially. If there were too many cameras attached to the equipment then the number of frames from each camera was low and there would be only partial recording of any observed incident. The Police Scientific Development Branch (PSDB) guidelines[53], that an image from each camera should be recorded at least three times in every two seconds, was achieved in four of the 13 systems under evaluation (see Table 4.3). In two cases, (monitoring residential areas) the rate of recording was extremely low, and, whereas one provided no evidence to the police, footage from the other system was described as 'virtually useless' by the police.

The digital systems under evaluation tended to have faster recording rates than analogue systems, but there was no hard and fast rule. In both types of system, the biggest determinant of recording rates was the amount of equipment, and system planners were guided principally by cost and by the advice of consultants.

Control room operation

The control room operation determined whether the system was likely to assist in detecting crime in the target area (for more detailed findings of the control rooms under evaluation, see Gill *et al.* 2005a). Four aspects of control room procedure were important: live monitoring; recording of evidence; communication links between agencies; and the area being monitored.

Seven of the 13 control rooms monitored for 24 hours a day, while six monitored at times identified by police intelligence as being marked by particularly high crime levels (see Appendix E). One significant objective of most control rooms was to observe hotspots and to make possible immediate deployment of police officers, or (particularly in urban centres) to share intelligence between agencies to allow exclusion of known offenders, such as retail offenders or alcohol-fuelled revellers. The control room studies revealed that the operation of most systems was not good enough to achieve these objectives.

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53 Aldridge, J. (1994): *Who will be the first to test your CCTV security or safety team?* CCTV Operational Requirements Manual, Police Scientific Development Branch, no.17.

Table 4.3: Technical characteristics of each system

Project	Type of camera	Good image quality during night-time viewing	Significant obstructions (not in text)	Digital/analogue recording systems	Recording speed matches PSDB guidelines*/recording speed
City Outskirts	PTZ	Yes	Yes	Digital hard drive, backed up by digital tape	Yes/1-2 frames a second
Hawkeye	Static	Yes	Yes – rain on camera lenses and foliage problems	Analogue	No/1 frame every 1-2 seconds
City Hospital	PTZ	N/R	N/R	N/R	N/R
South City	PTZ	Yes	Yes – a few cameras obscured by foliage	Digital hard drive	Not available
Market Town and Shire Town	PTZ, few static	No	Yes – a few cameras obstructed by foliage	Digital hard drive	Yes/1-2 frames a second
Borough Town	Static and PTZ	Yes	No	Analogue	Not available
Northern Estate	PTZ	No.	No	Analogue	Yes/1-2 frames a second
Westcap Estate	PTZ	No.	No	Analogue	No/1 frame every 3-5 seconds
Eastcap Estate	PTZ	No	No	Analogue	Not available
Dual Estate	PTZ	Yes	Yes – rain on camera lenses	Analogue	No/One frame every 3-5 seconds
Southcap Estate	PTZ	No	No	Digital hard drive	Yes/1-2 frames a second
Borough	PTZ	No.	No	Digital hard drive	N/R
Deploy Estate	PTZ	Yes.	No	Analogue and digital	N/A

* PSDB guidelines require three frames per two seconds.

As well as live monitoring, control rooms also provided recorded evidence to the police. Predictably, more evidence was provided for town and city centres, the hybrid system and the car park system than for the residential areas (see Appendix E). Interestingly, with the exception of the car park system, those areas where there were a greater number of tapes taken as evidence were those where there was a higher level of live monitoring.

Control rooms relied on good communication with end-users, and these links influenced the type and volume of incidents monitored and determined what happened to them.

The control rooms received a relatively small volume of communication. Control room studies[54] found that only 26 per cent of incidents were prompted by outside agencies such as police contacts and Retail and Pub Radio links, while operators themselves identified 74 per cent of incidents, ranging from 45 per cent to 93 per cent across the control rooms.

Likewise, control rooms passed on a modest number of live incidents to outside agencies. Across all control rooms, operators passed on information on approximately one fifth of incidents and only one-third of incidents related to identifiable offences. A quarter of crime-related incidents were reported to the police. Two control rooms passed on no intelligence at all during the observation. One monitored a car park system set up primarily to provide retrospective evidence to the police. The other system was set up mainly to reassure the public by its presence and the lack of communication did not interfere with the achievement of this objective.

A number of incidents that were not reported would have been of potential interest to the police. They included 'possible drug use', 'trying to break into a metal shed', 'very drunk, not allowed in any bars', 'very drunk, obstructing vehicles', 'abusive and violent', 'possible theft from shop', 'abusive to shopkeeper', 'man wielding knife in bar'.

Communication levels were affected by a number of factors:

In three out of the 13 control rooms, police officers carried out monitoring activities for some shifts, which increased the amount of intelligence entering the control room (see Table 4.4). Officers were able to locate crime hotspots and local offenders. Operators working in a busy city-centre system commented on the police presence in the following ways:

I quite enjoy it. They give an insight we don't have. They recognise individuals.

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54 See Appendix A for methodology. For comprehensive details of the control room studies see Gill *et al.* (2005a).

It helps having the police in there they tell us stuff. That bench there is where the pimps sit, we could just think they were anybody and ignore them.

The police know every nook and cranny, if we lose somebody when tracking them they will tell us look up here or there. They have foot patrol knowledge.

An operator working in a small control room monitoring a residential area made the following comment:

When the police are in here, it's much better 'cos they know what they're looking for and they can liaise with people on the ground – they know more what they're looking for – the local characters.

Police presence also increased the volume of incoming communication. The police called control rooms on a total of 92 occasions (during 462 hours of control room observation) and 44 of these occurred when an officer was present.

Nine out of 13 control rooms had access to police radios (see Table 4.4). Six of these were one-way links, which allowed operators to listen in and identify incidents in advance, and to begin recording in real time, so improving the quality of visual evidence. Across control rooms, 38 incidents came to the attention of operators through the overhearing of police radio, and although this is a small number, it accounts for nearly one third of police-prompted monitoring activity. Control room operators said:

We definitely pick most of the jobs up off police radio. It's more motivating… the job comes over the radio; if you get on it straightaway you can get there before the police.

We rely on the radios, they're our eyes and ears really, to find out what's going on. It would be better if we could talk to police on the radio as well.

Three schemes had two-way links allowing direct communication with officers on the ground. The following operator description illustrates what happens when this link is missing:

We can watch them on the screen missing the right person, because we cannot communicate with them at the time…They also release the suspect sometimes…sometimes they can be following them in the car or something, and they can go right past the person they are looking for, and we watch this, but by the time we get through to the police Comms and this is relayed to the police car, they can be long gone.

Control rooms without police radios relied either on direct lines to the police control room or on the standard 999 number to deploy officers to the scene of an incident. Operators' 999 calls were not given priority over calls from the public with the result that there was often a delay:

> I had someone being beaten up for half an hour whilst I called CAD [Computer Aided Dispatch] and in the end I had to ring 999.

Clearly, if an objective of any scheme is to direct police to incidents then two-way communication is a prerequisite.

Three control rooms had Retail Radios[55] linking the target area to the control room (see Table 4.4), and calls on this prompted an average of 14 per cent of daytime live monitoring incidents. Thus, a large proportion of daytime control room activity related to shoplifting in urban centres. Two control rooms also had Pub Radio (see table 4.4), which prompted eight per cent of incidents across the control rooms. The Pub Radio accounted for a quarter of incidents monitored in one urban centre where the objective of the system was to address night-time alcohol-related crime. Whilst it did not reduce crime, it ensured that intelligence was shared between agencies.

A number of control rooms could pass images through to the police control rooms, allowing the police to decide whether to deploy resources. In three control rooms operators simply passed images of potential interest, leaving it to the police to recognise their significance rather than backing up their communication with a telephone call. In one case, the video link was attached to the monitor that operators used for their regular monitoring activities so they often had to change the image to continue working, causing frustration to the police when the image changed.

Good communication relied on good operator police relations. Three control rooms had good relationships with both patrol officers and police control centres, which prompted a relatively high level of communication into and out of the control room (see Table 4.4). More often, though, this relationship was less effective. In all systems, police officers visited the control room to collect evidence, but a number of forces were unlikely to contact the control room during an incident or would call them too late, sometimes 20 minutes after the incident had occurred. Operators telephoning the police control room received varying responses depending on who was making and receiving the call. Sometimes, operators were reprimanded for using direct lines and required to use the 999 number, which gave rise to

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55 Retail and Pub Radio were services linking local businesses within an area. Shops or public houses purchased a radio and contacted other members of the scheme to warn them of potential offenders, suspicious characters or troublemakers. These services were often linked with the local CCTV control rooms.

reluctance to contact the police directly. Control room operators felt that their professionalism was being imputed when they were questioned about what they had seen. One operator commented:

> Every operator on this job knows how to pick up drugs. When you're questioned to that degree we don't like that.

The skills, knowledge and motivation levels of the operators determined how well they identified live incidents and whether they succeeded in obtaining evidential-quality images. A number of factors helped to determine the level of skill and the knowledge of operators.

Control room Codes of Practice are intended to provide guidelines on monitoring practice, for example, how to operate within relevant legislation such as the Data Protection Act 1998 and the Regulation of Investigatory Powers Act 2000, and how to obtain evidential-quality images. All the control rooms assessed for this report had a code of practice, but they were of varied quality and tended to lack vital information. Many were poorly written; operators complained that their Code of Practice would '*definitely not win the Plain English Award*'. Explicit advice based on Police Scientific Development Branch guidelines for control room operation was rare. Many quoted the data protection principles, but did not specify how they related to monitoring behaviour. The Codes were rarely read and many operators denied knowledge of their existence. One operator, who did not know where the document was kept and admitted to not having read it, stated that:

> …nothing had really happened for us to need to use it…most of it is common knowledge anyway, like not looking through someone's window…

Operators obtained knowledge and skills with regard to monitoring, relevant legislation, tape management and obtaining evidential-quality images from training, most of which was provided in-house. Evidence-gathering skills and knowledge of relevant legislation were also passed on through formal one- or two-day operator training courses, and operators recognised the benefit of these:

> I went on a X security course and was taught about image quality. The Home Office have certain requirements for evidential images. Take these people, you can look at them at distance and you can monitor them because they cannot be identified. You only really look at people if you really need to…obtrusiveness and stuff.
>
> (Control room operator)

An operator stated that the courses taught him:

What [I] *can and can't look at or shouldn't look at and…the requirements for evidential purposes… you zoom in for identification and zoom out so you can see what is going on around it.*

Another said that he:

…kind of knows about laws but it told you what you can and can't do. If footage is to stand up in court you have to get head to their knees, I was not doing job as good as should have been.

And a further operator pointed out that:

X was useful [it taught you] *what things to look for, how to write logs, what to look for and how to describe people.*

However, most operators felt they lacked training and that this affected their ability to do their job well; one commented that he experienced:

…silly little problems that are down to training, like police ask us to do something to the image and we can't because of lack of training.

Eleven out of the 14 CCTV systems were monitored from control rooms that were responsible for monitoring CCTV installed in other geographical areas (see Appendix E), and this had a significant impact on surveillance of the evaluated area. The cameras comprised a relatively small proportion of the total number of cameras in the control rooms, and received a corresponding amount of attention. In a 48-hour period, the maximum number of incidents occurring in any of the evaluated areas was 57, but this was unusual and occurred in a city- centre system. More usually, 20 or fewer incidents were identified, and in three residential areas the number was fewer than six (see Appendix E).

Furthermore, many of the evaluated systems received less attention than would be expected taking into account the proportion of cameras in the control room, which they accounted for. All of the residential areas, one hybrid area and one of the town centre systems were monitored alongside relatively busy urban centres, which dominated the operators' attention.

In three out of the five residential areas fewer incidents were identified per camera. For example, a residential system covered by 12 cameras, making up 13 per cent of those in the control room, accounted for only seven per cent of incidents monitored by the operators. A number of factors contributed to the lower level of monitoring in quieter areas.

1. They were less interesting to monitor.

2. Less intelligence was received about crime problems in those areas.

3. Operators had little knowledge of the geographical layout and the crime problems.

4. External agencies such as retail/pub radio directed the attention of the operators to town and city centre areas.

5. Monitoring of quieter areas was affected by the control room layout; two areas under evaluation were monitored from a separate monitoring station, which was not occupied when the control room was short-staffed, and another showed the images from 148 cameras on ten monitors (see Table 4.4).

One operator working in a control room that monitored several town centres stated that:

It is really difficult to spend time monitoring the Borough and Nearby Town cameras on a weekend late shift because Big Town is so busy…but it's OK, because they are always recorded.

This neglect of quieter areas had a range of impacts. Operators were less likely to spot a live incident in residential or quieter areas, but would rely principally on recorded evidence. However, this evidence would be of lower quality because operators could manipulate the recorded image only of incidents that they spotted live. This limited the usefulness of the system as a whole to one of deterrence to offenders and reassurance of residents.

Table 4.4: *Control room characteristics of each system*

Project	Effective Control Room organisation*	Number of evaluated project cameras	No. of cameras per operator	Proportion of cameras in control room from systems under evaluation	Proportion of incidents monitored under evaluation	Communication links with police**	Radio systems	Police employed in control room	Relationship with the police***	
									Police respond effectively to intelligence	Police regularly view CCTV evidence****
City Outskirts	Yes	47	48	29%	14%	Direct line	None	No	No	Yes
City Hospital	N/R	63	N/R	N/A	N/A	N/R	N/R	N/R	N/R	N/R
Hawkeye	Yes	556	123-153	100%	100%	Police radio – one way, police rolling brief	None	No	No	Yes
South City	Yes	51	65-86	19%	77%	Retail radio, Pub radio, Police radio – one way	Retail Radio-net, Pub radio	Yes (peak times)	Yes	Yes
Shire Town	Yes	12	27	44%	90%	Retail Radio	Retail Radio	No	No	Yes
Market Town	Yes	9	27	33%	10%	Direct line/ 999	Retail Radio	No	No	Yes
Borough Town	No	40	173-520	8%	6%	Police radio – one way	None	Yes	Yes	No

Northern Estate	No	11	25-40	15%	7%	Police radio – one way	None	No	Yes	No
Westcap Estate	No	12	20-60	20%	16%	None	None	No.	No	N/A
Eastcap Estate	No	10	50	10%	11%	Police radio – two way	None	No	Yes	No
Dual Estate	No	14	67	29%	20%	Police radio – two way	None	No	No	No
Southcap Estate	Yes	148	148	54%	4%	Police radio – one way	None	Yes – day time only	No	No
Borough	N/R	8	N/R	N/A	N/A	N/R	N/R	N/R	N/R	N/R
Deploy Estate	No	11	49-66	6%	6%	Police radio – one way	None	No	Yes	N/A

* A control room has effective organisation when a dedicated operator is employed to monitor the target area.
** In addition, all operators could contact the police via 999.
*** Analysis draws on qualitative data collected in control rooms, including interviews with operators and management personnel, and observation in the control rooms.
**** When the police viewed one tape or more a week this was classified as the police regularly viewing CCTV evidence.

Linking characteristics and crime statistics

CCTV systems are a complex mix. Tables 4.5 and 4.6 below summarise the main characteristics of each CCTV system evaluated, in an attempt to match them with the crime outcomes described in Chapter 3. The lack of significant findings in the statistical analysis makes it difficult to link particular characteristics of a CCTV system with a particular outcome, but it is immediately obvious that, whilst most systems were designed reasonably well and had few glaring faults, no system was perfect. For example, Hawkeye, where CCTV had the largest impact, had problems with foliage and rain on the camera lenses, which reduced image quality.

No one characteristic consistently caused a system to 'fail' or 'succeed'. For instance, Borough Town and Hawkeye CCTV systems were well designed, but both suffered from a relatively high camera-to-operator ratio, which reduced the potential for live monitoring. However, this had a greater impact on the Borough Town system, as this aimed to reduce alcohol-related disorders by relying on operators to spot an incident live and to deploy police officers to the scene. Hawkeye, on the other hand, aimed to reduce vehicle crime, which could be addressed by deterrence or by adequate provision of evidence to the police, and this meant that live monitoring was less crucial to its 'success'. Therefore, the importance of each characteristic for the effectiveness of each system varies from one project to another. This illustrates the importance of taking the objectives and mechanism of the system into account when defining what characteristics are crucial to the 'success' of the system.

This then underlines the importance of considering the objectives of a system when determining the effect that the presence or absence of a particular characteristic has on its operation. For instance, the Hawkeye system was essentially a reactive system, insofar as the police regularly used CCTV evidence as an investigative tool, and the operators' tape management skills contributed to the availability of this evidence. Blanket coverage of the target area meant that most offences committed in the target area were caught on tape. Therefore, a lack of active monitoring and poor communication with the police did not have a major impact on the effectiveness of the system.

Although in a number of areas CCTV did not affect the overall level of crime, it did have an impact on individual crime categories, and this can be explained by the presence of one or more of the characteristics identified in Tables 4.5 and 4.6. For instance, in South City, the scheme increased reporting of public order offences, and having a police officer stationed in the control room, operating a police radio, facilitated this increase in reporting. The

scheme also contributed to an increase in the number of reported instances of shoplifting, which occurred because operators were linked into a Retail Radio system. This allowed them to pass intelligence to the police and shop security guards. This is a further illustration of the fact that the objectives of a scheme, and the types of crimes it aims to tackle, influence the characteristics that are vital for its 'success'.

It is not possible to link the presence of any of the characteristics to overall crime outcomes. There have been schemes that have demonstrated elements of good practice; however, there is no one shining example that combines all of these elements. The tables illustrate the fact that a range of factors can contribute to the effectiveness of a scheme and they interact in different ways. This seriously complicates, indeed it prevents, the establishment of a direct link between a particular characteristic and a particular outcome.

Table 4.5:   Summary of characteristics of systems and outcomes of CCTV

Project	System objectives	Implementation/management issues			Camera coverage, density and positioning					Technical characteristics				Effect of CCTV system
	Address clearly defined crime problems	Appropriate project manager employed	Project manager had expertise about CCTV implementation	End users (police) engaged during	Availability of data for the target area*	Camera coverage (% of target area)	Density (cameras per km²)	Coverage adequate to meet objectives/type of coverage	Type of camera	Good image quality during night-time viewing	Significant obstructions	Digital/analogue recording systems	Recording speed matches PSDB guidelines** / recording speed	
City Outskirts	Yes	Yes	No	Yes	Police statistics target area	68	81	Yes/blanket coverage problem areas, good tracking	PTZ	No	Yes – a few cameras obstructed by foliage	Digital hard drive, backed up by digital tape	Yes/1-2 frames a second	Possibly reduced crime, deterrence, diffusion of benefits. No change of fear of crime
Hawk-eye	Yes	Yes	No	Yes	Police statistics target area	95-100	N/R	Yes/blanket coverage, all car parks	Static	Yes	Yes – rain on camera lenses and foliage problems	Analogue	Yes/1 frame every 1-2 seconds	Reduced crime
City Hospital	Yes	No	No	No	Police statistics target area	67	67	Yes/crime hotspots	PTZ	N/R	N/R	N/R	N/R	Crime reduced, but non-significant mostly vehicle crime, other factors may have caused reduction
South City	Yes	Yes	Yes	Partially	Police statistics target area	72	73	Yes/crime hotspots, limited tracking	PTZ	Yes	Yes – a few cameras obstructed by foliage	Digital hard drive	No/2.5 frames a second	Crime and fear of crime reduced, but non-significant. Public order increased

Location														
Shire Town	Yes	Yes	No	Yes	Police statistics, half of target area	76	94	Partially/crime hotspots, limited tracking	PTZ	No	Yes – a few cameras obstructed by foliage	Digital hard drive	Yes/1-2 frames a second	No effect
Market Town	Yes	Yes	No	Yes	Police statistics target area	34	93	Partially/crime hotspots, limited tracking	PTZ	No	Yes – a few cameras obstructed by foliage	Digital hard drive	Yes/1-2 frames a second	No overall effect
Borough Town	Yes	Yes	Yes	Yes	Police statistics target area	70	65	Yes/crime hotspots	Static and PTZ	Yes	No	Analogue	Not available	No effect of CCTV
North-ern Estate	Yes	No	Yes	Yes	Police statistics target area	87	127	Yes/blanket coverage	PTZ	No	No	Analogue	Yes/1-2 frames a second	Burglary reduced
Western Estate	No	No	No	No	Police knowledge of hotspot areas	NA	NA	Yes/crime hotspots	PTZ	No	No	Analogue	No/One frame every 3-5 seconds	Fear of crime reduced
Eastcap Estate	Yes	Yes	Yes	No	Police statistics target area	32	32	Partially/Blanket coverage main street, one gap in coverage	PTZ	No	No	Analogue	Not available	No overall effect but displacement within the target area
Dual Estate	No	Yes	No	No	Police statistics for part of target area	37	9	Partially/crime hotspots, limited tracking	PTZ	Yes	Yes – rain on camera lens	Analogue	No/One frame every 3-5 seconds	No effect on crime but reduced the fear of crime

Table 4.5: Summary of characteristics of systems and outcomes of CCTV (continued)

Project	System objectives	Implementation/management issues			Camera coverage, density and positioning					Technical characteristics				Effect of CCTV system
	Address clearly defined crime problems	Appropriate project manager employed	Project manager had expertise about CCTV	End users (police) engaged during implemen-tation	Availability of data for the target area*	Camera coverage (% of target area)	Density (cameras per km2)	Coverage adequate to meet objectives/type of coverage	Type of camera	Good image quality during night-time viewing	Significant obstructions	Digital/analogue recording systems	Recording speed matches PSDB guidelines**/recording speed	
South-cap Estate	Yes	No	No	No	Police statistics target area	73	184	Yes/blanket coverage	PTZ	No	No	Digital hard drive	Yes/1-2 frames a second	No effect on crime
Borough	No	Yes	Yes	Yes	Police knowledge of hotspot areas	NA	NA	Yes/crime hotspots	PTZ	No	NA	Digital hard drive	N/R	Crime increased but reports of displacement
Deploy Estate	Yes	Yes	No	No	Crime and disorder Audit	34	25	Partially/crime hotspots	PTZ	Yes	No	Analogue and digital	Not available	No effect on overall crime levels

* The most appropriate form of data available to each project to assess the crime and disorder problems in the target area.

** PSDB guidelines require three frames per two seconds.

*** Dual Estate had two target areas and there were disparities between coverage in the areas. One target area had 87 per cent of the target area with camera coverage and 173 cameras per km2 compared to only 6% camera coverage and 4 cameras per km2.

Table 4.6: Characteristics of control room operation matched against changes in crime rates

Project	Control room set up so that target area monitored effectively*	Number of cameras	Number cameras per operator	Proportion of cameras in control room from projects under evaluation	Proportion of incidents monitored from projects under evaluation	Communication links with the police**	Radio-net systems	Police employed in control room	Relationship with the police***		Effect of CCTV system
									Police respond effectively to intelligence	Police regularly viewing CCTV evidence	
City Outskirts	Yes	47	48	29%	20%	None	Retail Radio-net, Pub radio-net	No	No		Possibly reduced crime, deterrence, diffusion of benefits. No change fear of crime
Hawkeye	Yes	556	123-153	100%	100%	Police radio – one way, police rolling Brief	None	No	No	Yes	Reduced crime
City Hospital	N/R	63	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	Crime reduced but non-significant, mostly vehicle crime, not necessarily because of CCTV system
South City	Yes	51	65-86	19%	77%	Retail Radio-net, Pub radio-net, Police radio –one way	Retail Radio-net, Pub radio-net	Yes (peak times)	Yes	Yes	Fear of crime reduced. No change in crime. Increase public order
Shire Town	Yes	9	27	24%	90%	Retail Radio	Retail Radio	No	No	Yes	No effect
Market Town	Yes	12	27	55%	10%	Retail Radio	Retail Radio	No	No	Yes	No overall effect
Borough Town	No	40	173-520	8%	6%	Police radio- one way	None	Yes	Yes	No	Fear of crime reduced

Table 4.6: Characteristics of control room operation matched against changes in crime rates (continued)

Project	Control room set up so that target area monitored effectively*	Number of cameras	Number of cameras per operator	Proportion of cameras in control room from projects under evaluation	Proportion of incidents monitored from projects under evaluation	Communication links with the police**	Radio-net systems	Police employed in control room	Relationship with the police*** Police respond effectively to intelligence	Police regularly viewing CCTV evidence	Effect of CCTV system
Northern Estate	Yes	11	123-153	15%	7%	Police radio – one way	None	No	Yes	Yes	Crime reduced, particularly burglary
Westcap Estate	No	12	20-60	20%	16%	None	None	No	No	No	Fear of crime reduced
Eastcap Estate	No	10	50	10%	11%	Police radio – two way	None	No	Yes	Yes	No overall effect but displacement within the target area
Dual Estate	No	14	67	29%	20%	Police radio – two way	None	No	No	Yes	No effect on crime but reduced the fear of crime
Southcap Estate	Yes	148	175	54%	4%	Police radio – one way	None	Yes – day time only	No	Yes	No effect on crime
Borough	N/R	8	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	Crime levels increased and reports of displacement
Deploy Estate	No	15	49-66	6	6%	Police radio – one way	None	Yes	Yes	Not available	No effect on overall crime levels

*   The number of cameras per operator varies across control rooms because there are different numbers of operators per shift depending on the time of day.
N/R: Not relevant.

5.   Economic evaluation of CCTV Schemes

Introduction

An important aspect of the study of CCTV projects, which has not been covered in recent research, is the broad economic balance. Earlier research has focused on the effectiveness of systems and neglected to provide an evaluation of the economic costs and benefits of CCTV. Economic evaluation can be defined as:

> *The comparative analysis of alternative courses of action in terms of both their costs and their consequences.*
>
> (Drummond, 1997)

As this definition implies, economic evaluation is comparative in method. Given resource constraints, and therefore the fact that all possible interventions cannot be provided, it is necessary to consider both the costs and the economic consequences of alternative interventions. The term economic evaluation covers a range of methodologies, and the appropriate choice depends to a large extent on the data that is available. Two of the possible methodologies have been used for the purposes of the current study, a cost-effectiveness analysis (CEA) and a cost-benefit analysis (CBA).

A cost-effectiveness analysis compares interventions with a common outcome (such as crime reduction or reduction in fear of crime) to discover which produces a given level of outcome for the minimum amount of resources. This analysis provides a method that policy-makers can use to identify the best alternative when the value of the expected outcome cannot be measured in monetary terms, so preventing a full cost-benefit analysis, or where a cost-benefit analysis would be inappropriate, for example when policy choice is constrained.

A cost-benefit analysis measures both costs and benefits in monetary values and calculates net monetary gains or losses. The comparison of costs and benefits results in a ratio value, with values greater than one indicating that the monetary value of the benefits of the project outweigh the costs of implementing and running it. Whilst it has not been possible, as detailed further on to provide monetary values for all possible outcomes within this evaluation, it was felt that valuing reduction in crime (as this was a principal aim in almost all projects) would offer an important insight into the relative merits of the projects. Additionally, where projects do not produce a ratio greater than one, partial monetarisation of outcomes indicates how valuable other outcomes need to be to make the project worthwhile.

The remainder of this chapter provides the details required to complete the economic evaluation. The next section identifies the possible outcomes from the implementation of CCTV projects, who these outcomes affect and the processes through which they work. An outline of how outcomes may be measured and valued forms the basis for the following section. The focus then switches to identifying, measuring and valuing the resources utilised by projects. These two aspects, costs and outcomes, are brought together in the subsequent cost-effectiveness and cost-benefit analyses.

Identification of outcomes

No economic evaluation can be drawn up unless it is clear which factors might change as a consequence of a CCTV project being implemented. Over the last decade there has been a rapid growth in the number of CCTV schemes operating within the UK. This increase has primarily been based upon the premise that installing CCTV will lead to two principal outcomes: a decrease in the level of crime and a reduction in the fear of crime experienced by individuals. Fear of crime is in fact just one of a number of community benefits that may result from the policy. For example, CCTV is often used as part of a regeneration strategy for an area; and the mere presence of CCTV is viewed by some as an indication that communities are safe.

These claims underscore the need to appreciate the benefits that CCTV brings and the best means of achieving them. Tables 5.1a and 5.1b relate the possible outcomes to those who are likely to be affected by these outcomes and also the process by which the outcomes may come about. The potential benefits are those which produce savings and are outlined in Table 5.1a, whereas 5.1b summarises the additional costs that are incurred if CCTV systems operate effectively.

Table 5.1a: Potential outcomes and beneficiaries

Outcomes – benefits	Those affected by change in outcome		Process by which outcome achieved
	Community	Society	
Crime reduction			
In target area[56]	Potential victims of crime in affected areas (including those who take crime prevention precautions)	Savings in terms of responding to and dealing with incidents (fewer incidents to respond to)	Deterrence – through fear of capture Detection – apprehension of offenders Prevention – monitoring of target areas
In surrounding area (diffusion of benefits)			
Reduction in fear of crime			
Improvement in social cohesion	Individuals who feel safer and enjoy a greater sense of community	Less future intervention required	Reassurance – presence of cameras and signage Publicity – surrounding successful arrests
Increased use of area			
Increased investment in area	Local businesses		
Other community benefits			
Safety/injury avoidance	Individuals using the target area	Less intervention required	Prevention – monitoring of target area
Return of lost children			

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56 A full list of the crimes CCTV could possibly impact upon can be found in Appendix B.

Table 5.1b: Potential costs incurred

| Outcomes – benefits | Those affected by change in outcome | | Process by which |
	Community	Society	outcome achieved
Crime displacement			
Within target area	Individuals who would not otherwise have become victims of crime	Costs associated with extra offences	As a result of deterring offenders within view of the camera or within target area
Into surrounding area			
Deployment costs		Costs incurred in responding to and dealing with incidents, pursuit of evidence	By bringing these to the attention of the police and other agencies

The measurement and valuation of outcomes

Identifying possible outcomes of a policy is relatively straightforward; measuring and valuing the actual outcomes in order to conduct an economic evaluation is more complicated and problematic. For each outcome, Tables 5.2a and 5.2b show whether, and if so, how the outcome has been measured and consequently valued in this study.

Table 5.2a: Measurement and valuation of beneficial outcomes

Outcomes – benefits	Measurement	Valuation
Crime reduction		
In target area	Change in police recorded crime in relevant areas compared with a control area before and after intervention implemented	Cost of crime as estimated by Brand and Price (2000)
In surrounding area (Diffusion of benefits)		

Outcomes – benefits	Measurement	Valuation
Reduction in fear of crime		
Improvement in social cohesion	Change in proportion of respondents to public attitude survey	Not available
Increased use of area	Not available	Not available
Increased investment in area		
Other benefits		
Improved safety/security	Not available	Not available
Return of lost children		

Table 5.2b: *Measurement and valuation of cost-incurring outcomes*

Outcomes – costs	Measurement	Valuation
Crime displacement		
Within target area	Change in police recorded crime in relevant areas before and after intervention implemented	Cost of crime as estimated by Brand and Price (2000)
Into surrounding area		
Deployment costs	Not available	

Two principal aims of the evaluation were:

● To measure the effectiveness of CCTV in combating crime, disorder and fear of crime.

● To describe in more detail the impact of CCTV on fear of crime and individuals' behaviour.

Each of these aims required a different type of information to be collected and analysed. In addressing the first, recorded crime statistics were the principal data source, although the results from the pre- and post-implementation public attitude surveys provided criteria for measuring changes in the level of fear of crime. The public attitude surveys also formed the basis of analysis in relation to the second aim.

The principal objective of the crime data analysis aspect was to measure the impact of the CCTV project on the level of crime over time. To achieve this aim police-recorded crime statistics were examined, and the findings are summarised in Table 3.2 in Chapter 3, and the methodology used is detailed in the online Technical Annex to this report (Gill *et al.* 2005c).

Whilst for the evaluation a quasi-experimental model was adopted, where possible aiming to achieve Level 3 of the Maryland Scientific Methods Scale (Sherman *et al.* 2002), this was not always possible as suitable control areas could not be identified for every target area[57]. Where no suitable control was found, the divisional figures within which the target area was located were used as a proxy. It also has to be noted that as a result of slow implementation the number of post-implementation months over which change could be measured was restricted in some cases.

Where a statistically significant test indicated a difference between the target and the control over time, the cause-effect relationship was examined in greater detail. In order to record the impact of other complicating factors, fieldworkers produced an exhaustive Calendar of Action that charted the types and dates of extraneous factors that may have had an impact on the crime figures.

Furthermore, spatial analysis using GIS was conducted by which geographical trends in crime could be investigated. In addition to showing whether crime levels changed after the introduction of CCTV, GIS analysis indicated where exactly these changes occurred. Information of this sort can assist in the interpretation of how exactly CCTV may have influenced crime levels in the area. Spatial displacement and diffusion of benefits are outcomes that could be measured by means of GIS analysis.

Pre- and post-implementation public attitude surveys were conducted in relation to ten of the projects. However, in two of these the target area included two distinct locations and consequently the total number of surveys was 12 in both the before and after periods; seven control areas where also surveyed in both time periods. As regards those questions the number of responses to which was sufficiently large, significance tests on the difference in the proportion of respondents providing particular answers was undertaken. In order to confirm that differences between the before and after results were not due to natural variation, where possible they were compared with those in the control areas and shiftshare tests were applied to check their statistical significance (see Gill *et al.* 2005c).

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57 Although on occasions, as noted earlier, divisional figures appeared to provide a better comparison than control areas as their crime trends prior to CCTV installation gave a better match.

Valuation of the cost of crime was based upon the estimates detailed by Brand and Price (2000). These estimates provide an indication of the average cost-savings resulting from the prevention of crime. They include factors ranging from the cost of security measures taken in anticipation of crime, the cost due to a crime occurring (e.g. property stolen, emotional/physical impact, cost to victim and health services) as well as the cost to the criminal justice system.

For the majority of the categories of crime included in the analysis, the figures used in relation to the cost of crime were taken straight from Brand and Price (2000). However, with respect to criminal damage, robbery and violence against the person, a weighted average based upon the cost and number of the various individual crime types that make up these overall categories was calculated. For example, the cost of a criminal damage incident against individuals or households is £510, whereas the estimate for commercial and public sector victimisation is £890. Since an equal number of each type occur each year, the weighted average was calculated to be £700.

Identifying and measuring inputs

Information relating to the costs and resources utilised by each project were collected from appropriate project personnel using the guidelines laid out in two Home Office reports[58]. As stipulated by these guidelines, relevant costs were collected from the point in time when project teams had their bid accepted (between June and August 2001), to a year following the 'live' date of the system.

Data was gathered for the following categories of inputs:

Personnel: Information relating to the time spent on the project by those actually employed by the partnership organisations was included under this heading. These hours represented time that would not have been spent in the absence of the project, or that would have been spent on other activities. The costs of using external consultants were incorporated in the 'Other Overheads' section of the database.

The hours recorded for each individual were translated into monetary values based on actual salaries where possible, or, where this information was not available, based on their job description and the appropriate basic salary as defined in the Home Office toolkit. Consequently all personnel time, with the exception of London-based projects[59], was valued at the same rate regardless of location. Associated on-costs (i.e. National Insurance and

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58 Analysis of costs and benefits guidance for evaluators: http://www.homeoffice.gov.uk/rds/pdfs/cdp1costeff.pdf
    Measuring inputs guidance for evaluators: http://www.homeoffice.gov.uk/rds/pdfs/cdp3inputs.pdf
59 A London weighting was automatically applied in these cases.

pension contributions) were calculated at 22 per cent on top of the basic salary, while related non-pay running costs (i.e. office space, equipment and stationary) were calculated at ten per cent of basic pay.

Training: A measure of the additional resources used to train personnel to undertake project activities, excluding personnel hours that were included in the above input category. In all projects where training had been provided project personnel supplied a monetary figure for this activity.

Equipment: A measure of the additional equipment used by project activities, including the share of equipment used jointly by other organisations. This category primarily covered CCTV-related equipment, including poles, cameras, cabling and electricity supplies, but also control room equipment, i.e. monitors, VCRs/PCs and control panels. Again the projects or contractors supplied monetary values, often in the form of invoices.

Premises: A measure (number of hours) of the use of premises by the project, excluding personnel office costs. Premises costs primarily covered meetings to discuss project activities and, depending upon the size of the meeting room, these hours were converted into effective rental costs in accordance with Home Office guidelines.

Transport: A measure of additional transport resources used for project activities. Usually mileage covered was translated into a monetary value based on costs per mile, using conversions in the Home Office toolkit.

Research, advertising and publicity: A measure of the additional resources used for research, advertising and publicity in support of project activities – over and above those already included under personnel, equipment, premises etc. Actual monetary values were obtained from project staff.

Other overheads: A measure of any other resources used in support of project activities including the non-capital control room costs, based on two fundamental principles:

- Control room costs were directly related to the number of cameras under evaluation.

- The proportion of control room costs was calculated as the ratio of the number of cameras under evaluation to the total number of cameras linked to the control room; thus the calculation was based on the average as opposed to the marginal costs of monitoring each evaluated camera.

Average costs were chosen since the marginal costs incurred by the additional cameras were erratic and followed no discernible pattern. This occurred because of the impact of additional cameras on the fixed costs. Project staff usually provided total annual running costs for the control room.

A number of practical difficulties were encountered in collecting this information. These included the general unpreparedness of project staff to collect and supply the necessary information. This was encapsulated in a general view that the time required for this activity was an unnecessary imposition on project staff and an unnecessary drain on the time that might be spent on the 'real' project activities. This attitude was generally overcome by the persistence and skill of the field staff. In some areas there were additional difficulties related to the mobility of project staff combined with a lack of detailed records of the resources being used for project activities undertaken by former project staff.

For each project, data was collected on all resources used by public agencies in support of project activities. This includes resources financed directly by funding allocated to the project as well as additional resources provided by the police services, local authorities and other public agencies, financed from normal budgets for the ongoing activities of these services and agencies. These latter 'levered-in' resources are a fundamentally important element of the resource-use patterns arising as a result of project-based initiatives.

However, it should be noted that the data on funding project activities was based on information available to those individuals who were directly involved in those activities on a day-to-day basis. This information is not necessarily consistent with the ex-post accounting procedures used to report the use of Home Office funds.

Value of inputs

As the timing of the activities and expenditures of the various projects was not identical, all costs were converted into present value terms and at constant 1999 (Quarter I) prices; a discount rate of 3.5 per cent and an annual deflator of 2.5 per cent were applied. For each project, two cost figures are reported; the first is the full net present value of the project, while the second is an annual equivalent cost, taking account of the fact that the life expectancy of CCTV equipment is significantly greater than the period over which benefits have been measured. Generally, benefits in terms of a reduction in crime and fear of crime have been estimated over the 12 months following projects going 'live'. The underlying assumption with respect to CCTV equipment is that it will have a lifespan of around ten

years and therefore will continue to produce benefits over this time. Therefore, the costs associated with setting up the project have been depreciated over ten years, so that a comparison of yearly costs and benefits can be conducted.

Modelled costs and outputs

Table 5.3 summarises the value of inputs (£'s) incurred by each project during the evaluation period, based on net present value of inputs. It quotes the set-up and ongoing costs, the percentage that each represents of the total cost and the cost per camera. (A more detailed breakdown of costs can be found in Appendix F).

Table 5.3: Summary costs of inputs, each project

Project	Total cost (NPV)		% of total cost		Cost per camera	
	Set-up	Ongoing	Set up	Ongoing	NPV	Annual equivalent
City Outskirts	£733,053	£79,269	90.2%	9.8%	£17,283	£3,756
Hawkeye	£3,381,572[60]	£326,466[61]	91.2%	8.8%	£6,669	£1,394
City Hospital*	£70,105	N/A*	100%	N/A	£7,789	£1,033
South City	£1,231,160	£152,834	89.0%	11%	£27,139	£6,200
Shire Town	£166,415	£16,935	92.0%	8%	£15,279	£3,251
Market Town	£167,674	£13,082	92.8%	7.2%	£20,084	£3,926
Borough Town	£286,814	£22,056	92.9%	7.1%	£7,722	£1,503
Northern Estate	£216,496	£49,018	81.6%	18.4%	£24,138	£7,068
Westcap Estate	£181,071	£35,857	83.8%	16.2%	£17,994	£4,901
Eastcap Estate	£198,791	£44,520	81.7%	18.3%	£24,332	£7,090
Dual Estate – Area A	£56,891	£10,280	84.7%	15.3%	£13,436	£3,566
Dual Estate – Area B	£43,237	£10,282	80.7%	19.2%	£10,704	£3,204
Borough	£97,065	£31,191	75.6%	24.3%	£16,032	£5,509
Deploy Estate	£326,610	£47,159	87.4%	12.6%	£33,978	£8,227

It can be seen that there was a wide variation in cost per camera and this reflects the range of systems being evaluated. As outlined in Chapter 4 the systems varied over a range of

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60 Estimated cost. Costs were provided for installing 646 cameras in 60 car parks. However, crime figures are unavailable for two car parks in which 90 cameras had been installed and no information is available on the costs for individual car parks. Therefore the costs have been calculated pro rata based on the cost per camera.
61 Op cit.

characteristics, including the type of equipment used, whether and how it was monitored, and the total number of cameras in the control rooms: all of these will have implications for the projects' input costs.

As a percentage of the total NPV cost of the projects, equipment was the largest category of expenditure accounting for, on average, 78 per cent of resources. The percentage across the projects ranged from 57 per cent in Area B to 89 per cent in City Outskirts. While the corresponding figure for City Hospital was even higher at 95 per cent, no ongoing costs were available for this scheme and therefore the weight given for set-up equipment costs is an overestimate[62]. The difference in equipment costs across the projects reflects the variation in the types of systems: types of cabling or transmission equipment used; the availability of existing control room equipment; and the types of cameras installed. Two systems installing static cameras incurred average camera costs of approximately £7,000.

The proportion of total NPV costs that were funded from the Crime Reduction Programme ranged from 61 per cent in South City to 91 per cent in City Outskirts (City Hospital and Hawkeye are excluded from these figures) with an average of 79 per cent across all projects.

As expected, given the nature of CCTV projects, over 86 per cent of total NPV costs related to set-up. Total ongoing costs were closely correlated with the number of cameras installed, with a measured correlation coefficient of 0.95. With respect to the ongoing cost per camera, there was a relationship with the type of cameras installed; static cameras required lower ongoing costs per camera than PTZ cameras and redeployable schemes. For Borough Town (32 static and 8 PTZ) and Hawkeye (646 static) the ongoing costs per camera were £550 and £590 respectively, while for the two redeployable schemes, ongoing costs per camera were approximately £4,000. For PTZ schemes, ongoing costs per camera ranged from £1,500 to £4,500. In addition, ongoing costs were low where control rooms were monitored for less than 24 hours, or where the evaluated cameras were added to a control room, which already monitored a large number of cameras.

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62 The City Hospital system experienced substantial implementation problems with the result that an excessive number of meetings were held and excessive personnel time was spent dealing with the issues. As a result, the set-up costs are an overestimation of the likely expenditure that would have been incurred whilst the system was implemented. In addition, the system was never fully operational within the evaluation timetable, so that a full assessment of ongoing costs could not be made.

Cost-effectiveness analysis

For those schemes where a reduction in police recorded crime relative to the control was measured, regardless of whether the effect was statistically significant or not, Table 5.4 outlines the costs of achieving this outcome. However, the changes were statistically significant only in relation to City Outskirts and high- and medium-risk car parks in Hawkeye. As described in Chapter 3, the measured effects in City Outskirts could be attributed to confounding factors rather than the installation of CCTV. Furthermore, as outlined in Chapter 3 the crime changes are subject to wide variability. Therefore, the cost-effectiveness analyses may be based on random changes in crime and should be treated with caution.

For all projects amalgamated, and over a 12-month period, the number of crimes prevented by the CCTV projects is estimated to have been 320, while the annual equivalent cost was £1,973,009, giving a cost per unit of outcome of approximately £6,166.

Table 5.4: Cost per crime prevented

Project	Annual equivalent cost (£)	Crimes prevented	Cost per unit outcome (£)
City Outskirts*	176,542	433	408
Hawkeye			
Total	775,185	567	1,367
High risk*	270,436	436	620
Medium risk*	243,950	111	2,198
Low risk	287,164	15	19,144
Borough Town	60,115	37	1,624
Northern Estate	77,746	28	2,777
Shire Town	39,017	26	1,500
Eastcap Estate	70,899	14	5,064
City Hospital	9,303	10	930

* Statistically significant.

In relation to overall crime, little evidence was found of either diffusion of benefits or spatial displacement of crimes either within the target area or in the surrounding buffer zone. The one case where both may have occurred was complicated by the numerous other crime prevention projects being implemented at the same time as the CCTV project. It was not possible to disentangle the effects of the various projects, and therefore no account has been taken of the possible diffusion and displacement effects in the above analysis.

Crime reduction was just one of the principal objectives of the evaluated projects. They all also aimed to reduce the fear of crime experienced by individuals living in or using the target areas. Public attitude surveys aimed to capture the success of projects in achieving this aim by measuring the change in the percentage of respondents who worried about crime.

Table 3.13 in Chapter 3 indicated that in all the areas where surveys were conducted there was a reduction in worry about crime, although only in two of the six systems, where a control was available, was the reduction in the target area statistically significant, and in neither of these areas was there an actual reduction in recorded crime. Table 5.5 indicates the cost per percentage decrease in worry about crime in the two target areas that showed positive results in comparison to their respective control areas; both control areas actually experienced increases in the level of worry about crime.

Table 5.5: Cost per percentage reduction in worry about crime

Project	Annual equivalent cost (£)	Percent reduction in comparison to the control	Cost per unit outcome (£)
Area B	16,020	13	1,232
Westcap Estate	58,807	18	3,267ï

While the cost-effectiveness analysis presented provides an indication of the outcomes achieved and the associated costs, it cannot convey information on whether the costs involved in achieving the outcomes delivered an overall benefit to society. This is particularly relevant when the crime reduction outcome is itself a multi-factor variable, consisting of a large number of different crime types. Even with an overall reduction in the number of crimes, depending upon which crime types have been affected, the benefit to society may be less than the cost. Furthermore, when there is more than one possible outcome, and it is not possible to apportion costs to particular outcomes, the usefulness of cost-effectiveness analysis is limited. In such circumstances it would be more beneficial to conduct a cost-benefit analysis, in which all outcomes are given a monetary value that can be added up to give a total benefit figure.

Cost-benefit analysis

Despite the appeal of cost-benefit analysis, it does require significantly more information on outcomes than a cost-effectiveness analysis. In particular, it is necessary to attribute monetary values to all outcomes. As detailed in Table 5.2, monetary values were only available in relation to the number of crimes prevented or dispersed. As the overall crime category used within the analysis incorporated a large number of different crime types, it was first necessary to estimate the number of each crime type before and after implementation, as each has a different cost attached to it.

As regards City Outskirts, one of two projects to bring about a statistically significant reduction, Table 5.6 outlines the major changes in crime categories and the cost of these crimes.

Table 5.6: **Change in crime types in City Outskirts, cost of crime and cost-benefit ratio.**

	Change in number of crimes	Cost of crime (£)	Benefit (+)/Cost (−) of change (£)
Burglary	−30	2,300	69,000
Criminal damage	−39	700	27,300
Robbery	−24	4,742	113,808
Sexual offences	−1	19,000	19,000
Theft from MV	−119	580	69,020
Theft of MV	−34	4,800	163,200
Theft (not inc. MV)	−239	340	81,260
Violence against person	48	6,730	−323,040
Total saving to society			219,548
Total annual equivalent cost			176,542
Cost-benefit ratio			**1.24**

Overall, the project appears to have provided a benefit to society over the first 12 months after the cameras were installed. However, the cost-benefit ratio was substantially reduced by the increase in the incidence of violence against the person; although this was the only crime type to show an increase over the period, it has a high relative cost. As already mentioned however, the reduction in crime could equally be attributed to confounding factors or to influences on recorded crime trends other than CCTV.

The cost-benefit ratios for all systems where crime was reduced relative to the control are given in Table 5.7. In principle, where there was no statistically significant difference between the change in the target and in the control area, the cost-benefit ratio should be zero, but this applies to all but two systems, so that very little can be deduced about the cost-benefit of systems. Hence the table gives both the calculated and the 'real' cost-benefit ratios. Those areas with a cost-benefit ratio less than one can be judged to be economically unviable.

Table 5.7: *Cost benefit ratios for schemes where crime was reduced relative to the control*

	Annual equivalent cost (£)	Crimes prevented	Calculated cost-benefit ratio	Real cost-benefit ratio (based on statistical significance)
City Outskirts Hawkeye	176,542	437	1.24	1.24
Total*	775,185	567	0.67	0.67
High risk*	270,436	436	1.27	1.27
Medium risk*	243,950	111	0.42	0.42
Low risk	287,164	15	0.05	0
Borough Town	60,115	37	0.63	0
Northern Estate	77,746	28	–0.18	0
Shire Town	39,017	26	4.88	0
Eastcap Estate	70,899	14	0.35	0
City Hospital	9,303	10	1.79	0

* Statistically significant.

While the number of crimes prevented by the Hawkeye project appears very impressive, given the nature of the project only four types of crime were included in the analysis. Over 65 per cent of the crimes prevented were theft from motor vehicles and these have a relatively low cost-of-crime value (£580), and a further 28 per cent of offences were criminal damage, which has an associated average cost of £700 per incident. Consequently, the cost-benefit ratio indicates that the benefit, which accrued to society during the first 12 months of the scheme, did not outweigh the annual equivalent cost, reflected in a cost-benefit ratio of less than one.

When each of the car parks is placed in the appropriate one of the three cate.g.ories of risk, it is evident that the cost-benefit ratio varies considerably: low risk car parks show little benefit, while the high-risk car parks provide a benefit exceeding the costs involved, as indicated by a cost-benefit ratio greater than one.

In contrast, in Shire Town where the number of crimes prevented was relatively small, the resulting cost-benefit ratio indicates that the saving to society was reasonably large. This was a consequence of a substantial decrease in the number of offences of violence against the person, which have a high cost-per-crime value, and a moderate annual equivalent cost figure. Hence there was a high cost-benefit ratio of 4.88. Again, as these changes in Shire Town could be attributed to chance rather than any attribute of the CCTV system, these results must be treated with caution.

In Northern Estate, where the overall number of crimes prevented was similar to the number at Shire Town, the cost-benefit ratio indicates that no benefit to society resulted from the project. Whilst the number of burglaries, and to a much lesser extent robberies, declined in the target area, the incidence of violence against the person offences increased, outweighing all the savings from reductions in burglaries and robberies.

In Borough Town and Eastcap Estate, the savings from the reductions in crime were insufficient to offset the annual equivalent cost of the projects. Assuming the proportion of each crime type remains unaltered, the overall number of crimes that would need to be averted in these areas in order for benefits to outweigh cost would be: Borough Town – 47, and Eastcap Estate – 41.

Even though the reported results are not favourable, since a significant amount of capital had been expended, an additional cost-benefit calculation based only on the yearly ongoing costs was also carried out. This estimate was designed to indicate whether, with the equipment now in place, it is economically sensible to continue funding CCTV. It was assumed that over the following 12 months the same number of crimes would be prevented and that ongoing costs would also remain unaltered.

For those projects in table 5.7 with a ratio less than one, only the estimates for Hawkeye overall and Borough Town alter sufficiently to result in cost-benefit ratio values greater than one. Both medium and low-risk car parks, Northern and Eastcap Estates continue to exhibit ratios less than one.

Conclusions

This section of the report has provided information on the costs, and where appropriate the effectiveness and benefits, of the evaluated CCTV projects. Although all projects could be described as CCTV schemes, they were not homogenous in nature, covering a number of location types, utilising various types and quantity of equipment and being run in different ways. Despite these disparities there was a large degree of similarity in the cost of resources required to implement each project. With respect to the net present value of total resources, equipment was by far the largest cost driver for all projects, accounting for around 78 per cent of resources on average.

When the costs were compared with the effect of the projects, in terms of the number of crimes prevented, City Outskirts offered the best 'value for money' with the lowest cost per unit of outcome of £426. Hawkeye showed a large reduction in the number of crimes, but the annual equivalent cost of achieving this reduction was relatively large and therefore the cost per unit of outcome was also large.

As the unit of outcome used for the cost-effectiveness analysis related to numerous crime types, a cost-benefit analysis based upon the monetary value of averting particular types of crime was also conducted. The evidence from this analysis indicated that the type of crime averted was very important for determining if a project provided benefits to society that were greater than the associated implementation and running costs.

In City Outskirts there was both a large reduction in overall crime and a fall in the number of particular offences, the one exception being violence against the person, and although this cate.g.ory has a relatively large crime value, the increase was not sufficient to outweigh the value of the decrease in the incidence of all other crime types. Consequently, City Outskirts was one of only three projects that provided a cost-benefit ratio above 1. In the area of another project, Shire Town, the number of thefts from motor vehicles and general theft offences increased, while violence against the person and criminal damage declined significantly, with the result that a large cost-benefit ratio of over 4 was estimated. However, there was no significant change in crime in Shire Town relative to the control, so that the changes in crime there could equally be attributed to chance.

Of the projects where a reduction in crime was measured relative to a control area, only one produced a negative cost-benefit ratio; this was again related to the types of crime which declined or increased in number. In particular, while the number of burglaries declined by more than twice, there was an increase in the number of violence against the

person offences. The relative cost of these different crimes pointed to the conclusion that no benefits to society resulted from the project. The remaining projects all produced cost-benefit ratios between zero and one, indicating positive benefits that, when compared with costs, were insufficient to provide an overall benefit to society.

In summary, CCTV produced few cost-benefits. This is unsurprising, principally because the schemes had little overall impact on the incidence of crime, but also because the systems' complexity made them expensive to set up and run. The cost-benefits also depended on the type of crime saved. Even where CCTV installation showed the most promising results (in the Hawkeye car parks), the cost benefits were low because the type of crime reduced (vehicle crime) has a relatively small monetary value.

Thus, policy-makers could be forgiven for concluding that CCTV should not be continued. However, this would be premature. First, changes in crime levels are a poor measure of the success or failure of a system. Second, this would ignore the many other benefits of CCTV, which have no easily identified monetary value. Third, the economic evaluation was based on imperfectly implemented systems, which, had they been operated better, might have had a greater impact on overall crime levels and therefore produced a cost-benefit.

6. Conclusions: reflections on the effectiveness of CCTV

It would be easy to conclude from the information presented in this report that CCTV is not effective: the majority of the schemes evaluated did not reduce crime and even where there was a reduction this was mostly not due to CCTV; nor did CCTV schemes make people feel safer, much less change their behaviour. That, however, would be too simplistic a conclusion, and for several reasons.

First, crime rates appeared to the authors to be a poor measure of the effectiveness of CCTV. The problem about measuring outcomes in terms of overall crime rates was that they disguised some important successes with particular types of offence. Moreover, in some cases (although not many) an increase in crime was an indicator of success, and this needs carefully teasing out. Similarly, mechanisms *increasing* recorded crime rates can work alongside those that *reduce* crime, and these can cancel each other out. Recorded crime rates were subject to a great deal of background noise from other factors, such as other crime reduction initiatives in the areas being studied, regional and national crime trends, and changes in methods of crime recording, any of which could mask the small impact that CCTV might have. Moreover, it is indisputable that *some* evidence was being passed to the police, and that *some* monitoring (albeit very little in some areas) of target areas was occurring, and whilst these may not have been of sufficient volume to impact on crime figures, they could have had an impact on the handling of individual incidents. Indeed, on the streets, police officers and others including door-staff, were able to remind individuals that cameras were watching them as a way of increasing compliance. Similarly, police officers and the media point to the effectiveness of CCTV in high-profile cases, which are lost in overall crime figures. The importance of the crime-fighting role that CCTV plays in this way should not be underestimated.

Some weight should be attached to the retrospective use of CCTV images for evidential purposes. All schemes passed on *some* images (although only a few in some cases) to the police, which could be used to identify offenders or eliminate them from enquiries and to help in the investigation of incidents. Such images could be used either as evidence in court or to help extract a guilty plea, or to identify witnesses and victims at a scene of crime. This focus was outside the remit of the evaluation, but there was little doubt from comments made by the police interviewed, and from other research (Levesley and Martin, 2005; Gill and Hemming, 2004) that the police view was generally positive. However, there is a need for caution here. Some of the police showed concern that they were being 'imaged out'.

Cameras produce a lot of pictures and responding to and managing them will be a challenge for the future because this is labour-intensive work. Expectations here, on the part of the police and the public, need to be handled responsibly.

Second, there was a lack of realism about what could be expected from CCTV. In short, it was oversold – by successive governments – as the answer (indeed the 'magic bullet', Ditton and Short, 1999) to crime problems. Few seeking a share of the available funding saw it as necessary to demonstrate CCTV's effectiveness. After all, why would the government be giving out money for this and not other measures if it did not work? Yet it was rarely obvious why CCTV was the best response to crime in particular circumstances.

Thus there was a tendency to put up cameras and expect impressive results, ignoring the challenge of making what is quite a complex measure work (replicating the findings of Ditton *et al.* 1999), and failing to define what exactly the CCTV system was expected to do. In the first place, the crime problem must be defined properly, but some agencies failed to do this despite previous experience in this field. Consequently, CCTV was installed in areas and circumstances where it was unlikely to be effective. It is also a mistake to install a large number of cameras just because funding is available. Similarly, the installation of CCTV requires more than the production of a technically competent system; generally, project designers did reasonably well in this regard. However, systems have to be monitored properly or recordings made and stored properly; but the quality of this work varied considerably from one control room to another. Hence the researchers were often not evaluating carefully designed systems which addressed clearly defined crime and disorder problems, so much as failures of implementation.

In addition, and this is important from an evaluation perspective, the objectives often did not drive the scheme. For researchers, establishing a scheme's objectives was not straightforward. Although these had to be stated in tender documents, they did not play a significant role in deciding how the project was implemented. As the objectives were not the driving force and were rarely embedded in day-to-day practice, the failure to achieve crime prevention objectives was arguably less the failure of CCTV as a crime prevention measure than of the way it was managed.

Neither did project-designers think through how CCTV would fit alongside other measures already in place, or soon to be introduced, in order to achieve the optimum effect. Yet, more ambitious claims for CCTV can be made when it is used alongside other measures and implemented with an awareness of the potential pitfalls that this study has highlighted. At the very least CCTV has potential.

Perhaps a balanced judgement of the success of any measure – and one that is not often discussed in crime-prevention evaluations – should be reserved for times when the measure is working to its full potential and is installed correctly and in the right place. How useful are lessons about the effectiveness of measures that are still not fully developed? There is no doubt, judging by the information presented here, that this country is still learning how to use CCTV.

There were many instances of the successful use of CCTV which could not be measured by changes in crime, or even fear of crime. These included finding missing children, encouraging residents or visitors to visit an area, and acting as a catalyst to attract more funding into an area. Similarly, CCTV was used extensively as a means of controlling alcohol-related and other anti-social behaviour in town and city centres, monitoring and dispersing large groups of individuals, and moving on what many operators termed 'undesirables', such as beggars and on-street traders.

Finally, although the public for the most part did not feel safer, and despite their perceiving CCTV as less effective than they initially thought, they were still predominantly in favour of its use. Even though they concluded that it did not reduce crime, there was no pressure to have it removed, and there were no major concerns, once people had experienced CCTV, about infringement of civil liberties.

Going forward: building on the positive

There were some circumstances and some conditions in which CCTV appeared to be effective. It is perhaps helpful to discuss these as they provide clues to how to make the best use of CCTV in the future. The following factors are relevant to the explanation of successes and failures.

First, the type of area was important. Generalising for a moment, the findings suggest that CCTV works in small, enclosed areas. Much has been made of car parks, but there was some evidence of success in residential areas. For example, Northern Estate witnessed a reduction in burglary; Eastcap Estate, a reduction in vehicle crime; Dual Estate, a reduction in shoplifting; Area A, a reduction in total crime, although the numbers were too small to draw any conclusions about individual crimes; and City Hospital, a reduction in vehicle crime, but admittedly with caveats about the extent to which this could be attributed to CCTV. Although the changes were small and could admittedly be due to chance, a pattern emerged here. The concern is that indicators of success on which future projects may build can all too easily be lost in the complexity of the evaluation.

Second, there is some evidence that the greater the density of camera coverage of an area, the greater the chance of reducing crime. This is perhaps unsurprising, but there is no hard and fast rule and the characteristics of the area must be taken into account. One scheme with a high level of coverage (Southcap Estate) showed no corresponding reduction in crime. The area was extensive, covering a large number of properties and a large population (and it was notorious for its open drugs market). Thus, the potential for anonymity was great, reducing the likelihood of the system acting as a deterrent. Similarly, it is necessary to question the effectiveness of CCTV in reducing crime (drug use and dealing) on which street surveillance is not already having any significant impact.

Third, there is some evidence to suggest that CCTV was more effective in tackling acquisitive crimes, supporting the findings of earlier studies (see for instance Deismann, 2003; Brown, 1995). In particular, levels of theft of motor vehicles decreased in the majority of projects, although CCTV was often a contributing factor and not the sole reason for this decrease. The greatest change occurred in the Hawkeye car parks, which had a number of other favourable features (for instance, they were self-contained).

Fourth, CCTV was sometimes effective in addressing crime when used for 'special initiatives'. Some schemes targeted specific issues such as drug or alcohol-related offences, and on these – especially when working closely with the police – the initiatives showed some success. CCTV operators were often an important part of these operations.

Fifth, the relationship with the police is important. As the control room studies showed, there was considerable scope for improvement here, but where the police showed an active interest, especially by providing intelligence to guide monitoring, or by acting on operators' findings, or better still, providing some operator presence in the control room, then CCTV could be very effective.

Sixth, and this overlaps with the previous point, CCTV operated most effectively in conjunction with other crime-reduction measures (for example, Retail and Pub Radio, community wardens, and police operations). In particular, Retail Radio schemes added an important dimension to CCTV in that they enabled surveillance to be at least partly intelligence-led and this was crucial in town and city centres, which invariably suffered a high level of retail crime. This is a crucial point, as intelligence promptly draws operators' attention to incidents defined as 'suspicious'. However, the way in which CCTV was integrated into or was used in conjunction with other measures was often insufficiently thought through, and getting this right can help in optimising the effectiveness of the response to crime.

A seventh issue relates to the level of lighting. This has long since been recognised as an integral part of a CCTV system but it is easy to get it wrong, to pay insufficient attention to it, or to be prevented (by financial or other constraints) from addressing the matter effectively. In a number of residential areas, the lighting was too low, making night-time viewing difficult and compromising the quality of images produced. Conversely, where new lighting was added, or where cameras were positioned too close to existing lighting, this sometimes led to strobing or glare on the image; this occurred both in residential areas and town or city centres.

An eighth issue is the level of activity in the area or more specifically the levels of monitoring of different geographical areas from the same control room. Cameras installed in these areas were generally connected to large control rooms monitoring over a hundred cameras, so that even if the residential cameras received a proportionate amount of attention they would do very little monitoring. In fact, in most cases they were monitored less than proportionately. But the level of monitoring was probably more or less commensurate with the amount of activity in these areas (many residential areas were described by operators as extremely quiet).

Similarly, quiet town centres could suffer from a lack of attention if they were monitored from the same control room as busier town centres. This is perhaps of greater concern than the low level of monitoring accorded to a quiet residential area which is experiencing little activity. Each town centre would suffer exactly the same types of problems at the same time (retail- and alcohol-related crime), yet one would be monitored at the expense of the other.

Where CCTV appeared to have an impact on particular crimes in residential areas or quieter town or city centres this was likely to work by deterrence. The lack of live monitoring meant that offenders were unlikely to be arrested on the spot and the research has shown that less monitored areas also provided less recorded evidence to the police.

A ninth point concerns the type of system. There were no long-term crime reduction effects from redeployable systems, but this was unsurprising, given their short-term nature. It is interesting and somewhat ironic that one of the major difficulties with these types of systems was managing the withdrawal of cameras; people liked them where they were and wanted more, not fewer. Many people could see deficiencies in the system, but such doubts rarely led them to conclude that what the cameras were doing was not worthwhile.

More generally, the report has avoided claiming that if all the shortcomings in the implementation of CCTV schemes are overcome, the result will be a favourable impact on crime. That cannot be shown to be the case. However, setting realistic objectives and using these to drive implementation, backed up by good management strategies and strong staff support are central tenets of the Investors in People accreditation, held up as a badge of good practice. It does not seem too much of a stretch to suggest that, where these are lacking, effectiveness will inevitably suffer.

Concluding comments

What is clear is that all areas need to develop a strategy for using CCTV. Technology is still moving fast, there is likely to be more emphasis on the use of biometrics, on 'event-led' CCTV systems rendering them more 'intelligent', but these changes need to be matched by appropriate changes in policy. As systems become more complex, and become capable of achieving more, it is vitally important that all those involved are trained to meet the challenges ahead. Similarly, those using images, which includes policing agencies and all those involved in the criminal justice system, need to be brought up to date with the technical changes and the new opportunities that are generated so that they can prepare the ground. For example, while digital images offer greater flexibility of application they can by the same token be more easily manipulated. And finding the best ways of using images that come in so many different formats is an enormous challenge. Meanwhile, those concerned with privacy issues will want and need to monitor the increasing level of intrusion facilitated by technological advances.

Assessed on the evidence presented in this report, CCTV cannot be deemed a success. It has cost a lot of money and it has not produced the anticipated benefits. However, the findings on effectiveness were hardly surprising given the context in which CCTV schemes were implemented. The report has suggested that there were several contributory factors. Money was not given to the most needy areas, nor always to all those that had made a good case. There was little emphasis on showing why CCTV was the best solution, only that it was an acceptable one. More generally, there was no blueprint to follow and schemes were picked to be guinea pigs for the application of public money (Gill *et al.* 2005d). Perhaps the greatest criticism should be reserved for a policy which gave money to areas that had justified their claim on what appears to be thin evidence. Also, policy guidance made it a legitimate use of funding to install cameras for the purpose of reducing fear of crime, which does not encourage project designers or implementers to work out how the cameras might achieve this. Perhaps there was little surprise when it was found that implementation commonly failed. There were few clear guidelines and each area was left to find its own way.

It is easy, with hindsight, to state that effectiveness will be compromised if the wrong cameras are fitted or, of course, if they do not work, or if they are placed in the wrong location, or are not the most appropriate for the purpose, or if management is weak, or if the operators are not trained, or not experienced, or not familiar with the layout of the area, or if the police are not supportive and so on. To some extent, however, lessons were already there to be learned from previous projects and an opportunity was missed. It is some solace that the news is not all bad, as the discussion in this concluding chapter has highlighted. Public money is too precious a resource and the major flaws in the way that the CCTV programme has been handled need to be highlighted and their lessons learned.

Those who expected that this evaluation would show CCTV to be either an unparalleled success, or an affront to a democratic society, will be disappointed. The truth is that CCTV is a powerful tool that society is only just beginning to understand. It looks simple to use, but it is not. It has many components, and can impact in different ways. Too often CCTV has been judged on its ability to reduce crime rates, and often this will not be the best way of judging it. CCTV can, if properly designed and implemented, generate images, but unless the police and the criminal justice process make good use of them, then they will be of marginal value, and are certainly not likely to achieve major impacts.

Too much must not be expected of CCTV. It is more than just a technical solution; it requires human intervention to work to maximum efficiency and the problems it helps deal with are complex. It has potential, if properly managed, often alongside other measures, and in response to specific problems, to help reduce crime and to boost the public's feeling of safety; and it can generate other benefits. For these to be achieved though, there needs to be greater recognition that reducing and preventing crime is not easy and that ill-conceived solutions are unlikely to work no matter what the investment.

Appendix A: Methodology

Theoretical approach

The CCTV evaluation combined two methodologies:

1. Quasi-experimental research techniques (see Welsh and Farrington, 2002) were used to measure change in crime and fear of crime following the installation of CCTV.

2. Realistic evaluation techniques (Pawson and Tilley 1994; 1997) were used to explain *how* the particular initiative had worked, paying particular attention to the circumstances in which it was installed.

Methodological design

Detailed discussion of the statistical analysis can be found in the online Technical Annex (Gill *et al.* 2005c). However, the following provides a summary of the methodology used.

The approach adopted a quasi-experimental model of evaluation (see Cook and Campbell, 1976; Welsh and Farrington, 2002). It measured changes in police recorded crime and fear of crime in the intervention area (called the target area) and a comparable control, before and after the CCTV system has been installed[63]. In so doing, it aimed to achieve Level 3 of the Maryland Scientific Methods Scale of quasi-experimental analysis (Sherman *et al.* 2002). A buffer zone was identified for the purpose of measuring displacement and diffusion of benefits.

The target area was defined as the area covered by the cameras or as a geographical area identified by implementers as being covered by the cameras (e.g. if implementers placed cameras on the periphery of a particular estate or park with the intention of monitoring the activities of all individuals entering or leaving that estate; alternatively they would place cameras in key places on the estate in order to cover that estate's main activities; they would be deemed to cover the estate as a whole). Control areas were selected by similarity on

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63 Systems were often installed over a period of several months, varying from one to, in one extreme case, eight months. The two-year pre-intervention period was measured retrospectively from the point at which the first camera/pole was installed, whereas the two year post-implementation period was taken from the point at which the last camera was installed.

socio-demographic and geographical characteristics and crime problems. The buffer zone comprised an area of one-mile radius from the edge of the target area, or up to any natural boundaries, such as railway lines, which prevented displacement.

Public attitude surveys were carried out in 12 areas pre- and post-implementation (see Spriggs *et al.* 2005). The surveys were used to measure change in fear of crime.

Absolute changes in police-recorded relevant crime and crimes specific to individual CCTV systems were measured for periods of six, 12 and 24 months, prior to and post installation of CCTV, where the timescale of the evaluation allowed[64]. Relevant crimes were those types of crime, which could reasonably be influenced by the presence of CCTV, e.g. it excludes domestic violence.

Temporal trends in crime were investigated by plotting a line graph showing evolution of crime from a period two years prior to CCTV implementation to two years post implementation[65]. These were shown for the target area, the buffer area and the control area. Where no control area was available (see below), trends were compared with the crime trends in the Basic Command Unit. These assisted the analysis in three different ways. First, they allowed researchers to measure crime trends in the target area compared with the control area, and the Basic Command Unit data. Second, it allowed the evaluation to assess the impact of CCTV relative to other interventions implemented in the target area prior to or alongside CCTV, and which may, individually or along with CCTV, impact upon recorded crime. Fieldworkers collected information of monthly activity on other initiatives occurring within the target area (see Calendar of Action, below). Third, they took account of independent fluctuations in crime levels. Research has shown that crime patterns can be affected by pseudo-random fluctuations (Brown, 1995); regression to the mean (Scriven 1991); floor effects (Laycock and Tilley, 1995); or seasonal effects (Short and Ditton, 1995).

Spatial analysis, using Geographical Information Systems (GIS), was carried out to measure geographical crime trends, allowing the research team to determine where, as well as whether, changes in crime have occurred. It assessed changes in crime trends in the target, as opposed to the buffer area, to measure geographical displacement or diffusion of benefits and possible deterrence effects. By comparing the crime levels falling within the coverage of each CCTV camera (i.e. where the cameras could see, technically known as viewshed) and those within a 100 metre buffer area immediately surrounding the viewsheds, it was also possible to measure changes in crime patterns within the target area.

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64 Eight out of the 14 projects under the evaluation
65 When such data were available within the evaluation timetable.

Research problems

The foregoing outlines the framework behind the statistical analysis. However, there were three major research problems that both complicated and compromised the evaluation. The first relates to implementation failure in that some areas, that were originally allocated funding, did not introduce a scheme, or did so late. This had several ramifications. It meant that some projects initially included in the study, and subjected to pre-implementation analyses had to be dropped, while other schemes that remained in the evaluation could not be fully evaluated. For example, it meant that there was insufficient time within the evaluation time period to assess the impact of CCTV over a two-year follow-up period.

The second concerns access to data. This was an enormous problem that in some cases, and despite gallant efforts from a variety of people, including the police, Home Office, data protection officers and especially the research team, was never properly resolved. There were two principal reasons. Some police areas did not agree to provide data because they felt that it contravened the Data Protection Act. This was a misinterpretation as a specific data processor agreement had been negotiated with the police, and while this was not the only Home Office project to suffer, it did mean time was lost. A protocol had to be produced and then each force had to agree, taking some time. This was compounded by another problem in that some forces claimed they did not have the time to allocate resources to collate and prepare the data that was needed. It resulted in delays and some data never did arrive.

Third, it was not possible to identify a comparative control for every CCTV system. The geographical area used as a control must be sufficiently similar to that in which CCTV has been installed (Welsh and Farrington, 2002) taking into account key characteristics such as nature, size, layout and crime problems. Yet some areas such as city centres were unique. The area must also have no existing CCTV system, or at least one, which is stable, but the evaluation took place at a time when virtually all town centres and hospitals were in the process of expanding already existing systems.

So while the aim had been to achieve a Level 3 evaluation (Sherman *et al.* 2002), this was not possible in all cases, and for reasons that proved outside the control of the evaluators. Moreover, in some cases, and particularly car parks and small residential systems, the level of crime was so low it meant that meaningful analysis was not possible.

Realistic evaluation/qualitative methods

A range of research methodologies and data-sets were combined to determine the context in which the CCTV systems were installed and, therefore, the characteristics, which help to explain why a CCTV system had a particular impact. A range of different data-sets was obtained from each system.

For each project one fieldworker would take primary responsibility for liaising with project staff, carrying out qualitative interviews, attending project meetings and obtaining key project information, statistics, and copies of key documents. The fieldworker monitored the project throughout the implementation phase to a period one year following the date on which the system became fully operational, or up to the end of the evaluation period, whichever was the sooner[66]. As projects became live, the bulk of project activity was centred round the control room, and fieldwork activities shifted accordingly.

Desk-based study of documentation

A range of different documents was studied as part of the evaluation. These included the following:

- The initial bid documents submitted to the Home Office.
- Minutes from steering group meetings initially set up to supervise the installation of the CCTV system and in two cases carried on to monitor the ongoing operation of the system.
- Control room Codes of Practice.
- Tender documents and other documentation outlining the technical specifications of the CCTV systems.

These provided a range of information:

- The degree of strategic planning and operation behind the CCTV systems, and their stated aims and objectives.
- Details of the technical specifications of the systems.

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66 As a number of projects implemented relatively late in the evaluation period it was possible to obtain only a few months' post-implementation data.

Participant observation and interviews with project staff

Throughout the evaluation, researchers carried out a qualitative study. This took two main forms:

- Researchers carried out participant observation at steering group meetings, which were initially set up to supervise the installation of the CCTV system, and in two cases continued to monitor the live system. Throughout the evaluation period, fieldworkers attended nearly 200 such meetings spread across the 17 projects initially chosen for evaluation.

- Unstructured interviews were carried out with key project personnel, i.e. those who were identified as having significant input into the installation or operation of the CCTV system, or those involved in other crime reduction projects in the area. During the implementation phase, fieldworkers were in contact with project personnel on a weekly or twice weekly basis. Over the evaluation period fieldworkers carried out nearly 300 face-to-face interviews spread across the 17 projects initially under evaluation. These were supplemented by telephone interviews.

The interviews involved a range of agencies and individuals specific to the particular systems, and often incorporated those represented at steering group meetings. They included:

- Chair/manager of the CCTV scheme.
- Control room managers and staff.
- The consultant/technical manager involved in the project design and installation.
- Senior police officers with a key strategic role in the design of the CCTV system.
- Local police beat officers.
- Community safety team personnel.
- Other local authority personnel.

These observations and interviews were used to determine a number of issues:

- The intended aims and objectives of the CCTV system as understood or articulated by those designing or installing the system.

- The inter-relationship between individuals and partnership agencies and the impact that this had on the design, installation and operation of the CCTV system.

- The means by which significant decisions were made.

- The issues faced in system installation and operation and the means by which these were overcome.

- The characteristics of the area in which the CCTV system has been installed, such as the nature and character of the area, levels of deprivation, qualitative descriptions of crime problems and potential explanations.

- The mechanisms by which the system could work, both as identified by project personnel, but also as discerned by critical analysis by the fieldworker responsible for evaluating that project.

- Details of other crime reduction initiatives being carried out in the CCTV area.

Data-sets

Many of the qualitative findings required support from a range of quantitative data. These came in three formats: details about the interventions including the CCTV system and other initiatives being carried out in the area; socio-demographic data about the areas covered by the cameras; and CCTV control room-specific data.

Data on initiatives being carried out in the target area

- Details of camera systems including number of cameras, date and position of installation.

- Details of other initiatives been carried out in the area, including start date and duration, location and approximate volume.

This information was logged in a Calendar of Action, which recorded the monthly activity date for both the evaluated camera system and other initiatives. One of the objectives of the evaluation was to separate out the impact of CCTV from other initiatives being carried out in the area, and the Calendar of Action allowed this to happen.

Socio-demographic data about the target area

Socio-demographic data were obtained for the areas in which the CCTV systems were installed. These were from a number of sources, including Indices of Multiple Deprivation, and 2001 Census data. These formed two purposes:

● To inform the context into which the CCTV systems have been installed.

● To allow population densities to be calculated, allowing an estimate of relative crime rates to be obtained.

Control room data

Where available, two samples of data were collected from a sample[67] of control rooms from the date when the system became fully operational to the end of the evaluation period[68]:

● Incident and occurrence logs, providing information on the number, type and date of incidents monitored by the control room operators, both in the control room as a whole and, where these can be separated, the target area.

● The date and time of tapes seized from the control room, and the type of incident addressed. The local police normally obtained these.

These data were used to measure the following:

● The absolute level of control room activity in the target area, in order to determine whether CCTV could have reasonably been expected to impact on crime levels.

● The proportion of control room activity in the target area, compared with the other areas monitored from the same control room, to determine whether control room, or monitoring activity, was biased towards different areas connected to the same control room.

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67 The sample was chosen according to availability of relevant data as well as to represent the different types of systems.

68 This varied between projects. The objective was to carry out an in-depth evaluation of the CCTV system for a period of one year following the date of full operation (taken at the point at which all cameras in the system were producing a picture capable of being monitored from the control room or where the system had reached a stable state, taking into account camera faults or breakdowns which were an inte.g.ral part of most systems). There were a number of systems which achieved full operation too late in the evaluation timetable to evaluate for a period of one year.

● The type of incidents being addressed by control room operators or police obtaining evidence, and therefore the type of crimes, which could reasonably be expected to be influenced by control room activity.

Control room study

An in-depth control room study was carried out for each CCTV project under evaluation. The aim of the study was to determine how the operation of the CCTV control room contributed to the effectiveness of the CCTV system under evaluation.

The aims of the study were as follows:

● To examine the technical aspects of the control room and the cameras.
● To examine the operators' proficiency, attitudes, and behaviour.
● To examine the number and type of events that were monitored and the context in which they were monitored.
● To examine technical links and working relationships between the CCTV control room and other agencies, most notably the police and retail/pub radio schemes.
● To examine all of the above for CCTV, but most importantly to assess the impact on the effectiveness of the evaluated CCTV system.
● These issues provided a context for the record of incident logs and tape seizures obtained for the whole of the evaluation period (see above).

In order to achieve these aims an observational study was carried out in each control room. The control room was observed for 48 hours (or pro rata where the control room was monitored for less than 24 hours per day). A total of 462.5 hours was spent observing control rooms. Each type of shift was observed in a one-week period to cover time of day, and weekday and weekend operation. These reflected the shift patterns of the control rooms being studied, which changed across systems. There were four main types of shift patterns; 2 x 12- hour shifts per day, 3 x 8-hour shifts per day, and varying shift patterns throughout the week. Each control room study was carried out at least two months after the new system was fully operational, to ensure that the control room operators were used to the new cameras and that the system was operating to full capacity.

The observation comprised three main tasks: quantitative study, qualitative interview, and observation.

Quantitative study

The quantitative study had three main aspects.

a) Each time an operator actively monitored a target for one minute or more[69] was recorded, regardless of the nature of this target. Information collected included description of target, reasons for watching (where these could be determined), time surveillance started and how long it was maintained, cameras used, and what actions operators took as a result of the surveillance.

b) Number of calls to the control room, via telephone or radio, was noted. Origin of call, and action taken by the operators as a result, was also recorded.

c) Operator breaks away from monitoring screen, whether scheduled, or due to other tasks etc. was recorded.

Qualitative study

During each of the shifts a semi-structured interview was carried out with one of the operators. Topics covered included training, attitude to the job, perceptions of the new CCTV system, working relationships with the police and other incidents.

Observation

During the shifts, researchers observed operator behaviour, attitudes to work, what they monitored, and how they responded to contact with other agencies.

Cost-effectiveness and cost-benefit analysis

Cost-effectiveness and cost-benefit analyses were carried out on each CCTV system, following Home Office guidelines[70], and total costs were calculated using the Home Office costs database. The following input costs were collected from each project:

- Personnel costs – accounts for personnel time spent by individuals involved in the set-up and progress of the project.

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69 Defined as an incident by (Norris and McCahill, 2003)
70 'Analysis of costs and benefits guidance for evaluators' http://www.homeoffice.gov.uk/rds/pdfs/cdp1costeff.pdf
    'Measuring inputs guidance for evaluators' http://www.homeoffice.gov.uk/rds/pdfs/cdp3inputs.pdf

- Equipment costs – includes cost and installation of all CCTV equipment, control room hardware, installation and cost of cabling and maintenance costs.
- Transport – includes vehicle hire as well as transport costs.
- Training – where applicable includes training of operators.
- Other overheads – includes all other costs including work carried out under a fixed contract. Specifically, a number of projects employed a consultant to assist with the design and implementation of the system – these fees amounted to approximately ten per cent of total costs.
- Premises – any property used to run the system, including meeting rooms.
- Advertising and publicity.

Costs were divided into two phases: set-up (those incurred in making the system operational) and ongoing costs (those incurred once the system was operational).

Costs were collected by interviews with individual staff followed by a self-completion information grid, where the individuals were not able to produce the information at the time. Such information was supplemented by documentary evidence including bidding documents, invoices and bills.

Stakeholder interviews

A stakeholder survey was conducted in two project areas: Borough Town and Market Town. It aimed to determine local businesses' perceptions of the CCTV system, and to provide more rich and contextual information regarding public perceptions of CCTV. More specifically, it aimed:

1. To determine local businesses' understanding of the proposed/new CCTV scheme.

2. To determine the level of involvement by local businesses in the design, funding and implementation of the scheme.

3. To determine local businesses' attitudes towards the introduction of the CCTV scheme.

4. To determine the potential, or actual, impact that CCTV will have on the local businesses.

5. To determine how the actions of local businesses will impact upon the effect of the CCTV scheme.

6. To determine local businesses' desired impact of CCTV.

A sample of 25 businesses from within each target area was randomly selected to undergo a semi-structured qualitative questionnaire lasting approximately 30minutes. The target area was defined to include all areas within coverage of the new cameras, including pubs, restaurants, takeaways, retailers, and various service providers.

The sample was categorised into retail, service providers and pub/leisure, ensuring that a valid cross-section of the businesses within the areas was selected. Wherever possible, the manager, owner, or landlord of the business was questioned.

Focus groups

Focus groups were carried out in two areas in which redeployable cameras in Borough had been installed. Their purpose was to explore how much the presence of the CCTV camera(s) actually affected the people living in these areas. The following issues were discussed:

- Crime and disorder problems experienced
- Awareness of CCTV installed in the area
- Opinions about CCTV installed in the area
- Its perceived impact
- Feelings about its removal.

The focus groups were convened by local councillors or local authority workers in each area. 14 attended the first, of whom most were over fifty, and only four were men. All had lived in the village for at least two years and eight of those present had been living there for about 20 years or longer. A camera had been deployed in the village for 16 months before the focus group was conducted, occasionally supplemented by a second camera elsewhere in the village.

The second was attended by nine members of a local residents' group: all were over thirty, four were women and five were men. All the respondents had lived in the avenue for at least two years; however, some of the respondents had lived on the avenue most of their lives. A camera has been deployed on the avenue twice, for a total of eight months before the focus group was conducted.

Both focus group discussions lasted for an hour and a half in total, and were led mainly by one researcher, with another two asking additional questions. The two supporting researchers also acted as scribes, and the discussion was recorded and subsequently transcribed.

Research issues: obtaining police-recorded crime data

The research was compromised by delays in obtaining police-recorded crime data. This was a major problem and in future researchers and fund holders requiring such data would be advised to bear the following points in mind:

- Forces are inundated with requests for data and often have limited resources available. Some forces demanded payment for this service and it is suggested that this be built into any future tender for research monies.

- Crime prevention measures are rarely implemented across discrete police units (beats, divisions), and the most time-consuming element of obtaining data is extracting that relevant to the specific research area. This will have implications for the research costings. It should either be built into the anticipated funding for police forces, or researchers should ensure that they have the in-house expertise to extract these data (in particular, access to GIS expertise).

- Location-specific crime data falls under the remit of the Data Protection Act 1998.

- The process of negotiating access to any data, and particularly that which falls under the remit of the Data Protection Act 1998, is extremely time-consuming and needs to begin immediately following the award of research funding. This is a three-way process involving researchers, relevant force representatives and fund holders. This will culminate in a data sharing agreement to be signed by all forces and researchers (of which this research has developed a prototype).

- Some data protection issues may remain, which may restrict the potential of the research.

- The police require stringent security arrangements (BS 7799) for the storage of data falling under the remit of the Data Protection Act 1998, and this will invariably require changes both to security procedures and buildings. Research organisations would be advised to identify where such data are likely to be stored and obtain an initial security assessment immediately following the award of research funding.

● Negotiation of access to data is an ongoing process requiring continued personnel resources and this should be borne in mind by both fund holders and researchers when setting the research timetable.

● Researchers and fund-holders should be prepared for delays in obtaining data caused by lack of communication between data protection officers and data providers, changes in police staffing, inappropriate referrals by police personnel and a number of other issues raised. In an example from this evaluation, one area failed to deliver on police data because they were still raising data protection issues over a year after the data-sharing agreement had been signed.

Appendix B: List of Home Office crime categories

The following table summarises the Home Office (HO) Level one crime codes used in the classification for this evaluation. This includes only those offences that could be feasibly affected by the implementation of CCTV. While every effort has been made to fit in with Home Office classifications, this has not always been possible, as the authors were not using the second level codes, which specify more precisely what each offence is.

HO code	Offence type	HO code	Offence type
1	Violence against the person	54	Theft
2	Violence against the person	56	Criminal damage
4	Violence against the person	57	Criminal damage
5	Violence against the person	58	Criminal damage
8	Violence against the person	59	Criminal damage
13	Violence against the person	64	Public order
17	Sexual offences	65	Public order
19	Sexual offences	66	Public order
20	Sexual offences	92	Drug offences
25	Sexual offences	104	Violence against the person
27	Sexual offences	105	Violence against the person
28	Burglary	115	Firearm offences
29	Burglary	125	Public order
30	Burglary	126	Theft**
31	Burglary	130	Theft***
33	Going equipped	131	Theft***
34	Robbery	137	Theft
37	Theft***	139	Sexual offences
39	Theft	149	Criminal damage
44	Theft	165	Sexual offences
45	Theft**	182	Be.g.ging
46	Theft*	802	Dangerous driving
47	Theft	803	Dangerous driving
48	Theft***	804	Dangerous driving
49	Theft		

* Shoplifting
** Theft from motor vehicles
*** Theft of motor vehicles
Theft from motor vehicles and Theft of motor vehicles comprise vehicle crime.

Appendix C: Changes in individual crimes and significance levels

Scheme	Crime	Target before	Target after	% Change in target	Control before	Control after	% Change in control	Relative effect size	Upper Limit	Lower Limit
City	Theft	847	455	–46	16,122	15,022	–7	1.73	2.14	1.33
Outskirts	Theft from motor vehicle	220	101	–54	5,468	4,920	–10	1.96	2.80	1.11
	Theft of motor vehicle	59	25	–58	1,525	1,492	–2	2.31	3.42	1.20
South City	Criminal damage	360	288	–20	10,343	11,036	7	1.34	1.43	1.25
Market	Criminal damage	34	51	50	4,217	4,422	5	0.70	0.98	0.42
Town	Public Order	15	36	140	86	105	22	0.51	0.95	0.07
Dual Estate	Burglary	161	131	–19	7,164	6,442	–10	1.11	1.48	0.73
Borough	Burglary	27	49	81	1,448	1,559	8	0.59	0.90	0.29
	Criminal damage	82	183	123	2,179	2,330	7	0.48	0.66	0.30
	Theft	96	152	58	3,452	3,650	6	0.67	0.89	0.44
	Theft from motor vehicle	32	49	53	1,252	1,251	0	0.65	0.98	0.32
Deploy Estate	Criminal damage	296	456	54	153	136	–11	0.58	0.81	0.35

Appendix D: Characteristics of CCTV systems

Project	Reducing Fear of Crime main objective	Expand existing scheme	Obtain external source of funding	CCTV to help gain status award	Technical consultant employed	Obstruct-ions (Not in Text)	Use of auto-tours	Lighting levels/ factors affecting light levels	Design and implement ation problems
City Outskirts	No	Yes	Yes	No	Yes	Yes	Yes, but not prog-rammed well	Poor/ low light levels	Yes – minor impact on system
Hawkeye	No	No	No	Yes	Yes	Yes – rain on camera lenses and foliage problems	N/R	Good	Yes – minor impact on system
City Hospital	Yes	No	Yes	Yes	No	N/R	N/R	Good	Yes – minor impact on system
South City	Yes	Yes	No	No	Yes	Yes – a few cameras obscured by foliage	Yes	Good	Yes – minor impact on system
Market Town and Shire Town	Yes	Yes	No	Yes	Yes	Yes – a few cameras obstruc-ted by foliage	Yes – but restricted to preserve equip-ment	Poor/ neon lights	Yes – signifi-cant impact on system
Borough Town	No	Yes	No	No	No	No	No	Poor/ neon lights	Yes – minor impact on system

Project	Reducing Fear of Crime main objective	Expand existing scheme	Obtain external source of funding	CCTV to help gain status award	Technical consultant employed	Obstruct-ions (Not in Text)	Use of auto-tours	Lighting levels/ factors affecting light levels	Design and implement ation problems
Northern Estate	Yes	No	No	No	Yes	No	Yes – but technical faults	Poor/ low light levels	Yes – minor impact on system
Westcap Estate	Yes	Yes	Yes	No	Yes	No	Yes	Poor/ low light levels	Yes – minor impact on system
Eastcap Estate	Yes	No	No	No	No	No	No	Very poor/ lighting too bright	Yes – signifi-cant impact on system
Dual Estate	Yes	Yes	No	No	Yes	Yes – rain on camera lenses	Yes, but restricted to preserve equipment	Good	Yes – signifi-cant impact on system
Southcap Estate	Yes	No	Yes	No	Yes	No	No	Poor/ low light levels	Yes – minor impact on system
Borough	Yes	No	No	No	Yes	No	No	Poor/ low light levels	Yes – signifi-cant impact on system
Deploy Estate	Yes	No	No	No	Yes	No	Yes, but technical faults	Good	Yes – minor impact on system

Appendix E: Characteristics of CCTV control rooms

Project	Control room also monitors other geographical areas	Monitoring hours per day	Total control room incidents monitored over 48-hrs of observation	Proportion of total incidents monitored in the target area	Tapes taken for evidence (per week)*
City Outskirts	Yes	24	181	20%	2.1
Hawkeye	No	16 (not Sundays)	17	100%	3.5
City Hospital	N/A	N/A	N/A	N/A	N/R
South City	Yes	24	142	40%	N/R
Market Town and Shire Town	Yes	Average 9	20	100%	1.75
Borough Town	Yes	16-19	53	4%	0.5
Northern Estate	Yes	24	158	8%	0.42
Westcap Estate	Yes	24	42	12%	N/R
Eastcap Estate	Yes	24	178	11%	0.83
Dual Estate	Yes	Average 7	65	21%	0.92
Southcap Estate	Yes	24	119	4%	0.33
Borough	N/A	N/A	N/A	N/A	N/R
Deploy Estate	Yes	24	183	5%	N/R

*   Residential areas calculated from all tapes taken over a sample of 12-weeks over one-year period. Town/City centres calculated as an average.

Appendix F: Costs of individual CCTV systems

The following tables detail the value of inputs (£'s) utilised by each project during the evaluation period. Costs are split by category (e.g. personnel, equipment), source (CRP, non CRP) and whether they refer to set-up or ongoing[71] inputs. Additionally, the tables include a measure of the number of cameras installed by the project and the associated cost per camera based on both the total net present value of inputs and the annual equivalent total.

City Outskirts

Input (£)	Set-up CRP	Set-up Non-CRP	Ongoing CRP	Ongoing Non- CRP	Total	%
Personnel	0	5,845	0	6,393	12,238	1.5
Other	12,276	241	0	47,058	59,576	7.3
Equipment	714,065	0	9,688	0	723,753	89.1
Premises	0	67	0	16,129	16,196	2.0
Transport	0	33	0	0	33	0.0
Advertising	0	525	0	0	525	0.1
NPV total	**726,342**	**6,711**	**9,688**	**69,581**	**812,322**	
%	89.4	0.8	1.2	8.6		
Annual equivalent equipment	94,753	0	1,286	0	96,038	
Annual equivalent total	**107,029**	**6,711**	**1,286**	**69,581**	**184,607**	
Number of cameras					**47**	
Cost per camera (NPV)					**17,283**	
Cost per camera (AE)					**3,928**	

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71 Set-up costs refer to costs incurred during the design and installation of the system. Ongoing costs refer to costs incurred after the system becomes 'live'.

Hawkeye[72]

Input (£)	Set-up	Ongoing	Total	%
Personnel	185,094	53	185,147	4.3
Other	321,725	335,932	657,657	15.3
Equipment	3,417,534	0	3,417,534	79.3
Premises	0	43,327	43,327	1.0
Training	1,638	0	1,638	0.0
Transport	315	0	315	0.0
Advertising	2,642	0	2,642	0.1
NPV Total	**3,928,949**	**379,312**	**4,308,261**	
%	91.2	8.8		
Annual equivalent equipment	453,490	0	453,490	
Annual equivalent total	**964,904**	**379,312**	**1,344,216**	
Number of cameras			**646**	
Cost per camera (NPV)			**6,669**	
Cost per camera (AE)			**2,081**	

Whilst the cost information for the Hawkeye scheme related to a total of 646 cameras that were installed, the previous effectiveness evaluation only considered the impact of 556 of these cameras. This difference arose as no police recorded crime statistics were available for those car parks where the remaining 90 cameras were installed, and it was not possible to identify costs by specific car parks. Consequently, in the subsequent analysis the calculated cost per camera figures are used to imply the cost-benefit of installing the evaluated 556 cameras. Multiplying the cost per camera (AE) figure by 556 gave an annual equivalent total for Hawkeye of £1,157,036. The same calculation was conducted in relation to the three categories of risk previously identified.

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72 It was not possible to calculate the percentage of resources funded through the Crime Reduction Programme as project personnel could not provide the relevant information.

City Hospital

Input (£)	Set-up		Ongoing		Total	%
	CRP	Non-CRP	CRP	Non- CRP		
Personnel	0	17,132	0	0	17,132	3.3
Other	0	3,692	0	0	3,692	0.7
Equipment	497,084	0	0	0	497,084	95.2
Premises	0	3,743	0	0	3,743	0.7
Transport	0	17	0	0	17	0.0
Advertising	0	227	0	0	227	0.0
NPV Total (67 cameras)	**497,084**	**24,810**	**0**	**0**	**521,895**	
%	95.2	4.8	0.0	0.0		
Annual equivalent equipment	65,961	0	0	0	65,961	
Annual equivalent total (67 cameras)	**65,961**	**24,810**	**0**	**0**	**90,771**	
NPV (9 cameras)[74]					**70,105**	
AET (9 cameras)					**12,193**	
Number of cameras					**9**	
Cost per camera (NPV)					**7,789**	
Cost per camera (AE)					**1,355**	

South City

Input (£)	Set-up		Ongoing		Total	%
	CRP	Non-CRP	CRP	Non- CRP		
Personnel	314	7,379	0	116,215	123,909	9.0
Other	0	68,333	0	14,234	82,567	6.0
Equipment	840,452	303,775	0	0	1,144,227	82.7
Premises	10	16	0	22,384	22,410	1.6
Training	0	10,915	0	0	10,915	0.8
Transport	0	66	0	0	66	0.0
NPV Total	**840,777**	**390,483**	**0**	**152,834**	**1,384,093**	
%	60.7	28.2	0.0	11.0		
Annual equivalent equipment	111,524	40,309	0	0	151,833	
Annual equivalent total	**111,848**	**127,018**	**0**	**152,834**	**391,699**	
Number of cameras					**51**	
Cost per camera (NPV)					**27,139**	
Cost per camera (AE)					**7,680**	

73 No ongoing costs were provided by the project.

74 The costs are based on the entire 67-camera system; therefore, the AET has been recalculated based on the nine cameras that were evaluated.

Shire Town

Input (£)	Set-up		Ongoing		Total	%
	CRP	Non-CRP	CRP	Non- CRP		
Personnel	0	10,112	0	1,147	11,259	6.2
Other	0	3,331	0	7,407	10,738	5.9
Equipment	152,632	0	0	0	152,632	84.4
Premises	0	81	0	8,339	8,421	4.7
Training	0	222	0	0	222	0.1
Transport	0	38	0	41	78	0.0
NPV Total	152,632	13,783	0	16,935	183,350	
%	84.4	7.6	0.0	9.4		
Annual equivalent equipment	20,254	0	0	0	20,254	
Annual equivalent total	20,254	13,783	0	16,935	50,972	
Number of cameras					12	
Cost per camera (NPV)					15,279	
Cost per camera (AE)					4,248	

Market Town

Input (£)	Set-up		Ongoing		Total	%
	CRP	Non-CRP	CRP	Non- CRP		
Personnel	0	7,629	0	866	8,494	4.7
Other	0	2,413	0	5,895	8,307	4.6
Equipment	151,973	5,402	0	0	157,375	87.1
Premises	0	61	0	6,291	6,352	3.5
Training	0	167	0	0	167	0.1
Transport	0	28	0	31	59	0.0
NPV Total	151,973	15,701	0	13,082	180,755	
%	84.1	8.7	0.0	7.2		
Annual equivalent equipment	20,166	717	0	0	20,883	
Annual equivalent Total	20,166	11,015	0	13,082	44,263	
Number of cameras					9	
Cost per camera (NPV)					20,084	
Cost per camera (AE)					4,918	

Borough Town

Input (£)	Set-up		Ongoing		Total	%
	CRP	*Non-CRP*	*CRP*	*Non- CRP*		
Personnel	0	12,125	0	17,781	29,906	9.7
Other	0	0	0	3,575	3575	1.2
Equipment	274,461	0	0	0	274,461	88.9
Premises	0	228	0	700	928	0.3
NPV Total	**274,461**	**12,353**	**0**	**22,056**	**308,871**	
%	88.9	4.0	0.0	7.1		
Annual equivalent equipment	36,420	0	0	0	36,420	
Annual equivalent Total	**36,420**	**12,353**	**0**	**22,056**	**70,829**	
Number of cameras					**40**	
Cost per camera (NPV)					**7,722**	
Cost per camera (AE)					**1,771**	

Northern Estate

Input (£)	Set-up		Ongoing		Total	%
	CRP	*Non-CRP*	*CRP*	*Non- CRP*		
Personnel	2,454	5,708	829	41,718	50,710	19.1
Other	0	0	0	4,860	4,860	1.8
Equipment	208,317	0	0	0	208,317	78.5
Premises	0	17	0	1,611	1,627	0.6
NPV Total	**210,771**	**5,725**	**829**	**48,189**	**265,514**	
%	79.4	2.2	0.3	18.1		
Annual equivalent equipment	27,643	0	0	0	27,643	
Annual equivalent Total	**30,096**	**5,725**	**829**	**48,189**	**84,840**	
Number of cameras	**11**					
Cost per camera (NPV)	**24,138**					
Cost per camera (AE)	**7,713**					

Westcap Estate

Input (£)	Set-up		Ongoing		Total	%
	CRP	Non-CRP	CRP	Non- CRP		
Personnel	0	14,090	0	702	14,792	6.9
Other	23,721	0	0	20,647	44,368	20.5
Equipment	141,073	0	2,757	7,643	151,473	70.1
Premises	0	25	0	3,108	3,132	1.5
Transport	0	249	0	0	249	0.1
Advertising	0	1,914	0	0	1,914	0.9
NPV Total	**164,794**	**16,277**	**2,757**	**32,100**	**215,928**	
%	76.3	7.5	1.3	14.9		
Annual equivalent equipment	18,660	0	365	1011	20,035	
Annual equivalent total	**42,381**	**16,277**	**365**	**25,468**	**84,490**	
Number of cameras					**12**	
Cost per camera (NPV)					**17,994**	
Cost per camera (AE)					**7,041**	

Eastcap Estate

Input (£)	Set-up		Ongoing		Total	%
	CRP	Non-CRP	CRP	Non- CRP		
Personnel	22	2,360	154	939	3,474	1.4
Other	3,809	0	10,882	28,614	43,305	17.8
equipment	191,823	778	0	3,932	196,533	80.8
NPV Total	**195,654**	**3,137**	**11,035**	**33,485**	**243,312**	
%	80.4	1.3	4.5	13.8		
Annual equivalent equipment	25,454	103	0	522	26,079	
Annual Eeuivalent Total	**29,285**	**2,463**	**11,035**	**30,075**	**72,859**	
Number of cameras					**10**	
Cost per camera (NPV)					**24,332**	
Cost per camera (AE)					**7,286**	

Dual Estate – Area A

Input (£)	Set-up		Ongoing		Total	%
	CRP	Non-CRP	CRP	Non- CRP		
Personnel	247	3,560	0	5,172	8,979	13.4
Other	7,290	41	0	4,964	12,295	18.3
Equipment	42,123	1,998	0	0	44,121	65.7
Premises	1,607	12	0	2	1,621	2.4
Training	0	16	63	0	79	0.1
Transport	0	5	0	79	85	0.1
NPV Total	**51,267**	**5,633**	**63**	**10,217**	**67,180**	
%	76.3	8.4	0.1	15.2		
Annual equivalent equipment	5,590	265	0	0	5,855	
Annual equivalent total	**14,733**	**3,900**	**63**	**10,217**	**28,914**	
Number of cameras					**5**	
Cost per camera (NPV)					**13,436**	
Cost per camera (AE)					**5,783**	

Dual Estate[75] – Area B

Input (£)	Set-up		Ongoing		Total	%
	CRP	Non-CRP	CRP	Non- CRP		
Personnel	247	3,560	0	5,172	8,979	16.8
Other	7,290	41	0	4,964	12,295	23.0
Equipment	29,305	1,150	0	0	30,455	56.9
Premises	1,611	12	0	2	1,625	3.0
Training	0	16	63	0	79	0.1
Transport	0	5	0	81	86	0.2
NPV Total	**38,452**	**4,785**	**63**	**10,219**	**53,520**	
%	71.8	8.9	0.1	19.1		
Annual equivalent equipment	3,889	153	0	0	4,041	
Annual equivalent total	**13,036**	**3,788**	**63**	**10,219**	**27,106**	
Number of cameras					**5**	
Cost per camera (NPV)					**10,704**	
Cost per camera (AE)					**5,421**	

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75 In addition to Area A and Area B, 4 cameras were also installed along a main thoroughfare, however no impact assessment has been made of these cameras and therefore cost information is not reported.

Borough

Input (£)	Set-up		Ongoing		Total	%
	CRP	*Non-CRP*	*CRP*	*Non- CRP*		
Personnel	0	11,018	0	25,679	36,696	28.6
Other	0	78	0	2,303	2,381	1.9
Equipment	80,847	5,122	0	1,691	87,660	68.3
Premises	0	0	0	11	11	0.0
Training	0	0	0	210	210	0.2
Transport	0	0	0	1,299	1,299	1.0
NPV Total	**80,847**	**16,218**	**0**	**31,191**	**128,256**	
%	63.0	12.6	0.0	24.3		
Annual equivalent equipment	10,728	680	0	224	11,632	
Annual equivalent total	**10,728**	**11,776**	**0**	**29,724**	**52,228**	
Number of cameras					**8**	
Cost per camera (NPV)					**16,032**	
Cost per camera (AE)					**6,528**	

Deploy Estate

Input (£)	Set-up		Ongoing		Total	%
	CRP	*Non-CRP*	*CRP*	*Non- CRP*		
Personnel	0	10,142	0	12,222	22,363	6.0
Other	26,075	9,975	0	31,409	67,459	18.0
Equipment	280,378	0	0	3,470	283,848	75.9
Premises	32	0	41	17	89	0.0
NPV Total	**306,484**	**20,117**	**41**	**47,118**	**373,759**	
%	82.0	5.4	0.0	12.6		
Annual equivalent equipment	37,205	0	0	461	37,665	
Annual equivalent total	**63,311**	**20,117**	**41**	**44,108**	**127,576**	
Number of cameras					**11**	
Cost per camera (NPV)					**33,978**	
Cost per camera (AE)					**11,598**	

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