9 Crime reduction, diffusion and displacement: evaluating the effectiveness of CCTV

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Introduction

This chapter will be of interest to those wrestling with the problems of technique and methodology connected with measuring the effects of CCTV systems. This is an important task given the claims made about CCTV systems (see Ward, 1996). It is also important given the 'stunning' proliferation of such systems (Graham, Brooks & Heery, 1996). The evaluation of the crime reduction impact of CCTV systems has been the subject of little systematic, independent research. The only comparable existing studies are Bulos and Sarno (1995), Brown (1995), Short and Ditton (1996) and Squires and Measor (1996). Specifically this chapter aims to describe the process of evaluation and highlight some of the main findings that emerge from the Redton¹ scheme.²

The paper consists of three parts. First, the nature of the Redton town centre CCTV system is set out. This is followed by an examination of the general evaluation strategy before moving on to a discussion of the results obtained and their limitations.

The **Redton** CCTV system

Redton is a northern town, with a population of around a quarter of a million people. Formally a coal-mining stronghold the town has declined economically, especially since the pit closures of the 1980s. Unemployment is high in the metropolitan and surrounding area (the unemployment rates for the metropolitan area in October 1994, 1995 and 1996 were 12.23%, 10.98% and 10.16% respectively). This post-industrial inheritance has left an area characterised by shifting social patterns, which have strained traditional political, community and family ties.

Redton has a compact town centre, defined by arterial roads. Most of this

central commercial district is covered by the CCTV system. Prior to the introduction of the scheme concern was evident amongst the business community about the decline of the town centre, a decline attributed to economic depression and market competition (Skinns, 1997). The Safety in Redton Steering Group (Action Pack, 1994) saw targeting crime as a high priority and this perception was to some degree supported by business providers and town centre users (Skinns, 1997). However, when surveyed the business community prioritised economic decline over concern with crime. For the users of the town centre the main concerns were not specifically about crime but accessibility during the day, and at night, 'incivilities' including the presence of drunken people and unruly behaviour (Skinns, 1997). Regardless of the specific purpose of the scheme there was overwhelming support for the introduction of the CCTV system from the public and business group (Skinns & Salmon, 1995). Such support reflected the findings of other studies (Honess & Charman, 1992; Bennett & Gelsthorpe, 1996).

The Redton CCTV system, which became operational in October 1995, is a multi-agency, police-led, town centre system, consisting of 63 cameras located in the commercial centre, multi-storey car parks and main town centre arterial roads. Forty seven 'Help Points' are also located within the city centre to enable two-way communication between the public and the main control room. The estimated cost of the system over a five year period is $\pounds 2.3$ million (Skinns, 1997).

There are three control rooms. The main one is located in the police station and has access to all cameras; the ability to override the commands from the other two control rooms; and the responsibility for the crime prevention and detection aspects of the system. The main control room is staffed 24 hours a day by civilian Police Authority employees and has good communication links with operational police units (Skinns, 1997).

Recordings can be taken from all cameras and are routinely made, in 'real time' from the town centre cameras. Recordings can only be made at the main control room where all video tapes are stored in secure conditions. The scheme is managed by a steering group and an ethics committee has been established to advise on issues connected to access to tapes.

Evaluating Redton CCTV

The research design this study utilises can best be described as quasiexperimental (Cook & Campbell, 1979). Thus data relating to a time before the introduction of the CCTV scheme (October 1994 - September 1995) are compared with data relating to a time after the intervention (October 1995-September 1996). However, a 'process' model of evaluation was adopted, in keeping with Pawson and Tilley's (1994: 296) comment that 'programmes often do not perform as expected because of failures in implementation rather than conception.' Further, Berry and Carter's (1992) injunction that innovations should be assessed by reference to their articulated and agreed purposes rather than some abstract ideal, provide the basis for establishing the criteria for evaluation. Using this methodological paradigm interviews with key players and an examination of the minutes of the management group meetings uncovered nine primary aims of the system.

Previous studies of other types of CCTV systems (Home Office Crime Prevention Centre, 1990) and the difficulties of some of the early attempts to undertake in-house evaluations as noted by Short and Ditton (1996), suggested the need for rigorous and systematic data collection. In particular this meant finding ways of corroborating findings (by using, for example, both police statistics and victimisation reports), being responsive to a variety of interest groups and using both quantitative data and qualitative data to flesh out these findings.

A central feature of evaluation work, but one that has not been achieved by many studies of crime prevention and CCTV systems is independence (see Home Office Crime Prevention Centre, 1990). Essentially, this can be interpreted as fairness. Such fairness may not be easily accomplished given the politically charged character of evaluation and the heavily contested 'policy space' (Berk and Rossi, 1990:2) occupied by CCTV systems. At the very least, fairness or independence must mean that the evaluator has no stake in the outcome of the project and that evaluation should be conducted by outside bodies for the results to be in any way credible.

Measuring crime reduction displacement and diffusion

The crime reduction effects of the system in the surveilled streets of the town centre have been assessed by using four data sets: first, police recorded crime statistics; second, victimisation data, surveys of town centre users, multi-storey car park users, school pupils and the business community all collected before and after the system was installed; third, attitude surveys of 'key workers' (including Redton magistrates, police officers and traffic wardens), the public and the business group; and finally, through interviews with young offenders.

One of the key problems facing any evaluation of crime prevention schemes is how, in the light of our knowledge of the problems of relying on officially recorded crime figures, one measures the crime rate. In the end, and despite their limitations, it was decided to utilise the Recorded Crime figures which were both readily available and at least avoided some of the problems associated with the alternatives.

The main notifiable offence categories used in this study are: all offences, burglary and burglary other (including burglary of dwellings); other thefts (including theft from the person, going equipped); shoplifting; theft from a motor vehicle; theft of a motor vehicle; criminal damage; robbery; assault; sexual offences, public order offences (under the Public Order Act 1986) and other offences (including all other notifiable offences) .3 Such categories were felt to both display the type of offences committed in the town centre and indicate possible responsiveness to CCTV intervention.

Utilising this data the task was to determine whether there had been a significant reduction in recorded crime in the surveilled area of the town centre in the before (October 1994 to September 1995) and after (October 1995 to September 1996) periods. To arrive at a conclusion three questions were used to interrogate the recorded crime data: firstly, was there a significant before/after effect; secondly, was this effect significantly distinct from patterns in adjacent areas; and thirdly, was the before/after effect in the surveilled streets explicable by reference to previously established trends?

Though a variety of statistical methods have been used to measure these effects the results are summarised by reference to two main methods:⁴ the first two questions are addressed by the use of a two way analysis of variance and Tukey's method (abbreviated as 2ANOVA(T)). The 2ANOVA test enables an estimate of the significance of difference in two conditions (before/after and regionally) whilst avoiding the problems of undertaking multiple t tests. Tukey's method enables a more detailed post hoc analysis of the above results. The third question is answered using seasonally adjusted, linear regression calculations and 't tests' to compare actual and extrapolated values (abbreviated as line of best fit or LOBF). A significance level of 5% was used throughout.

The assessment of regional distinctiveness or separation from background noise and the measurement of displacement and/or diffusion of benefits effects required the identification of seven distinct areas and the collection of relevant recorded crime data on these areas. Redton consists of three police districts and is located in a broader area known here as Green County, which in turn consists of a further eight police districts. The first area identified consisted of licensed premises within the surveilled streets area This was identified to determine whether the (See Diagram 1). introduction of CCTV was pushing offenders off the town centre streets into licensed premises to commit offences, and also check whether any diffusion of benefits was evident from the outside streets to the inside of such premises. The next area was that of the surveilled streets, including all streets or parts of streets in the vision of the cameras. The third area included the commercial areas of four adjacent 'townships'. These nearby commercial localities, within 15 miles of the main town centre, were chosen to try to identify areas as close to comparable as possible to Redton town centre which might experience the displacement of criminal activity.

Selected residential areas constituted the fourth locality to determine background noise and displacement and diffusion effects. The fifth area Redton Central consisted of the area surrounding the scheme. This was chosen because of the potential for displacement and diffusion effects as well as providing a measure of background noise. The sixth and seventh area consisted of Redton East police district and Redton West police district respectively. This was selected to estimate both displacement and diffusion effects and background noise. Finally the Green County Police Area minus the whole of Redton Police district was used mainly to provide evidence of background noise. For the purposes of data analysis all the areas are





treated independently and each larger area excludes the offences committed in the areas it subsumes. Thus, for example, the total number of recorded offences for the town centre excludes the offences committed in licensed premises and, similarly, the total recorded offences for Redton Central excludes the recorded crime committed in three residential areas, the town centre streets under surveillance and, those committed in licensed premises.

In addition, to check the crime reduction effects in the town centre surveilled streets for previously established trends, police recorded crime data for the specified offence categories in the distinct areas were obtained for a period of 30 months before the start date of the system.

It is widely recognised that recorded crime data have severe limitations, not least because not all offences committed are actually reported or recorded (Mayhew et al. 1994: Jones et al. 1986). Clearly the impact of the CCTV system on crime might also include unreported or unrecorded victimisation. Consequently in measuring the crime reduction effect of the system the recorded crime data are supplemented by victim surveys. These were undertaken on a before/after basis involving four populations; town centre business providers (n= 130 each sweep with an average response rate of 60%); multi-storey car park users (n= 400 each sweep with an average response rate of 44%); school pupils, aged 14-15 years (n = 69 and 153 with an average response rate of 92%); and town centre users aged 16 years and over (n=1000 in each sweep with a 100% response rate). The samples (excluding the business group who were asked about victimisation only) were asked whether they had been a victim of crime in the town centre in specified, comparable, periods and whether they had witnessed any crimes whilst there. Responses to these questions are analysed using a significance of proportion test. A significance level of 5% was used.

A wider consideration of the effects of the system made possible by the use of survey data derived from before/after studies of the business group and the public. Such data is also corroborated by the surveys conducted with key workers including Redton panel magistrates, police officers and traffic wardens. This quantitative data was supplemented by some limited group discussions with young people at Redton Attendance Centre.

Possible displacement and/or diffusion of benefits effects are examined by means of comparing trends in recorded crime data in the different areas of the Redton Police District and neighbouring township with those of the area under surveillance. In addition offences occurring in licenced premises within the town centre area under surveillance have been collected separately to see if there is any evidence of displacement from the town centre streets to the inside of such premises. Displacement or deflection is defined here as the:

... effect of crime control programmes, by which efforts to prevent one kind of crime sometimes lead would-be offenders to commit a different kind of crime or the same kind of crime at a different time or place. (Barr & Pease, 1990: 278)

As Barr and Pease recognise, displacement is generally characterised as having a temporal and spatial dimension, however it may also involve tactical displacement (different method with same offence), target displacement (different target or victim with same offence) and perpetrator displacement (different offender same offence). It is also recognised that attempts to measure displacement effects are very complex and probably not possible by statistical methods alone (Gabor, 1990). The issue of displacement is further complicated by what has been termed 'Diffusion of benefits' (Poyner, 1991: 100) where significant reductions in crime occur in the experimental period but in areas not surveilled by the cameras. In this way the crime reduction potential of CCTV systems may include a halo effect spreading beyond the locale immediately under surveillance to the surrounding area.

Results

Has the Redton CCTV led to a reduction in recorded crime in the surveilled streets?

Area	% Change	2 Anova (T)	LOBF
Town centre licensed premises	-12.1	Not sig	Sig dec
Town centre streets under CCTV	-15.7	Sig dec	Not sig
Redton Central (R1)	-11.5	Sig dec	Sig dec
Residential areas next to town centre	2.5	Not sig	Sig Inc
Commercial area of townships	30.8	Sig inc	Sig inc
Redton East and West (R2 & R3)	0.1	Not sig	Not sig
Remaining 8 districts of Green County	3.3	Not sig	Sig inc

 Table 1

 Changes in recorded crime for all offences by different areas

Table 1 indicates there was a 16% decrease in offences in the before/after period in the town centre area. This downward trend is greater than for the rest of the central district and counter to the trend in the county as a whole and the two other districts (R2 & R3) which both show small increases in crime. However, as the line of best fit test shows, the change is not significantly different from what might have been expected in the town centre area, on the basis of previously established trends. Thus we cannot say with any certainly that the introduction of the CCTV system is responsible for the decrease.

Table 2
Changes in recorded crime for town centre and selected other areas by offence
category

Area	% Change 2 Anova (T)		LOBF
Burglary			
Town Centre streets under CCTV	-25.0 Sig dec		Not sig
Commercial centres of townships	26.1	Sig inc	Sig inc
Redton Central (R1)	-25.6 Sig dec		Sig dec
Other thefts			
Town Centre Streets under CCTV	2.3	2.3 Not sig	
Commercial centres of townships	42.4 Sig inc		Sig inc
Shoplifting			
Town Centre streets under CCTV	-11.3	Not sig	Not sig
Commercial centres of townships	29.5	Sig inc	Sig inc
Theft from motor vehicle			
Town Centre streets under CCTV	49.4	Sig dec	Sig dec
Commercial centres of townships	18.6	Sig inc	Sig Inc
Theft of motor vehicle			
Town Centre streets under CCTV	-44.8	Sig dec	Sig dec
Commercial centres of townships	30.1	Sig inc	Sig inc
Criminal damage			
Town Centre streets under CCTV	-32.0	Sig dec	Sig dec
Commercial centres of townships	51.0	Sig inc	Sig inc
Assault			
Town Centre streets under CCTV	6.8		Not sig
Other offences			
Town Centre streets under CCTV	26.5	Not sig	Sig inc

It is important to realise that CCTV may not impact on all offence types evenly and it is therefore necessary to took at the different categories to see if there are any individual variations. We do this in Table 2 which presents all the town centre results for each offence type and data for the other areas only where significance was achieved in both statistical tests.

The figures for 'burglary' and 'criminal damage' showed a 25% and 32% reduction respectively after the introduction of CCTV. However, this was in line with existing trends as indicated by the non-significance of the LOBF test. Therefore the reduction cannot be attributed to the effect of CCTV

with any degree of certainty. The smaller reduction of 11% for shoplifting was not significant as measured by either test. The figures for 'other thefts' and assault indicate a small rise in recorded offences although neither is significant. Only two offence types, theft of and from motor vehicles, show a decline which can, with any degree of confidence, be attributed to the introduction of CCTV. The reduction of theft from and of motor vehicles, in the town centre streets covered by the cameras, of nearly 50% would seem to be as a direct result of CCTV.

This preliminary conclusion as to the effectiveness of CCTV is corroborated by two other indices of the level of crime. The two sweeps of the victimisation survey enable a comparison of both levels of victimisation and the direct witnessing of crime in the town centre before after the scheme was introduced. Car park users, school pupils and town centre users all reported a statistically significant reduction in witnessing crimes being committed in the town centre. For instances, 24% of town centre users reported witnessing crime before the scheme was introduced as opposed to only 12% afterwards. Victimisation rates also fell for all groups surveyed. For the business community victimisation went down from 89% to 65%. For town centre users, from 5% to 3%. No substantial detraction from this picture was suggested by the data derived from interviews with young offenders.

Having established that there is some evidence for the reductionist effect of CCTV in the town centre area under the direct gaze of the cameras, it is necessary to consider whether other areas have been affected either through displacement or a diffusion of benefits.

Displacement or a diffusion of benefits?

Table 1 indicated that in the area immediately surrounding the camera system (Redton Central) there was an 11% decrease in crime overall. The 2ANOVA(T) tests suggest that this is significant both before/after and regionally. Further, the LOBF test shows that this results is against the expected trend, strongly supporting the view that no displacement has occurred from the town centre to the adjacent vicinities. Indeed, as the reduction is out of step with the trend data this would be supportive of the view that there has been a diffusion of benefits induced by the CCTV system. This is particularly true for burglary (See Table 2) which showed a 25% reduction in the town centre and a 27% reduction in Redton Central. This is the only individual offence category to show any significant change as measured by both the 2ANOVA (T) and LOBF tests. However, we need to be cautious in attributing causation since an alternative explanation of this trend may be that changes in police deployment - with officers previously allocated to the to the town centre being assigned to the outer areas - have led to an increase in preventative patrolling and a strengthening of deterrence. In which case the introduction of CCTV can still be seen as significant but only indirectly as it enables changes in resource prioritisation.

It is now necessary to consider the evidence for wider displacement (see Table 3). As we have seen crime does not appear to have been displaced to the immediate areas surrounding the town centre. However if we cast our gaze further and examine the data for the four outlying townships, we can see a highly consistent pattern of increases in crime. For all offences (see Table 1) there was a 31% increase and this is significant on both tests indicating that the increase was not to be expected on the basis of existing trends. Moreover, there have been significant increases in nearly every type of recorded crime in the townships: 'burglary and burglary other' increased by 26%, "other thefts' by 42%, 'shoplifting' by 30%, 'theft from a motor vehicle' by 19%, 'theft of a motor vehicle' by 30% and 'criminal damage' by 51%. The only offence categories which showed no significant increases were 'assault' and 'other offences'. However, little support for the view that crime had been displaced from the town centre was found in the data obtained from group interviews with young offenders.

Table 3
Summary of possible displacement and diffusion of benefits as measured by
recorded crime data

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Offence category	Evidence of displacement	Evidence of diffusion of benefits	
All offences	To townships	To Redton Central	
Burglary/ burglary other	To townships	To Redton Central	
Other thefts	To townships	None	
Shoplifting	To townships	None	
Theft from motor vehicles	To townships	None	
Theft of motor vehicles	To townships	None	
Criminal damage	To townships	None	
Assault	None	None	
Other offences	None	None	

It is now possible to estimate of the net effect of the system (see Table 4) taking into account the changes in the crime rate across the various localities. To the reductions that occurred in the licensed premises, town centre streets, and Redton Central we therefore have to add the small increase in crime in the residential areas and the very significant increase in the four townships.

In terms of its crime reduction potential, we can say on the basis of officially recorded crime data and corroborated by the results of the victim surveys that the introduction of CCTV has been modestly successful in achieving one of its central aims. When diffusion and displacement are properly taken into account the overall effect of introducing CCTV has been a reduction in recorded crime of six percent.

Area	Before	After	diff.	%Change
Town Centre licensed premises	257	226	-31	-12
Town Centre streets under CCTV	2918	2459	-459	-16
Commerical areas of townships	764	999	235	31
Residential Areas	4847	4966	119	2.4
Redton central district	6909	6115	-794	-11.5
Totals	15695	14765	-930	-6

The net effect of CCTV on recorded crime (all offences) on the town centre
and wider area

Table 4

These results, however, must still be treated with some caution. First, the full impact of CCTV may have been limited by 'teething troubles' with the technology (Skinns 1997). Further, as with any innovation, the organisational infrastructure to exploit its potential is often slow to emerge, however as time progresses and issues are addressed the system may have a greater impact.

Second, the evaluation, relied on only 12 months post implementation crime data. Given that we know that local crime rates fluctuate widely, and apparently randomly, from month to month and year to year, it is premature to reach any definitive judgment.

Third, the central rationale of the quasi-experiment is that other things remain equal. But have they? In the real world it is not possible for evaluators to demand that nothing else changes in the experimental area. And indeed, in Redton there were changes in policing styles particularly in the town centre and in the outlying areas; changes in parking arrangements in the town centre (restricting the number of cars parked on the street); and finally the growth of out of town commercial and entertainment centres.

Fourth, while victim surveys have been used to corroborate the findings from official statistics they are also subject to qualification. Some offences will have been under-reported to the surveys. Respondents may have not restricted themselves to the time period specified when declaring victimisation.

Finally, time restrictions meant dealing with notifiable offences only. Therefore, it is just not known what the impact of the CCTV was on summary offences such as Drunk and Disorderly and Breach of the Peace. It is with these caveats in mind that the results have to be interpreted. But they do not, in my view, undermine the central findings that, in the first year of operation the introduction of CCTV did not lead to a statistically significant reduction in all offences recorded in the area under surveillance. However, it did lead to a significant reduction in theft of and from motor vehicles in this area. Further, the introduction of CCTV did lead to a diffusion of benefits to the area immediately surrounding the system. Whilst there was no evidence to support the view that the cameras merely displaced crime from the streets to inside commercial premises, there was evidence that a significant displacement to the outlying townships occurred.

Conclusion

Rigorous attempts have been made to assess whether the introduction of CCTV has affected the crime rate and we are left with the paradox that it has both decreased and increased crime. But establishing a connection between the introduction of CCTV and a changes in the crime rate does not tell us why that reduction or increase has occurred (see Tilley, this volume). Inevitably this means re-investing evaluation with criminological theory and undertaking a detailed examination of why and how CCTV systems affect crime. This will necessitate a number of in depth studies. First, of offenders to determine the existence of and limits to, 'anticipatory conformity' (Norris and Armstrong, 1997:2). Second, of control room staff to determine how they utilise their panoptic vision and 'total recall'. Third, of police units to explore how they respond to the panoply of information that CCTV systems collect and store. Fourth, of legal personnel such as crown prosecutors, defence lawyers and magistrates, to assess what use and value they place on video evidence. This will necessitate the use of methods which place far greater emphasis on qualitative data.

Notes

- 1. Redton is a pseudonym for the city of Doncaster and Green County for South Yorkshire. At the time of writing the sponsors of this research had not had the chance to formally consider or respond to the findings of the evaluation. Therefore, as a matter of etiquette and good research practice it was decided that this article should anonymise the area under study. The sponsors have now accepted the final report and are happy for its findings to be made publicly available to a wider audience. I thank them.
- 2. Thanks to the Safety in Redton steering group for having the foresight to initiate a full scale evaluation.
- 3. Sexual offences, public order offences and robbery are excluded from specific analysis but included in the overall total as All Offences.
- 4. I wish to acknowledge the role of my statistics 'minders', Professor Ken Pease and my colleague, Bill Wood. This does not imply they are

responsible for the conclusions drawn.

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