NOTE

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A REVIEW OF THE INCREASED USE OF CCTV AND VIDEO-SURVEILLANCE FOR CRIME PREVENTION PURPOSES IN EUROPE

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Abstract:

This report describes the evolution of Closed Circuit Television (CCTV) video surveillance from a simple system involving a camera and a video recorder to the sophisticated digital, multi-camera systems, integrating fully functional cameras capable of tracking a person's movements across public space. Most European cities now have extensive CCTV surveillance in private and semi-public space, particularly in the transport and retail sectors, but many countries are following the UK's example and deploying open street CCTV for the purposes of crime prevention in their major cities. While the growth of open CCTV in the Nordic countries has been limited, in other countries, particularly France, Italy and the Netherlands many cities now have open street CCTV systems.

The regulation of CCTV in Europe is primarily through the application of data protection law. This has been shown to be uneven in its scope and application. Moreover, CCTV sits uneasily with the Data Protection concept of consent. Consent is implied in the public operation of CCTV and data subjects have not given it freely. Moreover, data is being processed without subject's knowledge and this suggests that regulatory requirements need to be strengthened and extended.

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A REVIEW OF THE INCREASED USE OF CCTV AND VIDEO-SURVEILLANCE FOR CRIME PREVENTION PURPOSES IN EUROPE

1) WHAT IS CCTV?

At its simplest, Closed Circuit Television (CCTV) consists of a camera coupled by a cable to a display monitor and it was this type of system in the early days of CCTV monitoring that was popular in many retail establishments as it was an 'affordable, do-it-yourself, self contained system' (Constant and Turnbull 1994:3). These early systems were often extended to connect up to four cameras to the monitor, the images from which could be displayed individually or in a pre-programmed sequence. The cameras were, generally, static and had a fixed focal length. The next innovation was to add a video recorder, enabling the image displayed on the monitor to be recorded on videotape and played back at a later time. To this was added the ability to move the cameras in either the horizontal or vertical plane, usually coupled with the ability to change the focal length of the camera enabling the cameras to zoom. These fully functional cameras are often referred to as Pan, Tilt and Zoom (PTZ) cameras.

The recording of images has also undergone considerable change. The sheer volume of tape required to capture the images of, say, a four-camera system recording in real time could be overwhelming[1]. The solution has typically been to 'multiplex' the monitoring and recording so that images from four or more cameras are displayed on each screen and captured on a single tape. However, it still requires the tapes to be changed every three hours. To overcome this, time-lapse recording is often used, whereby not every frame of video stream is recorded[2]. Both 'multiplexing' and 'time-lapsing' decrease the quality of each individual image but reduce the number of tapes required. This of course may have considerable implications for the ability to use recorded footage to identify individuals or events.

Although many, particularly larger CCTV systems, incorporate the range of more advanced technical capacities, consisting of a number of fully functional PTZ cameras coupled not just to a monitor but to recording device as well, Gill and Spriggs have noted: there is a 'tendency within the criminological literature to discuss CCTV as if it were a single measure, CCTV systems can differ quite markedly' (Gill and Spriggs 2005:1). Indeed, in their survey of CCTV in London, Norris and McCahill found that three quarters of institutions had fixed cameras only, nearly one in ten (8%) had no recording facility, and a third (30%) did not have the capacity to multiplex the images (McCahill and Norris 2003: 60-61). The Urbaneye study of video surveillance in Europe found that the average system operating in publicly accessible space studied was 'technologically rather simple with three fixed cameras, one monitor, sequential switching between the cameras and no linkage to third parties' (Hempel and Topfer 2004:6).

It is not just in technical sophistication that CCTV systems differ. They also differ in their organisational arrangement. In themselves cameras do nothing. If a camera is mounted on a wall, coupled to a monitor and a video recorder we have a CCTV system. But if no one notices the camera, and nobody looks at either the monitor or the tapes, its social and criminological impact is zero. This is particularly relevant because, as many studies have shown, awareness of being under surveillance cannot be assumed. Early evaluations of CCTV in the UK found that up to 60% of people in city centres that had installed CCTV were unaware of its presence, and in Berlin shopping malls with cameras only 40% of shoppers were aware of them (Ditton 2000; Helten and Fischer 2004:9). Nor can it be assumed that the images are being monitored. The typical situation in European countries reported in the Urbaneye study was that: 'Monitoring of images occurs only on an irregular basis by one observer who often has to fulfil other parallel tasks' (Hempel and Topfer 2004:7). For a CCTV camera to have an effect, at the minimum, someone needs to be conscious of it and alter, or at least consider altering their behaviour because of its presence or believe that it will lead someone else to do the same.

It is therefore essential to recognise that CCTV is not merely a technical system – it is a socio-technical system. To understand its impact, as a crime prevention strategy, it is necessary to

understand that it is located in a highly varied organisational environment, and this variation will have a significant impact as to how a system is used. Some systems have permanently staffed control rooms, in which a team of operators monitors the images from the system on a 24-hour basis, and can actively scan and track the population through the use of PTZ cameras. Other systems are unmonitored, and the tapes only reviewed if incidents come to light. In some systems control rooms are staffed by police officers, are directly linked to the command and control systems of their force and can order other police officers to attend incidents. In other systems civilian, local authority staff, or private security officials monitor the cameras and, although they can relay pictures to the command and control room of their local police, have no power to determine what the police response should be[3].

2) CCTV AND CRIME PREVENTION

As Weiss (1987) has argued there are three main types of crime prevention activity: primary, secondary and tertiary.

Primary crime prevention is focussed on the offence rather than the offender, and is often associated with situational crime prevention strategies which focus on the immediate and localised context of the offence.

Secondary crime prevention is concerned with offenders rather than offences and seeks, by intervening in the lives of those who are most at risk of offending, to prevent them committing crimes in the future.

Tertiary crime prevention strategies focus on reducing or preventing the criminality of already known offenders, and this will typically involve forms of rehabilitation programmes with convicted criminals.

As a crime prevention strategy CTTV has generally found its theoretical justification from situational crime prevention and, as such, is neither concerned with the wider social structural causes of crime nor interventions aimed at fundamentally altering the individual. Indeed, as disillusion with both social welfare approaches and the efficacy of criminal justice measures in prevention have prevailed, the appeal of situational crime prevention has increased. The appeal comes not just from its supposed efficacy, but also in its de-politicisation of the problem of crime. As Ron Clarke, one of the leading exponents of situational crime prevention has noted, it relies 'not on improving society or its institutions, but simply on reducing opportunities for crime' (Clarke 1992:4).

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Situational crime theorists, drawing on rational choice theory, see crime as being committed by individuals who, having weighed up the cost of benefits of crime, choose crime. Central to this is an evaluation by the potential offender of two questions: *Will I succeed in carrying out the crime? If I do succeed, will I get caught?*

Situational crime prevention strategies attempt to decrease the potential offenders' belief that they are likely to be successful and increase their belief that they are likely to be caught. Situational strategies do not therefore try to change the basic motivation of the offender but instead try to increase the costs and risks associated with committing a particular crime at a particular time. They are concerned with opportunity reduction, through target hardening and removal, and increasing the chance of detection. Increased surveillance is often at the heart of situational crime prevention measures and the introduction of CCTV seeks to influence the decision-making of the 'rational' offender who, on calculating the risks, will choose not to commit crime under the gaze of the cameras because there will be a strong possibility of being caught. It is primarily a strategy based on deterrence, but even if it does not deter should increase the chances that an offender will be caught. If an offender is caught this may also prevent future crime in three ways through:

- incapacitation: if the offender, is punished by imprisonment, they will be prevented from committing similar types of crime;

- specific deterrence: since the rational individual who has been caught once, will probably reassess likelihood of capture and therefore refrain from committing the act again;
- general deterrence: others who having seen that a person has been caught and punished for the offence calculate that the potential costs offending out weigh the benefits.

Although it might seem a relatively straightforward matter to test such a theory, the reality is rather different. In trying to answer the question 'Does CCTV Prevent Crime?', professional evaluators have to grapple with five major issues before they can be confident that they have an answer.

First, in trying to measure CCTV's preventative capabilities, evaluators have usually relied on police derived statistics of recorded crime but, as criminologists are acutely aware, the relationships between officially recorded crime data and the underlying or 'true' rate of crime is highly problematic. As the most recent British Crime Survey notes, over half of all crimes uncovered by the survey were not reported to the police and not all crimes reported to the police are recorded by them (Kershaw et al. 2008:4). Similar problems have been noted at the European level (Killas et al. 2003:21ff). The importance of this is that, as the rates of reporting and recording tend to fluctuate year on year, the official recorded crime statistics tend to be an unreliable guide to the changes in the underlying rates of criminal victimisation. As Norris and Coleman have observed, evaluators using the official crime figures during the early 1990s 'would have shown a reduction in crime of 20%, merely because of changes in reporting and recording practices. (…) In other words, the real rate of crime could have remained the same, CCTV having no impact, and yet the evaluators would have probably claimed that CCTV was an unqualified success in reducing crime' (Coleman and Norris 1999:ch6). This is particularly important because, in general, the installation of CCTV is hypothesised to lead to a reduction in crime. However, if the cameras allow the police to see and find evidence of crimes which would have previously gone unreported, such as drug dealing, drunk driving and fights between young men, then rather than a reduction in recorded crime for these offence types, an increase may result, although the underlying rate of crime will have remained unchanged. To overcome these problems Farrington and Painter have argued that: ideally, evaluators should use both officially recorded statistics in conjunction with victim surveys and self reported measures of reporting (Farrington and Painter 2003:74). But in reality this rarely happens.

Second, one of the key problems in assessing any crime prevention initiative is that, while it may appear that a number of crimes have been prevented, in fact they may have merely been *displaced* to another area or committed at other times or in different ways. Criminologists have six types of displacement associated with crime prevention initiatives: temporal, tactical, target, functional, geographical and perpetrator (Barr and Pease 1990; Gabor 1978).

In the case of CCTV it is predominantly functional and geographical displacement that is most likely to occur and a number of studies have found strong evidence of displacement taking place. Skinns' evaluation of the Doncaster CCTV system, for example, found clear evidence of geographical displacement, for, although there was a reduction in crime in the town centre streets of 16%, this was offset by the increase in crime in the surrounding townships by 31%. When these were taken together the overall reduction in crime was only 6% (Skinns 1998:185). Similarly, in Birmingham, the evaluation by Brown (1995) produced strong evidence for geographical displacement for two different offence types, 'street robbery and theft from the person' and 'theft from a motor vehicle'. In the case of the former, Brown concluded that:

> Since the installation of cameras, the incidence of these types of offences in areas surrounding zone A has increased sharply, and by the end of the study period, the number of offences per month is over three times as high as when the cameras were installed (Brown, 1995:35).

In Sutton the installation of the cameras led to a marked change in the pattern of thefts in the town centre, so that while thefts on streets declined by 7%, thefts inside commercial premises increased by 30% (Sarno 1996). This would suggest that there is evidence for geographic, tactical and target displacement as it would appear that offenders switched locations, changed targets from pedestrians to in-store customers, and switched from purse-snatching (mugging) to stealth thefts of handbags.

Third, evaluators face the problem of generalisation and have to be aware that CCTV is not a single phenomenon. It comes in many shapes and sizes, is deployed in a variety of contexts, operates in very different institutional settings, and has varying degrees of technical sophistication. This means that findings based in one context may have little relevancy in another. Thus, for instance, the finding that CCTV acts as a deterrent in a car-park, will not mean that it would have the same effect in a town centre.

Fourth, evaluators have to be aware of changes to the area under surveillance. In the real world, it is likely that while the evaluation of CCTV is being undertaken other changes are occurring to an area. As Skinns notes in relation to Doncaster:

> In the real world it is not possible for evaluators to demand that nothing else changes in the experimental area. And indeed, in [Doncaster] 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 (Skinns 1998:185).

Fifth, evaluators have to be sensitive to the problem of reactivity. A problem for all evaluators is the extent to which the very act of evaluation itself influences the results of the study. This is generally referred to as *reactivity* and can be defined as 'any time participants suspect or know they are being observed, experimented with, or tested there is a chance that their behaviour may be modified by the measuring instrument' (Smith 1981:335). In Oslo, CCTV was introduced while simultaneously increasing the level of police patrol. The presence of the extra officers patrolling the town centre may well have had a significant deterrent effect on crime in its own right, thus making any claims about the success of the CCTV system impossible to disentangle from the effect of the increased police presence (Winge and Knuttsson 2003).

It is for these reasons that criminologists and professional evaluators treat many of the claims made by those promoting CCTV systems with caution.

3) THE DEVELOPMENT OF CCTV

3.1) The Development of CCTV in the UK

The history of the growth of CCTV surveillance in the UK has been well documented elsewhere[4] and there is no space go into much detail here. Although the numbers of privately owned CCTV systems in the commercial and retail sectors grew steadily from the mid 1960s, by 1991 there were no more than ten cities with open street systems in operation. What characterised these systems was that they were small scale, locally funded and set up as the result of individual entrepreneurship, often on the part of a local police officer (Ditton and Short 1998).

In 1993, two ten-year old boys were caught on CCTV in a shopping mall abducting a toddler whom they subsequently killed. Amidst high levels of public anxiety about rising crime, CCTV had been placed in the national spotlight[5] and, in reaction, the government announced a 'City Challenge Competition' to allocate £2 million of central government money for open street CCTV: 480 bids were received, and 106 schemes funded from an increased allocation of five million pounds (Norris and Armstrong 1999:37-8). The competition was repeated between 1995 and 1998 and in total they secured £85 million for the capital funding of 580 CCTV systems. By the mid 1990s CCTV dominated the Government's crime prevention programme, accounting for over three-quarters of its budget (Welsh and Farrington 2004:500).

In 1999, the new Labour administration, as part of its ambitious crime reduction programme, set aside £153 million to support the expansion of CCTV. The two rounds of the competition received 1550 bids and around 450 of these were funded (Norris, Wood and McCahill 2004).

Given that there was also substantial government investment in the CCTV surveillance of schools, hospitals and transport facilities, it is not unreasonable to estimate that between 1995 and 2005 over £500 million of central and local government funds were allocated to CCTV (See McCahill and Norris 2003). In addition, during the same period it was estimated that in total around £4.5 billion of private funds were spent on the installation of CCTV and maintenance of CCTV systems in the UK, and this excludes the monitoring costs associated with these systems (Norris, Wood and McCahill 2004).

How many cameras or systems this translates to is impossible to accurately measure, although in 1999 it was estimated that in an urban environment, on a busy day, a person could have their image captured by over 300 cameras on thirty separate CCTV systems (Norris and Armstrong 1999:ch3). Armitage (2002) suggests that there are 500, publicly funded, open street systems deploying some 40,000 cameras. More generally, Norris and McCahill 'guestimated' on the basis of a survey in one London borough that there may be as many as 4.2 million publicly and privately operated cameras in the UK or 1 for every 14 of the population (McCahill and Norris 2003).

3.2) Development of CCTV outside Europe

In the USA, the first national survey of CCTV carried out in 1997, found only 13 police departments using CCTV to monitor public space and by 2001 this had increased to 25 (Nieto et al. 2002: 14). However, since 2001, and the terrorist attack on the World Trade Centre, billions of dollars of federal money have become available for domestic security projects, and this has fuelled a massive expansion of public area CCTV. Major cities such as Baltimore, Chicago, New Orleans, Philadelphia, San Francisco and Washington now boast extensive systems, for instance:

> Chicago has 2,250 cameras in its "Homeland Security Grid," which DHS helped finance with a $5.1 million grant, and will be adding cameras in the next two years with funds from another $48 million grant from Homeland Security. By 2006, Chicago will have a 900-mile fiber-optic grid. The cameras are linked to a $43-million operations center constantly monitored by police officers (EPIC: 2005).

In California alone 37 out of 131 jurisdictions now operate public space video surveillance programmes (Scholosberg and Ozer 2007:2). In Canada, in 2009, the SCAN study reported that 30 cities had installed, or were considering installing public pace CCTV systems (SCAN 2009) Similarly, in Australia, Wells reported that over 30 mainland cities had installed public area CCTV system (Wells et al. 2006:2).

3.3) The Development of CCTV in Mainland Europe

In Europe, the proliferation of cameras in public and semi-public space has been well documented by the Urbaneye Project (Hempel and Topfer 2004). In their study of six European capitals they found that CCTV was common in publicly accessible space such as shops, banks, restaurants, bars, and transport termini. Across their sample cities, 29% of such publicly accessible institutions used some form of video surveillance although the proliferation was uneven. For instance, in London 40% of publicly accessible spaces were monitored by surveillance cameras, compared with only 18% in Vienna (Hempel and Topfer 2004:27-34).

In terms of open street, publicly operated, crime reduction systems, Urbaneye data shows that in 2003 Denmark and Austria had no open systems, there was only one in Norway (consisting of six cameras), at least 14 systems in Budapest alone and 15 in Germany. In the UK there were over 500 systems. Thus, while in the UK there were around 40,000 open street CCTV cameras monitoring public space there were probably fewer than 1000 across the other European countries included in the survey (Hempel and Topfer 2004:27-34).

In many European countries not included in the Urbaneye survey, there was also sustained growth in open street CCTV before 2004. In France, after the laws were relaxed governing public space surveillance in 1995, there was a rapid deployment of CCTV in public space: 'between 1997 and 1999 more than 200 French cities received the approval for the installation of CCTV in high risk locations

and 259 for the protection of public buildings such as town halls, public libraries, schools and museums' (Hempel and Topfer 2002:10). Similarly, in the Netherlands the first cameras were used in public space in 1997, but by 2003 more than 80 of the country's 550 municipalities were using CCTV in public places (Flight et al. 2003:93). In the Republic of Ireland, the first CCTV system was installed in Dublin in the mid 1990s, and expanded in 1997. In 2004 the Minster for Justice announced a major expansion of open street CCTV throughout the country with plans to extend to 21 different areas (PDP 2004). In Italy, 'in response to rising anxieties about crime, the Ministry of the Interior has installed CCTV in the 'most sensitive areas' of 50 Italian cities and in the City of Milan, there are now over 600 hundred publicly funded cameras (Calabria 2003; Fonio 2007:6).

While some countries, particularly the Nordic countries of Norway, Denmark, Sweden and Finland, had been reluctant to install wide spread open street CCTV systems for crime prevention purposes, this does not mean that they have not embraced CCTV in other settings. For instance, in 2002, although there was only one open street system in Norway and no system in Denmark, a survey of 440 publicly accessible locations in Oslo and Copenhagen found that 32% had CCTV in Copenhagen and 38% had CCTV in Oslo (Wiecek and Saetnan 2002). Similarly, in Stockholm, in 2000, although there was no public CCTV system, there were an estimated 11,500 CCTV cameras in the city, in a variety of settings that came under the authority of the Stockholm regulatory board (Gras: 2004). In 2004, in the Finnish city of Tampere, half of the city's twenty schools installed CCTV as a crime prevention measure (*Helsingin Sanomat* 2004).

As the Director-General of the Swedish National Council for Crime Prevention commented in the case of Sweden, which would be true of Scandinavia in general:

> The use of CCTV surveillance for the purposes of crime prevention has become increasingly common on public transport, in taxis and in schools. It has also become common to use CCTV surveillance in bank entrances and near cash point machines. There are, however, still few examples of the use of CCTV for crime prevention purposes in larger public spaces where large number or people gather and move around such as on streets, or in parks (Foreword to Welsh and Farrington 2007:5).

Since 2004, the spread of publicly funded CCTV across the European mainland has gathered pace. In the wake of the Madrid and London terrorist bombings, there has been a massive expansion of CCTV deployed in public transport infrastructures, particularly airports, railways and metro systems, of traffic monitoring, and in educational establishments.

In France, in 2007, it was announced that the government was planning to increase its estimated 340,000 CCTV cameras threefold and, in particular, to expand the number on the Paris metro to 6,500 (Reuters 2007). Since 2004, Germany has doubled the number of cites with CCTV from 15 to 30 (Topfer 2008), the Republic of Ireland has increased the number of cities with either police or community run CCTV system from 21 to 49 (DJELR 2007). Despite the long-standing reluctance to embrace public area CCTV in Nordic countries, Finland introduced a major system in Helsinki in 2006 (*Helsingin Sanomat* 2006) and in Denmark, Copenhagen introduced a 19 camera system in 2008 (*IceNews* 2008).

In eastern Europe, The Polish capital of Warsaw launched a major city wide system with 515 cameras in 2007[6]. In the Czech republic Prague's systems has been expanded to 400 cameras, (EDRI 2008) and in Croatia, Zagreb announced a new 225 cameras city wide system to be introduced in 2009 (Croatian Times 2009).

By 2009, Austria, Bulgaria, Croatia, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Lithuania, Netherlands, Norway, Poland, Portugal, Spain, Sweden, Switzerland, and the UK all boasted CCTV systems operating in public space for the purposes of crime prevention[7].

4) PUBLIC OPINION AND CCTV

The introduction of CCTV to city streets in the United Kingdom has enjoyed widespread public support, with successive surveys finding positive support for the deployment of CCTV cameras running at between 60% and 90%[8]. Similarly, the majority of citizens do not appear unduly concerned about the civil liberty implications of CCTV cameras (Bennett and Gelsthorpe 1996:86; Ditton 2000:700) and over three quarters of respondents believe that CCTV on their streets would make people feel safer and reduce their fear of crime[9].

What is true of the UK is largely true in Europe and the rest of the world. In a recent review of 11 public opinion surveys from around the world, it was concluded:

> There is overwhelmingly strong support for video surveillance, whatever the stated goal. Variations exist between the goals of having the camera systems, with terrorism raising the most scepticism by respondents, but in all cases there is indisputable support in favour of the cameras (SCAN 2009:42).

Similarly the Urbaneye survey of public attitudes towards CCTV in five European capital cities concluded:

> Confirming previous studies that have surveyed public opinion on CCTV in Britain, German, Finland, Denmark or Switzerland, we found a majority of respondents being supportive of CCTV in all five capital cities. However, national differences in the acceptance of CCTV are significant with Britons being most supportive and Austrians and Germans being rather sceptical. Moreover, people draw a clear line where they accept CCTV. Most people support CCTV in banks or transportation facilities while oppose it in intimate spaces such as changing rooms. In international comparisons, the most different attitudes were found towards open street CCTV which is seen as a 'good thing' by 90% of people in London and by only 22% in Vienna (Hempel and Topfer 2004:42).

Perhaps the most striking finding from the Urbaneye study was that, whereas over two-thirds of Londoners said they would 'welcome CCTV on the street where they lived', in all the other European capitals less than one third would support such an initiative.

If public opinion reveals a broad level of public support, there are, however, some important qualifications to be made. Where people are asked about their support in the context of a survey on civil liberties rather crime control, they are much less supportive (Ditton 1998). A number of surveys have indicated that a sizable minority, between one-quarter and one-third, thought that CCTV would erode civil liberties and up to a third of people stated they disliked being watched[10]. The findings are also stratified by age and gender, with younger people and males being less supportive[11].

Finally, although support for CCTV is generally high, survey respondents consistently place other crime prevention measures such as increased levels of police patrol or improved street lighting above CCTV in their list of priorities (Bennett and Gelsthorpe 1996) and as the Urbaneye survey found that 39% of European citizens interviewed believed that cameras were a 'poor substitute for police officers' (Hempel and Topfer 2004:46).

5) THE EVALUATION OF CCTV

In Britain, in the early 1990s, the mass expansion of state funded CCTV occurred before any systematic evaluation as to its effectiveness for preventing and detecting crime was carried out (Norris et al. 2004). The absence of evaluation seems not just to be a British malady. As Nieto et al. noted in 2002 regarding the USA:

> In general, we find that there have been very few studies of the effectiveness of the CCTV surveillance systems. Crime related statistical data are not required for use of federal grant funds, nor is there a requirement that all grantees report incidents of crime occurring where the

> cameras are located. Despite their increasing use, there is limited evidence that CCTV camera surveillance programs are successful crime-prevention tools (Neito et al. 2002:13).

In Australia the story was similar, as Wilson and Sutton reported in 2003: 'To date only two evaluations of open-street CCTV are publicly available in Australia … However, in both cases insufficient pre-installation data was available to assess the impact of CCTV on offending' (Wilson and Sutton 2003: 2).

In the absence of systematic evaluation in the UK before widespread public funding was made available for CCTV, politicians relied on the self-interested claims of practitioners and system promoters to justify its crime reduction potential. While a number of small-scale evaluations had been conducted during the 1990s, the results of these studies came up with mixed and often contradictory findings.[12] The first major evaluation, funded by the Scottish Office, was of the effectiveness of CCTV in two Scottish cities and this also produced contradictory findings. As Ditton and Short reported:

> Put at its starkest, after the installation of open-street CCTV in Airdrie, recorded crimes and offences fell to 79% of their previous recorded levels, and detections rose from 50 to 58%. Conversely after the installation of open street CCTV in Glasgow, recorded crimes and offences rose to 109% of their previously recorded levels, and detections fell from 64% to 60% (Ditton and Short 1999: 212).

A similar pattern emerges when we review the most recent key evaluations from around the world.

In Los Angeles the evaluators reported that neither camera systems they studied had 'any significant effect in reducing violent or property crime rates within the target areas' (Cameron et al. 2007:29). In Philadelphia, Ratcliffe and Taniguchi reported overall a 13% reduction in crime but this was largely made up of a reduction in less serious disorder crime. For serious crime there was no statistically significant reduction. They go on to note that:

> The introduction of CCTV was associated with considerably different inputs on each crime site. At half of the sites crime did not reduce in the target area (Ratcliffe and Taniguchi 2008:12).

In San Francisco, King *et al.* found that there was a statistically significant drop in property crime of 13%. However, the rationale and justification for the system had been the reduction in violent crime: they found no evidence that cameras had an impact on violent crime (King et al. 2008:11).

The Australian Research Council funded evaluation of the impact of CCTV in two Gold Coast suburbs and the Queensland City Train Network concluded that overall:

> The effectiveness of CCTV as a crime prevention measure is questionable. From this research it appears CCTV is effective at detecting violent crime and/or may result in increased reporting as opposed to preventing any type of crime (Wells et al. 2006:iii).

The UK Home Office funded evaluation of 14 CCTV systems, one of the largest and most systematic ever conducted found:

> 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 have been due to chance alone and all could in fact represent either a chance variation or confounding factors (Gill and Spriggs 2005:43).

The findings of individual evaluation studies have, over the last decade, been systematically reviewed by a number of researchers for and on behalf of national or regional government agencies. In 2003, Deisman's Review for the Royal Canadian Mounted Police concluded:

> The review shows that the effects of CCTV on crime are both quite variable and fairly unpredictable. Deterrence effects of CCTV are not constant over time and they can vary over crime categories. For example, CCTV systems appear to have the least effect upon public

> disorder order offences. The magnitude of deterrence effects appears to depend on location: the greatest effect appears to occur in car parks (Deisman 2003:2).

Ratcliffe's 2006 review of 21 evaluation studies, as part of his *Problem Orientated Guides for Police* funded by the US Department of Justice concluded that:

> CCTV is more effective at combating property offences than violent offences, … appears to work best in small, well-defined areas (…and…) achieving statistically significant reductions in crime can be difficult (Ratcliffe 2006:19).

Welsh and Farrington's 2003 UK Home Office funded meta-analysis of 22 British and American evaluations that met their minimum requirements of scientific adequacy, concluded:

> that CCTV had a significant desirable effect on crime, although the overall reduction in crime was a rather small 4%' (Walsh and Farrington 2003:42).

While this may be seen as a partial endorsement of CCTV, it is important to note that only half of the studies included showed a positive effect, with the other half showing either negative or no effects. Moreover, CCTV had little or no effect on crime in public transport and city centre settings. The only statistically significant results were to be found in car parks. (Welsh and Farrington 2003:42-43).

In 2007, Welsh and Farrington conducted an update of their meta-evaluation adding another 22 evaluations to the list and concluded:

> The results suggest that CCTV caused a small (16%) but significant decrease in crime in experimental areas compared with controlled areas. However, this overall result was largely driven by the effectiveness of CCTV Schemes in car parks, which caused a 51% decrease in crime. Schemes in most other settings had small and non-significant effects on crime: a 7% decrease in city and town centers and in public housing. (Welsh and Farrington 2007:8).

Similarly, in 2008 Cameron et al., using a similar methodology, and drawing on a slightly different selection of studies reported:

> Of the 44 evaluations included in our analysis, 43% reported the cameras had no or an uncertain effect on reducing crime, 41% percent reported statistically significant reduction in crime, and 15.9% reported some undesirable effect … Within the 19 evaluations that found no statistically significant effect on crime or were uncertain as to CCTV's effect, 36.8% (7) reported a reduction in crime, 52.6 percent (10) reported an increase in crime, and 10,5% (2) reported no change or a very small change in crime (Cameron et al. 2008:4).

5.1) Detecting crime and gathering evidence

Despite that fact that CCTV is often cited as being a major tool in assisting the police in the investigation of crime, as the UK's Home Office's 2007 National CCTV Strategy notes:

> Little formal research has been undertaken to establish the impact CCTV has on the investigation of crime. Those examining the issue therefore have to rely on limited research and anecdotal evidence provided by operational police officers (Home Office 2007:24).

However, there is some evidence that can be derived from various studies. The evaluations of CCTV in Scotland found that, while the introduction of CCTV in Airdrie led to an increase in the clear up rate[13] from 50% to 60 %, in Glasgow it fell from 64% to 60% (Ditton and Short 1999). In their Australian evaluation Wells et al. found that in the course of 100 hours of observation of the control rooms 181 incidents were surveilled by the camera operators which led to 51 arrests. However, as they go on to note:

> Although it was anticipated that most surveillance incidents would be initiated by the camera operators themselves, it was determined that approximately half resulted from the police

> requesting specific surveillance of a person or incident. The observational study also suggests 7 of the 51 arrests were the direct result of the camera network with the remaining arrests attributable to police communication and simultaneous detection (Wells et al. 2006:ii).

In the San Francisco evaluation it was found:

> As of August 2008 the SFPD had requisitioned CSC footage 120 times, or approximately 3 times per month over the last 3 years. Since the program began in 2005, CSC footage had assisted the SFPD in charging a suspect with a crime in six cases (King et al. 2008:13).

The relative ineffectiveness of CCTV's contribution to prosecutions was confirmed by a senior Metropolitan Police Officer who described the contribution of CCTV to cutting crime as 'an utter fiasco' since, in London, only three percent of street robberies, a crime that you would expect CCTV footage to be particularly useful investigative tool, had been solved using CCTV footage (BBC News 2008).

5.2) CCTV and fear of crime

It is often claimed that regardless of its preventative effect or contribution to criminal arrest and prosecution, the presence of CCTV provides reassurance to the public and makes them less fearful about becoming a victim of crime. As we have seen, a number of attitude surveys have shown that people report that they would feel safer if CCTV were installed. However, while the public believe that, in general, people will feel safer when the cameras are introduced, when people are asked whether it will make them feel personally safer far fewer think it would.[14] It has also been found that knowledge of the camera watching over them had no effect on respondent's levels of fear of crime, seemingly repudiating the idea that CCTV can be justified as a measure to reduce the fear of crime[15]. The 2005 British Home Office evaluation reported:

> 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 that those who were unaware of them (Gill and Spriggs 2005:60).

This finding is supported by studies that have attempted to explore people's actual behaviour rather than just their attitudes. These show that CCTV has a limited impact in getting people to use their town centres and high streets more[16]. As the Home Office 2005 evaluation found:

> 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 (Gill and Spriggs 2005:54-55).

6) THE FUTURE OF CCTV

One of the key drivers in contemporary CCTV applications is cost reduction. Increasingly the solution has been to centralise the control room functions, considerably reducing the monitoring cost of each individual system but simultaneously reducing their connections to local communities.[17] In major cities this has allowed for the creation of state-of-the-art, ergonomically designed, control rooms and for the general professionalization[18] of practice creating control rooms which, according to one journalist, increasingly resemble the 'Bridge of the Starship Enterprise.[19]

In Sheffield, in the UK, for example, the Sheffield Wide Image Switching System, or SWISS, has a control room staffed 24 hours a day and can now control over 150 publicly funded cameras covering the city centre streets. However SWISS has also integrated other public and privately owned camera systems including those of an out-of-town shopping mall, tram system and university and its cameras are linked to Automatic Number Plate Recognition (ANPR) software that checks vehicles suspected of involvement in criminal activity (Sheffield City Council 2009). The SWISS system has also been

involved in a pilot study which allows the still images from any of the SWISS cameras to be broadcast to police officers on the street via a hand-held computer (Jane's 2003).

In the UK, and increasingly mirrored in cities across Europe, large city centre systems have been created consisting of between 100 and 500 cameras. They have a mixture of static and fully functional PTZ cameras, enabling a person to be tracked as they move through the central area. The images from all the cameras are recorded, but often in time-lapse mode. However key cameras and any that the operators specifically nominate will record in real time and at high definition. The control rooms are staffed 24 hours per day with up to six operators watching the screens at any one time. They have direct communication links to police command and control centres where live footage can be relayed and viewed and where decisions are taken as to appropriate deployment. Many systems are also integrated into 'shop watch schemes' providing a radio link with private security guards and store detectives and they are increasingly digital.

6.1) Digitalisation

Traditional CCTV systems were analogue, tape-based systems (Constant 2001:25). Increasingly as older systems are updated they are incorporating digital recording and storage facilitates by bolting them on to their existing analogue systems, and many new systems are entirely digital.[20]

Digitalisation is important for a number of reasons. First, it enables the images captured from cameras to be transferred to a computer. Potentially this makes the storage, retrieval and transfer of images easier as they are recorded on to the computer's hard drive or DVD. Second, it allows for the analysis of those images to be processed by 'intelligent' algorithms to extract information from the image and to easily integrate both the video signal and information contained in it with other computer applications such as a GIS systems. Third, digitalisation allows for the distribution of the images over the Internet, using IP protocols and this appears to be the next evolutionary step, in the full migration from analogue to digital systems. In effect this means CCTV images can be distributed, almost instantaneously, to anywhere in the world, and to a variety of devices such as mobile phones or hand held computers (Petrook 2005).

6.2) Face and vehicle recognition

Although there have been a number of high profile media stories about the installation of facial recognition software into Britain and the US[21] after September 11th and some very ambitious performance claims about the abilities of such systems[22], the reality remains that facial recognition technology has not advanced to a point where a person's face can be routinely and accurately identified as they move though a city street.[23] In their comprehensive review of the effectiveness and policy implications of Facial Recognition Technology (FTR)[24], Introna and Nissenbaum, concluded:

> There are good reasons to believe that it will still be some time before FRT will be able to identify "a face in the crowd" (in uncontrolled environments) with any reasonable level of accuracy and consistency. It might be that this is ultimately an unattainable goal, especially for larger populations (2009:70).

However the technology is maturing, and is finding successful application in more limited domains such as access control. The most recent, American government sponsored vendor test, found significant improvement in the performance of a number of systems (Phillips et al. 2007) and the UK Government is actively piloting the possibility of a national database of photographs for use with facial recognition systems (Ranger 2006).

If the face has remained an elusive target for those seeking the holy grail of identification, the motor car has provided a far more amenable route. Once images are digitised they are capable of being algorithmically processed to extract the information from the licence place to retrieve the individual's record from the register of car owners. Once a name is established it can potentially be linked to the entire range of databases that police have access to.

Australia, New Zealand, France and Canada have all been using or piloting the ANPR technology (Watson and Walsh 2008). For instance, in Quebec, the traffic authorities have been piloting a system that reads licence plates and compares them with outstanding fine and prohibited driver databases (Traffic Technology International 2008).

In the UK, one of the first major applications of ANPR was launched in 1996, as part of the city of London's defences against the IRA terrorist threat: all vehicles entering the City of London had their licence plates checked against police databases. In 2003 the Home Office drew up plans to extend this for more routine crime prevention purposes, and launched a national pilot scheme which:

> involved 300 officers operating as part of 50 intercept teams across 23 police forces (…) in the first nine months 22.8 million vehicle registration marks were read (…) of which 900,000 (4%) were of immediate interest to the police. Within the resources available, the intercept teams stopped 136,857 vehicles (PA Consulting 2004).

These stops led to the arrest of 10,546 people for offences ranging from burglary to drug related offence, and 2611 persons for driving offences. In other words, seventy-five percent of the arrests were for neither traffic nor driving related offences.

In the light of the pilot, in March 2005 the Association of Chief Police Officers launched their national strategy, entitled 'Denying criminals the Use of the Roads' (ACPO 2005). Their vision: to create a national network of licence plate readers 'utilising police, local authority, Highways Agency, other partner and commercial sector cameras' (ACPO 2005:6) and this will include integrating the existing town centres and high street cameras where they can be made ANPR compatible (ACPO 2005:18).

The significance of ANPR is that it integrates a surveillance device, the camera, with the police national computer and all of its associated databases. Like open street CCTV it targets all under its gaze but greatly enhances its surveillance capacity as it creates a major investigative resource of a vehicle's movements and locations, regardless of the status of the driver.

As Watson and Walsh, in their Australian review of ANPR argue, the British Police have exploited the system's potential for:

> data mining as a means of building a picture of a person's (i.e. offender's) habits and lifestyle. The risk in this approach, however, is that profiles of non-offenders can also be derived from ANPR databases using data mining techniques (2008:8).

The Australian Privacy Commissioner noted the British system:

> Would soon be collecting and storing around 35 million images per day and stated that they planned to keep this data for two years. Further, the ANPR data that is collected is not only mined and matched with a number of databases, but also then stored for future use. The Office would caution against establishing infrastructure that could be used in such an expansive and invasive manner (Office of the Privacy Commissioner 2008:6-7).

6.3) Behavioural recognition

Researchers at Kings College London have developed a software package that uses CCTV to automatically monitor crowd flows, congestion rates and abnormal behaviour. One of their algorithms models the behaviour of suicidal commuters and uses it to predict if someone is a potential suicide risk and about to throw themselves under a train. The software's

> ability to spot people contemplating suicide stems from the finding made in analysing previous cases, that these individuals behave in a characteristic way. They tend to wait for at least ten minutes on the platform, missing trains, before taking their last few tragic steps. Velastin's deceptively simple solution is to identify patches of pixels that are not present on the empty

> platform and which stay unchanged between trains, once travellers alighting at the station have left (Graham-Rowe 1999:25).

At present there are few algorithms and these are of limited capacity to accurately identify deviant behaviour or predict its occurrence. But computer vision scientists are actively trying to develop and perfect such algorithms[25] and some have been deployed in operational settings. For instance the Passenger Transport authorities in Rome, London, Paris, Brussels, Milan and Prague, have all participated in trials of an Intelligent Pedestrian Surveillance System which alerts operators to suspect packages, abnormal movements by passengers and unusual behaviour (EST no date). However, as Dee and Velastin note:

> Much remains to be done in the area of behaviour analysis and modelling, building systems that could make sense of human behaviour especially in unstructured or changing environments such as public places. (Dee and Velastin 2008:329-342).

7) SOCIAL IMPACTS OF CCTV: DISCRIMINATION AND SOCIAL EXCLUSION

As Norris and Armstrong have shown in their study of the operation of three CCTV control rooms, selection for targeted surveillance is, at the outset, differentiated by the classic sociological variables of age, race, and gender. Nine out of ten target surveillances were on men (93%), four out of ten on teenagers (39%) and three out of ten on black people (32%) Moreover, while displays of 'suspicious behaviour' played a part in determining who was surveilled, it was not the most important reason. From their study 36% of people who were subject to prolonged targeting, were surveilled for 'no obvious reason'. Only one quarter (24%) of people were targeted for surveillance because of their behaviour but 34% of people were surveilled merely on the basis of belonging to a particular social or sub-cultural group. Unwarranted suspicion did not fall equally on all social groups. Two thirds (65%) of teenagers were surveilled for no obvious reason compared with only one in five (21%) of those aged over thirty. Similarly black people were twice as likely (68%) to be surveilled for 'no obvious reason' than whites (35%) and men three times (47%) more likely than women (16%). In short, the young, the male and the black were systematically and disproportionately targeted, not because of their involvement in crime or disorder, but for 'no obvious reason' and on the basis of categorical suspicion alone.[26] As Norris and Armstrong concluded:

> As this differentiation is not based on objective behavioural and individualised criteria, but merely on being categorised as part of a particular social group such practices are discriminatory (Norris and Armstrong 1999:150).

These British finding have been confirmed by studies in other parts of Europe.

In the Netherlands, Dubbeld's study of a railway CCTV control room described graphically the selective targeting practices of the operators:

> Operators had their own ways of categorising and classifying the objects of their surveillance. Operator identified suspicious individuals as 'Naffers' (short for North Africans, usually Moroccan or Turkish men) or called them 'cockroachs', 'crazy pancakes', 'little rats', 'nazis', 'faggots', annoying little men', 'mongols', or 'pancakes' (Dubbeld 2004:121).

In Milan, Fonio, on the basis of her observational study of a CCTV control room reported:

> In particular, North-Africans and East Europeans were tracked for no particular reasons but their appearance … Behavioral patterns did not play an important role in determining who had been monitored. Two social categories were also targeted on the basis of their appearances: young people, in particular those who were poorly dressed and nice-looking women (Fonio 2007:14).

Thus, rather that promoting a democratic gaze, the reliance on categorical suspicion intensifies the surveillance of those already marginalized and increases, yet further, their chance of official stigmatisation.

As von Hirsh and Shearing have noted, exclusion is frequently at the heart of situational crime prevention strategies and that is 'now being extensively used in privately owned spaces that have public functions, such as shopping malls' (von Hirsh and Shearing 2000:77).

Wakefield's study of an English mall with an extensive CCTV system found, over a five-week period, that 578 people were excluded and 65% of these exclusions involved 'known offenders' (Wakefield 2000:134:5) As McCahill reported in his study of the CCTV system in a North of England mall, it was anonymous groups of teenagers who were most likely to be targeted, deployed against and ejected; not because of any past or present legal infraction but because they were, in dress and demeanour, seen to be disrupting the commercial image of the mall (McCahill 2002).

Similar results have been found in Lomell's study of the operation of three CCTV systems in the Norwegian capital:

> Summing up, one can say that in Oslo, CCTV has had it most exclusionary effects in the most privatised of public spaces, where it is used mainly as a discriminatory tool ensuring marginalized people are kept out of site of consumers. Ejections were a substantial result of video surveillance operations at two of the sites namely the shopping mall and the transport center. In large part, these ejections were pre-emptive. That is to say, the majority of the exclusions were in response to appearances and categorical suspicions; only a minority of these ejections was in response to observed criminal or nuisance behaviours (Lomell 2004).

8) THE LEGAL FRAMEWORK: STRIKING THE BALANCE BETWEEN ENHANCING SECURITY AND PROTECTING PRIVACY AND PERSONAL DATA.

Video-surveillance for crime prevention purposes will have to comply with the provisions contained in the main European instruments concerning protection of individual privacy and of personal data:

-- article 8 of the European Convention for the Protection of Human Rights and Fundamental Freedom (ECHR)

-- articles 7 and 8 of the Charter of Fundamental Rights of the European Union

-- Directive 95/46/EC on the protection of individuals with regard to the protection of personal data and on the movement of such data (Data Protection Directive)

-- Council of Europe Convention for the Protection of Individuals with regard to Automatic Processing of Personal Data (Convention 108) of 1981

A recent Council of Europe report stated:

> There is no European legal instrument on video surveillance as such …(and)… Few countries have provision in their law that specifically regulate the use of video surveillance, let alone video surveillance in public spaces (Sharandin 2008).

Across Europe, in the main, the regulatory instruments fall under the auspices of data protection provisions. They are, however, patchy in their scope and application. While some jurisdictions require the specific authority of regulators to install systems[27] others rely on post hoc notification, and in some there are routine powers of inspection to ensure compliance while, in others, inspection may

only be justified after a complaint. In essence the law in many countries does little to restrict the spread of CCTV. Even where there are specific laws or codes, relating to the provision of public signage, they are frequently breached. For instance, the Urbaneye survey found that only 51% of systems in publicly accessible space were accompanied by signs alerting people that they were under surveillance. The range varied from 80% signage in Norway to only 20% in Hungary and Austria. Moreover, information as to who was the data controller and whom a person should contact in regard to the system was often missing. Without this data it is impossible for a person to exercise their subject access rights specified under data protection codes (Hempel and Topfer 2004:7).

Even in Sweden with a relatively strong regulatory regime, Gras reported that many systems were found to be in breach of signage regulations, but also that over a three year period only 400 of the estimated 11,500 cameras had been inspected by the regulatory authorities (Gras 2004:224).

In the UK, the Information Commissioner, responsible for implementing the Data Protection Act has no powers of inspection, few staff, and the Act allows for mass registration of multiple systems, making it impossible for citizens to find from the register any details about a particular system. The UK CCTV User Group, the umbrella organisation representing public authority systems, has expressed its concern that:

> the Information Commissioner has inadequate investigative staff to ensure compliance with the Act. Only if complaints are made about a specific system will any investigation be carried out. We are also concerned that whilst organisations are required to 'notify' her of any CCTV system, this can be within the 'bulk notification' of all that organisation's Data Protection obligations and there is therefore no separate record which can identify every CCTV system and who is responsible for operating it (CCTV User Group 2001).

As a consequence, in the UK, the law appears to be routinely breached. For instance, a survey in London found 78% of systems failed to comply with the signage requirement of the act (McCahill and Norris 2003:62).

The introduction of CCTV, creates a profound asymmetry of power between the watcher and the watched: not only are citizens watched by an unknown and unseen eye whose gaze they can neither challenge nor avoid, but data about them is increasingly extracted and automatically processed, in ways they have not given their consent to or even have any knowledge. And the camera's gaze does not fall equally on all citizens, often those deemed 'suspect' merely on the basis of appearance, rather than objective behaviour, are subject to exclusion particularly from the semi-public space of the shopping mall and transportation facilities. As Automatic Number Plate Recognition systems are deployed, citizen's anonymity of movement in public space is undermined. The British experience shows we need to be aware that we are referring to a technology that is now enabling each citizen's movements, through their associated vehicles, to be permanently recorded on a police database. Furthermore, it allows the individual to be linked to all the material held within a variety of databases held on the Police National Computer; not only their criminal record history, but also more general intelligence files and associated data bases. And as facial recognition software is perfected over the next decades anonymity will be even further undermine. In this context: regulation should address the following issues:

- citizens should be made aware that their presence in an area is subject to video surveillance. For then, in the knowledge they are being monitored by cameras, they can consciously decide how to conduct themselves;

- citizens should have the right to expect that their image will not be divulged to any third parties without their consent, except where this is exceptionally required for the prevention and detection of a specific crime;

- citizens should have a right to be assured that systems are necessary, operating fairly and in accordance with the laws and administrative rules that govern their use. This requires that they be subject to independent licensing, audit and inspection and not just registration, and

that the authorities have sufficient personnel to undertake their duties. The results of licensing and inspections should be made public.

But this merely addresses the relatively simple issue of a camera, a monitor, an observer and a recording device. It is the computer, not the camera, which poses the greatest challenge to privacy. So finally, citizens should have a right to know what information is held about them, and how it is being used. This right would require a positive reporting requirement on the part of the authorities to provide to each individual an annual information transaction report. The report would include a copy of all the data they hold and details of any processing it has been subject to. This would at least go some way to rectifying the asymmetry of power of the surveillance gaze, particularly where consent to use our personal data has been implied, rather than positively granted.

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Endnotes

[1] Consider that if each camera were connected to a video recorder a four-camera system, using three-hour tapes would generate 900 tapes per month and would require the almost constant supervision of the video recorders.
[2] In a five camera system the picture rate would be updated every 0.2 seconds. Each of the images for each camera is recorded at a rate of five frames per second as opposed to 25 frames per second associated with normal video recording. What this effectively means is that 80% of the information from each cameras is lost.
[3] See Norris and Armstrong 1999:171ff for a discussion of system integration.
[4] See Norris and Armstrong 1999; Norris, Wood and McCahill (2004), Webster (2009),
[5] These images were replayed night after night on the national news, achieving an iconic status in the subsequent moral panic about youth crime and while CCTV had not managed to prevent the killing, the ghostly images at least held out the prospect that the culprits would be caught.
[6] Personal communication, March 2009, from Pawel Waszkiewicz who is evaluating the Warsaw system
[7]Austria (Topfer 2008b), Bulgaria (Axis Communications 2008), Croatia (Croatian Times 2009), Czech Republic (EDRI 2008), Denmark (IceNews 2008), Finland (Helsingin Sanomat 2006), France (Hempel & Topfer 2009), Germany (Hempel & Topfer 2009), Greece (Samatas, M. 2004), Hungary (Molnar 2003), Ireland (DJELR (2007), Italy (Calabria, M.2003), Lituania HRMI 2009) Netherlands (Flight, et al. (2003) Norway (Winge and Knutsson 2003), Poland ([See footnote 6]), Portugal (Euro Weekly News 2008), Spain (Doron 2008), Sweden (Blixt M. 2003), Switzerland (Klauser 2007), and the UK (Norris and McCahill 2006).
[8] See: Honess and Charman 1992; Bennett and Gelsthorpe 1996; Squires and Measor 1996 & 1997; Ditton 2000; Williams and Johnstone 2000; Hempel and Topfer 2004; and Gill and Spriggs 2005.
[9] Bennett and Gelsthorpe (1996) found that 73% of their sample believe CCTV to be effective in reducing fear of crime; Squires and Measor (1997) found 90% thought 'that introducing CCTV into the town centre would make people feel safer' and Ditton (2000) that 79% of respondents ' thought that CCTV cameras would be effective at making people feel they are less likely to be victims of crime and disorder'.
[10] Bennett and Gelsthorpe (1996) found that of the 30% of people who stated they were worried about the civil liberty implications 36% of them stated it was because they did not like being watched and in Ditton's (2000) survey a full third (33%) of his respondents stated they 'minded' being watched on the streets and Hempel and Topfer (2004) found that 41% or people thought that 'CCTV invades privacy'.
[11] William and Johnstone's (2000) study of two Welsh towns found that while 85% of adults welcomed CCTV, between 60 and 70% of male teenagers, male students and female students believing the introduction to be unnecessary,. Hempel and Topfer 2004 reported on its European wide survey that 'As a general rule younger people were much more likely to be found opposing CCTV and doubting its benefits than the elderly' p47.
[12] In their review of 13 of the methodologically reliable studies conducted in the UK before 2000 Coleman and Norris (2000) concluded that in answer to the question: Does CCTV reduce crime? 'The criminological evidence is far from straight forward: the effects are neither universal nor consistent'.
[13] detections expressed as percentage of recorded crimes and offences.
[14] Squires and Measor 1997 found that while 90% thought CCTV would make people feel safer only 30% thought it would make *them* feel safer.
[15] Ditton, J. et al. (1999) found that although 79% of people thought CCTV would reduce fear of crime, before a system was introduced, answers to the post implementation surveys, show that those who were aware of the cameras 'were no more likely to say they felt safer or used the streets more often than other city centre users' as '75% of those aware feel safe (as opposed to 77% of the unaware), and 53% of those who are aware of CCTV worry about being a victim (as opposed to 49% who are unaware).
[16] Squires and Measor 1997 found very few people, only 2% in the day time and 3% at night time, felt that the system had anything to do with the frequency of their visits to the town centre. Similar results were obtained in the London Borough of Sutton, a large majority of respondents reported 'no influence of CCTV on their use of the high street' (Mahalingam 1996 p 57).
[17] For example, in 2000 the West Yorkshire Passenger Transport Executive, installed a 118 camera systems to surveille the main bus termini covering Bradford, Calderdale, Kirkless, Leeds and Wakefield council districts. The central control room in Leeds is manned for 24 hours and covers bus stations located in an area spanning 324 square kilometres (Drury 2001: 50-51).
[18] Here CCTV operators are more likely to be relatively high paid and trained, on permanent contracts with job security, and subject to clear lines of supervision and management oversight.
[19] See Alaouff (2002). Although there are an increasing number of highly 'professionalised' control rooms, is this in contrast to many older system, which were (and still are) poorly designed, ad hoc creations, often run by temporary, poorly paid staff working long hours, having high turnover, limited or non-existence training and poor management oversight. See Norris and Armstrong 1999, McCahill 2002 and Norris and McCahill 2006, for a descriptions.
[20] *CCTV Today* July /August 2005;28.

[21] Eg. *Guardian*, June 13 2002; for a review of US see EPICs Facial Recognition Web page http://www.epic.org/privacy/facerecognition/
[22] See Zuriek and Hindle 2005 for a review of biometric security claims after 9/11.
[23] See Norris et al. 1998 and Norris 2003 for a review of the difficulties in recognising a face in a crowd.
[24] The report has an excellent discussion of the moral and political considerations of FRT particularly in relation to fairness and informed consent.
[25] for example The European Commission under its Information Society Programme sponsored sponsoring a 'Face and Gesture Recognition Working Group' comprising vision scientists from 6 European countries 'to encourage technology development in the area of face and gesture recognition' and in the US the Homeland Advanced project agency is sponsoring Object Video to develop ' the next generation capabilities for intelligent video surveillance systems – specifically automated scene understanding (Drury 2005:16).
[26] For a full discussion of the findings see Norris and Armstrong 1999.
[27]eg France and Norway.
[28] All electronic sources accessed between 12th and 20th March 2009.