

## CCTV advice & the future

### What is CCTV

Wiki; Closed-circuit television (CCTV), also known as video surveillance, is the use of video cameras to transmit a signal to a specific place, on a limited set of monitors.

The idea behind a cctv system is so that footage from a camera will be recorded and stored for a period of time on the premises without interference from any other circuit/device etc and prevents an unauthorised person from viewing live or playback. A CCTV system is a security system and should be designed to minimise potential vulnerabilities, flaws and failure.

### CCTV Products

Products such as Ring, Nest, Arlo, Blink or any other cloud based Wi-Fi camera are not technically CCTV systems. Please be careful not to be misled here. These devices are heavily reliant on a stable Wi-Fi and broadband connection. If for example, Google's servers go down, so does your Nest product, no saved footage, no security system. Same applies to Amazons ring products. If your broadband fails, same applies. If your Wi-Fi is jammed by an intruder, same applies. Not to mention, the image resolution, camera chipsets, infrared, microphones are all of poor build quality designed for mass market sales. I never have and never will, sell or advise anyone to buy one of these products. There is always a better solution no matter your budget.

In principle, a CCTV camera will need a constant power source (12/24/54/230v) and provide a video signal wether analogue (old tech) or digital (new tech) (IP).

The video signal in analogue cameras is rather basic and is carried along a coax cable in wave form and connects to a Digital Video Recorder which effectively digitises the footage.

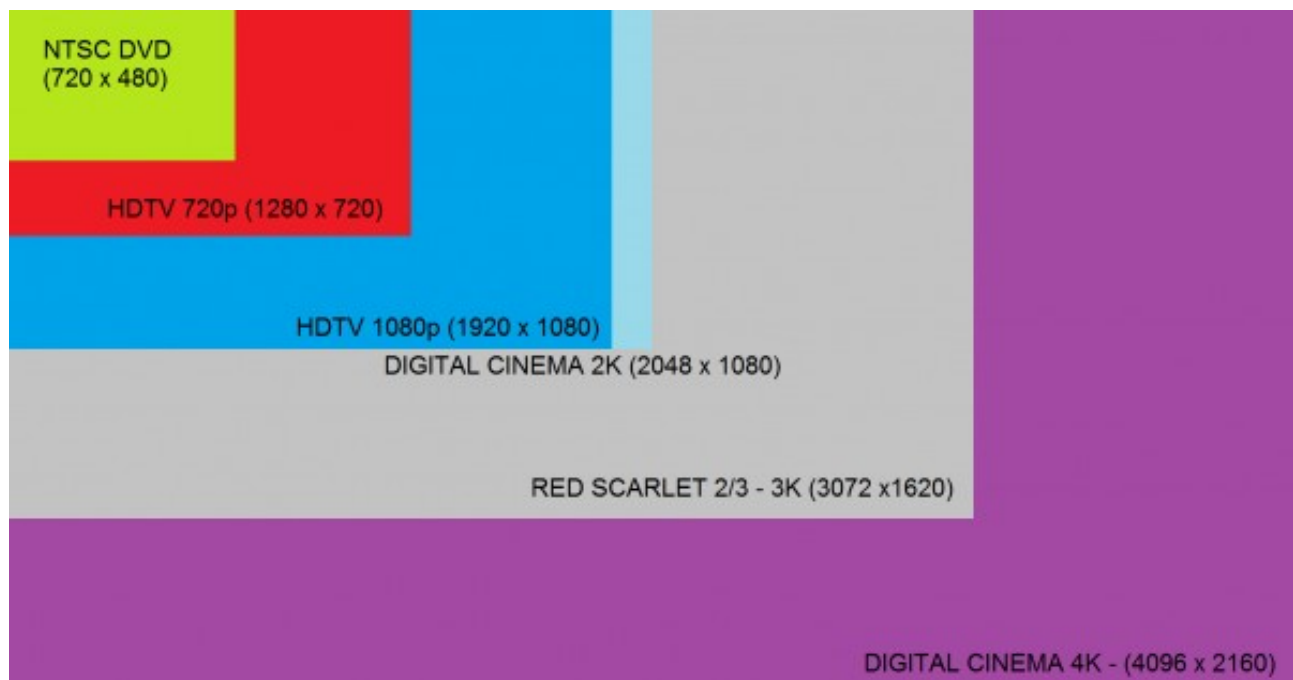
The video signal in a digital IP camera is transmitted via Ethernet cable (Cat5e/Cat6 etc) to a Network Video Recorder. Along with video much more information can be transmitted, the IP camera could be compared to a mini computer allowing the engineer to access camera head settings to adjust things like image brightness, infrared sensitivity, timers, analytics and much much more.

If you would like to learn more about the theory of analogue vs digital tap here:

<https://learn.sparkfun.com/tutorials/analog-vs-digital/all>

### What is image resolution

Any CCTV camera isn't just any CCTV camera, they come in all different shapes, sizes and technical specifications. In short resolution is quite simply how many pixels are transmitted from the camera (imagine millions of tiny squares to make up an image).



As you can see from the chart above, the higher you go in resolution, the more image you are going to get for your money.

The well known HD1080p is 1920 pixels x 1080 pixels which equals 2,073,600 pixels, in other words 2 Mega Pixel or 2MP.

4K Ultra HD is 4096 pixels x 2160 pixels which equals 8,847,360 pixels, in other words >8 Mega Pixel or 8MP.

Not only do you get more image for your money the higher you go, it allows you to digitally zoom into the image much better and further too!!



When you see footage online, and it's extremely blocky and pixelated... it's quite simple... there isn't enough pixels within the resolution to provide you with a detailed image.



If you have a CCTV system try this... go stand outside, stand facing the camera at 5 meters, 10 meters and 15 meters distance (if it can see that far). Go back to your system, and play back. Carry out a digital zoom and inspect the image quality, are you identifiable? Do not base your image on live view, so many people go wrong here... live video is not the same as recorded video. Try this experiment both in the day and at night.

### Frames Per Second

In super simple terms, this is how many image snap shots are taken every single second to provide you with an animated video.

You might recall, years ago when crime-stoppers used to show footage on tv, the subject would appear to majestically teleport from one place to another.... this was due to low frames per second, usually 1-2.

Nowadays, with analogue CCTV systems, you can push it to around 12-15 frames per second with 2MP (HD1080p) on a multiple camera system. With an 8MP 4K analogue camera it's usually around 7-8 frames per second and you are usually limited to 1x 8MP camera on the Digital Video Recorder due to bandwidth constraints.

With digital IP CCTV systems we can achieve 25-30 frames per second right up to 8MP (4K Ultra HD) across all connected channels on multiple camera systems. That's a very smooth video at a very high resolution fully recorded continuously for at least 30 days.

Some may argue that you don't need 25-30 FPS on a CCTV system to get a smooth video. It's not about that. If you really broke down your evidence, into its raw frames/images, you will almost certainly get the identification you require providing you also have the resolution to do so.

Upon request I can supply 12MP systems if you want even more clarity and if you have an open cheque book I can supply you with a 30MP 7K system... check this out from Avigilon: <https://youtu.be/M8oQuZQWikA>

## Storage

Back in the day, VHS tapes were used. The cameras would connect via coax to a multiplexer (video switcher), the video signal would then be looped into a VHS tape recorder. When the tape filled up, it would be replaced and put into storage for X amount of days then re-used.

When Digital Video Recorders came on to the scene this effectively got rid of the need for VHS tapes. Using video compression and a Surveillance SATA hard drive (Similar to those you would find in a PC), the system uses a feature called continuous archive. Continuous archive basically means, when the hard drive fills up to its maximum capacity, it will re-write over its earliest recording and continue in a loop so to speak.

Dependant on the amount of cameras connected, image resolution, quality set, compression type, frames per second, this will determine how many days recording you will achieve. All of this should be calculated at design stage of any CCTV installation and allow for future expansion. All of the above also applies to IP Network Video Recorders.

Do you own a cctv system? Go and check to see how many days recording you have... I would always aim for 30 days recording. Why 30 days? Here's a number of reasons...

1. You might not know about an incident until weeks later
2. Someone has burgled your property, chances are they've been before and scoped it out perhaps you might get a clearer image
3. Police delays in collecting evidence. The courts can not accept footage recorded from a screen onto a mobile phone, the raw footage with the correct time/date needs to be exported from the system.
4. Investigations, chances are a subject may have passed your property on X date but this was unknown to police until a few weeks later perhaps.

Top tips!

When playing back footage of an incident, slow the footage right down to try and get some stills. Use the digital zoom feature on your system, no placing your phone closer to the screen doesn't help here....

If you are tech savvy, you can export footage directly from your system using a USB stick... import this to a PC or laptop then share your footage. You may need to convert the video file here to something more compatible such as AVI or MP4.

If your system is accessible remotely on your phone or tablet, enable screen recording and use the digital zoom feature within your CCTV app when viewing footage. You will always get better clarity when zooming, viewing playback directly rather than after it's been exported. Always download the raw full file along with any zoomed footage to ensure your footage is fully compliant.

### Security Lighting & Camera illumination

Security lighting is a fantastic deterrent, it can also be a nuisance. Most security floodlights have a PIR (Passive InfraRed) sensor and should only trigger in sudden influxes of heat i.e human body heat. Anything cheaper than £50 will most definitely light up not only your bedroom but your neighbours also, for no reason whatsoever, all night long. You will become accustomed to the light activating and eventually ignore it. Unless your neighbour rips it off the wall first... (all in all, not good if you have an intruder).

If your in the market for a security floodlight then I highly recommend Steinel products, they are bright, reliable and look the part too!!





Camera illumination is getting better and better year on year... the technology is dynamic and it's innovative. The new Hikvision 8MP dark-fighter cameras will provide you with full colour if there is some subtle background lighting (from a street light for example). In complete darkness they will switch to mono and emit the infrared light which is invisible to the human eye. The technology within these products provide fantastic black & white illumination up-to 30 meters.



We now also have the 4MP IP Colorvu cameras, at night these cameras activate two very bright LED's which provide a subtle light to the area visible to the human eye but provide full colour in complete darkness up to 30 meters. The LED's are actually rated as class 2 LASER's (Light Amplification by Stimulated Emission of Radiation). Don't worry, class 2 is completely harmless, when looking into these lights your natural reaction will be to look away... but perhaps not for a curious intruder, who knows?? Thanks for the mugshot 😊



Before choosing Colorvu or Darkfighter you should consider whether there is any existing supplementary lighting? Are you happy to settle for a lower resolution? Will the bright light emitted from the camera giveaway the location of your camera? Is a white light solution actually needed?

### Types of cameras...

Static, fixed lens, varifocal, motorised zoom, PTZ....

Yep, that list could get much longer, here's a mini break down...

**Static Camera:** A term used for a camera that is situated in a fixed position, angled at the time of installation and that's it.

**Fixed lens:** The same as a static camera but you choose the lens type for the environment or requirements.

2.8mm lens will give you a super wide angle view.

4mm lens will be a tad zoomed in

6mm lens will be a tad more zoomed in

8mm lens will be a tad tad more zoomed in

12mm lens will be... I'm sure you get the drift.

Lens selection when designing a cctv system is really important. Each camera serves its own purpose.



Varifocal camera: Again, the same as a static camera however varifocal lenses will allow the installer to adjust the zoom in or out at the time of installation and then locked into position. These cameras are usually 2.8-12mm.

Motorised Zoom: Again, is the same as a static camera however motorised zoom cameras allow the user to use the optical zoom in or out of its fixed position. These are available in various forms such as 2.8-12mm or 9-96mm super zoom!

PTZ (Pan Tilt & Zoom): Is a fully functional camera which allows the user to spin 360 degrees continuous, tilt it up and down and use the optical zoom in some cases up to 90X!

There are many many more different types of CCTV cameras but we'll just stick with the basics for now.

### Equipment & Products Conclusion

To conclude camera types etc, please, take it from me... 15 years experience with CCTV & extensive commercial security back ground, 12 of these years I've been installing Digital IP cameras. If any installer tries to tell you they are rubbish, pointless or over engineered they quite simply don't understand IP and just wants to sell you an easy plug and play coax based analogue system.

This is the exact reason I keep seeing poor quality CCTV systems all over Facebook because the industry has become a race to the bottom. I was always taught, if you buy cheap, it will bite you on the arse first then you will buy again. Do it right the first time, you don't even have to buy from me, just choose IP! I'm considering some training days for local installers to bring them up to speed with IP based systems and their configuration so if you're interested, please reach out and depending on numbers this might actually happen.

By purchasing even a basic IP CCTV system, you have future proofed your home or business. Analogue systems have hit their limitations, they won't improve much more now and will eventually be phased out. So when your analogue system fails (which all electronics fail eventually),

you will need to pay to have your full system re-cabled in Cat5e/Cat6/Cat7 which ever is appropriate.

Yes, IP camera systems are more expensive than analogue systems and for very good reason too... because they work and do the job they were intended for (not to mention build quality, stronger materials, longer warranty). If you're going to protect your property, then you may as well save up and do it right.

Any camera is better than none? Not if you can't identify someone, you may as well have not bothered. Honestly.

The only time I would advise installing a coaxial based system is when an existing system needs to be upgraded and there is no physical way of recabling the job. In my opinion, that's why turbo HD cameras are still available on the market but they have hit their limitations.

Our preferred choice of CCTV system brand is Hikvision, Hikvision is becoming a well known household brand but be careful here. This manufacturer has been very clever in the equipment it has brought to market, they have their extremely basic DIY equipment (Hi-look) through to the pro equipment. The specifications vary in every single piece of hardware so be careful in the fact that a camera isn't just a camera when it has a lower price point.

There are many other brands available, Hikvision is not the best however the equipment comes with a workable price tag with a lot of functionality. Manufacturers such as Aviglon, Samsung, Axis, Bosch are considered better brands but again hardware provided is usually a thought process at design stage of the installation.

Be careful when purchasing Hikvision equipment online and consider only buying from Authorised distributors. There are a lot of grey market imports with Hik equipment which contain Chinese firmware rendering these cameras useless on UK firmware NVRs. In addition this equipment should come with a three year warranty but only if the business you bought from is still trading by the time you need a replacement.

## Networking

CCTV systems are now online, on your phones, on your tablets... do you know who's really watching??

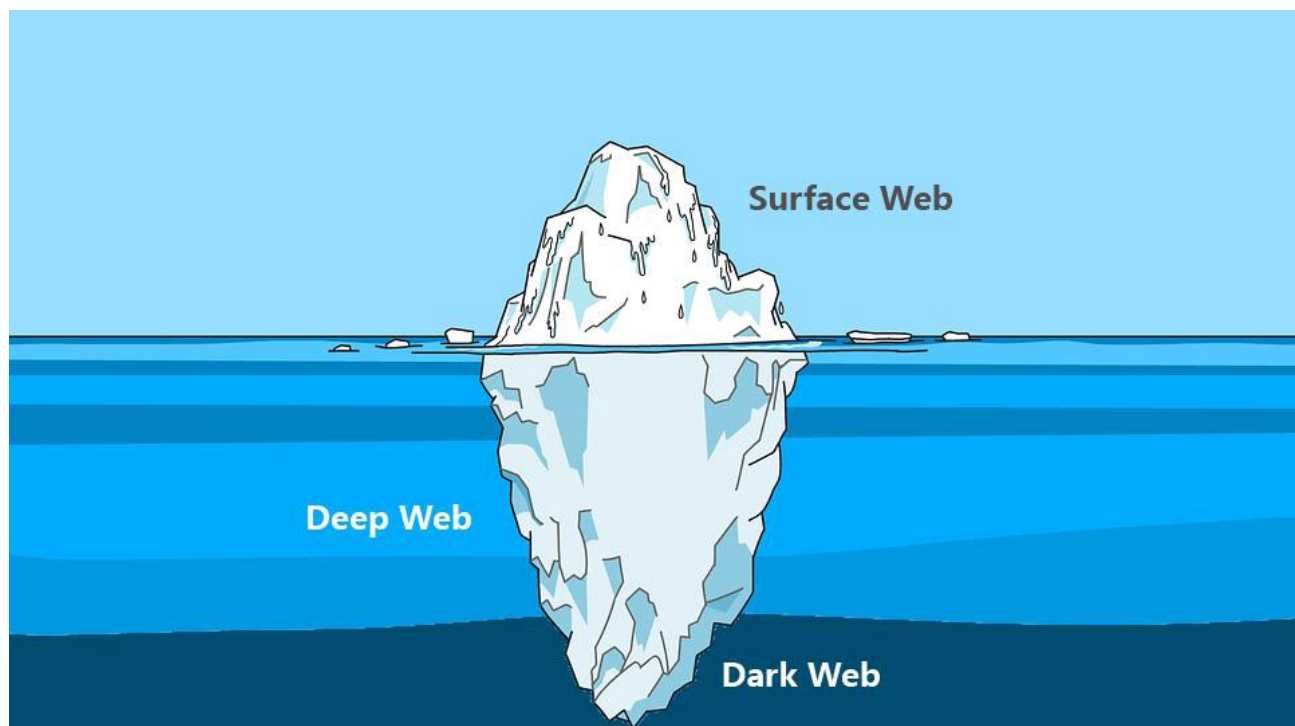
Me being me, I research the possible vulnerabilities of the systems that I provide... (my wife thinks I'm a sad b\*stard 😂) I've been down the rabbit hole that is the deep web and transcribed forums full of conversations from China to Russia all discussing hacking techniques and links to exposed and vulnerable CCTV systems. It's all there and it's really quite frightening!!

Only in December 1500 user credentials were found on the dark web for Ring doorbells:

<https://www.google.co.uk/amp/s/techcrunch.com/2019/12/19/ring-doorbell-passwords-exposed/amp/>

Check out this surface web site with insecure cameras all over the world: <http://insecam.org> more notably or worryingly three of our local schools were also listed on this website some time ago; <https://www.google.co.uk/amp/s/www.bbc.co.uk/news/amp/technology-43211899>

You can also search the IoT directory here for more insecure devices: <https://www.shodan.io>

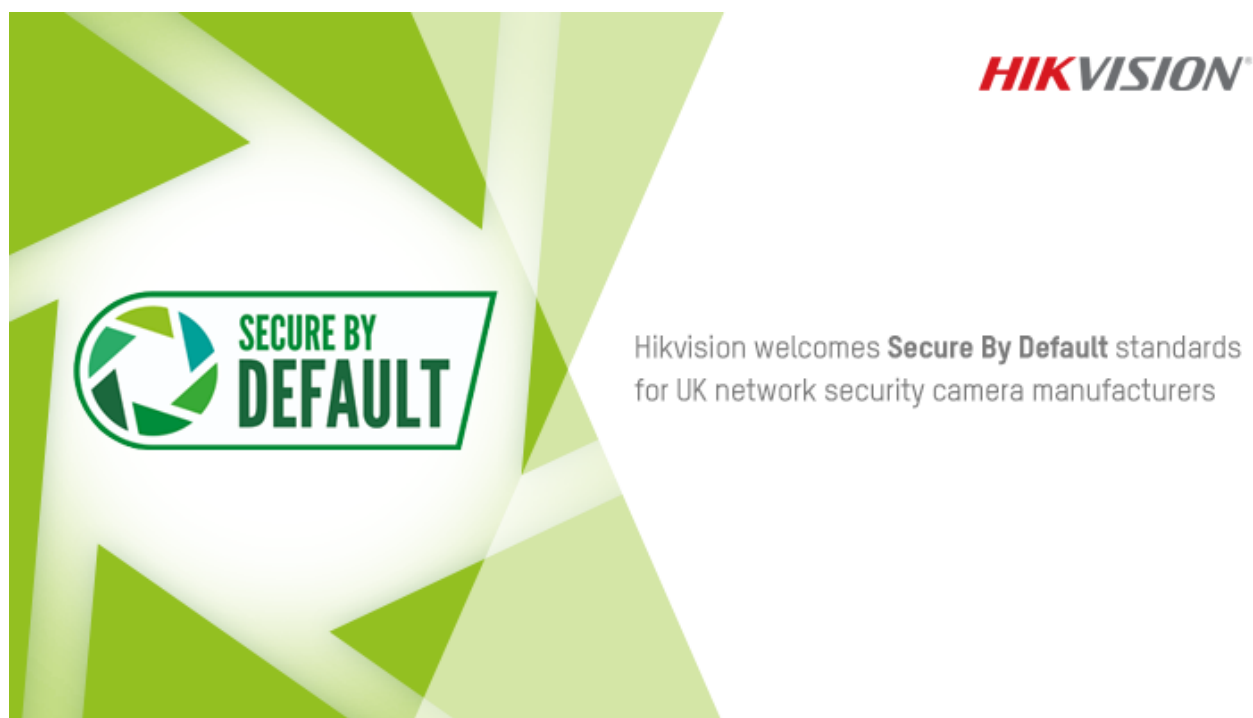


When you connect your system online or trust an installer to do it for you here's a few things that need to be considered...

1. Have the default passwords been changed to something more secure? Yes this includes 8 characters, capital letter, a symbol and some numbers... default passwords are the easiest way for a hacker to gain access view or disrupt your system - yes this really happens!
2. If you use a P2P service do you have stream encryption enabled?
3. Ensure your router firewall ports are changed from the default settings of that on your DVR/NVR.
4. Is your CCTV system considered high security? You might need a VPN service enabling to provide stronger protection.

The latest Hikvision CCTV equipment that we install, is undergoing approval by the UK's surveillance commissioner Tony Porter under his scheme 'Secure by Default, Secure by Design' this forces approved manufacturers to make sure that the installer has to input a strong password on power up. For me, additional steps such as those outlined above must always be carried out.

More info here: <https://www.gov.uk/government/publications/secure-by-default-self-certification-of-video-surveillance-systems>



## Motion detection or Analytics

An alert based system which notifies your smart phone/tablet/monitoring centre of activity.

Most CCTV systems, even ring door bells dare I say it... are capable of motion detection. This is the most basic and most unreliable way of providing you with alerts that someone has approached your property. It's configured by overlaying a grid over the image on the system, you simply choose how much of that grid is the detection area. If something crosses into that area like a human, a cat, dog, mouse, a leaf, a shadow, a rain drop then it will send you an alert. It gets pretty annoying. You'll sooner turn it off as it will drive you up the wall.

### Analytics & Video Content Analysis:

This is where the CCTV industry got clever. Analogue DVRs are capable of processing analytics, however because this is done at the DVR within its hardware/software it's not as reliable as a digital IP camera which processes the image at the 'edge' or onboard the camera. Digital IP cameras provide higher FPS, Resolution & Image quality therefore more reliable alerts.

The programmer will create virtual lines or box areas onto the system, adjust the thresholds and sensitivity and the camera does the rest. The camera will constantly be analysing the image and should something come into the detection area this will then send an alert. Humans, car head lights, cats/dogs can trigger these alerts so not quite 100% accurate however it certainly won't annoy you if the wind or rain picks up which is quite common the UK!

Deep Learning False Alarm Management NVRs - This is a form of artificial intelligence embedded into a GPU for much faster processing. The system will autonomously study and learn the detection area and after a short period of time, be able to determine the difference between humans, vehicles, animals & wildlife. The alerts you receive are near to 100% accurate.

We now have deep learning cameras also available, whilst they are still not as accurate as the Deep learning NVR method they pretty much do the job providing you with human & vehicle detection alerts. Hikvision have branded these cameras as AcuSense which stands for Accurate Sensing.

## Artificial Intelligence

AI is already part of our everyday lives, whether you know it or not... the smart device you are reading this on already knows your thoughts before you have spoken the words. As I type this article the auto suggested words are popping up in front of my eyes 🧐🧐. AI is being used by corporations across the globe to target market and make money. AI will be used for bad, but it will also be used for good.

AI within CCTV systems is a huge milestone that is still heavily in development, an area that I certainly want to be ahead of the curve with. A system that can predetermine the actions of a human, will analyse a situation and predict an outcome which in turn provides a response in the form of an alert for human intervention.

There are so many possibilities, far too many to list right now but here's a few:

- Human detection: Is the human crouching, jumping, acting suspicious, lurking, walking, fighting, acting aggressive...
- What is the human carrying? Flowers, rucksack, knife, gun...
- Object removal, has an item of value been removed at an unusual hour outside of its predetermined schedule? Is your car...
- Appearance search, scan connected cameras from last known location to current known location based on age, gender, ethnicity, height, width, clothing type and colour. This could be used to track a criminal or even a missing person.

Facial recognition is another possibility however is a grey area with much controversy, it could do so much good however again so much bad. The UK surveillance commissioner is working towards regulating this technology which I am watching closely.



We do however, have coming to market very soon, a GDPR complaint facial recognition system which is designed for retail stores, hotels, pubs, clubs or any other businesses premises that allows access to the public. In essence, the premises owner will have an app on a smartphone which will alert them or security staff of a 'person of interest' entering the premises which allows them to monitor the person or remove them from the building if needed.

How does this work? A camera will be situated at the main entrance, data will be processed on site with non-reversible biometric data transmitted and stored in the cloud for a short period of time. If for example a subject is caught shoplifting, the store owner or security staff can input the information of the subject into the system. This data will now be stored for two years and if the subject Re-enters the store, an alert will not only be sent to the smart phone but any other system owner in an 8 mile radius will also receive that same alert if the subject enters their store/premises.

This comes in very handy to allow business owners to be extremely vigilant of who enters their premises and is a fantastic proven system to reduce shrinkage within the business. Pubs/clubs that have a high rotation/change of security staff can seamlessly receive information on past trouble makers and make an informed decision to deny access or monitor the situation closely. A barred from one, barred from them all scheme that actually works.

## Crimes in our local areas & how CCTV will benefit in the reduction of crime

For around two years now, every morning I will wake up, head downstairs, make a brew, I like most people will flick onto Facebook and it's happened again. Another car, another house...

Someone's lively hood tampered with, vehicle rifled through, possessions stolen. I was a target in August, fortunately for me... one was apprehended by the Police and was sentenced to 16 months imprisonment. The CCTV footage I provided, went viral with viewers amazed by the quality (8MP IP with some additional lighting).

One thing that sticks out the most for me after seeing this rise in crime is that most people with CCTV are completely unaware that it's happened until hours after the fact. Most likely sleeping. When I was targeted, I was lucky, the Police were already en-route due to a nearby resident being awake and her ring camera being ripped off the wall who subsequently called the Police. Many others are not so lucky. Here's my solution...

It is a proven fact, that a community CCTV system will indeed reduce crime. Similar schemes have been implemented across America and if done correctly can be a huge success. Its not just about evidence, it's about reaction and physical intervention by catching these criminals in the act, to have our own SIA approved intervention team who will liaise with the Police at all stages. It's not about taking over the job of the Police, we would never, ever have the resources or capabilities of the Police, it's about supporting & providing intelligence every step of the way.

The more high quality evidence we can get on a subject by having higher quality camera systems in place the chances are we can together reduce crime in our local areas for not only ourselves but our children. If we can stack the charges up against someone, the better chance the CPS has of applying a suitable conviction.

We have our very own monitoring centre in development, a central hub where we can connect CCTV cameras to one secure location operated by SIA CCTV Licensed Operators. A place where we can watch over our clients property & receive alerts while you sleep bridging the gap between something happening and somebody knowing about it.

Whilst I was aiming for March live date, I'll genuinely say I underestimated how much work was to be done to achieve this. That being said, this is still happening albeit a little delayed, we now have the keys to our premises and work has begun with the minor refurbishment and full kit out/installation. We've been busy obtaining SIA qualifications, we have accreditation's pending with the SSAIB and have received over 70 applicants for staff which we are working through.

Once up and running we'll be looking at how we can make our centre effective as possible utilising cutting edge server based technology, providing not only a monitoring & response solution but an investigation based service to assist with the reduction of crime to our local town and surrounding areas.

You can find loads of information on our website <https://hamisec.uk> which includes CCTV installation pricing (all inclusive), we have credit card facility's, PayPal processing and also offer finance for all our installations.

More to follow on this soon, thanks for reading!

Kevin Hamilton