

[dstl]

The Science Inside



Science  
& Technology  
in Policing

Defence Science and Technology Laboratory

# Police Futures

A TASTE OF THE FUTURE



Ministry  
of Defence

UK OFFICIAL

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# Introduction

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Every element of modern policing is touched by developments in science and technology (S&T) and the S&T routinely used today was once considered futuristic. The pace of technological development is rapid as can be seen when we consider the way policing now manages crowds, uses body-worn equipment, employs data analysis, develops intelligence, identifies people, exploits forensic opportunities, supports victims, trains the workforce and communicates – compared to 10yrs ago. Much has changed in a relatively short period of time and we should expect the rate of technological transformation to accelerate.

The NPCC Strategic Plan 2021- 2025, highlights how important S&T is to delivering a world-class police service and to support this the NPCC Police S&T Strategy sets out: the science system required to understand, commission, and use S&T within

policing; the way in which S&T will be prioritised and the overall conditions required for the success of the science system.

The NPCC Police S&T Strategy also highlights that policing needs a broad science and technology portfolio that balances today's requirements with future needs. Considering the future will ensure policing is well placed to exploit future opportunities and to anticipate potential threats. However, the future can be difficult to explore – the further the time horizon, the more uncertain the future is. At any time there are multiple plausible versions of the future and trends that sometimes feel reliable but are not linear and can be disrupted by other events. This document aims to provide you with a taste of the future. We will take a look at some examples of future S&T, consider terminology, introduce some futures methods, signpost you to useful resources and bring the future to life through stories.

## A couple of considerations

The work has been developed at the lowest possible classification so that it can be shared as widely as possible. It therefore does not contain more sensitive assessment of the potential threat posed by the criminal use of S&T or indicate current policing capability.

The work has been developed to give you a little information about a lot of futures areas and resources where you can find out more. You should consider it the start of the conversation, a conversation we hope you will continue to have with colleagues.



What is today, but yesterdays tomorrow?

Eugene Krabs



# What do we mean by Futures?

## A word about language...

People use terms like futures, foresight, strategic insight and horizon scanning interchangeably and the related work sits in different functions (strategy, analysis or business planning teams) within policing.

Futures thinking is an application of a set of methods, skills and traits which use all parts of the brain, both analytical and creative. A curious and open mind is required for futures thinking, as well as the ability to work with uncertainty. This means that futures practitioners must be flexible to adapt their approaches, and they must consider multiple paths and why and how these paths develop in order to determine the best path to take.

Those working in futures may not recognise it. There are many people in policing whose role includes keeping one eye on the future. They may be working in analysis teams, strategy development, senior decision making roles, performance functions or innovation initiatives, etc.

## How we've used terms in this document:

**Futures** – a general term that encompasses the wide range of approaches and methods that help us think about the future.

**Insight / Foresight** – insight is knowing why something has or is happening and foresight is being able to identify and anticipate what may happen. Both rely on understanding that is underpinned by the acquisition and development of knowledge.

**Technology watch (or 'tech watch')** – is the monitoring of science or technology that has been identified (often through horizon scanning) as of interest.

**Horizon scanning** – is a technique used to identify things that are emerging or anticipated and have features which make them interesting.

**Driver** – is a trend that, over time, may have a fundamental impact on the development of the topic or area of interest.

**Trends** – are based on information (not just data) that indicates a discernible pattern of change (trends are not linear and can alter direction – sometimes dramatically).



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## Section One

# The Service Lines

This section delves deeper into the seven service lines outlined in the NPCC Police S&T Strategy. The service lines are enduring thematic areas: Crime Prevention; Personal Safety; Mobility; Identification & Tracing; Surveillance & Sensing; Analytics and Interconnectivity.

Each service line will be considered in turn and you will learn a little more about the service line itself (as outlined in the [NPCC Police S&T Strategy](#)). You'll also find an example of a future S&T topic that illustrates the service line and a short story that brings the whole thing to life.

- Crime Prevention
- Personal Safety
- Mobility
- Identification & Tracing
- Surveillance & Sensing
- Analytics
- Interconnectivity

*Acknowledgement – with special thanks to the College of Policing Futures Team for developing the short stories that feature in this section.*

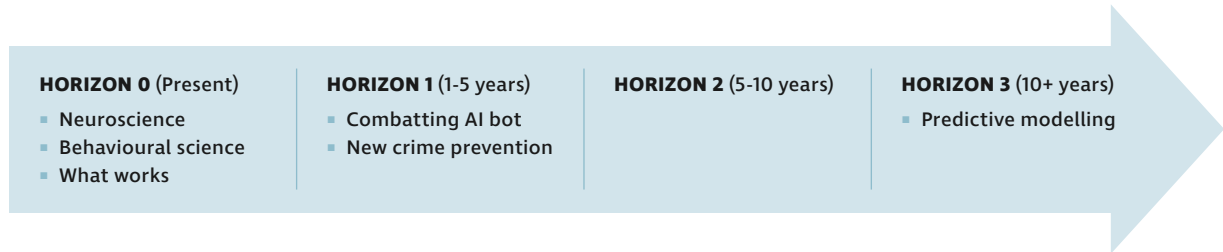


# Crime Prevention

The ability to understand and respond to drivers and inhibitors of crime, including crowd management, public trust, mental health and wellbeing.



Information from the NCC Police S&T Strategy



## Predictive Modelling

Predictive modelling is linked to the Crime Prevention service line and time Horizon 3 (from 2033+)

### Summary

Predictive modelling using machine learning (ML) and artificial intelligence (AI) can recognise patterns in existing data sources, combining information from a variety of sources and identify subtle patterns to make inferences of outcomes or suggest an appropriate response.

### Action for Policing to Consider

- Link in with other security and academic partners such as the Alan Turing Institute.
- Consider how AI and ML can be used to support human decision making in policing, and the use of such data in the criminal justice system.
- Develop public trust in police use of AI and ML systems.

### Impact on Policing

- Improved ability to recognise patterns or trends in disparate data sources, increasing ability to process large amounts of information in a timely manner.
- Improved use of police resources, allowing officers to focus on interpretation of information, rather than collation of data.
- Support to decision making through the generation of potential solutions to issues, helping decision makers explore and consider different hypotheses in a technique known as automated hypothesis generation.

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## Crime Prevention *continued*

- Automated behavioural analysis, predicting potential routes for a suspect vehicle in the current traffic conditions or notifying officers of an individual acting in a suspicious manner.

### Underpinning S&T required

- Development and validation of “explainable AI” and assurance of ethical standards, particularly when used to provide decision making support.
- Improved secure communication networks enabling effective sharing of information across relevant organisations.

### It's 2036...



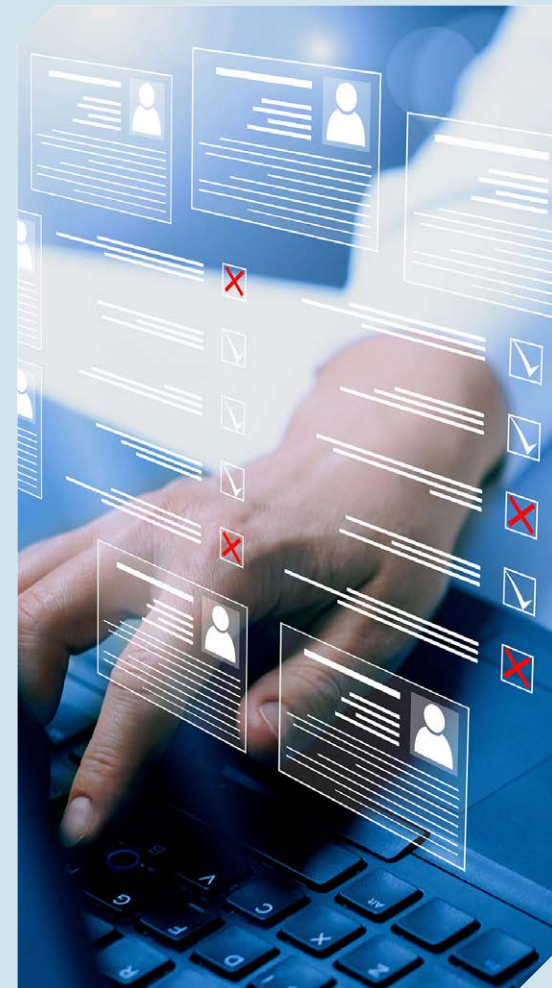
and PC Raheem is reviewing the list of online crime incidents that the AI monitoring interface (Aimi) crime-combatting bot, managed to prevent last night.

Aimi monitors platforms that have been identified as facilitating increased criminal activity ranging from harassment to fraud.

The AI bot uses predictive modelling to learn patterns of behaviour identifying and monitoring micro-transactions that appear to be suspicious, making inferences about potential future offending behaviour.

It then uses specialist software to flag the activities of criminal users to investigators, enabling their timely review and developing the intelligence picture for PC Raheem and her colleagues.

Aimi raises flags on the offenders, potential victims and offence types, alerting other teams to the risk posed, and enabling them to take a more proactive approach.



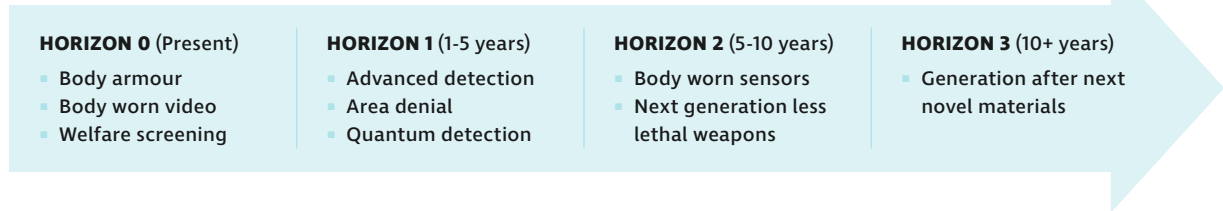


# Personal Safety

The ability to protect our workforce and members of the public through e.g., body-worn equipment, location resilience, less lethal weapons.



Information from the NPCC Police S&T Strategy



## Next generation less lethal weapons

Next generation less lethal weapons is linked to the Personal Safety service line and time Horizon 2 (from 2028+)

### Summary

Less Lethal Weapons (LLW) provide a physical effect in order to mitigate a threat, without substantial risk to the subject of permanent or serious injury, or death. They can provide opportunities to safely gain operational advantage from potential threats within crowded areas through targeted deployment.

### Action for Policing to Consider

- Ensure all LLW developments are compliant with the relevant Codes of Practice and other legislation, ensuring transparency to the public and confidence in ways in which new technologies are used.

- Improved understanding of the global landscape and explore how existing technologies are used by other global partners.
- Continued monitoring and evaluation of current technologies to identify capability gaps and limitations.

### Impact on Policing

- Increased options to mitigate threats or de-escalate in a wider variety of operational situations.
- Increased options for crowd management and event control.

continued over



## Personal Safety *continued*

- Improved safety for Police officers, through being able to employ less lethal options at greater range.
- Improved safety to the public and wider communities.
- Potential to mark an individual, identifying them for later detection, or to arresting officers.

### Underpinning S&T required

- Improving directed energy and acoustic technologies, including reducing the size, weight and power.
- Improved understanding of effects of novel LLW technologies on human physiology.

### It's 2031...



neighbourhood patrol.

It's one of the worst heatwaves so far in 2031 and PCs Davies and Lee are on their usual

Their uniforms have been developed using smart material which monitors the officers' movement and vital signs throughout their patrol and responds to the increasing heat by opening a series of ventilation valves which help reduce body temperature and the possibility of heatstroke.

The fabric also contains a sensor enabling positional data to be collected for all officers wherever they are, even in high rise buildings or on underground transport systems, along with a balance sensor which alerts the control room if a deployed officer appears to be off their feet for more than 60 seconds.

The data gathered from the smart fabric uniforms is collated by the welfare hub at HQ and allows patrol deployments to be more responsive to both welfare requirements and external factors such as the changing temperatures.

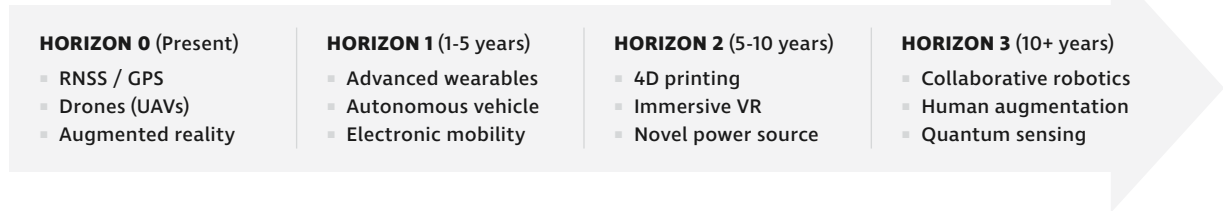


# Mobility

The ability to move to / from locations quickly to prevent, detect, or respond; access difficult locations safely to maximise intelligence and minimise risk.



Information from the  
NPCC Police S&T Strategy



## Robotics and Autonomous Systems

Robotics and autonomous systems linked to the Mobility service line and time Horizon 1 (from 2024+)

### Summary

Improving capabilities of technologies within robotics and autonomous systems provide a wide range of opportunities for integration of technology into our daily activities. These systems could include robotic systems controlled directly by Officers, although in future, these systems may be able to operate independently in the environment.

### Action for Policing to Consider

- Market exploration of off-the-shelf industry capabilities, and collaboration with other government departments.
- Appropriate legislation to allow police use of drones in a variety of operational situations.

- Public perception and trust of robots in front line policing.

### Impact on Policing

- Improved situational awareness through use of autonomous systems or robots. This could include: the use of small aerial systems to follow suspects, reducing the need for police to chase individuals; the covert monitoring of suspect vehicles reducing the need for high speed pursuits; improved crowd management with drone surveillance, improving public safety at events; and use of robotic or autonomous systems to search for vulnerable individuals or evidence in crime scenes.

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## Mobility continued

- Robots can be used in situations where it is unsafe or inaccessible for a human, or to supplement officers when enforcing cordons around crime scenes.
- Robots could assist officers with information capture, data processing and situational awareness in the field.
- Reduced reliance on police helicopters, increasing responsiveness and flexibility.

### Underpinning S&T required

- Next generation sensing and detection techniques, improving situational awareness.
- Operation of autonomous or robotic systems in urban environments, including comms, navigation and collision avoidance.
- Human-Machine interfaces to improve control and communication with robots and autonomous systems.

### It's 2050...



DI Chung is responsible for the operational deployment of a surveillance team

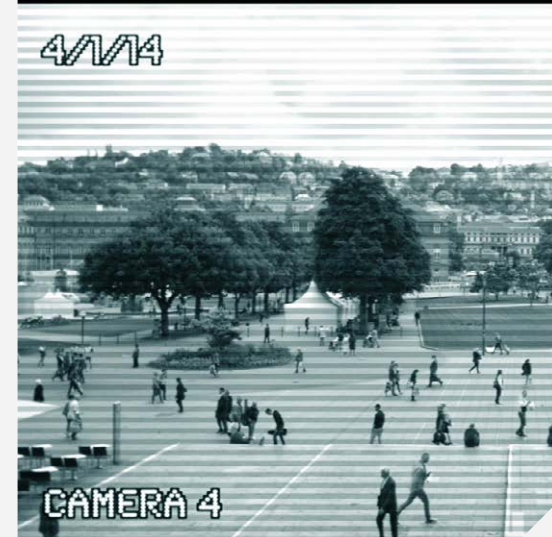
monitoring an Organised Crime Group (OCG) associated with the supply of weapons.

DI Chung and some of his colleagues have volunteered to trial tactical support chips which are implanted into their index fingers. Each chip provides geo-location and biometric data on the implanted officer and enables the capture of evidential material without the need for external devices or wearable technology.

DC Walsh has been operating undercover within the OCG for several months and has been gathering actionable intelligence during this time. His chip allows DI Chung to monitor his location and be more confident in his safety throughout this deployment. It also provides real time intelligence including audio feeds and data downloaded covertly from the phones of the group members. This can be corroborated and acted upon by the surveillance team without compromising DC Walsh's identity.



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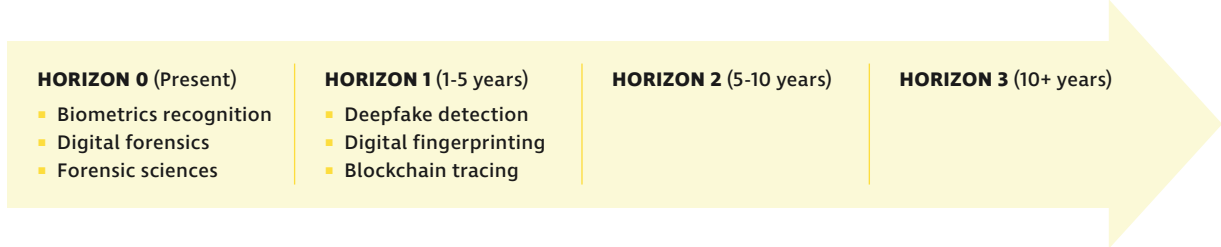


# Identification & Tracing

The ability to trace, attribute, and confirm the identity of a person, location, activity, etc., to evidential levels, such as tracing missing persons.



Information from the NPCC Police S&T Strategy



## Deepfake detection

Deepfake detection links to the Identification & Tracing service line and time Horizon 1 (from 2024+)

### Summary

Deepfakes are created through the use of advanced artificial intelligence and machine learning (ML) techniques to manipulate media. A person's likeness, both audio and visual, can be added to media such as images or video. Increased access to open source ML models, tools and techniques means that the barrier to entry for creating manipulated media has never been lower.

### Action for Policing to Consider

- Consider potential impact of reduced trust in audio, video, or photographic evidence on police investigations.
- Understand the evidential credibility of media and maintain trusted ways in which to prove or disprove deepfakes.

- Collaboration with international partners to ensure common standards are adopted.

### Impact on Policing

- Photographic or video evidence is currently widely used in investigations and prosecutions. The potential inability to prove unadulterated images or videos are real may lead to challenges to the quality of evidence.
- Requirement to rapidly identify false images to ensure they do not affect investigations or prosecutions.
- Improved detection of manipulated media, including their source.

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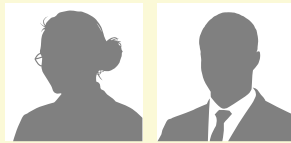
# Identification & Tracing *continued*

- Potential threat of impersonation of the Police for disinformation or defamation purpose.
- Rapid, autonomous processing of media to identify true media in order to maintain evidential standards.

## Underpinning S&T required

- Access to next generation computing, including technologies such as quantum or optical computing will improve decryption capabilities which allow for improved source tracing.
- AI-enabled tools designed to detect outputs from all available deepfake creation capabilities such as diffusion networks, text-to-speech models and autoencoders.
- Tools designed to recover media when anti-forensic methods are used.
- Ongoing validation using bespoke, government-owned datasets as model outputs.

## It's 2029...



Cyber-analyst Charithra is assisting DI Lungu in a homicide case and has been able to

identify a potential suspect from footage captured at a store nearby.

The video initially appears to be uncompromised, but the serious nature of the offence under investigation requires Charithra to send the footage away for further analysis.

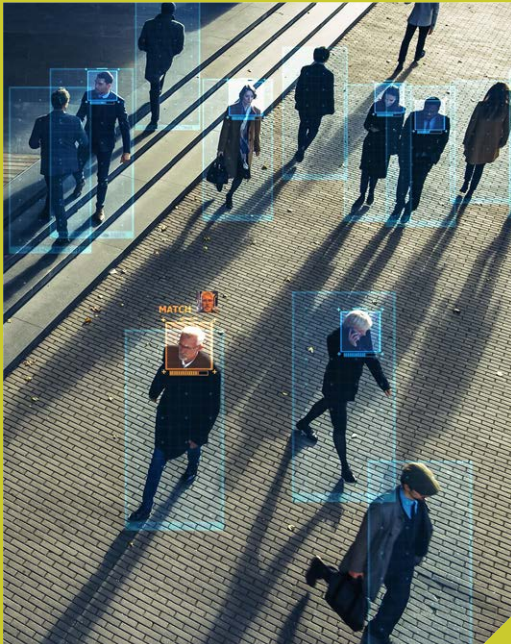
Papa Delta software housed at the regional technology hub uses AI to review the metadata sitting behind captured imagery and assess whether any corruption has occurred.

Following the AI review, the team at the hub inform Charithra that the footage has been subject to a deep fake attack, seemingly to implicate someone else in the offence committed. They work in tandem with Charithra and the rest of her team to build up the intelligence picture around the fake footage, eliminate the original suspect and identify new persons of interest.

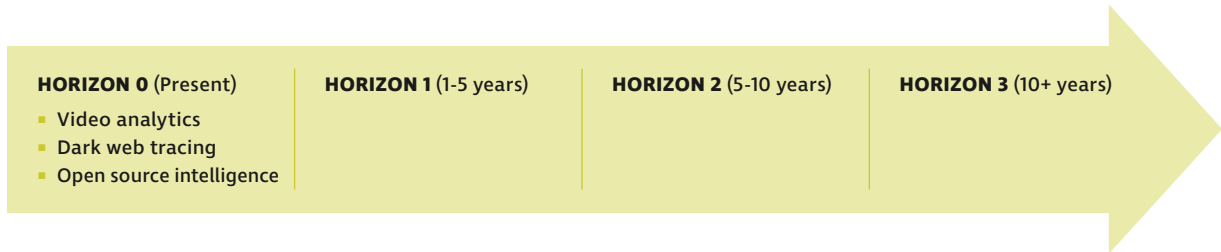


# Surveillance & Sensing

The ability to lawfully monitor and collect data from people, activity, movements, behaviours, objects and data overtly and covertly.



Information from the NPCC Police S&T Strategy



## Next generation sensing

Next generation sensing is linked to the Surveillance & Sensing service line and will be relevant from time Horizon 1 (2024+)

### Summary

Sensing detects stimuli such as light or heat through a device or machine, and transmits that data to a connected receiver.

This capability improves upon human senses, providing opportunity to detect and record data outside of our field of vision or understanding.

### Action for Policing to Consider

- Understand the industry and academic landscape, including scoping activities of connected innovation networks.
- Ensure that policing adopts open frameworks / architectures, enabling easier and cheaper upgrades and consistency with other security

and defence partners when using multi-sensor equipment.

### Impact on Policing

- Integrated body worn sensors provide real-time data on concealed weapons.
- Potential to integrate ethical facial recognition data to frontline officers – real-time access to priors and warning of previously violent offenders.
- Improved situational awareness – real-time data of surrounding areas and detection of hidden suspects.

continued over



## Surveillance & Sensing *continued*

- Improved detection of concealed weapons and items of interest at security checkpoints for events and border security.
- Improved crowd control – rapid detection of violent or antisocial behaviour.

### Underpinning S&T required

- Integration of microelectronics into fabrics improves the available applications for body-worn sensors without increasing the burden to the carrier.
- Autonomous systems for ethical facial recognition / sensing capabilities to provide real-time data feeds to those in the field.

### It's 2040...



In North Yorkshire, after a series of agricultural equipment and vehicle thefts, Police Sergeant Singh has deployed boundary sensors and drones in the area to try and develop the existing intelligence picture and prevent further thefts.

When an attempt is made to break into a plant manufacturing compound, the boundary sensors detect the perimeter has been breached, triggering an audible alarm in the compound, an alert to the team at the Rural Crime Unit (RCU), and a signal which deploys a hive of insect drones housed within the compound.

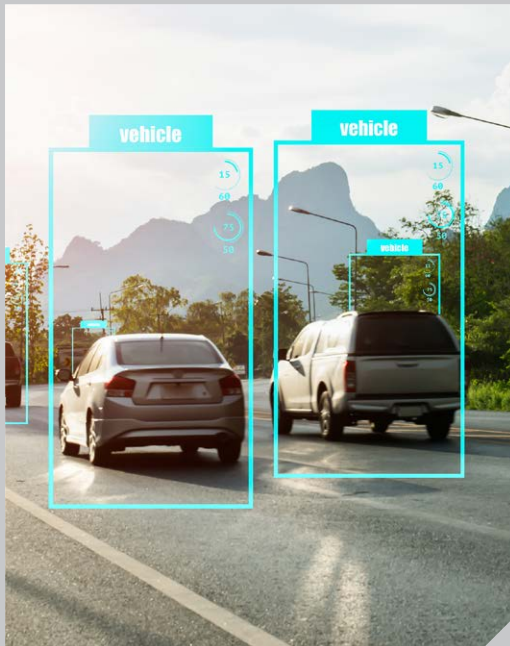
Once activated some of the drones use thermal imaging technology to follow the perpetrators as they attempt to steal parts of the equipment, with others attaching themselves to the machinery under attack. All drones deployed stream live footage captured from their positions to the Rural Crime Unit (RCU).

The drone footage has captured sufficient imagery of the vehicles involved in the attempted theft to update and inform the arresting officers of the potential perpetrators on arrival at the compound.

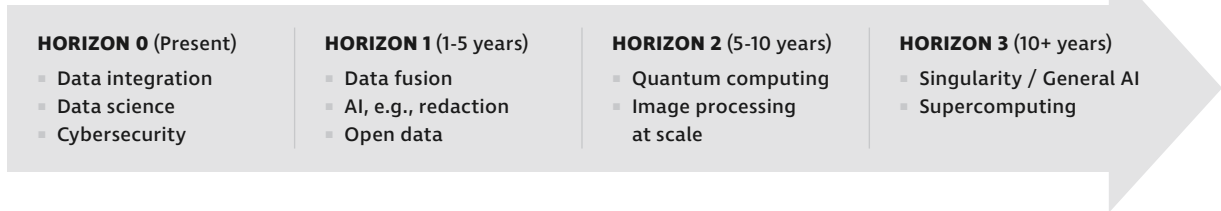


# Analytics

The ability to synthesise information to draw insights that can lead to actionable decisions, often in combination with other information and at scale.



Information from the NPCC Police S&T Strategy



## Object Detection and Image Processing

Object detection and image processing link to the Analytics service line and time Horizon 1 (from 2024+)

### Summary

Object Detection utilises Artificial Intelligence (AI) to autonomously analyse images. The AI model can be pre-trained on items of interest through labelled datasets. In the future, it may have the ability to learn from previous activities to improve accuracy or speed of detection. These techniques could be used to identify stolen items, automatically monitor images and video footage for specific models of vehicle or types of clothing, or to potentially monitor sensor outputs, detecting concealed weapons.

### Action for Policing to Consider

- Public trust and perception in AI systems, including explainable AI processes and transparency in data collection.

- Evidential credibility of AI gathered data, including supporting legislation and policy if relevant.
- Potential development of government- or police-owned datasets with which to train AI models.

### Impact on Policing

- Large-scale automated image processing and analysis, significantly reducing the time taken to assess images from seized devices, or search CCTV footage.

continued over

## Analytics continued

- Improved detection and tracking of suspect vehicles, based on their colour, make, model and / or distinctive markings, not just their VRN.
- Improved detection of concealed weapons when combined with other sensing technique outputs, improving both Officer and public safety.
- May enable comparison of recovered objects against a database of reported stolen items.

### Underpinning S&T required

- Improving electronic devices and physical computing capabilities.
- Improved secure communications networks, including the integration of quantum cryptography networks.
- Testing of AI systems against representative data sets.

### It's 2031...



and DCS McDermott's team is tasked with investigating an organised crime group responsible for sharing child pornographic material within a space on the metaverse.

They use automated analytical software to process the imagery and collate any intelligence that may help to identify the individuals or locations featured. The software automatically cross-references the imagery with that held by the technology hub and works simultaneously to uncover IP addresses behind the accounts.

Algorithms process the darker areas of the imagery, identifying additional 'hidden' figures outside of the camera's direct field of vision. This enhanced intelligence picture enables the team to develop hypotheses around the scale of the operation and perpetrators involved.

Access to this type of software significantly reduces the effects of trauma-exposure on the team, as manual trawling of imagery is replaced by the analysis by the AI. The efficiency of the software and autonomous element to the sorting, sifting and cross-referral also allows the team to develop more pro-active and preventative investigations.



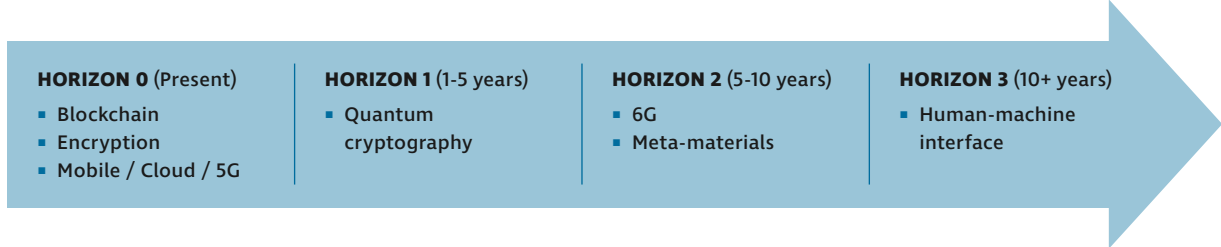


# Interconnectivity

The ability to pass information quickly, accurately, and securely, and the ability to intercept or disrupt communications of others.



Information from the NPCC Police S&T Strategy



## Human-Machine Interface

Human-machine interface links to the Interconnectivity service line and time Horizon 3 (from 2033+)

### Summary

Human-Machine Interface (HMI) influences the ways in which humans control, interact and coordinate machines and technology. This includes novel ways that leave the hands free, improving speed of data capture and real-time access to information, improving interactivity and functionality.

### Action for Policing to Consider

- Market exploration of off-the-shelf capabilities.
- Connect with existing security and defence partners to understand the “art of the possible” and inform police aspirations.
- Scoping exercise to understand the societal, ethical and legal implications for the uptake of integrated machine interfaces.

### Impact on Policing

- Hands-free control of equipment such as communications, drones or robots, through gestures or directly through mind control.
- Increased speed of information capture, through integrated speech-to-text, or automated translation services.
- Enhanced options for communications with Officers in the field, providing real-time access to relevant information.
- Improved situational awareness through real-time mapping of surrounding areas, including static and moving objects / people.

continued over

## Interconnectivity *continued*

- Adoption of telexistence, whereby remote officers control robotics in the field. This increases safety for Officers as there is reduced need for physical exposure.

### Underpinning S&T required

- Integration of sensors, communication systems, information systems and controls, potentially into pre-existing systems.
- Improving computing power and data processing will increase the speed of access to relevant situational data.
- Understanding the impact on human cognition of neural integration to enhance communications.

### It's 2040...



and PC Beharie attends a scene after a hit and run incident. Whilst she's talking to a few witnesses, she realises that one of them only speaks Japanese.

Using specifically designed earpieces that she and the witness can both wear, their dialogue is translated in real-time enabling them to communicate.

The software used by the earpieces also automatically generates a transcript of the dialogue and uploads versions of the witness statement in both languages to the database. PC Beharie shows the Japanese copy of the statement to the witness on site, who confirms they are happy that the content is accurate and electronically "signs" the statement.

Once back on patrol, PC Beharie's smart glasses alert her that a vehicle parked across the street matches the description of a vehicle from a robbery nearby. After automatically running a check on the vehicle, the smart glasses show PC Beharie that the registered owner has warning markers for violence.

On learning this, PC Beharie requests backup so she can arrest the suspect on their return to the vehicle without putting herself at risk.



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## Section Two

# Technical Spotlights

We'll be taking a slightly closer look at two of the technology areas – Sensing and Human-Machine Interfacing. Both technologies feature in the NPCC Police S&T Strategy and have the potential to impact on each of the seven service lines.

- Surveillance & Sensing  
NPCC S&T Strategy Service Line
- Interconnectivity  
NPCC S&T Strategy Service Line



# Surveillance & Sensing NPCC S&T Strategy Service Line

## Sensing Technology Spotlight

This section is intended to expand on the NPCC Police S&T Strategy. It will provide an overview on some of the current capabilities and look further into the future horizons on what sensing capabilities might become available.

### What is Sensing and what can we do now?

Sensing is the term we use to describe the process of finding out the nature of something, whether that is on the scale of atoms, the universe, or familiar everyday objects. Our own biological senses of seeing, hearing, touching, tasting and smelling allow us to do this to a greater or lesser extent. At the same time, advances in scientific knowledge have allowed us to develop a wide range of technologies and techniques that enhance our natural abilities. In the case of seeing, we have developed instruments that span the whole of the electromagnetic spectrum, of which light that we see is one very small part. On the other hand, while we have developed instruments to detect and identify odours, we have also trained dogs to indicate the presence of specific odours, making use of a dog's intrinsically ultra-sensitive nose compared to ours.

### What does sensing mean for policing?

Sensing capabilities are critical for modern policing to be effective in serving the public. Different sensing modalities provide different types of information that can help build a picture of what is present at a particular time and place and therefore help with decision-making for the best operational outcome.

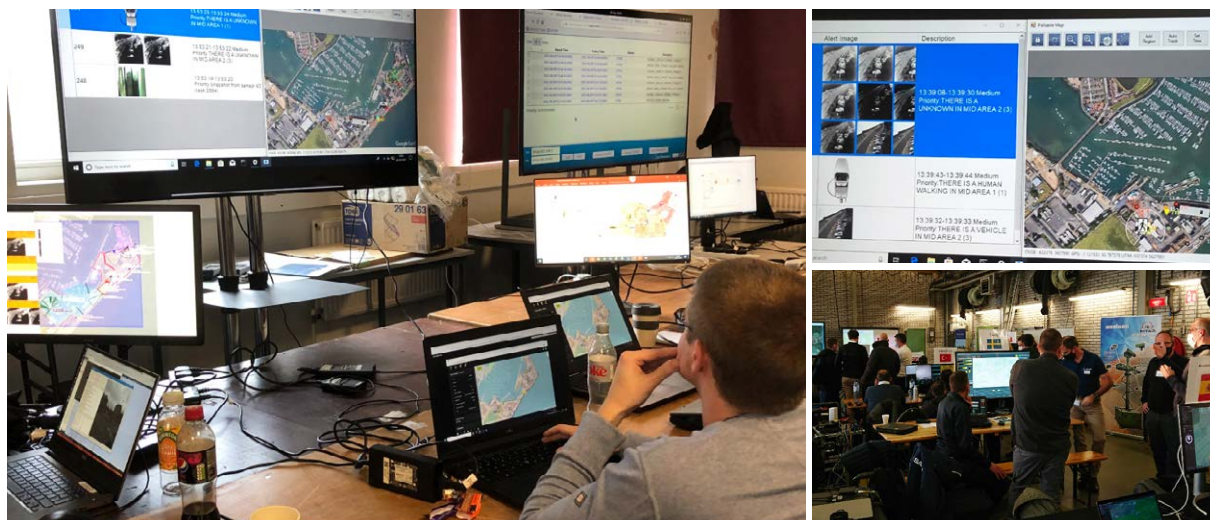
Examples of current in-service sensing capabilities include thermal imagers, visible cameras, metal detectors, ground penetrating radar, sonar, microphones, breath analysers and 'sniffer' dogs. These mature technologies and techniques are representative of a wide range of sensing capabilities for providing situational awareness, screening people, searching for hidden objects, surveillance and so on. These sensing capabilities are possible only because of continued investment in underpinning science and in the development of enabling technologies.



## What might we be able to do in the future?

### Horizon 1 (1-5 years)

- **Key points:** classical / "Quantum 1.0" sensor technologies still prevail, focussed on improved **whole system sensing performance and effectiveness** through **signal processing and information fusion**, new sensing concepts from other application domains and 'mass market' sensor technologies including **open architecture** for hardware-independent applications and more efficient **technology insertion** for new hardware.
- Sensing capabilities at present (Horizon 0) are mainly systems that are used separately in any given scenario. Decision-making is therefore based only on the information provided by an individual sensor technology. Continuing, rapid advances in the areas of artificial intelligence (including machine learning) and autonomy (including 'computing at the edge') open up the possibility to develop and test concepts for networks of sensors. Decision-making is then based on the combined information provided by multiple sensor technologies at different times and in different locations. This process of combining the output of different sensors is called information fusion. The technology exists



Credit: Images of SAPIENT from gov.uk website.

to do this: **SAPIENT** is an open architecture for **multi-sensor information fusion and sensor management**. The information uncertainty is minimised by tasking individual sensors based on their fused output. This then feeds the **decision-making** for the choice of **operational response** to achieve a **desired effect**.

- **'Mass-market' technologies** (e.g., automotive radar modules, wifi and video game graphical processing units) continue to provide opportunities for developing new sensing concepts or improving the performance of existing sensing technologies. Exploration

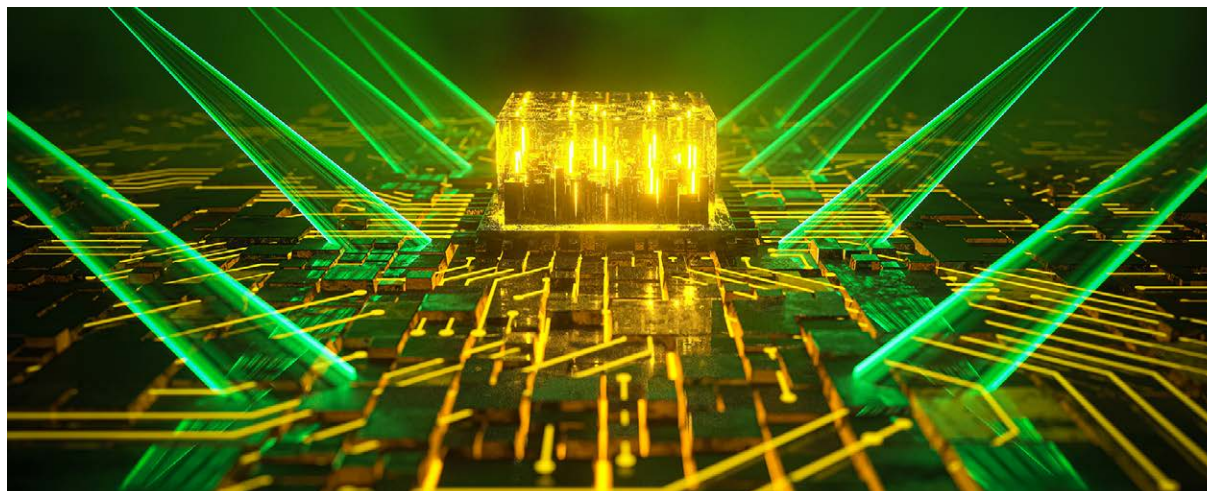
of **'parallel worlds'** may lead to new ideas for solving particular problems / challenges (e.g., detection of knives concealed on people) by adapting sensor technology used for a different purpose and developing this into a new sensing capability for policing.

*continued over*

# Surveillance & Sensing NPCC S&T Strategy Service Line *continued*

## Horizon 2 (5-10 years)

- **Key points:** development of new **quantum-enhanced sensor technologies** continues to advance towards practical devices, but still relatively immature. However, combined with new computing techniques and technologies this opens up **novel sensing concepts**. Continuing advances in signal processing are critical to improving the performance and effectiveness of existing sensing systems. Hardware improvements to existing sensor technologies are possible with new materials and techniques (e.g., graphene, Rydberg atoms and meta-materials), which allow operation across a wider frequency range without loss of sensitivity.
- The UK [National Quantum Technologies Programme \(NQTP\)](#) offers the prospect of new **quantum-based sensing devices** that are smaller (Size), lighter (Weight), more energy-efficient (Power) and cheaper (Cost) – so-called reduced SWaP(+C) – than current sensing technologies. The vision of the [Quantum Enhanced Imaging Hub](#) within NQTP is "... is to pioneer a family of multidimensional cameras operating across a range of wavelengths, time-scales, length-scales, creating a new industrial landscape for imaging systems and their applications in the UK."



More concretely, this hub is all about developing "new types of **ultra-high sensitive cameras** with capabilities that extend beyond the scope of existing camera technology."

## Horizon 3 (10+ years)

- **Key points:** "Quantum 2.0" sensor technologies properly emerge with **bio-engineered / quantum biological sensors** on the cusp of practical devices with massively reduced SWaP(+C) permitting further novel sensing concepts at the **interface of physics, biology and engineering**.

- Looking this far ahead to say what sensing capabilities might be available is full of uncertainty. Advances in science and technology are not smooth. However, it is likely that quantum-based sensor technologies will continue to mature so that quantum-enhanced sensing systems begin to replace older sensor technologies because of their improved performance and effectiveness. Quantum-enhanced sensing systems also start to provide entirely new capabilities such as imaging through an obscuring medium (cloudy water, fog, dust, etc.) or barrier (camouflage netting, foliage, etc.).



## Relevance to the Service Lines

### Surveillance & Sensing

The ability to lawfully monitor and collect data from people, activity, movements, behaviours, objects and data overtly and covertly.

- The NQTP is already demonstrating the potential for new sensing concepts (e.g., based on single photon / pixel cameras) such as ultra-low flux covert illumination and non-line-of-sight (NLOS) imaging. Such enhanced sensing capabilities like these will mature (increase in TRL – “technology readiness level”) over the course of the three time horizons, but how could they be used and what difference would it make to existing operational tactics, techniques and procedures (TTPs)?



### Analytics

The ability to synthesise information to draw insights that can lead to actionable decisions, often in combination with other information and at scale.

- The development of new sensor technologies will give policing new sensing capabilities. But how will these multiple capabilities be best deployed? What is the optimum mix of sensing assets to use against a given object in a given environment? To what extent will the sensing assets and the decision-making for directing sensing assets be autonomous given a set of requests for information (RFIs) from a police officer? These are research questions whose answers will lead to dynamic collection and fusion of multiple sources of data, information and knowledge, the output of which informs a commander’s decision on what action to take. The SAPIENT standard for multi-sensor data and information fusion (i.e., Bayesian probabilistic) provides such an open architecture for dynamic collection by, and prioritisation of, sensing modules for detection, tracking, recognition and identification (DTRI) of targets, and thereby answer those questions.



## Challenge / How can we use Sensing?

- A particular current and urgent challenge is that of detecting a knife concealed on a person. Knife crime is a complex social problem with many causes and there is a critical need to focus on prevention including public health approaches. However, downstream of this, frontline policing needs timely and effective ways to find knives carried by people, which is critical for increasing community confidence.
- Detection in this case means distinguishing from benign items and any sensor technology needs to have a low false positive rate to give confidence to both policing and the community. On the other hand, a low false negative rate is also critical so that concealed knives are not 'missed'. Any 'miss' means a continued threat to public safety.
  - Current Capabilities: metal detection 'wands' and 'arches'; short range, controlled settings, and divestment of personal belongings to resolve alarms.
  - Future Goal: longer range (for officer safety), non-divestment of personal belongings, uncontrolled flows of people.



- The science and technology supplier base in academia and industry is actively pursuing new ways to solve this 'sensing question', and we are linking with our international partners to influence their efforts in related application spaces. Suppliers are approaching the question at both a fundamental and applied level, from development of signal processing techniques, proof of concept studies to demonstrate new components based on new materials, to implementing familiar sensing techniques in new ways. In this way we are collectively and collaboratively developing sensing concepts for assessment and demonstration in support of subsequent equipment procurement decisions for manufacture and to put into service with policing.

## How might policing need to prepare for the future of sensing?

- A cultural change will be required in terms of equipment capability development and actively exploring "generation-after-next" technologies and requirements to drive advances in the fundamentals of sensing.
- Officers will need to be increasingly aware of sensing sciences and their potential operational impact. The level to which officers are upskilled will depend on their chosen career but all officers would benefit from basic awareness.
- Build on collaboration opportunities. Sensing is a large field and policing will need to increasingly work with industry, academia and partners across government (for example through initiatives such as the **National Security and Innovation Exchange**).

# Interconnectivity NPCC S&T Strategy Service Line

## Neural Interfaces Technology Spotlight

This section is intended to spotlight potential applications for Neural Interfaces (as part of Human-Machine Interfaces) including how this might benefit the Police in the future. This technology has significant impact on how we will integrate with machinery moving forward.

### What is Neural Interface Technology and what can we do now?



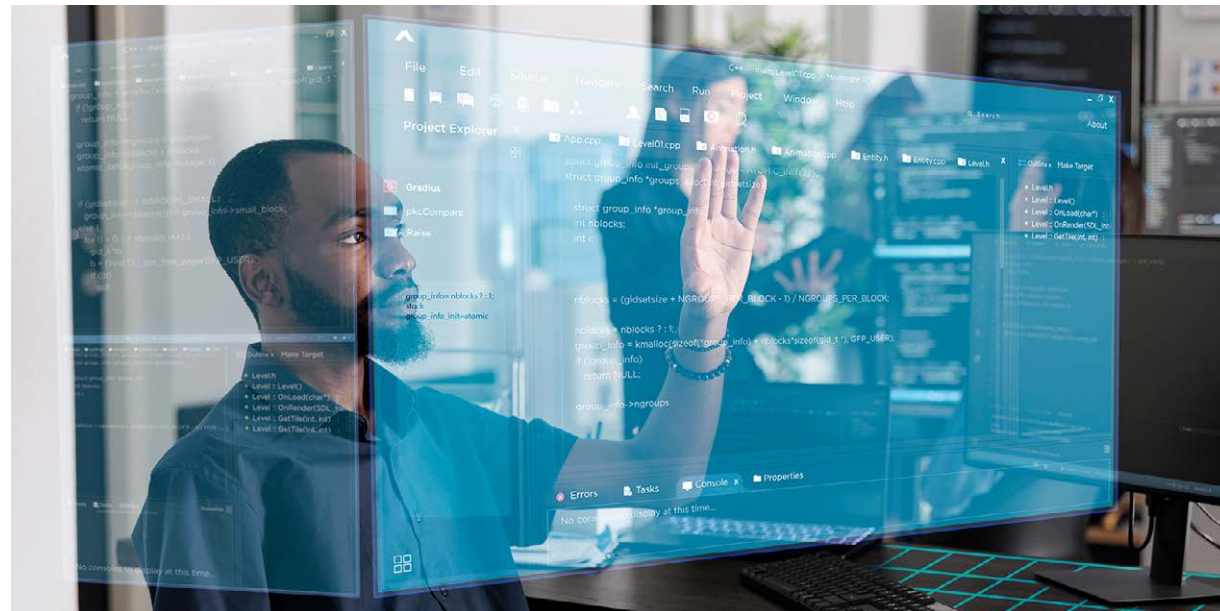
- Neural interfaces include any technology that enables the measurement of the internal state of a human via the nervous system. Examples of such devices include eye movement trackers and brain activity recording equipment.
- These devices are frequently used in neuroscientific research to understand how the brain functions. Currently, many devices which record brain activity rely on being in a controlled environment such as a research lab, and their effectiveness is severely limited when exposed to real-world settings, which can induce data artefacts through movement or sources of electrical interference. However, ongoing developments in sensor technology, combined with developments in AI, are expected to enable the use of neural interface devices in real world settings.
- The ability to capture and process neural data in real time promises a future where humans can interact with machines using wearable technology and is likely to be the core of future man-machine interactions. This can be in the form of actively controlling the input to a machine through a brain computer interface (BCI), for example by selecting different options on a screen or by sending commands to an autonomous robot such as a drone, all using only your mind.
- Neural interfaces can also operate passively by constantly monitoring the neural data it receives and assessing an individual's 'brain state'. In doing so, a device can detect features of interest in the individual's brain activity and react accordingly. For example, a system could monitor whether an individual is becoming cognitively overloaded with a task, and if they are, could simplify the amount of data being shown to them, thereby easing the cognitive burden. Such a system is able to run autonomously and respond to changes in a user's cognitive function in real time and is termed a neuroadaptive system.

## What might we be able to do in the future?

As the use of neural interfaces in real-world settings is heavily dependent upon continued advances in sensor and AI technologies, they will mainly be realised in the later time horizons.

### Horizon 3 (10+ years)

- Controlling autonomous systems – The ability to command an autonomous system to perform a predetermined set of actions, will be achievable in real-world settings. For example, this could include ordering a drone to fly to a certain area and provide surveillance by simply focussing on the area.
- Neuroadaptive systems for heads-up displays – Future information displays will include not just screens, but heads up displays and Augmented Reality systems. In order to regulate the flow and quantity of information delivered to an individual, neuroadaptive systems can monitor their cognitive state and reduce the amount of distracting information during stressful or busy times, preventing personnel becoming overloaded.



- Threat Detection Alerts – through the continuous monitoring of cognitive state both at the individual and team levels, when officers detect potential threats or danger, nearby officers can be alerted to increase situational awareness or to call for assistance if needed.

# Interconnectivity NPCC S&T Strategy Service Line **continued**

## Relevance to the Service Lines

### Interconnectivity

The ability to pass information quickly, accurately, and securely.

- The advance of neural interfaces would dramatically change human-machine interactions, enabling hands-free communication with machines.



### Personal Safety

The ability to protect our workforce and members of the public through e.g., body-worn equipment, location resilience, less lethal weapons.

- Continuous monitoring of bio-data would enable rapid response to detected threats as well as alerts during cases of injury.



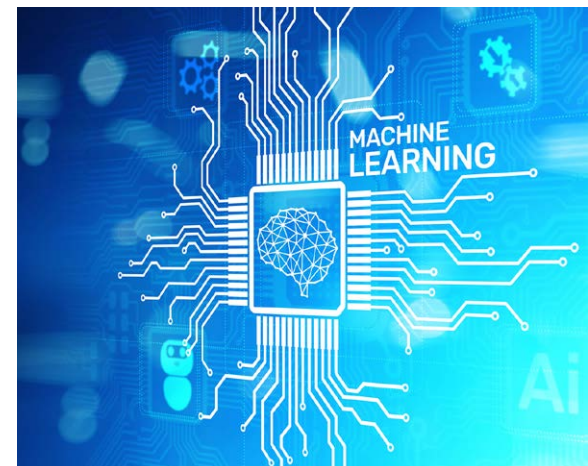


## Challenge / How can we use Neural Interface Technology?

- Wearable sensors are currently at a medium TRL, and continued development should provide suitably accurate data for a variety of neural interfaces. Implantable sensors are at a lower TRL, and will always produce more accurate neural interfaces, however they are associated with more extensive ethical implications. It is likely that human research with such sensors will be led by countries with lower ethical standards than the UK and its allies. For this reason it is important to maintain awareness of animal studies and the broader strategic environment by engaging across Government. Currently neural interfaces are not employed within Policing, however there are clear areas in which their utilisation could provide performance enhancements. These areas must be identified, with the requirements of a potential neural interface clearly articulated. To develop these future systems, Police will need to engage broadly with industry, academia, national and international partners.

### How might policing need to prepare for neural interface technologies?

- Policing will need to work with others (including the public) to understand and assess the ethical, moral and societal implications of neural interface technologies.
- Legislative change should be anticipated in terms of both policing use of neural interface technologies but also in broader legislation as the technology is adopted in other sectors and society.
- Sensing – the development of robust sensors, capable of capturing accurate biological data in real-world conditions.
- AI and Machine learning – advances in AI and machine learning techniques will be needed to process the biological data in real time and adapt to changing conditions in the environment.



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## Section Three

# Mythbusting

Science and technology futures involves developing insight and that includes understanding what is commonly thought to be true or possible but in fact isn't (or at least not yet!) and equally identifying things that many people think are not possible but in fact are (or are likely to become) a reality. In this section we look at some mythbusting and show the power of keeping an open mind and challenging your own and others assumptions.

- Introduction
- Mind Reading
- Neural Implants
- Brain Stimulation
- What should *you* do?

# Introduction

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Neuroscience is a field of study focussing on the brain but more broadly the nervous system. There are many pop science publications, media pieces, commercial technologies that cite neuroscience research and make misconceptions, misinterpretations, and over generalisations.

Indeed, it is such a pervasive issue that professionals in the field coined the term '**neuro-myths**' i.e., an incorrect understanding of the brain, held by large numbers of people. Neuro-myths are plentiful and wide-reaching and in many cases are actively harmful, when brought into operational practices.

There are many myths about the brain, some resulting from the marketing of 'commercial off the shelf' (COTS) technology that is ready to procure today, but which have little scientific evidence to support their use. Because the brain (and any technology related to it) is so complex and the scientific study of it, so impenetrable, it is easy to misunderstand or even misguide end-users who may look to utilise the promised benefits.



# Mind Reading

It is quite a common perception that current brain imaging technology is able to read your thoughts. You might have come across some articles that suggest this. Indeed, there are advances in neuroscience which scratch at the surface of decoding the human brain and the thoughts, behaviours, and quirks therein. Using large machinery like fMRI scanners (as you might find in a hospital) and sophisticated analysis techniques, neuroscientists are able to link certain actions, attitudes, and / or behaviours to activity in the brain (e.g., wiggle your fingers and we can pinpoint that in the relevant areas of your brain).



However, this requires **a lot** of data, detailed knowledge of whatever the task was including access to very precise timings about it (down to the millisecond). In truth, even with all that, there's still a lot of inference we have to do about the findings; whether it truly reflects what we think it does (does X brain region actually drive Y behaviour?) and whether the data applies to everyone. Beyond that, we really don't know how activation of neurons (brain cells) or groups of neurons give rise to complex phenomena like thought, language, and emotion!

## Neuro-rights

There is a growing concern about 'neuro-rights' – the right to respect people's "physical and mental integrity" and protect "brain activity and information related to it" (**see Box 1**). It'll never really be possible to use brain waves to steal your credit card number or invade your mind – we just don't have that technology. Some companies might suggest that we do and quite often when they cite research, the studies involve very invasive technology on patients requiring clinical treatment of a serious condition. While this approach has generally shown that it's possible to (e.g.) spell out words using just thoughts, it should be very heavily caveated that this is because of highly invasive surgery, the result of months of training, and is rarely successful or accurate – a caveat commercial companies would rarely tell you about.

## Box 1. International regulation

In September of 2021, Chile became the first nation to enshrine the protection of 'neuro-rights' into their constitution. International organizations such as the UN, UNESCO, the Council of Europe, the Organisation for Economic Co-operation and Development, as well as national parliaments are working on the inclusion of neuro-rights into various forms of regulation.

## What's the bottom line?

There are many ways to infer people's preferences and behaviour and they are much simpler than scanning a brain. Neurotechnology is not as advanced as commercial companies will make it seem.



# Neural Implants

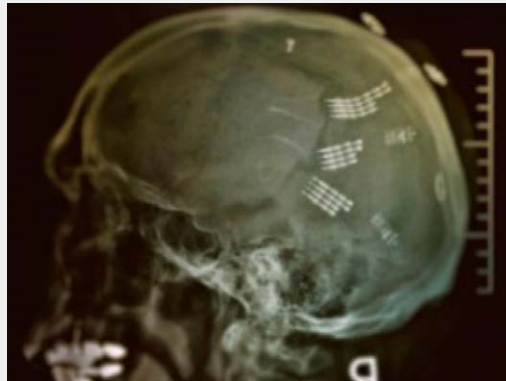
There have been many depictions of Brain Computer Interfaces (BCIs) within popular fiction, for example, 'The Matrix' played on the idea that we could learn new skills by downloading them into our heads. Likewise, 'Elysium' and the Borg from 'Star Trek' play with the idea of improving human performance through the physical implantation of devices, controlled by the brain. This technology is far more advanced than we could ever develop, certainly within the timeframes eluded to. Equally, surgery exposes the patient to a significant risk of infection, with BCIs, creating an added risk of causing haemorrhage or damage to cortical tissue (see Box 2). Currently, we only ever do this when the risk is largely mitigated by existing dysfunction. However while the NHS may never look to implant healthy humans, it is likely this technology will be sought by other groups within society.

## Citizen Biohacking

Biohacking involves the deliberate use of substances or technologies to alter the human body in order to improve cognitive or physical performance, or to change the way that humans interact with the environment around them (see Box 3). Citizen biohacking is conducted in many cases by individuals who experiment on themselves and share their experiences within relatively closed communities. This leads to a situation where effective regulation of techniques and technologies is not possible and citizen biohacking is continuing without medical or scientific oversight or input.

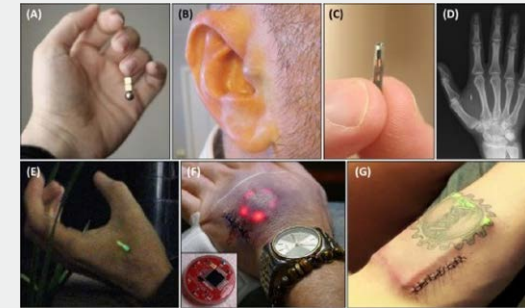
As this approach becomes more general practice, it will likely impact policing services; in border control, cybersecurity, prison and probation.

### Box 2.



In 2014 Dr Phil Kennedy, often referred to as the father of cyborgs, paid a surgeon to implant electrodes, connecting his brain to his computer. During the surgery, his brain swelled up and the incision on his skull would not close. When he awoke, he was temporarily paralysed and had to have the device removed. This is the only documented case of a neural implant in a healthy human.

### Box 3. Implants used by biohackers



- A. Magnet in a finger.
- B. Magnets in the ear.
- C. RFID tag.
- D. RFID tags implanted in the finger and thumb.
- E. Tritium lighting implants.
- F. LEDs in hand.
- G. Temperature sensor in forearm.

## What's the bottom line?

Neural interfaces may never be effective enough to justify the risks associated with physical implanting. Cottage industries may still pursue the practice as it has with other tech.

# Brain Stimulation

Brain stimulation refers to non-invasive and invasive techniques and technologies that temporarily alters brain functioning through electrical or magnetic stimulation. This is an area of interest to many domains but keenly within training and human performance – this is because stimulating the brain is believed to kick-start the process of neural plasticity (the brain's ability to grow, adapt, and reorganise). There is some evidence of that. However, what people get distracted by, is the notion that the stimulation creates gains in human performance; that it gives you abilities that you don't already have. A lot of media portrayals of altering brain functioning comes from this idea that we use only 10% of our brain, which isn't true. We use all of our brain (see **Box 4**). In reality, all this technology does is lowers the threshold for neuronal firing. Said another way, it makes it easier (or harder, depending on your technique) for the brain to do what it's already capable of doing.

There is a fair amount of controversy whether brain stimulation techniques are actually effective. A specific form of stimulation called transcranial direct current stimulation (or tDCS) has thousands of papers and hundreds of meta-analyses, scrutinising its efficacy. Indeed, an international survey revealed that only 18% of the 265 published tDCS researchers asked, believed that tDCS was "mostly" or "absolutely" effective for performance enhancement in healthy individuals. As with

## Box 4. 10% of the brain

This is an appealing idea because it suggests the possibility that we could become so much more intelligent, successful or creative. It probably comes from the fact that 90% of the cells in the brain are glial cells, like support cells, and the other 10% are neurons which do more of the thinking. So perhaps people heard that only 10% of the cells do the hard graft and assumed that we could harness the glial cells too. But these are different kinds of cells entirely. There is no way that they could suddenly transform themselves into neurons, giving us extra brain power.



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neural interfaces, there are various COTS devices on the market, selling the notion that they can improve rates of learning and the extension of memory, simply with a small period of electrical stimulation. And, just like neural implants, there's a cottage industry of people experimenting with the technique at home, without any expertise or oversight – at best this has had no effect, at worst caused significant lesions and even triggered seizures.

## What's the bottom line?

Electrical stimulation cannot enhance skills beyond a human's biological potential and it is no replacement for well-developed training.

# What should you do?

Neurotechnology has the potential to support policing, however it is crucial that police become intelligent customers in this area. To achieve this it is important to:

## 1. Recognise that this technology is coming

A number of state and non-state actors are already investing heavily in this area: China has spent over ¥8.5 billion (£1 billion) through the China Brain Project and North America, approximately US\$6 billion (£4.8 billion) through the BRAIN Initiative. Likewise large conglomerates including Microsoft and Facebook are pursuing the commercial development of the underlying technology, with players like Neuralink pushing strongly on the wide-scale commercial adoption.

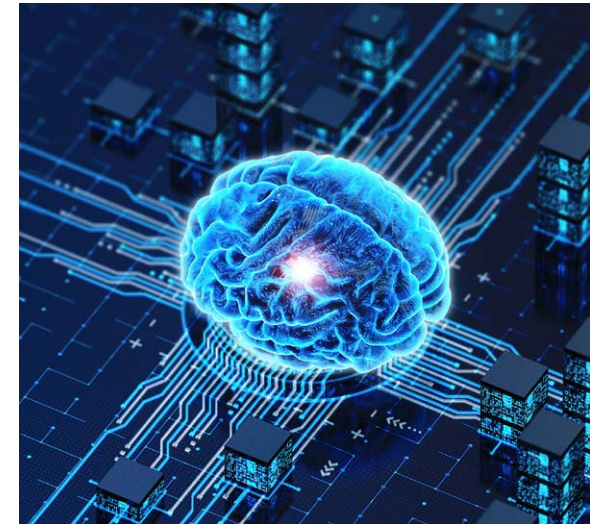
It is crucial that UK Policing engages with this area to ensure that its bespoke requirements are considered by industry as they develop the commercial solutions. Without this engagement the technology will not be 'secure by design' and as a result will not be exploitable into UK operational use.

## 2. Begin policy discussions early

Policy Makers need to have early understanding about the enablers and barriers to the use of this technology within the UK. There are many pitfalls and red-herrings around neuro-rights which over inflate the capability of neurotechnology. In reality, there are threats to using this tech but they are not so grand as invading one's thoughts. Engagement with Subject Matter Experts will ensure the UK is positioned to leverage and regulate this technology when it inevitably sees wide-scale roll out.

## 3. Engage with Subject Matter Experts

Dstl works with partners to generate a network of academic and industry groups so that UK MOD and wider Government has access to this technology in future capability. This includes a number of activities to develop the fundamental science and evidence, through PhD projects and industry led experimentation. This technology area is at a crucial point that requires input and support from integrators to ensure that the technology, the sensors, the algorithms, and networking is secure by design.



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## Section Four

# Developing Insight Through Collaboration

Here we will look at a collaborative platform (**Futures Platform**) that this work has experimented with to engage a police futures community and ask their views on specific topics (over a number of time horizons) themed by their relevance to the NPCC Police S&T Science Strategy.

We'll discover why it's helpful to experiment with novel ways of developing insight, drawing on diverse views and explore the insight that can result.

- Futures Platform
- Rating Matrix





# Rating Matrix

## Concepts that have the potential to affect a limited number of Police Officers and Staff, and may be accessible through commercial solutions (i.e. off-the-shelf)

### AI Robotics

Useful in high risk areas, e.g., underwater searching, hazardous materials at a crime scene, bomb disposal, dealing with a hostage taking.

### Cheap DNA Tests

Rapid DNA screening at crime scenes could identify suspects much quicker leading to earlier interventions. It would also assist with unidentified persons.

Could this assist with driving down costs of existing forensic provision in Policing and Criminal Justice?

### Music Directly into Head

Might this have unintended consequence of creating risk via inattention and distraction? Could you use sound bubbles in public places that encourage group behaviours? Could these be used in adverse ways?

### Bionic Eye

... Sensor tech is a priority strand that policing needs to be globally monitoring, testing and hypothesising – red teaming, etc.

### Electronic Skin

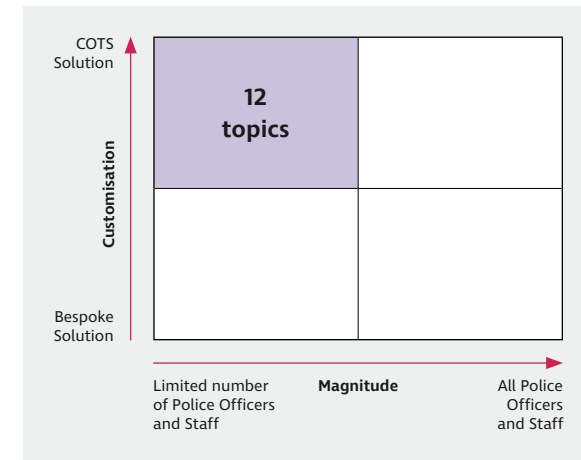
Applications in searching / deploying sensors in a search environment on the human professionals body.

### Home Robots

Such robots could provide options in situations involving vulnerability and safeguarding considerations, e.g., providing reassurance.

### Point Cloud & Light Detection and Ranging (LiDAR)

Offers opportunities for 3D mapping with crime data overlays ... and the ability to generate scenarios overlapping somewhat with digital twin approach, virtual reality (VR) tech for briefing and familiarisation, training, event planning.



The 12 topics also include:

- 4D Printing
- Adenine Based Gene Editing
- Cyborg Plants
- Invisible Online Surveillance
- Sprayable Clothing

## Rating Matrix continued

### Concepts that have the potential to affect a limited number of Police Officers and Staff, and may require a bespoke solution

#### Algorithmic Biology

- “ If applied to understanding behaviour, [this] could revolutionise considerations of criminality and offending.

#### Drone and Bot Swarms

- “ Potential benefits of multiple drone use in ‘swarms’ for situations such as policing widespread public disorder and / or protests over a wide geographic area and major search operations including missing persons to be able to cover large areas more quickly, compared to using small numbers of devices at a time.

#### Exoskeleton

- “ ... mitigate risk in certain policing situations regarding extreme endurance and combined with other capabilities and data collection devices allowing an integrated command system ...

#### Insect Drones

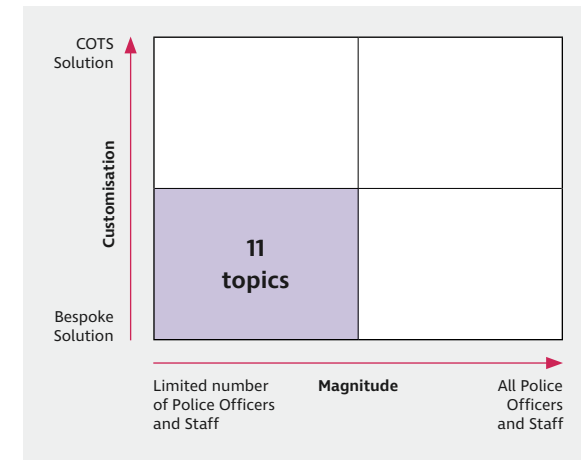
- “ Whilst this kind of device could be useful for intelligence and surveillance purposes, there may be significant implications ... from a human rights, proportionality and necessity perspective.

#### Laser Weapons

- “ Directed Energy weapons could replace conventional firearms in Armed Policing.

#### Microwave Weapons

- “ As per ... Laser Weapons – any development of Less Lethal Weapons could be used by all officers in place of Taser, Batons, etc. It could enable a lower use of force and provide an additional de-escalation tool.



The 11 topics also include:

- Brain-AI Symbiosis
- CRISPR Gene Editing
- Human Body Garage
- Teleportation
- Thought-Controlled Machines

## Rating Matrix continued

### Concepts that have the potential to affect all Police Officers and Staff, and may be accessible through commercial solutions (i.e. off-the-shelf)

#### AI Bot Customers

- High potential for criminal exploitation, new crime types and impacts on supply chains.

#### AI Deep Learning

- Probably many opportunities for major enhancements to capacity and capabilities of police analysts, performance and strategic planning functions.

#### AI Machine Intelligence

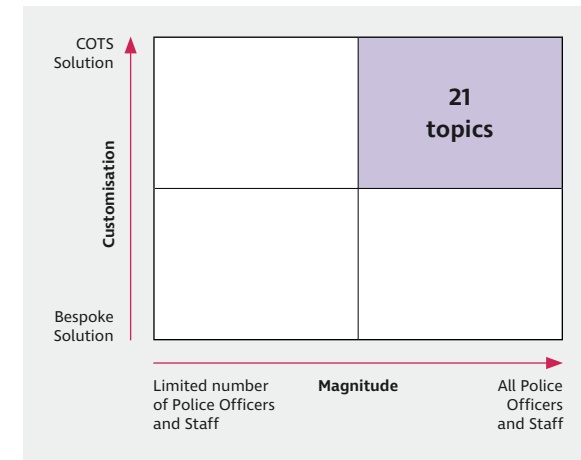
- Potential uses in screening multiple hours of video footage from CCTV and body cams etc, screening Social Media for criminality, assisting in analysis of downloaded data in investigations. Automated redaction for court cases – in summary potential huge savings in officer time, improved outcomes at court and improved public confidence.

#### Augmented Reality Glasses

- Interconnectivity is a priority for policing. Presenting 'live' safety critical data to the officer without diverting their attention helps officers.
- In combination with other innovations and brain computer interfaces, the duality of glasses being physically protective for police frontline as well as an enhancement to activity and decision presents opportunity.
- The cognitive overwhelm threat is real when we are still working out the human brain's capability and capacity and how it is affected by context and experience.

#### Deepfake Videos

- Any police officer could be the victim of a 'deepfake' video showing criminal activity / misconduct causing significant harm to them or to their career. The ability to credibly counter this is critical for officer safety and more broadly confidence in policing.



The 21 topics also include:

- Blockchain
- Flying Cars
- Identify Everything with AI
- Quantum Internet with Drones
- Thought-Reading from a Distance
- Voice & Gesture Control

continued over



# Rating Matrix *continued*

## Digital Humanities

- Improved understanding of sentiment and societal behaviour may enhance policing of sensitive issues, improve police-public communication and prevention of harm. [It] will need a strong ethical core to mitigate potential fears of misuse.

## Intelligence Amplification

- IA could assist in both general policing tasks (low level investigations, local intelligence analysis) and also in tackling organised crime and terrorist networks – there are applications across policing where large amounts of data need to be analysed.

## Invisibility Cloak

- Serious organised crime (SOC) and counter terrorism (CT) threat relevant requiring capability and capacity development in policing.

## Metafabric

- Highly relevant to police operability across a range of environments and activity as climate impacts land.

## Nanotechnologies & Materials

- Policing should focus on using commercially available developments in computing power to aid existing tasks rather than seek specific nanotechnology solutions.

## Quantum Computers

- There is huge scope for major advances in terms of police and law enforcement analytic capabilities and capacity. This would apply in both operational and non-operational business contexts.  
[Also] big opportunities for data insights into the police workforce to help make more informed and intelligent decision making.

- Having such powerful data analytical capability and capacity would also require very strong data security provisions to ensure confidential and potentially highly sensitive information remains secure.

## Quantum Internet

- Very significant opportunities for policing research, engagement and sharing of information between forces, other law enforcement agencies and partners in a much more secure environment than currently possible.

## Road Traffic as Software

- In the longer term, potential implications for roads policing and enforcement. Would require Government to consider and introduce relevant new and revised legislation to be capable of anticipating and accommodating such change.

## Smart Helmets

- ... Police also use helmets for Public Order and integrated Comms / Physiological Monitoring / Situational Awareness tools could be of great assistance. Similarly in Ballistic Helmets worn by Armed Officers.

## Smart Wearables

- ... incorporating radio, GPS tracking, video camera into officers' uniforms would improve their safety and enhance their effectiveness.

## Rating Matrix *continued*

### Concepts that have the potential to affect all Police Officers and Staff, and may require a bespoke solution

#### Camera Revolution

- Such small devices could be valuable for covert surveillance and intelligence purposes. The opportunity for wall based cameras as described could [also] be useful in certain high security/high threat environments.
- Whilst these could be useful for intelligence and surveillance purposes, there may be significant implications for conflict and controversy from a human rights, proportionality and necessity perspective.

#### Computer Vision

- The ability to both proactively and reactively scan video footage for a particular face will be invaluable for policing – (i) seeking a wanted suspect or missing person known to be in a particular area or (ii) reviewing seized CCTV footage after a crime to identify a suspects movements.

#### Facial Recognition

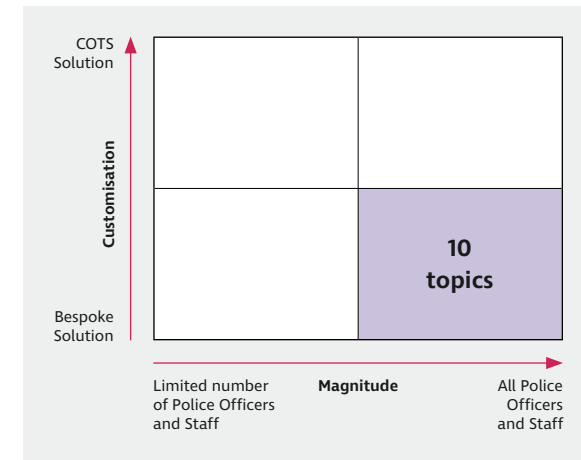
- Impacts all areas of policing and society potentially beneficial for security [however] any implementation must be as democratic and transparent as possible.

#### Predictive Crime Prevention

- This could present significant opportunities for policing, but would need careful thought about how to maximise benefits of and learning from existing local solutions used for predictive crime prevention ... Ideally solutions that all forces can access and share data between each other and work with all local IT systems would be very important.

#### Telepresence

- Priority. The way we have adapted to virtual meetings driven by the pandemic shows swift adaptation even if this is now causing some organisational conflict around physical presence in offices and “visibility” – concept of visibility in policing needs developing by NPCC and should take into account telepresence opportunities.



The 10 topics also include:

- Digital Twins
- Global Brain
- Intelligent Augmented Reality
- Polymorphic Encryption
- Swarm Intelligence

## Section Five

# Global to Local

Global trends, such as climate change, can have a significant impact on our daily lives including the work we do. It is essential to consider these trends, as they provide insight into the possible future world in which science and technology may be adopted including implications for workforce, society, supply chains, and manufacturing. This insight can help us anticipate and prepare for the future. In this section, we will examine some of these global trends and their potential impact on policing.

Understanding global trends and their potential impact on law enforcement is crucial to preparing for the future and exploiting technological advantage but it is important to note that trends are not linear, and their trajectory can change dramatically. Discontinuities may alter a trend permanently or even result in it vanishing altogether.

### ■ Megatrends



Watch DCDC's '[Bucking the Trend](#)' video for more. In addition it can be helpful to consider trends and their impact in a range of possible futures.



The College of Policing's '[Future Operating Environment 2040](#)' helpfully outlines four possible worlds that can be used to explore the future in more detail, how opportunities and threats may play out and how we might prepare for them.

# Megatrends

Megatrends are observable and generally recognised trends that are likely to have global impact. We'll take a look at a handful of them and consider the impact they might have on policing but always remember trends can change – accelerate, decelerate, discontinue, etc., so there is always more than one possible version of the future.

## Megatrend 1: Climate change

The average surface temperature in the UK has increased by 1.2°C since pre-industrial times, and all decarbonisation pathways proposed by the Intergovernmental Panel on Climate Change indicate further warming. While the aim is to limit warming to 1.5°C, the evidence suggests that we should be prepared for warming up to 4°C. The degree of climate change experienced will depend on our ability to control global emissions in the coming decades. It is projected that sea levels could rise by 40cm by the end of the century.

Unabated climate change may result in more severe weather events, hotter summers, and colder winters. This could cause flooding, droughts, heatwaves, storms, snowfall, and changes in habitats, among other impacts. These effects could have a profound impact on citizens, including increased pressure on local infrastructure and services (such as health), higher costs of food production, and competition for resources. Significant changes will be necessary in how people live, work, and spend their leisure time in order to adapt to these challenges.

### What might this mean for policing?

**Personal safety:** Clothing and equipment may become less reliable and effective in extreme weather conditions. Therefore, new materials and techniques will be required. Solutions (including those that are inspired by nature) will be required to develop materials that can combine the need to protect, the need to adapt to climate extremes and the need to integrate a broad range of other technologies that police officers use.

**Mobility:** Contributing to emission targets may initially drive the transformation of the policing fleet but there will be other benefits to more sophisticated electrification solutions. Existing technologies, such as drones, may develop in a way that provide new modes of transport in the mid-term and emerging technologies such as telepresence may reduce or remove the need for officers to have a physical presence in a specific location.

**Public unrest:** A slow response to climate change may result in increased grievances and mainstream protest movements, with demonstrations becoming more violent and widespread. This may be exacerbated if

state intervention is required to meet environmental targets, resulting in civil liberties groups becoming more active. These kinds of increasingly polarised societies will lead to new policing challenges.

**Evolving criminality:** Climate change is already leading to new crimes (such as incidence of wildfire arson) and transnational stressors brought on by climate change, such as pressure on supply chains, infrastructure, natural resources, and population displacement, will result in new vulnerabilities that may be exploited by criminal or terrorist groups.

### Exploring discontinuities – what if?

What would happen if rises in temperature indirectly leads to an environment in which a pathogen becomes equally infectious to numerous animal and plant species?

Adapted from [DCDC Global Strategic Trends](#)



## Megatrend 2: Social inequality

By 2050, the world's population is projected to increase by approximately 2.1 billion, reaching around 9.8 billion people. Society within different countries will be very different with developing countries experiencing rapid growth and younger populations, whilst European and East Asian countries will likely have a quarter of their population aged over 65.

Regional differences within countries have generally increased, and unless mitigated successfully, social inequality within the UK will continue to rise. This is exacerbated by disparities in access to education, social mobility, political advantages, and healthcare provision, leading to an increasing gap in income and wealth distribution.

These trends could result in a breakdown of social cohesion within and between specific countries. The resulting instability may lead to fragmented societies and have a negative impact on national security by creating vulnerable communities and individuals.



### What might this mean for policing?

**Local responses for local communities:** More tailored policing solutions will be required to cater to the demographics of local communities. Building public trust in policing will become even more important with a deep understanding of local communities and the most effective engagement and interventions. Novel techniques that rely more on behavioural science and trust building could be prioritised and solutions that quickly identify (and counter) disinformation will have benefits at a local through to national level.

**Digital inclusion:** Communities already experience unequal access to the digital world and this inequality is set to increase. Disadvantaged communities may have fewer digital skills, less connectivity, and limited access to equipment or networks. As a result, communities and individuals

may become marginalised and novel techniques will be required to police communities that inhabit real and virtual spaces differently.

**Population movement and urbanisation:** The convergence of certain megatrends, such as social inequality and climate change, may result in significant population movement (between and within countries). Currently urban communities are growing at a faster rate than rural communities and cities of the future will look very different. Policing more densely populated cities and towns where for example there are: reduced green spaces, limited private transport options and where building heights are significantly greater, will need novel science and technology to police successfully.

### Exploring discontinuities – what if?

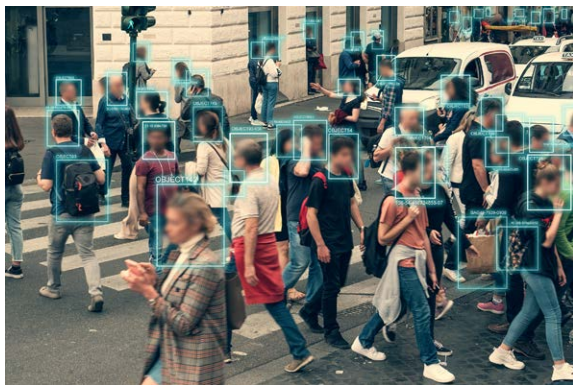
What would happen if there was a fundamental change to one of the major Worldwide religious belief systems (i.e., something similar to the Christian Reformation)?

Adapted from [DCDC Global Strategic Trends](#)

## Megatrend 3: Technological convergence

There are lots of examples of technological integration, most smartphones combine camera, phone, computer, and media technology but in the future technologies may converge in ways that see the acceleration of existing capability and the emergence of new capability. Convergence will see technologies that are more than a sum of their parts.

Artificial intelligence that allows us to exploit the data which often results from new technology, combined with enhanced processing power and increased interconnectivity have the potential to be game changing. It could result in 'shocks' that change or stop current trend lines.



### What might this mean for policing?

**Workforce:** Policing may face increased challenges in recruiting individuals with the necessary skills to understand the nexus between technologies. Business models may need to shift to focus on the ability of the police to technically assure outsourced work. This may be especially true in areas where the public expect enhanced transparency and scrutiny (for example the use of biometrics). Convergence may also change the shape of the workforce, as cognitive and attentional burdens change, and attributes such as intuition and interpersonal skills become more highly valued.

**Digital surveillance:** Technological advancements are likely to take digital surveillance systems to new frontiers in the next 20 years. While current systems typically track and record a person's digital footprint, future systems may possess the ability to interpret people's moods and emotions. Neurotechnology may allow the monitoring of brain events and an understanding of intentions.

**Evolving role of policing:** Traditional crimes are likely to decrease and crime-as-a-service (specifically in deeply technical areas of organised crime) may become more prevalent. Policing may become increasingly involved in activity where there is state actor involvement.



### Exploring discontinuities – what if?

What would happen if the internet becomes just too unsafe and the public cease to use it which drives the development of alternative technologies?

Adapted from [DCDC Global Strategic Trends](#)

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## Section Six

# Futures Methods and Tools

Horizon scanning (actively gathering information for the purpose of identifying patterns or signals) is probably the most widely recognised futures technique but there are a lot of other tools and techniques that futures practitioners use to structure how they explore elements of the future.

- Using tools to explore the future
- Tool 1 – Delphi
- Tool 2 – Driver Mapping
- Tool 3 – The Cone of Plausibility

# Using tools to explore the future

## Futures thinking

Futures thinking is best done in collaboration with many people who bring different views and backgrounds to the table. Futures thinking requires an open mindedness that is quick to question

and slow to judge. By bringing different views and perspectives together this enables futures thinking to be robust and for innovative ideas to be created.

Thinking about the future is something we do day-to-day.

For example, when we plan what we are going to do for the week, where we are going to go on our next holiday, or what we are having for tea.

Thinking far into the future requires more skill, effort, techniques and can feel uncomfortable.

Five ... ten ... fifteen years' time often feels so far away that it can be too difficult to imagine.

If we do not think strategically about the future then we could miss opportunities that could greatly benefit us, or not be prepared for risks that threaten us.

Mitigating possible future threats and anticipating how we might exploit future opportunities can help us achieve a preferred future which is advantageous to us.

Futures practitioners use a range of tools and techniques to aid in futures thinking and provide structure.

As with most tools, these techniques can be used on their own or can be blended with others, it just depends on what provides the most optimal outcome for the objectives.

We will look in more detail at just three techniques, [Delphi](#), [Driver Mapping](#), and [The Cone of Plausibility](#), and how to use them.



# Tool 1 – Delphi

Delphi is a research method that looks at different perspectives from a group of individuals that have different backgrounds to brainstorm on a particular futures topic. The method will allow for a summary of views on a particular area to be expressed and these can aid in setting priorities in a project.

## When would you use Delphi

This method is useful for providing a summary of the views and opinions captured by key stakeholders and experts in order to shape the scope of a project. If the key stakeholders are included in the project from an early stage, they may feel more involved in shaping the work and therefore more invested in the project and more likely to champion it.

The downside of this method is that only the views of the people asked are expressed, and these individuals can only tell you what you know. Delphi can be time consuming and lacks the creativity of some of the other tools. Therefore it is recommended to blend the results with some of the other findings to ensure a broad range of views are captured.

## Key steps

1. Identify a group of around 20 individuals knowledgeable about the topic.
2. Start consultation with a survey or questionnaire to start a flow of ideas.
3. Do a second survey to delve deeper into certain areas and rank the points spoken about.
4. Analyse the results by discussing with the group and seeing where there is consensus and disagreement, and any interesting points.

## Example project

### Novel Materials in Police Uniforms

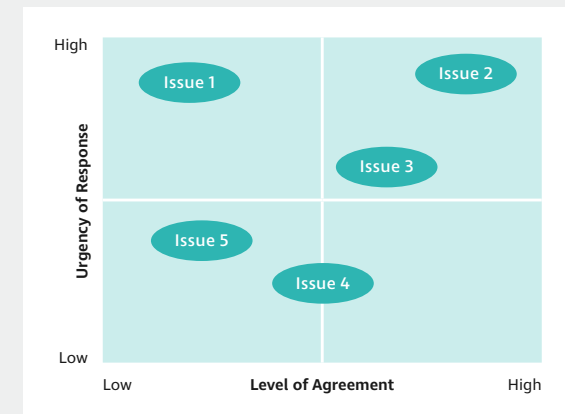
#### Key areas to ask for expert views on:

1. What emerging and novel materials that are likely to be accessible in the future are the most useful for policing?
2. What technology will be most compatible with police uniforms in the future to increase policing capabilities?

#### Key areas to ask for police officers views on?

1. What are the most important requirements for future police uniforms?
2. What tech would be the most useful to incorporate into police uniforms in the future?

The results can be plotted on a matrix like the one here to determine which answers are deemed the most important in order to shape the scope of the project; Novel Materials in Police Uniforms.



# Tool 2 – Driver Mapping

Driver mapping is used to identify the key drivers and emerging trends that are shaping the future of a particular topic. It also seeks to understand the drivers in terms of the potential impact they may have and the level of certainty (or not) in whether and how the driver might realise. Drivers that may have the highest impact and are the most uncertain will be of interest to the project.

## When would you use driver mapping

This method provides a matrix to show the drivers that the participants feel are the most relevant, providing a clearer picture of the drivers that are the most significant. Even though this is a useful engagement tool for stakeholders, it can be limited in terms of helping to understand the relationships and interactions between the drivers.

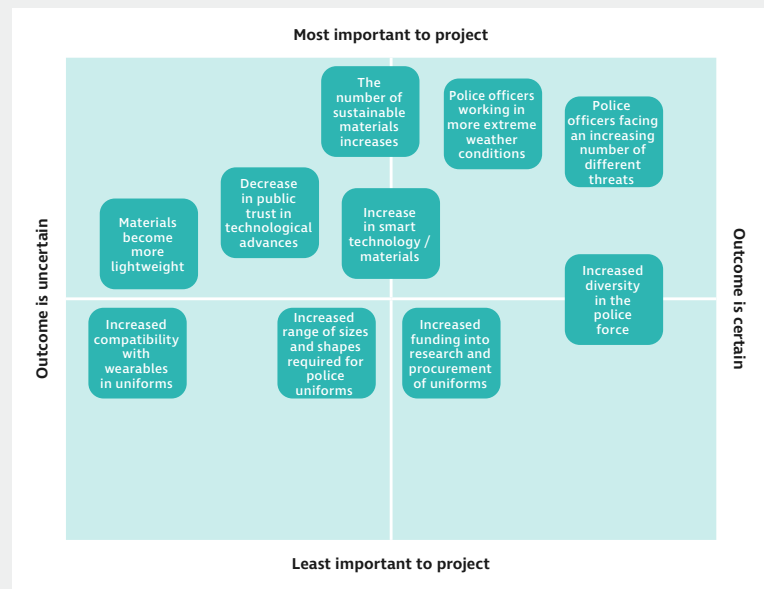
## Key steps

1. Gather a group of individuals in a workshop. Do some preparatory research to identify trends, changes or patterns relevant to the topic or project.
2. Write the relevant trends on post it notes (frameworks like political, economic, social, technological, legal and environmental (PESTLE) can be useful to generate thinking).
3. Ask the group to help map the drivers identified on a matrix using importance and uncertainty as axes.
4. The matrix can be used to explore drivers and how they might impact on the topic or project.

## Example project

### Novel Materials in Police Uniforms

Get stakeholders and subject matter experts to determine the drivers that will impact the advancement of novel materials in police uniforms. Group these in appropriate themes to determine the most impactful drivers in order to shape the projects priorities.



# Tool 3 – The Cone of Plausibility

The cone of plausibility is a scenario generation tool which allows a range of futures to be created to describe how a topic may appear over different time horizons. The process helps groups explore probable and plausible futures and what a preferable future might look like.

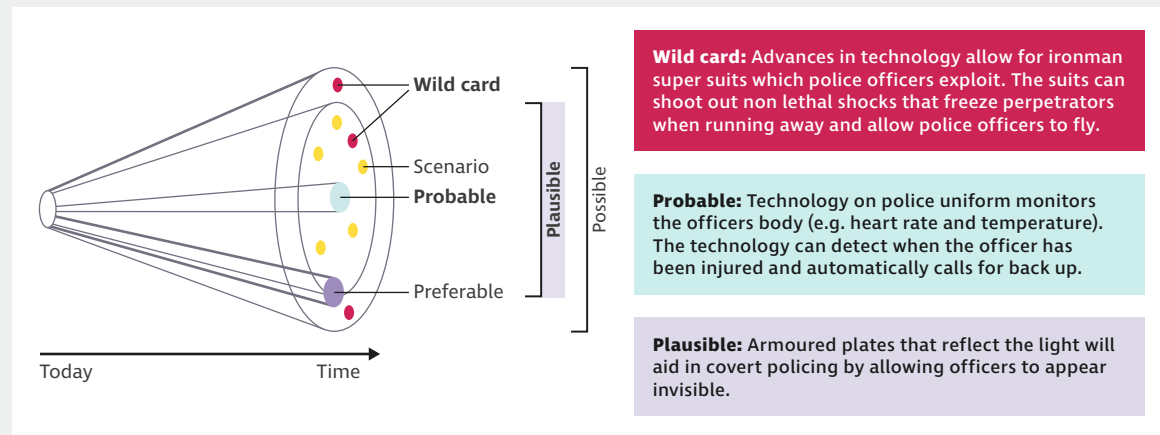
## When would you use the cone of plausibility

This technique will generate a few scenarios and allows participants to deepen their understanding of the drivers influencing change. It's a useful tool for engaging stakeholders and challenging those who have a rigid view on what the future looks like. This tool can be used to underpin the connections and interactions that cause change and can allow Futures projects to be brought to life by allowing the participants to imagine what the future looks like.

## Key steps

1. Gather a group of individuals for the workshop and identify a list of drivers (i.e., trends that could have a fundamental impact) relevant to the topic area.
2. Prioritise the drivers with the group and use the top seven for the following steps:
  - a. Create a baseline scenario by making assumptions about the seven drivers identified. The baseline scenario is what the group predicts the future will look like based on current knowledge and assumptions.
  - b. Assumptions change over time depending on disruptions, changes and discontinuities so the next step is to alter the assumptions to produce a range of plausible alternative scenarios; potential futures.
  - c. Create a wildcard scenario by radically changing the driver that was deemed the most stable and drastically altering it.

## Example project Novel Materials in Police Uniforms



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## Section Seven

# Learning from Science Fiction

Fiction and specifically science fiction allows us to explore the science and technology of future possible Worlds without the limitations (both physical and cognitive) of reality. And it's amazing how accurate people can be in anticipating the future when they are creative and consider the art of the possible through storytelling.

### ■ Learning from Science Fiction



# Learning from Science Fiction

Story-telling allows a level of creativity that is free of current constraints. Science fiction is both a way to learn about what the future might be and also a way to communicate plausible futures to an audience.

## What does Science fiction do?

Science fiction is Futures Thinking as well as Thinking about the Future

- Failure to anticipate the future can leave us facing risks and challenges we are unprepared for.
- Worse, others may prepare where we don't, turning the tables on us.
- Science fiction explores how the future might be; and prepare accordingly.

- These skills build on established knowledge to:
  - Understand the present and past.
  - Anticipate the unexpected.
  - Avoid surprise, avoid future shock.

## The Shock of the Future

What's the advantage for policing?

- Science fiction, future thinking, enables us to:
  - Explore possible situations and scenarios.
  - Understand how crime may develop.
  - Understand how social media may indicate trends ...
  - ... and respond appropriately to ensure public safety.

- Science fiction has presented many ways that Policing might play out in the future.

- This includes something as unusual as literal prediction, as presented in 2002's *Minority Report* or the satirical depiction of cyborg enhanced police in 1987's *Robocop*.



Credit: Gabbot-Attribution-ShareAlike 2.0 Generic (CC BY-SA 2.0).



## Science fiction is not reality ...

... Real life is messy

- Science fiction follows pre-determined narratives but the real world doesn't.
- These pre-determined outcomes allow us to understand the importance of context and how events, technologies and people combine as a system.
- Enabling us to better cope with the "mess" of real life.

# Learning from Science Fiction *continued*

## Policing in Science fiction

### What has come before and where it might go

#### Literature

##### *"Rule 34", Charles Stross 2012*

A police procedural covering several murders across Europe influenced by artificial intelligence and advanced computer technologies.

##### *"Lock In" & "Head On", John Scalzi, 2014 & 2018*

A highly contagious virus has crippled the world locking people in their own bodies. Robotic bodies enable them to interact with the world again but police investigation reveals all is not as it may seem.

##### *"The Demolished Man", Alfred Bester, 1960*

In a future where the police are psychic how might someone commit a murder? What is the ultimate sanction in this society: the "demolition" of the title?

#### Cinema

##### *"Blade Runner", Ridley Scott, 1982*

Even with highly advanced technologies some aspects of investigation remain the same while others are strikingly different.



Credit: Brett Jordan-Attribution 2.0 Generic (CC BY 2.0)



Credit: Blade Runner Spinner-Tydence Davis-Attribution 2.0 Generic (CC BY 2.0)

##### *"Minority Report", Steven Spielberg, 2002*

A leading police officer is incorrectly identified by the "pre-crime" unit as to being guilty of murder in the future: he tries to prove his innocence while finding who will really commit the crime.

#### Comics

##### *"Judge Dredd", 2000AD, 1977 to present, John Wagner, Carlos Ezquerro et al.*

Crime of all types besets a US-spanning city of over 90% unemployment where only the most efficient, brutal police force in history can begin to protect the citizens: the Judges. Explores themes from the comical to the serious including the nature of policing itself.



Credit: Boyce Duprey-Attribution-NonCommercial-ShareAlike 2.0 Generic (CC BY-NC-SA 2.0)

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## Section Eight

# Futures Perspectives

There are many different people working in police futures (and some may not realise they are part of this important community!) They work in a variety of roles and in different functions within their organisations. In this section we'll hear from some of them and learn how they use the future in their roles, what they feel is useful and the challenges they face when considering the future.

- Q&A: Research & Evaluation Officer
- Q&A: Director of What Works
- Q&A: Strategic Business Analyst
- Q&A: Head of Evolve (Innovation)
- How can we make futures thinking useful to decision makers?

# Q&A: Research and Evaluation Officer

## Research and Evaluation Officer

Hampshire and Isle of Wight  
Constabulary

### Tell us a little about your role

“ As the Research and Evaluation Officer my role involves coordinating our engagement in academic research, promoting evidence-based policing, and completing an environmental scanning publication. My role connects to futures in policing, because a lot of future directions are identified in academic research, or evolve as solutions to problems which exist today and will worsen tomorrow.

### What's your futures story?

“ I am new to futures work, and have found this a fairly complex concept to navigate. Our environmental scanning publication is good at looking at today, and even the next month, but anything further afield than that is a new area I'm trying to navigate. One of my biggest struggles so far is understanding the technology and science side of futures, due to not having a background knowledge in these areas. However, I think with the ongoing developments in these areas they will continue to be a large part of futures work in the future, so will be areas of my knowledge that I want to develop further.

### How is thinking about the future useful to you?

“ Policing environments tend to be reactive due to the demand forces face. This means that within the operational teams there is often a limited capacity to explore and think about futures. To me, futures is therefore important in my role, because I have the capacity to explore this and have the existing distribution structures to share knowledge to senior leaders accordingly.

### What does 'futures thinking' mean to you?

“ To me, futures thinking, means understanding the problems we can expect to see in the future and exploring how we can implement actions today to ensure we are properly equipped to deal with them.

### Imagine its 2050 – What do you think policing might look like?

“ Future policing will be a lot more technology based, with a lot more crimes occurring in the digital world.



continued over

## Q&A: Research and Evaluation Officer *continued*

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### Tell us about a future science and technology development you've read or heard about that *really* excited you

“ There's been research in both the public and private sector which has used wearable devices to track biometrics, this data has been paired with cognitive function tests to provide snap shots of individual wellbeing. When explored across teams, this use of technology has enabled wide-scale issues to be identified, and rectified by organisations, to ensure employee wellbeing. The link between technology and wellbeing is not something I automatically connected, and so I have found it very exciting to find out about work like this.

### Are there ways in which you think policing can better understand the future?

“ There is the need for greater collaboration across police forces in future understanding. The problems which will effect one force in the future, will effect all of them. A centralised collaboration with input from the National Police Chiefs' Council, College of Policing and subject matter experts from other organisations would be the ideal solution to ensure policing can better understand the future. I also think a better understanding of technology across police employees would benefit in creating a deeper understanding of how technology will affect the future.





# Q&A: Director of What Works

## Rachel Tuffin

### Director of What Works

College of Policing

#### Tell us a little about your role

“ I am the Director of What Works here at the College. I'm responsible for identifying, creating and sharing good practice. I have developed a futures capability at the College because we need to look ahead to understand the challenges and opportunities ahead for the service. That way, we will be able to intervene before problems reach a critical point and we've missed the opportunity to invest in something that could have made a difference.

#### What's your futures story?

“ I first became involved in futures work around 15 years ago, which was before the College was even founded. I was working at its predecessor organisation, the National Police Improvement Agency, where we were looking for the whole range of different threats and opportunities that were coming up so that we could better prepare. Back then, futures was absorbed into the work of a wider team. At the College, I have been able to set up a dedicated futures and horizon-scanning team. The team has produced Future Operating Environment 2040, the first national horizon scanning programme across policing that identifies 10 key trends over the next 20 years and outlines their potential impact on society and the service. The team is currently working on more immediate-to-medium term horizon-scanning that looks at where we need more insight and information.



#### What does 'futures thinking' mean to you?

“ Futures thinking is about testing ourselves and making sure we are prepared and resilient. It is not about gazing into a crystal ball and saying this is definitely going to happen. We are trying to understand the range of different threats that are coming up and what the service needs to prepare. We use a set of techniques such as devising scenarios to explore future trends and where they might lead us. We also look back where issues have come up repeatedly in the past and are therefore likely to come up again. As well as a technical activity, it's also a mindset where you have to honestly believe that you can prevent certain problems by spotting them and talking about what we need to put in place.

continued over

## Q&A: Director of What Works *continued*

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### How is thinking about the future useful to you?

“ It has had a major influence on planning the College’s future work. When we were drawing up our 2022-24 Business Plan, we looked at our Operating Environment 2040 piece and asked “if that’s what the future holds, then what does the College need to do to prepare itself and the service?” As a result, there is a much greater emphasis on strengthening digital capability, preparing for new technologies such as AI and shaping the future of the workforce so that it has the right people and skills to meet the challenges we have identified. It is also important for setting our research agenda.

### Imagine its 2050 – What do you think policing might look like?

“ I think there might be some very local visible arrangements, with plenty of additional private ‘bought-in’ policing, and then some national arrangements which are more ‘high-tech’ and which are much better linked with other sectors in terms of prevention and public health. I think policing will be much better linked into its evidence-base and officers and staff will be used to adding to the evidence, and will take that for granted. There will be much better national analysis helping to identify problem-solving opportunities and, linked with other sectors’ data, opportunities for predictive work, linked to the prevention mentioned earlier. I also think there might have been a great leap forward by then in the use of biotech, which will be another big shift, akin to the impact of smartphones and social media on us all.

### Tell us about a future science and technology development you’ve read or heard about that *really* excited you

“ I would be really excited about being able to do national crime and intelligence analysis centrally, so that you no longer have to do force-by-force data collection to get the information for a proper problem profile. At the moment, there is just not enough data available at the centre. With both violence against women and girls and homicide prevention we are having to ask each force to send us this information, and even then we do not always get a complete set of data. We still don’t really know who the victims are and we have to use other sources like the Crime Survey. Being able to pull it all together centrally would make a huge difference. Achieving that will be a massive piece of work, but it is underway, currently being led by NPCC Digital, Data and Technology Coordination Committee (DDaT).

# Q&A: Strategic Business Analyst

## Scott Owen

### Strategic Business Analyst

Bedfordshire Police

#### Tell us a little about your role

“ I am a Strategic Business Analyst for Bedfordshire Police and one of my main work portfolios is Futures Planning lead. This has involved introducing the concept of futures thinking to the Executive and Senior leaders lifting it from basic horizon scanning in the world of intelligence analysis, to a strategic framework with supporting strategic analytical product.



#### What's your futures story?

“ Formalising the Force's horizon scanning and futures planning has always felt like unfinished business for me since my days as an operational intelligence analyst. The release of the College of Policing 2040 product and re-structure of our analytical and business support functions during the pandemic in 2020, created the organisational requirement to localise futures thinking and narrow what Bedfordshire Police needs to care about in the next 10 years and beyond. Although much of my skills were self-taught through research and interest, the Heads of Horizon Scanning Meetings conducted by the Government of Office for Science has proved a useful forum for methodologies and to listen to like minded professionals trying to land futures thinking in other public sector organisations. Although it will never be the top priority in Policing, there is currently a healthy appetite for futures thinking and building this into longer term business planning and delivery cycles.

#### What does 'futures thinking' mean to you?

“ As sufficient an understanding as possible of strategic environmental emerging trends and threats that may influence the Force's or other organisations direction in the mid to long term future. I personally see futures thinking as a strategic agenda that should be embedded into existing, more core areas of business. Using techniques such as scenarios and wider research deep dives, it is crucial that futures focuses on the 'so what' and make realistic recommendations to improve both understanding, and the ability to triage the potentially endless signals that could possibly 'disrupt' society.

continued over

## Q&A: Strategic Business Analyst *continued*

### How is thinking about the future useful to you?

Thinking about and entertaining possible futures is in my view critical for public sector organisations, such as police forces, to enable them to be agile and adaptable. In it's simplest terms, if the Force has researched and evidenced key trends and issues that are more likely to transpire they will be less surprised if and when some of them do occur and require responding to. By horizon scanning emerging threats at an operational level, to linking to strategic risks and long term business planning at a strategic level I think it is one of many tools that should be used to consider where to best use limited resources and prepare for possible demand changes in future years.

### Imagine its 2050 – What do you think policing might look like?

The fundamental requirement of needing to mainly deploy humans to real time incidents as quickly as possible to prevent, disrupt, or deal with the consequences of crime and safeguarding incidents feels unlikely to change massively although expect huge complexity. Functions such as response, the short-term detention of those under suspicion, and the longer term investigation of crime and safeguarding the most vulnerable still feel likely to be continued requirements. Resource allocation will be much more evidence and data driven enabled by AI, automation and robotics. Ubiquitous drones and superior specialist capabilities should be able to cope with vastly greater volumes much more quickly, with the ability to rapidly identify what is relevant or not. Wildcard scenario, the 43 forces no longer exist and something more akin to an AI led National Crime Agency nationally directs resources and specialist capability based on national threat scoring whilst simultaneously tasking local response.

### Tell us about a future science and technology development you've read or heard about that *really* excited you

Web 3.0 and the extent to which cryptocurrencies will be more disruptive and mainstream is of interest to me. In terms of excitement, from speaking to subject matter experts and academics around the metaverse recently the extent to which augmented reality may become more helpful and mainstream is an exciting prospect, e.g. smart glasses that overlay mapping and other data over your real world view and the likely hand gestures needed to operate this hands free.



# Q&A: Head of Evolve (Innovation)

## Dylan Aldridge

### Head of Evolve (Innovation)

Office of the Police Chief  
Scientific Advisor

#### Tell us a little about your role

I am the Head of Innovation within the Office of the Police Chief Scientific Advisor, responsible for delivering the Evolve pillar within the NPCC Science & Technology strategy. In particular, improving the means by which we pull through low technical readiness level (TRL) technology proof-of-concepts, often tested and developed at a local level, through to evaluated, high



TRL technology solutions to be adopted nationally. Ensuring wherever possible we are taking problem led, rather than solution led, approaches to technology. Providing a better return on investment for policing nationally, and building towards a more cohesive system of technology adoption in the future.

#### What's your futures story?

I first became involved in Futures from a police science and technology perspective around 3 years ago, when I took up a senior leadership post within a Home Office innovation function. However, my career before the Home Office was across intelligence and analysis, which required me to use emerging and fluid information to make probabilistic predictions about future events, which I have found to be a very transferrable set of skills since moving into thinking about science and technology futures. In particular in bridging the gap between assessments on how threat is likely to evolve, and thinking about how we build our evidence base for maximising value from existing capabilities, or how we adopt or build new capabilities, to meet those threats.

#### What does 'futures thinking' mean to you?

As Head of Innovation, I need to be thinking about where we can leverage the system to most effectively tackle here and now challenges through adopting high TRL technology, while also looking ahead to what lower TRL technology we want to be priming for future horizons. Future thinking, beyond anecdotal insights, is therefore highly valuable in helping shape where we focus our attention now on what may feel like hazy or ill-defined longer term challenges. Crucially, it can provide the evidence base to get policing leadership thinking ahead to the importance of investing time and focus now, to better equipped to deal with challenges 3, 5, 10, or even 15 years from now.



continued over



## Q&A: Head of Evolve (Innovation) continued

### How is thinking about the future useful to you?

“ Futures thinking is not about predicting with certainty, but considering how near term trajectories around criminal behaviour, emerging technologies that may become socially ubiquitous, and shifting social behavioural trends, may present challenges and opportunities for partners across Government, police, and law enforcement. Allowing us to better understand our vulnerabilities in responding to those challenges and threats, and build resilience, before they become a critical mass problem in the future. I don't believe that there is a prescriptive way of approaching futures thinking, but I have found that where possible adopting a multi-disciplinary approach can generate high value insights. Mixing technologists, social scientists, business architects, security subject matter experts, policy experts, etc., together can tackle group think and uncover fascinating scenarios to model.

### Imagine its 2050 – What do you think policing might look like?

“ I don't think that for the average citizen policing will look much different than it does today from the outside, even if the methods of transport and kit our officers carry will reflect the technological standards of the time. The greatest change to policing in the next 27 years will be in how data is used to identify, contextualise, prioritise, and respond to threat, risk, and harm. I would hope that by 2050 it will be a lot of the leaps in capability behind the scenes that the public won't see, but will feel the benefit from, that will be the greatest change.



### Tell us about a future science and technology development you've read or heard about that *really* excited you

“ The answers to most of policing's problems sit outside of policing. We must resist wherever possible the urge to look at policing challenges, particularly in the S&T space, as unique and needing to be solved in-house. Clear line of sight across related government sectors, in particular national security and Ministry of Defence, is important, as is how we engage academia and industry. Providing a connected and maturing Futures community across those areas that policing can be an active and critical part of would be highly valuable. As is bringing future problems thinking to life in a way that feels tangible, through Hackathons and access to sandpits.

# How can we make futures thinking useful to decision makers?

## Research & Evaluation Officer ...

“ Decision makers in policing tend to have a lot of decisions to make, in fairly tight timeframes. In order to make the right decisions, they're reliant on the subject matter experts providing information in a way that is understandable, clear, and digestible. For this purpose, I always find bullet point summaries before lengthy explanations are excellent in providing the key points, with additional information available if required. Additionally, while a lot of us enjoy data visualisations, it's key to ensure that these are easily decipherable, with a short accompanying explanation of data sets if required.

## Scott Owen ...

“ Focus on and be upfront about the 'so what' as early as possible. Workshops should be safe, non-judgmental and fun with all thoughts and ideas on the table and then gradually focus in over time from all possibilities, to priority areas, and then why it matters. Creating specific recommendations that help to enhance understanding or progress action in priority areas will allow them to contribute to the wider goal of being more prepared for the changing demands of the future. Accept upfront that this will never be everyone's top priority and therefore acknowledge that with your audience, making futures sessions fun and engaging and using a variety of techniques should create more engagement. In Policing futures thinking is part of promotional board processes to more strategic ranks too so that is a useful in.

## Rachel Tuffin ...

“ Working directly with forces is essential. We ran workshops for all forces across England and Wales where they tested themselves on their resilience and whether they are putting in place the right things to address the drivers of future threats. It's also important to feed futures work into the forums that set the strategic direction for policing. We have sent a paper on AI to Chiefs Council and regularly input horizon-scanning into the multi-agency boards that have been set up to make policing work as a joined-up single system, the Strategic Policing Partnership Board and the Policing Systems Working Together group.

## Dylan Aldridge ...

“ As much as futures is looking ahead, there is real value wherever possible in tying it to the here and now, and demonstrating where a future threat or challenge is a continuum or an evolution of something we are dealing with now. For many strategic and operational leaders I imagine the concept of Futures will feel untethered to the challenges that are causing them pain in the immediate term. The consequence, as we have seen in the past, is that eventually future problems become today problems, but we are less prepared for them. Within the NPCC S&T strategy we've broken out the science and technology landscape across seven service lines, each with short, medium, and long term horizons. This allows us to de-risk and accelerate decisions on S&T over the next 12-18 months, while simultaneously priming the strategic thinking on how policing gets ahead of the challenges and opportunities of the future, such as Quantum Sensing or Advanced Wearables.

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## Section Nine

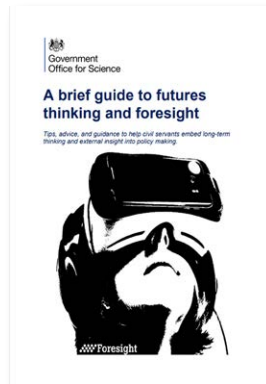
# Signposting to Resources

This document has provided a short introduction to a broad range of futures topics and discussions. It was designed to interest, enthuse and introduce you to futures. There's a huge amount of related information for you to explore and here we signpost a selection of it for you. Keep exploring...

- Further reading

# Further reading

**Guides and toolkits**  
that can help you  
understand and use  
futures thinking



**A brief guide to futures thinking and foresight**



**Three horizons**  
A toolkit to help you think and plan for the long-term



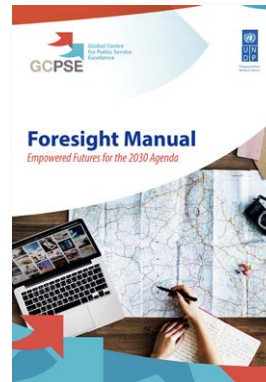
**The Future is Ours**  
Strategic Foresight toolkit – making better decisions



**The Futures Toolkit**  
Tools for Futures Thinking and Foresight Across UK Government



**Unfogging the Future**  
A Dstl Biscuit Book



**Foresight Manual**  
Empowered Futures for the 2030 Agenda



**Introduction to Strategic Foresight**



# Further reading continued

**Contextualisation and strategic trends** that can support you thinking about the 'bigger picture'



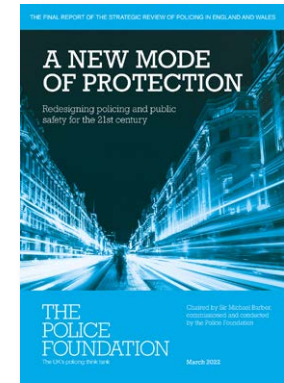
**Foresight**  
Centre for Strategic Futures 2021



**Mega Trends 2023**  
Understanding an era of surprises



**Scanning for the Future(s) of Policing**  
First steps towards a new global paradigm



**A New Mode of Protection**  
Redesigning policing and public safety for the 21st century



**NATO S&T Trends 2020-2040**



**Global Strategic Trends**  
The Future Starts Today



**Policing 4.0**  
Deciding the future of policing in the UK



**Trend Deck**



**Policing in England and Wales**  
Future Operating Environment 2040



# Further reading continued

**Sources of information about emerging S&T that provide insight into what the future might hold**



**Stories from Tomorrow**  
Exploring New Technology Through Useful Fiction



**Technology Futures**  
Projecting the Possible, Navigating What's Next



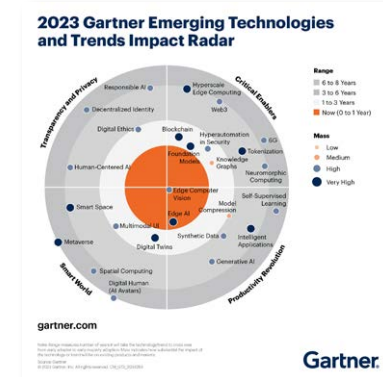
**McKinsey Technology Trends Outlook 2022**



**MIT Technology Review**  
10 Breakthrough Technologies 2023



**ARUP – Emerging technologies**

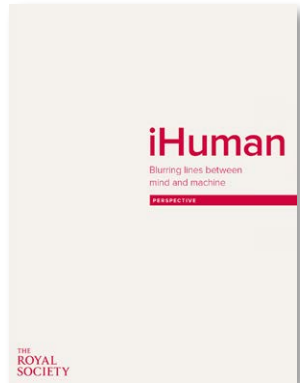


**2023 Gartner Emerging Technologies and Trends Impact Radar**

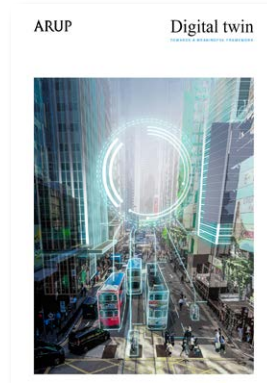


## Further reading continued

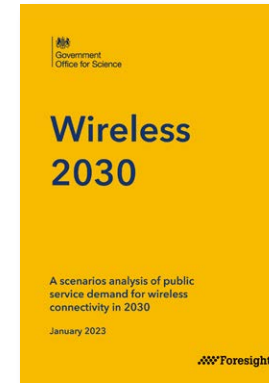
**Topic specific research**  
that can provide  
you more detailed  
assessment



**iHuman**  
Blurring lines  
between mind and  
machine



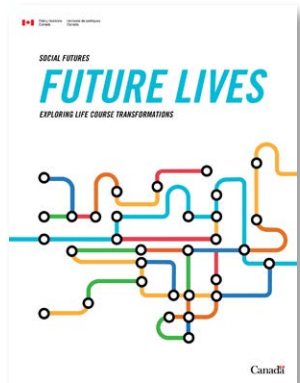
**Digital twin**  
Towards a  
Meaningful  
Framework



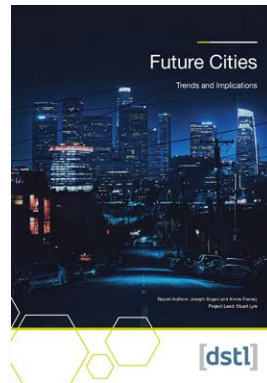
**Wireless 2030**  
A scenarios analysis  
of public service  
demand for wireless  
connectivity in 2030



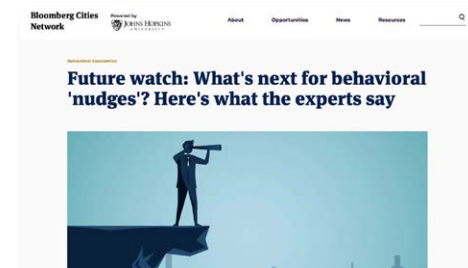
**Future uses of  
Space Out to 2050**  
Emerging threats  
and opportunities  
for the UK National  
Space Strategy



**Future Lives**  
Exploring life course  
transformations



**Future Cities**  
Trends and  
Implications



**Bloomberg Cities Network**  
Future Watch: What's next for behavioral  
'nudges'? Here's what the experts say

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- Hampshire Police
- Home Office S&T Commissioning
- Futures Platform
- Government Office for Science





The Science Inside

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