CSIR
in
Integrated
SECURITY & SAFETY
A safe city is a smart city.....

Technologies in future crime prevention

Braam Greeff
Research Group Leader: Systems Engineering

DPSS (Defence Peace Safety and Security)

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Introduction to the CSIR......what we do?.....future crime prevention focus areas....key future disruptive crime prevention....technologies.....CSIR’s role in future crime prevention capabilities
The objects of the CSIR are, through directed and particularly multidisciplinary research and technological innovation, to foster, in the national interest and in the fields which in its opinion should receive preference, industrial and scientific development, either by itself or in co-operation with principals from private or public sectors, and thereby to contribute to the improvement of the quality of life of the people of the Republic…'

(Scientific Research Council Act 46 of 1988, amended by Act 71 of 1990)
Introduction: strategic relationships

• We have signed a Memorandum of Agreement (MOA) with SAPS in February 2014

• Since then, we maintain an operational- and strategic relationship, advising SAPS in various aspects of crime prevention on request

• MOA is currently under review to adapt to new requirements
Focus for national impact: Research impact areas

**Defence & security**
- Information security
- Interoperability and standardisation across organs of state tasked with defence and security
- Command, control and coordination
- Tactical and strategic situation awareness
CSIR Defence, Peace, Safety and Security (DPSS)

Vision and role:
To contribute significantly,
through scientific and technology excellence,
to the security of South Africa,
the region and continent,
and its industrial and human capital development.
What we do: SAPS stakeholder engagement

SAPS Special Operations Response unit, a two day work session on future command centres
SANParks: Development of an anti-rhino poaching capability

- Development of the anti-poaching Mission Area Operations Centre (MAJOC) centre was performed in collaboration with SANParks
- Successful implementation planning within the stakeholder site at Skukuza in the Kruger National Park were also performed within the facility
Development work-sessions with SANPArks at the CSIR to develop the optimum solution over 3-year period
The “Black-mambas” are the first all-female anti-rhino game ranger team

Established by the Balule private game reserve

Using the CSIR’s CMORE system as an anti-rhino poaching situational awareness tool.
Long-range optical sensor systems for crime detection

• **Biometrics: Contactless fingerprint detection capability**
  - The CSIR has developed a contactless fingerprint detection system which could detect fingerprints without damaging the print

• **Long-range, multi-spectral observations**
  - For the long-distance observation of sensitive areas during night and day conditions

• **Smart video-camera detection capabilities**
Situational awareness – CMORE platform

*Intelligence-based policing platform*

- Development and integration of various sensor systems to create purpose-fit situational awareness systems
Crime prediction modelling
Currently used to predict possible future rhino poaching locations

- Future crime prediction modelling enables the optimum use of scarce resources predicting possible future crime locations
Audio detection and direction finding systems

• Detection of gunshot events

- The CSIR has as part of its Safety and Security Flagship research program, developed an audio detector prototype that could detect gunshot events and also determine the position of such events.

- This technology could be applied in secure environments to detect dangerous events which generate audio signatures.
Determine future required crime prevention technologies and capabilities?

• What technologies should we focus on……..?

• We should also focus on cities…….. but why?

• Future safe city’s crime prevention needs will drive technology development
Urbanization Challenge

50% of the world's population lives in cities today and 70% of the global population is expected to live in urban environments by 2050.

Key Drivers

Growth/Development/Acuteness of:
- Terrorism, Crime and Emergencies
- Road congestion
- Energy consumption
- Gas emission and waste contamination
- Demographics
- ...

Need/requirement for:
- Clean water and air storage
- Effective transportation networks
- Reliability and efficiency of energy
- Safety and Security
- Connectivity and Communication

• 50% of the world's GDP is produced in Cities with over 750k population

• 75% of energy produced is consumed by cities

• 80% of the world CO2 Emissions are from cities

Ability and necessity to transfer current approach of urbanization development to the format of Safe and Smart Cities
Safer cities (The Economist index) evaluation criteria framework

- It makes sense to invest in smart city technologies that supports your evaluation criteria for safer city audit policies

<table>
<thead>
<tr>
<th>DIGITAL SECURITY</th>
<th>HEALTH SECURITY</th>
<th>INFRASTRUCTURE SECURITY</th>
<th>PERSONAL SECURITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>City of Chicago cooperating with the Department of Defense and local colleges on cyber-security training.</td>
<td>All cities in the top five are in countries with universal health coverage.</td>
<td>Stockholm moved up 17 places in this edition of the index, the 2nd biggest leap after Hong Kong (33 spots).</td>
<td>US $32m in lost cash was turned into the Tokyo Metropolitan Police in 2016.</td>
</tr>
</tbody>
</table>
| 1. Tokyo  
2. Singapore  
3. Chicago  
4. Amsterdam  
5. Hong Kong | 1. Osaka  
2. Tokyo  
3. Frankfurt  
4. Zurich  
5. Seoul | 1. Singapore  
2. Madrid  
3. Barcelona  
4. Stockholm  
5. Wellington | 1. Singapore  
2. Wellington  
3. Osaka  
4. Tokyo  
5. Toronto |

As “smart cities” connect their infrastructure cyber-attack vulnerabilities rise. Inter-agency cooperation is essential to fend off threats.

Cities designed with adequate walking and green spaces encourage fitness and health lowering the risk of conditions such as heart disease.

Investments in “green infrastructure” help cities to better protect themselves from the impact of extreme weather events.

More cities will start matching CCTV cameras with artificial intelligence technologies so that criminal behaviour can be detected as it happens.
## Digital security measurement indicators

*The Economist safe cities index*

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<thead>
<tr>
<th>INDICATOR</th>
<th>UNIT</th>
<th>SOURCE</th>
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</thead>
<tbody>
<tr>
<td>1.1.1. Privacy policy</td>
<td>1 – 5, 5 = strong policy</td>
<td>DLA Piper Data Protection Laws of the World; Economist Intelligence Unit analysis</td>
</tr>
<tr>
<td>1.1.2. Citizen awareness of digital threats</td>
<td>0 – 3, 3 = very aware</td>
<td>Economist Intelligence Unit analysis</td>
</tr>
<tr>
<td>1.1.3. Public-private partnerships</td>
<td>0 – 2, 2 = close partnerships</td>
<td>Economist Intelligence Unit analysis</td>
</tr>
<tr>
<td>1.1.4. Level of technology employed</td>
<td>0 – 100, 100 = highest</td>
<td>Economist Intelligence Unit analysis</td>
</tr>
<tr>
<td>1.1.5. Dedicated cyber security teams</td>
<td>0 = none, 1 = national only, 2 = national and city level</td>
<td>Economist Intelligence Unit analysis</td>
</tr>
</tbody>
</table>

### B. OUTPUTS

<table>
<thead>
<tr>
<th>INDICATOR</th>
<th>UNIT</th>
<th>SOURCE</th>
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<tbody>
<tr>
<td>1.2.1. Frequency of identity theft</td>
<td>%</td>
<td>Gemalto Breach Level Index; Economist Intelligence Unit analysis</td>
</tr>
<tr>
<td>1.2.2. Percentage of computers infected</td>
<td>Scale 1 – 5, 5 = most</td>
<td>Kaspersky Lab</td>
</tr>
<tr>
<td>1.2.3. Percentage with internet access</td>
<td>%</td>
<td>ITU</td>
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</table>
Frost & Sullivan has defined a smart city as one that has an active presence and plan in at least five of the eight criteria below and has clearly demonstrated projects in place.
Which capability domains should we invest resources to have impact in future crime prevention strategy priorities?

- Future successful safe city’s investment focus shall be in:
  - Knowledge Centricity
  - Cyber Security
  - Critical Infra-structure Protection

Source: Zolan Wirth: Pictures of the future, security scenarios
Defining Safe Cities

Safe City can be defined as:

(1) An initiative to integrate security solutions across stakeholder groups in a given city to enhance response to security and safety incidents...

(2) The implementation of reliable and all-coverage security measures to counter incidents that a city and its inhabitants are susceptible to...

(3) A combination of civic partners (law enforcement, businesses, and residents) to maintain order and create stability in cities by deploying advanced security systems...

(4) Security concept where key entities of a city work together to identify and act in real-time to security threats of any scale and time

Safe City is a plan to enhance public security and welfare by deploying networked security systems across several entities in a society to optimise the necessary response from detection to action.
How SMART drives SAFE and vice-versa

Smart Buildings: At least 50% of buildings will be green and intelligent, built with building integrated photovoltaics (BIPV); 20% of the buildings will be net zero energy buildings.

Smart Technology: Intelligent communications systems connecting home, office, iPhone and car on a single wireless IT platform.

Satellite Towns: The main city center will merge with several satellite towns to form one megacity.

Smart Infrastructure: Multimodal transport hubs providing air, rail, road connectivity to other megacities.

Smart Energy: About 20% of the energy produced in a city will be renewable (wind, solar).

Smart Grid: Infrastructure to enable real-time monitoring of power flow and provide energy surplus back to the grid.

Smart Cars: At least 10% of cars will be electric, with free fast-charging stations every half mile.

Megatrends in parallel industries will influence core smart city components and present opportunities for participants.

Source: Google Images

R i = Real-time information available
Integration is the Key Enabler and the biggest Challenge to “Creating” a Safe or SMART city

Implications

- It demands the procurement of new systems.
- It increases workload by sharing responsibility across different operators.
- It is a long-term commitment that is susceptible to governance chance and political agenda.
Smart policing becomes a reality in SMART cities

Problem-based policing, predicative policing are inherently designed-in capabilities

- When $Ri$ is available you can create a smart city intelligence-based policing system
### Future SMART city technology implementation and integrations risks (minimum set)

**Significant future risk: Implementation and INTEGRATION of technologies on a city-level**

- **RISK**: The portfolio of future smart city technology needs are not supplied by a single source integrator supplier. The integrator know-how is lacking in most cases.

#### Technology Areas

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<thead>
<tr>
<th>Technology</th>
<th>Video</th>
<th>Sensors</th>
<th>Analytics</th>
<th>C3I</th>
<th>Networks (IoT)</th>
<th>System Integrators</th>
<th>Cyber</th>
<th>Data Mining</th>
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*Source: Frost & Sullivan*
Disruptive technologies in crime prevention – a quick look at a few dri

**Mobile:** powerful mobile devices and apps, using internet, act as front end for many innovative solutions

**Cloud:** on-demand access to rich application functionality & computing power allow for exponential scalable solutions in a “pay-per-use” model

**Big Data:** large volumes of data (structured data, sensor data, audio, video, social media) form the lifeblood of smart solutions

**Artificial Intelligence:** cognitive systems combine machine learning with the ability to interact via natural language and create insight from data

**Internet of Things:** physical objects equipped with advanced sensors and connectivity transform into smart objects and generate a plethora of data

**Social Robotics and Drones:** social robots and drones replace human labor on a large scale, not only for routine work but increasingly for providing services

**Blockchain:** algorithm that facilitates registering transactions in an indisputable way without the use of an intermediary or a central administration

**3D Printing:** additive manufacturing allows for efficient production of unique products where and when they are needed

**Crowd Sourcing:** the process of soliciting contribution from a group of people to obtain needed services, ideas, or content, and especially from an online community

**Co-Creation:** brings together parties to jointly create a mutual valued outcome. In the context of smart cities, these are (communities of) citizens, private companies, knowledge institutes and public organizations that form an ecosystem to solve societal problems in a creative way.

**Gamification:** the use of game thinking and game design elements (competition, levels, badges, etc.) in non-game contexts. The objective of gamification is to stimulate people to change their behaviour in a desired way.

**Digital Twins:** Digital Replica of physical objects. In smart city context, to build digital replica of a city. This is useful to visualize the city with different layers including buildings, utilities, services, etc. Helps urban planning with simulation.
Solving the integration problem?

- Design the future smart city as an inherently safe enterprise
Smart cities need to be designed intrinsically safe – the key risk

An integrated security layer needs to be “designed-in”

Source: Siemens
in conclusion

- Technologies such as data fusion, data analytics, facial recognition, intelligent video cameras, command centres, biometrics, situational awareness systems, sensors, Internet-Of-Things (IoT) systems, cyber security, data mining…….

- …….will play a key role in the future of safer and smarter cities and communities….

- However, these technologies can only be applied successfully with impact by law enforcement agencies and communities if their use are intrinsically designed into the future smart city enterprise and well integrated by knowledgeable system integrators
Thank you

Braam Greeff
bgreeff@csir.co.za
www.csir.co.za