AFRICA INDUSTRIAL INTERNET PROGRAMME

AIIP Action learning deign thinking project report

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1. Introduction

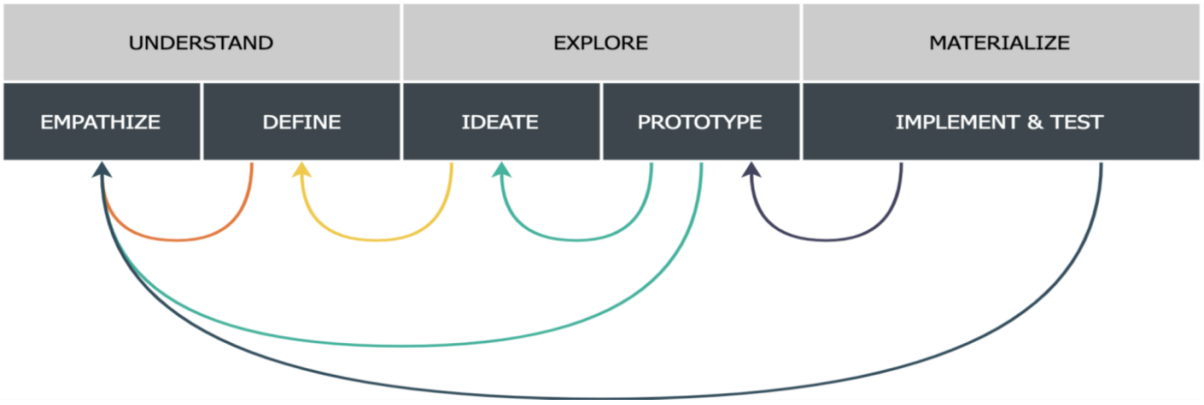
Crime is a major problem in most major cities around the world more especially in Johannesburg's Central business district. In the past few years more and more companies are relocating their office headquarters away from the CBD. For companies that stayed in the Johannesburg CBD, the daily commute to work is increasingly becoming a very unsafe for employees of those companies. Finding a solution or a method to improve safety during travels from and to work makes for an ideal I&I (Innovation & Intrapreneurship) action-learning project. This project is selected because the solution is not obvious and the design thinking process can be applied for better understand needs/issues, to identify and develop effective solutions.

2. Process followed

The overall crime problem in the Johannesburg CBD is a massive problem that will take far more resources and time to resolve, as a first step for this project, it was imperative to use design think approach to first understand and to scope the problem correctly such that is can be in the form of a scalable solution that can be implemented to the whole of the city.

2.1. Design thinking overview

Design Thinking is a method designers use in ideation and development. The method describes a human-centred, iterative design process consisting of 5 steps—Empathize, Define, Ideate, Prototype and Test. Design thinking is useful in tackling problems that are ill-defined or unknown.



According to https://www.interaction-design.org/literature/topics/design-thinking the five stages of design thinking are described as follows:

> *"Empathize*
> *The first stage of the Design Thinking process demands gaining an empathic understanding of the problem you're trying to solve, mainly through some form of user research. Empathy is crucial because it allows you to set aside your own assumptions about the world in order to gain insight into users and their needs.*
>
> *Define*
> *During the Define stage of Design Thinking, you put together the information you have created and gathered during the Empathize stage. You analyse your observations and synthesize them in order to define the core problems you and your team have identified so far. This is where you ensure that what you are addressing sits in sharp relief before you, its properties known in full.*

Ideate
The process's third stage finds you ready to start generating ideas. With the knowledge you have gathered in the first two phases, you can start to "think outside the box" to identify new solutions to the problem statement you've created, and you can start to look for alternative ways of viewing the problem.

Prototype
In the Prototype phase of Design Thinking, your design team produce a number of inexpensive, scaled-down versions of the product or specific features found within the product so you can investigate the problem solutions generated in the previous stage.

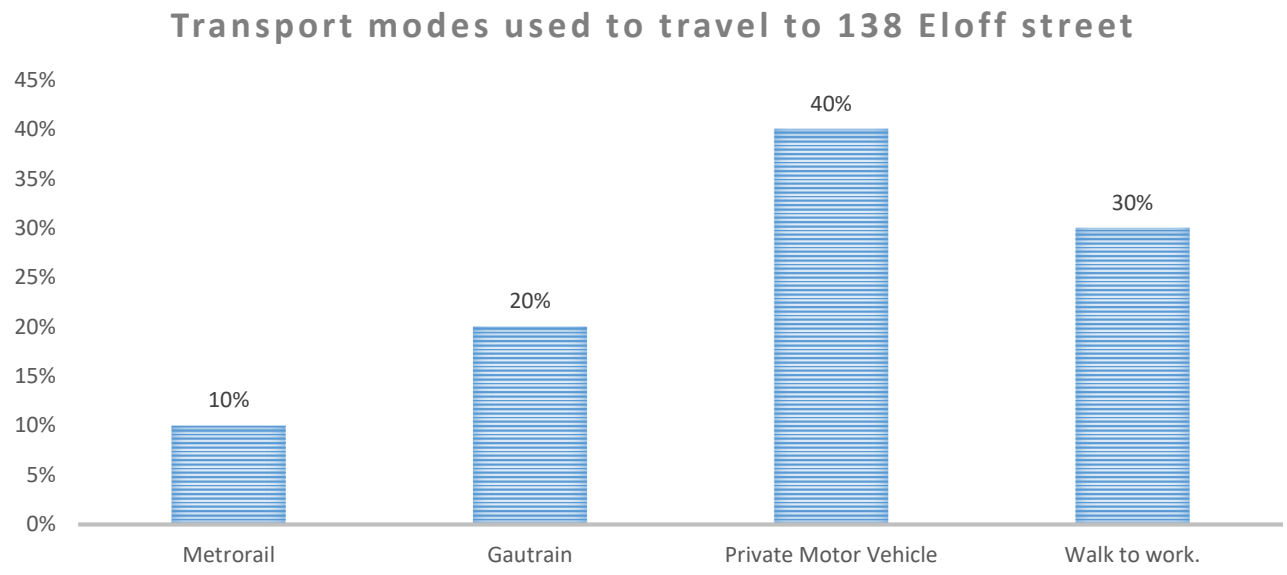
Test
In the Test phase of Design Thinking, you rigorously test the completed product using the best solutions identified during the prototyping phase. This is the final stage; however, in an iterative process, the results generated during the testing phase are what you will often use to redefine one or more problems."

2.2. Design thinking application

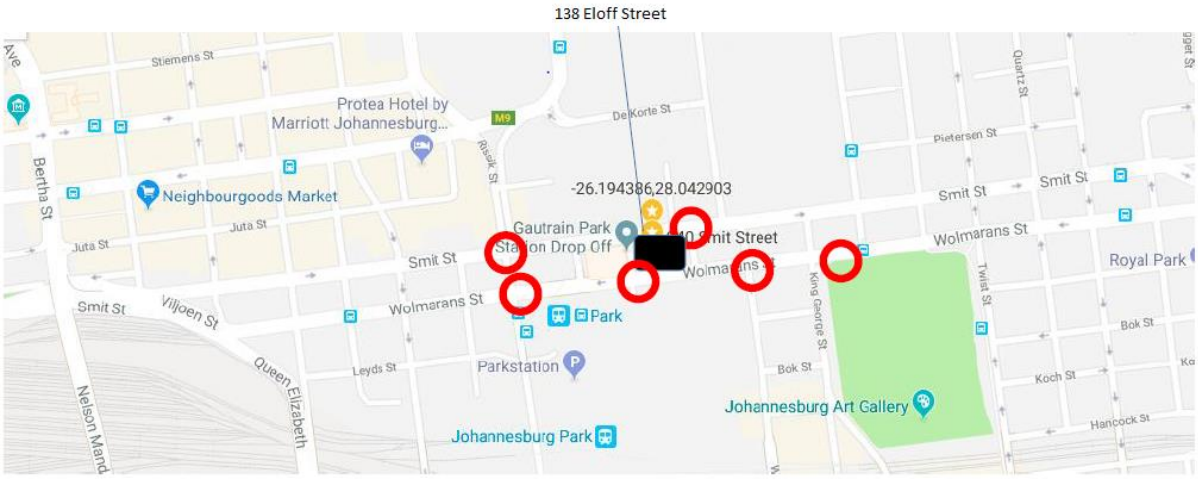
Given the limited time and resources available for this project we decided to limit all the solution to one building in Johannesburg CBD. This is our regular work environment at 138 Eloff Street Johannesburg (building Name is the same as the street address). To gain better insights into crime trends and patterns we decided to perform an analysis of the vicinity of the work area and to review previous crime incidents around the area.

2.2.1. 138 Eloff Street (GPS Location: -26.194743, 28.042736) – Empathise First iteration (Research)

138 Eloff Street is at the edge of the Braamfontein improvement district. The 138 Eloff street building is positioned close to Johannesburg's main multimodal transport hub. This provides transport options such as Train (Metro and Grautrain), Bus, Taxi. The approximately 120 employees based at 138 Eloff Street have a variety transport options to use to commute to work. The estimated modes of transport statics are as following 10% Metrorail, 20% Gautrain, 40% Private Motor Vehicle and 30% Walk to work.



A review of the recent reported incidents that occurred around the building was conducted as part of the "Empathise First iteration process". The red circles in the map below shows where the recent reported incidents occurred. The types of reported incidents include; Armed robbery, muggings, attempted high jacking and pick pocketing.



2.2.2. Understanding the problem – Empathise second iteration (Research)

To obtain a clearer picture of the crime situation at 138 Eloff Street, we decided to interview a few colleagues. The following questions were developed for the interviews:

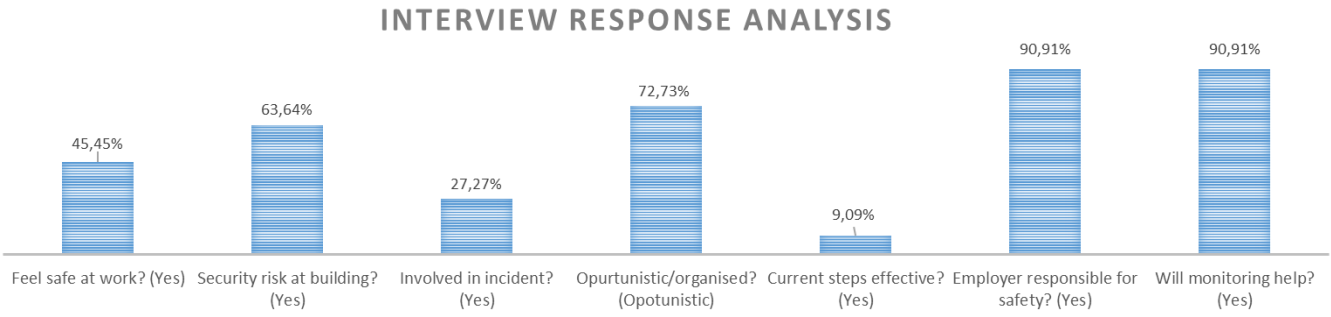
1. How long have you worked at 138 Eloff Street?
2. Do you feel safe at or coming to 138 Eloff Street?
3. Do you feel that there is a security or safety problem at 138 Eloff street?
4. How severe do you feel that the problem is on a scale of 1 to 10?
5. Have you been a victim of any criminal activity in or around your workplace?
6. Please elaborate on any experience.
7. Have you ever felt that your life has been in danger in or around 138 Eloff Street?
8. Have you ever felt that your possessions has been in danger in or around 138 Eloff Street?

9. Do you think the crime incidents around 138 Eloff Street are organised or random/opportunistic crimes?
10. Do you feel that the current steps being taken will sufficiently address the risks?
11. Do you have any ideas or proposed solutions to safety risks at 38 Eloff Street?
12. Do you think Transnet as your employer should be responsible your safety in the vicinity of your work place?
13. Do you think monitoring the area will reduce crime?
14. What steps have you taken to ensure your personal safety?
15. If the crime situation doesn't improve will you reconsider your employment with Transnet

A team discussion was held and the initial list it was decided that the questions to be trimmed to 10 concise questions:

1. How long have you worked at 138 Eloff Street?
2. Do you feel safe at or coming to 138 Eloff Street?
3. Do you feel that there is a security or safety problem at 138 Eloff street?
4. Have you been a victim of any criminal activity in or around your workplace, and please elaborate on any experience.
5. Do you think the crime incidents around 138 Eloff Street are organised or random/opportunistic crimes?
6. Do you feel that the current steps being taken will sufficiently address the risks?
7. Do you have any ideas or proposed solutions to safety risks at 38 Eloff Street?
8. Do you think Transnet as your employer should be responsible your safety in the vicinity of your work place?
9. Do you think monitoring the area will reduce crime?
10. What steps have you taken to ensure your personal safety?

Interviews were conducted on 11 colleagues and the results were collated below:



It is clear from the people interview that there is a general feeling of a lack of safety when traveling to the work place while the was a marginal agreement that the security with the building was sufficient. There was also an over whelming feeling that increased monitoring will assist in mitigation of the crime problem in the area.

2.2.3. Defining the Problem

The interview phase provided clearer insights that help develop a definition a project scope definition that was achievable and implementable. The formal project definition was defined as:

"Employees have experienced an increase in robberies in the vicinity of the 138 Eloff Street Office. This problem requires research to evaluate the extent of the problem as well as to gauge employee safety concerns. A cost effective solution to improve security as well as employee and public safety within the immediate vicinity of the 138 Eloff Street Offices is required"

The definition above moved the initial project focus (see the initial project definition below) from a security threat within the building to a security threat in the vicinity of the building. This was as result of the empathise phase which the users (our colleagues) overwhelmingly agreed that there was no major problem within the building.

"Project Description: Transnet Freight Rail, Technology Management have had security breaches in the recent past which is effecting employee safety and mental wellbeing. A solution to address this security concern is of great importance."

2.2.4. Finding a solution – Ideate phase first iteration

A brainstorming session of free flowing ideas was held with all members of the ground contributing ideas on to the groups slack channel. The main idea of this phase was to use the learnings from the interview phase to craft ideas around how to make the commute to work safer. The proposed ideas can be loosely grouped into the following categories:

1. Increased policing
    i. Visible policing - Participants felt increased monitoring/security would deter crime.
    ii. Armed Security - Participants felt increased monitoring/security would deter crime.
    iii. Forming a security task team with government, and businesses in the area.
    iv. Deploy military.
    v. Mobile police stations.

2. Personal safety improvement
    i. Changing commuting patterns/hours – This is because of crime occurred during slow moving peak traffic hours
    ii. Carry Weapons – Self-defence was raised as a common theme on how to make pedestrians feel safer
    iii. Shuttle Service – Motorist felt parking in other location and using company provided shuttle service would improve safety.
    iv. Provide pedestrians with pepper spray.
    v. Audio monitoring for signs of distress.
    vi. Audible Warnings.
    vii. Crime Whistles.
    viii. Training and awareness.
    ix. Bullet proof vehicles.
    x. Personal panic buttons.
    xi. App to report incidents.
    xii. Vehicle following drone. (Supervised passage)

3. Increased monitoring
    i. CCTV monitoring – Participants felt increased monitoring/security would deter crime.
    ii. AI monitoring - Participants felt increased monitoring/security would deter crime.

iii. Drones monitoring - Participants felt increased monitoring/security would deter crime
iv. Armed Drones - Participants felt increased monitoring/security would deter crime.
v. App to monitor audio from smartphone for distress.

4. Relocation
   i. Work from home – Avoiding the travel to work was a popular proposal amongst those interviewed.
   ii. Moving Offices.
   iii. Build a company campus.

5. City intervention
   i. More street lighting.
   ii. Renovation of the immediate vicinity.
   iii. Reduce hiding spaces. (empty buildings)
   iv. Anti-crime advertising.
   v. Reduce unemployment rate.
   vi. Larger sidewalks.
   vii. Remove public benches.
   viii. Improve public transport.
   ix. Community upliftment programs.
   x. Gautrain expansion.

2.2.5. Fine turning the ideas – Ideate phase second iteration

2.2.5.1. An APP for reporting crime incidents (Improved crime reporting) – there is a general crime reporting apathy amongst those interviewed. This was due to the perception that very little is done about crime, however there is a double edged sword for incident under reporting. Under reporting of crime results in less police resources being allocated to fight that crime. This necessitates the creation of an easier system/method to report crime that is both real time and widely available. A mobile application is a clear and simple answer to that problem. It was therefore decided that an application will be designed for this purpose.

2.2.5.2. Drone monitoring (Improved monitoring) – Improved monitoring came out as a key recommendation from the interviews. This drone monitoring will be based on autonomous drone technology where drones will be pre-programmed to randomly patrol the vicinity of the building.

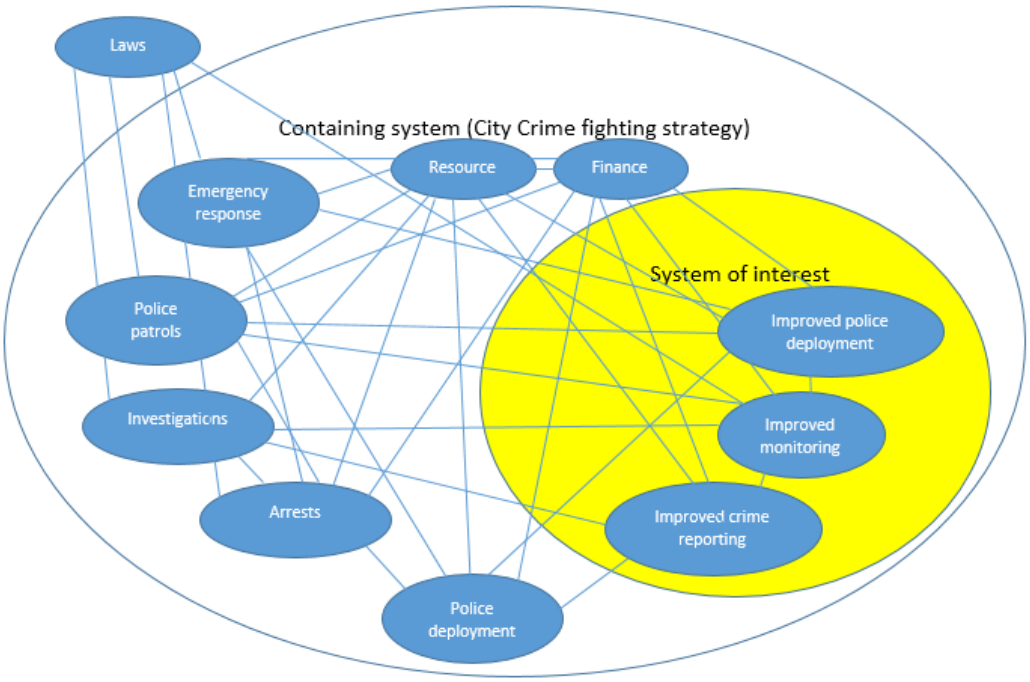
2.2.5.3. AI (Artificial intelligence) based police deployment (Improved police deployment)– Video footage from drone patrols will be fed directly to a central back office where machine learning algorithms will be used deployed to automatically analyse people movements for signs of imminent attacks as criminal generally following the same/similar patterns of attack. AI based algorithms will then be used to predict and to deploy security to incidents where either crime is about to occur or a crime has just occurred.

A systems thinking approach is paramount for a crime fighting strategy to be effective, hence the above ideas where sifted through for prototyping. They provide a method to report, detect and to improve police/security response to crime incidents. The complexity of the crime situation

necessitates a “Poached egg” diagram (see diagram below) which places our system (“The system of concern”) and the broader containing system (“The City Crime fighting strategy”).

There are quite a lot of complex dependencies between our system and the broader crime fighting strategy. It is therefore important that our system is viewed as a method of improving the three main visible policing aspects:

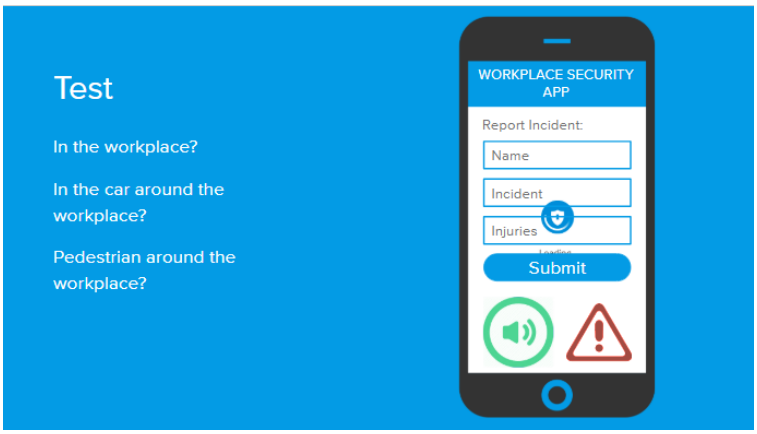
i. Improved crime reporting
ii. Improved monitoring
iii. Improved police deployment



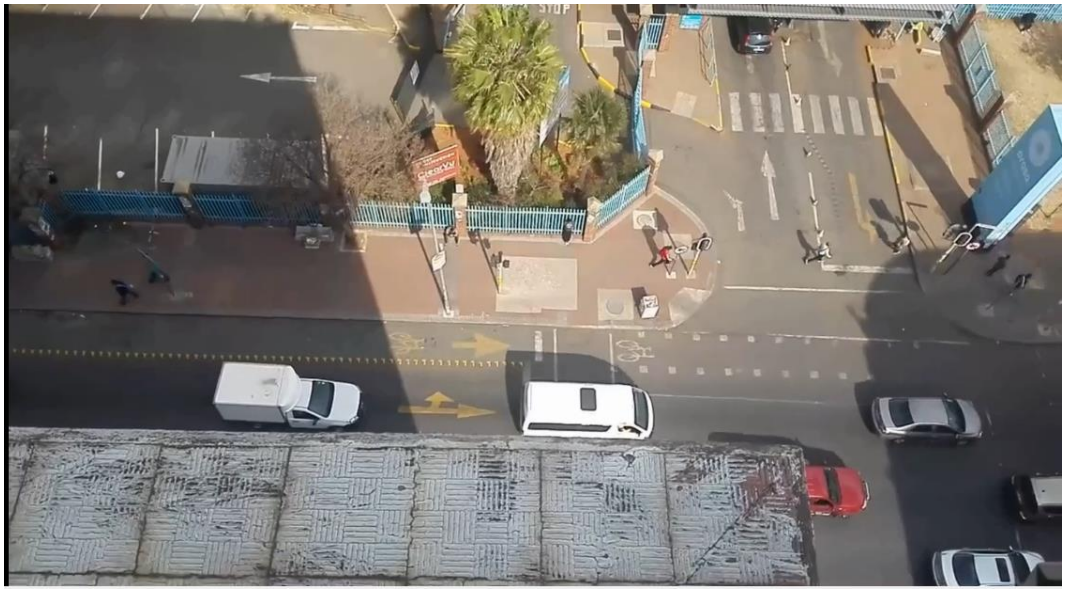
2.2.6. Prototyping and implementation

A video illustrating the prototype can be found at https://github.com/Seloke/Innovation-and-Intrapreneurship under the title “Prototype Presentation.mp4”.

2.2.6.1. An APP for reporting crime incidents (Improved crime reporting)



2.2.6.2. Drone monitoring (Improved monitoring)



2.2.6.3. AI (Artificial intelligence) based police deployment (Improved police deployment)

2.2.7. Testing

Key take away from the piloting of the idea based on simulated drone footage are listed below:

- Drone sound levels can cause the public to be annoyed,
- Wider camera angle need is required,
- Drones are potentially vulnerable to sabotage
- On-board storage should be considered
- Low camera resolution could make image processing challenging
- Power supply and recharging means the drone will be out of service for a time
- Data connectivity issues
- Expensive industrial drones which are more weather resistant need to be consider

Another prototyping phase which considers the point above in therefore required.

3. Project review

3.1. Manager's feedback main points

- Broader Community is impacted by crime incidents
- Drones could be loud and could annoy pedestrians
- Facial recognition feature must be added and linked to a police criminal database
- Incorrect criminal element profiling could do more harm than good
- This concept is implementable but will come at substantial setup cost.

3.2. Impact on the organization

- The solution presented will ensure police resources are used efficiently,
- A monitoring back office needs to be created where humans can oversee automatically generated drone incident reports,
- Full time drone pilots and armed response is required
- Maintenance of drones might have a significant cost implication

4. Conclusion

As a theoretical proof of concept the project described above shows that a design and systems thinking based approach can be applied to even the most complex project. Even though the project scope was broken down to a seemingly small and achievable goal it was still quite difficult of get a fully functional prototype develop (beyond the theoretical ideal illustration). If implement correctly the project proposed above will ensure that limited police resources are deployed efficiently and effectively.