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LEADING SAFETY ON THE EDGE OF DISRUPTIONS: CREATING A REPOSITORY OF RAILWAY KNOWLEDGE AS A SURVIVAL KIT IN AN ERA OF TURBULENCE

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Outline of the presentation

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- **Problem statement**
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- **Challenges**
- **Artificial Intelligence**
- **Predictive Policing**
- **Conclusions**
- **Recommendations**

Background

- **Railways in South Africa started in 1860 . The railways had to recruit from overseas all staff who required specialised knowledge of many facets of railway service**
- **The personnel were recruited from 27 countries abroad. This applied equally to engineers and graded personnel who had to plan, survey, build and maintain railway lines and repair the rolling stock**
- **Railways were the first to provide technical education in South Africa**

Background continue

- **Railways were the trailblazers of technical training centres in several cities that have developed into some of our present technical colleges**
- **Railways built schools for the children of their personnel, provided teachers and made free travel for scholars**
- **Most of the freeways in South Africa were built by railway engineers**

Problem statement

- **Theft and vandalism of railway infrastructure have become two social problems that disturb the smooth running of the railways**
- **Railway stations have been vandalised**
- **Fencing structures have been vandalised**
- **Overhead Traction Equipment (OHE) destroyed**
- **Railway Signalling equipment vandalised**

Problem statement continues

- **The use of diesel locomotives due to damaged OHTE**
- **Carbon emission**
- **Copper cables stolen**
- **Rail tracks removed in some sections**
- **Falling back on the old train control systems & skills during the fourth industrial revolution (4IR)**
- **What happened to the developmental flame?**

OHTE vandalised



Railway station vandalised



Rail tracks removed



Informal settlements next to the railway line



Impact on railway operations

- **Negatively affects train schedule (interruptions/speed restrictions and cancellations due to accidents)**
- **Vandalism/sabotage of signalling system - can lead to derailments**
- **Theft of overhead cables – lead to derailments and electrocutions**
- **Vandalism of points – can lead to derailments and the spillage of hazardous material**
- **Mushrooming of informal settlements along the railway lines**

Challenges

- **Commuters who rely on the trains are being forced to use expensive alternative modes of transport such as mini bus taxis and buses**
- **Most of the railway operations personnel who were trained in the old train control systems that are currently being used due to theft and vandalism have gone into retirement**
- **The diesel fuel that is being used on diesel locomotives is very expensive**
- **There is a shortage of diesel locomotives to run a full services (this will result in commuter unrest which can result in diesel locomotives being torched)**

Challenges continue

- **Commuters take their frustration on railway property**
- **Some countries do not have enough money to replace vandalised railway infrastructure**
- **The railways are forced to go back to the old technology of train control in the era of Automation and AI**

Empower law enforcement officers with artificial intelligence (AI)

- Traditional policing approaches will not solve the problem of theft and vandalism, artificial intelligence is required
- AI on which the 4IR is largely predicated makes machines intelligent. A machine is regarded as intelligent if it can analyse complex information and extract insights using imagination
- While computers traditionally relied on people to tell them what and how to react, AI is based on machines that learn and make their own decisions
- We can deploy AI systems to analyse data from multiple sources and identify irregular activity associated with crime

Predictive Policing is the way to go

- **The railways can use AI to manage theft and vandalism by applying analytical techniques, particularly qualitative techniques to identify targets for police intervention and prevent and solve theft and vandalism of railway infrastructure**
- **Crime could be prevented by applying scientific methods**
- **AI algorithms can be used to predict and prevent crime**
- **The perception that crime is random is inaccurate and misleading; there are patterns and structure to crime**
- **The technology is premised on its ability to recognise patterns of crime and identify anomalies**

Conclusions

- **Theft and vandalism are social problems that disturb the smooth running of our society and AI is required to address this challenge**
- **Impacted railways need both retrogressive skills (skills that were used in the past) and progressive skills (4IR skills)**
- **If this situation goes unbridled, impacted countries may be compelled to go back to steam (iron horse) or horse drawn wagons**

Recommendations

- **Train Operations personnel to be retrained on all methods of train working (old and new systems)**
- **Train Drivers to be retrained on the current traction power (diesel and steam)**
- **Introduction of block post as station to station working. This will need the following to be put in place:**
 - **Communication system & equipment**
 - **Sufficient authority forms**

Recommendations Continue

- **In-cab signalling – replace on track and track side signalling**
- **Fencing needs to be restored**
- **Access to the railways network should be from the legal access points (station)**
- **Partnership with local communities through commuter forums**
- **Introduction of drones for patrolling the railway network**

If we do not act now what would happen?



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- **Railways will be like dinosaurs or Solomon's temple in Jerusalem if we do not galvanise into action**
- **We may be compelled to hire steam locomotives from heritage organisations to haul trains**
- **Employees in the railway industry will lose their jobs because there won't be any trains running**
- **We either change or we will be changed. We should change our lives under our direction or we will be changed by forces outside our control**

Solomonic wisdom

“Revolution requires the demolition of all that is obsolete, stagnant, and hinders progress. Without demolition, you cannot clear the site for new construction.” Mikhail Gorbachev

Two magic words

- Thank you