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Operational Intelligence from Data: Driving Innovation Through University-Industry Partnerships

Presented by **Dr J P Barnard**



Agenda

- About Stellenbosch University & Research Group
- The Challenge
- Can Academic Partnerships help?
- Examples
- Summary

About Stellenbosch University

About Stellenbosch University

- Ranked First in SA on
 - 1.5 Research Publications per capita (2015)
 - 84 Patent Co-operation Agreements (2009-2015)
- 13 A-rated researchers (2015)
- 30150 students (2015)
- 266 Doctorate degrees (2015)
- 1366 Masters degrees (2015)
- Your knowledge partner

About Extractive Metallurgy: Process Monitoring & Control

- Stellenbosch University Engineering Faculty
 - Process Engineering Department
 - Extractive Metallurgy Research Group
 - Process Monitoring & Control
 - » Research Lead: Dr Lidia Auret
 - » 2 Doctoral students (2016)
 - » 9 Masters students (2016)



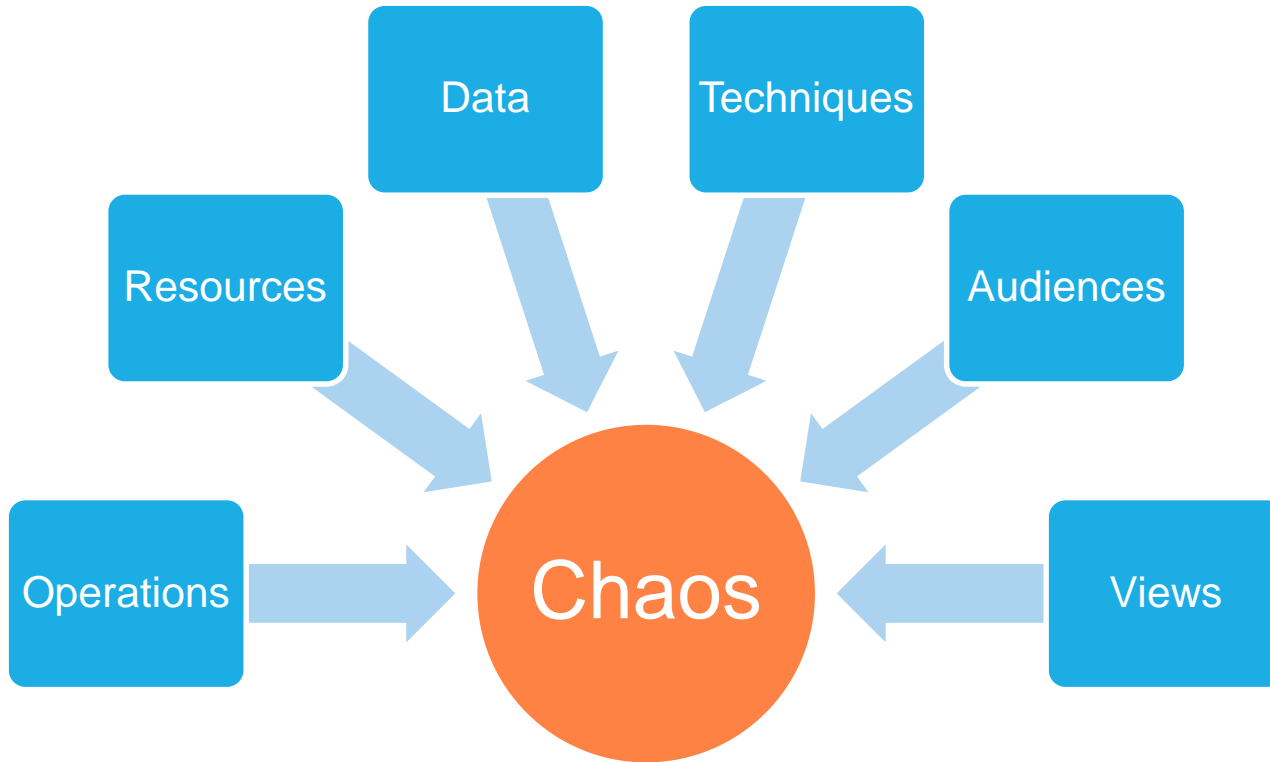
Process Monitoring & Control Research Themes

- Optimal Sensor Placement
- Computer Vision Techniques
- Process Monitoring Technique Validation
- Fault Detection & Alarm Optimisation
- Fault Identification & Root Cause Analysis
- Economic Performance Tracking
- Cost-benefit Optimisation of Operational Intelligence

The Challenge

The Challenge: Order out of Chaos

- 10 000 – 100 000 PI Points per plant
- 3 000 – 10 000 PI AF Elements per plant
- Various Manufacturing Operations
- Various Resources
- Various Data Views
- Various Process Monitoring Techniques
- Various Audiences & Stakeholders



Cost-Benefit Of Operational Intelligence

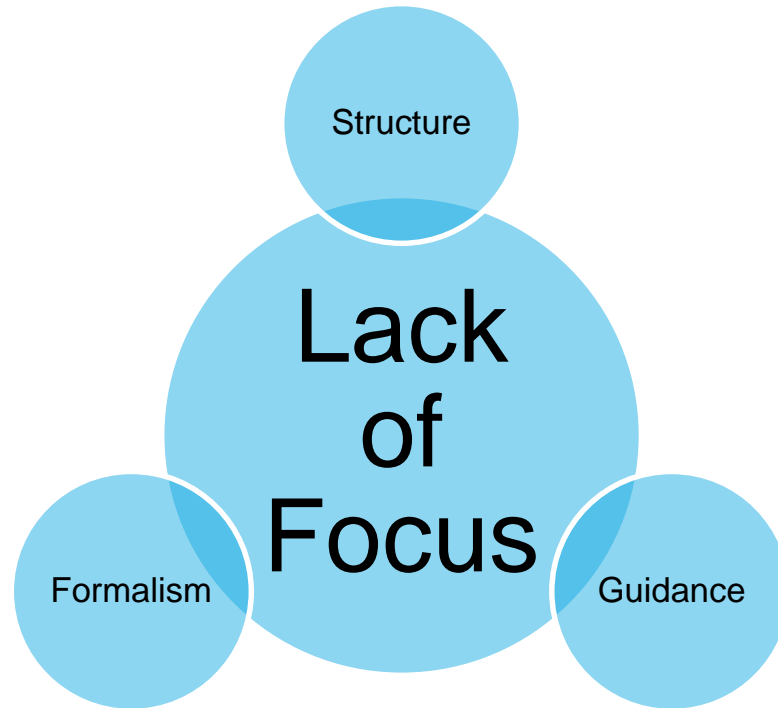
- In Reality
 - Often too low
 - Insufficient Return on Investment
 - Disappointment
 - Underinvestment
 - Abandonment

What Do We Actually Want of Operational Intelligence?

Sufficient Operational Visibility

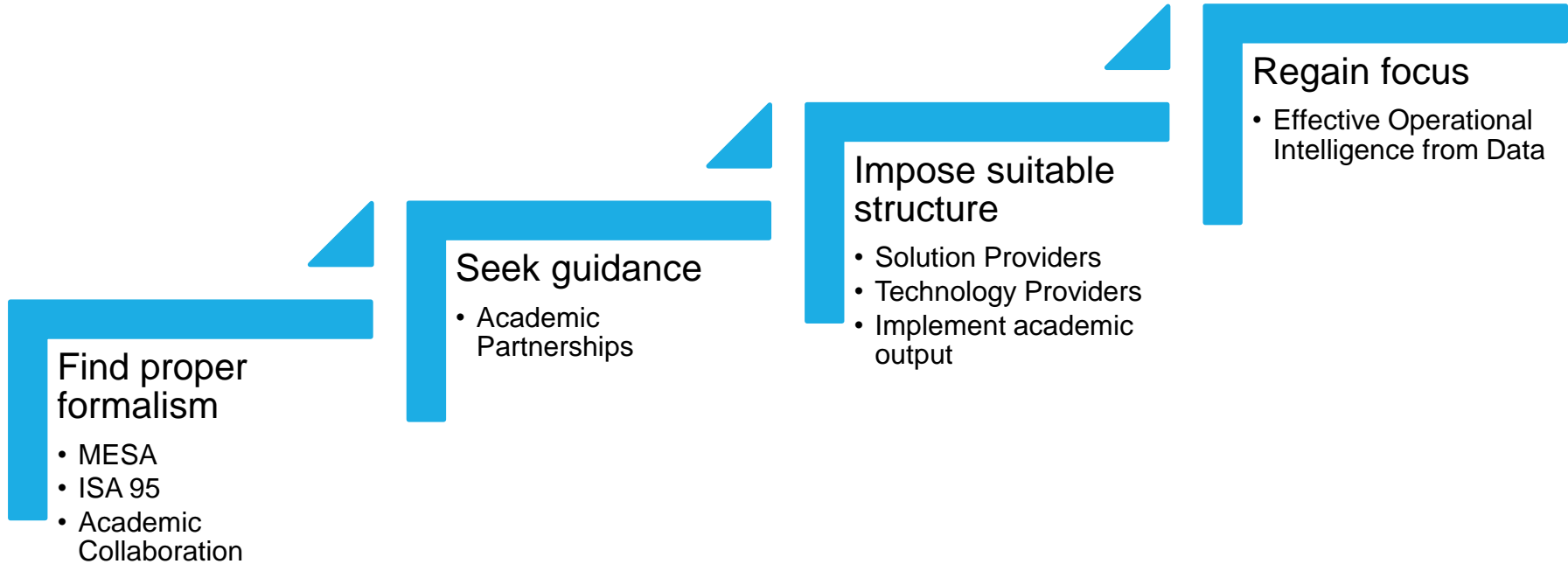
- Critical, Actionable Information
- Well Presented
- In time
- To the Right Audience

So What is The Problem with Operational Intelligence?



Towards a solution

How Can We Restore Order out of Chaos?



Improved Formalism: MESA & ISA 95

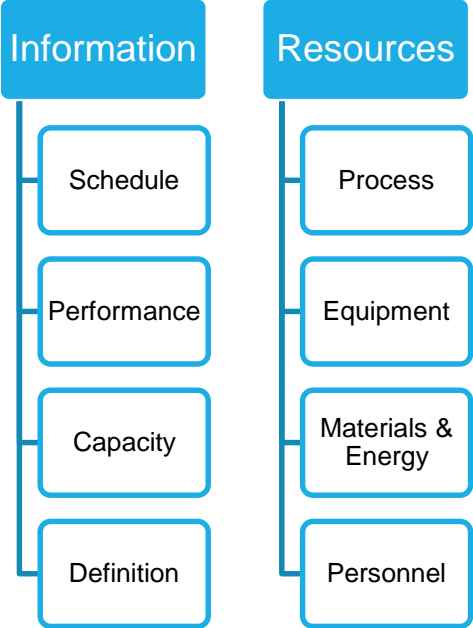
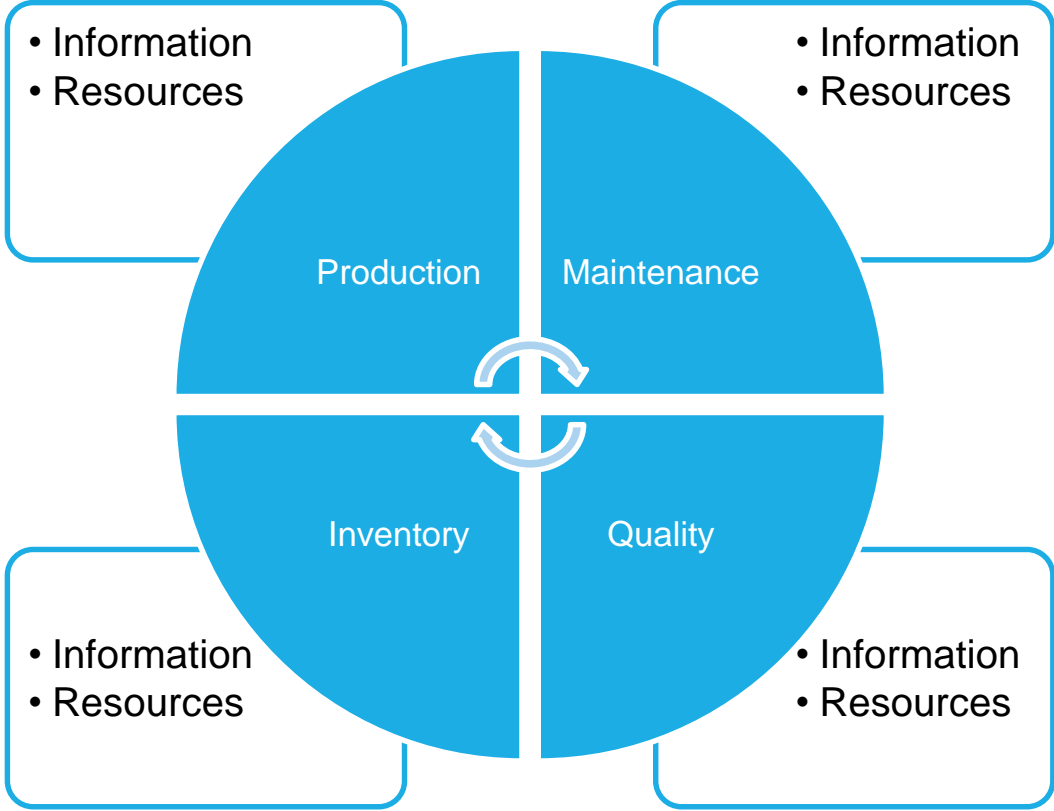
Holistic, formal Operational Intelligence

- Enhance system integration
 - Business Systems
 - Manufacturing Management Systems
- Formalise activity, data, resource

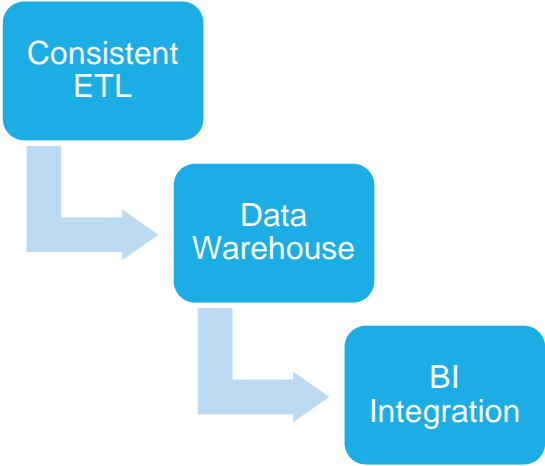
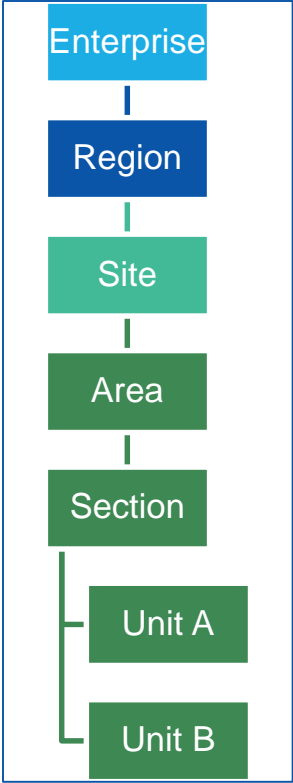
Benefit operational intelligence

- Lean
- Comprehensive
- Integrated

ISA-95 Formalises Operational Intelligence



ISA-95 Formalises Asset Tree



Guidance: Academic Partnerships

Directed Research

Active knowledge transfer

Involve

- Industrial client / sponsor
- University
- Solution providers
- Operational Intelligence Technology providers

Improved relevance of academic output



Academic Partnerships: MESA Certified Post-Graduate?

Introduce MESA certification course

- Engineering Masters program
 - Industrial Engineering
 - Mechanical/Mechatronic Engineering
 - Process Engineering

Masters in Engineering with MESA certification

- Certificate of Awareness
- Certificate of Competency

PI System in Academic Research

Record Simulink process simulations

Capture plant asset trees during MESA course

Target PI System in process monitoring demonstrators

Implement Research Data Management

- Structure by research group, project, experiment
- Implement structure in PI Asset Framework
- Capture time series in PI Archive
- Capture configuration data in PI AF Tables
- Use PI DataLink to integrate Excel



Examples

Example: PI-MATLAB Analytics Framework

Integrate PI System & MATLAB

- Generalised MATLAB-PI Interface
- Target PI Asset Framework SDK
- Extensible analysis framework & library

Multivariate Statistical Analysis

- Implement analyses in MATLAB
- Calculate Time-In-State KPI
- Store analysis results in PI System



Examples: Industry-University Collaboration

Anglo American Platinum

- Operational Performance Monitoring Review
- Follow-on Masters & Doctoral projects

Glencor

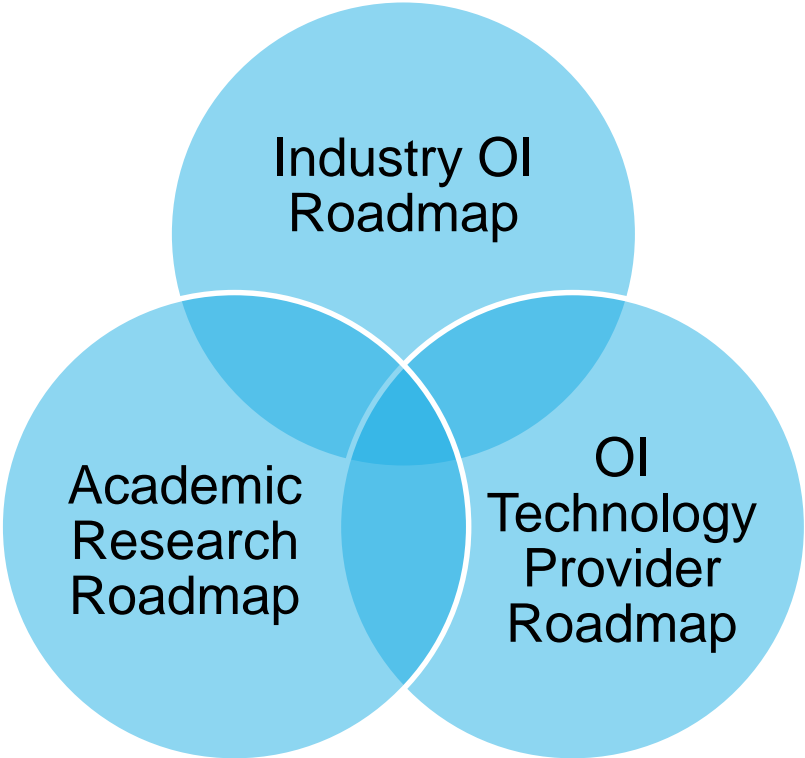
- Computer Vision Master project
- Involve South African smart sensor provider

Stone Three Mining

- Student Fellowship Program



Examples: Industry-University Partnerships



Summary

Summary

COMPANY and GOAL

Prominent South African research university
“Your knowledge partner”



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CHALLENGE

Operational Intelligence
confusion and
ineffectiveness

- Lack of operational visibility
- Lack of structure
- Lack of formalism
- Low data fidelity
- Ineffective KPIs

SOLUTION

Structured, guided
approach, with directed
academic research

- Directed academic research
- Research themes & road maps
- Involve technology vendors
- OSIssoft's PI System, PI DataLink
- Consider MESA post graduate

RESULTS

Sponsored post-graduate
research on directed topics
underway

- Economic performance tracking
- Statistical PM technique validation
- Optimal sensor placement
- Computer vision technique
- Root-cause analysis technique

Contact Information

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Stellenbosch University



Questions

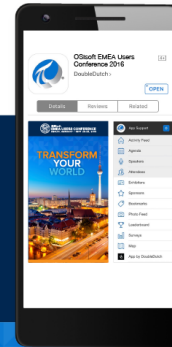
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State your **name & company**

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감사합니다

谢谢

Danke

Merci

Gracias

Thank You

ありがとう

Спасибо

Obrigado



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