Enterprise Architecture considerations governing the implementation of an Industrial IT strategy at Anglo Platinum

EA practitioners conference - June 2008

Presented by Johan van Tonder
Manager: Information Management
Anglo Platinum
Agenda for discussion

1. Understanding the business objectives of an Industrial IT program
2. Key considerations across the EA stack influencing the design
3. The importance of an effective approach to architecture
4. The IIT applications and technology architecture at Anglo Platinum
5. Key functional MES requirements for the minerals processing industry
An Industrial IT strategy focuses on **Integrated Automation** and **Access to Information** to support **Decision Making**.

1. Metallurgical processes are *continuous* and *highly automated*. Effective control depends on a *constant stream of high quality data*.

2. *Effective management* of large integrated metallurgical complexes requires managers at all levels to *coordinate their efforts*.

3. A sustainable approach to **Operational Performance Monitoring** requires all levels of management to work from the *same set of reliable information*.

4. This enables operational *effectiveness* and *efficiency* targets to be agreed, to *maximise business value*.

5. Often attempts at *metrics based management* *falter* because the data gathering process is *unsustainable*.

6. Globally, systems used by **Commercial and Industrial IT are converging**
The road to Business and Operational Intelligence cannot be walked in a day… Will your design stand the test of time?

Enterprise architecture considerations governing the implementation of an Industrial IT strategy at Anglo Platinum by J van Ton der June 2008

The road to Business and Operational Intelligence cannot be walked in a day… Will your design stand the test of time?

Enterprise architecture

Agreed conceptual MES architecture

Agreed standards for all layers of EA for IIT

Main release: data contextualisation, multiple models & templates

Agreed portal strategy in production

Competency centre operational

First plant uses automated dashboard

Phase 1 functionality across all Concentrators

Product is the best in MMM

Global roll-out

 Specialty optimisation active

Feed blend optimisation active

Production scheduling active at refinery

Past

Q208

H208

2009

2010

2011

To-Be

Agreed design for operational support of IIT

Interim release for connectors

Agreed functional roadmap for IIT deployment

Agreed functionality for product replacement

Implemented PI platform for Smelter A

Phase 1 implemented for furnaces

Phase 1 supported by management

Cross functional team lead the IIT program

Agreed the design and roles

Phase 1 implemented for milling

Concentrator dashboard in Excel, mostly manual data capturing

Agreed the design and roles

Concentrator deployment

Smelter deployment

Refineries deployment

Work completed

Current focus

Longer term outcomes
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### Business process considerations in the Industrial IT world

#### Human driven processes

- People execute the process steps

#### Human machine interactions in processes

- People control the process
- Machines execute the process

#### Automated machine interactions

- Machines control the process
- Machines execute the process
Information needs in the Industrial IT world

Strategic decisions

Decisions to control process execution
- Geographically disparate management structure
- Continuous operations
- Functional experts

High degrees of sophistication
- Tendency towards “lights out” automation
- Metallurgical processes are multi-variant
- Automates and Artificial Intelligence

Need for expert analysis
- Collaborative decision making
- Line execution
- Experts on call
Five key models enables a **contextualized view of data** without compromising integrity or flexibility.
Technology considerations in the Industrial IT world

- Often linked to physical plant assets
- Safety is a big consideration
- “Always on” technology
- Speed of data processing
- Remote location often implies poor connectivity
- Historical context implies “many different standards”
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Your operating model will deliver an architecture and resulting product, but is that what you intended?

In 1884, Sarah Winchester, heiress to the Winchester Arms fortune, bought a 6-room house in Santa Clara while still under construction.

She promptly discarded the plan, and kept 22 carpenters full time employed for 36 years!

The house eventually had approximately 160 rooms, with some very unique features:

- 3 elevators
- 47 fireplaces
- Rooms around rooms
- Staircases leading to no-where
- Doors opening to blank walls
- Doors opening to steep drops to the lawn

This was a perfect match for the owner’s needs,

- *but she was trying to confine ghosts!*
Operational Intelligence is a subset of a sound Information Management strategy

Enable easier access to high quality information across all levels of management
- Follow a consistent methodology in deploying business projects aimed at delivering better information
- Provide leadership to an information management competency centre in Anglo Platinum, incorporating AApic group initiatives

Support the implementation of sustainable improvements in business process effectiveness
- Support business process standardization by applying enterprise architecture principles in the modelling of business processes
- Develop and implement a business process management methodology capable of supporting controlled changes to established practices
- Develop a business process training methodology

Support AApic in their pursuit of global initiatives within the group
- Align with Group IM in support of AApic shared service objectives in Finance, HR, Supply Chain and SHE
- Reduce the cost of commodity IT services in agreement with business

Support internal competency development in pursuit of continuous improvement
- Develop internal competency in the management of information
- Develop internal competency in enterprise architecture practices
- Pursue a deliberate talent management program

Deliver and support industrial information technology systems in Anglo Platinum’s operations
- Support operational performance monitoring by leveraging data contained in base systems
- Develop and support the enabling industrial technology infrastructure in Process division
- Agree an automation strategy in Mining

Agile delivery of integrated solutions within a predictable time frame
- Utilize proactive portfolio management to ensure effective implementation of investment decisions
- Utilize program management as a means of controlling delivery
- Introduce competency centers as a means of improving delivery
- Implement an integrated applications management strategy
- Manage expectations through improved relationship management
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A sustainable approach to real time information-based decision making in the mineral processing industry requires a layered architecture.
The nature of the installed base often requires a combination of centralized and decentralized deployment of architecture.
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The Industrial IT architecture is driven by the main functions, input and output data flows in each layer of the architecture

<table>
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<tr>
<th>Architecture layer</th>
<th>Main functions</th>
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| Manufacturing execution systems | 1. Provides a **logical framework**, based on linked objects, within which the execution of process steps within a plant are managed. Tracks the execution of these process steps.  
2. Performs **continuous metal balancing** across key plant unit operations and the plant as a whole, as well as across the entire metallurgical complex.  
3. Provides **material tracking and genealogy** functions, and assigns material properties to tractable batches (either physical or logical, e.g. time-based) at plant level.  
4. Provides a **maintenance management and execution** function at plant level, based on detailed information about fault root cause analysis.  
5. Accepts forecasts from metal forecasting as targets for a period and **optimizes and controls plant performance** to this target, considering local plant conditions.  
6. Receives **logistics scheduling** instructions from a scheduling system and ensures its execution at plant level. Manage macro blending from concentrators to the smelters.  
7. It provides **operational reporting and analysis** functions to plant personnel, to support in-the-moment decision making requiring access to detailed plant level performance information.  
8. Support **event-based integration** to other systems (such as SAP, LIMS, WB, logistics scheduling)  
9. Enables Enterprise wide **Energy Management** |
| Supervisory systems | 1. Real time supervisory executable control logic to ensure reliable and optimal plant operation.  
2. Continually calculates and provides set points for the control system layer.  
3. Provides MES with granular detail on reasons for plant failure, based on root cause analysis.  
4. Deploy “soft sensors” where a physical measurements are either impossible or not yet deployed.  
5. Execute in accordance with recipe (either internally selected, or instructed by MES)  
6. Unit process level blending within the smelters, based on feed stock on hand and projected from MES level. |
| Control systems | 1. Controls unit processes, typically a selection of machine controllers and addressable field equipment.  
2. Collects and reports these values to a PLC supervisory layer (e.g. WINCC), or an APC (advanced process control) system. |
| Field devices | 1. To execute control instructions received from the control system layer |
Integrated architectures requires different stakeholder groups with traditionally disparate agendas to work together

• **Rational design** is a prerequisite for success, but does not guarantee it

• **Team dynamics and cultural design** are vital

• **Relationships** need to be nurtured