

Innovation in Oil & Gas

IT & OT Integration



Synopsis

A recent paper by IDC predicts the following as a Leading trend that will impact us in 2016.

QUOTE

By 2018, 60% of global 1000 companies will integrate IT & OT at the technology, process, security & organization levels to fully realize the value of their IoT investments."

Information technology (IT) and operational technology (OT) were seen as two distinct domains of a business. When hardware and software application used to transform data meet a set of devices and processes that act in real time on physical operational systems, you can start to approach engineering and design differently, efficiently manage workflow and increase productivity. Recent advancements have been forcing these areas closer for a convergence and the most significant driving force has been the Internet of things (IoT). Finding a way to extract intelligence from the connected devices and use it to make better decisions and improve processes is radical and this being the sweet spot, navigating IT/OT convergence is increasingly critical for business decision makers today.

Industrial operations will change more radically in the next 10 years than in the last 50 years as 34% of entire IoT growth opportunity is in manufacturing, transportation, utilities, retail and healthcare. With the integration of IT & OT at the technology, process, security & organization levels, the following areas would be transformational,

- 1) Faster time to market
- 2) Lower total cost of ownership
- 3) Improved asset utilization
- 4) Enterprise risk management

This calls for the great need for asset-rich companies to unleash the untapped value of IoT in the coming few years and this must help customers realize tangible business values.

UNQUOTE

This paper makes an attempt to unravel what this means to the 'Energy & Utilities' segment and what lies in store for us to influence our Thought Leadership on 'IT and OT Integration'.

BACKGROUND

Some basics first. Plant IT can be structured in a level-based linear hierarchy model based on functionality and can be depicted pictorially as below, based on ISA-95 standard. This is also loosely called a "business process and applications view".



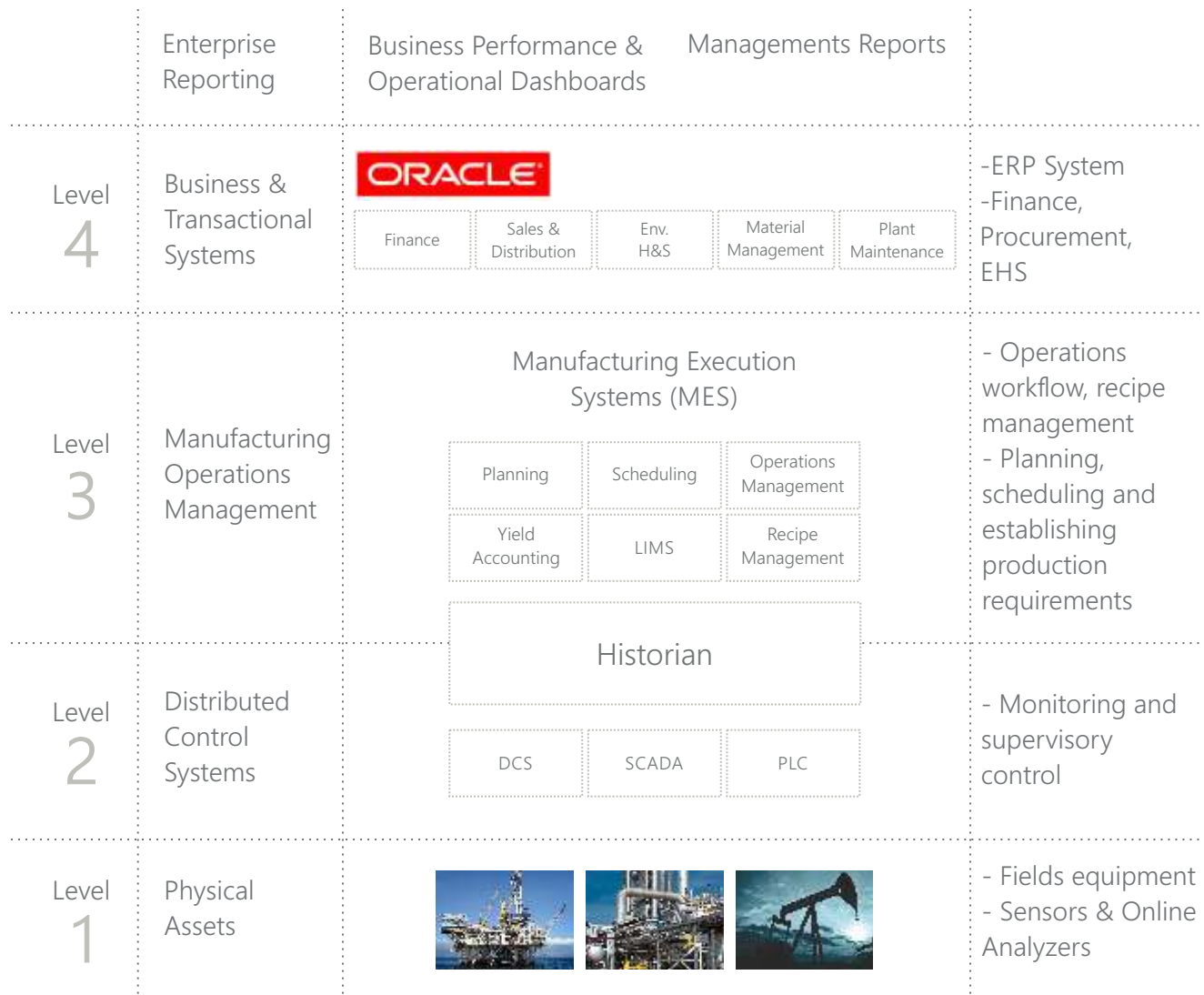


Figure 1: Industrial OT and IT and Levels under ISA-95 Standard

The various applications, tools and systems in an industrial plant can be distinguished into distinct levels.

Level 0: Business Processes themselves

Level 1: Instrumentation and control Systems: Input Sensors from field instrumentation and controls – Temperature, Pressure, Flow/ Manipulated Variables such as Valves, Actuators which emanate from Instrumentation and field control systems. Obviously, this is the IoT layer where the IOT deployment would happen.

Level 2: These are systems for monitoring and supervisory control which automate control and localized optimization.

Level 3: These systems typically called Manufacturing Operations Management (MOM) systems address planning, scheduling and establishing production requirements to address demand and optimization of operations. These systems are also called as “Industrial IT” systems.

Level 4: These are business transactional and enterprise management applications. HMEI has implemented SAP for managing corporate transactional and financial requirements of procurement, payroll and inventory management. These fall under “Corporate IT” systems.



Level 2 and 3 applications would fall under Operational Technology (OT) layer, whereas Level 4 applications belong to the Information Technology (IT) layer.

Below picture will provide more inputs on Levels and what it means from business functionality and contextual information residing at each level.

	Domain	Typical Functionality	Associated Systems
Level 4	Business Transactional & Enterprise Management Demand/Supply Balance, Financials, HR, Payroll, Compliance	<ul style="list-style-type: none"> Managing the corporate transactional requirements, procurement, payroll, strategic planning, inventory management. Interface with external banks, trade partners, system exchange market place etc. Granularity - Months, weeks from an operational perspective - Daily from a transactional perspective 	ERP Systems, Banking/Financial Systems, Trading & Risk Management
Level 3	Manufacturing Operations Managements Planning, Yield Accounting, Historians & Advisory Systems	<ul style="list-style-type: none"> Operations workflow, recipe management Planning, scheduling and establishing production requirements to address demand. Optimization of unit operations Interface with overall strategic plan and reporting as well as operational control systems Granularity - Minutes, hours, weeks, shifts 	Planning/Scheduling, Yield Accounting, Energy Management, Plant historian, Laboratory Info Systems, Ops Logbook, KPI Manager, Process Modelling, Document Management
Level 2	Distributed Control Systems	<ul style="list-style-type: none"> Monitoring and supervisory control. Automated control and localized optimization. Granularity - Seconds, minutes, hours, shift 	DCS, SCADA, Tankfam Management, CPP
Level 1	Instrumentation & Field Control Systems	<ul style="list-style-type: none"> Sensing and control of field equipment, process units. Interface with higher level information systems Granularity - Seconds 	Field Instrument, Online Analyzers, Equipment Monitoring, Systems Interfaces (Fieldbus etc.)

Problem Statement:

- 1) Typically industrial plants have a highly hierarchical organization structure where departments work in silos with information exchanged on a need to know basis.
- 2) Level 1, Level 2 often do not come with adapters and connectors ready for integration with themselves and other levels. In this industry, applications running in different levels are usually not integrated due to various technical and semantic challenges. They operate in different contexts across levels; therefore systems across level are not on the same page/domain functionally as well as technically. Information coming from one application lacks the context required for other applications to comprehend. Applying standard integration techniques (ESB driven or process driven) are not sufficient and in addition, required the mechanism to semantically enrich the message to make it apprehensible to other systems.
- 3) Level 3 – Industrial IT systems and Level 4 – Corporate IT systems have mutually incompatible service levels.
- 4) Security issues tops the list of current barriers, which means that opening up access to Operations Technology would be a prime concern for internet or cyber-attacks. No company would want unhindered access to Control systems (Level 1). Control Systems emit information using OPC Specification which is an Industrial Automation Spec but not an IT Standard.



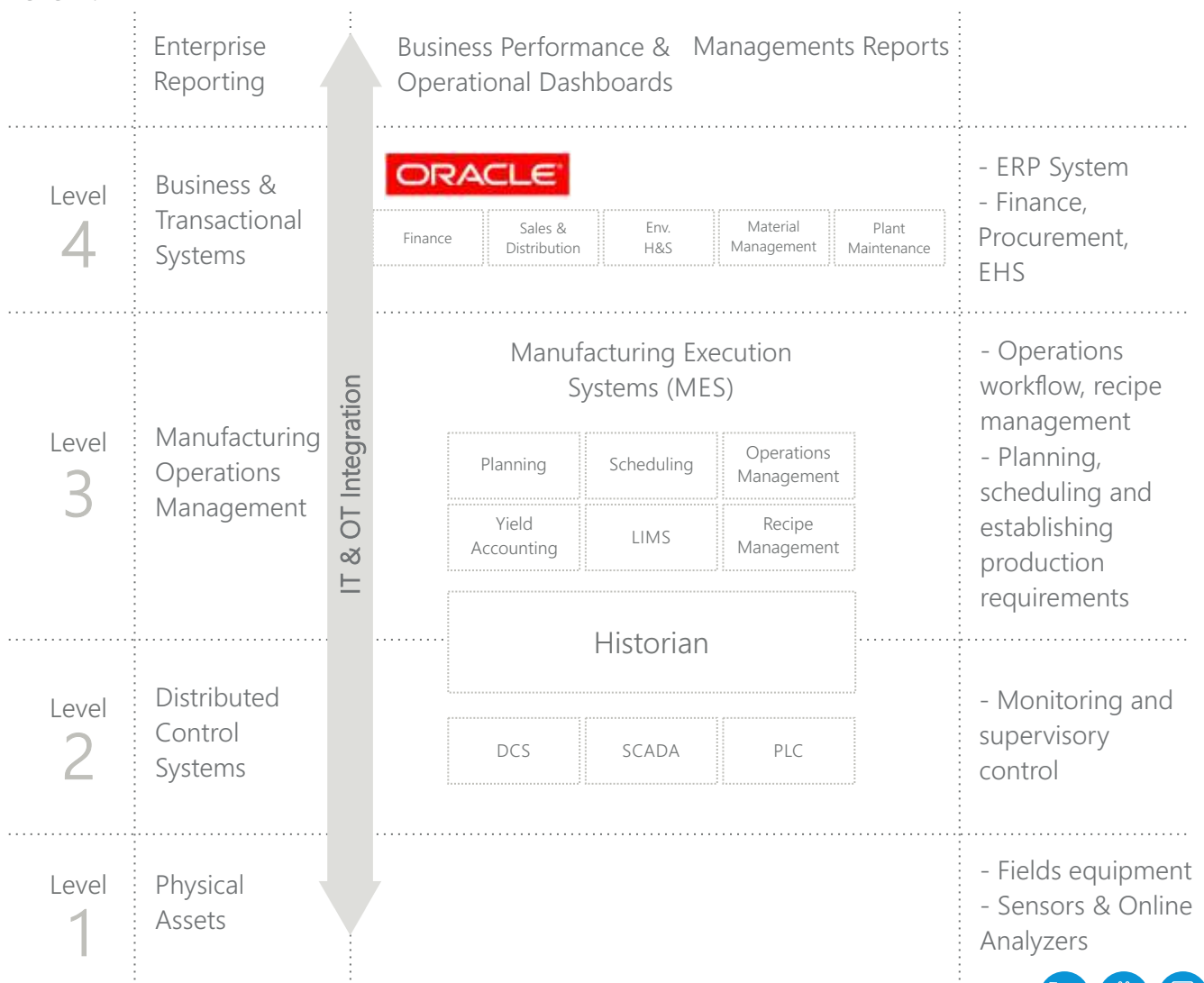
Value proposition - IT & OT

Imagine an integration of the enterprise with seamless exchange of information and knowledge happens, not after 10-15 years of the plant becoming operational, but immediately as the systems are set up. By starting as an integrated enterprise with end to end business process focus and not department focused, these industries will be able to reach a high level of maturity early-on.

Transactional data gets captured / entered only once and in the system that covers the process and then is integrated to the other systems that need this data. This is the basic purpose of the integration layer that finally leads to a Management Reporting layer.

All these systems which when integrated interact with each other and achieve better coordination of business & production processes, real time view of production processes which in turn would help in quick analysis and better decision.

To top it all, Enterprise Reporting would provide the organization Business Performance & Operational Dashboards that are seamless and a true reflection of the data stored in Level 1 thru Level 4.



Conclusion

IT is primarily designed for the Corporate World, primarily focused on cost, productivity, compliance, efficiencies and logistics. For OT, these applications are more aligned to physical world of plant – what we call as 'things' as endpoint. Focus for OT is alarms, events, state, condition, detection of fault. When the IT Trends (SaaS, SOA and Mobility) converge with OT Trends (Smart Things, Predictive Analytics), the result would lead to Intelligent Solutions – Smart Manufacturing, Smart Grids, etc.

We would need to think differently to now look at not just looking at providing solutions thru Efficiency or Productivity improvements thru IT + OT collaboration, but also predict outcomes. It is this opportunity of the Smart Building thru the right framework, platform and business drivers that we need to leverage on.

End result? A convergence that is part Technology (IT) and part process / culture (OT) that would give the customer enhanced service and also a new revenue model where we predict outcomes based on varying utilization levels of solutions within the enterprise.

- For further information, please review our website at www.kpit.com

References

1) More than 50% of the survey respondents believe IoE has the potential to automate anywhere from 25 percent to nearly 50 percent of manual processes. To realize these improvements, however, oil and gas companies must transform the way they do business particularly in the area of IT-OT convergence (people, process, and technology). Fifty-nine percent of survey respondents do not believe that their firms' IT and OT strategies are closely aligned

- <http://www.iebmedia.com/ethernet.php?id=10937&parentid=74&themeid=255&hft=88&showdetail=true&bb=1>

2) Oil & Gas organizations need the assistance from third-party technology vendors in IT and OT Integration. Among all needs, Strategic Planning for IoT solutions was the no. 1-ranked (cited by 37 % of respondents) & Implementation was the No. 2-ranked area of need (30 % of respondents)

- http://www.cisco.com/c/dam/en_us/solutions/trends/iot/docs/iot-data-analytics-white-paper.PDF



3) According to Oxford Economics,

a. By transforming business processes through IoE, oil and gas companies can capture their share of \$600 billion of Value at Stake between 2016 and 2025, according to Cisco Consulting Services. For a \$50 billion O&G firm, this translates into an 11 percent bottom-line (EBIT) improvement.

b. IoE also generates business and operational advantages. Respondents identified “faster problem resolution” as the No. 1 business benefit of IoE, while “improved production efficiency” was the top-rated operational benefit.

c. According to Oxford Economics, IoE adoption by the O&G industry has the potential to increase global GDP by up to 0.8 percent—or \$816 billion—by 2025

- http://www.cisco.com/c/dam/en_us/solutions/industries/energy/docs/OilGasDigitalTransformationWhitePaper.pdf

4) By 2018, 60% of Global 1000 Companies Will Integrate IT and OT at the Technology, Process, Security, and Organization Levels. By 2019, 45% of IoT-Created Data Will Be Stored, Processed, Analyzed, and Acted Upon Close to, or at the Edge of, the Network Associated Drivers

- <https://www.idc.com/research/viewtoc.jsp?containerId=259856>

About the Author

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Rishi has accumulated over 17 years of industry as well as consulting experience, with competencies in multiple ERPs (SAP and Oracle JD Edwards), Downstream Oil & Gas Refinery IT systems, Oil & Gas Domain, Retail business domain and Large Program & Project Management. He has lead teams in implementing and sustaining solutions in Manufacturing Execution Systems (MES) (also known as Manufacturing Operations Management (MOM)) and Integration of all business applications (ERP/SAP) with MES for downstream - Oil and Gas Refinery.

He started his career with Hindustan Petroleum Corporation Limited and has strong domain experience in Supply chain planning and downstream processes. Thereafter Rishi moved over to Infosys in JDE Consulting, where he was responsible for managing JDE implementation and support / development projects as well as package evaluation & product fitments, creating business cases. His previous assignment was as a Program Manager for HPCL-Mittal Energy Limited (HMEL) where he was instrumental for setting up business processes and systems for Plant-floor' (field instrumentation) to 'Top-floor' (Management Dashboards) Integration including the intermediate control systems (DCS / SCADA) and transactional systems (SAP, MES) which is unique for the industry - this enabled linkages between all major processes across business value chains in Oil and Gas downstream.

In various roles, he has provided thought leadership through creating solutions, publishing whitepapers and showcasing the industry trends and customer case studies while speaking at various events.

