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Identifying the Path to Success for Industry 4.0



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What is Industry 4.0? Wikipedia...

"... cyber-physical systems monitor physical processes, create a virtual copy of the physical world and make decentralized decisions.

Over the Internet of Things, cyber-physical systems communicate and cooperate with each other and with humans in real time..."





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Components of Industry 4.0 Attributes of all these connected "things"

- Discoverable
- Autonomous
- Model-based
- Communicative
- Self-monitoring
- Secure
- Standards-based

Imagine the collaborative behavior that could emerge !



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Solutions MUST Enable Industry 4.0 *The Drive Towards Increased Productivity*

The evolution toward smart manufacturing is enabled by the confluence of

Connectivity Network Robotics Connectivity Manufacturing Smart Automation Devices **Computing Power** Agile Manufacturing **Intelligent Software** Intelligent Internet of Things Customization Manufacturing Intelligent Knowledge-Systems **Ability to Manage** Software Remote enabled, Highly-connected, Infrastructure Diagnostics productive, high **MASSIVE DATA** Advanced powerful embedded mix, agile Analytics and real-time **Field Data** manufacturing applications Big Data / Local Data Collection Cloud Storage 3D Printing Local 0000 Processing Intelligent Smart Machines Warehouse Sensors Automation Electronics Suppliers Who Act Decisively will Benefit by Creating Added Value for their Customers RUDOLPH 8

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Understanding Supply Chain Yield Dynamics

Requires Complex Enterprise Level Supply Chain Optimization:

- Big Data
- Digital Threads
- Package to Tool Correlations
- Real-time Dashboards
- Best in Class Yield Analytics

Solutions Must Remove Risk from the Electronics Supply Chain



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Big Data Defined



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Why Can't Decisions Be Made Quicker?



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- Multi-variate prediction modeling
- Linear Regression: Y ~ X
- Project observed (X) variables and predicted (Y) variables to a new space







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Decision Tree Mathematics

What is a decision tree?

- Sequential statistical test
- Identify primary cause/effect
 - Continuous Variables
 - Liner regression or curve fitting
 - Categorical Variables
 - ANOVA
 - Time Based data
- Split data based on primary effect
- Repeat to create tree with 2^N branches
- More than one valid predictor
 - Show best answer first
- Presentation-ready graphics





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Digital Threading – Multi-chip Module



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MCM – Analysis Of All Manufacturing Data



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Advanced RF Device Digital Threading – Duplexer Example



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Advanced RF Device Digital Threading – Duplexer Example



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Summary

- The Goal is Actionable Intelligence
- New Analytical Paradigms will be Required
- Requirements:
 - The Right Data → Actionable, Secure, Relevant and High Integrity
 - At the Right Time → Current, Accurate and Transparent
 - In the Right Format → Visible, Predictive and Prescriptive





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