Living in an Automated World

"New Solutions for e-Manufacturing"

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The Problem

- **Industry growth is premised on continuous cost reduction**
- **Moore's Law has primarily driven technology**
- **First wave of manufacturing development focused on yield management**
- **A broader view is required to continue Moore's law**

Manufactures must adapt

"the old rules don't apply anymore"

THEN

TECHNOLOGY

NOW

MANUFACTURING

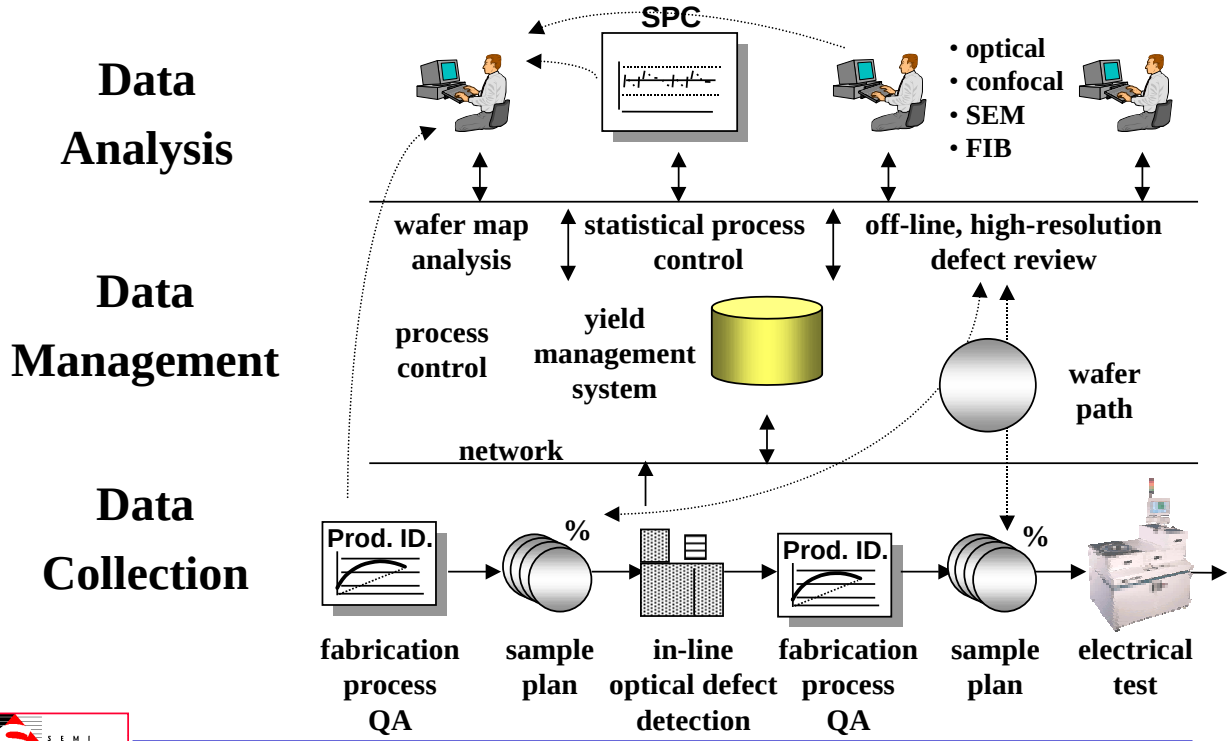
Today's environment

- **Lack of "manufacturing" investment**
- **Skyrocketing capital cost**
- **Old, closed, proprietary system architectures**
- **Incompatible data structures, even with standards**
- **Lots of data, but no real "knowledge"**

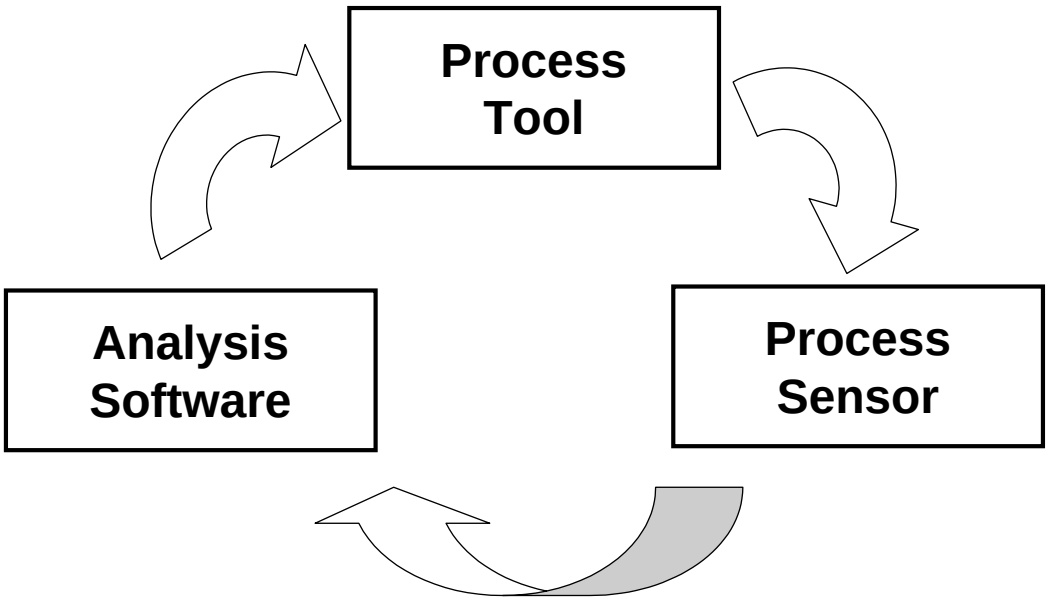
Capital utilization

- Fabs now cost $1.5B (USD)
- Equipment OEE is at 50%
- Fab economics driven by defect density and revenue per wafer
- IF we were talking about a paper or steel mill - they would have been closed down

Data intensive process management



Closed-Loop Process Control (CLPC)



Software becoming essential

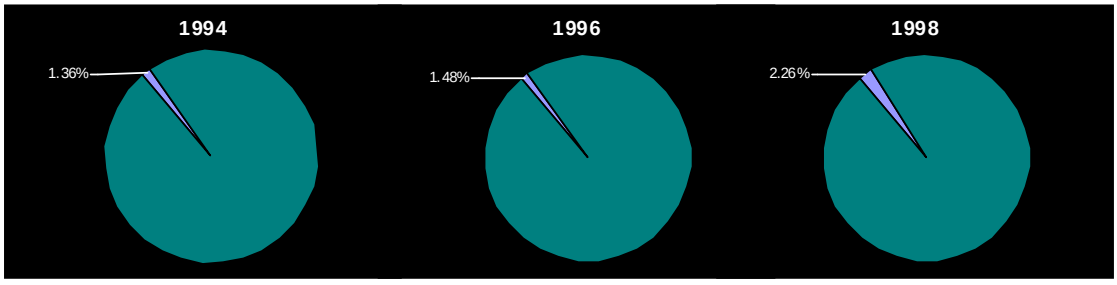
- **Process control leading to exponential data growth**
- **Problem resolution time and problem avoidance critical**
- **Engineering and production efficiency are key cost differentiators**

Current software environment

- Outdated software environments
- Isolated mainframes, data islands
- Slow or no networks
- Proprietary vendor formats
- Limited customer and equipment vendor understanding
- Spending is low compared to potential

Software has been neglected

- Many companies still using mainframes and isolated solutions
- Software as a percentage of fab equipment expenditures



New technologies will enable e-Manufacturing

- Fully distributed computing
  - Fast networks, inexpensive systems
  - Java, ActiveX, Web-based
- Massive, cheap database technology
- Rapid deployment – easily modified
- Contemporary GUI – ease of use
- Open systems!

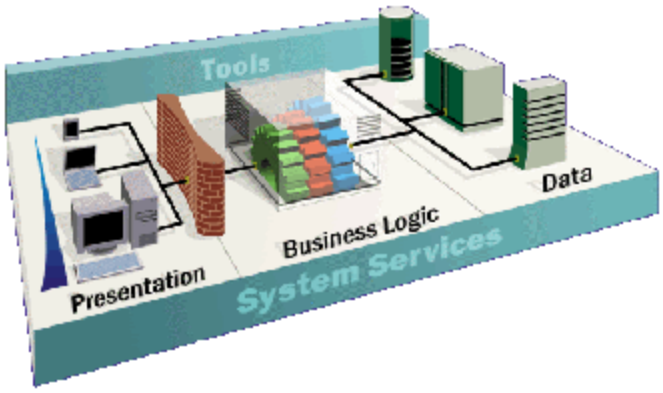
Open systems

- Solution for distributed innovation
- Protects the customer
- Doesn’t lock up your data!
- Focuses on interface
- Implementation can still be proprietary
  - although open source model is emerging

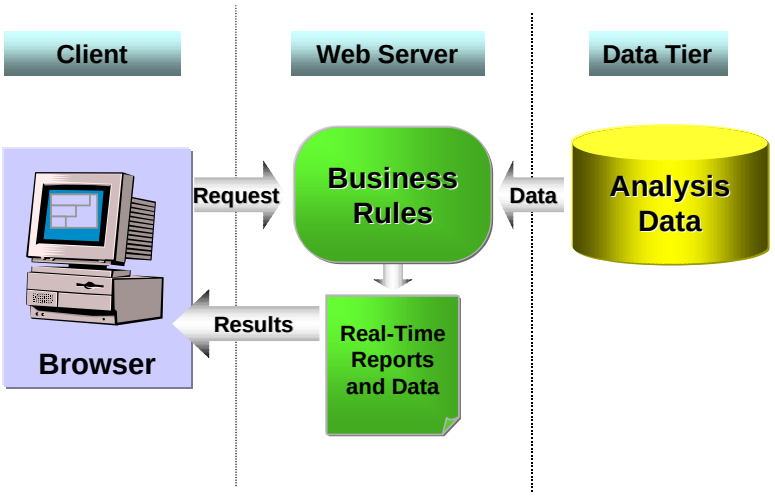
Key challenges

- **Link fab islands to provide cross-fab solutions**
- **Improve engineering efficiency by automating the monitoring process**
- **Sharpen the learning curve to provide faster new product ramp-up**
- **Eventually … provide adaptive process control**

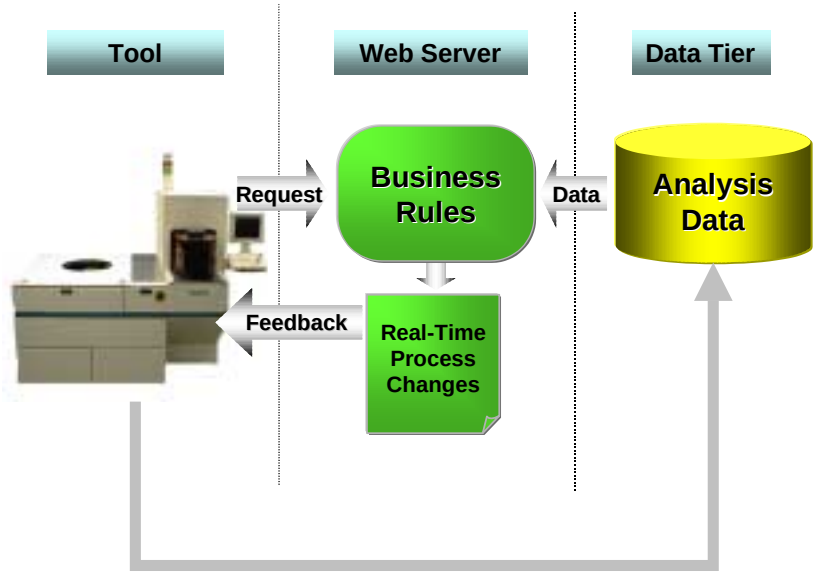
Web-based Model



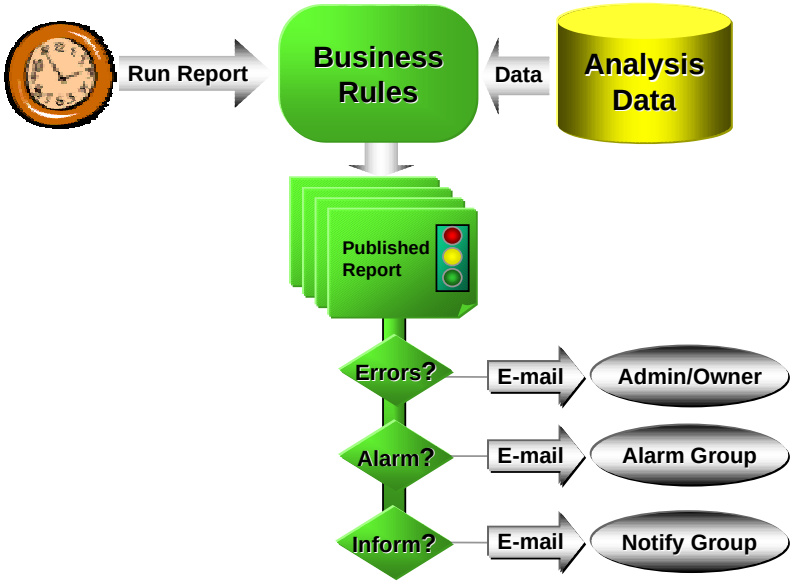
Example: Dynamic Reporting



Example: CLPC



Example: Automated Reporting



Conclusions

- **Distributed computing and open systems need to be embraced and implemented**
- **Distributed and adaptive process management will be key to future success**
- **Solutions from other industries need to be evaluated and absorbed (cross-pollination)**