

# ITRS Factory Integration (FI)

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Korea

## **2011 FI Contributors:**

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# Factory Integration Summary

## ❖ All FI technology requirements tables and potential solutions tables updated

- ☞ Operations, Equipment, AMHS, FICS and Facilities
- ☞ Chapter write up done
- ☞ Very good job by FI team members – Thanks to all who participated and contributed!

## ❖ Identified key focus areas for FI

- Energy issues identified from 2 Workshops on Energy
- ☞ Productivity, quality improvements and waste reduction for 300/450mm
- ☞ Energy & Resource Conservation, efficiency and compliance
- ☞ Migration from reactive to predictive approach in control, scheduling, maintenance and yield management
- ☞ Green technologies for facilities management
- ☞ Decision Support based on effective data usage & management



# Factory Integration Summary

## ❖ Key Focus areas in 1<sup>st</sup> half of 2012

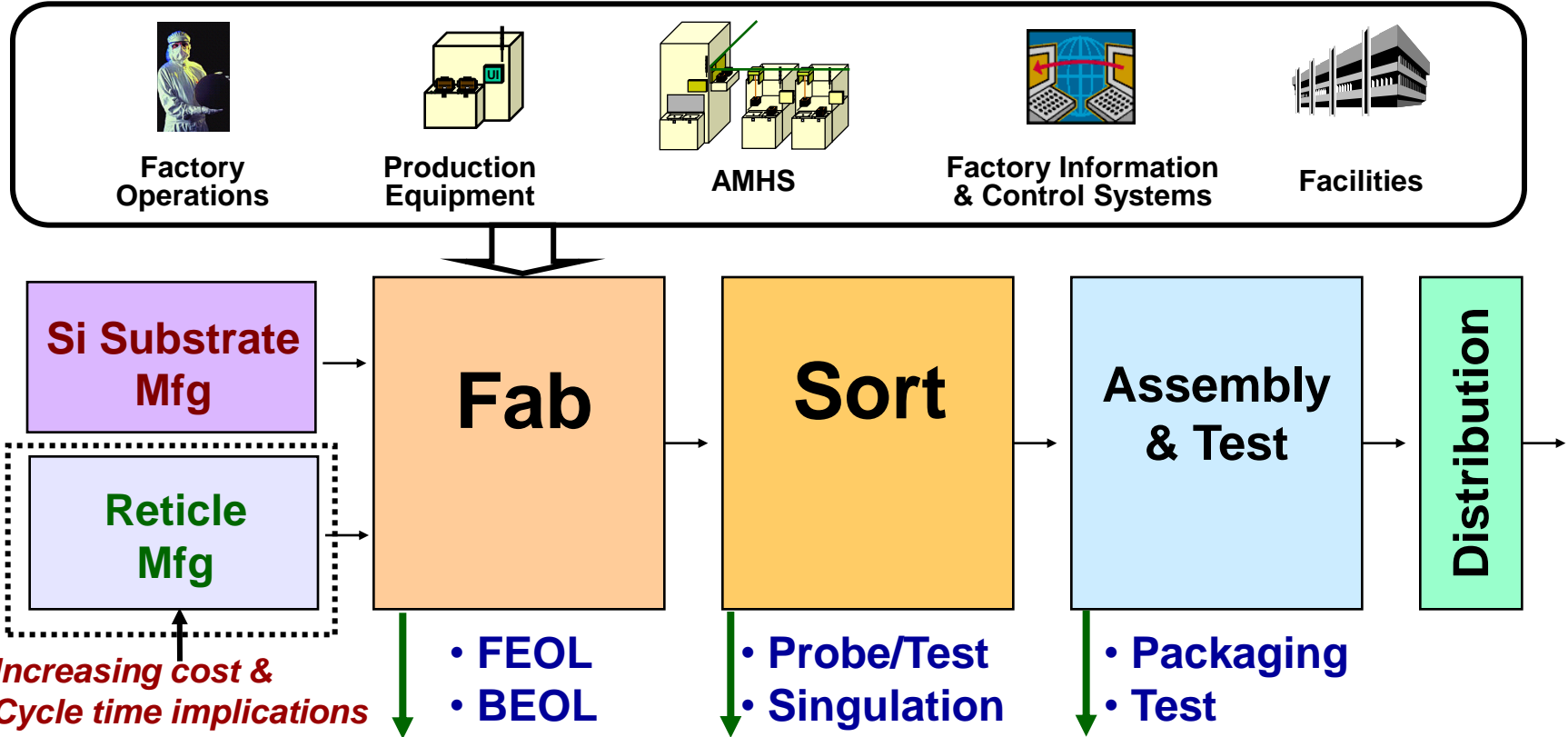
- ☞ Cost and Energy modeling for process tools
  - ☞ Linking facilities and fabs to common goals
- ☞ Explore predictive systems and control methodologies
  - ☞ Workshop topic in July 2012
  - ☞ Yield based control methodologies
- ☞ Manufacturing process quality improvements
- ☞ 300mm/ 450mm productivity improvements
- ☞ Energy conservation/efficiency/metrics (collaboration with ESH)
- ☞ Feedback to Standards
  - ☞ *(FI will facilitate a better alignment with relevant Semi Standards)*
- ☞ EUV introduction

## ❖ Long Term Focus Areas

- ☞ Future generation Fab productivity and cost optimization
- ☞ Fab Simulation with Real time adjustments



# Factory Integration Scope and Drivers



## Factory is driven by Cost, Quality, Productivity, and Speed

- ↳ Reduce factory capital and operating costs per function
- ↳ Faster delivery of new and volume products to the end customer
- ↳ Efficient/Effective volume/mix production, high reliability, & high equipment reuse
- ↳ Enable rapid process technology shrinks and wafer size changes



# Factory Integration Requirement Drivers

**Cycle Time Reduction & Operational flexibility**



**Cycle Time/Operational Flexibility:**  
Multiple lots per carrier and/or fewer wafers per carrier. Get new products to customer much faster.

**More good wafers out per tool**



**Output per tool must increase:**  
Find breakthrough solutions that result in significant increases in good wafer out and increased OEE (eg: APC, e-Diag)

**Highly automated factory**



The 300mm factory is much more **automated** and must be designed to transport hot-lots and hand-carry's.

**Reduce Time to Money**



**Reduce time to \$\$\$/Cycle-time reduction:**  
What are stretch goals for cycle time from ground-breaking to first full loop wafer out. How to achieve quicker shrink?

**Factory size is becoming an issue**



**Increased floor space effectiveness:**  
Don't want each new generation to drive big increase in cleanroom size, esp. since fab is segregated Cu/non-Cu and new metal layers added at each node.

# FI Sub team –Some Emerging Themes/Challenges

	Subteam	2011-12 Challenges
1	<b><u>Factory Operations (FO)</u></b> Focus: 1) Reduce Lot Cycle times, 2) Improve Equipment Utilization, 3) Reduce Losses from High Mix	Wait time waste reduction Proactive data visualization
2	<b><u>Production Equipment (PE)</u></b> Focus: 1) NPW reduction, 2) Reliability Improvement, 3) Run rate (throughput) improvement 4) Equipment Intrinsic efficiency	Equipment Engineering capabilities 300mm/450mm Productivity and Quality improvement Energy Conservation and Efficiency Reactive to Predictive control Designed in APC for tools
3	<b><u>Automated Material Handling Systems (AMHS)</u></b> Focus: 1) Increase throughput for Traditional and Unified Transport, 2) Reduce Average Delivery times, 3) Improve Reliability	AMC Prepositioning of carriers
4	<b><u>Factory Information &amp; Control Systems (FICS)</u></b> Focus: 1) Increase Reliability, 2) Increase Factory Throughput	Data Quality Reactive to Predictive control
5	<b><u>Factory Facilities (FF)</u></b> Focus: 1) Reduce Costs 2) Utility 3) Footprint	Improve integration between PE and Facility Systems Improve Facility design and construction cost control Improve Facility and PE Interface Improve Facility response to ESH requirements



## Factory Integration Conclusions

- ★ **All FI technology requirements tables and potential solutions tables updated**
  - ❖ **Operations, Equipment, AMHS, FICS and Facilities**
- ★ **Identified key focus areas for FI**
  - ★ **Plans defined for 2012 and beyond**
  - ★ **Migration from reactive to predictive ....**
- ★ **Working with other TWG on cross-cut issues**
  - ★ **2 Workshops on Energy organized with ESH**
    - ★ **Alignment between facilities and ESH**
    - ★ **Definition of energy metrics for ITRS tables**
  - ★ **Virtual metrology and other predictive techniques with Metro**
  - ★ **EUV Timing and alignment with Facilities design**
  - ★ **450mm timing and requirements**



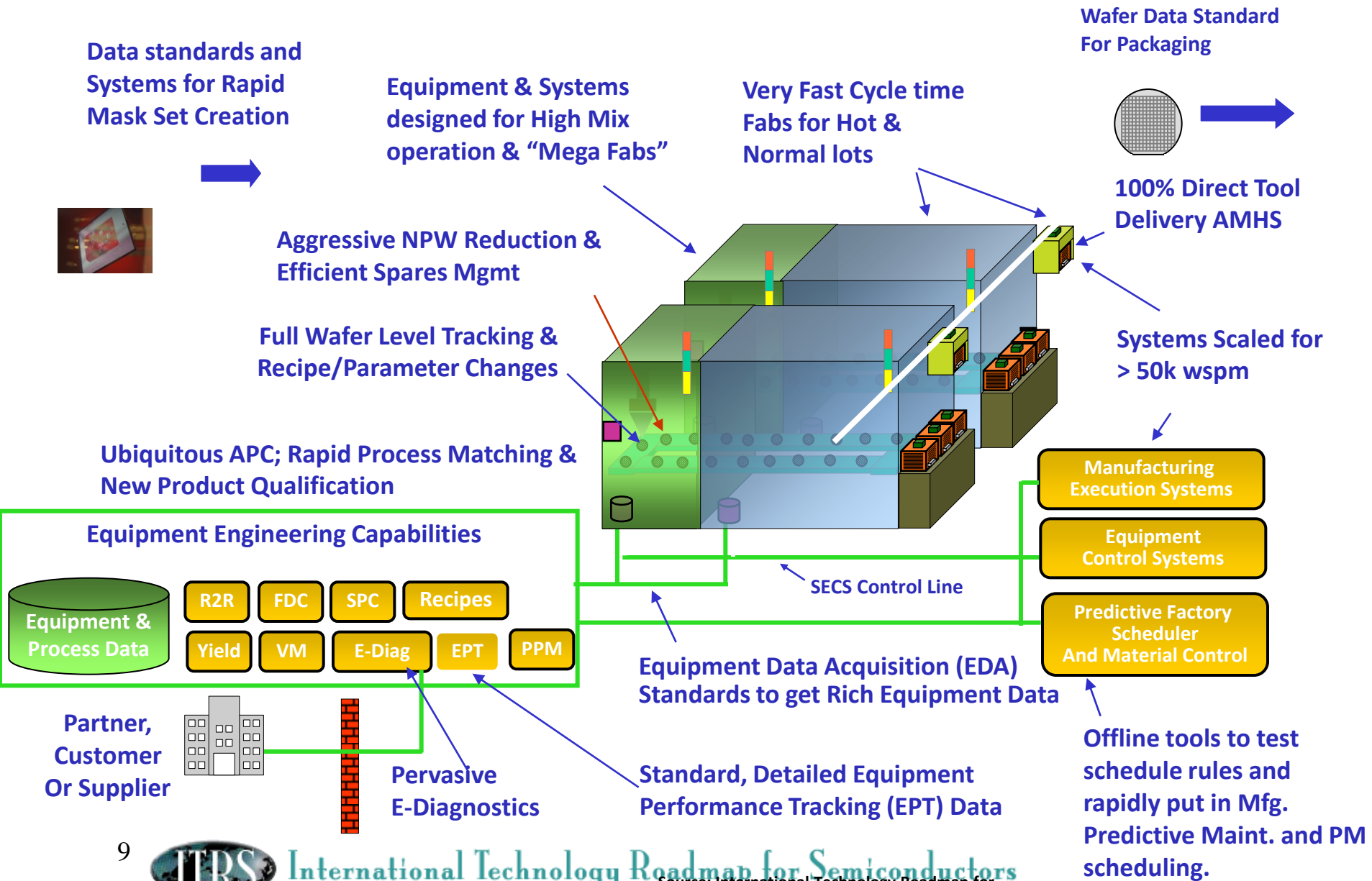
# Back up



International Technology Roadmap for Semiconductors

*2011 ITRS Factory Integration*

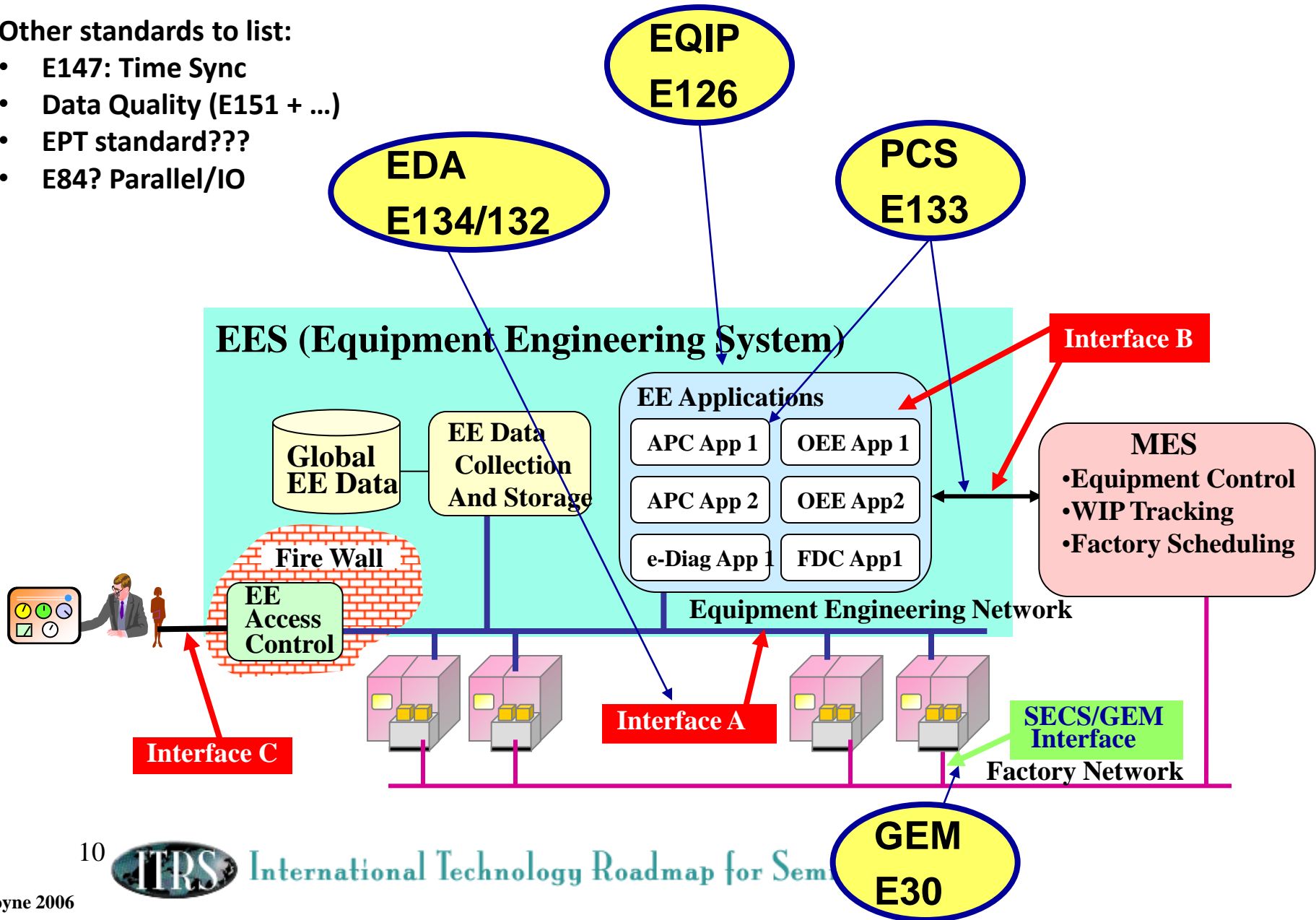
# Some Projected Attributes of a 300mm $\leq$ 45nm Fab



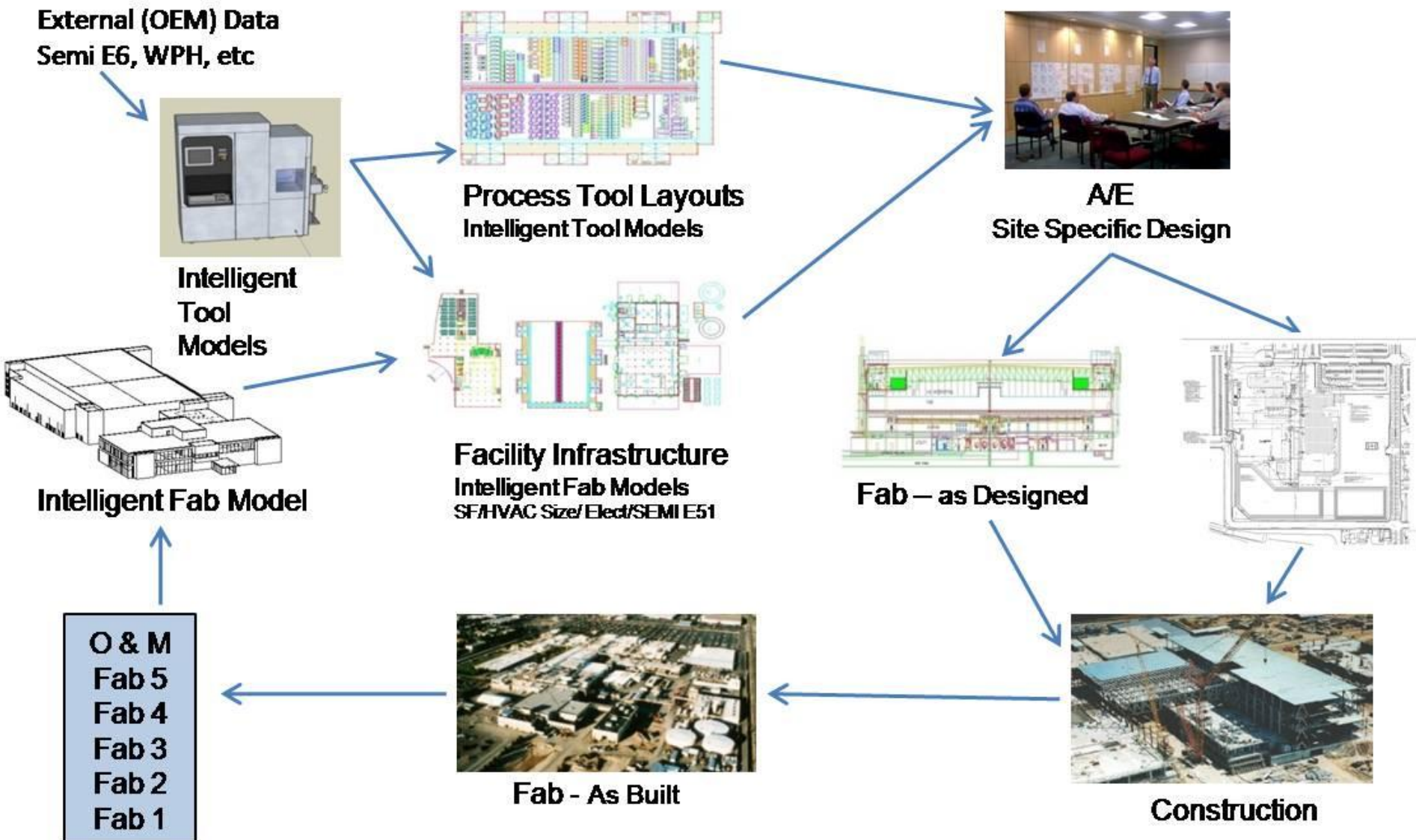
# Communication Standards

Other standards to list:

- E147: Time Sync
- Data Quality (E151 + ...)
- EPT standard???
- E84? Parallel/IO



# Building Information Model & Vision in support of Facility Life Cycle



# Resource Conversation Interfaces

