Difficulties and Challenge of Commercializing New Metrology

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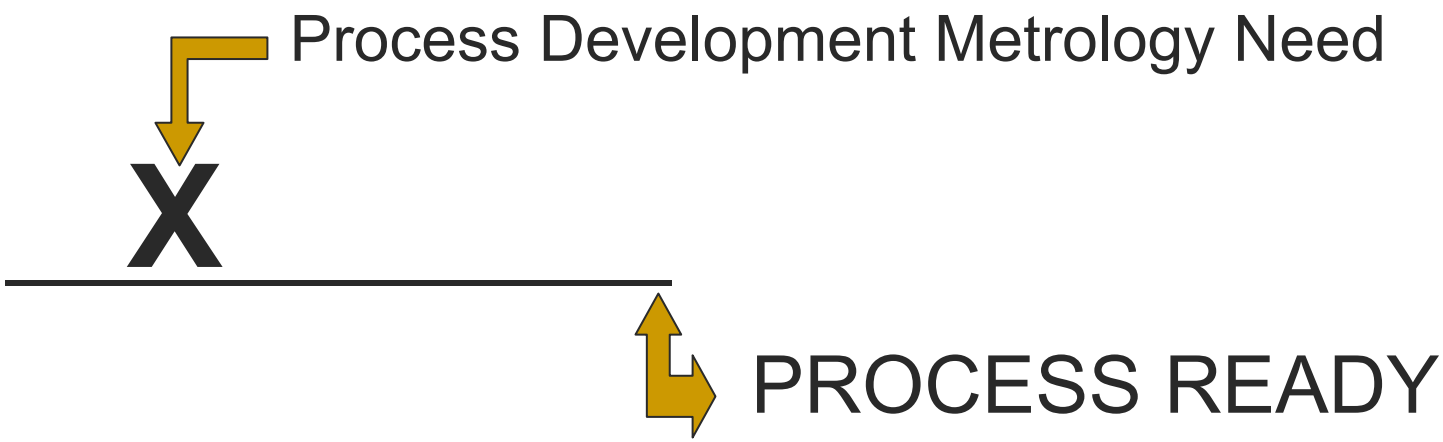
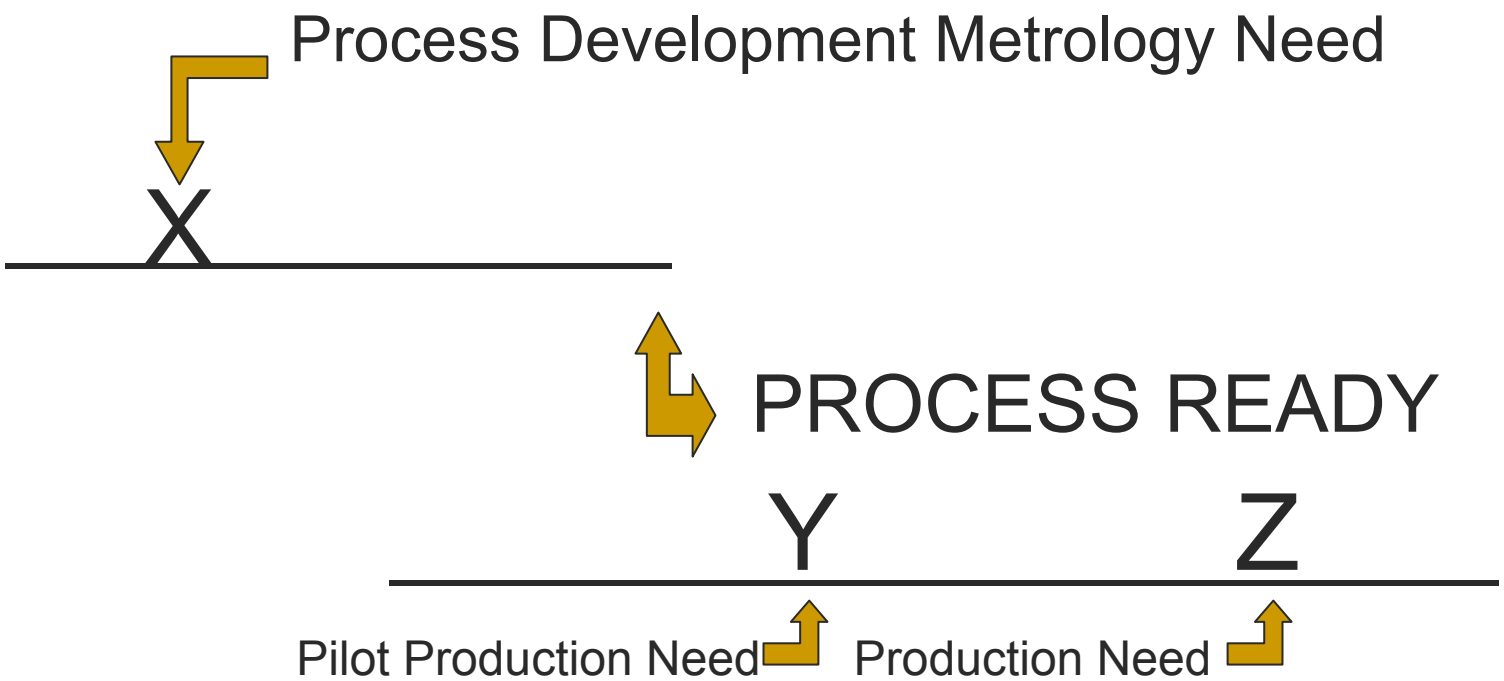
METROLOGY IN BALANCE

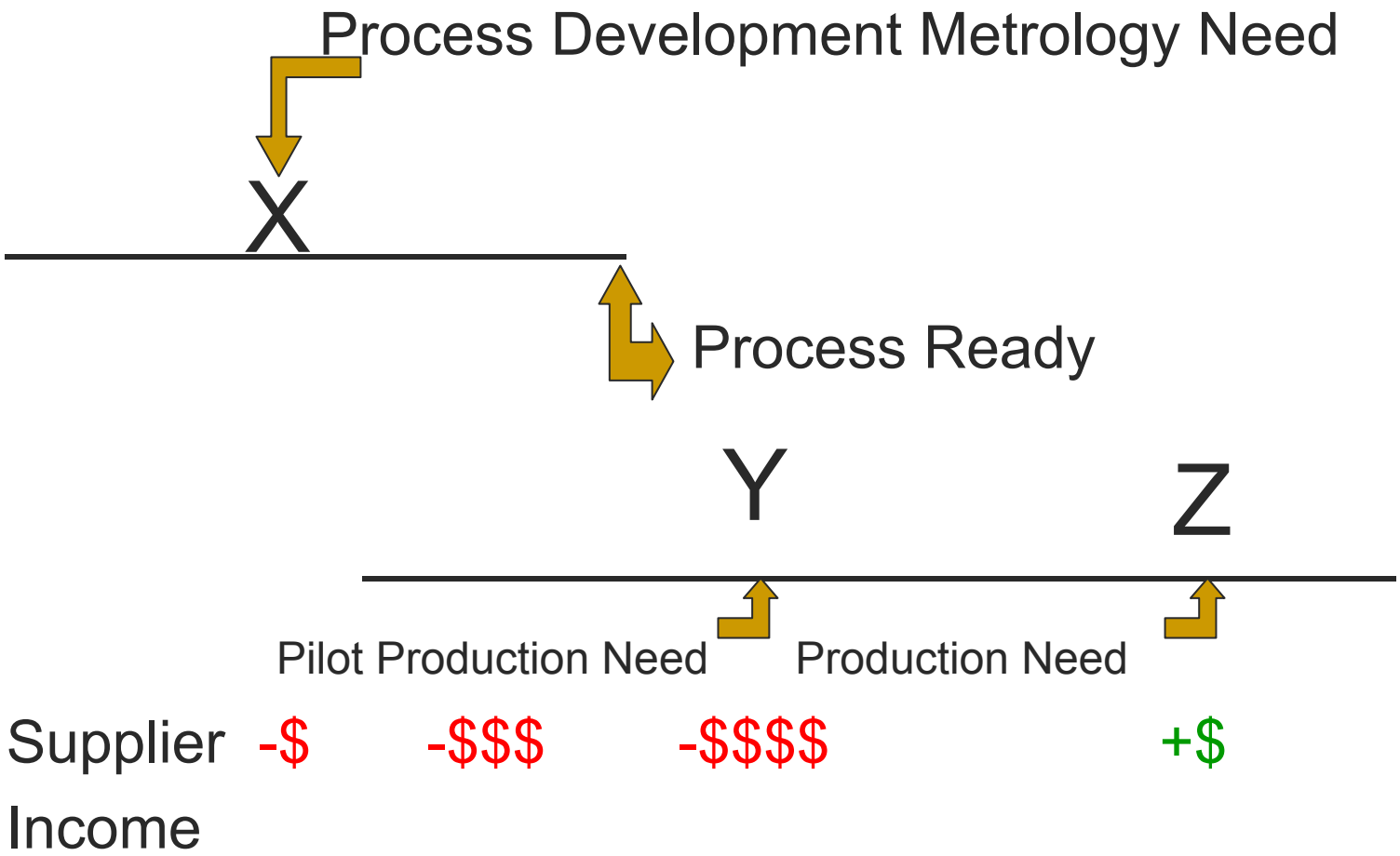
ROADMAP TIMELINE



ROADMAP TIMELINE



ROADMAP TIMELINE



WHAT IS THE SUPPLIER LIKELY TO DO?

LIKELY SUPPLIER RESPONSES

- Try to extend current equipment to meet the early need with a very small, intense team
- Try to get working prototype for pilot production need with technical risks solved

LIKELY SUPPLIER RESPONSES (Continued)

- Try to have production unit ready when production buys are real
- Some software and extra features may come later

LIKELY CUSTOMER RESPONSES

- We are accelerating our roadmap by a year
- We are moving our technical specifications forward one full roadmap node
- We want it extendable and field upgradeable for two more roadmap nodes

LIKELY CUSTOMER RESPONSES (Continued)

- We insist that the software and machine interface be at the new standards which we will define in about 6 months
- Within 120 days, we will define whether we want 200mm wafers, 300mm wafers or a bridge tool that can do both
- The timing of delivery is critical

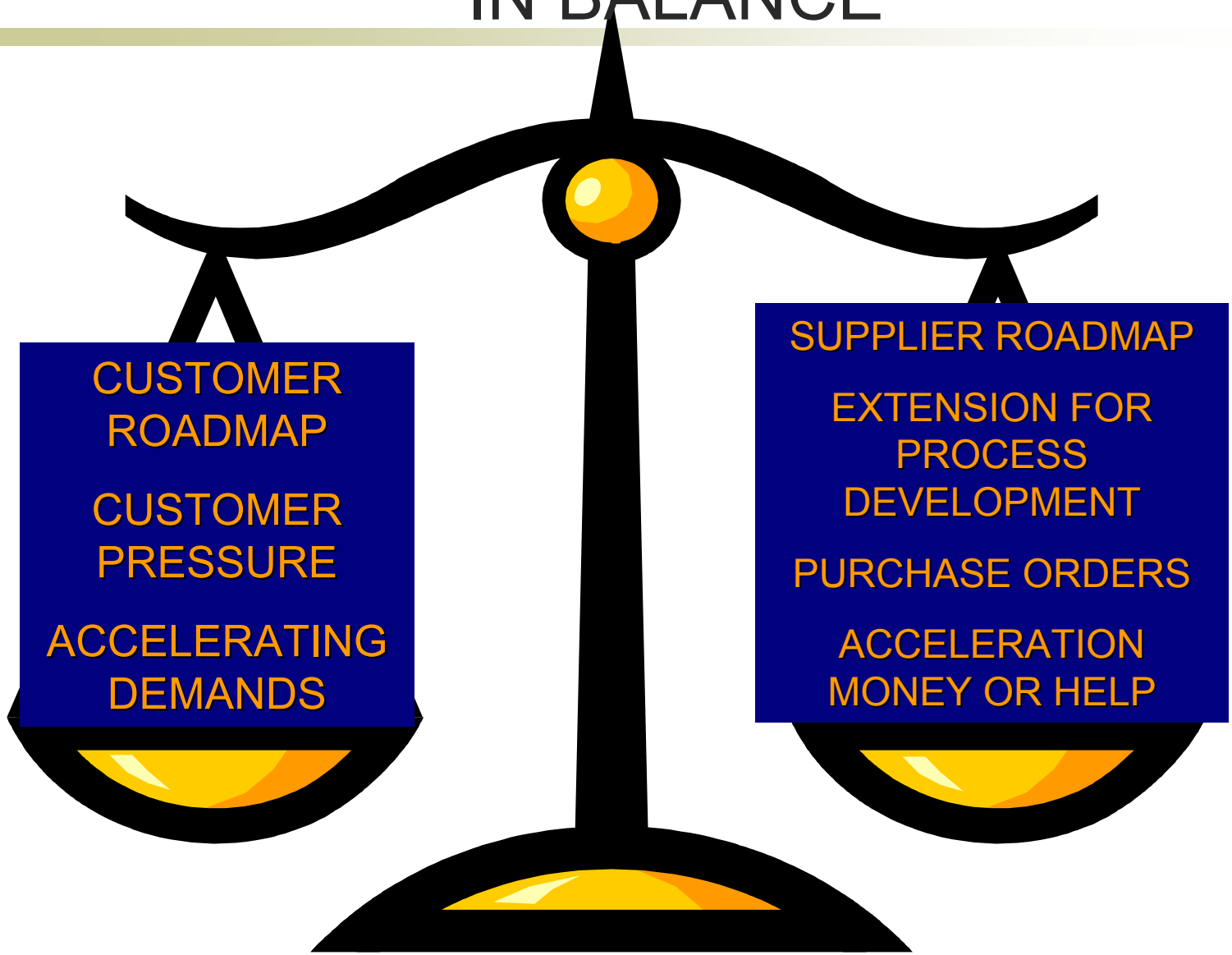
TWO COMMON RESULTS:

- NEW METROLOGY IS:
  - Too late for the early process developers
  - Too expensive for the production capital budget

METROLOGY


CUSTOMER ROADMAP
CUSTOMER PRESSURE
ACCELERATING DEMANDS

METROLOGY DEVELOPMENT IN BALANCE



EXAMPLES

- MASK MAKING METROLOGY:
  - D.W. Mann

    Stellar Metrology → I.C. Masks

    Seed Funds
  - Accelerating Metrology Change

    Customers & Sematech

    Acceleration Funds and Royalties/Equity

EXAMPLES
(Continued)

- GEMSECS: tool interface technology
  - SEMATECH → SEED MONEY
  - CUSTOMERS → PURCHASE ORDERS

EXAMPLES
(Continued)

- Test patterns in Kerfs and Die:

  High force probe cards and high precision probers

  Customer – commitment for 100 units and down payments

EXAMPLES
(Continued)

- OUTSOURCING SERVICES:
  - Gas and Chemical Suppliers
    - pay within gas/chemical use
  - Custom engineering
    - base pay plus bonus

EXAMPLES
(Continued)

- Film Thickness in stacked layers:
  - Venture Capital & IPO
- Copper dishing and erosion
  - Venture Capital

EXAMPLES
(Continued)

- Microloop test patterns/vias:
  - Self Funded
  - Took 6-9 months out of process debugging/certification
  - High level decision making required

EXAMPLES
(Continued)

- 300mm wafer conversion
  - Group dynamic to accelerate was a wrong decision!!!!!!!
  - Over $1,000,000,000 spent in conversion a generation too early!!!!!!!!!

Metrology
“Balance in use”

- A company spent over $100 Million Dollars on metrology and software in an advanced fab and didn’t hire the people to interpret and monitor the resultant data:
  - Result: Periodic yield crashes

    Periodic chip performance problems

METROLOGY

- A company bought over $120 Million Dollars in metrology and support software for an advanced fab and had low yields due to a design flaw.
- It took over 1 year to fund the effort to design a more error-tolerant circuit. Then the yields were higher.

The need for balance

- Clear Roadmaps
- Good Supplier Relations
- Technology
- Productivity
- Robust Performance
- Timely data interpretation/action

Management structure where smart, balanced decisions can be made…….

Do These Experiences Apply to Integrated Metrology?

- Will it increase or decrease performance?
- Will it increase or decrease productivity?
- Is it actionable within the time requested?
- Will it increase or decrease user and supplier profitability?