



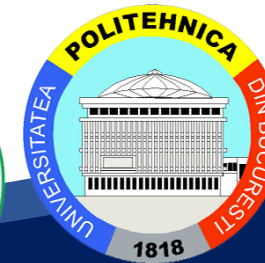
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# Collaborative Manufacturing Systems

## I Collaborative Manufacturing Management

Collaborative Manufacturing Management  
Fundamentals and Infrastructure



Curriculum Development  
of Master's Degree Program in

Industrial Engineering for Thailand Sustainable Smart Industry

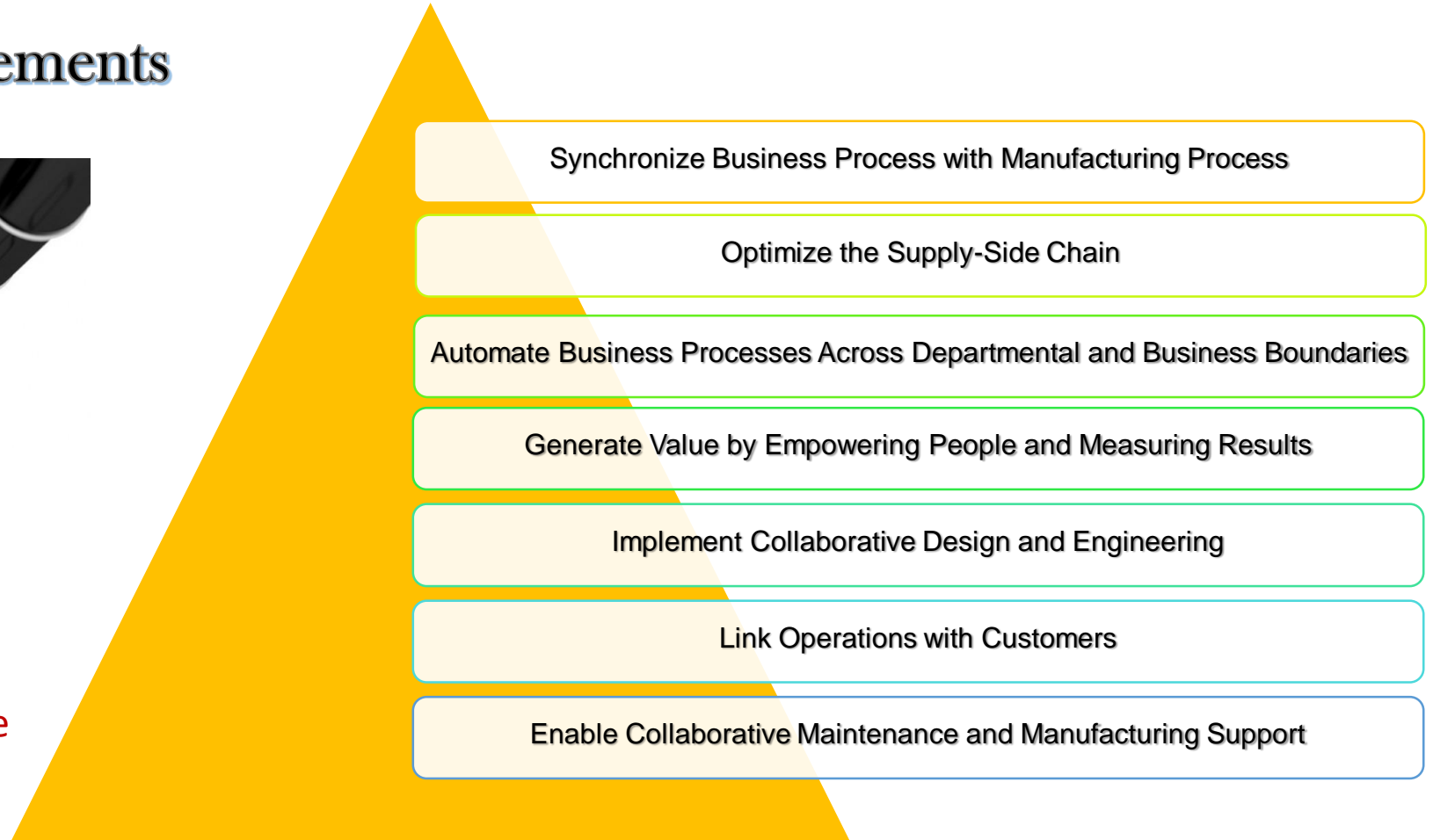


# 1. Collaborative Manufacturing Management (CMM) Fundamentals

## 7 CMM Requirements



**Manufacturers** need a **vision** of how collaborative manufacturing is developing, where it will go, and **how all the pieces fit together**

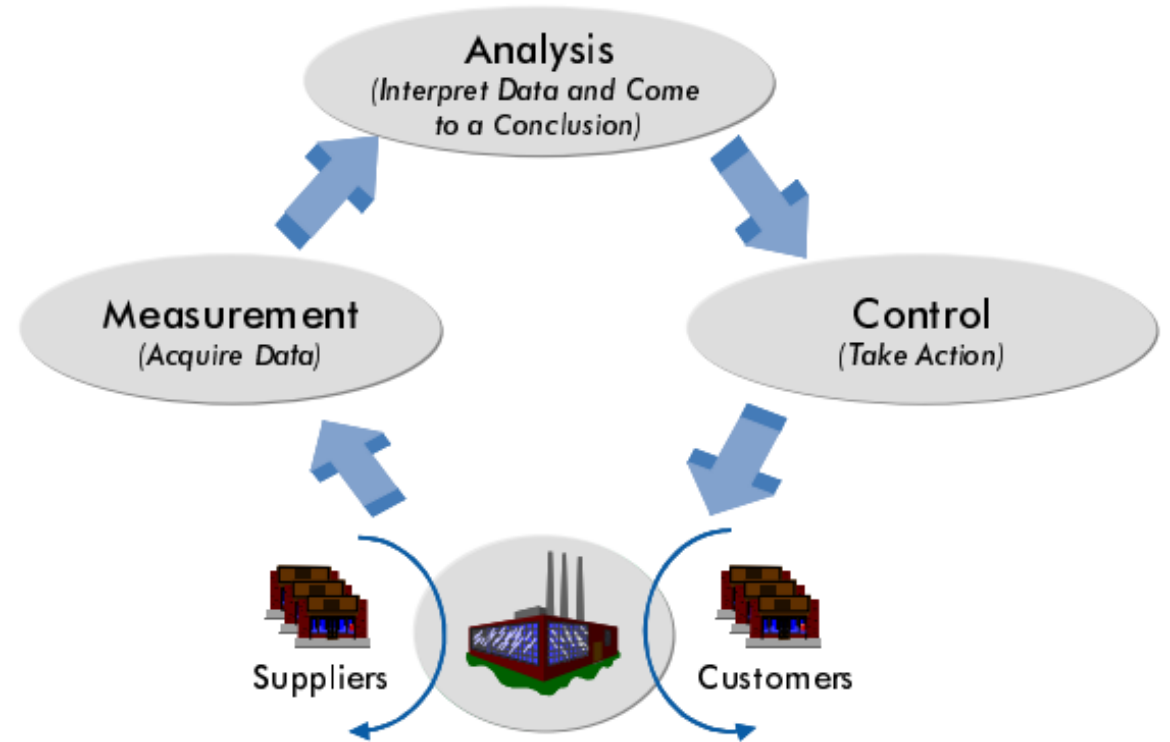


# 1. CMM Fundamentals

## 7 CMM Requirements

### 1. Synchronize Business Process with Manufacturing Process

- **Multi-Dimensional Collaboration:** Collaboration must be embraced on the plant floor in five key dimensions; enterprise systems, suppliers, customers & channels, product design partners, production equipment support providers
- **Surface and Share Information:** The collection, dissemination, and analysis of information about production operations is recognized to be strategically than the physical product produced



### Real-time Business Process Control

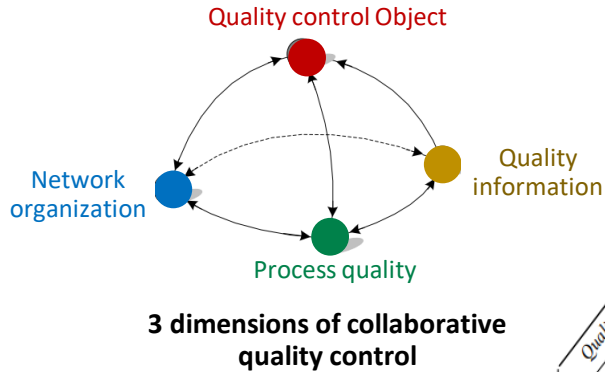
# 1. CMM Fundamentals

## 7 CMM Requirements

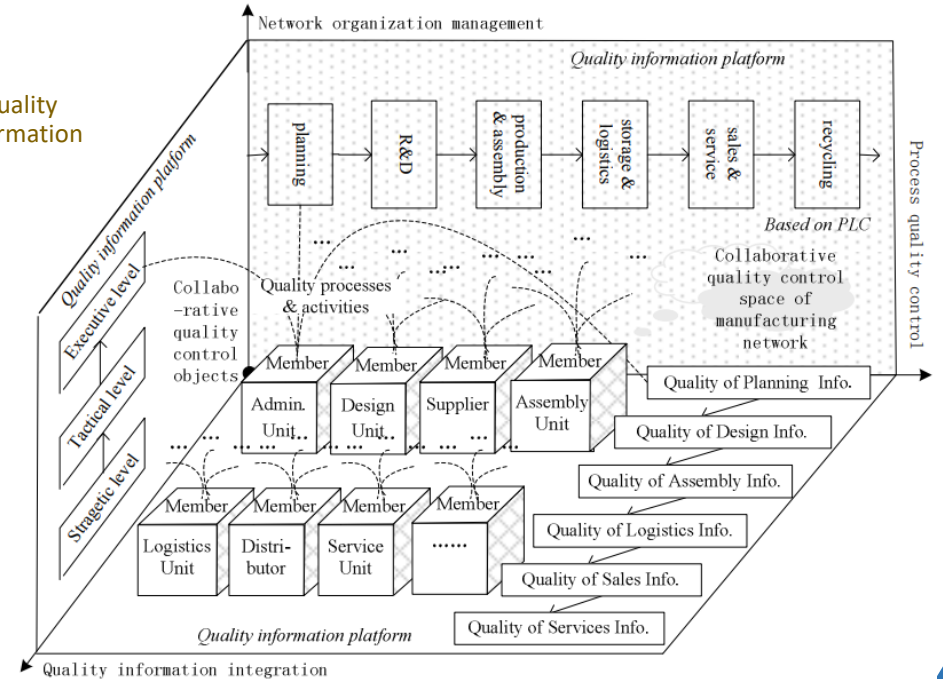
### 1. Synchronize Business Process with Manufacturing Process

Guo et al. (2010) developed *multi-dimension collaborative quality control model* for analyzing quality chain environment and product quality formation processes in manufacturing Network

- The model include three dimensions: *process quality, network organization and quality information.*
- The key contents of each dimension are:
  - Process quality control* methods for every major phase of *product life cycle*
  - Quality collaboration* oriented *organization construction*
  - Quality information* integrated methods



Multi-dimension collaborative quality control model





# 1. CMM Fundamentals

## 7 CMM Requirements

### 2. Optimize the Supply-Side Chain

- Plants can utilize supply chain management and procurement systems to improve their upstream supply chain performance.
- Collaborative manufactures can leverages this information in real-time to distribute work throughout the production network in response to actual demand, rather than forecasts, thereby gaining the competitive edge





# 1. CMM Fundamentals

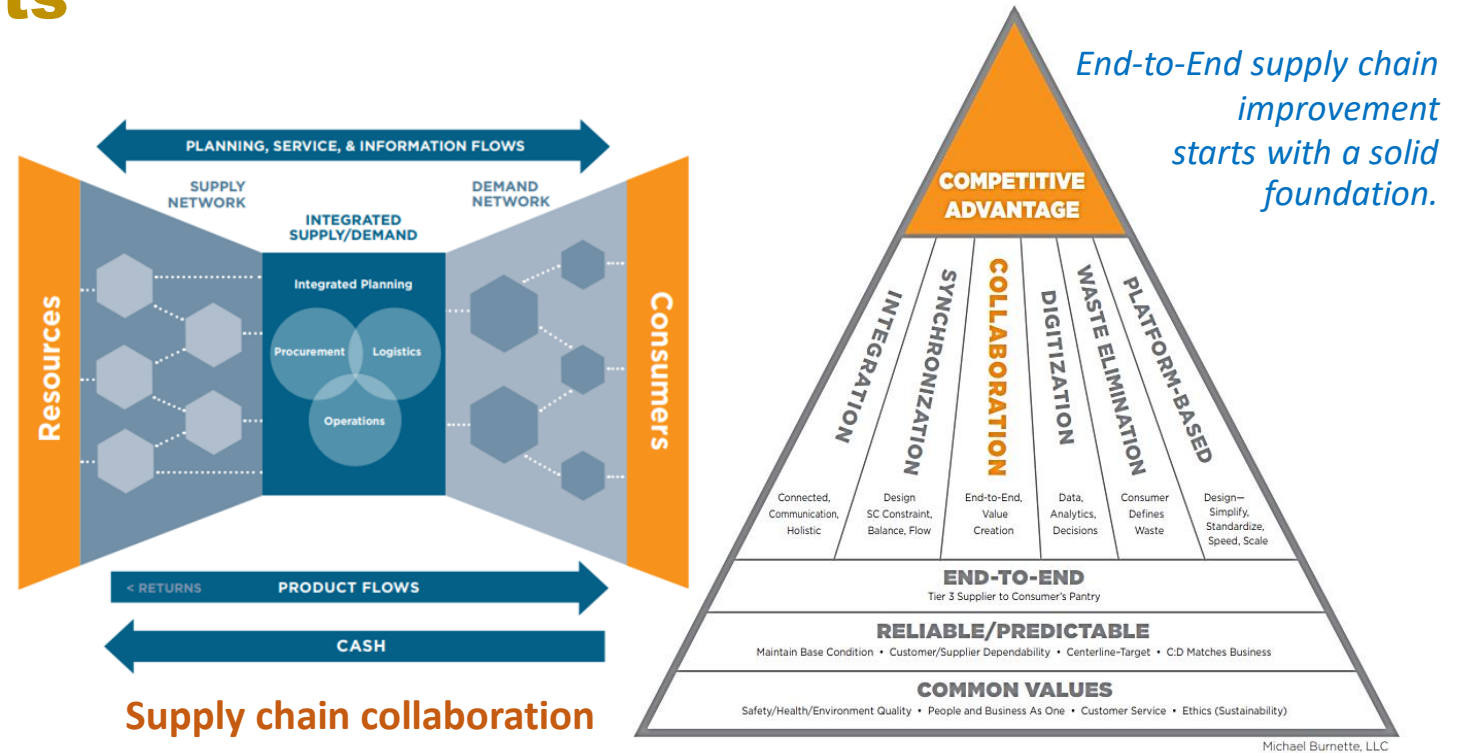
## 7 CMM Requirements

### 2. Optimize the Supply-Side Chain

**Collaboration** across *procurement, logistics, and operations* to **optimize total value creation** stands at the heart of the **end-to-end supply chain model**.

Major product supply and demand transformations **occur** when companies are able to **successfully integrate** across these disciplines. This **end-to-end integration** is **highly complex** and requires **high levels of collaboration**.

### End-to-end supply chain improvement model



HASLAM college of business from [https://haslam.utk.edu/sites/default/files/E2E\\_Collaboration\\_0.pdf](https://haslam.utk.edu/sites/default/files/E2E_Collaboration_0.pdf)



# 1. CMM Fundamentals

## 7 CMM Requirements

### 3. Automate Business Processes Across Departmental and Business Boundaries

- An important aspect of the industrial software marketplace evolution is dimension of control or **automating business processes** to **meet economic targets** given variable **inputs or scenarios**.
- **Digital and Computing devices** become pervasive and exchanges change the **dynamics of buying and selling** from one of providing data or information visibility to human decision makers to one of providing the **benefits of real automation and business process control**.

# 1. CMM Fundamentals

## 7 CMM Requirements

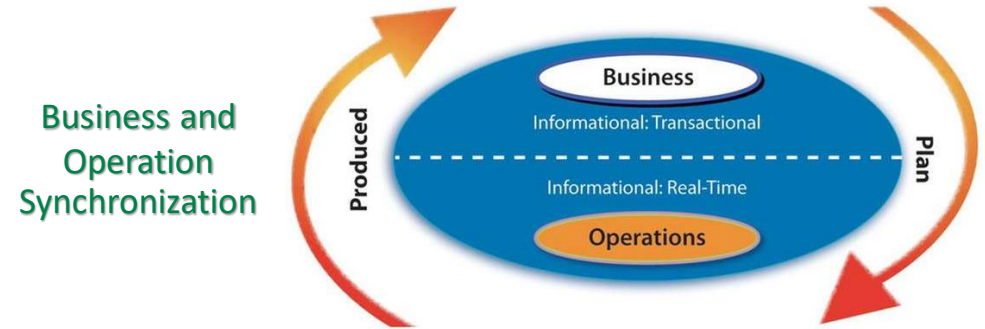
### 3. Automate Business Processes Across Departmental and Business Boundaries

**Industry** has seen much **collaboration-related activity** due to the increasingly **dynamic** and global nature of the **competitive environment**.

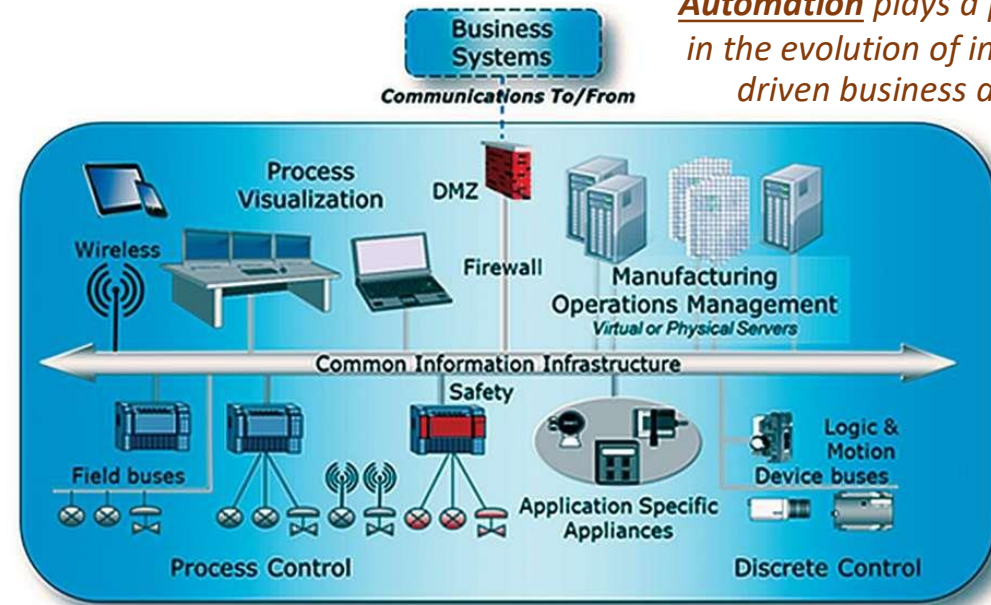
**Automation** plays a **pivotal role** in the evolution of information-driven business architecture. It can help companies manage business processes by **connecting systems and people** in a coordinated way. In addition, **real-time information** can be shared throughout the **enterprise** and **supply & design chains**.

**Collaborative Process Automation System (CPAS)** goes far beyond the traditional definition of a distributed control system (DCS) and uses a **very broad definition of automation**.

**CPAS** makes every attempt to break down artificial barriers to allow information to **flow as required** to **accomplish the required purpose**.



**Automation** plays a **pivotal role** in the evolution of information-driven business architecture





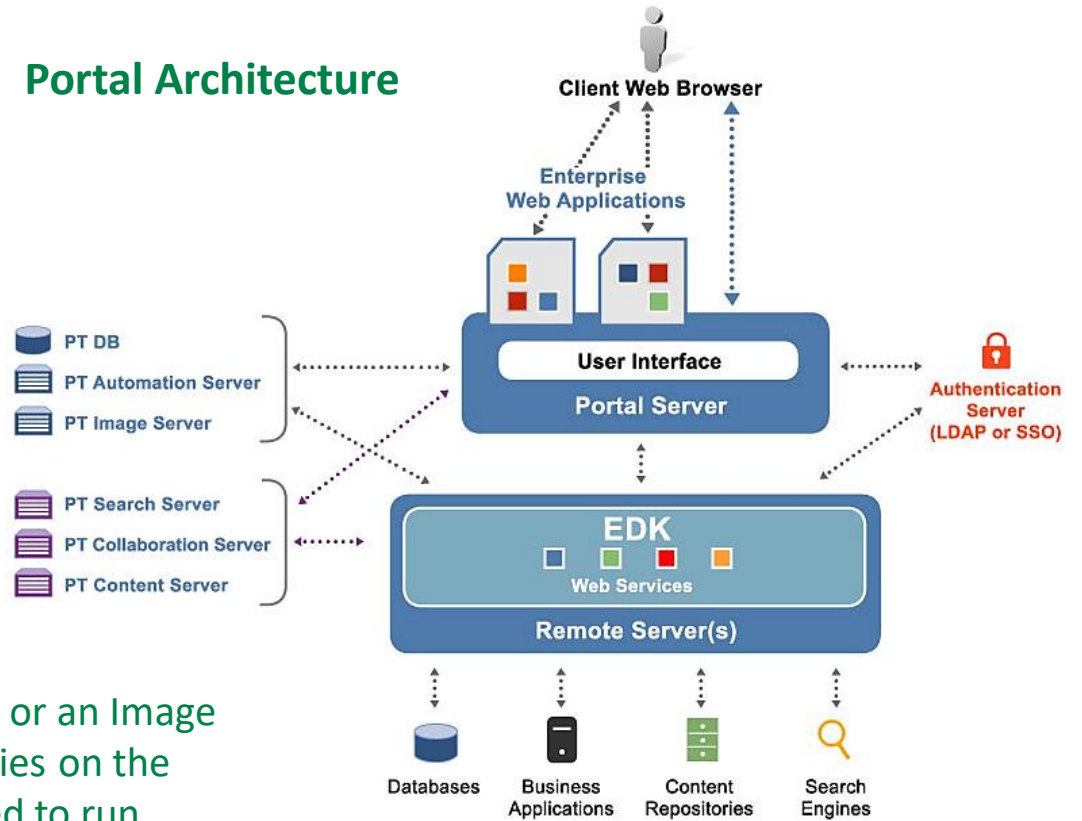
# 1. CMM Fundamentals

## 7 CMM Requirements

### 4. Generate Value by Empowering People and Measuring Results

Web-based/Cloud tools such as Portals allow collaborative manufacturing managers to visualize information from a variety of systems throughout the enterprise and interpret the results in conjunction with established metrics.

Portal Server may actually be load-balanced across several machines, or an Image Server and a Remote Server might simply be different virtual directories on the same machine. In a large implementation, separate machines are used to run specific components of the portal.



[https://docs.oracle.com/cd/E13174\\_01/alui/devdoc/docs5x/Overview\\_of\\_the\\_Portal\\_Architecture/PlumtreeDevDoc\\_Overview\\_Intro.htm](https://docs.oracle.com/cd/E13174_01/alui/devdoc/docs5x/Overview_of_the_Portal_Architecture/PlumtreeDevDoc_Overview_Intro.htm)

# 1. CMM Fundamentals

## 7 CMM Requirements

### 4. Generate Value by Empowering People and Measuring Results

#### Cloud management and monitoring tools



<https://phoenixnap.com/blog/cloud-monitoring-tools>

Microsoft  
Cloud  
Monitoring

DX  
Infrastructure  
Manager

AppDynamics

**Cloud monitoring** uses automated and manual tools to *manage, monitor,* and *evaluate* cloud computing architecture, infrastructure, and services.

It *incorporates* an overall cloud management strategy allowing administrators to *monitor* the status of **cloud-based resources**.

It helps to *identify emerging defects* and *troubling patterns*, resulting of **preventing issues** that might turn into significant problems.

# 1. CMM Fundamentals

## 7 CMM Requirements

### 5. Implement Collaborative Design and Engineering

- **Collaboration** system must be *support* **assembly sequence planning**, **work instructions development**, **routing and operations times**, **performance analysis** and **optimization**.
- **Collaboration** must be integrated with **plant business systems**.
- *After the initial* product and process design, **collaborative** systems must *support* **ramp to volume**, **local process optimization**, **change management** and **manufacturing improvement projects** (e.g. cost reduction)

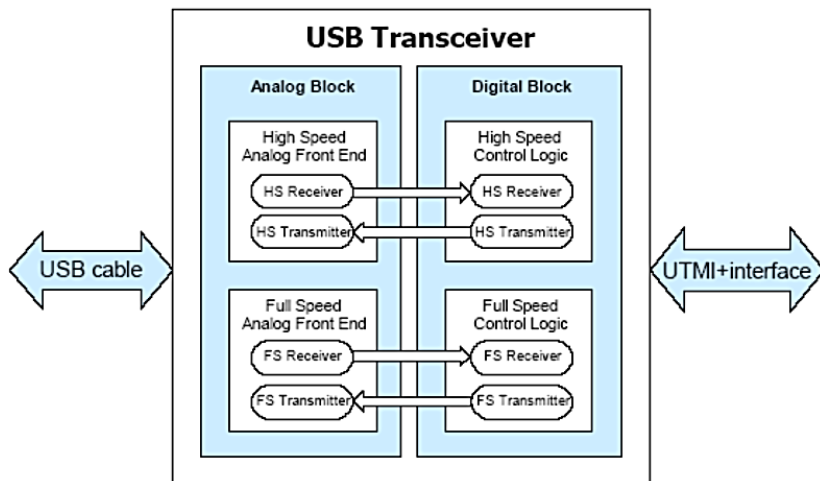
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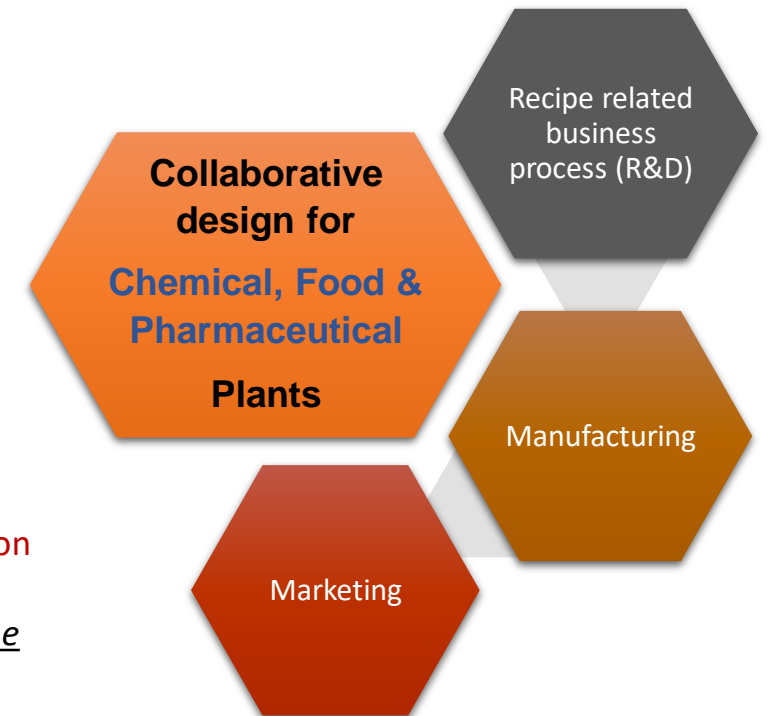
### 5. Implement Collaborative Design and Engineering

#### Mixed-signal electronic component design

A *collaboration platform* has been applied in the *complex heterogeneous electronic component design* that required **collaboration** among two **dispersed SMEs** **operating** at three different locations.



*Dispersed engineers* from involved companies were supported in their **distributed collaboration** during **various design tasks**, from **design specification refinement** that required use of the collaboration workspace to **distributed verification** that needed integration of distributed tools.



# 1. CMM Fundamentals

## 7 CMM Requirements

### 6. Link Operations with Customers

The essence of **collaboration** is the **ability for individual plants** to synchronize their work in **real-time** based on **accepted orders** and to coordinate the production and delivery of **component materials** at the production level in a **highly distributed manner**.



Sharing of **current production information** throughout the **value chain** and the **enterprise**.

- Information on orders, inventory levels, specifications change orders

**Flow upstream  
from customers**



- Production information on quality, material availability and production status

**Flow downstream  
to customers**





# 1. CMM Fundamentals

## 7 CMM Requirements

### 7. Enable Collaborative Maintenance and Manufacturing Support

- **Collaboration** of *plant equipment suppliers* is important for production equipment **failures or downtime**.
- **Manufactures or suppliers** can push out the **delivery schedule**, **remote monitoring** and **maintenance of plant equipment** in short time with embedded internet access.
- *With the right interface*, remote users can then **monitor the equipment**, **supply consumables** and support or provide **diagnostics and maintenance**.

# 1. CMM Fundamentals

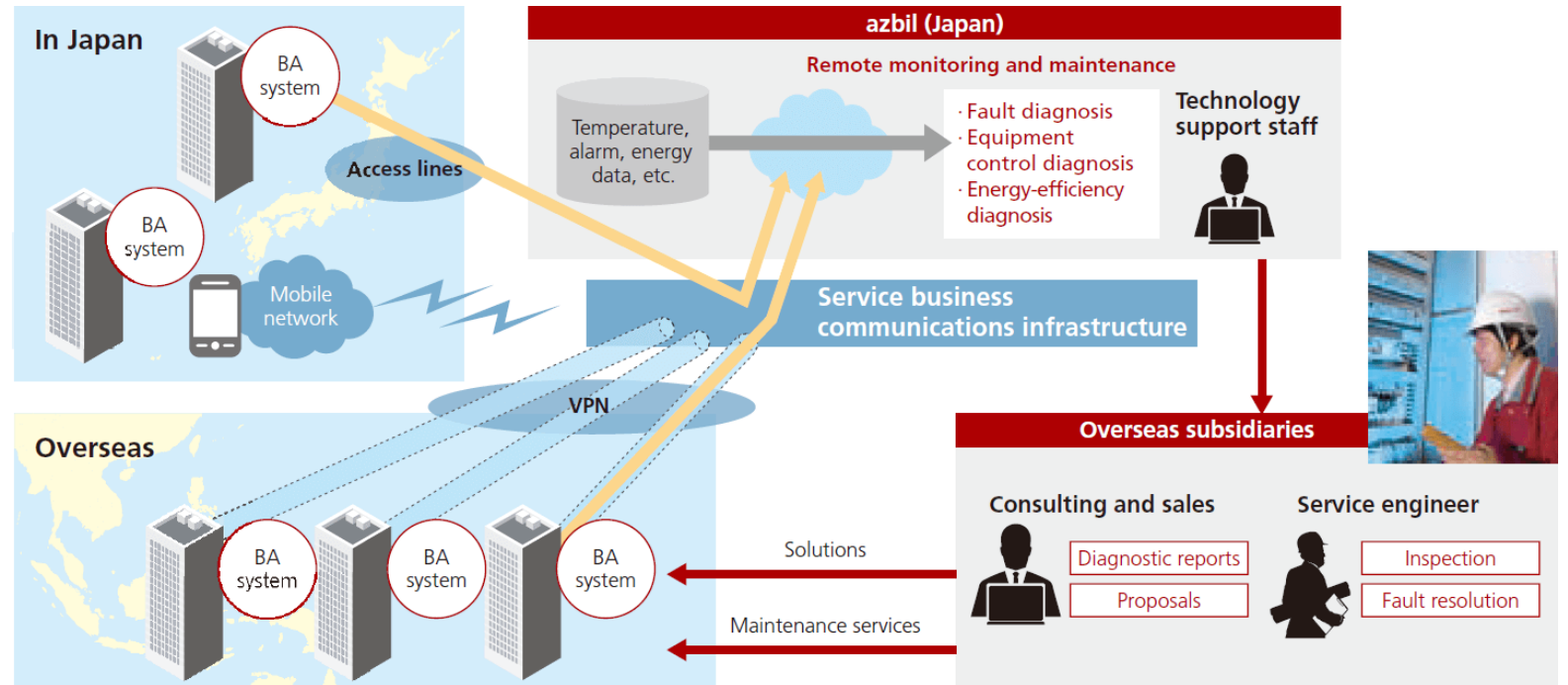
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### 7. Enable Collaborative Maintenance and Manufacturing Support

#### Remote maintenance

(Azbil's maintenance service)

Remote maintenance system can automated control devices, by means of remote data collection and event analysis to ensures the systems are always running in an appropriate state, and can be quickly revived even if problems occur.



<https://www.azbil.com/products/building/solutions-services/maintenance-service/index.html>





## Activity: Self Study (Collaborative Tool Adoption)

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**After reading the article:** *“Challenges to Collaborative Tool Adoption in a Manufacturing Engineering Setting: A Case Study”*  
(Wierba et.al, 2002)

### **Discussion:**

What could be “Collaboration requirements and Collaborative tool deployment?”





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# Thank You

Together We Will Make Our Education Stronger



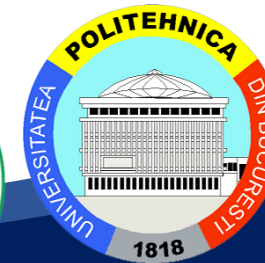
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