



ISA-95 Introductie Training

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Trainer : ISA-95
ISA-88
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Owner : Care Automatisering



Why did we Start ISA 95 ?



- A sharp increase in the needs of B2M integration
- Integration of logistics systems to manufacturing is hard to do
 - Different systems, cultures, terminology,...
- Effective operations of manufacturing is hard to do
 - MES solutions are too related to processing methods and too industry specific
- Many benefits expected from standardization and documentation of “best practices”





What Is ISA95?

- A USA and International standard
 - ANSI/ISA95.00.01 “Enterprise — Control System Integration — Part 1: Models and Terminology”
 - Also IEC/ISO 62264-1 international standard
 - ANSI/ISA95.00.02 “Enterprise — Control System Integration — Part 2: Object Model Attributes”
 - Also IEC/ISO 62264-2 international standard
 - ISA95.03 “Enterprise — Control System Integration — Part 3: Models of Manufacturing Operations”
 - Also IEC/ISO 62264-3 international standard
 - ISA95.04 “Enterprise — Control System Integration — Part 4: Object Models of Manufacturing Operations”
 - In development
 - ISA95.05 “Enterprise — Control System Integration — Part 5: Business to Manufacturing Transactions”
 - Released in 2007
 - Draft IEC/ISO 62264-5 international standard
- SP95 is the committee developing the ISA95 standards

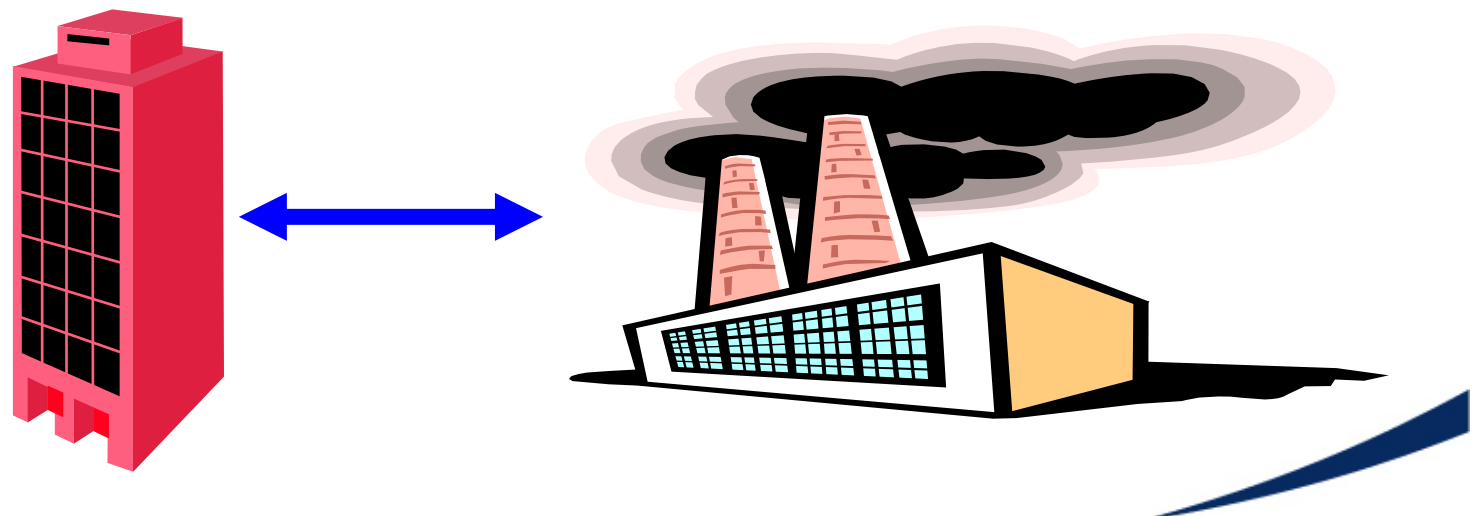


How Does ISA95 Help?

- Separate the business processes from the manufacturing processes
 - Allow most changes in production processes without requiring changes in scheduling and logistics processes
 - Allow most business processes to change without requiring changes in production processes
- Provide a clear demarcation of responsibilities and functions
- Provide a clear description of exchanged information

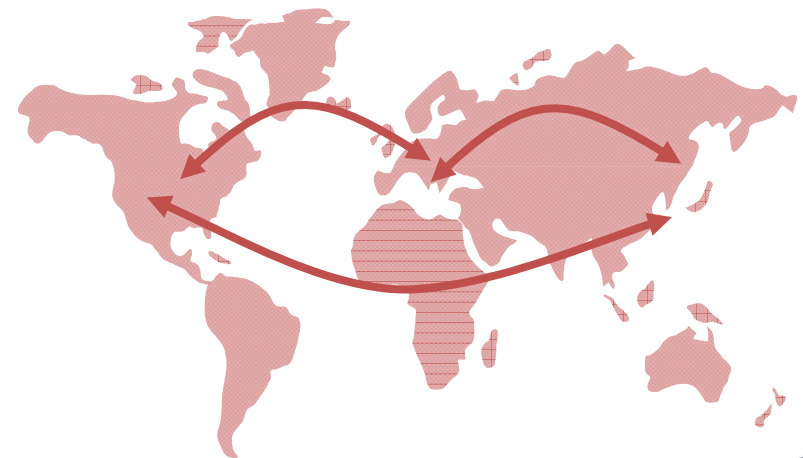
Purpose of The ISA95 Standard

- Improved integration of manufacturing through communication by defining
 - A common terminology
 - A consistent set of models
- Emphasize good practices for integration of manufacturing systems with other enterprise systems



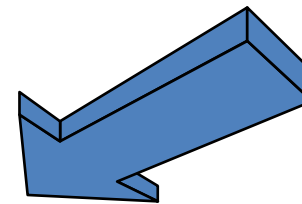
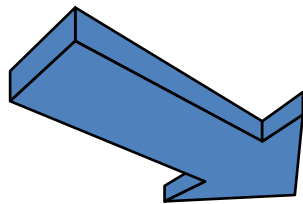
Benefits of ISA95 Standard

- Reduce cost and difficulty of integration of business logistics systems with manufacturing systems
- Expected benefits when the committee started to develop the standard
 - Better planning and scheduling through better information
 - Support for “available to promise” strategy
 - Support for agile manufacturing and flow manufacturing strategies
 - Reduced errors in optimized supply chain operations

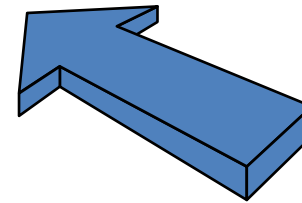
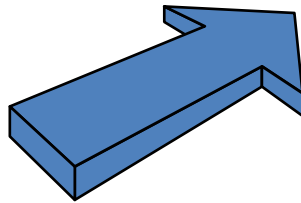


Business Defines The Need

- There must always be a business need for information to be exchanged
 - There is always some business process that needs information from production, or needs to exercise control of production



- ***Requirements for exchanged information are always driven by business needs & business processes***

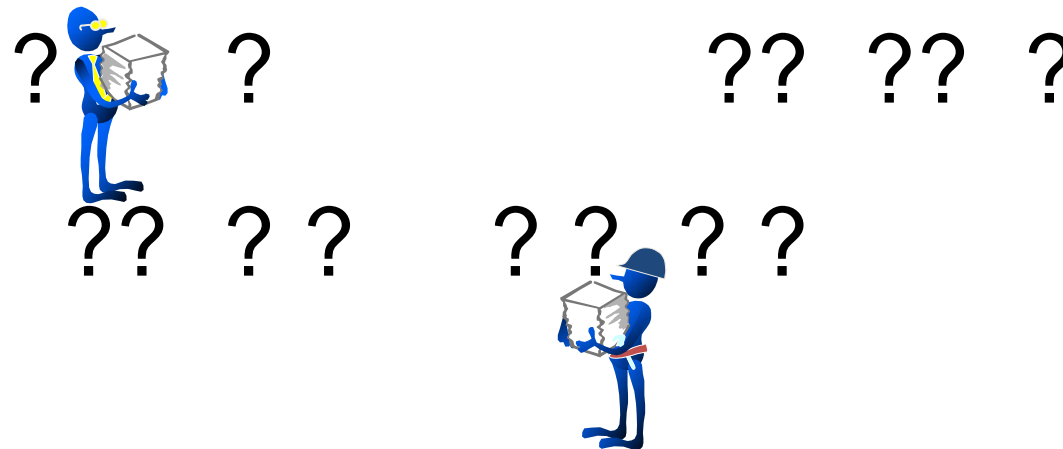


Computer Systems in Manufacturing

Enterprise Resource Planning Systems **ERP - Logistics**

Data Library

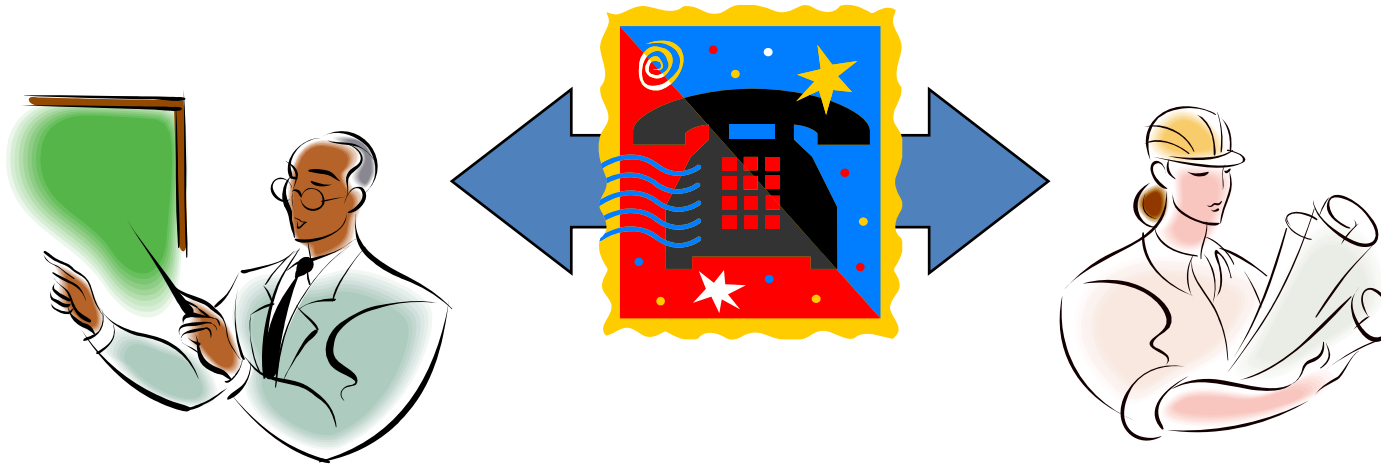
BOMs
Routings
Recipes
Standards



Plant Floor Control Systems

SCADA, DCS, PLC, CNC, ...

- Very little or none



- The language is different

Enterprise Resource Planning Systems ERP - Logistics

Data Library
BOMs
Routings
Recipes
Standards



DETAILED SCHEDULING

MAINTENANCE

LIMS

SCADA

SPC

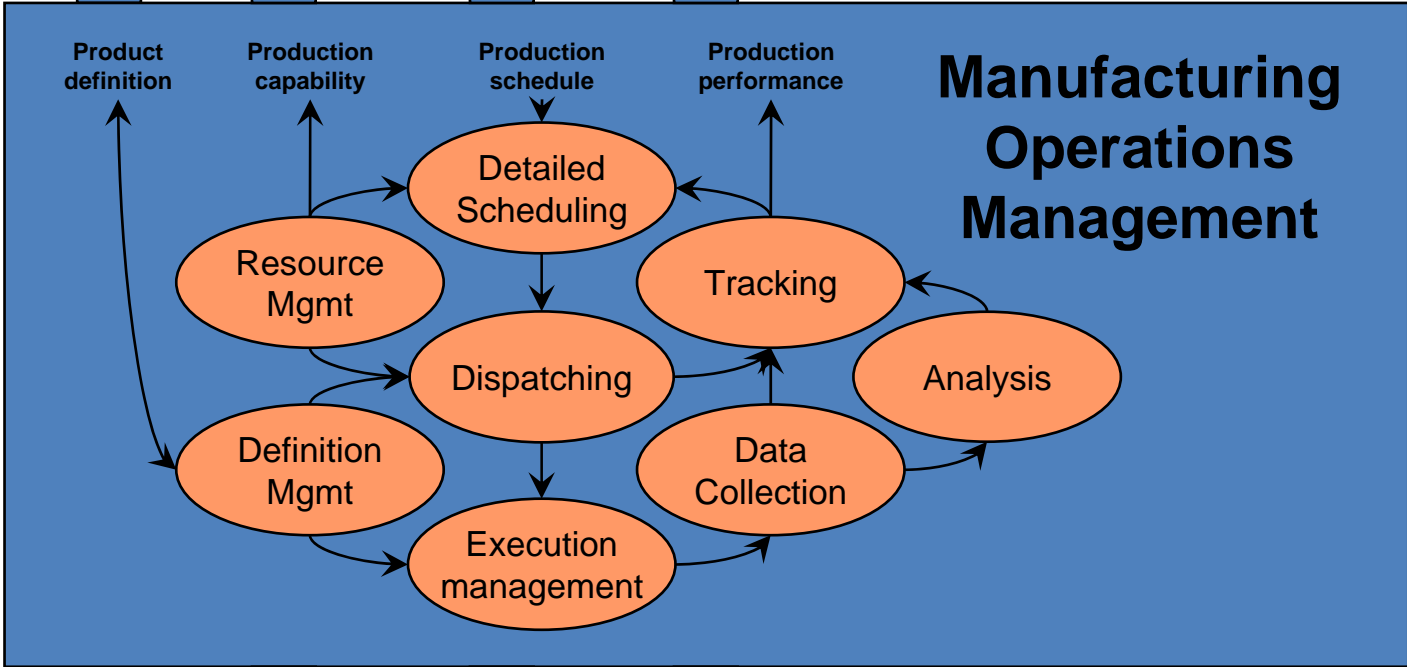
DATA
COLLECTION



Manufacturing Control Systems

SCADA, DCS, PLC, CNC, ...

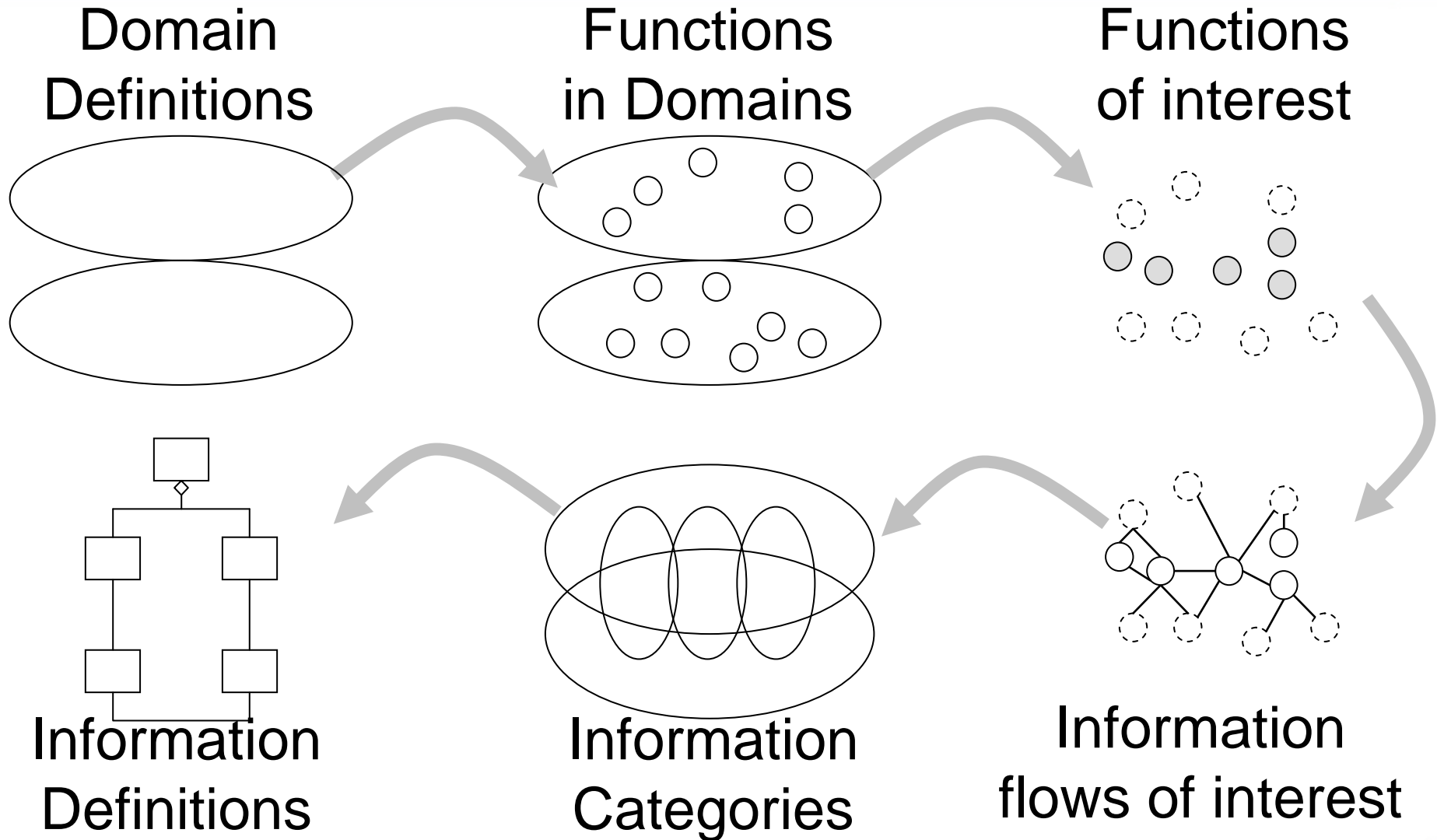
Enterprise Resource Planning Systems **ERP - Logistics**



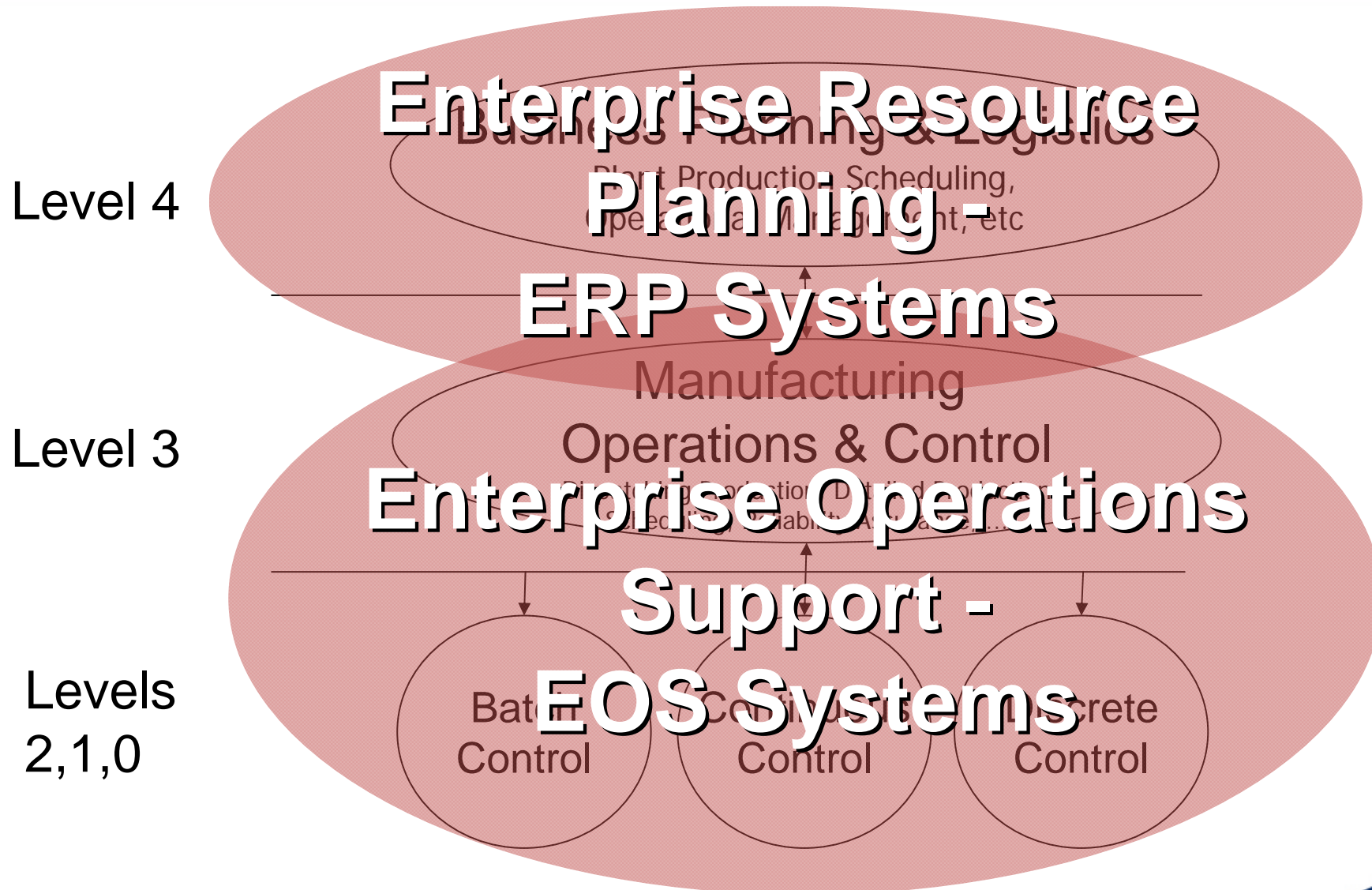
Manufacturing Control Systems

Scanners, CNC, PLC, DCS, SCADA, PC, HMI, ...

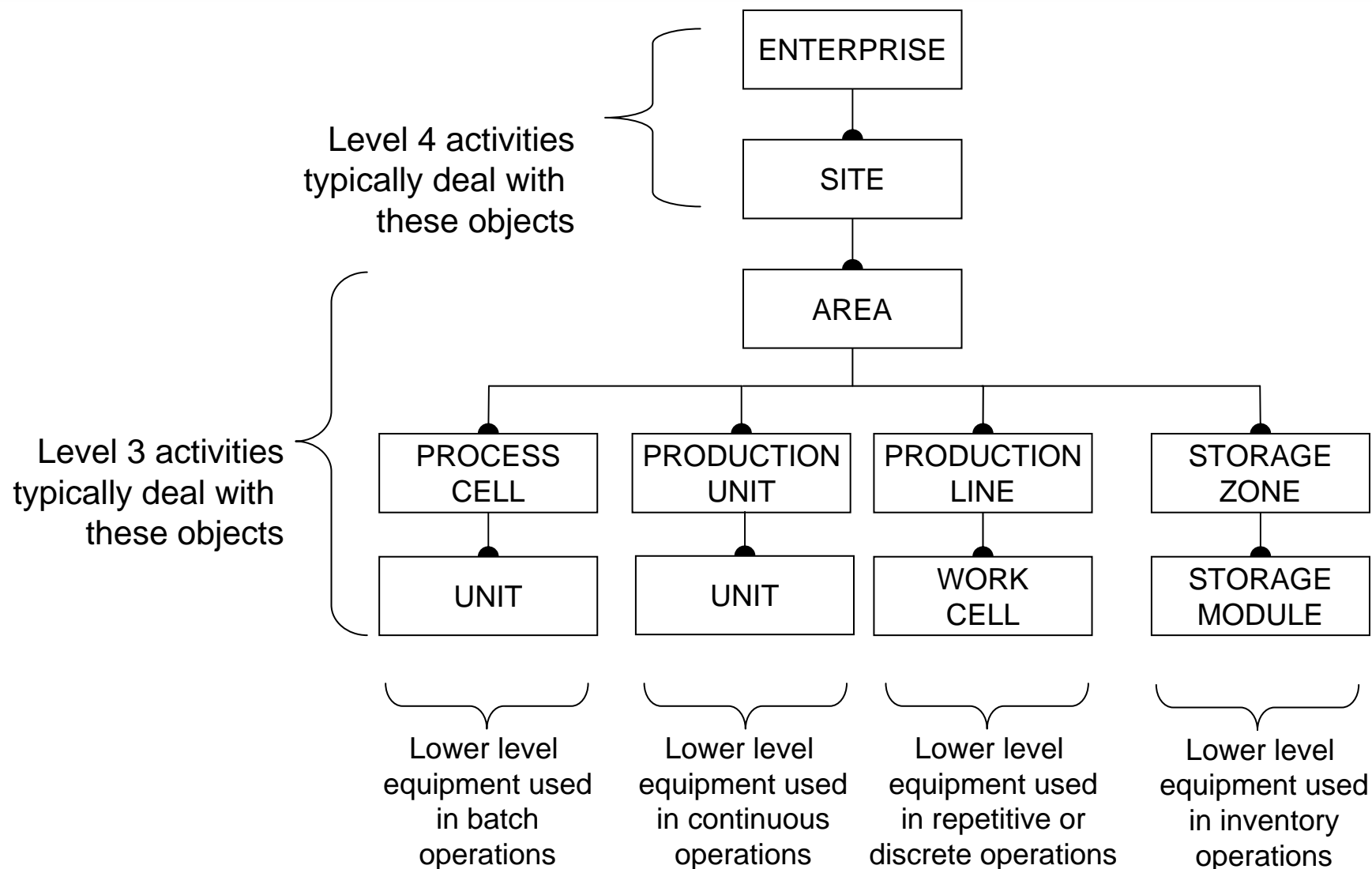
Models and definitions



S95.01 ERP - EOS Interface

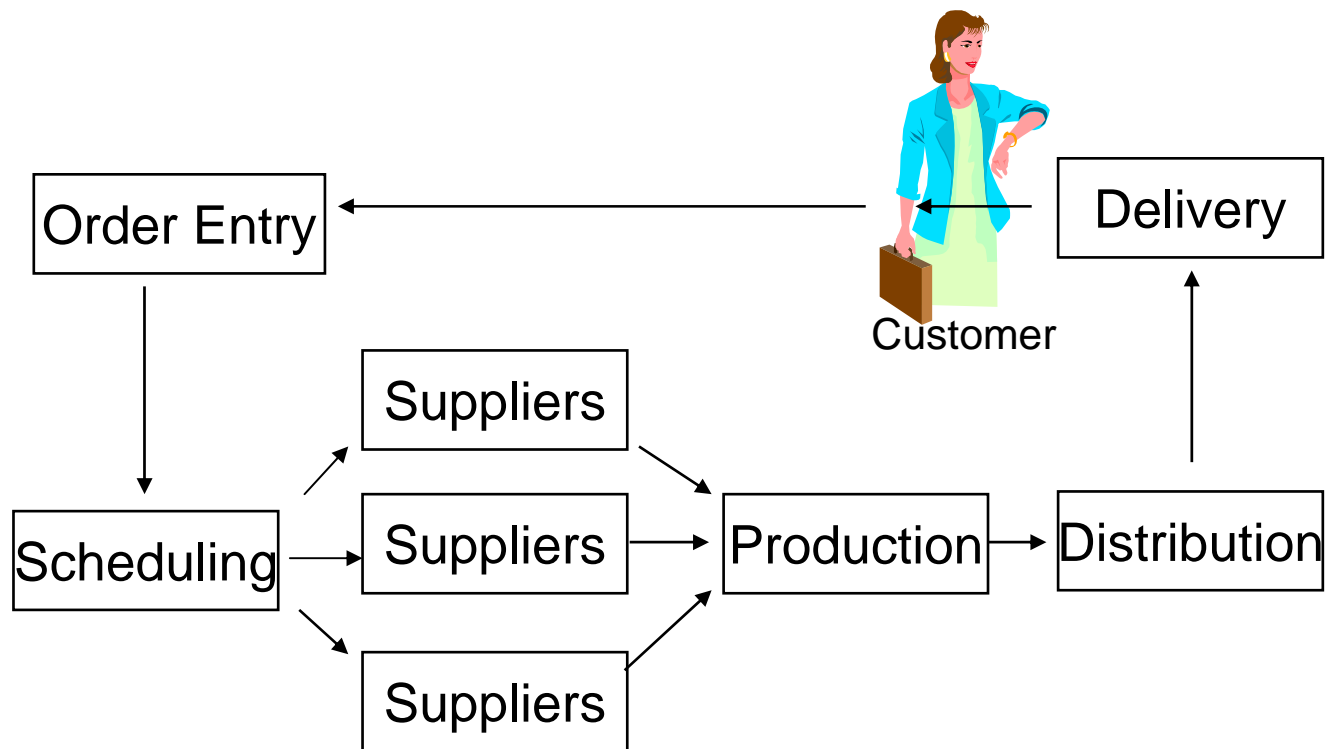


Equipment Hierarchy Model

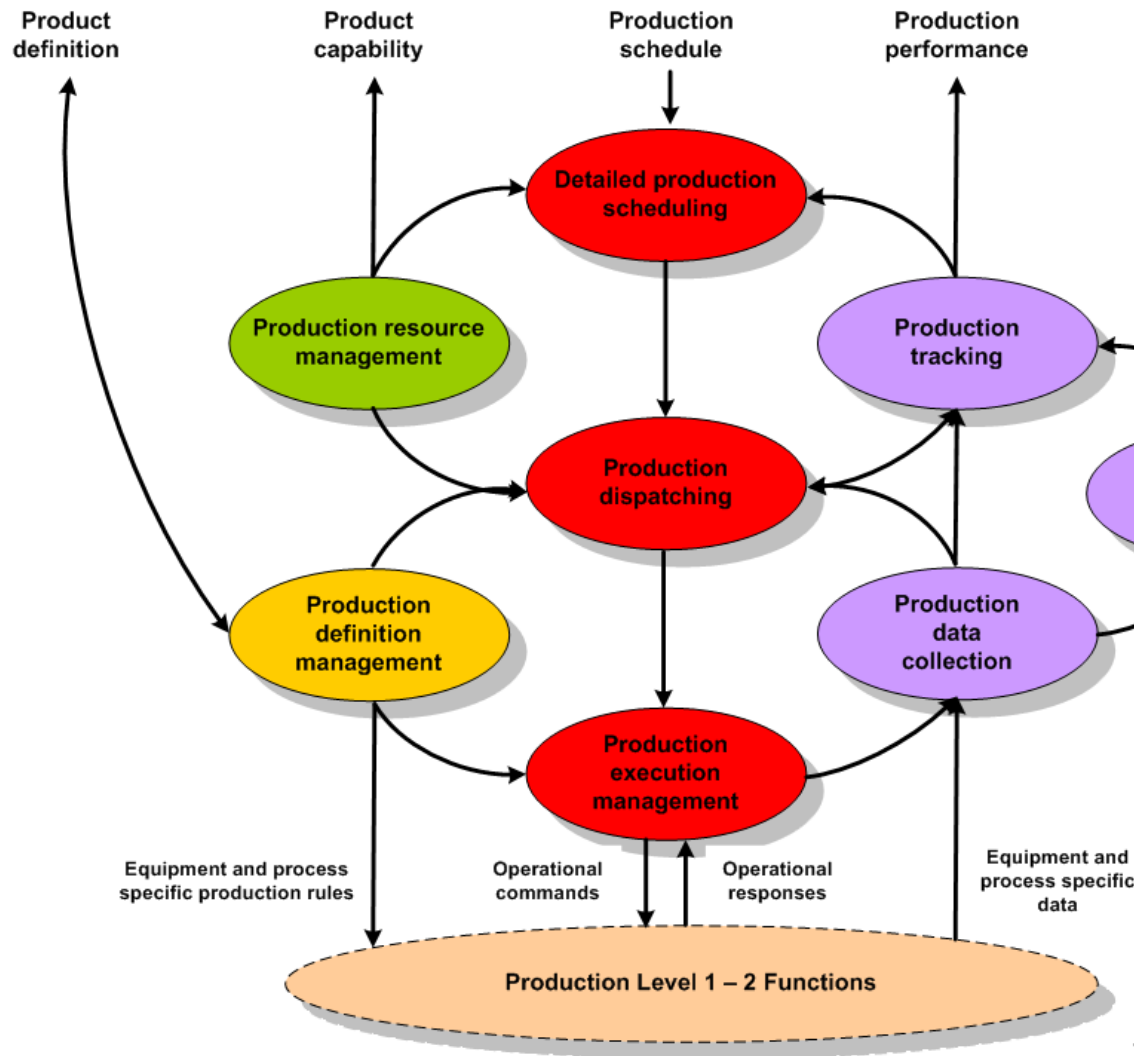


Manufacturing in the Supply Chain

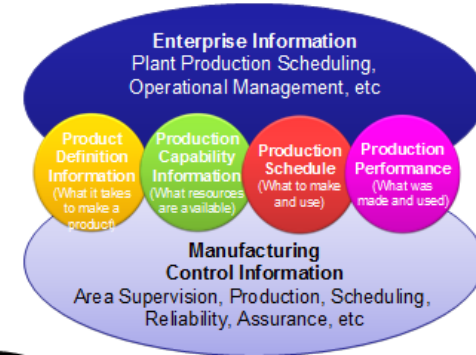
- The Supply Chain
 - The network of activities in a company that take place from customer order to customer delivery



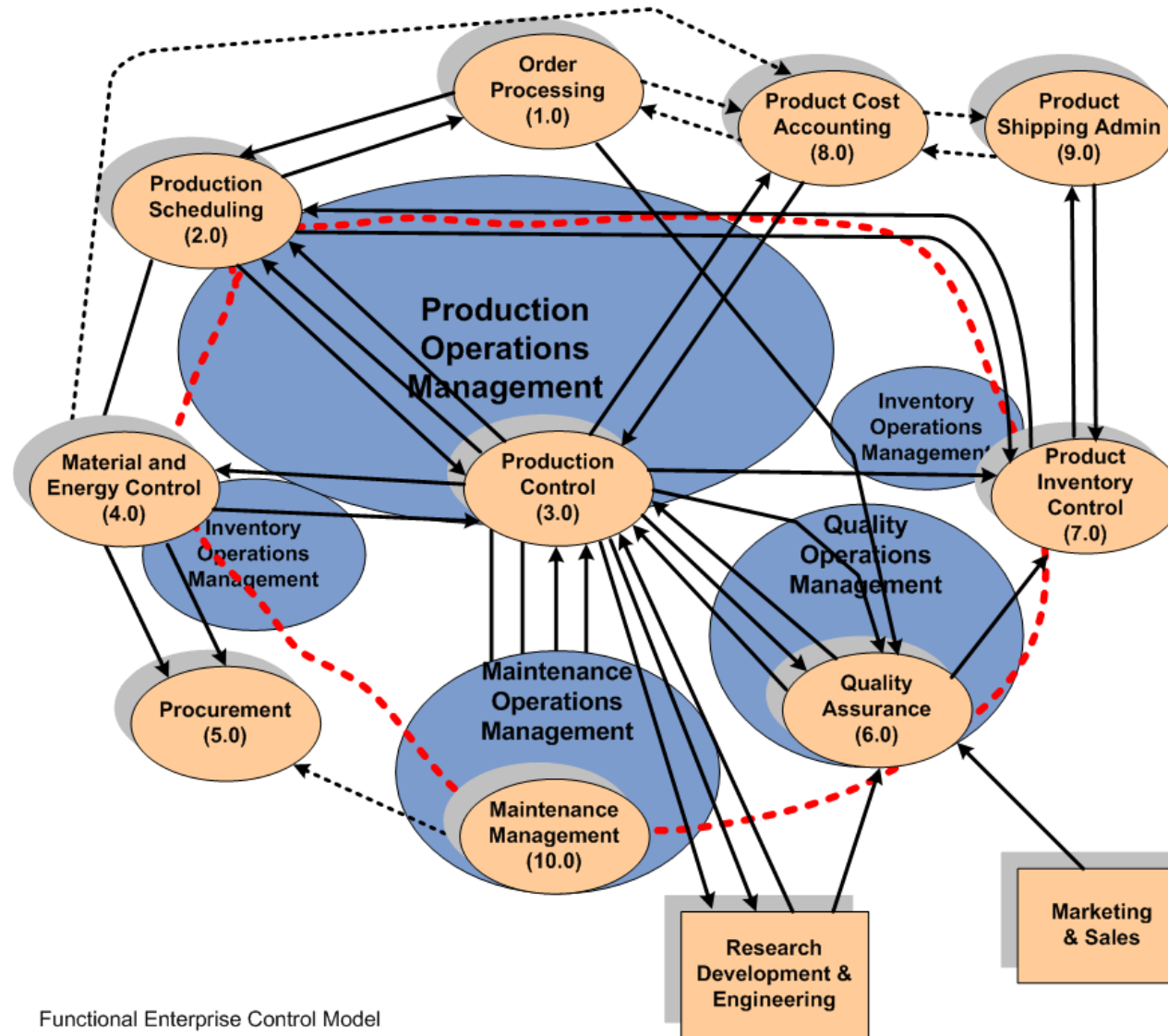
Activity Model



Four Categories of Information



Mapping activity models on enterprise functions



Functional Enterprise Control Model

Information Categories

Business planning & logistics information
Plant production scheduling, operational management, etc

Operations definition information
(What must be defined to make a product)

Production capability information
(What resources are available)

Operations schedule information
(What to make and use)

Operations response information
(What was made and used)

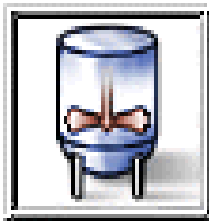
Manufacturing operations & control information

Production operations, maintenance operations, quality operations, etc

Object Definitions



Personnel



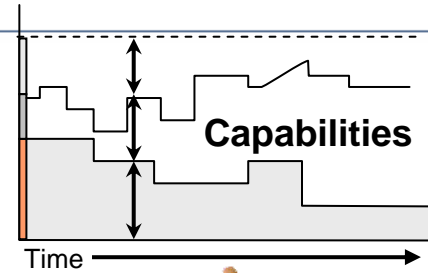
Equipment



Material



Process Segments



Operations Definitions



Operations Schedule



Operations Performance



3 Physical Resources Object Models



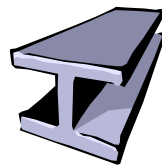
Personnel

← Management of personnel
needed for production



Equipment

← Management of equipment
needed for production



Material

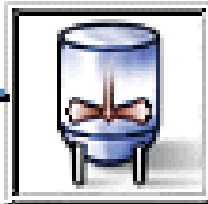
← Management of material
needed for production



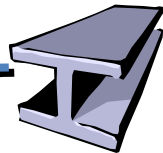
Resources



Personnel



Equipment



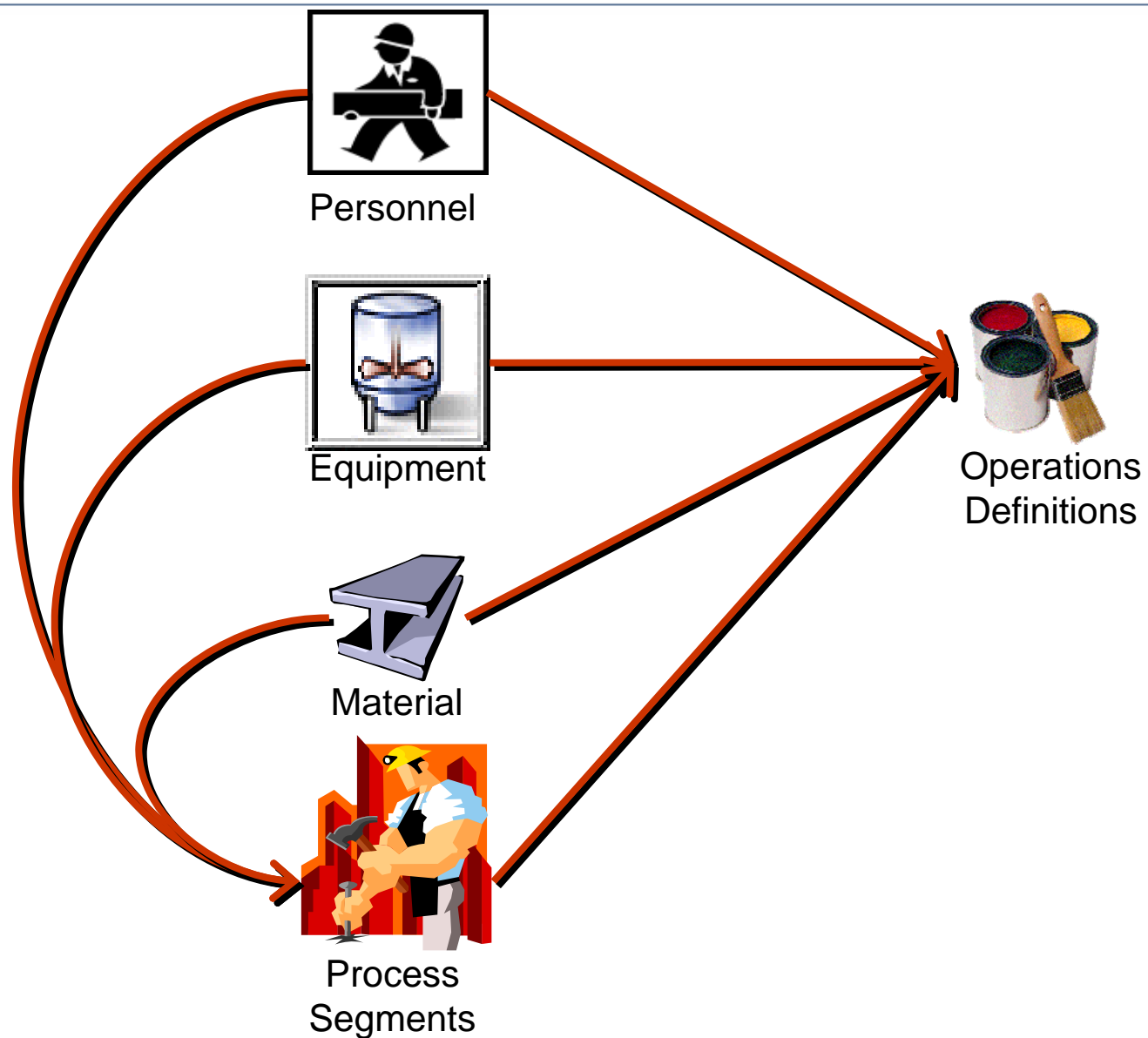
Material



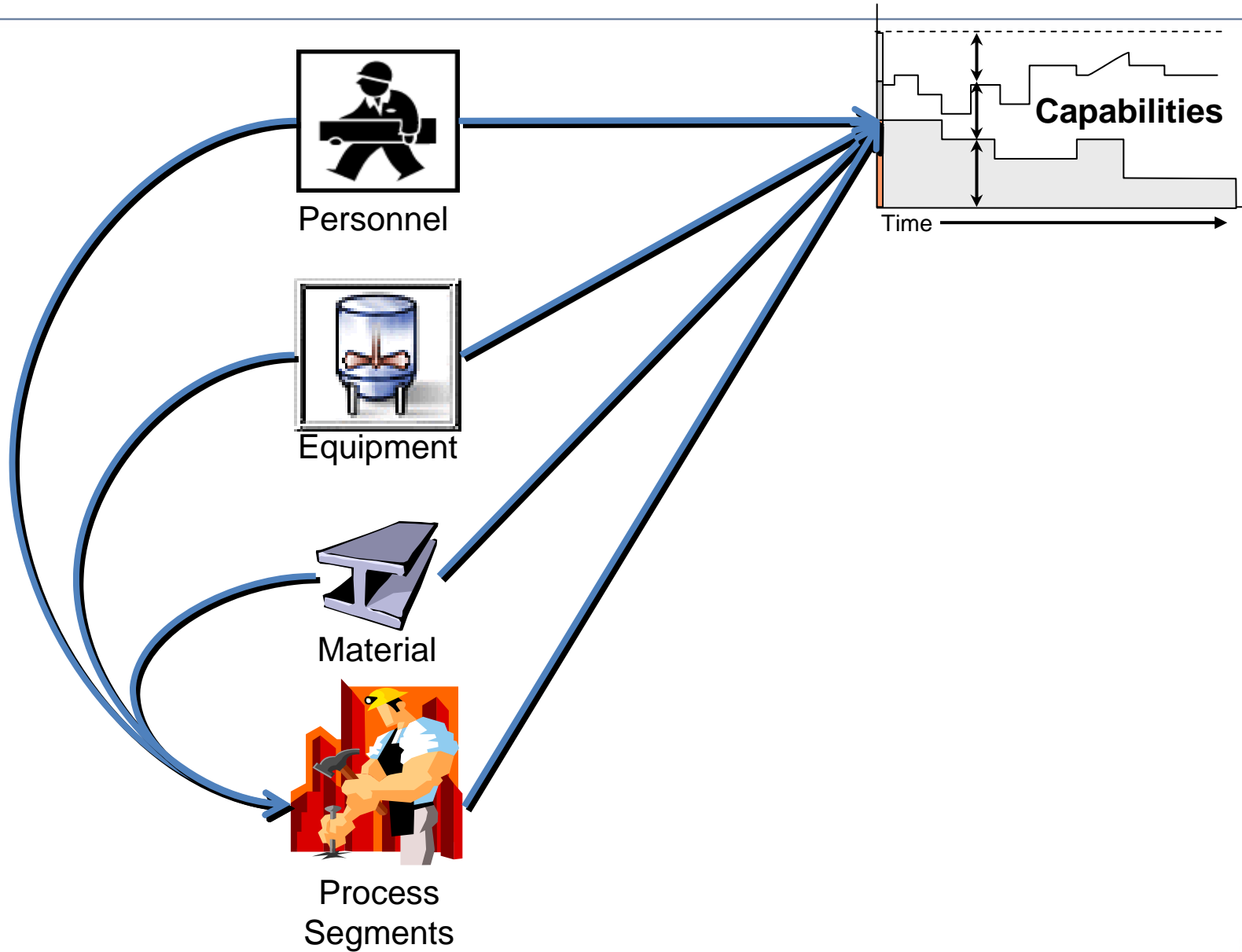
Process
Segments



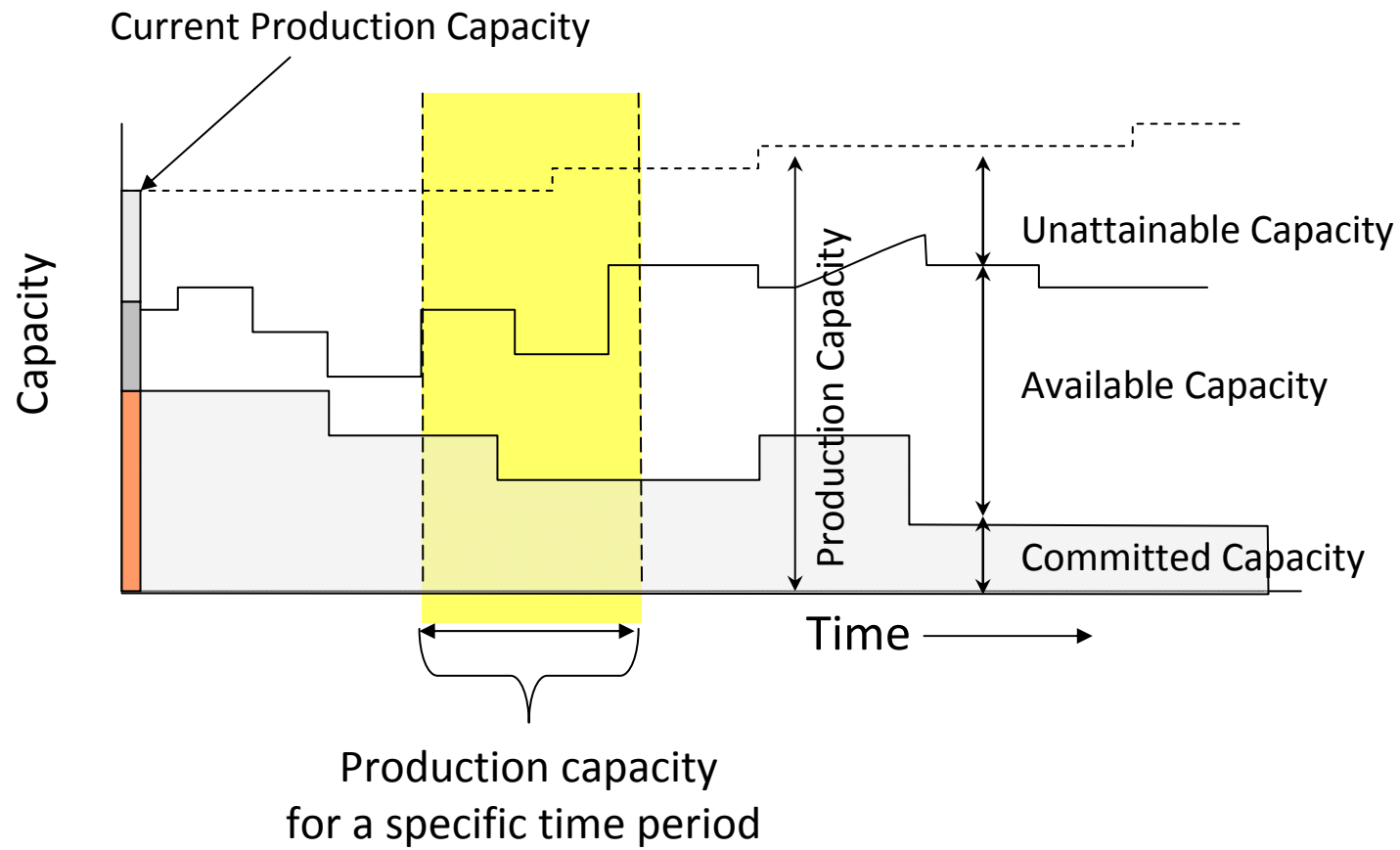
Operations Definition Object Model



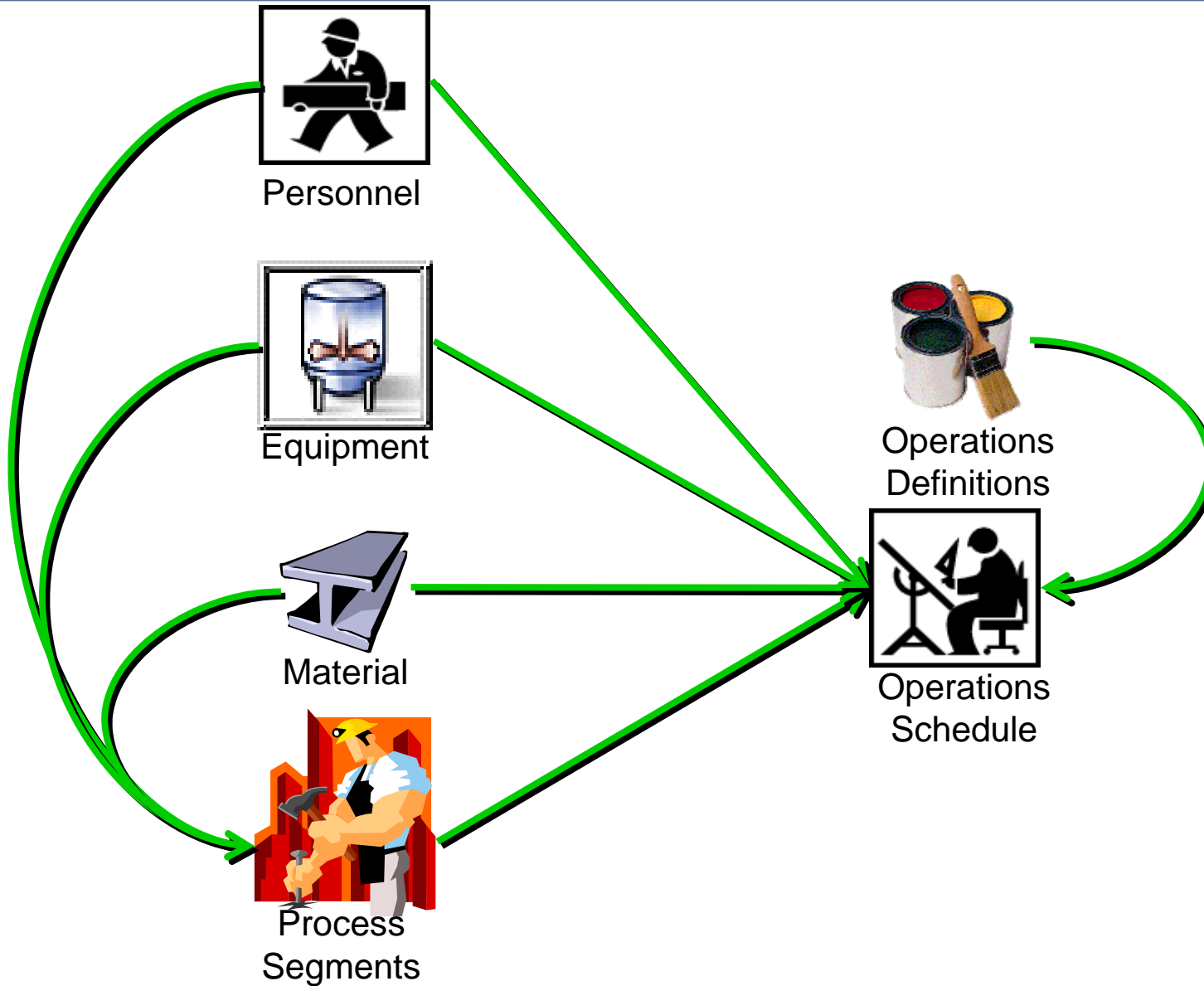
Capability models



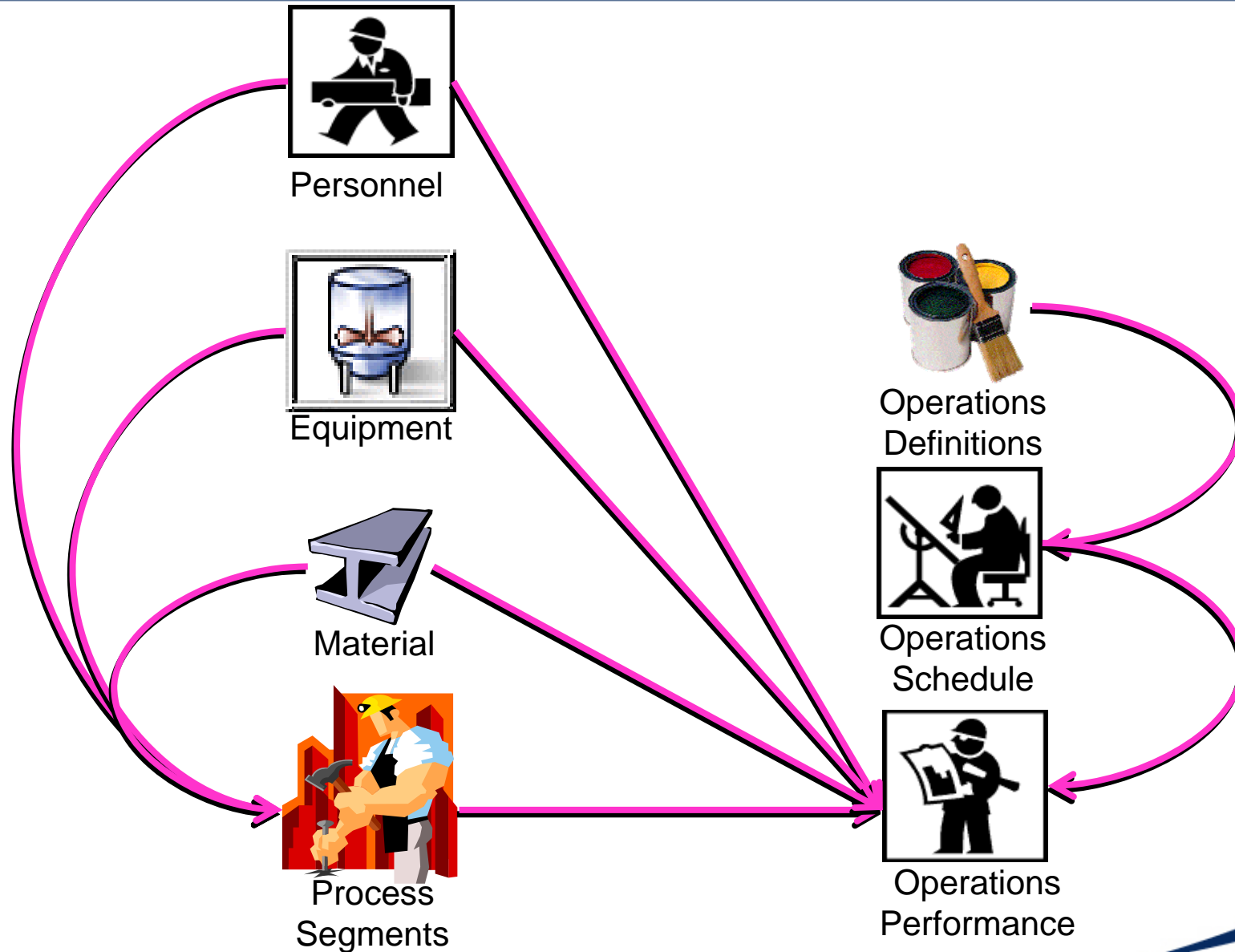
Capability



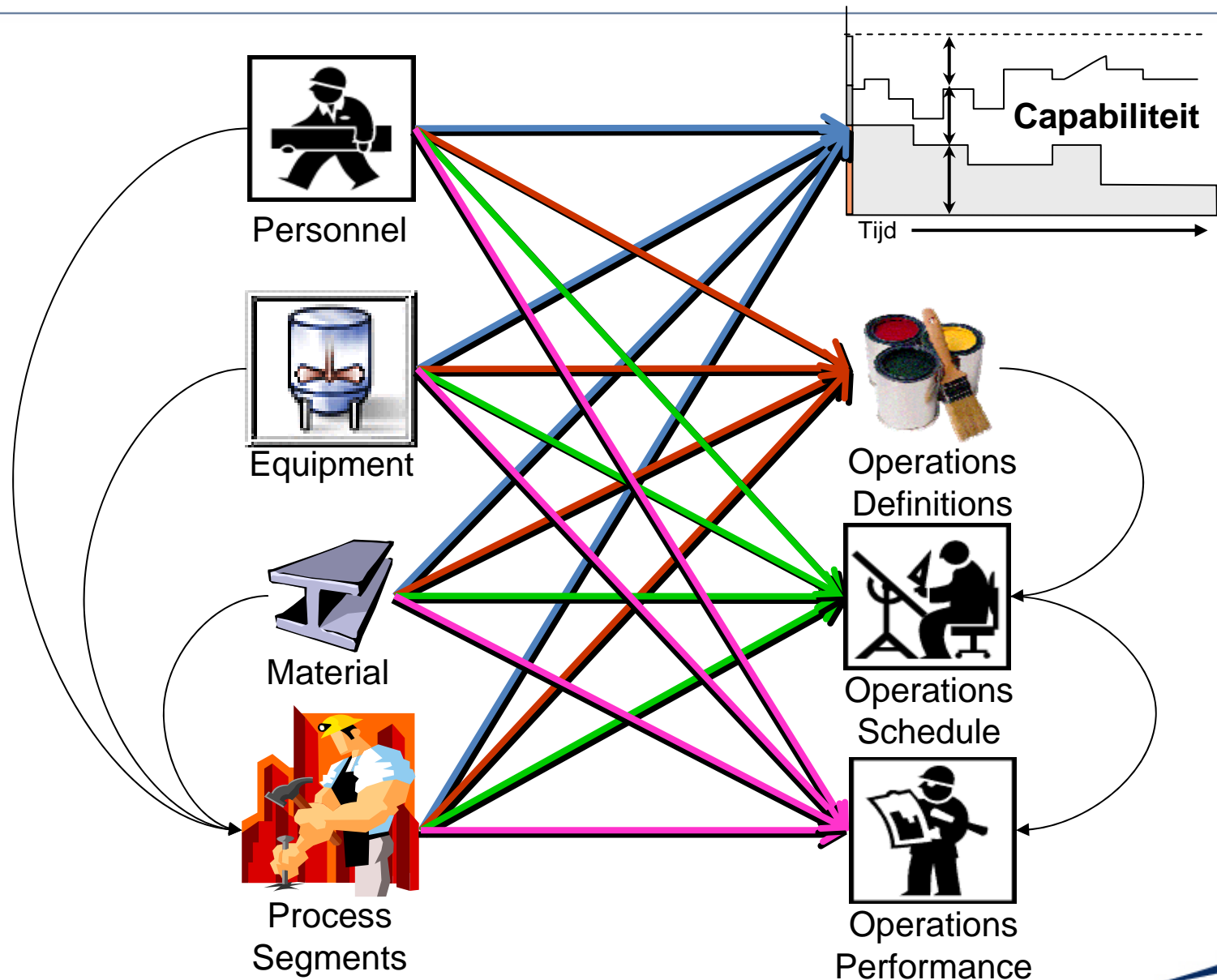
Operations Schedule



Operations Performance

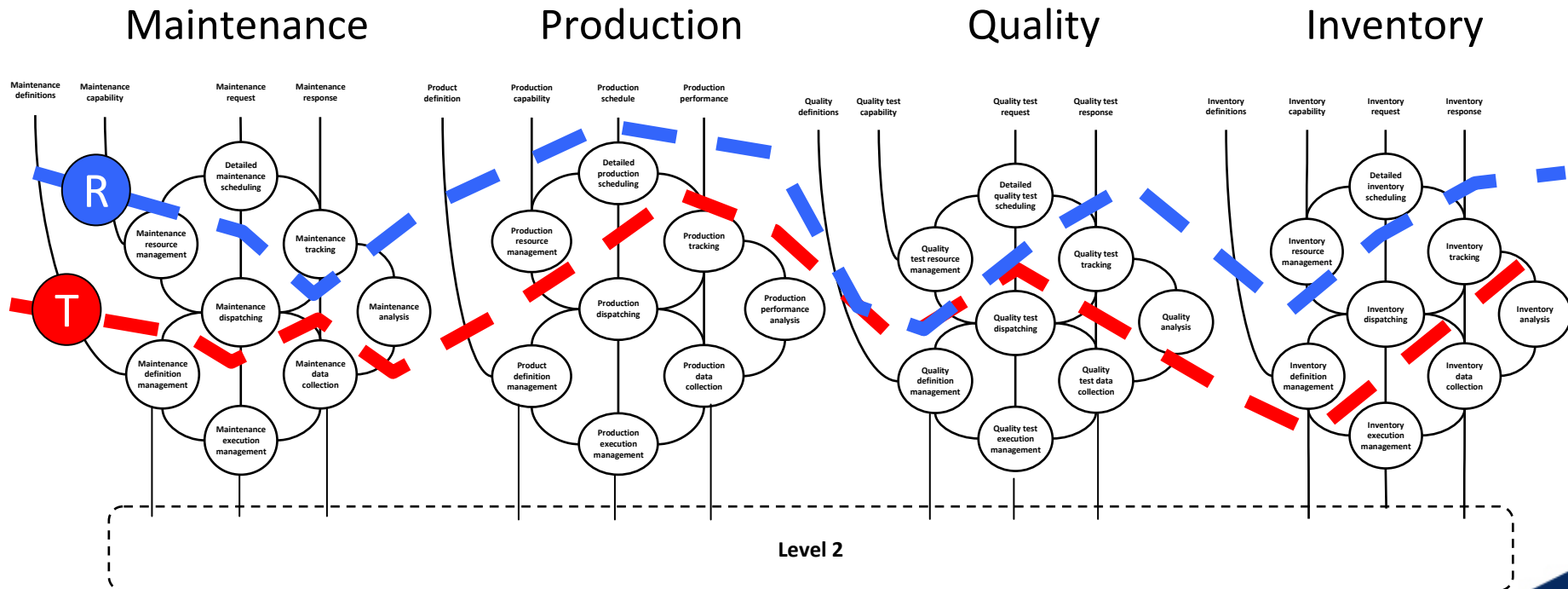


Relations between objects



Lines of Technical Integration

- In addition to line of responsibility, there may be a line of technical integration
- The two may not, probably will not, be the same



Technical Integration



- Functions may be supported by ERP tools
- Functions may be supported by Control System tools
- Functions may be supported by LIMS (Laboratory Information Systems)
- Functions may be supported by MMS (Maintenance Management Systems)

Now Define The Information



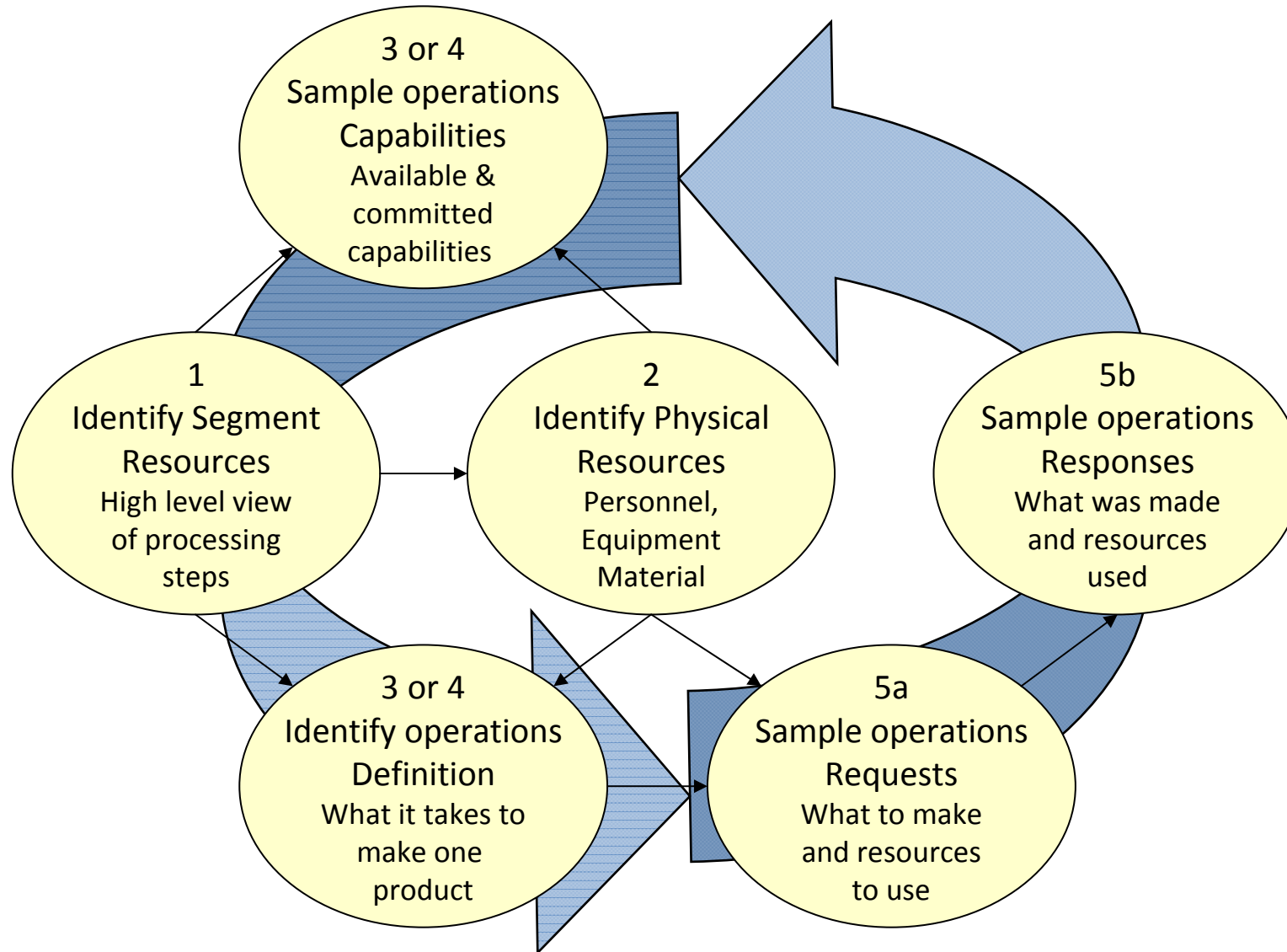
- No matter where the lines of integration fall
 - You need to identify segments
 - You need to identify personnel resources
 - You need to identify equipment resources
 - You need to identify material resources
- You may need to identify the operations definition
- You may need to identify operations capabilities
- You may need to identify operations schedules
- You may need to identify operations performance

An Implementation Method



- Why
 - Why is the information being exchanged
 - Identify the business reason for the exchange
- What
 - What information is to be exchanged
 - Defined using ISA95 terms and map to local terms
- Who
 - Who generates the information, who receives the information
- When
 - When is the information exchanged, event or time
- How
 - What is the specific mechanism to be used

Project Implementation— Sequence (cont'd)





Implied Ownership

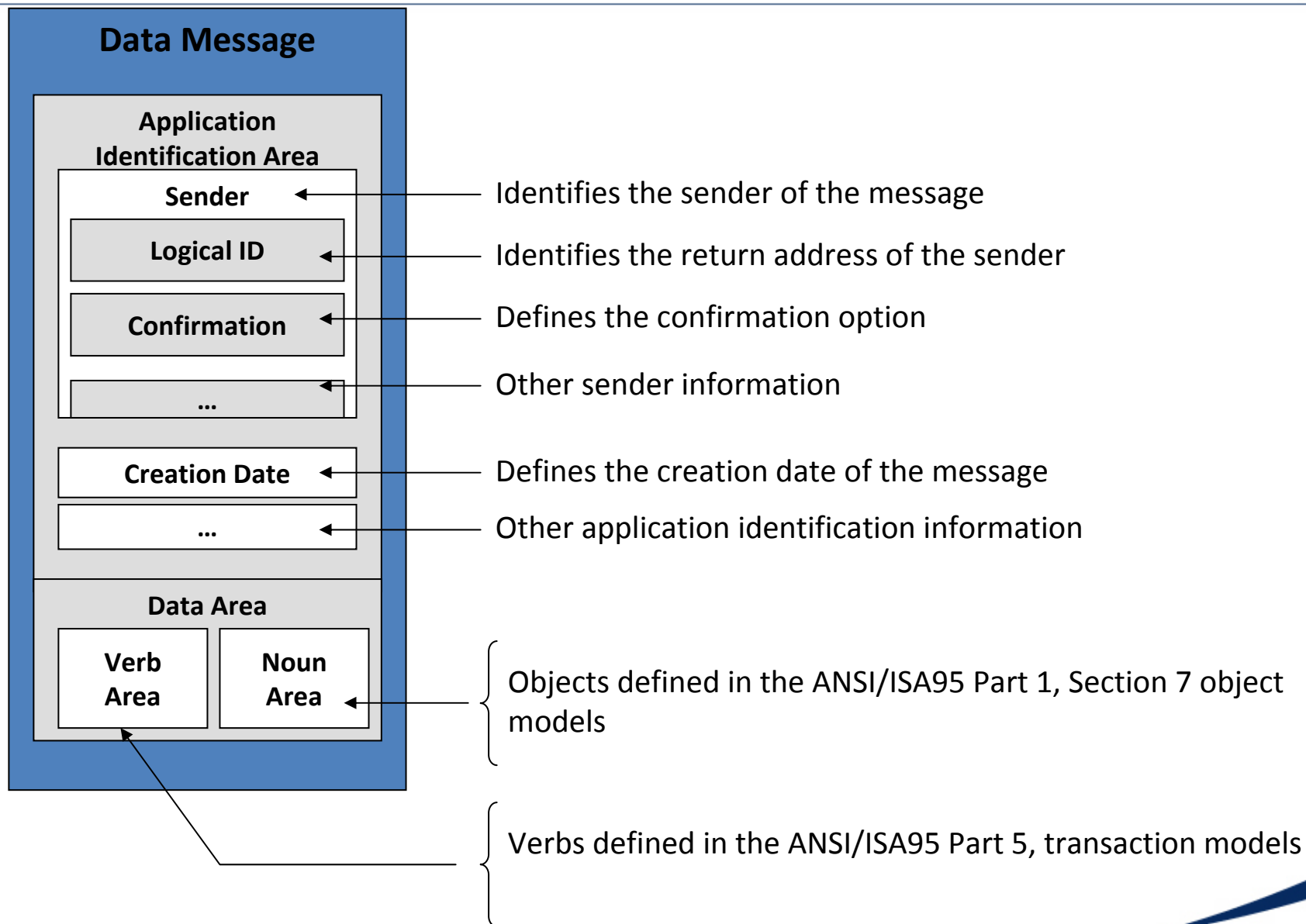
- ISA95 models represent information. They do not imply communication itself
 - Information objects can be dispatched within several systems
 - Transactions can be related to only parts of the information models
- Two-way communication through transactions
 - Implied 2-way communication and ownership in the production information model that does not exist in the other models
 - ISA95 Part 5 — Business to Manufacturing Transactions
- Example:
 - Business "Sends" production schedule — production requests
 - Manufacturing "Sends" production performance — production responses
 - or — production capability



Business Processes and Transactions

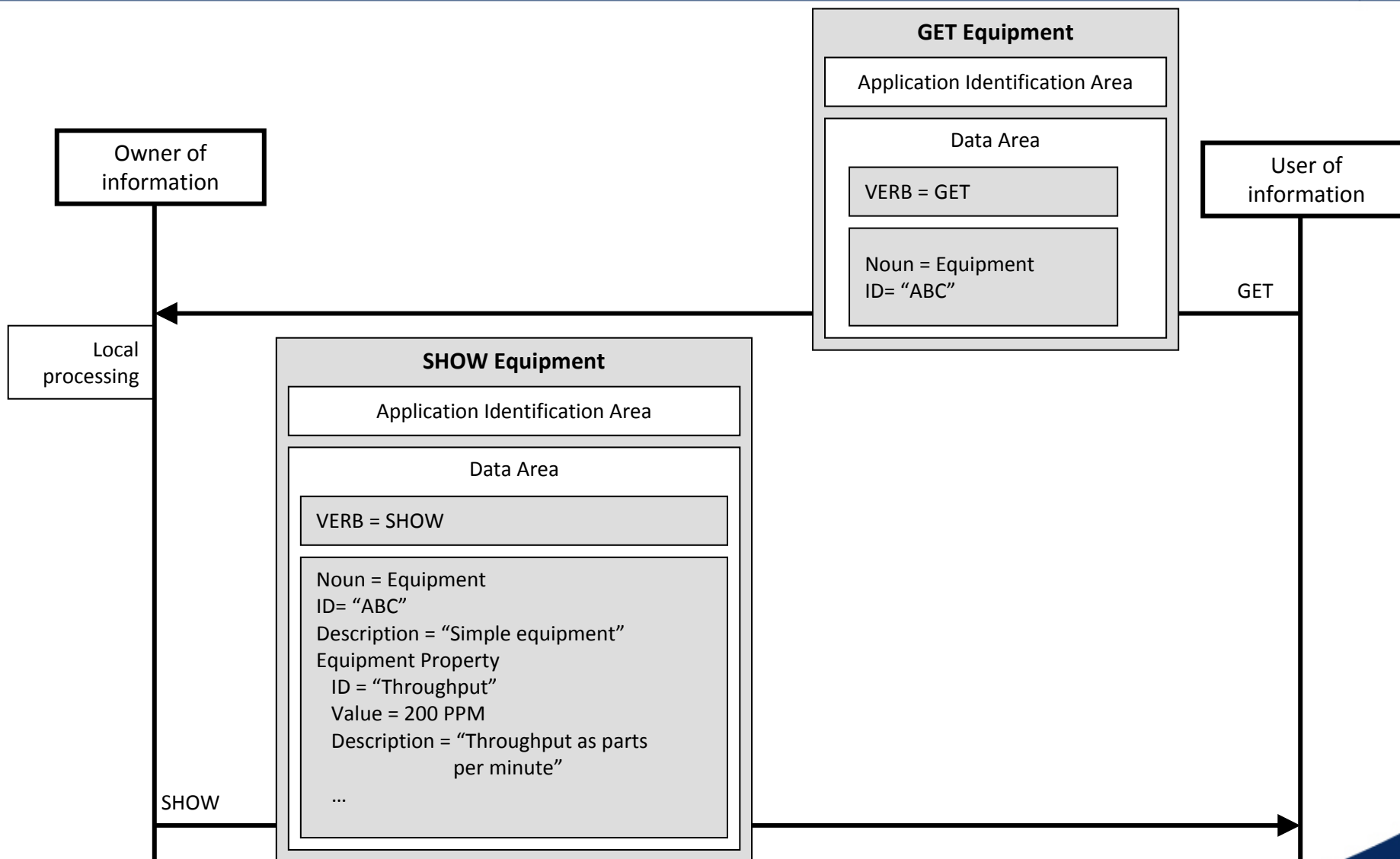
- Business processes: sequence of information gathering and processing involving one or several systems or parts of a system.
- Examples
 - Load simulation (sending a bunch of production requests to the detail scheduling system to verify the impact of forecast on production)
 - Synchronization of a production schedule
 - Production report
 - Target process segment lookup
- Improvement of enterprise metrics through business processes
 - Imply to automate business process execution
 - Imply/justify integration need
- Business processes are based on Transactions (information + action request)

ISA95 Part 5 Message Elements





Typical Part 5 Message Transaction





Part 5 Defined Messages

Verb	GET	ADD, CHANGE, CANCEL	PROCESS	SYNC ADD	SYNC CHANGE	SYNC DELETE
Nouns						
Personnel Class	YES	YES	no	YES	YES	YES
Person	YES	YES	no	YES	YES	YES
Qualification Test	YES	YES	no	YES	YES	YES
Equipment Class	YES	YES	no	YES	YES	YES
Equipment	YES	YES	no	YES	YES	YES
Capability Test	YES	YES	no	YES	YES	YES
Maintenance Request	YES	no	YES	YES	YES	YES
Maintenance Work Order	YES	no	YES	YES	YES	YES
Maintenance Response	YES	no	YES	YES	YES	YES
Material Class	YES	YES	no	YES	YES	YES
Material Definition	YES	YES	no	YES	YES	YES
Material Lot	YES	YES	no	YES	YES	YES
QA Test	YES	YES	no	YES	YES	YES
Process Segment	YES	YES	no	YES	YES	YES
Production Capability	YES	no	YES	no	no	no
Product Definition	YES	no	YES	YES	YES	YES
Production Schedule	YES	no	YES	no	no	no
Production Performance	YES	no	YES	no	no	no



Design Sequence

