



*THE FORUM FOR AUTOMATION AND
MANUFACTURING PROFESSIONALS*



What is Above a Master Recipe? An Integrated View of Production

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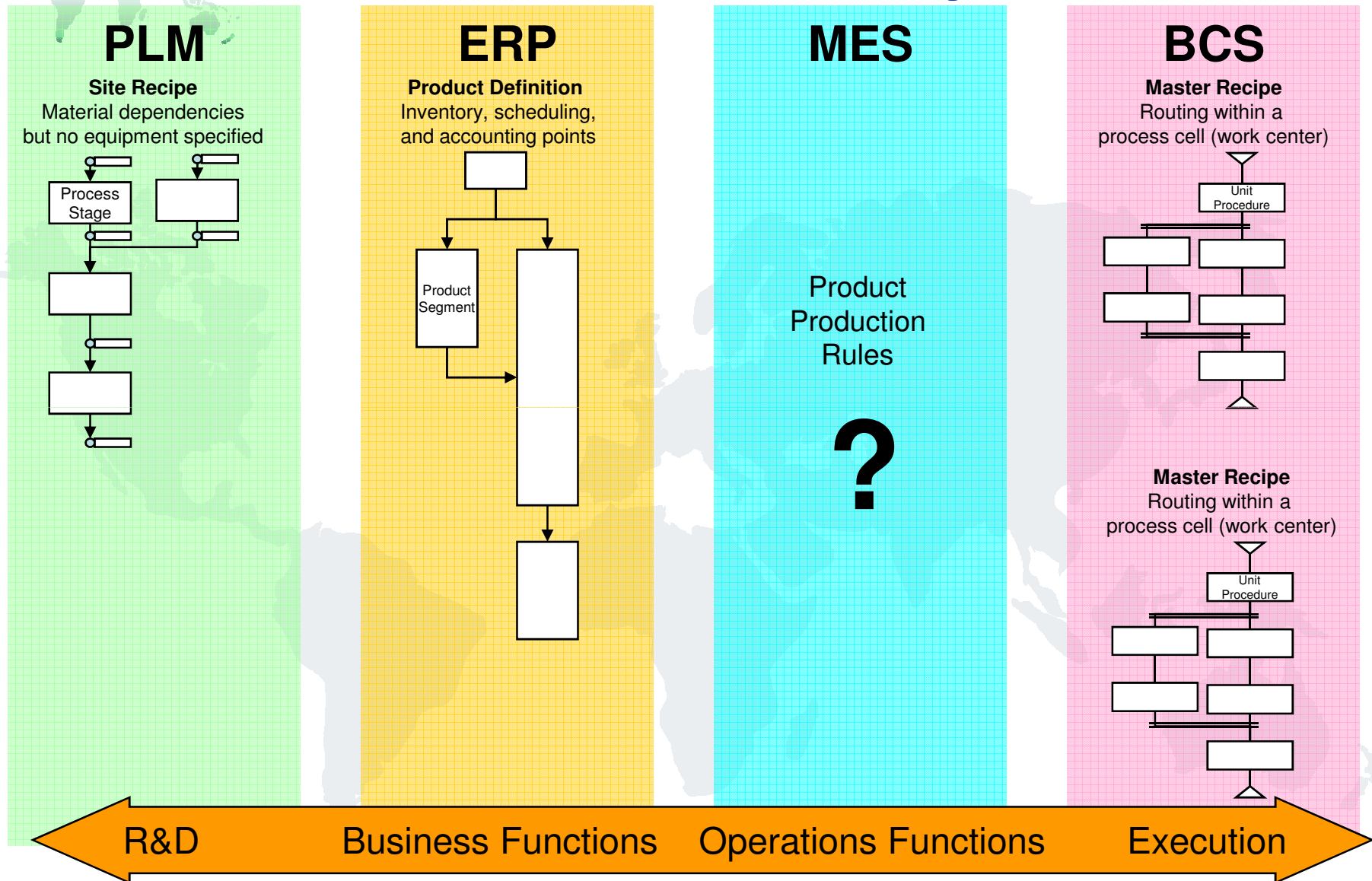


There is a Missing Element

- ISA 88 defines 4 types of recipes
 - General, Site, Master, Control
- The Master Recipe is limited to a process cell
- Yet the “higher level” Site recipe is equipment independent (a definition of the chemical and physical processes)
- What sequences and controls the work flow and material routing between process cells?



The Missing MES Element



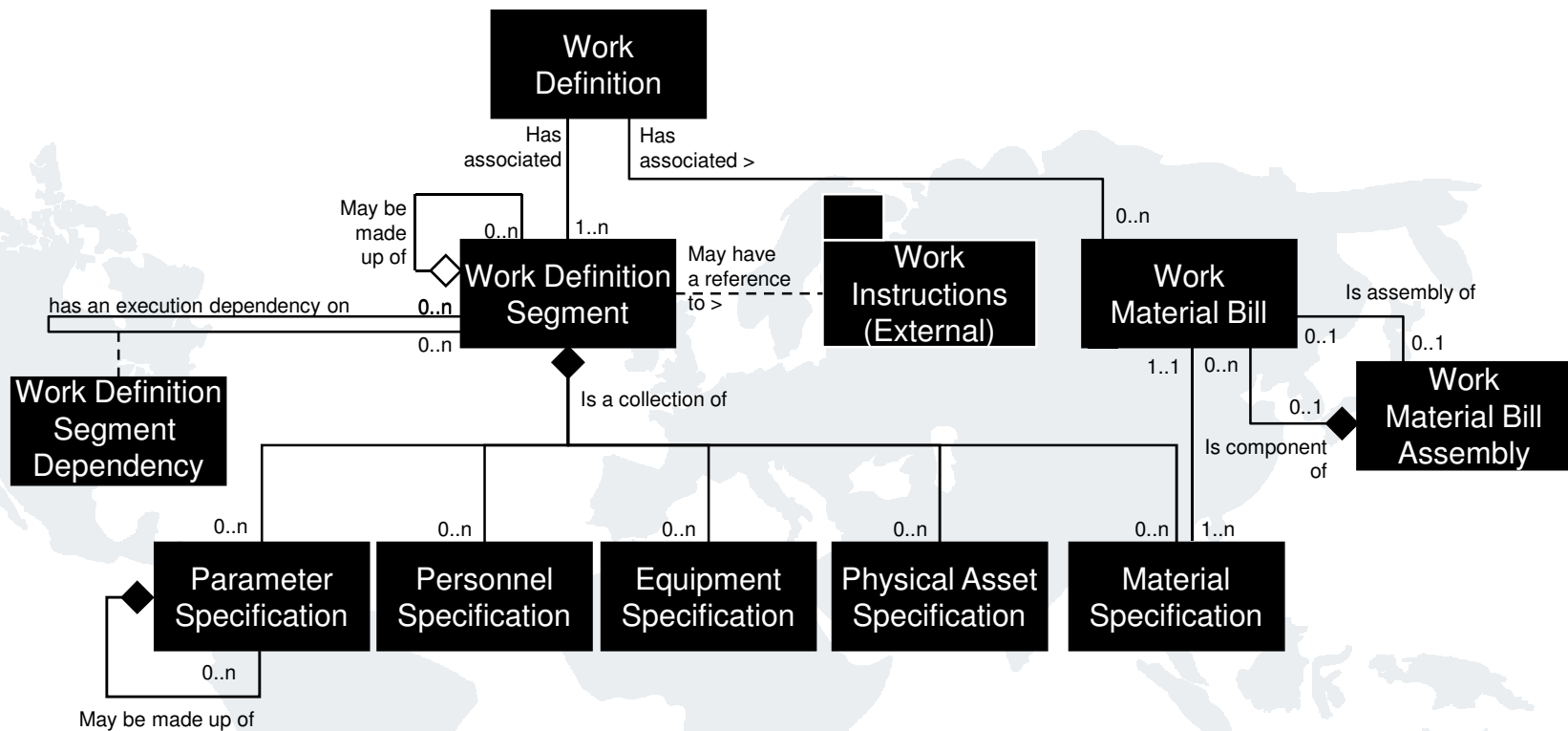


The New “**WORK**” Models in ISA 95

- **Work Capability** – A description of the available, unattainable, and committed capacity for a specified resource for a specified period of time.
- **Work Schedules** – A description of the work to be performed, made up of *Work Requests* that relate to a Work Definition. A *Work Schedule* may be considered a Detailed Production Schedule.
- **Work Performance** – A description of the work actually performed, made up of *Work Responses* that may relate to a *Work Definition*.
- **Work Definitions** – A description of resources and routings required to implement the work. The *Work Definition* defines a routing made up of *Work Definition Segments*.



A Simplified Work Definition Model

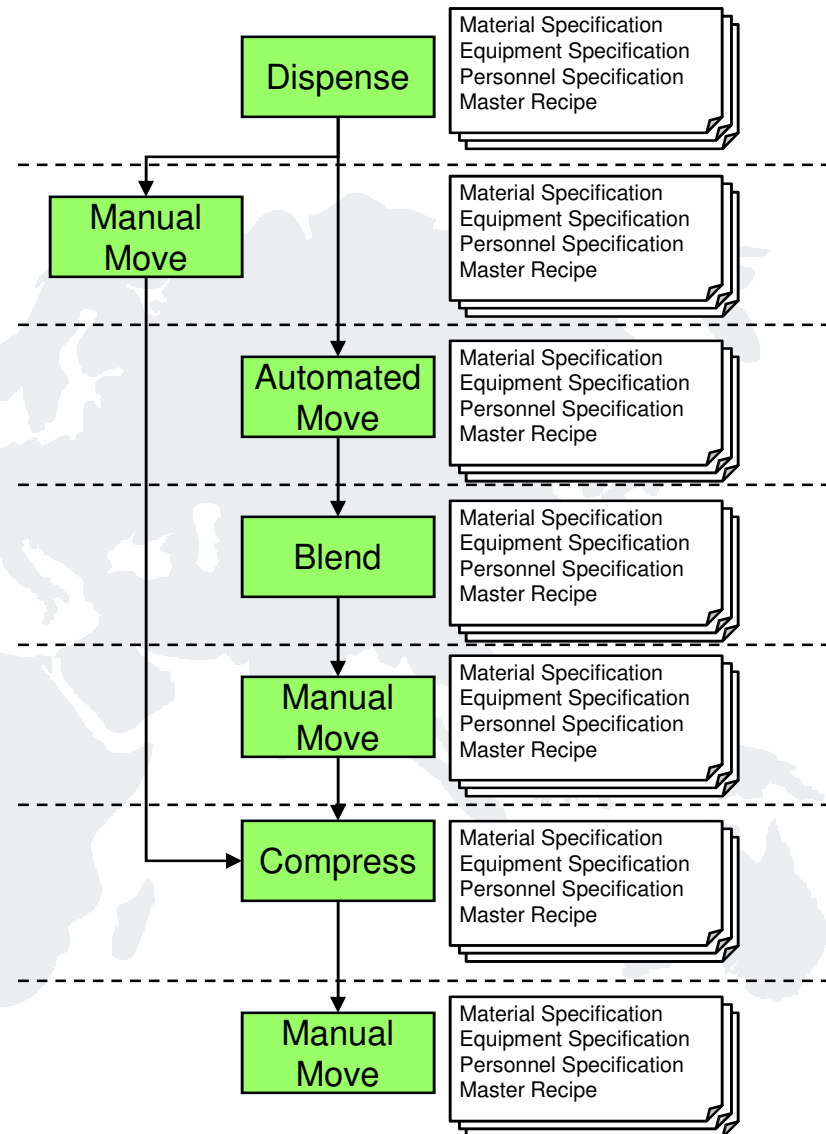


From: ISA 95 Part 2 Update, Working Draft 3



A Routing Graphical Representation

- Each rectangle represents a single work definition segment
- Directed lines represent material flows
- Synchronization, not shown, could be dotted directed lines
- Each segment has an associated set of resources required when the segment is executed



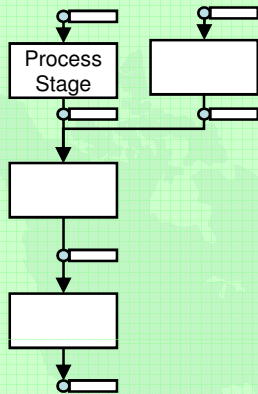


Work Definition as the Missing Element

PLM

Site Recipe

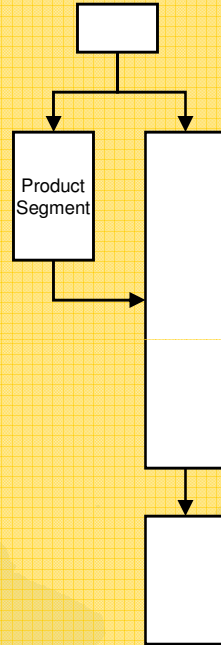
Material dependencies
but no equipment specified



ERP

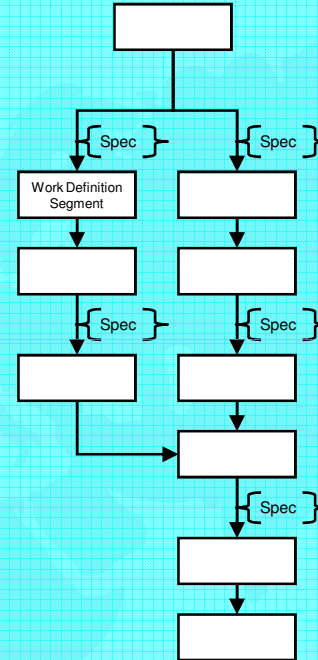
Product Definition

Inventory, scheduling,
and accounting points



MES

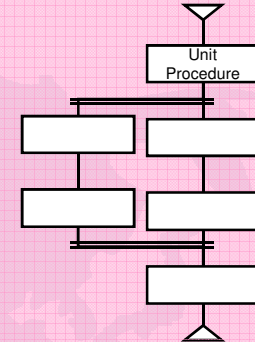
Work Definition
Work Center routing
and instruction identification



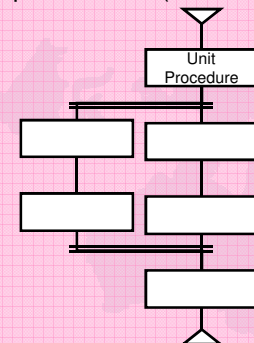
BCS

Master Recipe

Routing within a
process cell (work center)

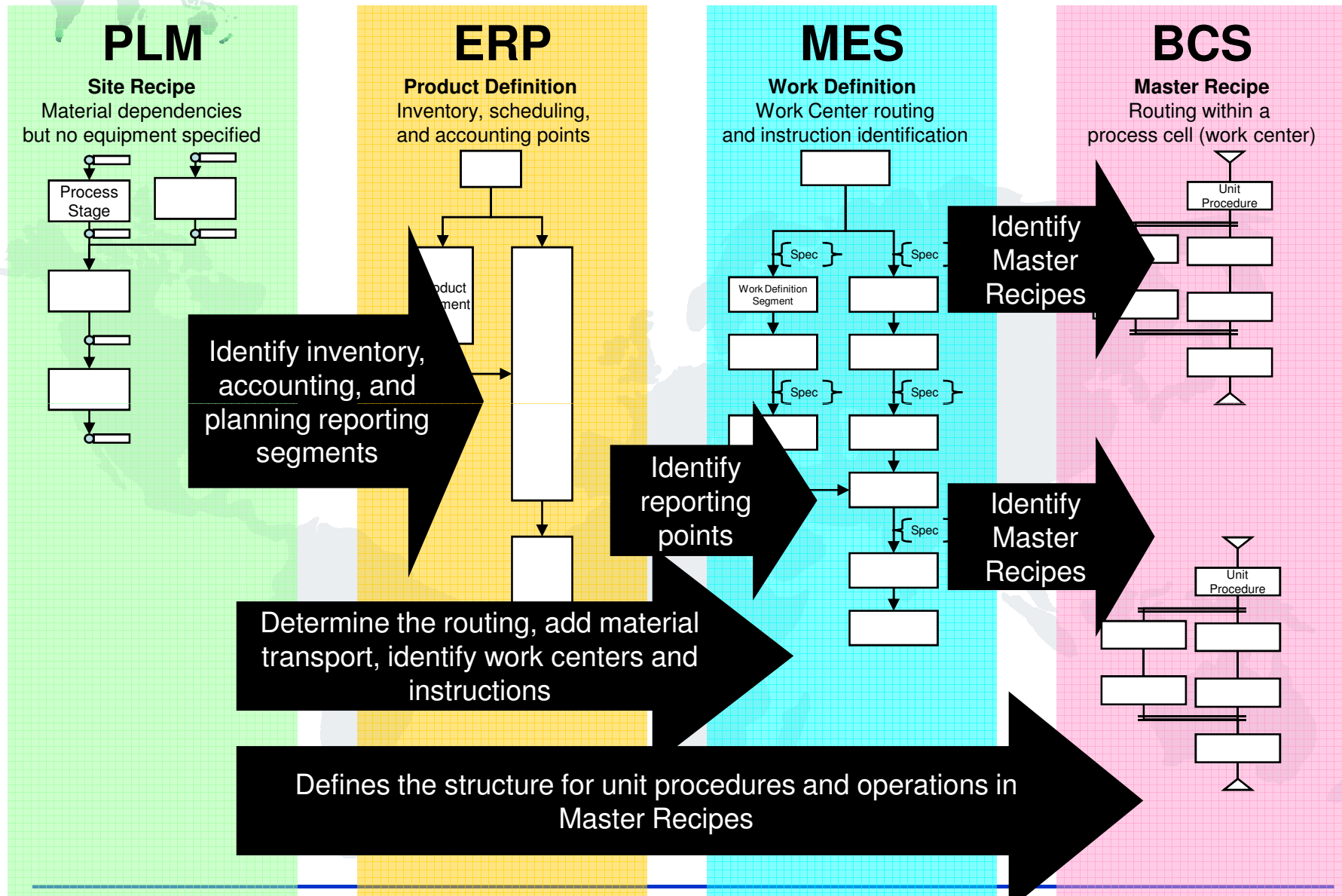


Master Recipe
Routing within a
process cell (work center)



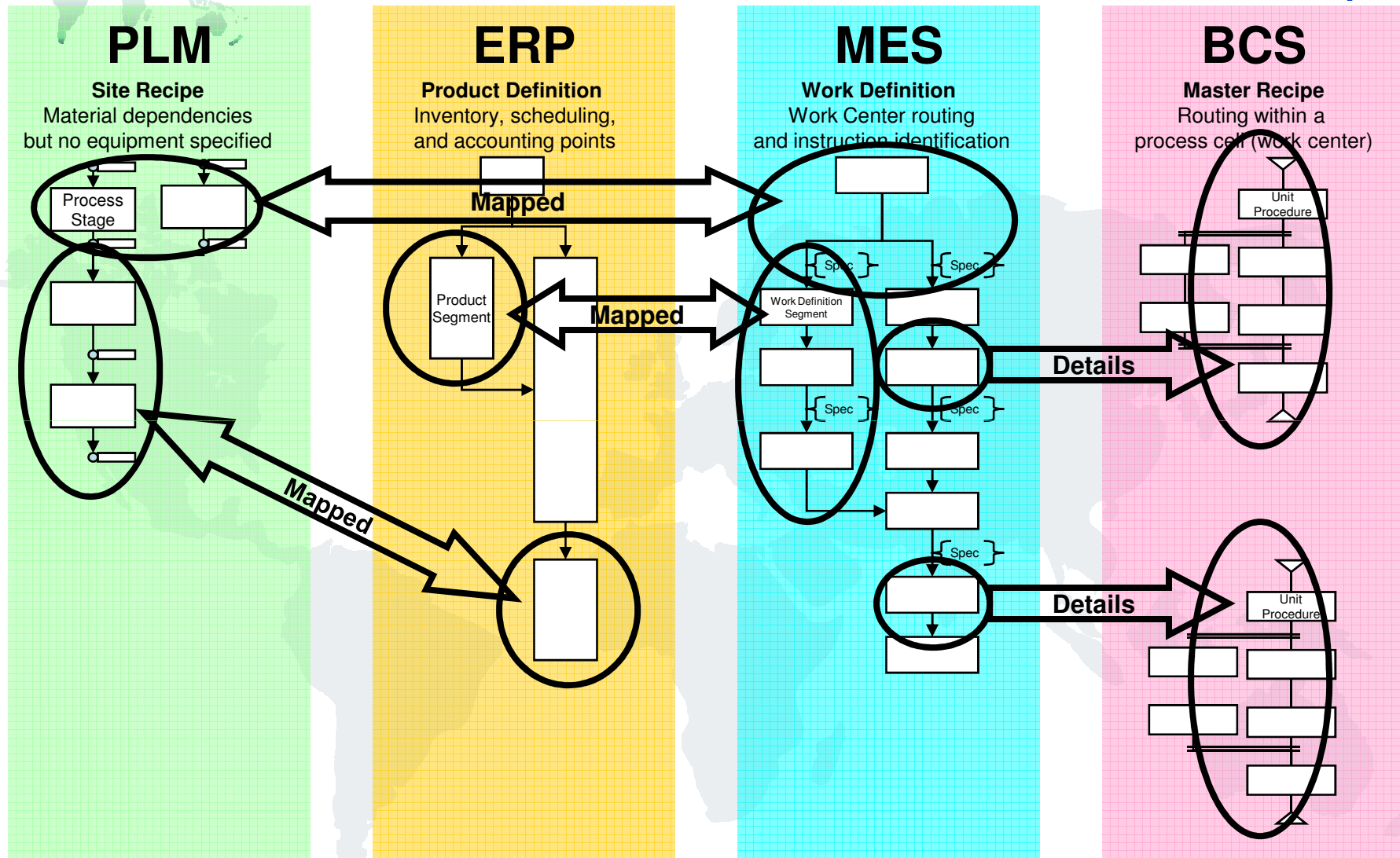


How the Elements Relate



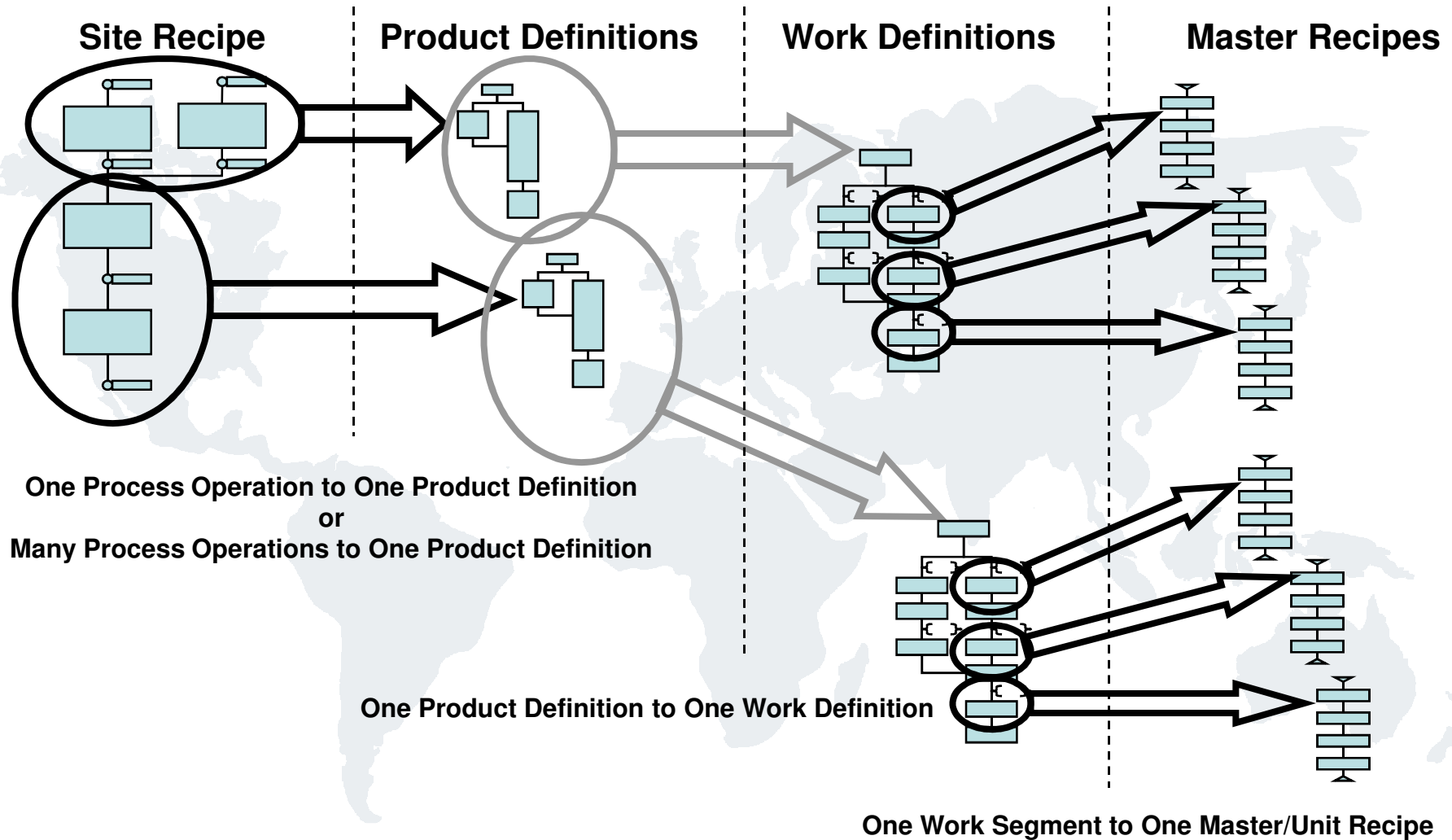


How the Elements Map





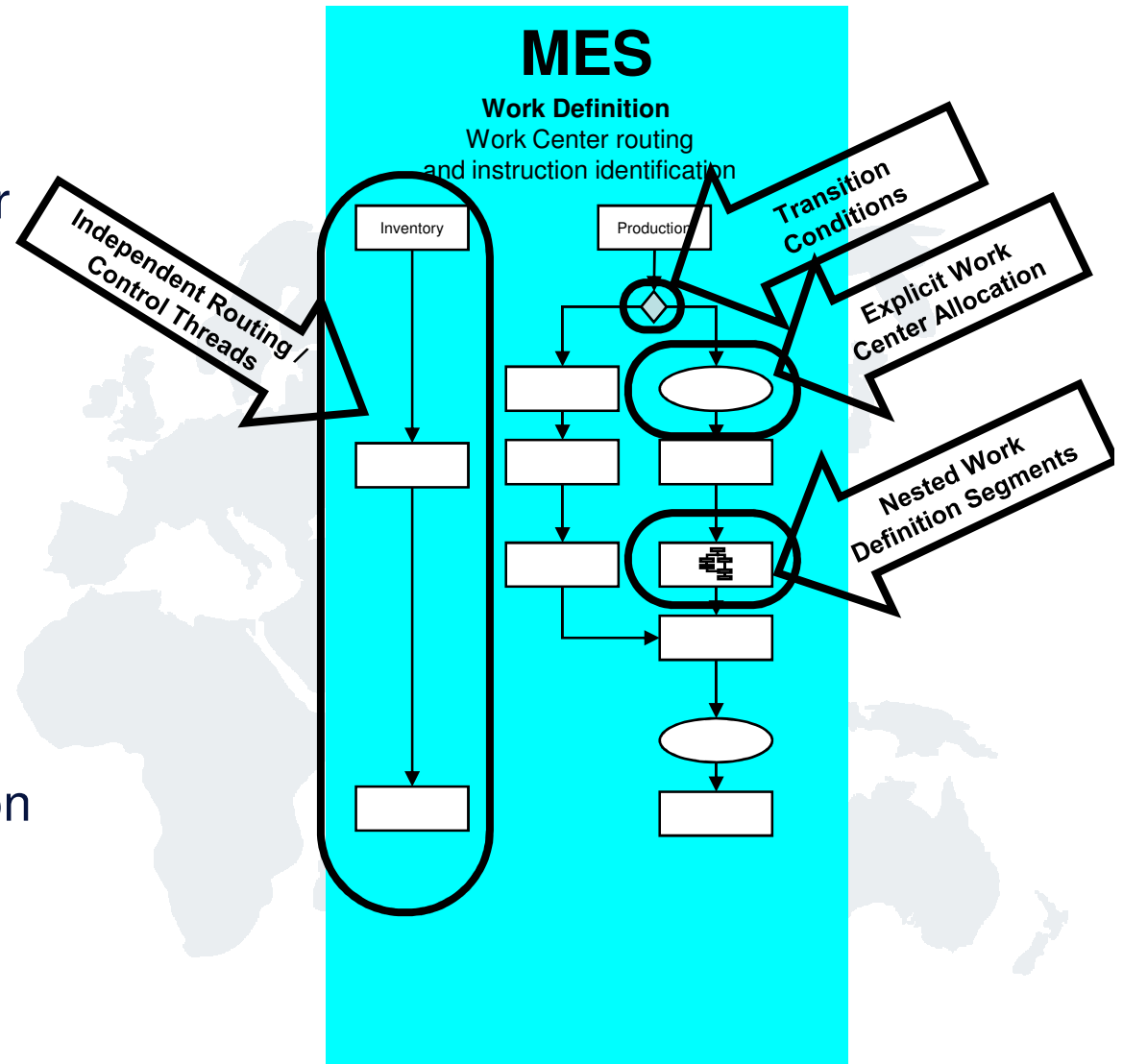
An Example of Mapping





Augmented Work Definition Segment Logic

- If the Work Definition Segment is to be used for execution,
- then additional rules may have to be added to the logic
- Transition Conditions
- Independent routing threads
- Explicit work center allocation and deallocation
- Nested work segment definitions





Master Work Definitions

Control Work Definitions

- **Master Work Definition**

- Identifies *Material Classes* or *Material Definitions*
- Identifies nominal production run sizes (standard job size)
- Identifies equipment classes for work centers and work units
- Identifies classes of master recipes or unit recipes
- Contains a *Work Bill* – A definition of all resources used in the work definition independent of which work segment definition they are used in

- **Control Work Definition**

- Created as a copy of a *Master Work Definition*
- Used to control one job (as defined in ISA 95 Part 3) – One *Control Work Definition* for each job
- Defines exact batch sizes or production run sizes
- May identify *Material Lots* or *Material Sublots* for the job
- May identify specific work centers and/or work units for the job
- May identify specific *Master Recipes* to be used for the job



R&D
Activities

Level 4
Activities

Level 3
Activities

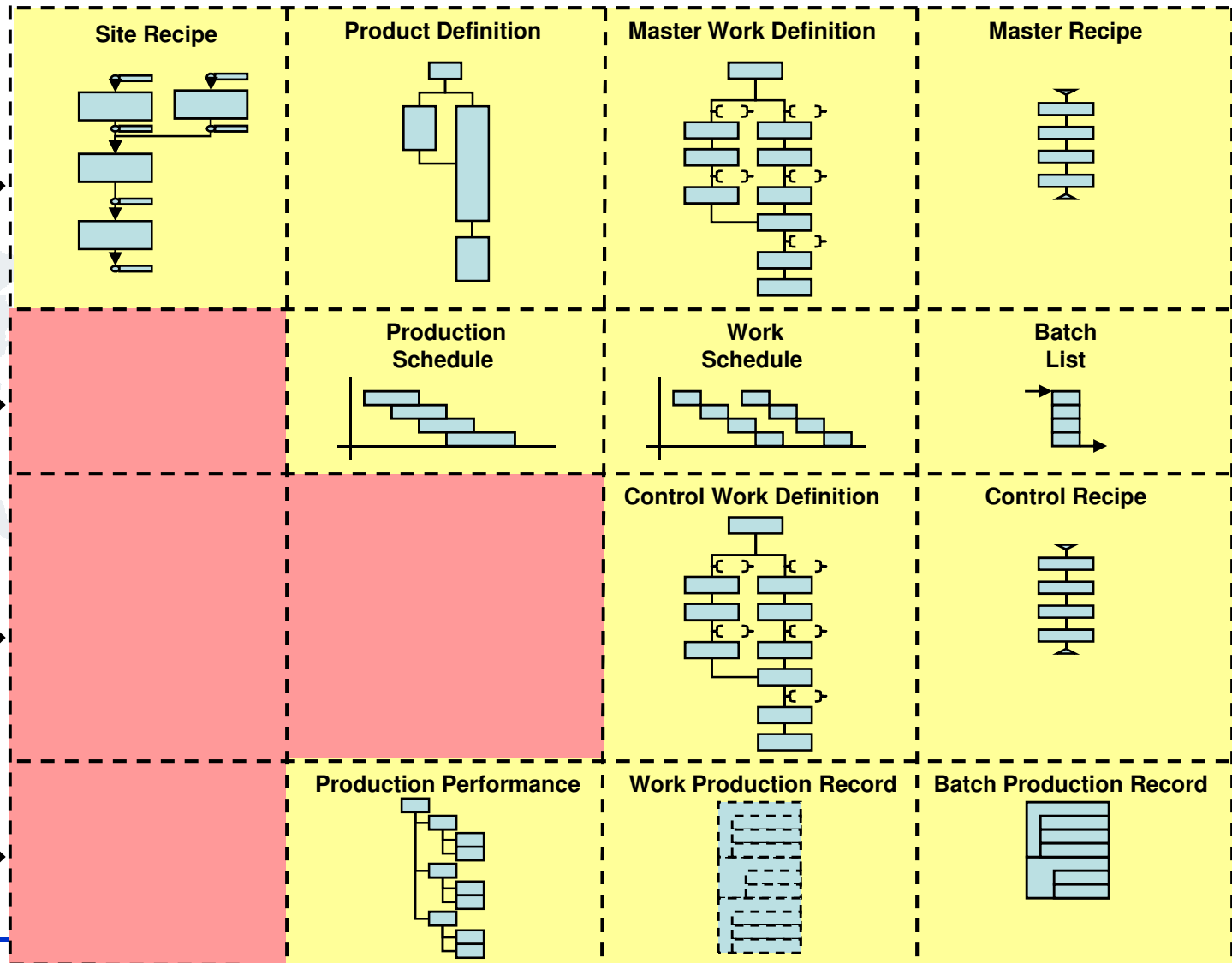
Production
Execution

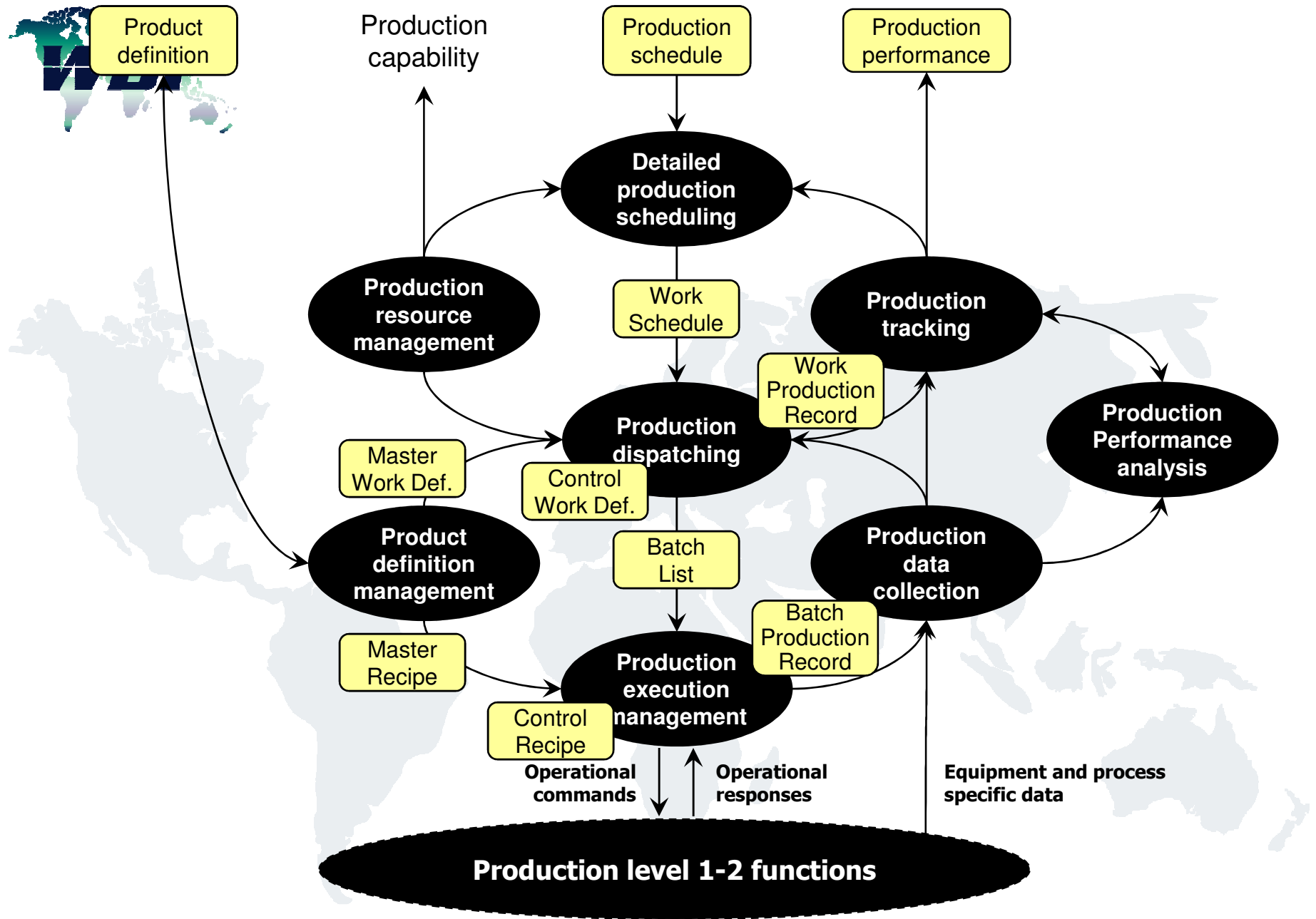
Product Related
Definitions

Output from
Scheduling

Executable
Elements

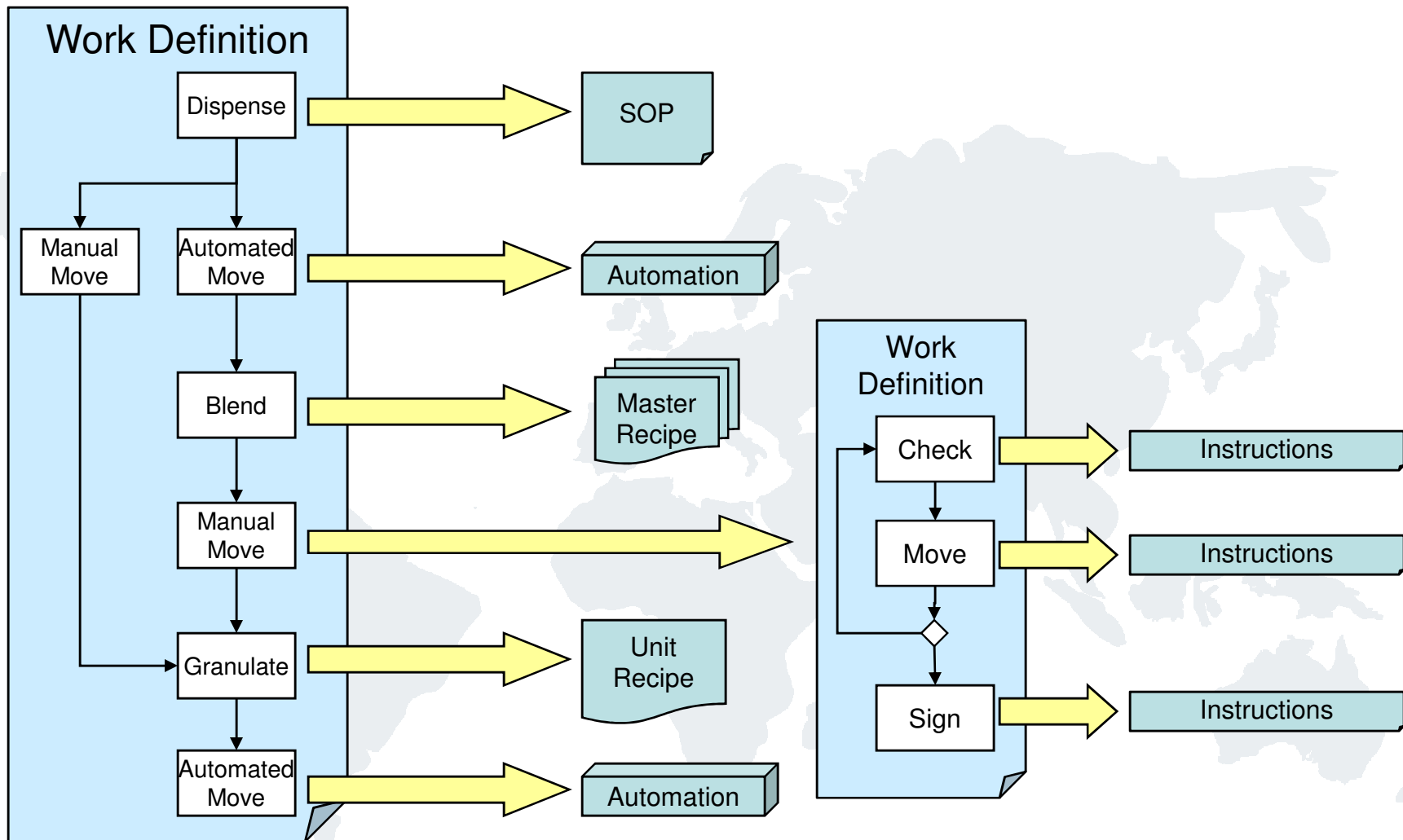
Execution
Results







Work Definition Segments Can Point To Many Types of *Work Instructions*





Summary

- The use of *Work Definitions* answers a question that every ISA 88 practitioner has asked, “What is above a *Master Recipe*?”
 - *Work Definitions* can be used to control the flows of material between process cells
 - It provides a mechanism to integrate material handling and material movement, integrates laboratories, material movement, and maintenance work flows into an integrated view of production.
- The description of a *Work Definition* may be extended to include information required for execution of the definition.
- A terminology for *Master Work Definitions* and *Control Work Definitions* is proposed.

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