



Implementation of a Paperless System in a Sterile Manufacturing Facility

Marian Phelan
Process Engineer
Merck Sharp & Dohme



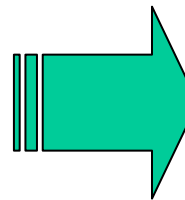
Strategic Initiatives

The following Strategic Initiatives of MESA International are associated with this presentation:

**Lean Manufacturing
Quality & Regulatory Compliance**

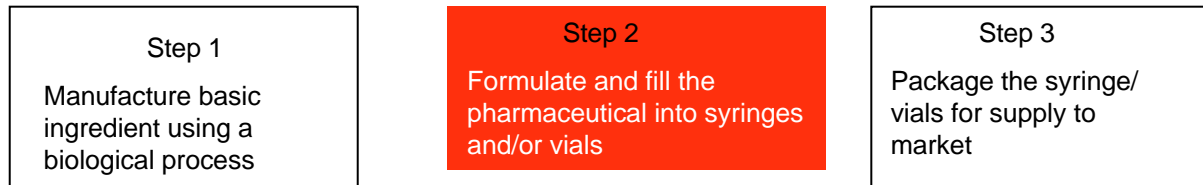
- Overview of Merck Sharp & Dohme at Carlow
- The Benefits of MES
- System Overview
- Deployment Methodology
 - Iterative Development
- Resource Requirements
- Keys to Project Success

Merck Sharp & Dohme at Carlow



Outline of Manufacturing Process

- Formulation and Filling Facility part of a world wide supply chain to deliver important human vaccines & other biologics products to global markets
- VBSF – Vaccine & Biologics Sterile Facility
 - Vaccines - Preventative against disease
 - Therapeutic Proteins (TPs) – Treat existing conditions
- These products are typically brought to market in three basic steps

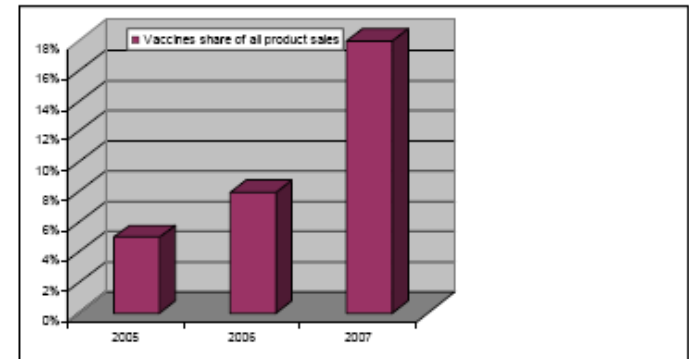


- Injectable vs. oral products
 - Vials and Syringes
 - Sterile Conditions
 - Additional “elements” in a medicine can cause bad side effects
 - Eliminate contamination potential to get into our products.
- There is no additional processing or purification that is done to the product once it leaves this site.
The product is injected directly into the patient.



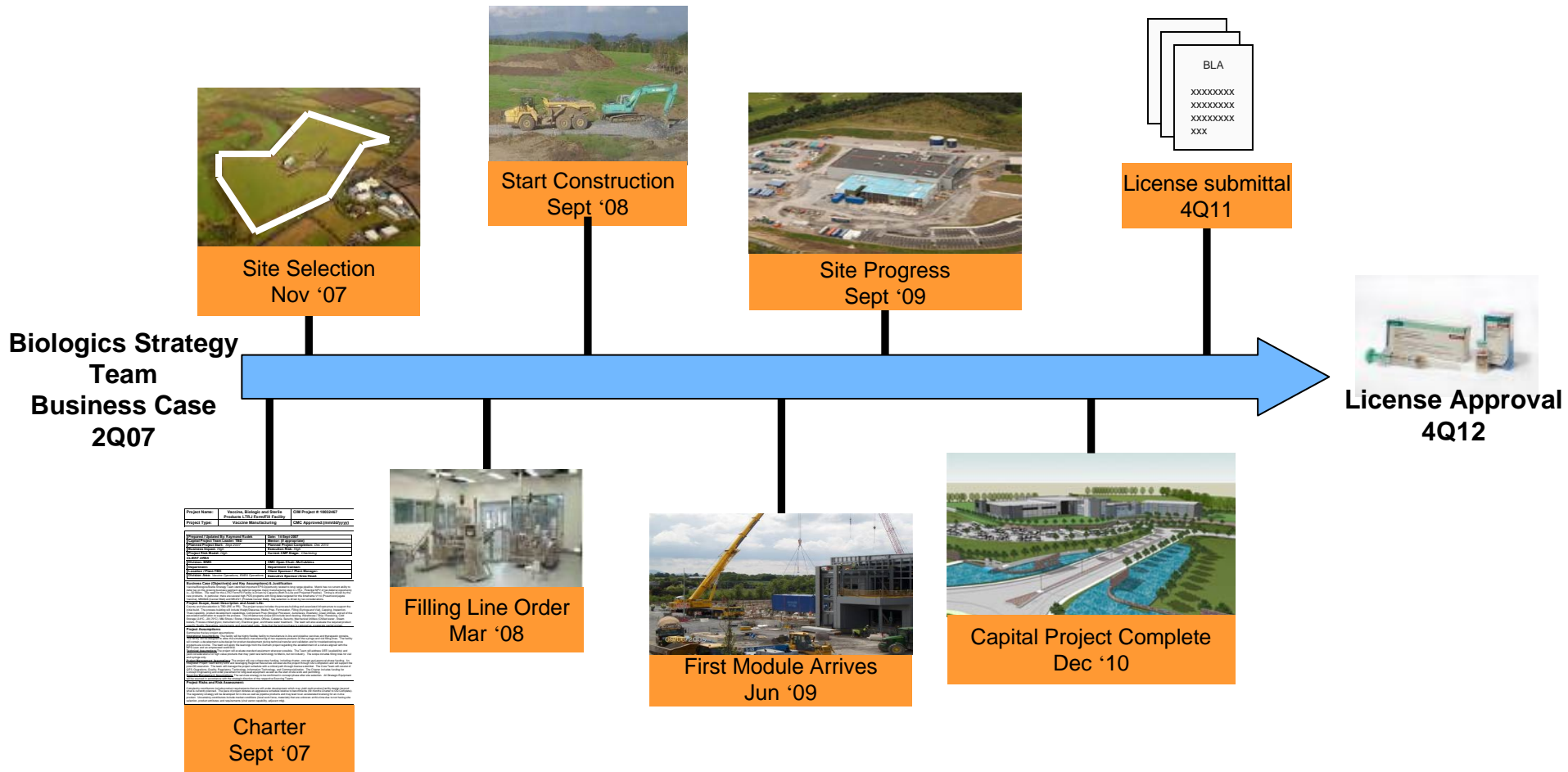
Driver for New Site Carlow

- Vaccine Sales growth to hundreds of millions to billions in the last 5 years – 18% of overall sales
- Range of products we will fill
 - Existing Products :
 - GARDASIL® cervical cancer
 - New products in development
 - (cancer, bone treatments, ear
 - infections)
- Initial Investment in Carlow €220MM
- Employment ~170 people during operations



Merck Vaccine Sales – Vaccine share of all product sales

Project Timeline





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The Benefits of MES in MSD

Benefits of MES

Priority	MES Benefit
1. Compliance	<ul style="list-style-type: none"> •Enforced Compliance of Work Rules & Quality •Equipment Management / Sterile Tracking •Reporting by Exception
2. Supply	<ul style="list-style-type: none"> •Cycle Time / Inventory Reduction •Increase RFT •Procedural Data Collection – Process Stabilization
3.Strategy	<ul style="list-style-type: none"> •Extend ERP deployment benefit •Enforced lean practices. •Empower people to focus on 5S and Kaizen.
4. Profit Plan	<ul style="list-style-type: none"> •Decrease Operating Expenses



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System Overview



Functional Overview - Automation at High Level

Enterprise

↑ Automated interface

Manufacturing
Execution
System

↑ Automated interface

Shop Floor

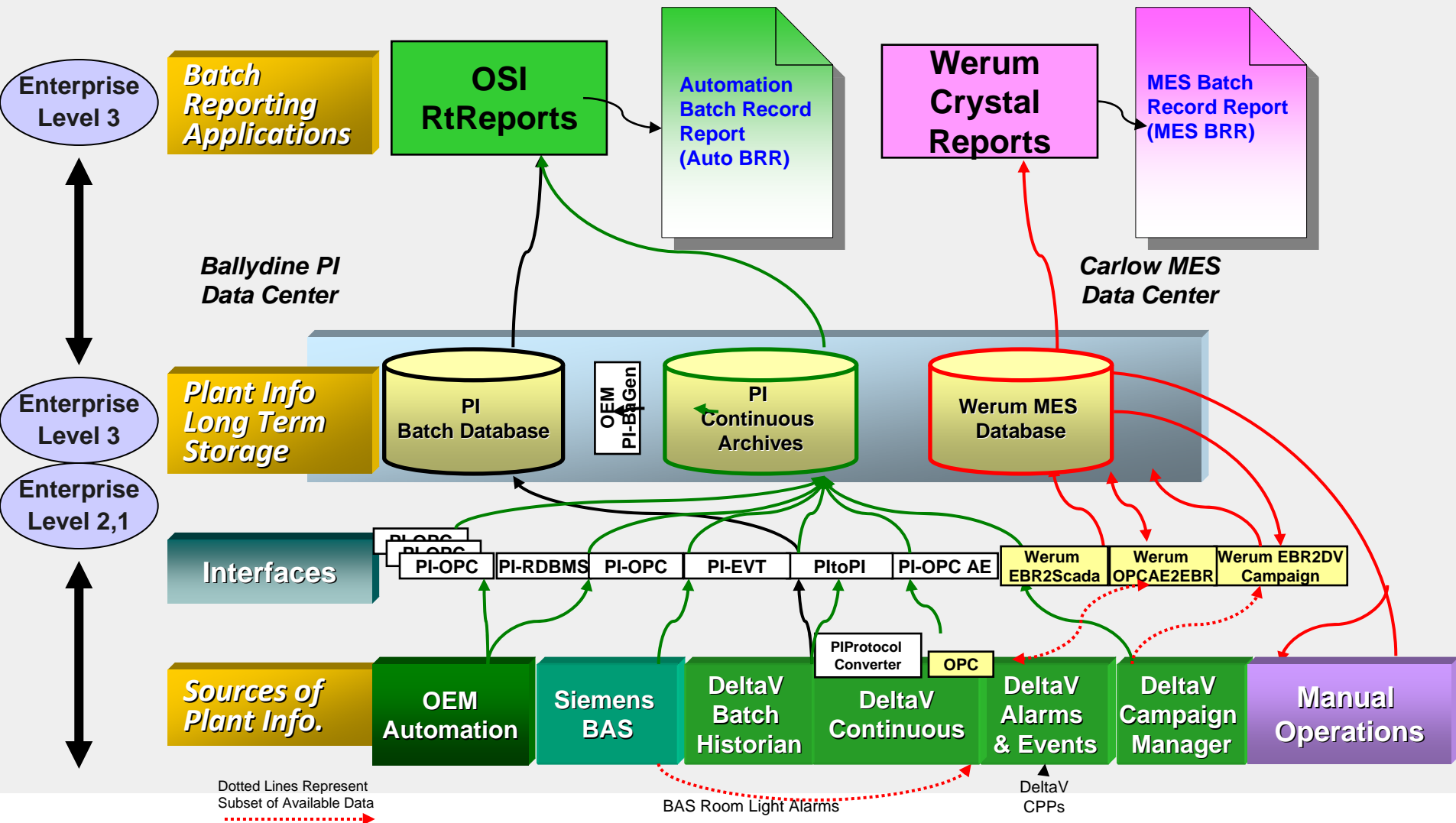
(People, Equipment, DCS)

Enterprise Resources Planning (ERP) – provides financials, order management, production and materials planning, etc.

Manufacturing Execution System (MES) is computer system used to coordinate, measure and control critical production activities. MES links the ERP system and the shop floor manufacturing people, equipment, and process automation systems.

Shop Floor – Where physical production takes place. DeltaV or local controllers control at this level.

Systems Landscape & Interface Diagram (Bottom Up)





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Deployment Methodology



Voice of Business

- Successful implementation through consistent use of deployment model
 - Make system lean-reduce implementation efforts (cost/time)
 - Reduce validation-SLC documentation/closeout
 - Eliminate redundancies/duplication
- Not lose sight of global standards
 - Consistent rules- e.g. Cleaning
 - Pre-defined business process based on predefined functionality.
- Low cost for implementation
- Low cost for system life cycle, make right decisions for lifecycle
- Fast delivery
- “Process” should not miss any requirements (gap analysis)



Fundamentals

- A globally developed, integrated suite of application
 - Minimize
 - Effort to deploy
 - Cost to deploy
 - Cost to maintain
- Built upon common, standard business requirements, business processes, and data structures
- Developed by a cross-functional team with input from all Stakeholders
- Integrated with other key Enterprise Solutions to maximize supply chain effectiveness



Deployment & Design Principles : Guidelines

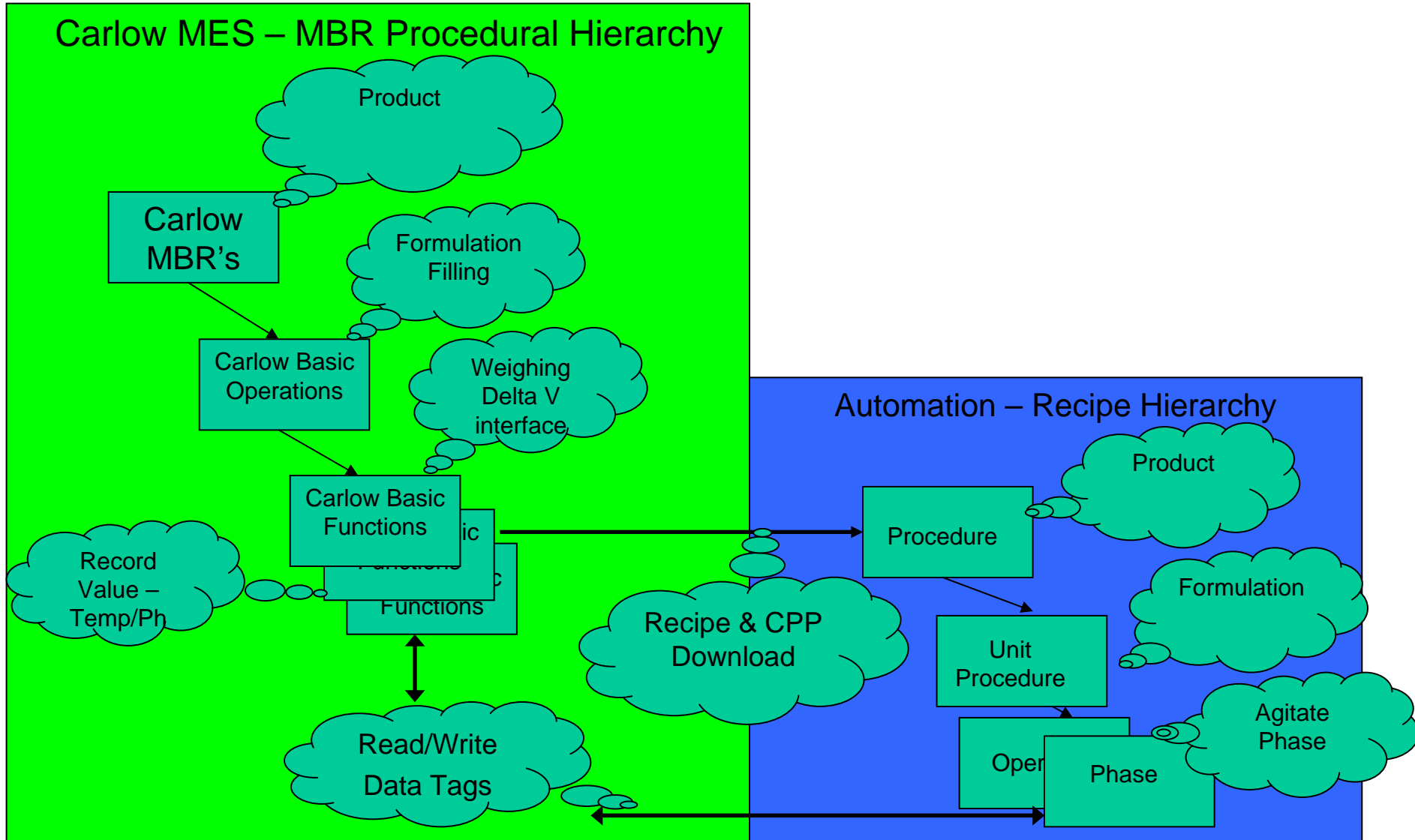
- PAS-X has been selected as it offers functionality required to meet Merck's business requirements globally
- Use out-the-box functionality – avoid customisation
- Align business processes with out-the-box functionality
- Adhere to the Merck System Architecture
- "80% is good enough"
- Implement a Merck Global Solution

This is a change of mindset - the project mantras:

Why is the standard solution not sufficient?

Trust The Process

S95 Integration with S88





Deployment & Design Principles : toolkit

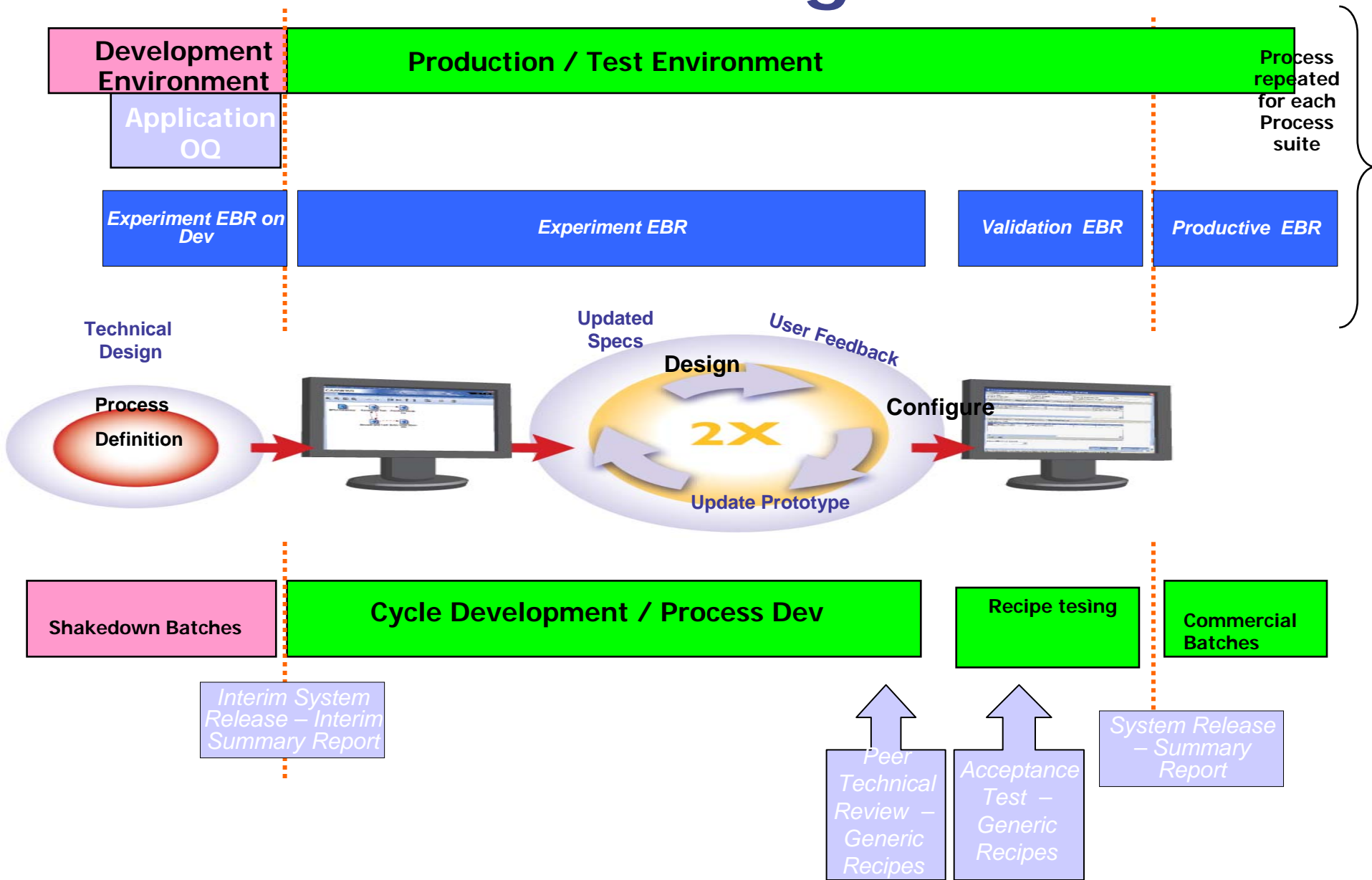
- Standard Basic Operation for Manual Weigh and Dispense
- Standard Reports and Labels
- Global SLC Deliverables
- Site SLC requirements
- Template Site SLC documents
- Global state diagrams
 - Cleaning
 - Calibration
- Validated Productivity Tool
- Proven Deployment Model



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Iterative Development

MBR Design, Development & Testing Plan



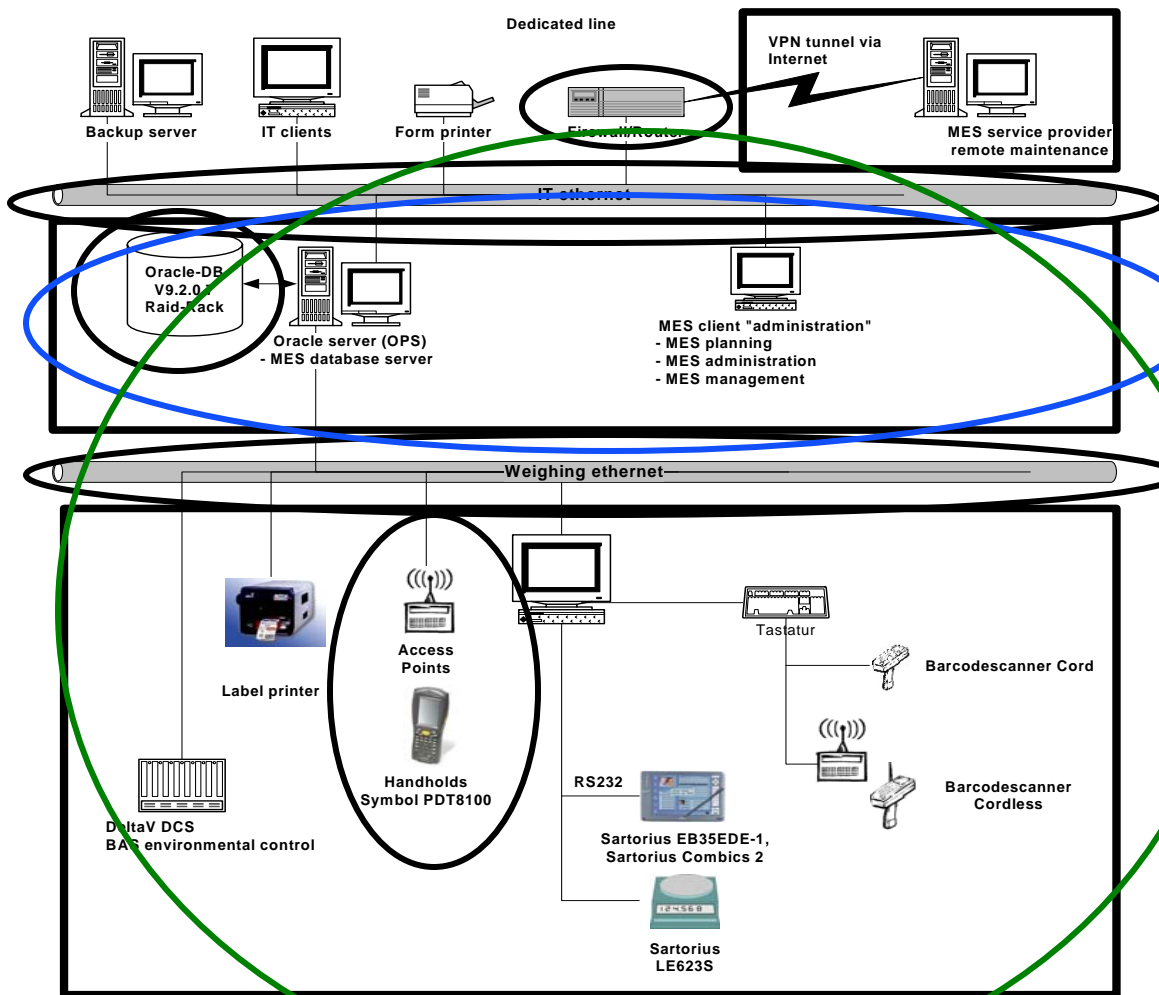


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Resource Requirements

Deployment & Design Principles: Participants Roles

Global IT



Global Team

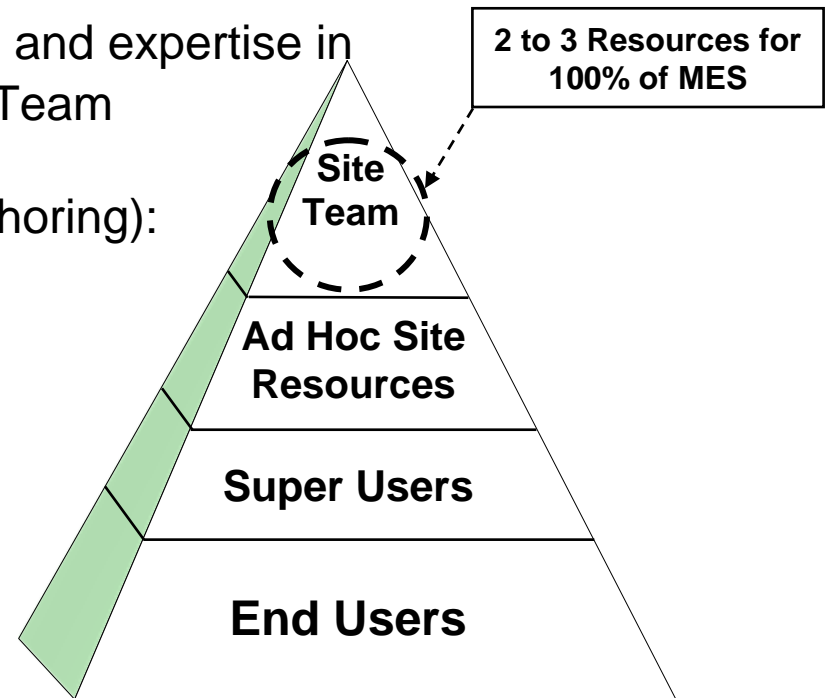
Site Team

Site MES Core Team Skills

- Site Team Members should be capable of becoming the Site MES system and process experts.

- Employees should be selected with skill and expertise in the following types of functions: - Suite Team

- Weigh / Dispense (Operations)
- EBR Operations (including MBR authoring):
 - Manufacturing
- QA :
 - Record Review
 - Reports and Information
- Materials Management
- Scheduling / Planning
- Technical Administration



Note: May select candidates that can cover multiple functions.



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Success Factors

Keys to MES Project Success

- Knowledge of the Manufacturing process
- Gaining experience with Werum's PAS-X system
- Learning how to integrate Automation Systems to PAS-X
- Define Requirements early in the process and use iterative development



Keys to MES Project Success

- Automation development methodology
 - Guidance documents
 - Prototyping processes
 - Dedicated central development labs and staging environments
- Automation deployment methodology
 - Ability to remediate automation, run in local mode then integrate when EBR is ready
 - Maximum flexibility to accommodate production schedules

P2ESM Keys to MES Project Success

- Implement an efficient change control process
- Use Phased release – allows for successful parallel deployment and continued downstream process development/testing.
- When developing keep business continuity as design feature
- Develop recipes and testing strategy using FMEA tools



Critical Success Factors for Sustainability

- IT infrastructure and systems architecture
 - High-availability and redundancy for critical process systems
 - Comprehensive security measures of integrated automation network segment
 - Full data, product, production protection with virtually 'zero' loss due to IT
 - Standardized computer systems and infrastructure technology adds robustness

- Senior management commitment with Plant level ownership
- Standardize on processes and approach
- Strong Project Team with all core functions represented
- Engagement, Engagement, Engagement!!

Questions

