

Design-Driven Enterprise From Design to Manufacturing

For custom-engineered projects (ETO)



22.04.2022

Our model company

Conveyor Solutions AG is a manufacturer of

- components
- equipments
- systems

for sorting and transporting of luggage or packages.

They

- configure to customers needs (CTO/MTS),
- design customer specific solutions (ETO, CTO+),
- manufacture in large quantities.



Conveyor's Challenge

Senior management would like to

- Become more **customer centric** and **agile**
- Reduce **cost** and **workload**

Now we focus on **their project business** unit.

Can they use the same **standard MES system** to manufacture custom-designed solutions, which was chosen for their configurable products business?

(See webinar 2 for the configurable MES scenario)

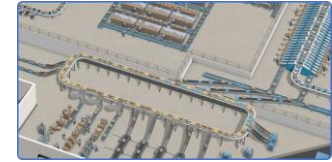


**What capabilities are required to solve
Conveyors' business challenges?**



DESIGN-DRIVEN ENTERPRISE

Engineer to Order (full scope)



BID PURCHASE

TECHNICAL PLAN

ENGINEER

PURCHASE PLAN

MANUFACTURE

DELIVER INSTALL INVOICE

OPERATE

BID

- Inquiry Intake
- Design Collaboration with Customer
- Quotation Specification
 - Receive und store customer requirements.
 - Create BID-TOS (from Template, from scratch or from Excel-Input).
 - Create Solution proposal (Drawings, Specs, etc) und send them to the Customer by Document Control Center (Collaboration).
 - Negotiation of the solution proposal.
- Quotation Costing
 - Start Easy-Cost Planning
 - Calculate cost
 - Create a SAP offer/bid (SD – based on commercial product) and do the pricing based on the calculated costs.

PURCHASE

- Design & Purchasing Collaboration with Supplier

TECHNICAL PLANNING

- Basic Design for all disciplines
- Create Layouts for the plant
- Proof the bid content
- Define activities for quality and material management

ORDER FULFILLMENT

- Create customer related to quotation
- Fine tuning of work breakdown structure, the TO and its links (Networks, Milestones)
- Detailed scheduling of the project (PS)
- Cost estimation based on networks and its activities
- Cash management, invoice and billing plans, down payment processing
- Budgeting
- Release of structures (Project versions)
- Execute first down payments (if required)

TECHNICAL DESIGN

- Detailed Design for all disciplines
- 3D-mechanical engineering with PLM-direct integration
- Material take out
- Planning of production 6 procurement (PS)
- Collaboration with customer & suppliers
- Release of documents for next phase
- Manufacturing Work Instructions, Routing, Quality management
- Service-BOM, Documents, Planning

ORDER FULFILLMENT

- Release Advance Procurement
- Invoicing of Suppliers
- Confirm engineering hours
- Concurrent project costing
- Claim management

PLANNING

- Release Engineering position in TOS for production or procurement (growing structure)
- Integration of TOS and project management creates automatically production and procurement orders
- Costing based on the now available product information
- Scheduling of production orders and procurement orders
- Capacity analysis and optimization of production (PS-PPDS)
- Hand-over production orders to MES
- Change Management
- Track procurement orders

ORDER MANAGEMENT

Release of production orders

ASSEMBLY

Work Instruction

INLINE QUALITY MANAGEMENT

Recording of data collection in the product history record (digital twin)

MACHINE INTEGRATION

DELIVERY

- Delivery directly from the project
- Dispatch and transport processing
- Site Processing
- Confirmations
- Procurement of Installation Material and Services
- Project/Site Controlling
- Invoicing (vendor)
- Billing (Customer)
- Cash-Management

ORDER FULFILLMENT

- Release Advance Procurement
- Invoicing of Suppliers
- Confirm engineering hours
- Concurrent project costing
- Claim management
- Acceptance of the complete delivery by the customer
- Analysis based on POC (Percentage of Completion)
- Final Billing to Customer

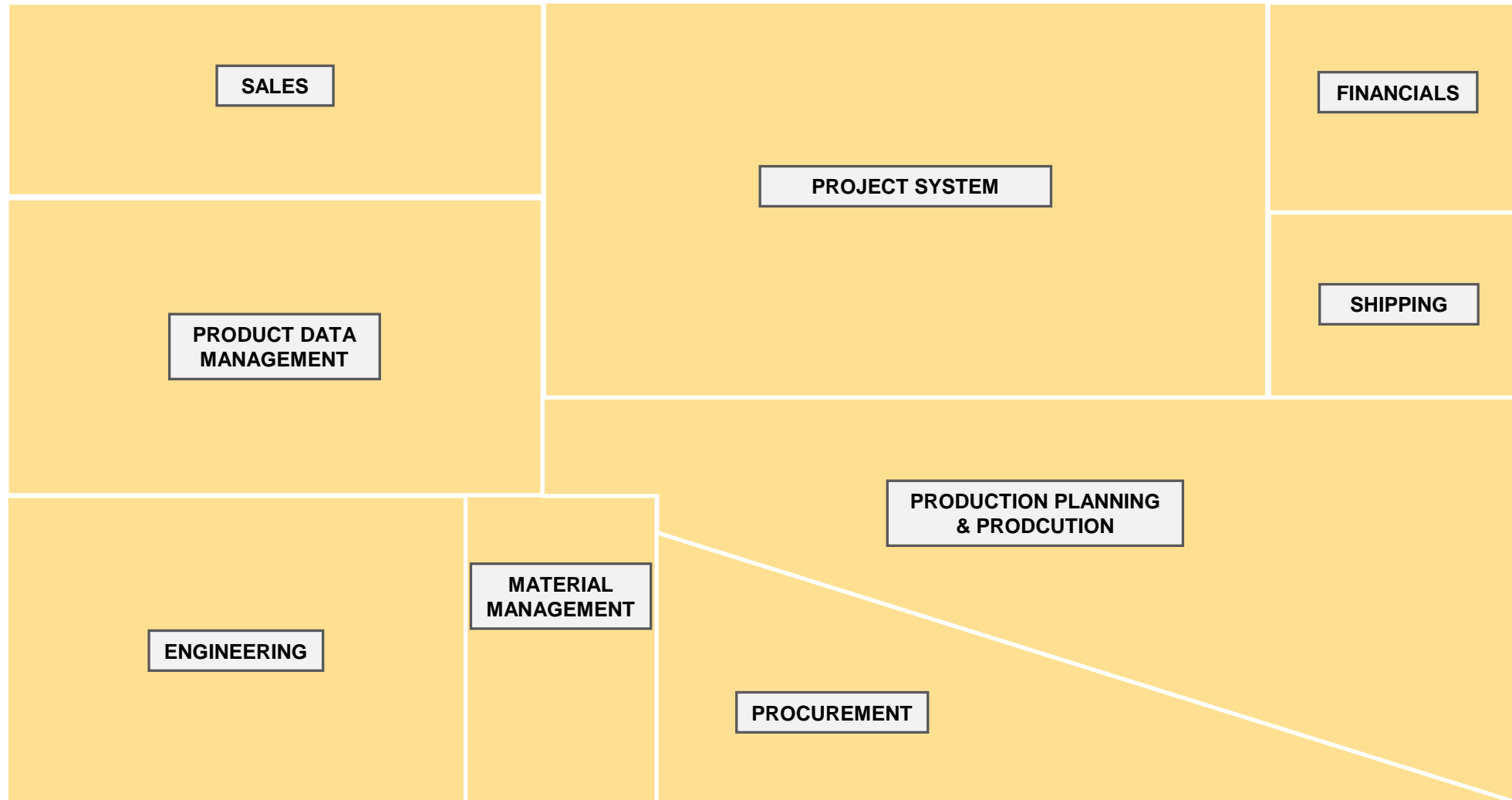
INTELLIGENT ASSET MANAGEMENT

Providing Digital Twin (as installed, as maintained) to service providers and IOT services

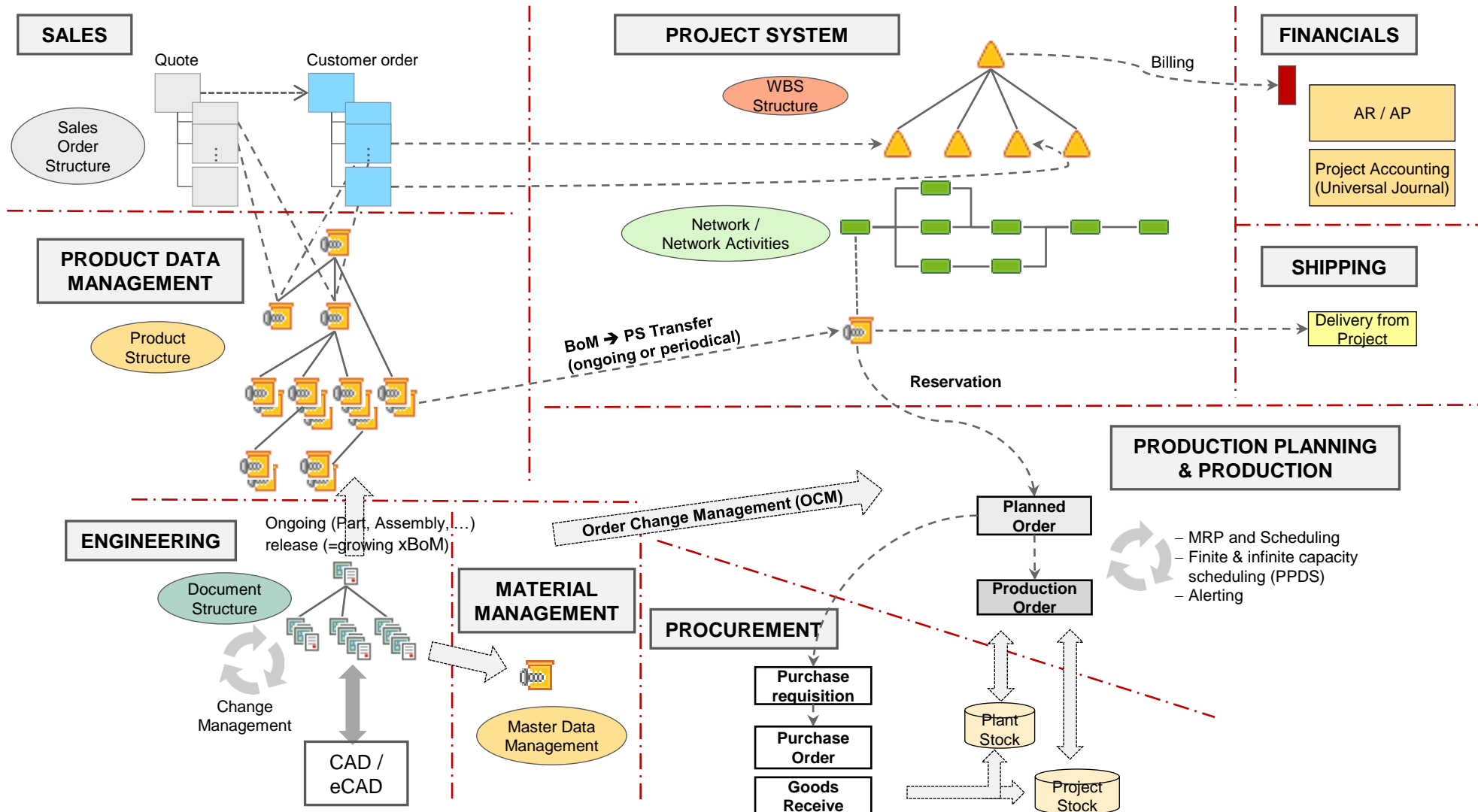
SERVICE MANAGEMENT

- Ticketing
- Service-Ausführung
- Service Order Execution
- Visual Spareparts
- Visual Service-Instructions
- Digital Twin Insight
- Digital Twin Monetization

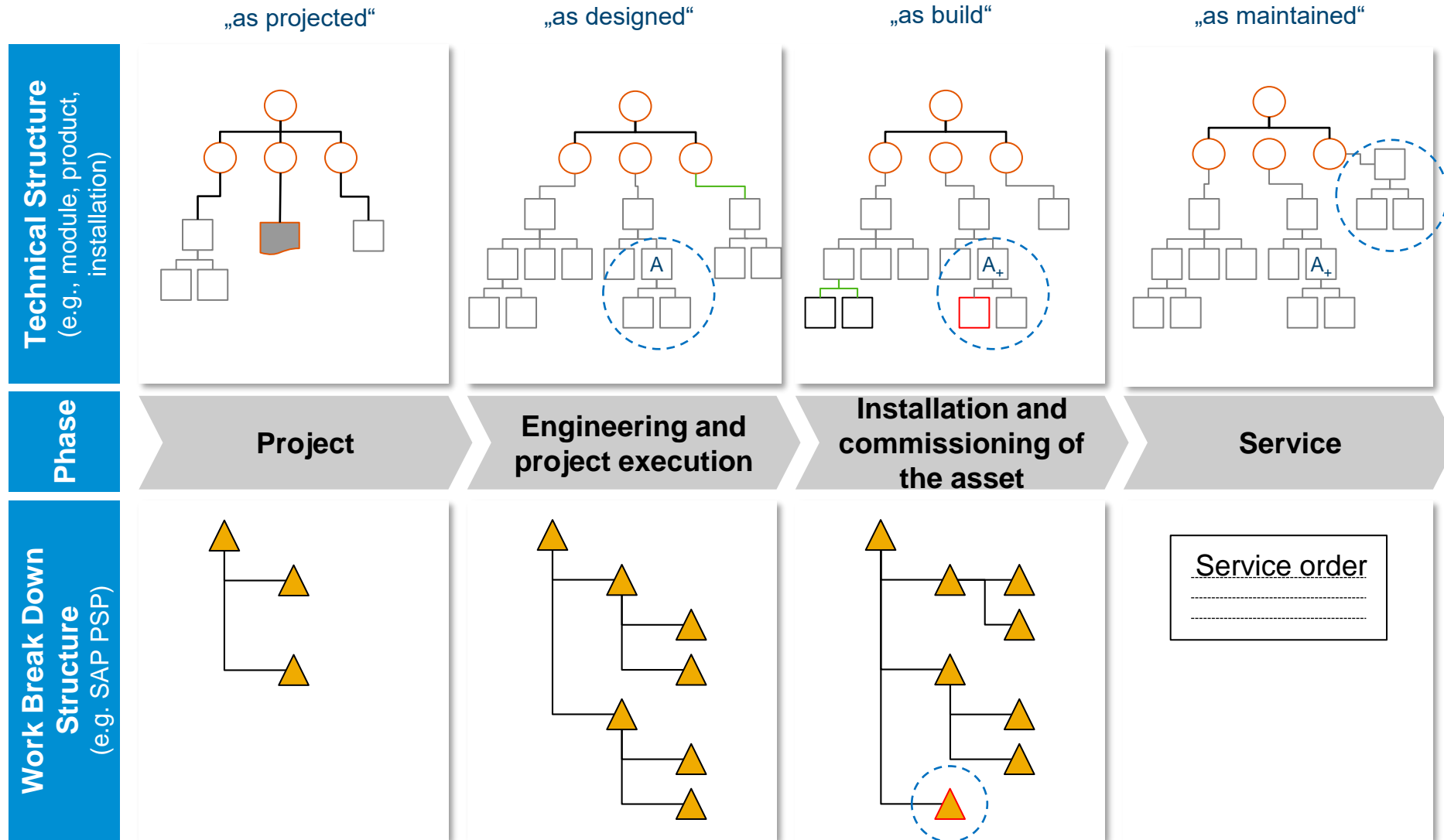
Design-driven Enterprise Architecture for ETO



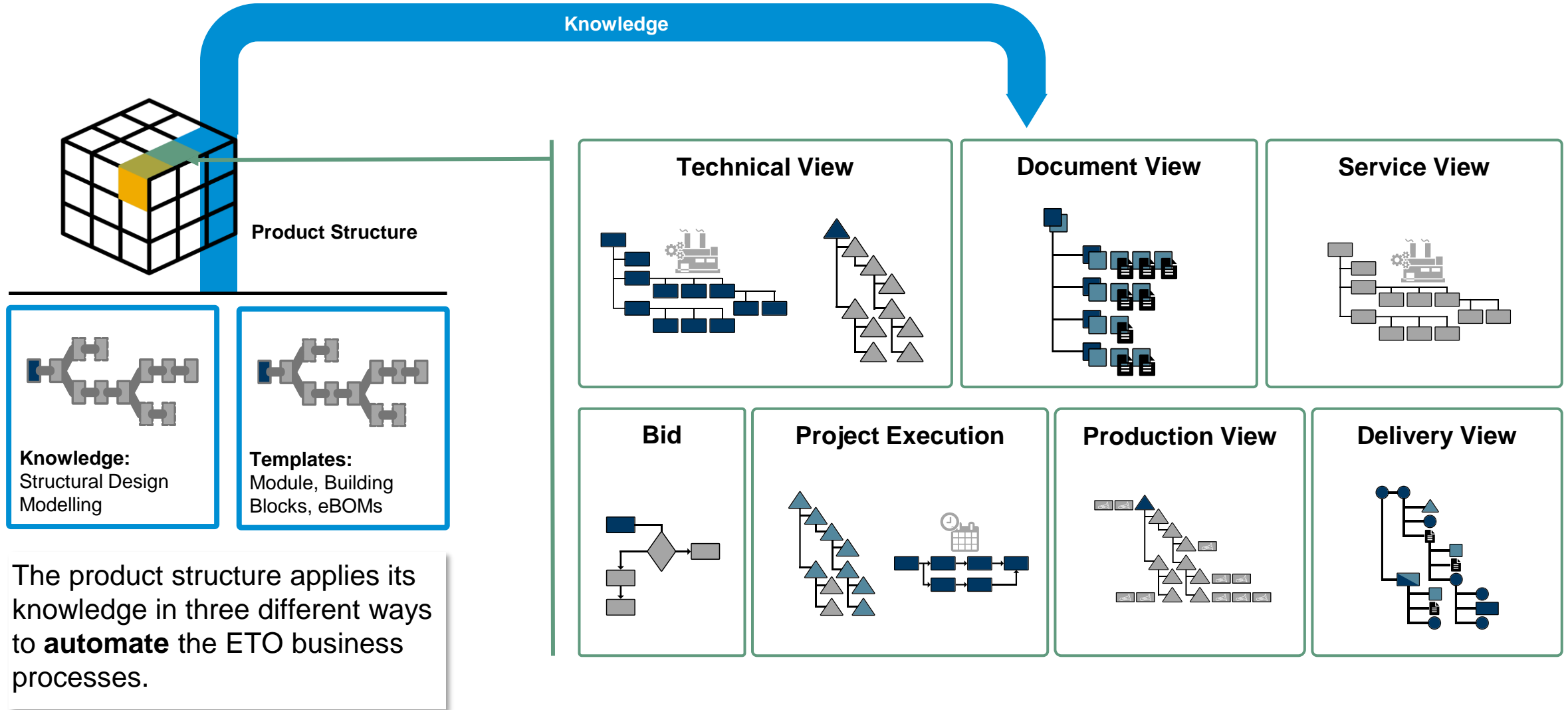
Design-driven Enterprise Architecture for ETO



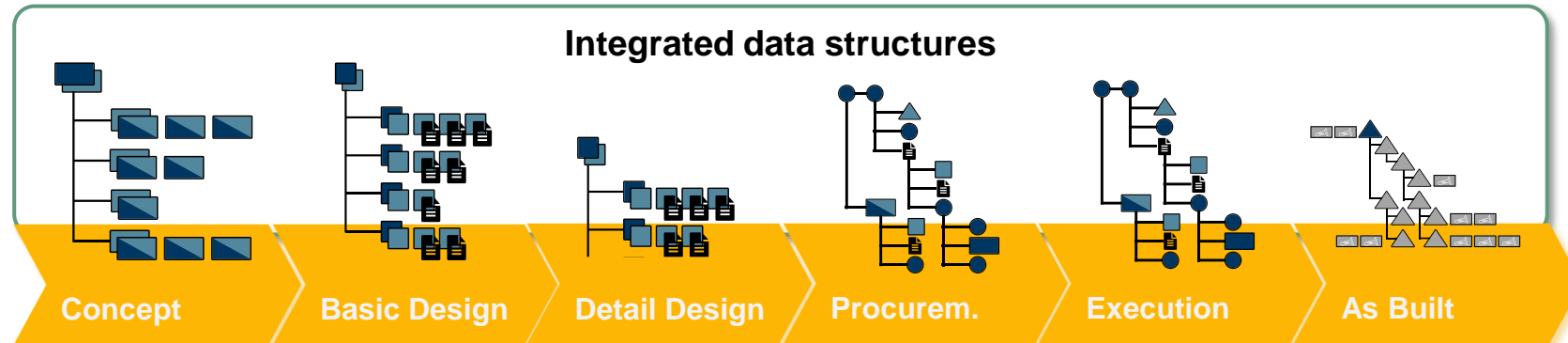
Each phase requires special structures



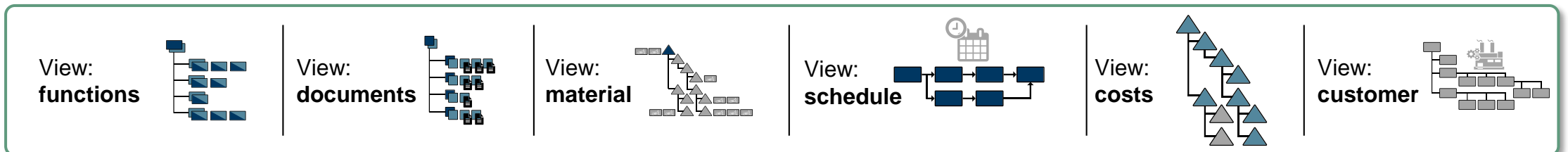
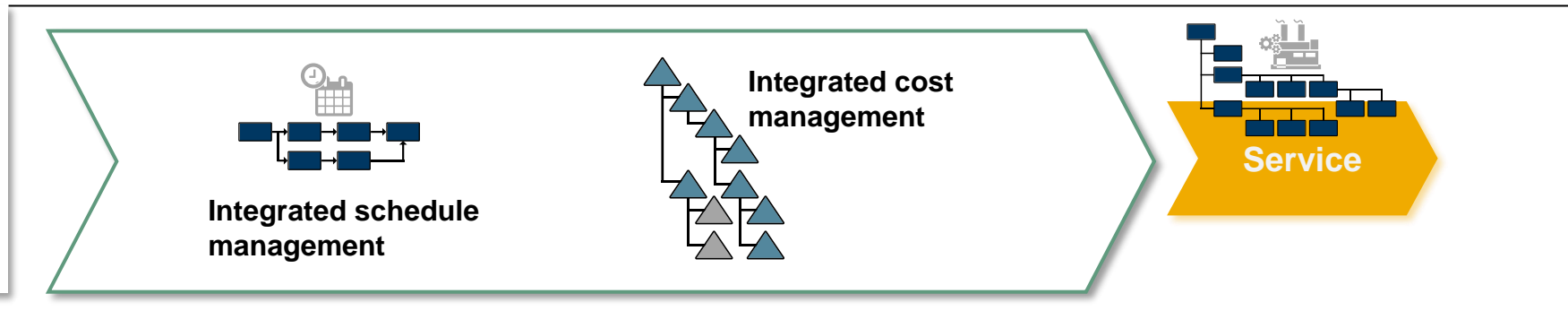
Design-Driven Enterprise: Product Structure Automation



Design-Driven Enterprise: Product Structure Integration

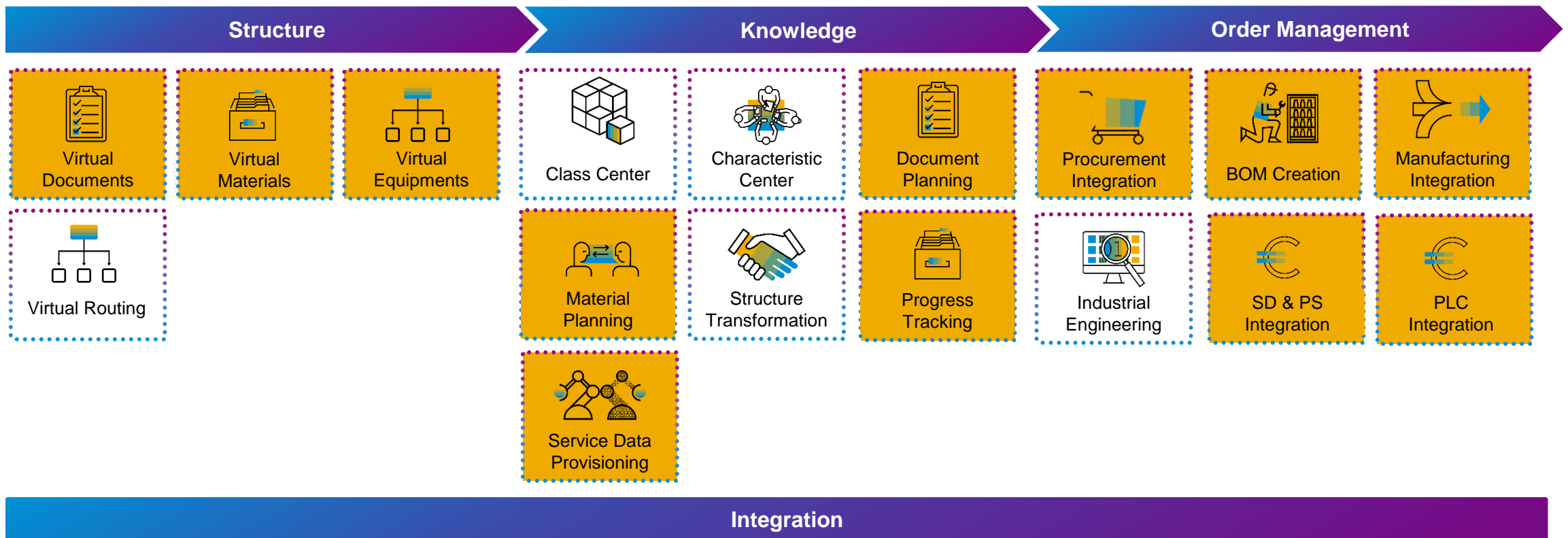


The product structure knowledge results in a **seamless integration and automation** of the ETO process.

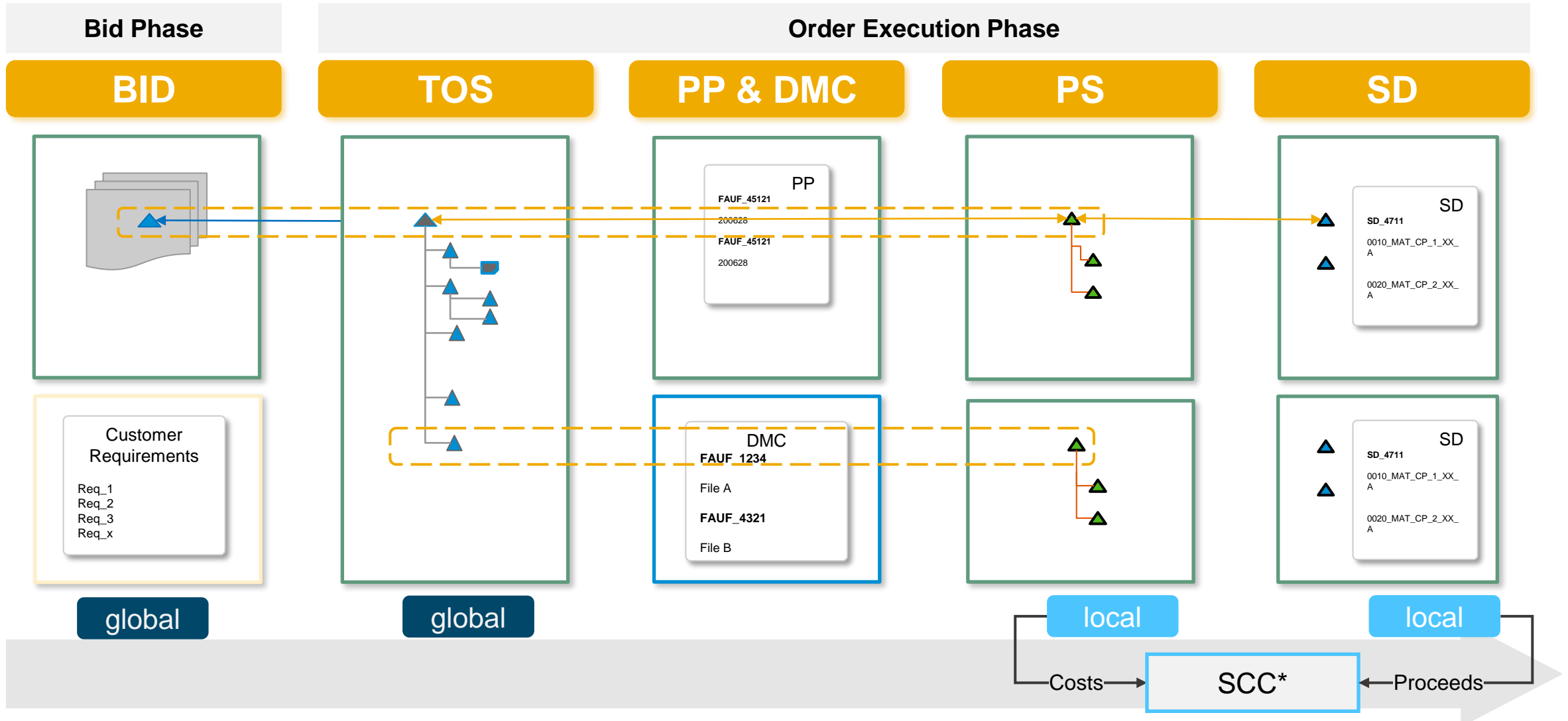


The business processes in SAP PPG are designed to help our customers address the needs of the design-driven enterprise.

Business Processes in SAP Product Process and Governance

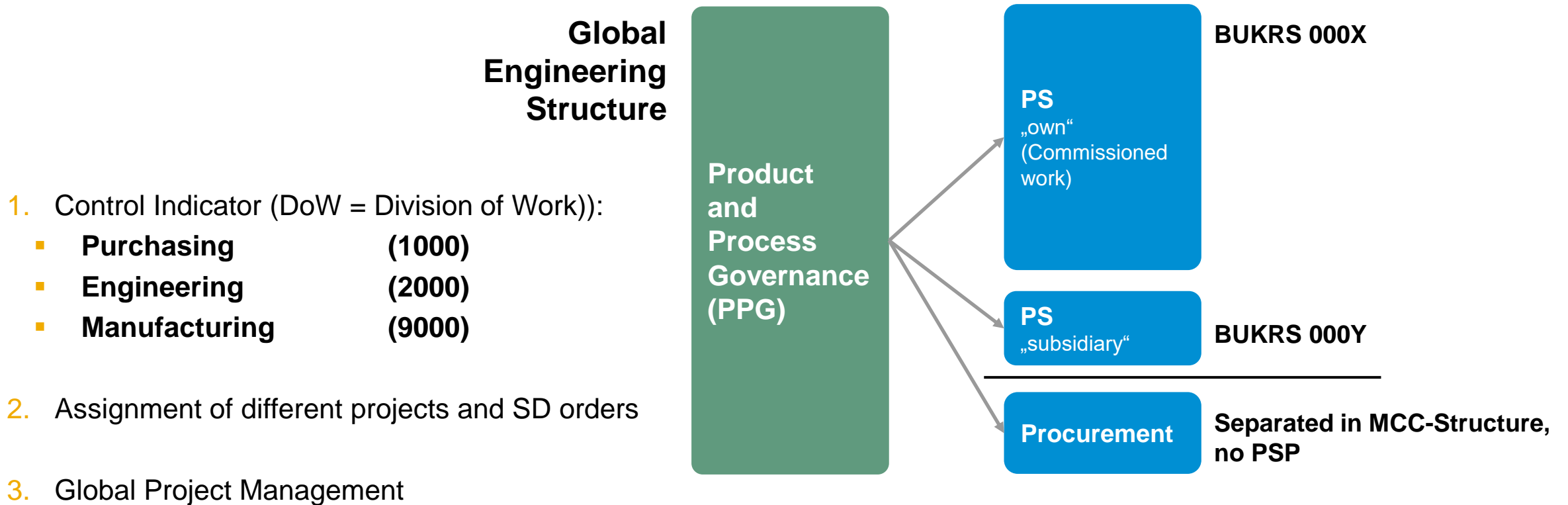


Overview – PPG Capabilities 1: Automated PS-Integration

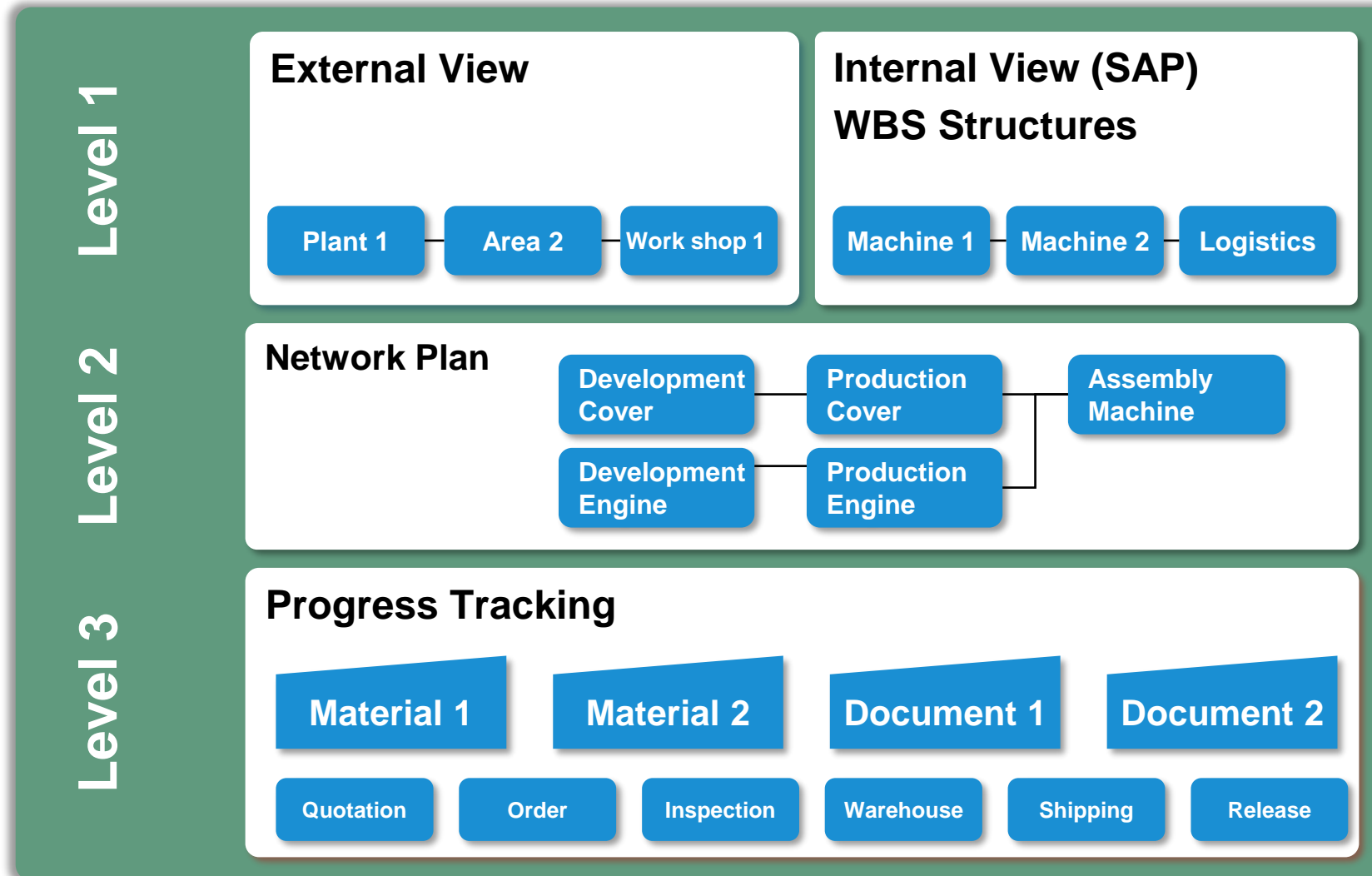


Overview – PPG Capabilities 2: Multi Project Assignment

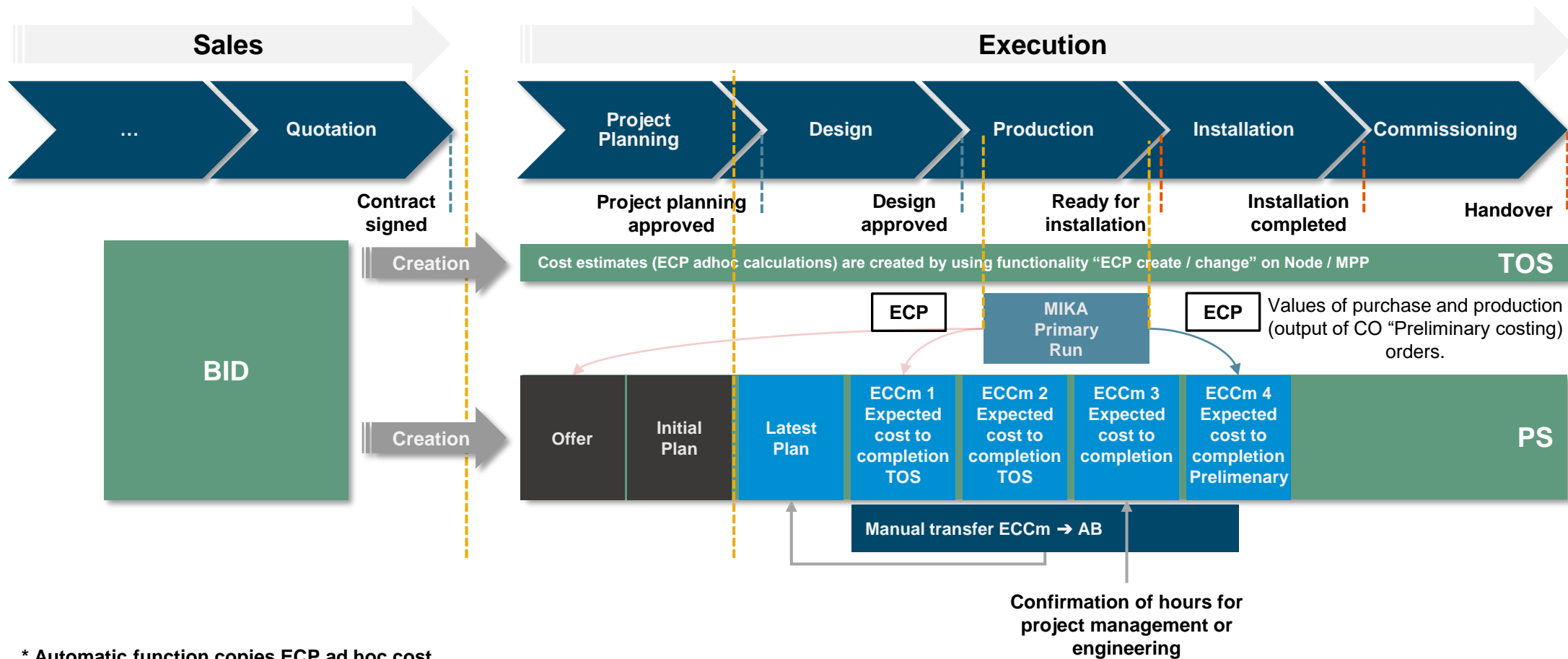
Example: Global cross-company code supplies and services determination



Overview – PPG Capabilities 3: TOS Integrated Progress Tracking



Overview – PPG Capabilities 4: Concurrent Project (Manufacturing) Costing

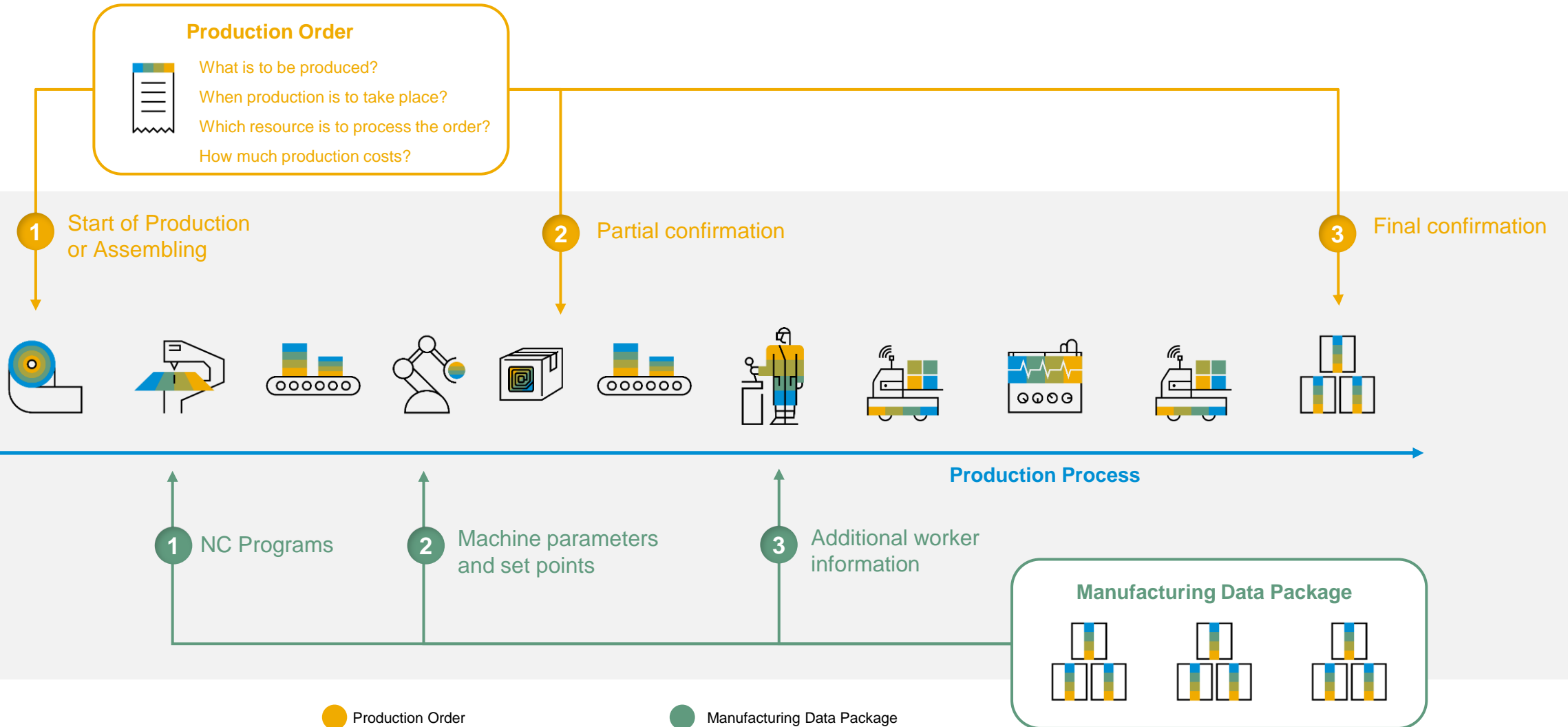


* Automatic function copies ECP ad hoc cost estimates to ECP PS cost estimates including linkage ECP / TOS / PS.

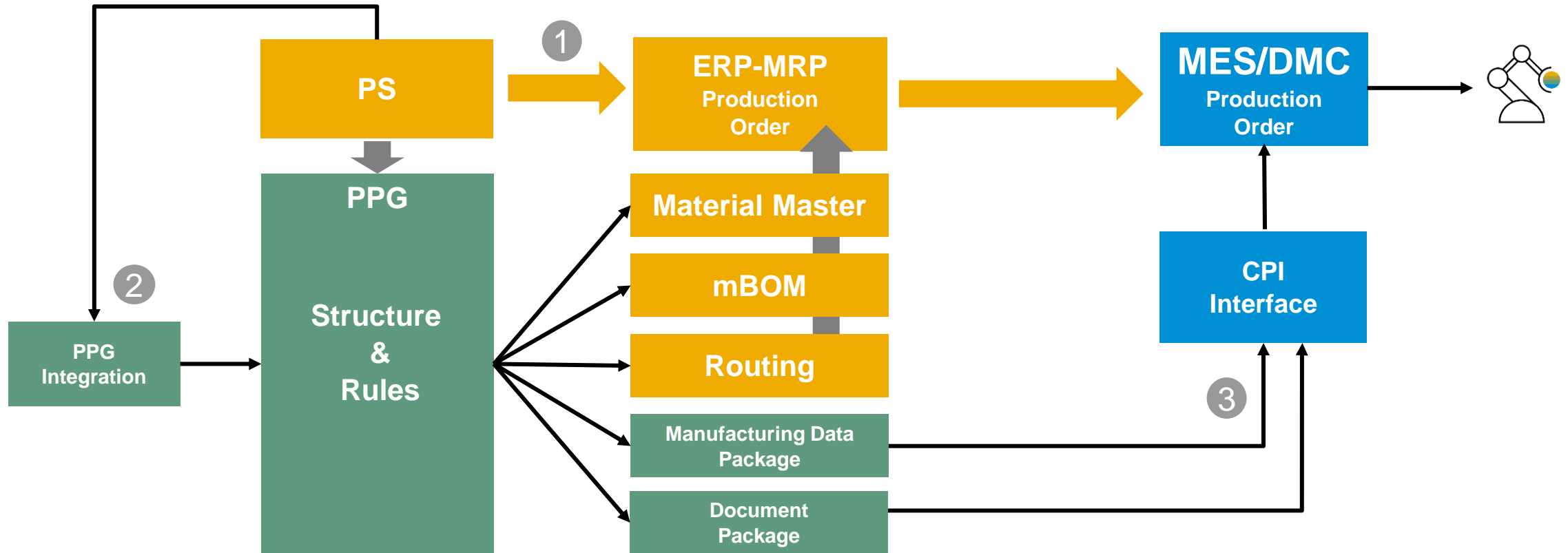
How do we solve Conveyors' business challenges in manufacturing?



Manufacturing Information Flow



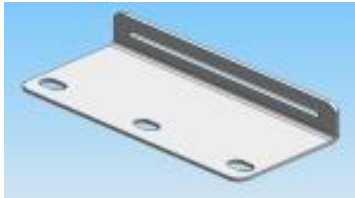
Automated Generation and integration of Manufacturing Data Data



1. The TOS defines the product und generates a production order.
2. The PPG integration and data model assigns or generates the specific production data for released nodes.
3. To provide more detailed data for each production order to MES a manufacturing data package is generated.

Example – Lot size 1 – Manufacturing Phases

Manufacture of components



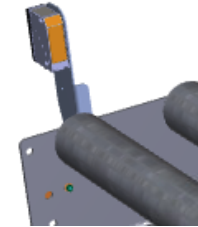
1. **Material View:**
 1. **Raw Material**
2. **ERP Routing 01:**
 1. **Activity 10: Cutting**
 2. **Activity 20: Bend**
3. **Manufacturing Data Package:**
 1. **Details for laser controller**

Phase 1 – Base Frame



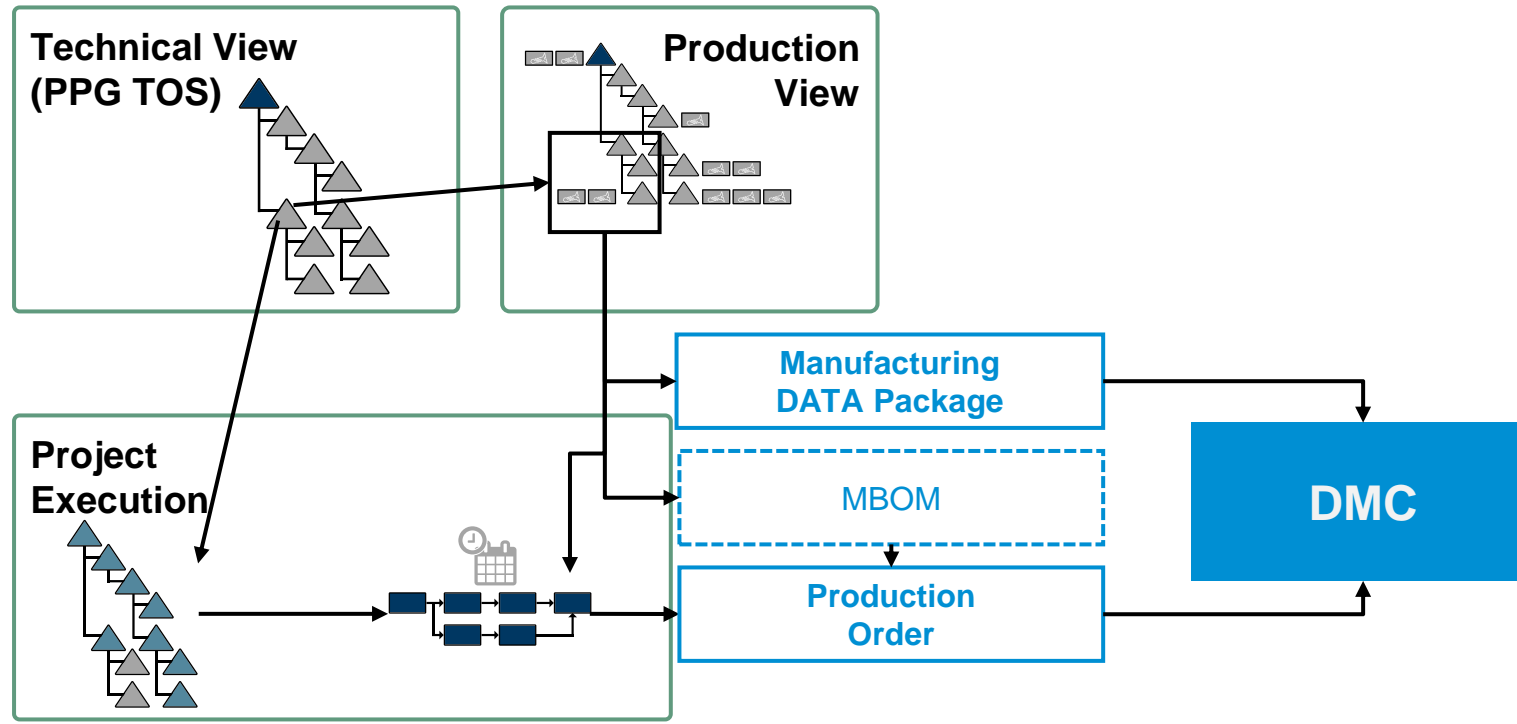
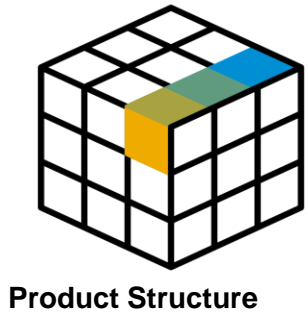
1. **Material View:**
 1. **Side Panel**
 2. **Roller**
 3. **Screws**
2. **ERP Routing 02:**
 1. **Activity 10: Assemble**
3. **Manufacturing Data Package:**
 1.
 2.

Phase X – Optical barrier

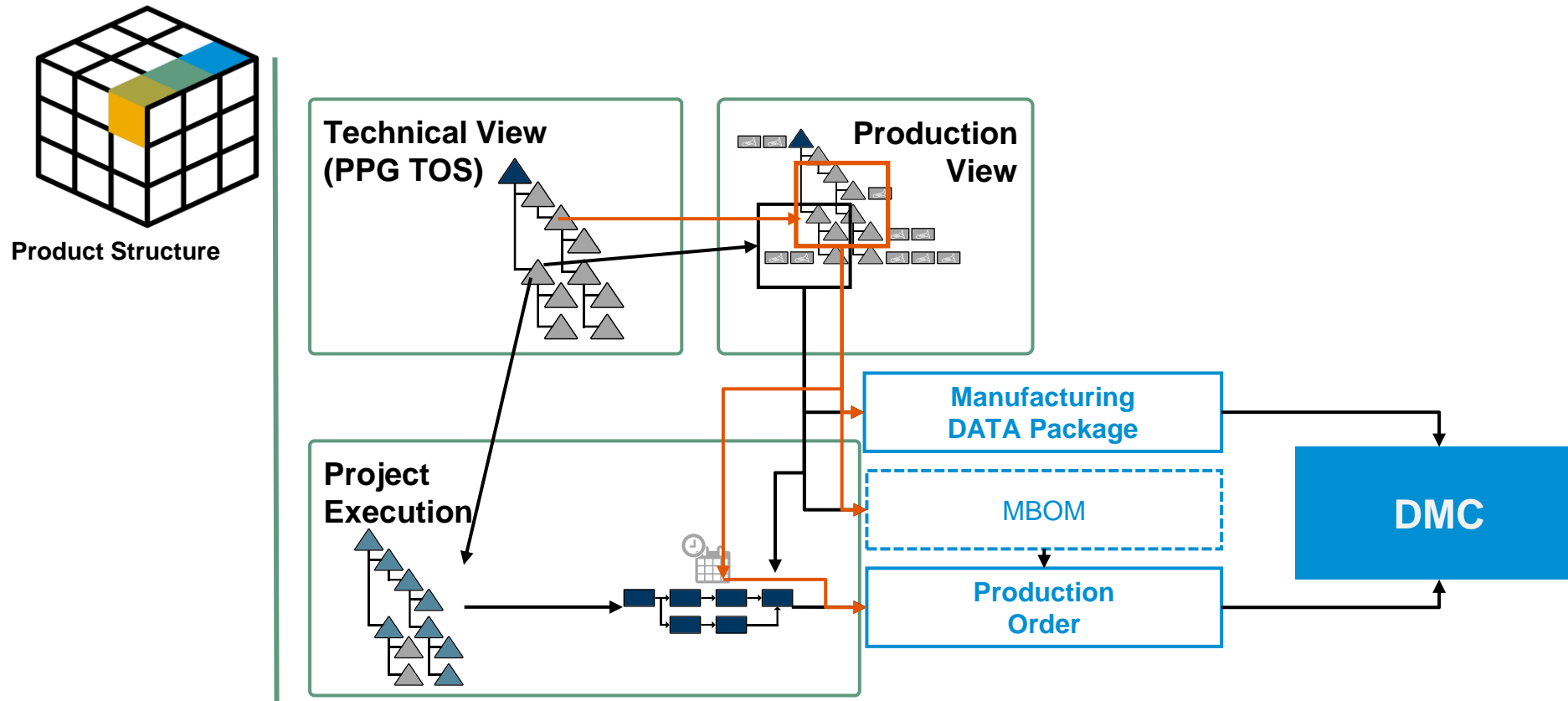


.....

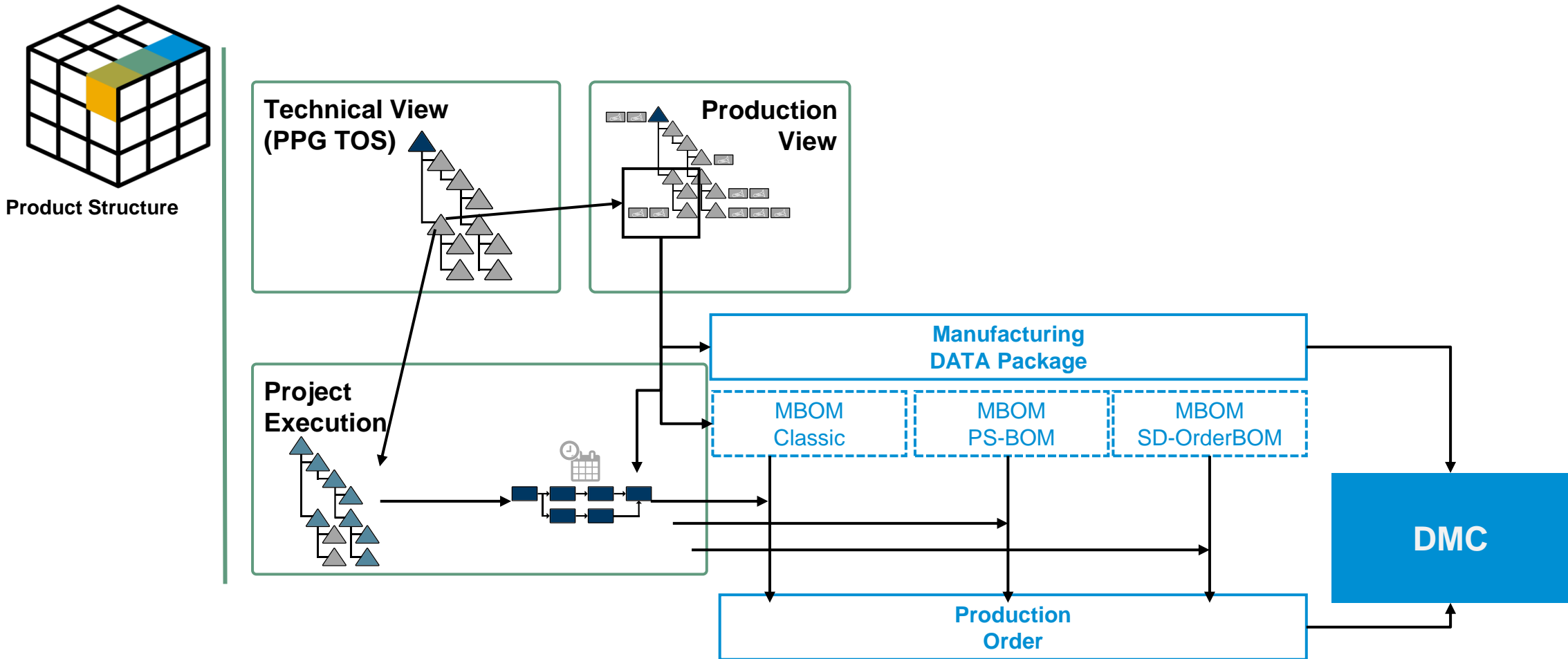
Hand-over to Manufacturing: Overview



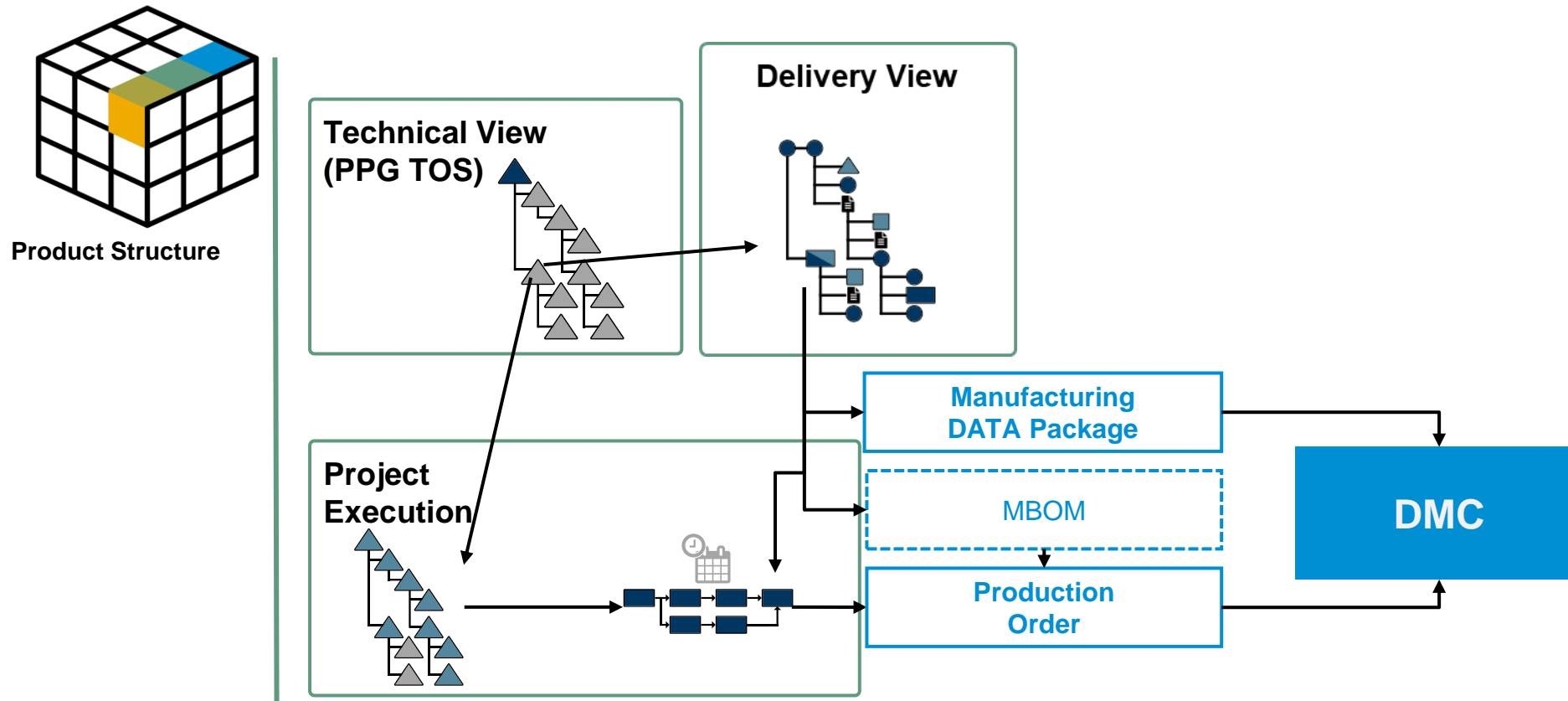
Hand-over to Manufacturing: Network Plan and Release to Manufacturing



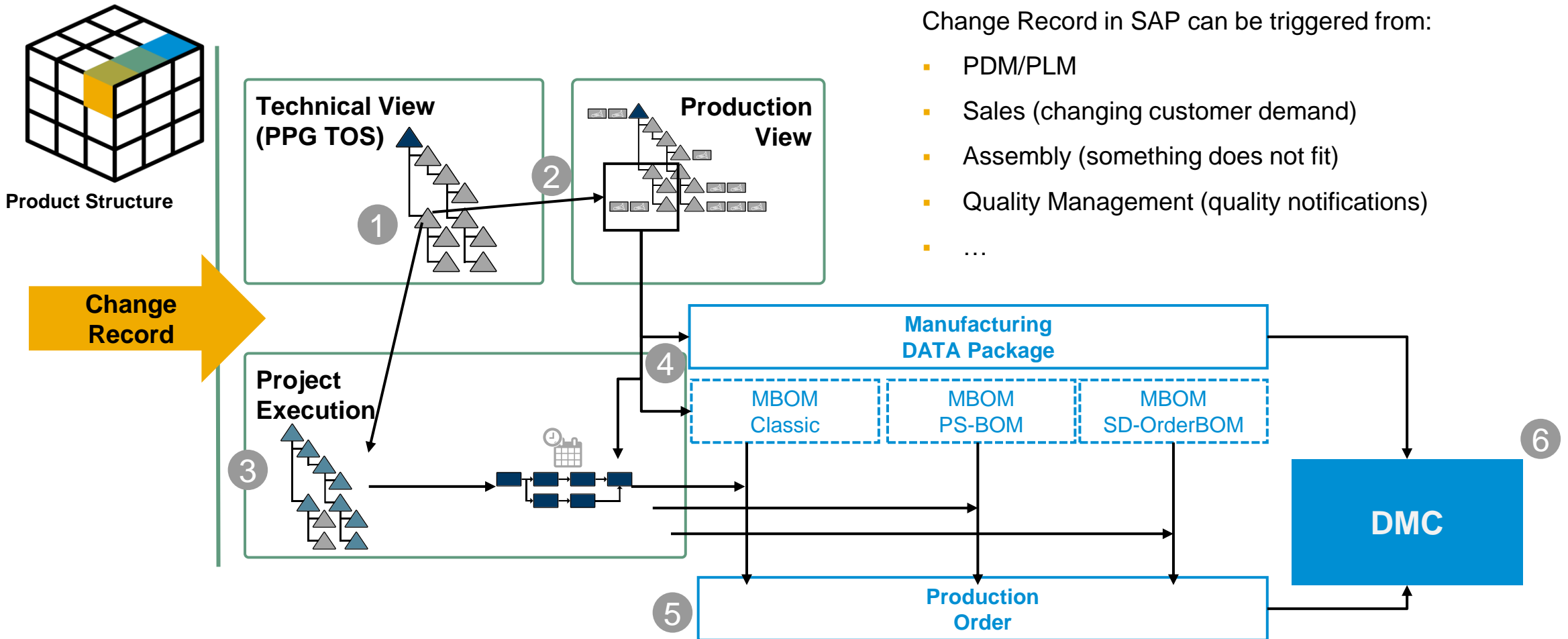
Hand-over to Manufacturing: Different BOM-types are supported



Hand-over to Manufacturing: Disassembly is supported



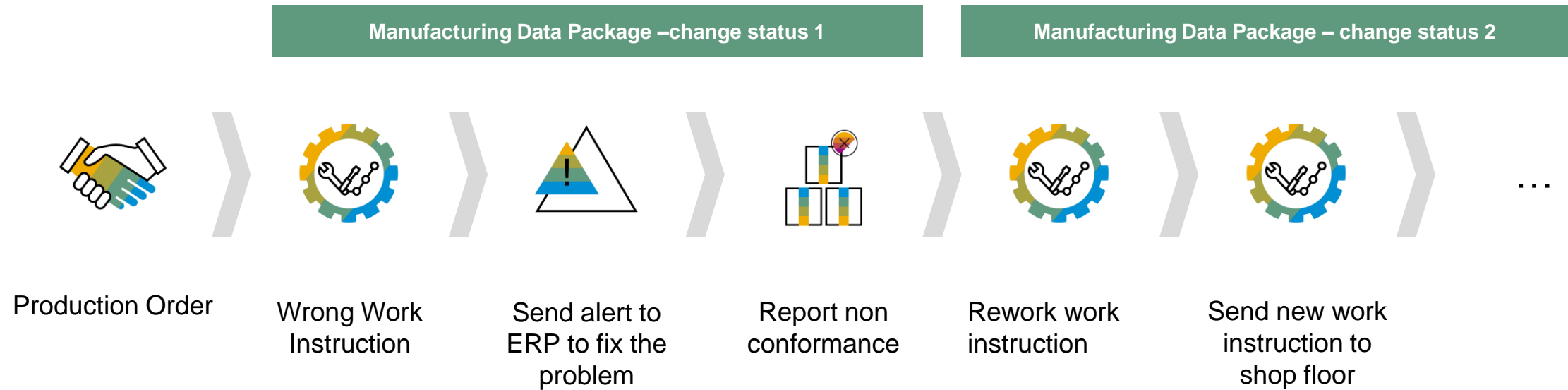
Hand-over to Manufacturing: Change Management is supported



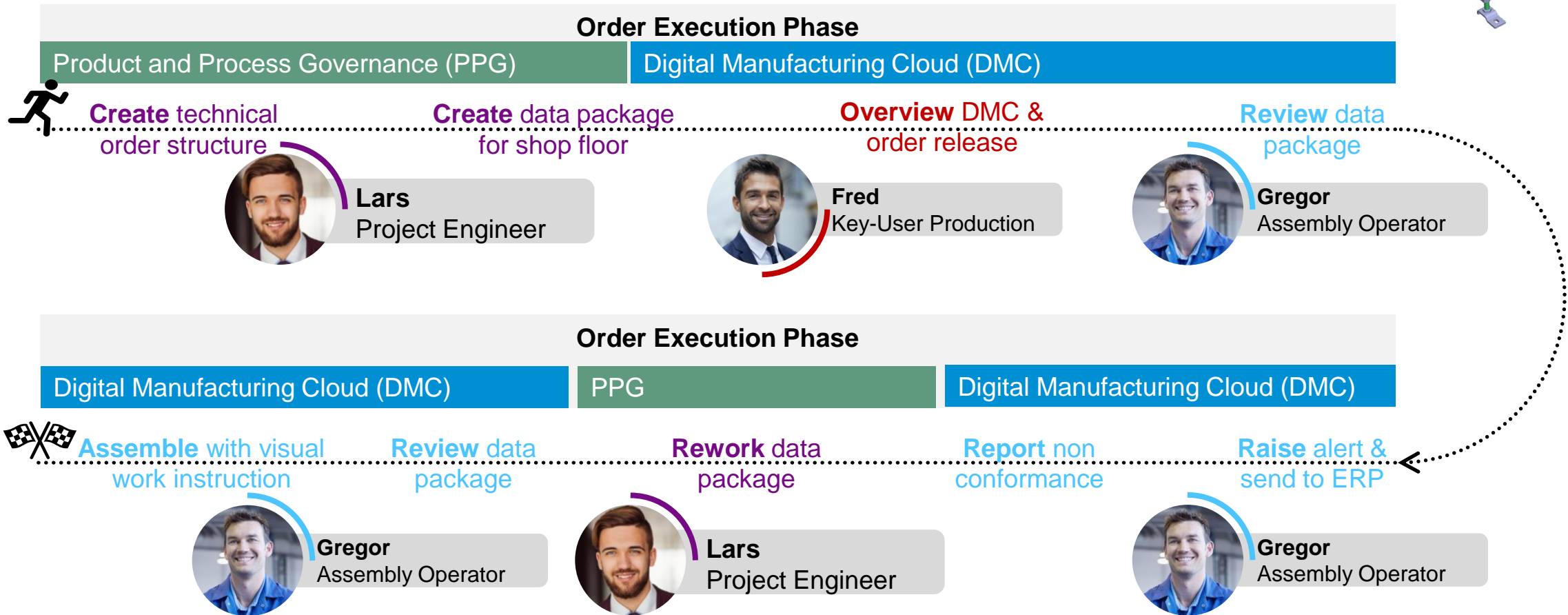
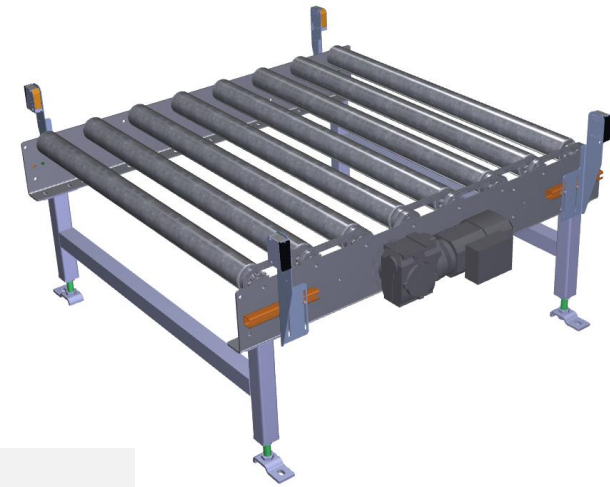
How will Conveyor work within SAP in the future?



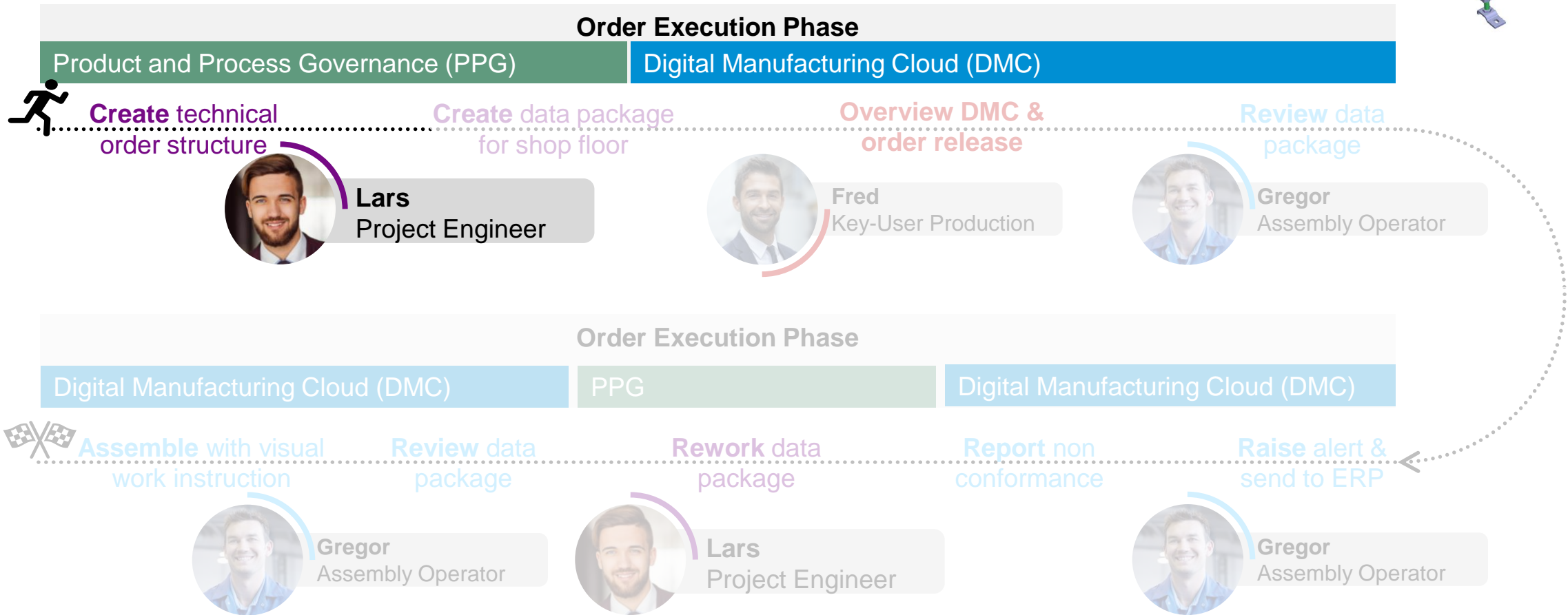
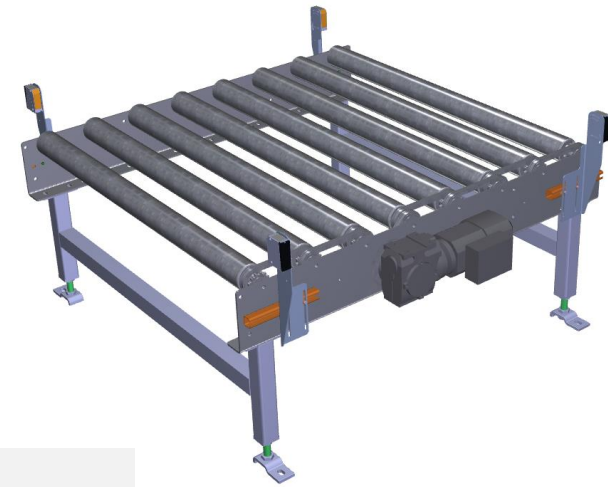
Simplified Process Flow



From Design to Manufacturing: Detailed Process Flow



From Design to Manufacturing: Detailed Process Flow



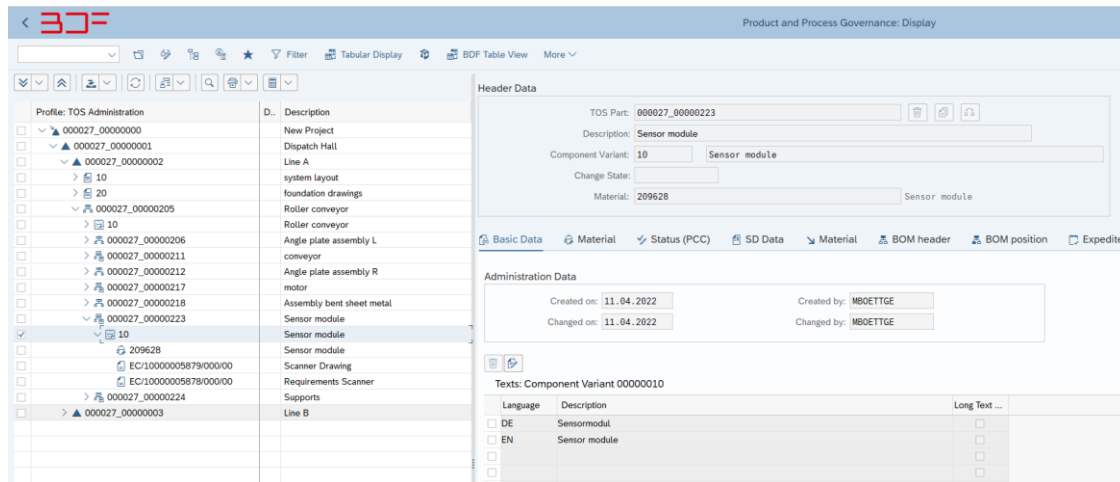
Create technical order structure

Business Outcomes

“As an **Project Engineer**, I want to create the product data so that downstream processes can be executed automatically.”



Lars
Project Engineer



Process Highlights & Benefits



In the **technical order structure (TOS)** the allocation of the scope of supply and services (LLU indicator) is planned.

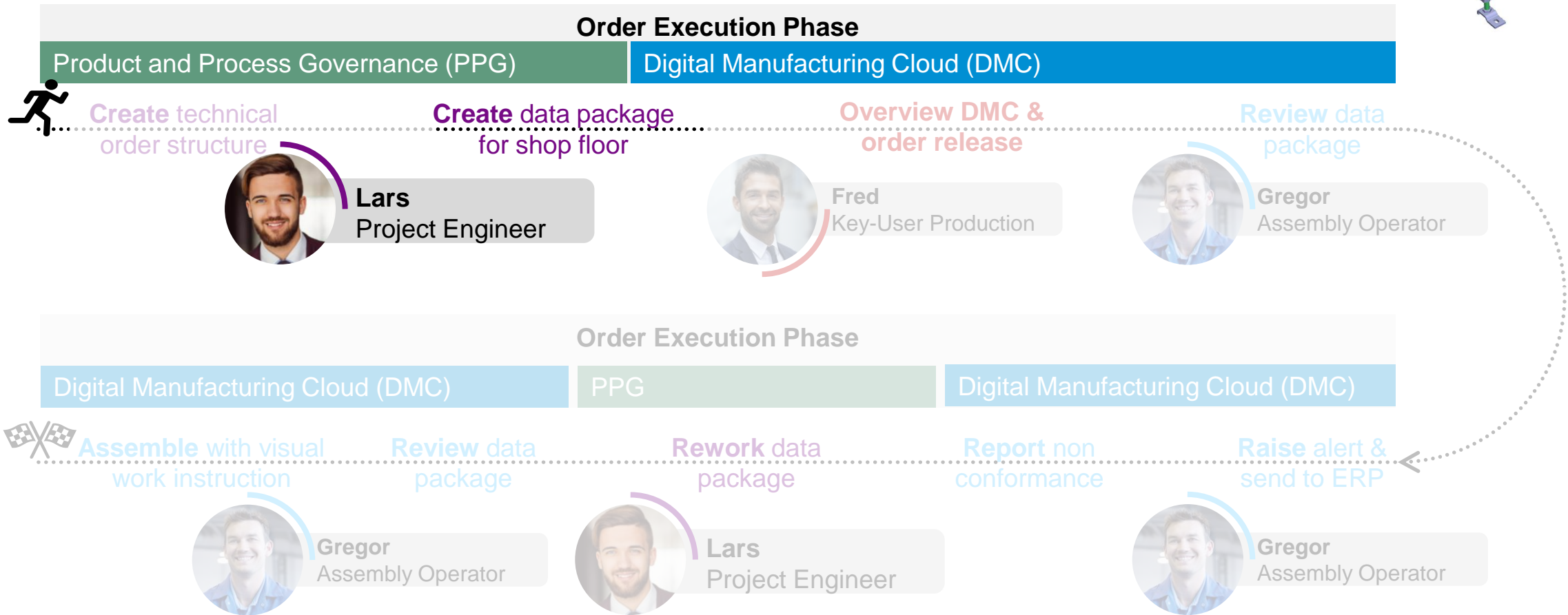
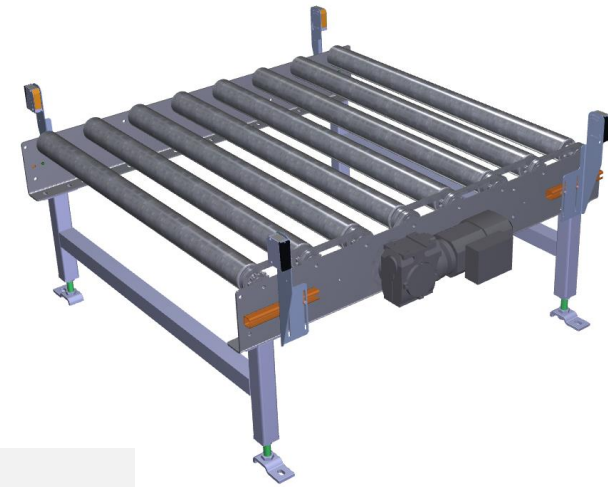
The TOS determines which items are **to be procured where and how:**

- Procurement: own / external (procure / make) / customer
- Engineering: internal / external / customer
- Differentiation of the individual locations and all combinations

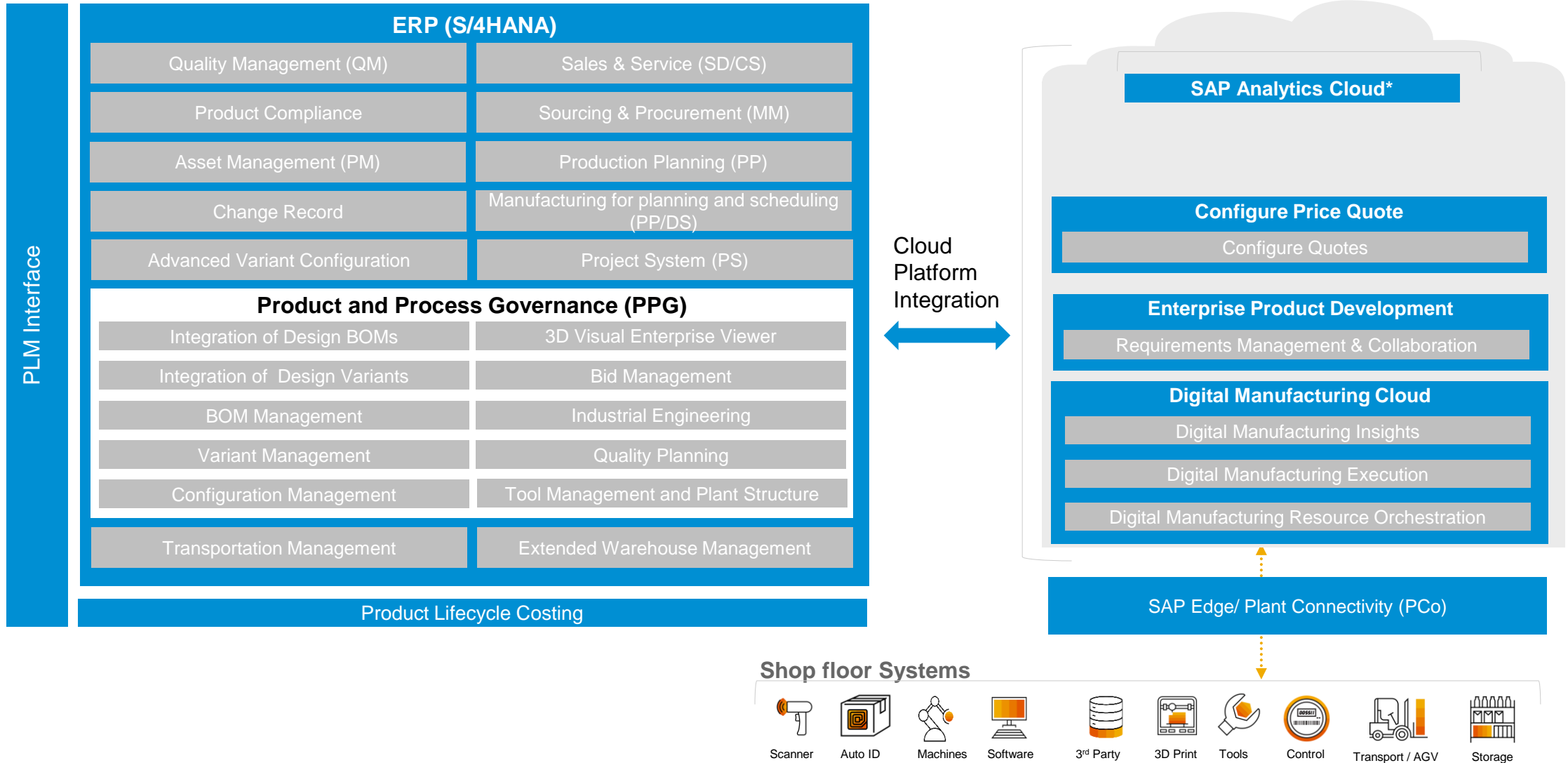


Provide digital twin foundation early in design phase

From Design to Manufacturing: Detailed Process Flow



Architecture ERP & MES



Create manufacturing data package for shop floor

Business Outcomes

“As a **Project Engineer**, I want to supply the shop floor with all the relevant data so that production can be started and there are no queries.”



Lars
Project Engineer

The screenshot shows the SAP Product and Process Governance: Change interface. On the left, a tree view displays the project structure under 'Profile: TOS Administration'. The selected item is '000027_00000205 Roller conveyor'. On the right, a table displays the 'Upd iPPE Object' data for the selected item.

Upd iPPE Object	Variant	Description	Changed by	Created by
000027_00000223	10	light barrier	MBOETTGE	MBOETTGE

Process Highlights & Benefits



The automation level increases if the shop floor is provided not only with a variant specific routing and mBOM but also with all other instructions in a single data package.



Change management is simplified if only the data package needs to be edited. Thus new products can be launched faster.

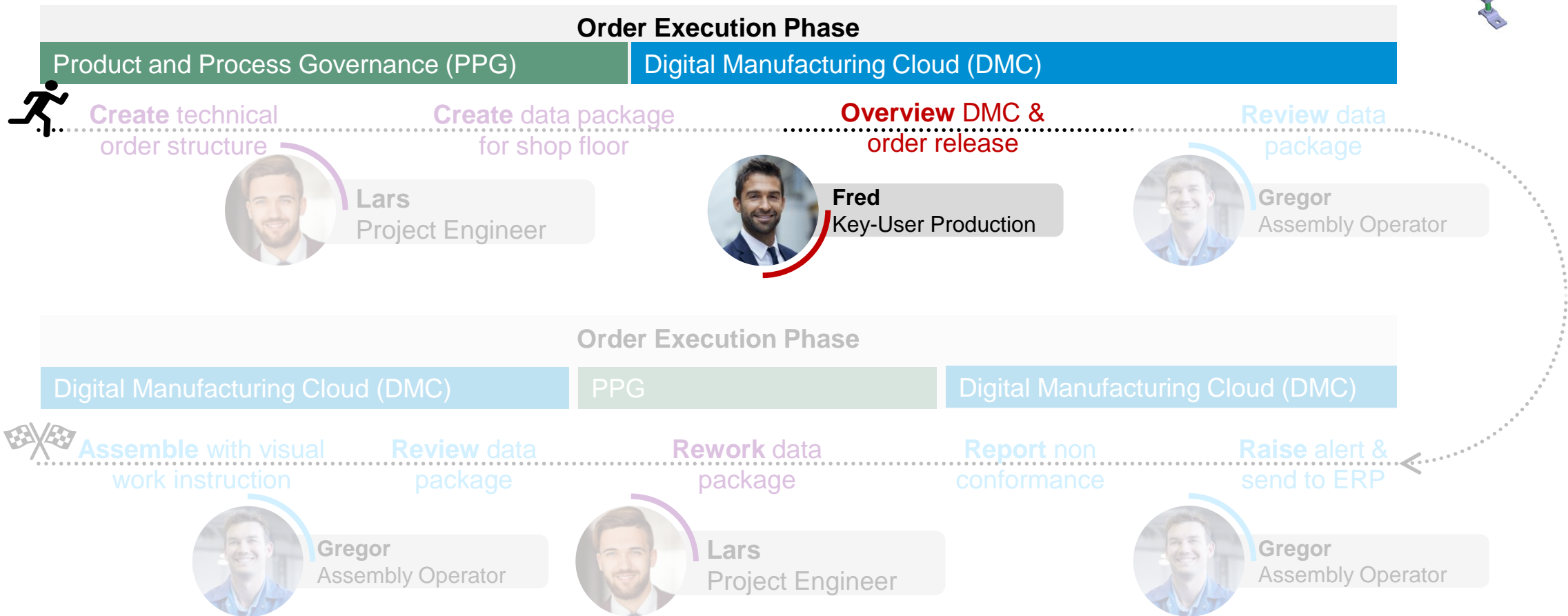
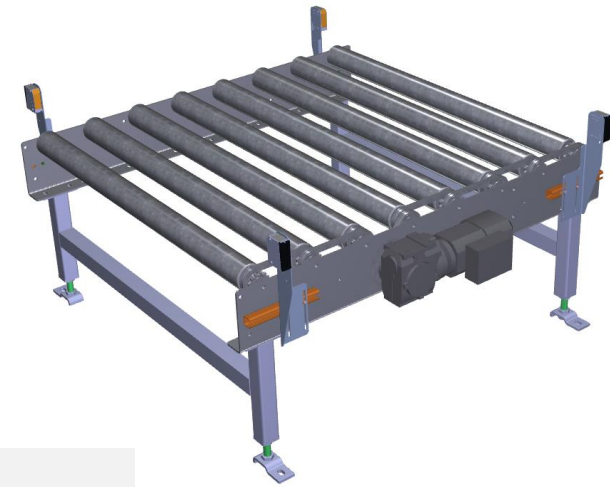


The ability of the technical order structure to **configure the manufacturing data package automatically** allows to fully leverage the flexibility of the robots.



The complexity in the manufacturing execution system and customization effort is **reduced**.

From Design to Manufacturing: Detailed Process Flow



SAP Digital Manufacturing Cloud – Launchpad

SYNTAX Home Plant: 2000 (Modellfabrik, SAP Webinar)

My Home Manufacturing Insights Manufacturing Execution Personalized Dashboards, Reports, and KPIs Manufacturing Master Data Management Enterprise Hierarchy Manufacturing Automation Manufacturing Insights Configuration AI/ML Scena

Favorit

- Manage Orders
- Montage (Montage Pod)
- Manage Alerts
- Product History
- POD Designer

Insights

- Global Insights
- Plant Insights
- KPI Analytics
- OEE Insights
- Manage Alerts

Execution

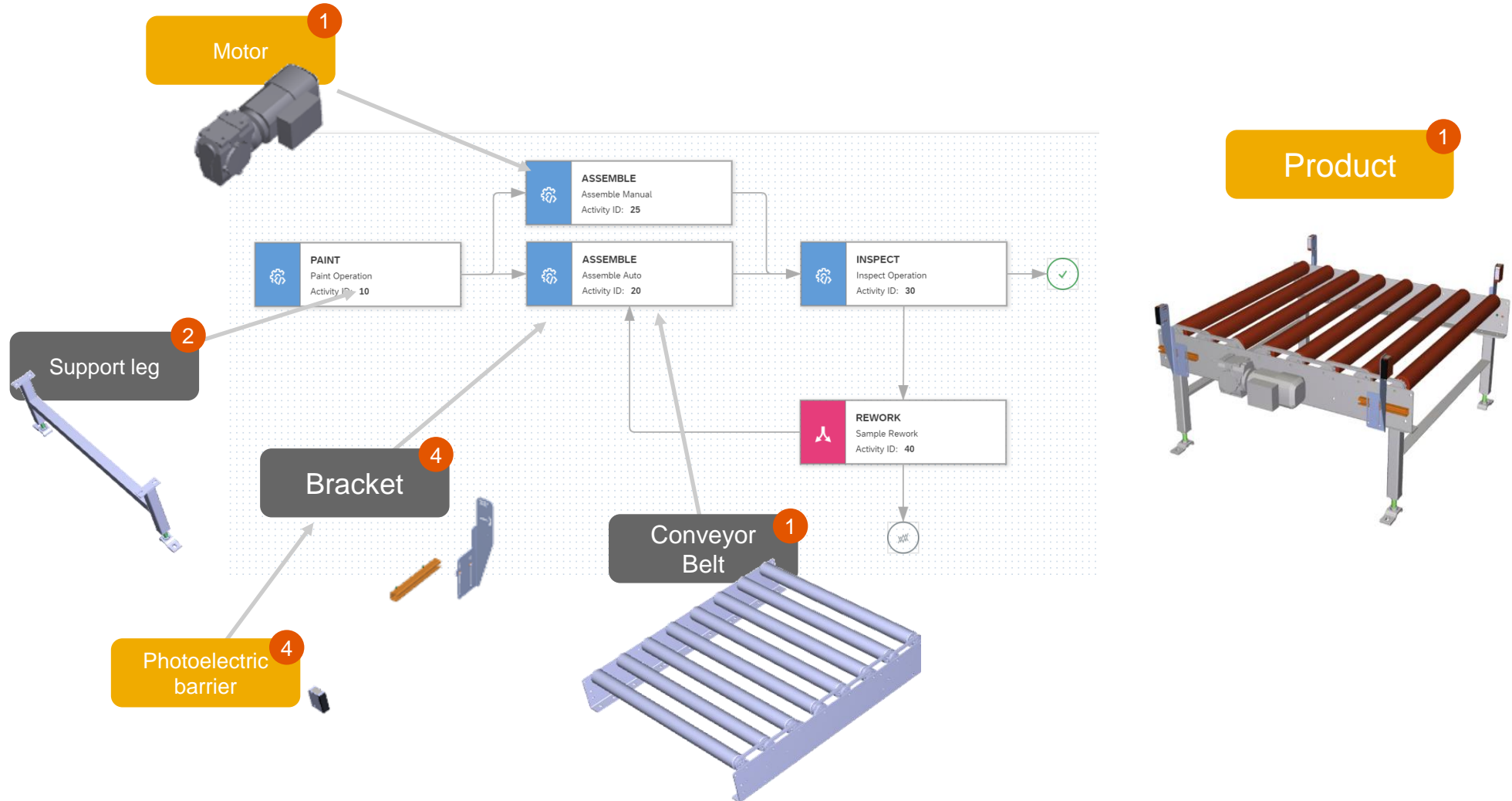
- Dispatching and Monitoring (Old Version)
- Dispatching and Monitoring 2.0
- Schedule Labor
- View Labor Schedule
- Schedule Tools
- Work Center POD (Default)
- Order POD (Default)
- Operation Activity POD (Default)
- OEE POD
- Post-Production Reporting POD (Default)
- Manage Holds
- Manage Resource Assignments
- Load Resources with Components
- Manage Floor Stocks
- Manage Staging
- Manage Orders
- Manage Cancellations
- Manage Tool Assignments

Digital Manufacturing Cloud is an MES solution.

The MES solution covers manufacturing execution, analytics and scheduling. It guides the worker, integrates with machines and provides full traceability of the production process.



Flexibility in the SFC Definition enables the exact Genealogy



Supervisor order release

Orders

10001 [X] [Q] Release Status: [v] Execution Status: [v] Planned Start Date: [MMM d, y, h:mm:ss a] [📅] Planned Completion Date: [MMM d, y, h:mm:ss a] [📅] Material: [📄] Customer: [] Customer Order: []

Go Clear Adapt Filters (1)

Items (7)

Order ID	Material / Version	Material Description	Release Status	Execution Status	Order Quantity	BOM / Version	Planned Start Date/Planned Completion Date	Quantity Progress Completed	UOM	Batch
1000129	209570 / 1	Roller conveyor	Releasable	Not In Execution	1 EA	209570_RF_240V / 1	Mar 29, 2022	0 of 1	EA	>
1000135	209570 / 1	Roller conveyor	Released	Active	1 EA	209570_RF_240V / 1	Mar 31, 2022 – Apr 1, 2022	0 of 1	EA	>
1000131	209570 / 1	Roller conveyor	Released	Active	1 EA	209570_RF_240V / 1	Mar 29, 2022	0 of 1	EA	>
1000132	209570 / 1	Roller conveyor	Released	Hold	1 EA	209570_RF_240V / 1	Mar 29, 2022	0 of 1	EA	>
1000133	209570 / 1	Roller conveyor	Released	Active	1 EA	209570_RF_240V / 1	Mar 29, 2022	0 of 1	EA	>
1000130	209570 / 1	Roller conveyor	Released	Not In Execution	1 EA	209570_RF_240V / 1	Mar 29, 2022	0 of 1	EA	>
1000143	209570 / 1	Roller conveyor	Released	Not In Execution	1 EA	209570_RF_240V / 1	Mar 29, 2022	0 of 1	EA	>

Release Order

1000129

Material: 209570 / 1 (Roller conveyor)

Order Information

Production Type: SFC-Based

ERP Order: Yes

BOM / Version: 209570_RF_240V / 1

Routing / Version: 209570_ROLLER / 1

Priority: 500

Planned Material / Version: 209570 / 1

Build Quantity: 1 EA

Available Quantity to Release: 1 EA

Quantity to Release: 1 EA

Batch:

Planned Start: Mar 29, 2022, 4:02:41 PM

Planned Completion: Mar 29, 2022, 4:03:41 PM

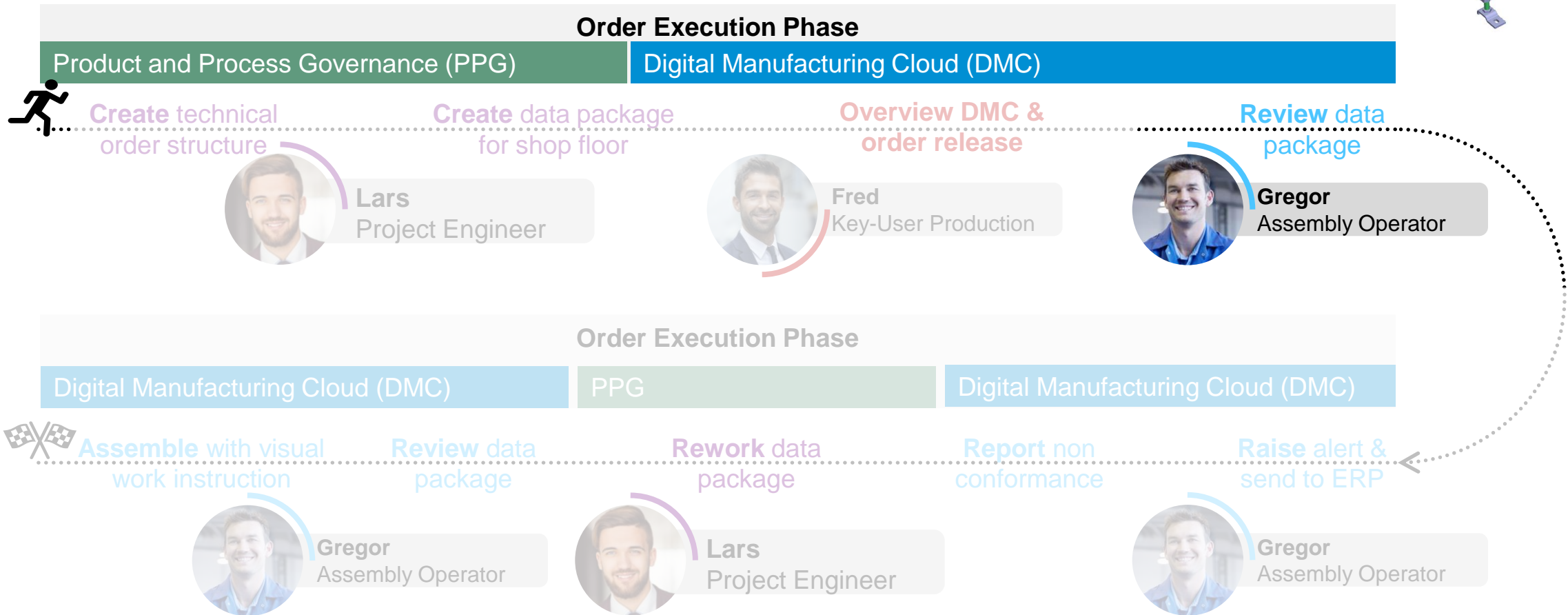
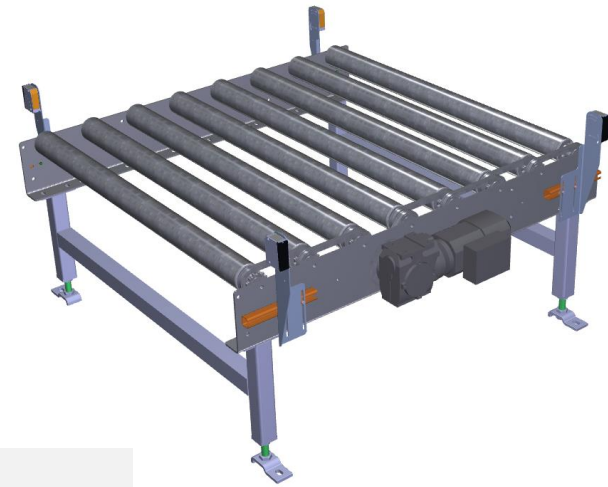
Scheduled Start: Mar 29, 2022, 5:00:00 PM

Scheduled Completion: Apr 1, 2022, 9:15:00 PM

Release Edit Copy Hold Release Close

Release Cancel

From Design to Manufacturing: Detailed Process Flow



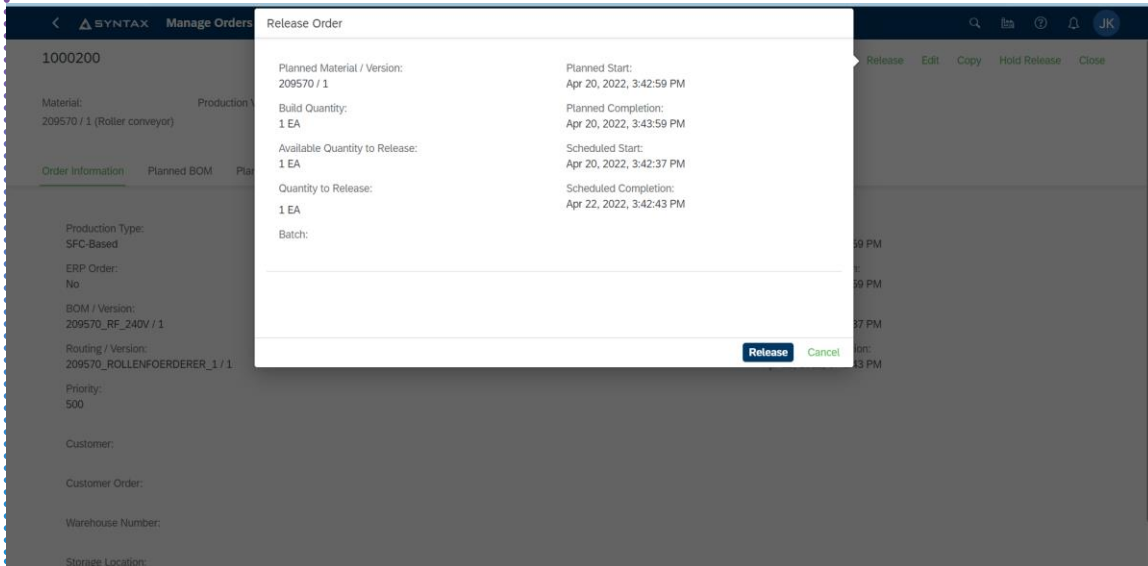
Review data package

Business Outcomes

“As **Assembly Operator**, I want to review relevant data for my tasks to work error free.”



Gregor
Assembly Operator



Process Highlights



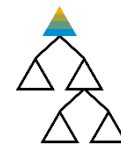
Work error free



Review all relevant Order details before release



React just in time changes e.g. Priority

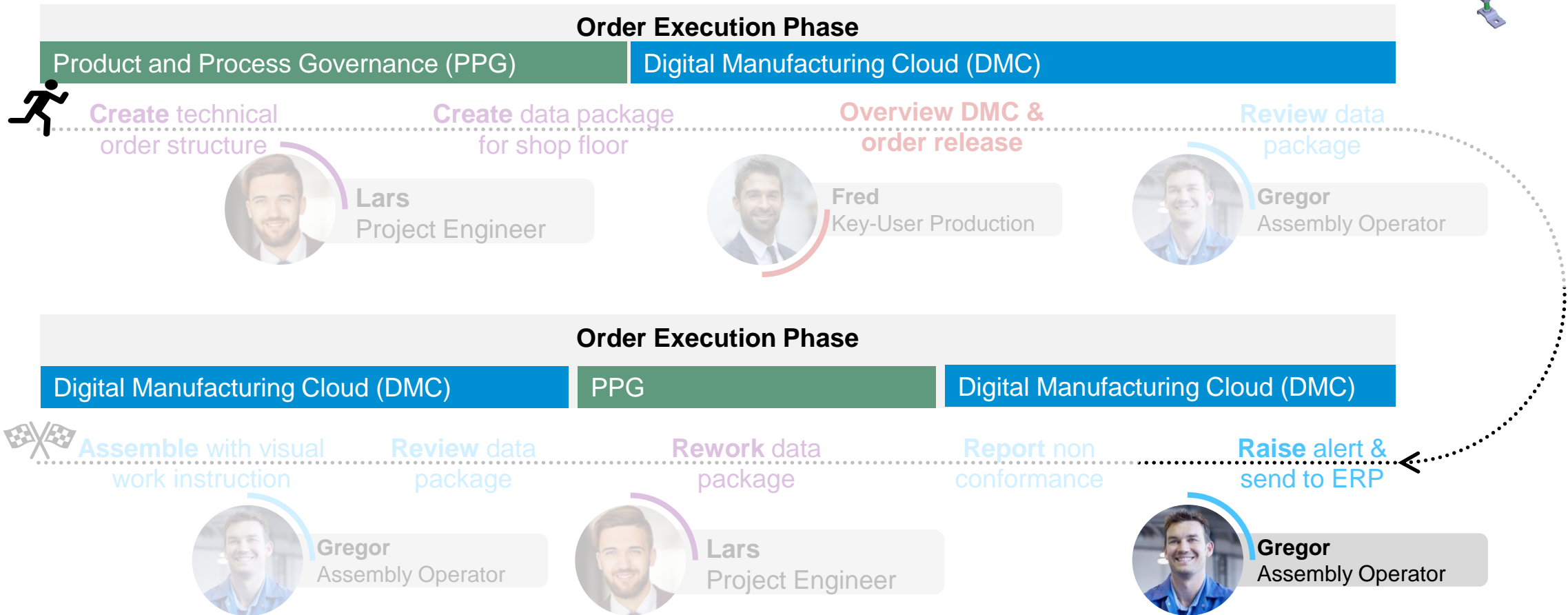
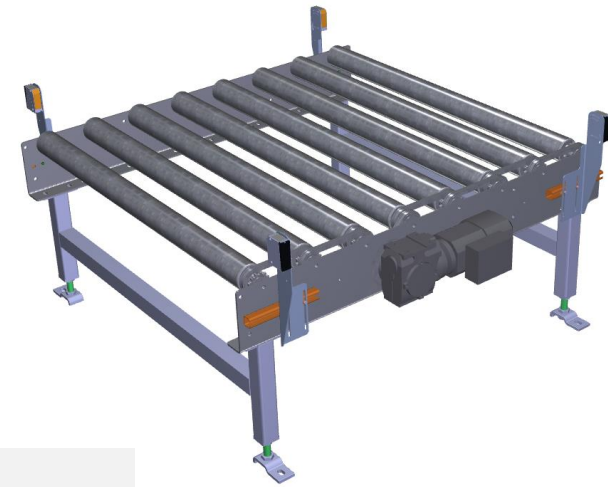


Visualize Bom, Routing, Status, Customer and Yield/Scrap Progress view



Full integrated interface with ECC, S/4HANA and S/4HANA Cloud

From Design to Manufacturing: Detailed Process Flow



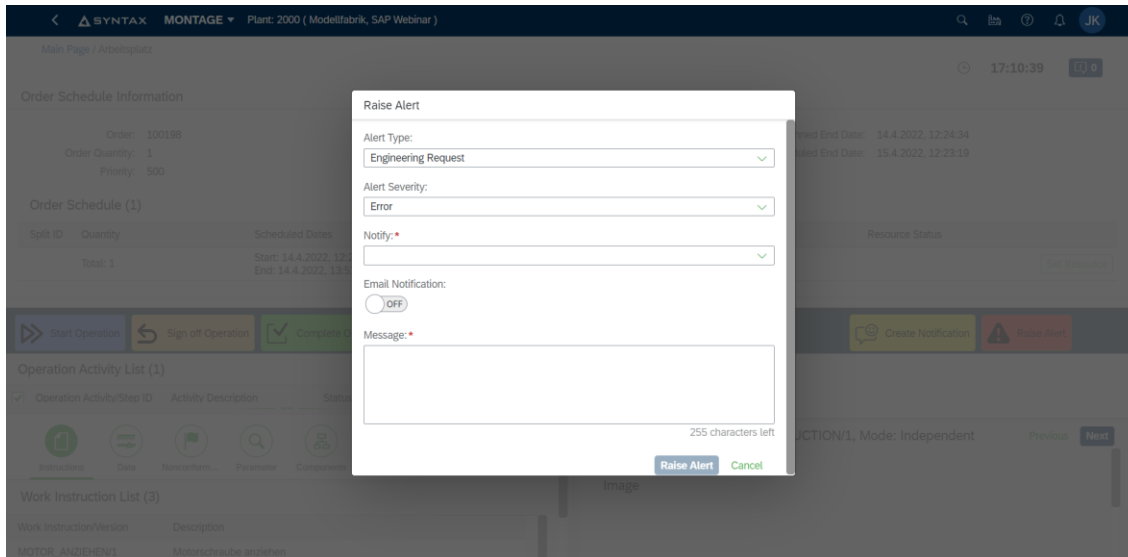
Raise alert & send to ERP

Business Outcomes

“As an **Assembly Operator**, I want to inform my supervisor in case of errors or malfunctions during production”



Gregor
Assembly Operator



Process Highlights



Send alerts to ERP System



Include text to specify the alert



Choose from different type of alerts

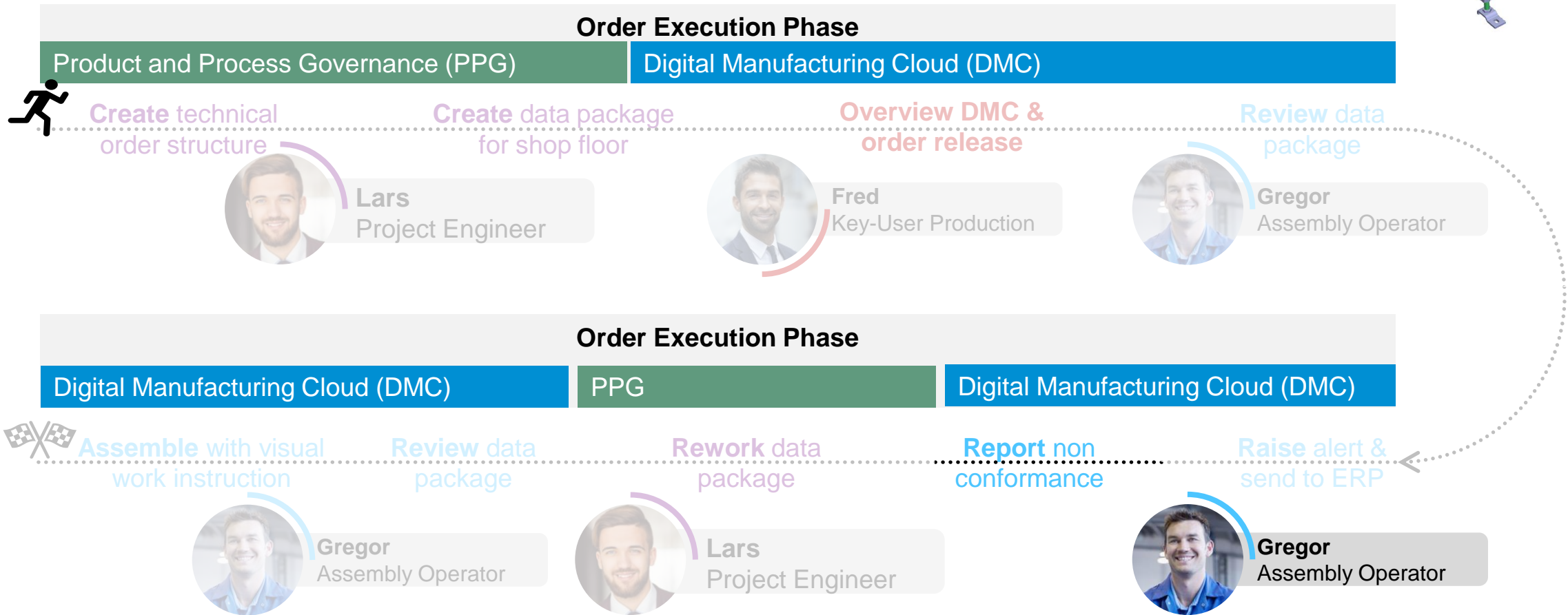
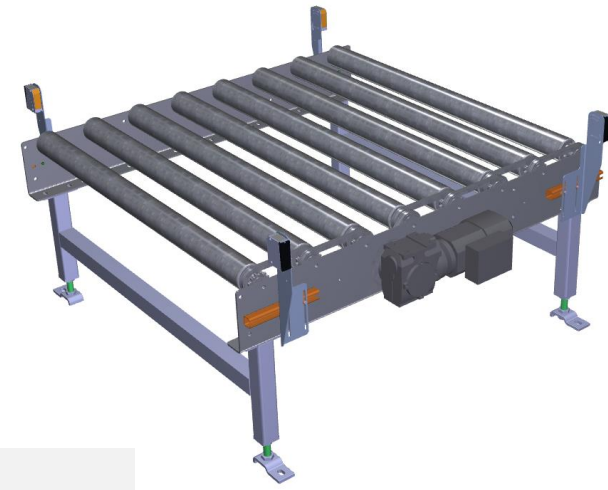


Allow to inform supervisors by email



Manage raised alerts, by closing or reopening them

From Design to Manufacturing: Detailed Process Flow



Report non conformance

Business Outcomes

“As an **Assembly Operator**, I want to log errors, warnings or to inform supervisors during production, so that everything is well documented.”



Gregor
Assembly Operator

The screenshot displays the SAP interface for reporting a non-conformance. At the top, there are navigation buttons: Start Operation, Sign off Operation, Complete Operation, Create Notification, and Raise Alert. Below this is the 'Operation Activity List (1)' table:

Operation Activity/Step ID	Activity Description	Status Icon	Qty	Action
0010/10	Assembly instruction (69Nm)	Green square	1	Complete

Below the table is the 'NC Data Tree' table:

NC Code	NC State	Date / Time	Operation ...	Resource	Component	Action
WRO...	OPEN	Apr 20, 20...	0010	MONTAGE		Close

At the bottom, there is a 'Nonconformance Data Entry' form with fields for SFC (2000397), Nonconformance Code, and Attachments. A 3D model of a metal frame is visible on the right side of the interface.

Process Highlights



Overview of available non conformances for a product



Log non conformance code by the operator



Automated disposition routing based on non conformance code

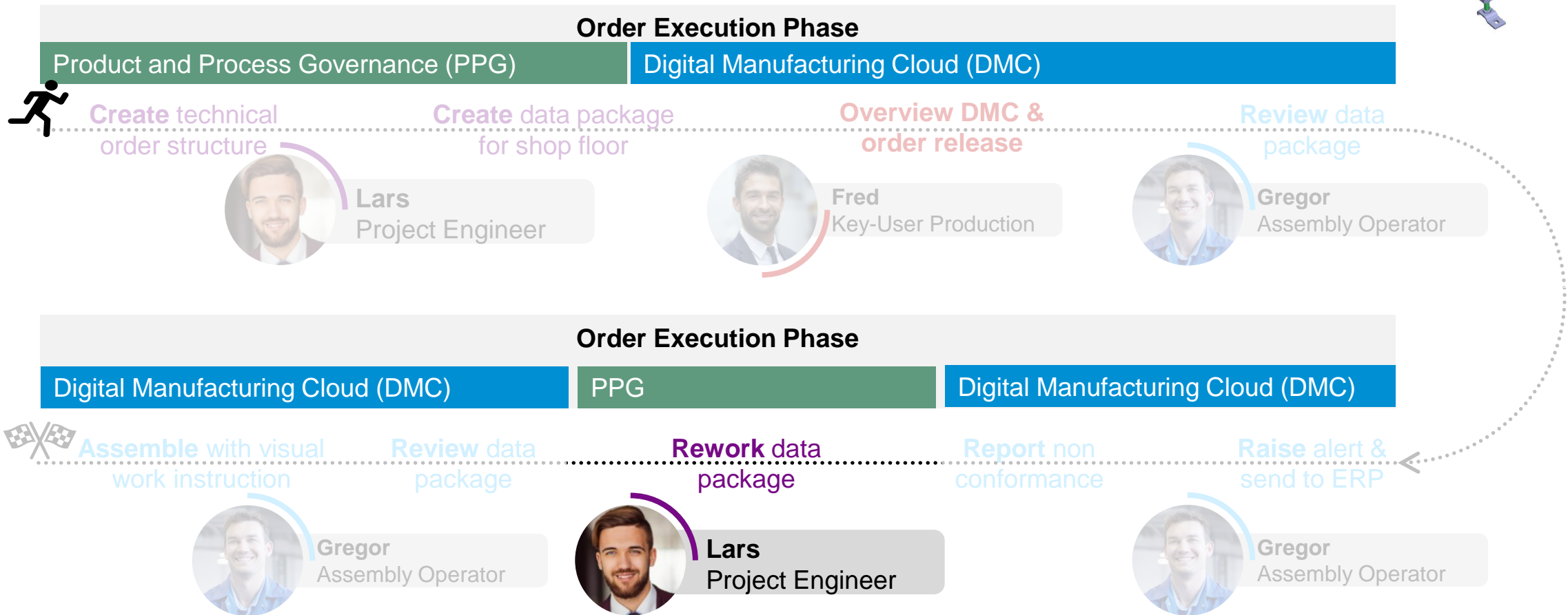
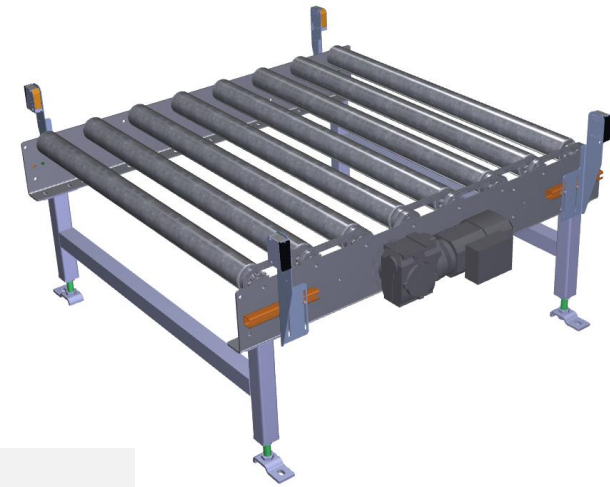


Attach files of logged non conformance



Close or open non conformance

From Design to Manufacturing: Detailed Process Flow



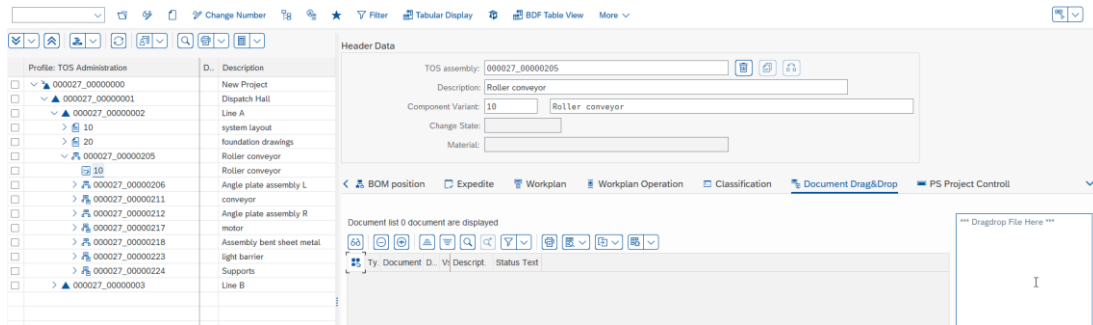
Rework manufacturing data package for shop floor

Business Outcomes

“As a **Project Engineer**, I want to supply the shop floor with all the relevant data so that production can be started and there are no queries.”



Lars
Project Engineer



Process Highlights & Benefits



The automation level increases if the shop floor is provided not only with a variant specific routing and mBOM but also with all other instructions in a single data package.



Change management is simplified if only the data package needs to be edited. Thus new products can be launched faster.

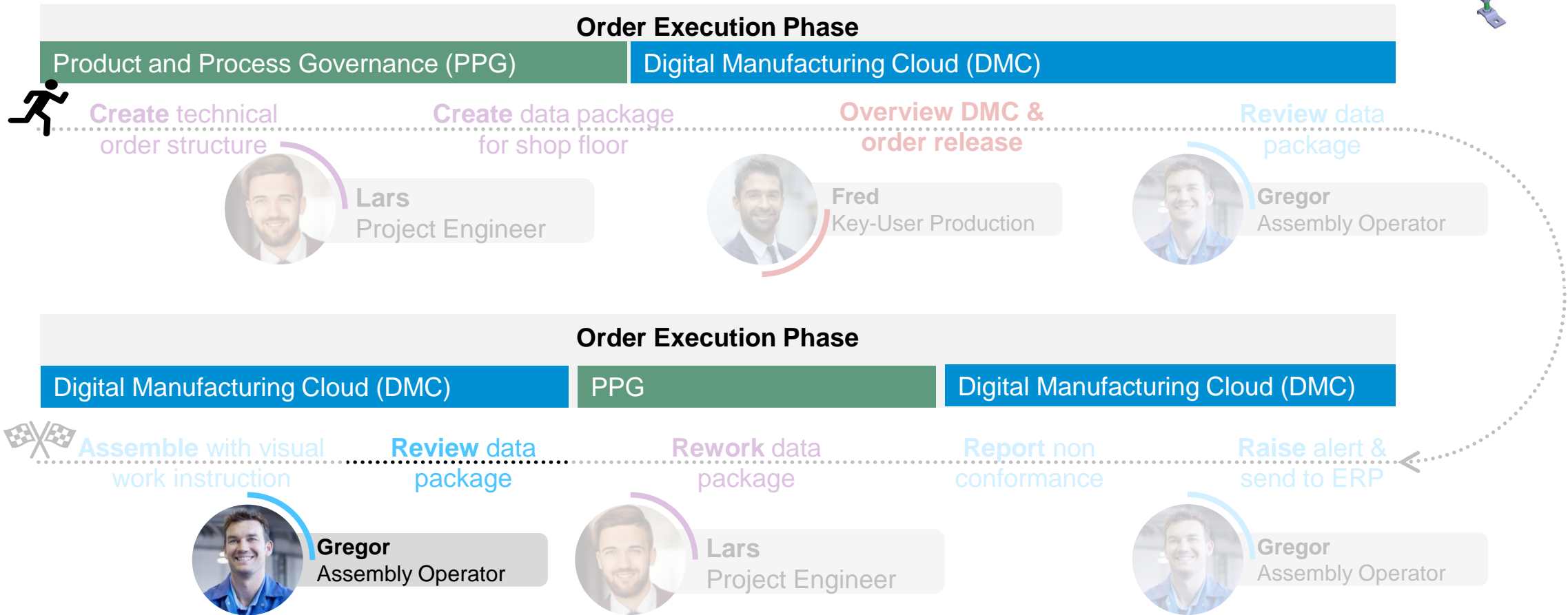
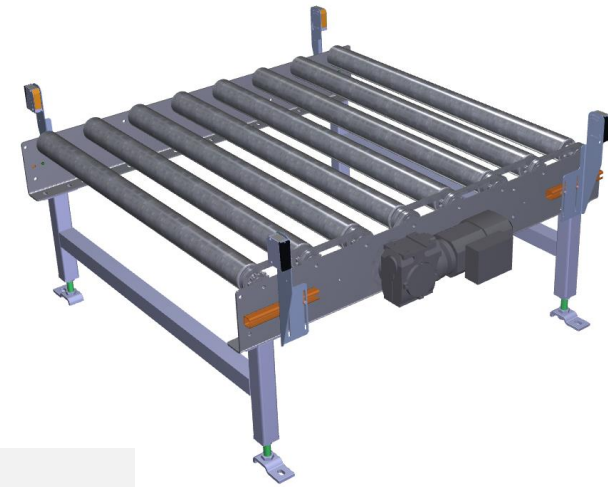


The ability of the technical order structure to **configure the manufacturing data package automatically** allows to fully leverage the flexibility of the robots.



The complexity in the manufacturing execution system and customization effort is **reduced**.

From Design to Manufacturing: Detailed Process Flow



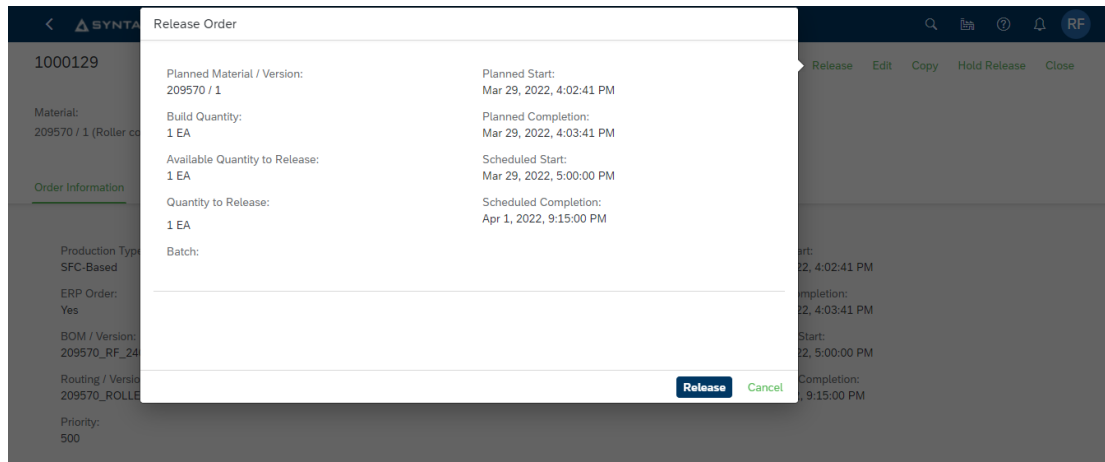
Review data package

Business Outcomes

“As **Key-User Production**, I want to decide which order should start so that I can influence the priority.”



Gregor
Assembly Operator



Process Highlights



Release an order to the shop floor



Review all relevant Order details before release



React just in time changes e.g. Priority

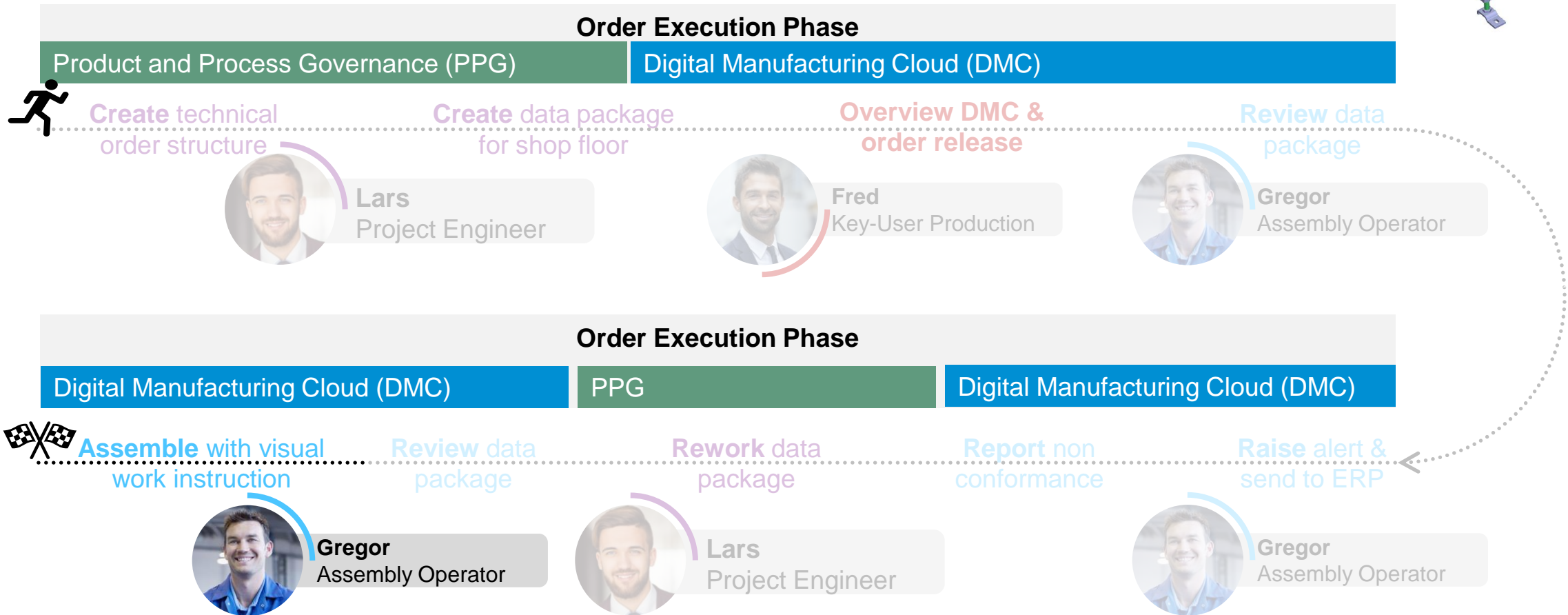
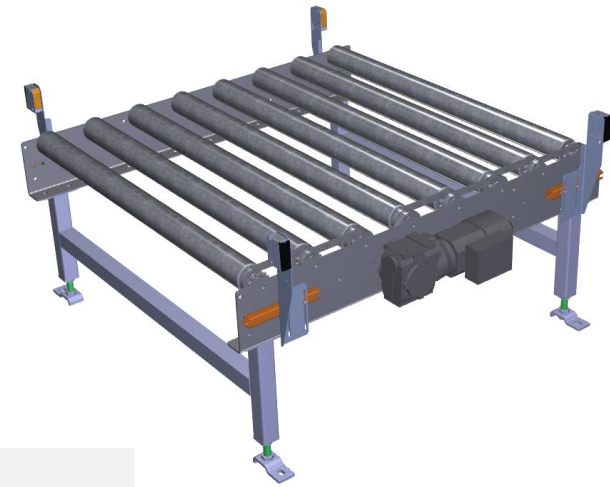


Visualize Bom, Routing, Status and Yield/Scrap Progress view



Full integrated interface with ECC, S/4HANA and S/4HANA Cloud

From Design to Manufacturing: Detailed Process Flow



Assemble with visual work instruction

SYNTAX MONTAGE Plant: 2000 (Modellfabrik, SAP Webinar)

Main Page / Arbeitsplatz 21:41:13

Start Operation Sign off Operation Complete Operation Create Notification

Operation Activity List (1)

Operation Activity/Step ID	Activity Description	Status Icon	Qty	Action
0010/10	Assembly instruction (69Nm)	◆	1	Start

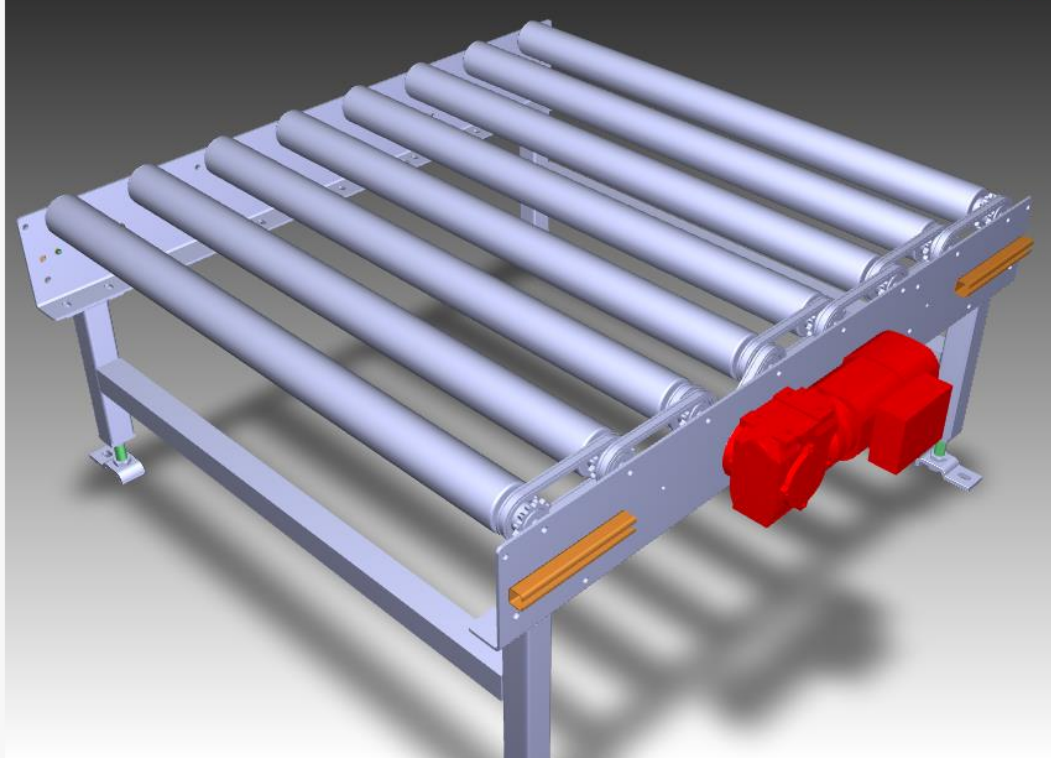
Instructions Data Nonconform... Features Components

Component List

Assembly Sequence	Component/Version	Description	Required Quantity	Remaining Quantity	Action
Not Assembled					
30	209576 / 1	Engine 240V	1	1	Assemble
40	209617 / 1	Support	2	2	Assemble
Assembled					
10	209575 / 1	Assembly group bent sheet metal	4	0	Remove
20	209578 / 1	Conveyor 2m/s	1	0	Remove

Work Instruction ROLLENFOERDERER_MODELL_240V/1, Mode: Independent

3D Object



Assemble with visual work instruction

Business Outcomes

“As an **Assembly Operator**, I want to see which components I have to use and how many remain so that I am always informed.”



Gregor
Assembly Operator

The screenshot displays the SAP Montage interface. At the top, there are navigation buttons: 'Start Operation', 'Sign off Operation', 'Complete Operation', and 'Create Notification'. Below this is the 'Operation Activity List (1)' table:

Operation Activity/Step ID	Activity Description	Status Icon	Qty	Action
0010130	Assembly instruction (69Nm)		1	Start

Below the table is a 'Component List' section with a sub-table:

Assembly Sequence	Component/Version	Description	Required Quantity	Remaining Quantity	Action
Not Assembled					
30	209976 / 1	Engine 240V	1	1	Assemble
40	209617 / 1	Support	2	2	Assemble
Assembled					
10	209575 / 1	Assembly group bent sheet metal	4	0	Remove
20	209578 / 1	Conveyor 2m/s	1	0	Remove

To the right of the component list is a 3D model of a roller conveyor assembly, with a red component highlighted.

Process Highlights



List all components based on ETO/CTO/MTS BoM



Use text based work instructions and visual work instructions like images, drawings or 3D models



Choose the Assembly Mode: Choose Sequence and Choose Auto Next

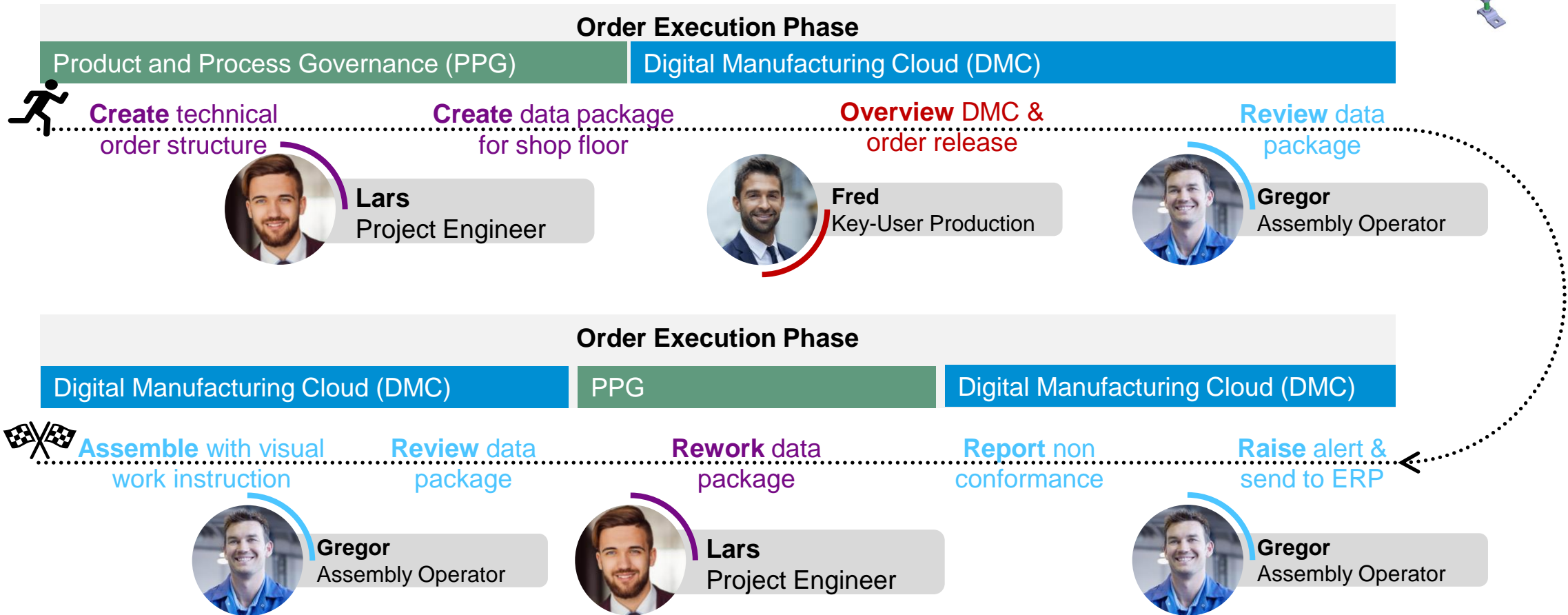
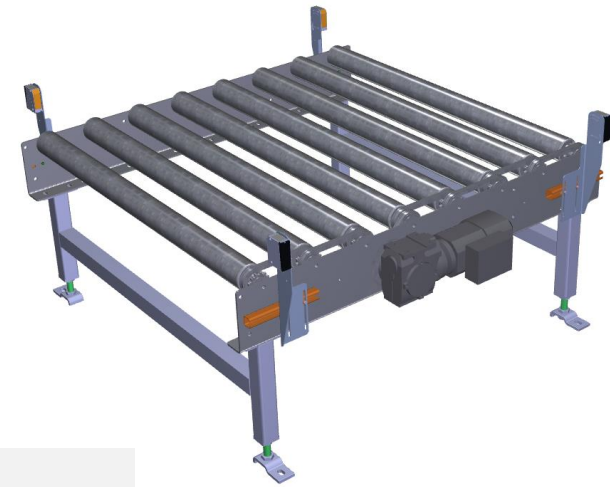


Allow Skipping Components



Executing Discrete or Time-Based Assembly

From Design to Manufacturing: Detailed Process Flow



Summary

The Design-Driven Enterprise is
AGIL.EFFICIENT.CUSTOMER-CENTRIC

- ✓ Increase the level of automation in the process flow from engineering into sales, production, service via the **smart product structure**.
- ✓ Increase the level of flexibility via integration of **smart product structure, project management** and **manufacturing execution** in production.
- ✓ Achieve a high level of consistency, automation and accuracy across all departments by utilizing **the smart product structure within the SAP core**.





Design-Driven Enterprise

**From Project Start to Service for the Project
Business**

29.04.2022

Thank you & see you soon.

Contact Information:



Sunita Mathur
Business Development
Digital Supply Chain

SAP | M.: +43 664 8289569
Email: sunita.mathur@sap.com
LinkedIn: [Sunita Mathur](#)



SAP® Digital Supply Chain

Follow us



www.sap.com/contactsap

© 2022 SAP SE or an SAP affiliate company. All rights reserved.

No part of this publication may be reproduced or transmitted in any form or for any purpose without the express permission of SAP SE or an SAP affiliate company.

The information contained herein may be changed without prior notice. Some software products marketed by SAP SE and its distributors contain proprietary software components of other software vendors. National product specifications may vary.

These materials are provided by SAP SE or an SAP affiliate company for informational purposes only, without representation or warranty of any kind, and SAP or its affiliated companies shall not be liable for errors or omissions with respect to the materials. The only warranties for SAP or SAP affiliate company products and services are those that are set forth in the express warranty statements accompanying such products and services, if any. Nothing herein should be construed as constituting an additional warranty.

In particular, SAP SE or its affiliated companies have no obligation to pursue any course of business outlined in this document or any related presentation, or to develop or release any functionality mentioned therein. This document, or any related presentation, and SAP SE's or its affiliated companies' strategy and possible future developments, products, and/or platforms, directions, and functionality are all subject to change and may be changed by SAP SE or its affiliated companies at any time for any reason without notice. The information in this document is not a commitment, promise, or legal obligation to deliver any material, code, or functionality. All forward-looking statements are subject to various risks and uncertainties that could cause actual results to differ materially from expectations. Readers are cautioned not to place undue reliance on these forward-looking statements, and they should not be relied upon in making purchasing decisions.

SAP and other SAP products and services mentioned herein as well as their respective logos are trademarks or registered trademarks of SAP SE (or an SAP affiliate company) in Germany and other countries. All other product and service names mentioned are the trademarks of their respective companies.

See www.sap.com/trademark for additional trademark information and notices.

