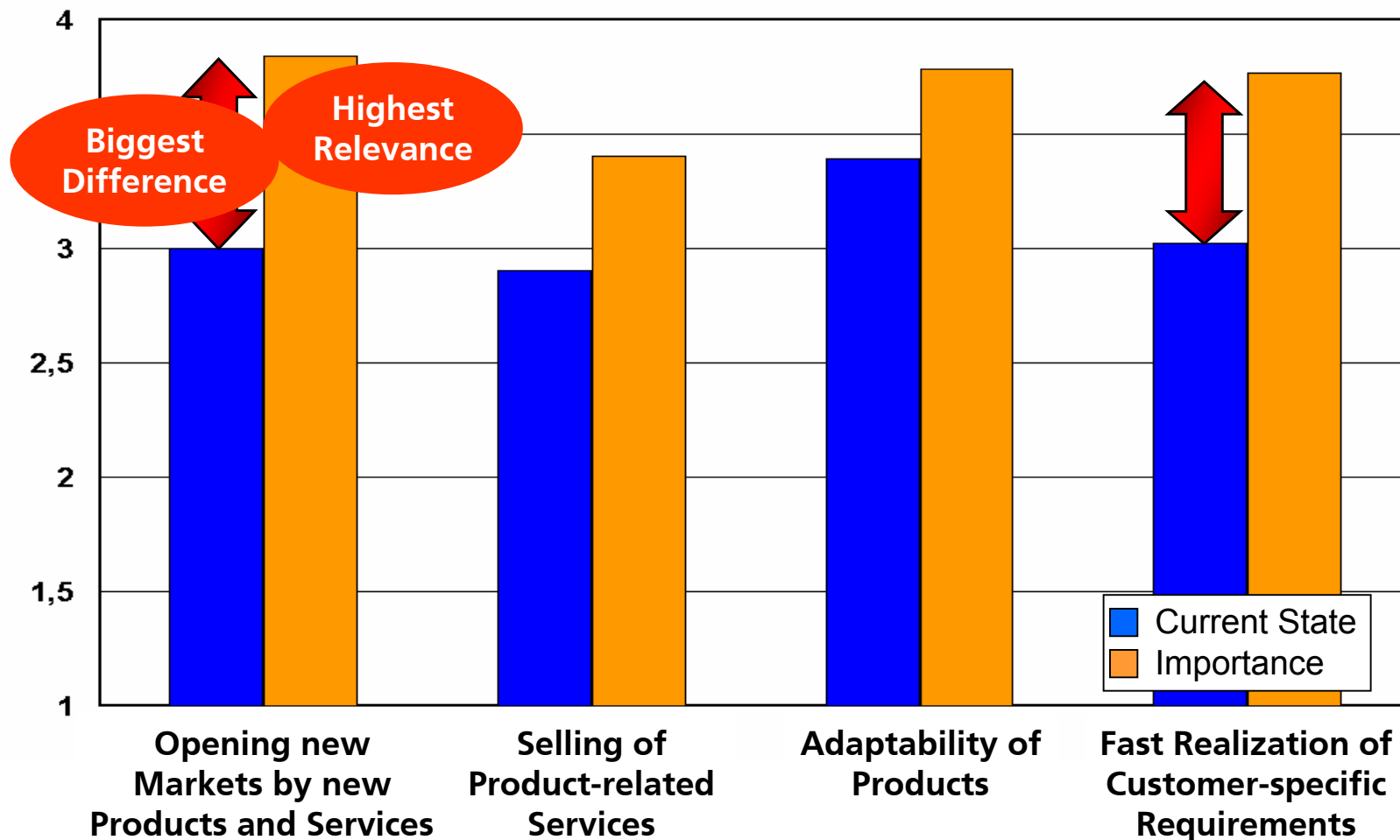


Method- and Tool-Support for a Customer-Integrated Assembly Process

- Reasons for Customer-Integrated Assembly
- Application Overview
- Methodical Approaches
- Shopfloor Information Concept

The Contribution is based on work and results achieved in the project
“MUSKIM – Methoden- und Systemunterstützung für die kundenintegrierte Montage”,
which is funded by the German Ministry for Education and Research in the
„Production of the Future“-Programme (BMBF FKZ 02PB4020)

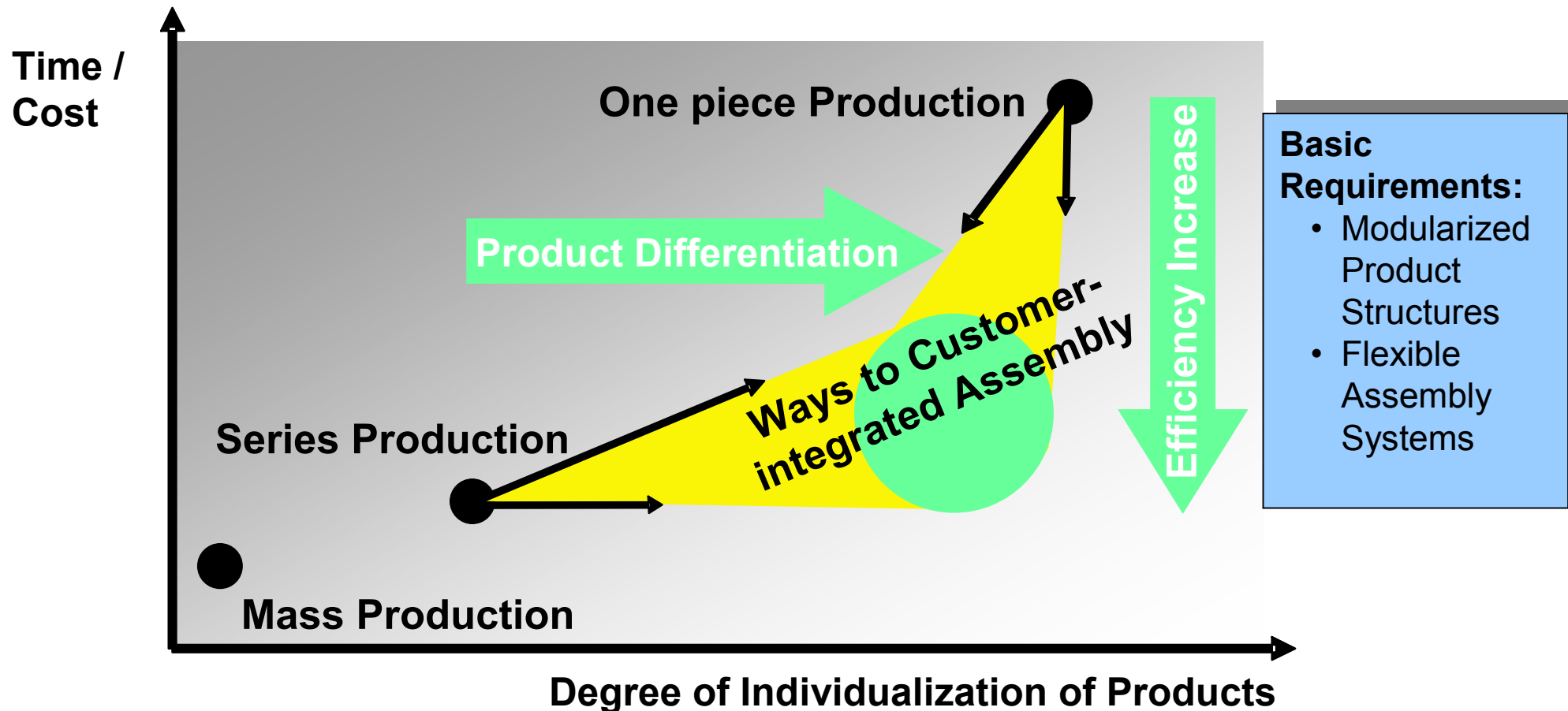
Flexibility Study 2005: Needs and Current State for Market Offers



The „Market-Offer-Flexibility“ got the highest ranking among the flexibility fields!

Market Opportunity and Project Mission

Customers demand or expect individualized products!



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Classification of Customer-integrated Assembly

Criteria	Possible Values				
Product Range: (Individualization Level)	Standard Products without Variants (No individualization)	Standard Products with Supplier-defined Variants (Predefined Individual.)	Standard Products with Customer-specified Variations (Limited Individualization)	Individual Products specified by Customer (Full Individualization)	
Production Strategy:	make to stock	distribute to order	assemble to order	make to order	engineer to order
Product Structure:	Small Number of Components		Large Number of Components with simple structure	Large Number of Components with complex structure	
Production Lot size:	Mass Production	Series Production	Small Series Production	One Piece Production	
Order Fulfillment Functions:	Product Specification by Sales & Customer	Adaptive Design & Assembly Planning	Comp. Manufacture, Subassemblies, Final Assembly	Customer and Service Feedback	
Product Size or Weight	Small (e.g. FESTO-Valve)	Middle (e.g. Bruker-Stereoskope Transtechnik-Power Control)	Big (e.g.. RITTAL-Control Housing Krones-Bottle Handling Machines)		

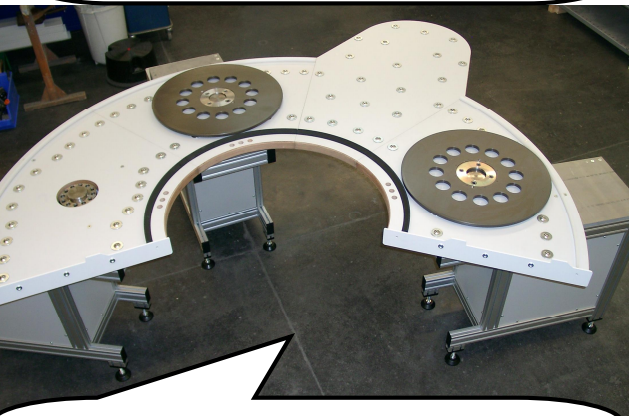
Muskim Project - Expected Results



Business Process Library with Master Modules and Synchronisation Points for Customer Integration

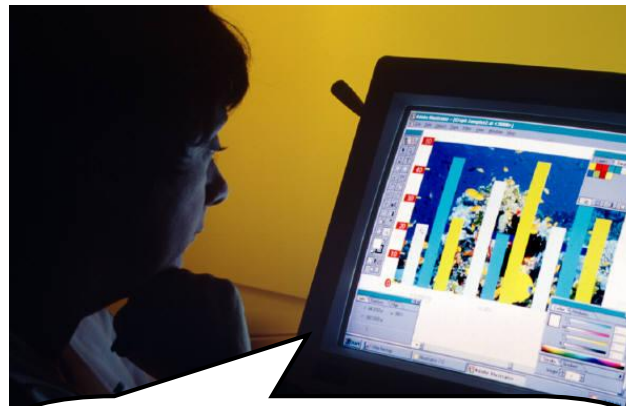


Procedure and Tools for rule-based product configuration and workplan generation



Prototype of hybrid low-cost Assembly Station with minimized Changeover Times

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Intranet based Assembly Information Portal with Customer Access



Assembly-Station integrated Learning Concept

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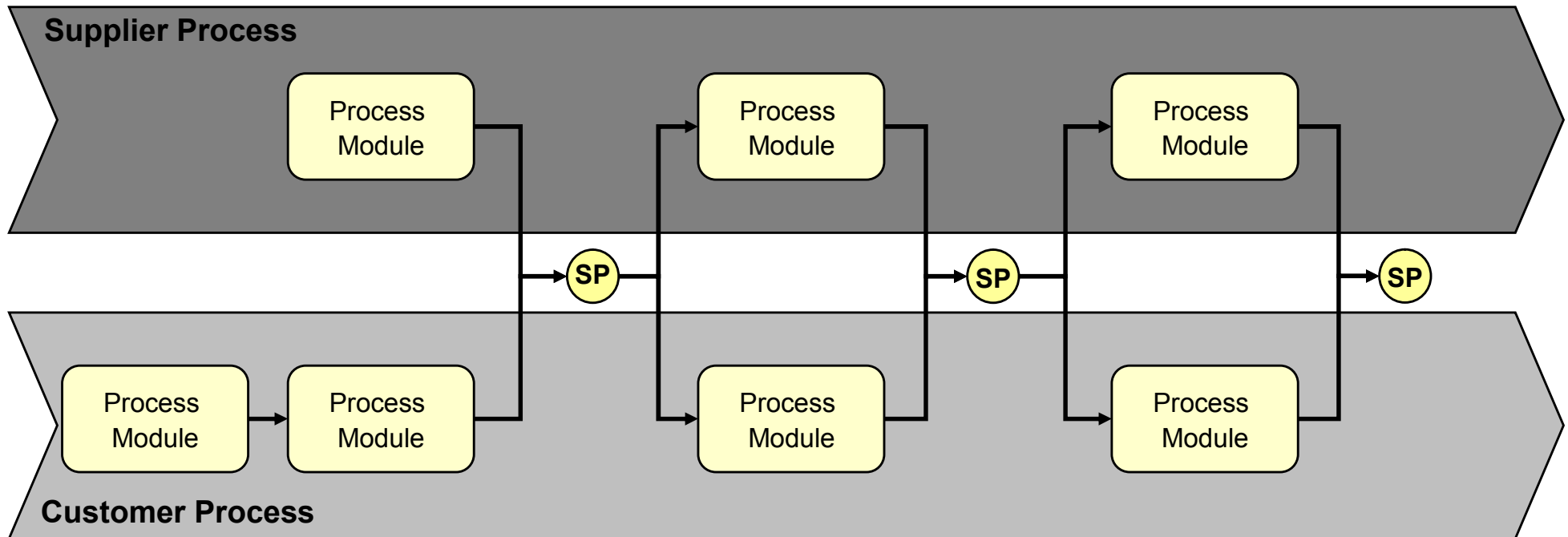
Folie 5



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Methodical Approach: Synchronization Points for Customer Interaction

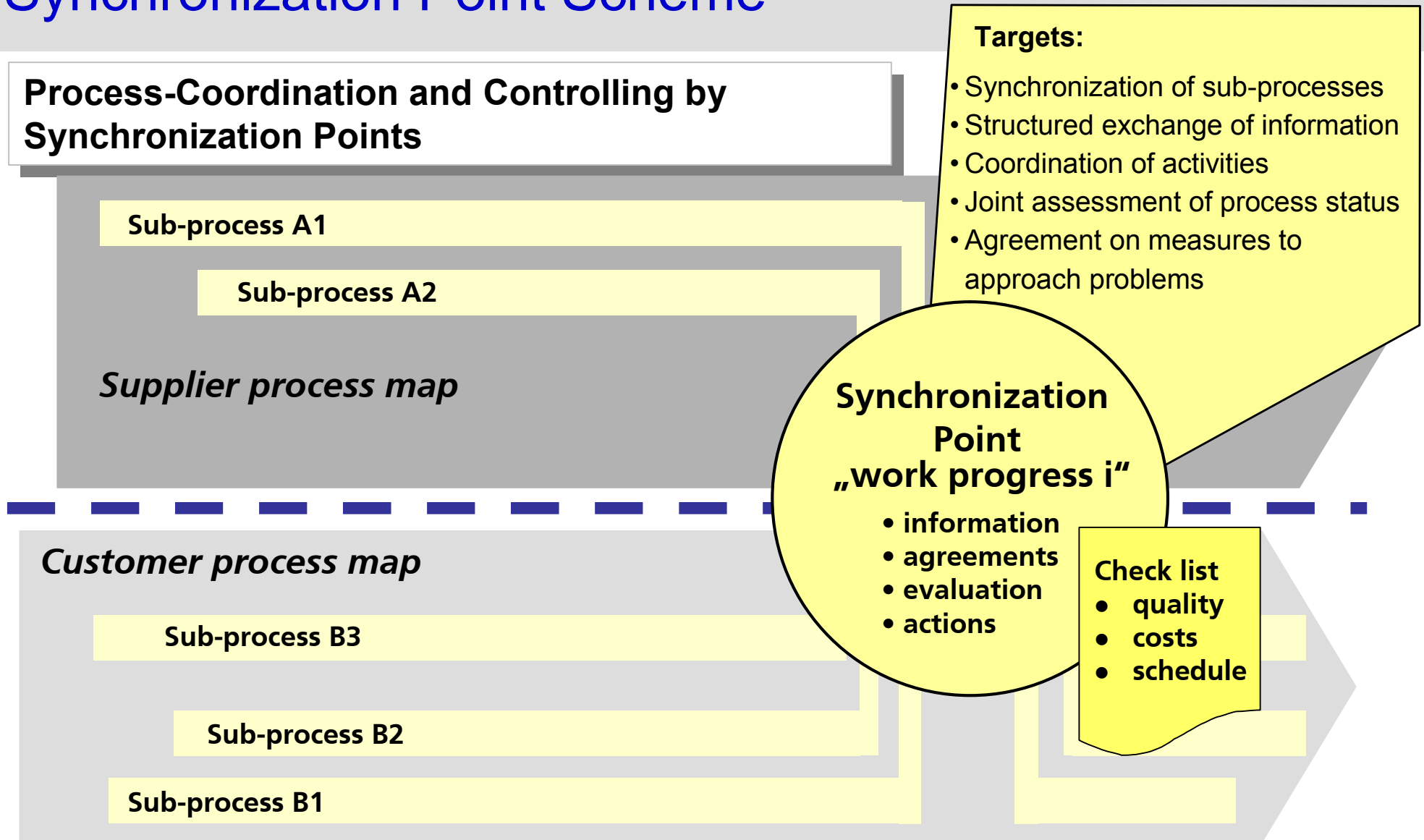
Process-Coordination with Synchronization Points (SP)



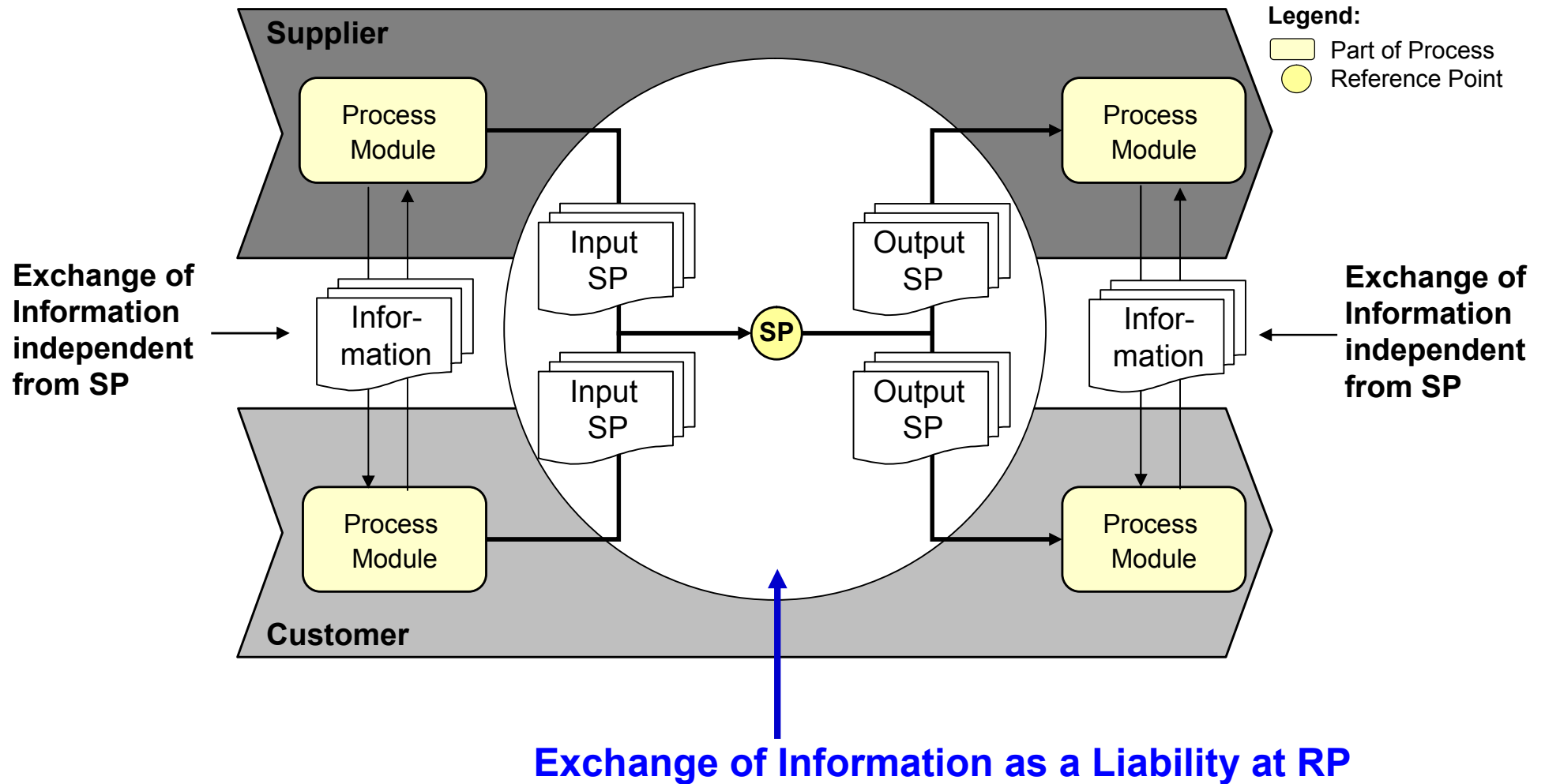
Synchronization Points coordinate the simultaneously running processes between the Customer and the Supplier

Synchronization Point Scheme

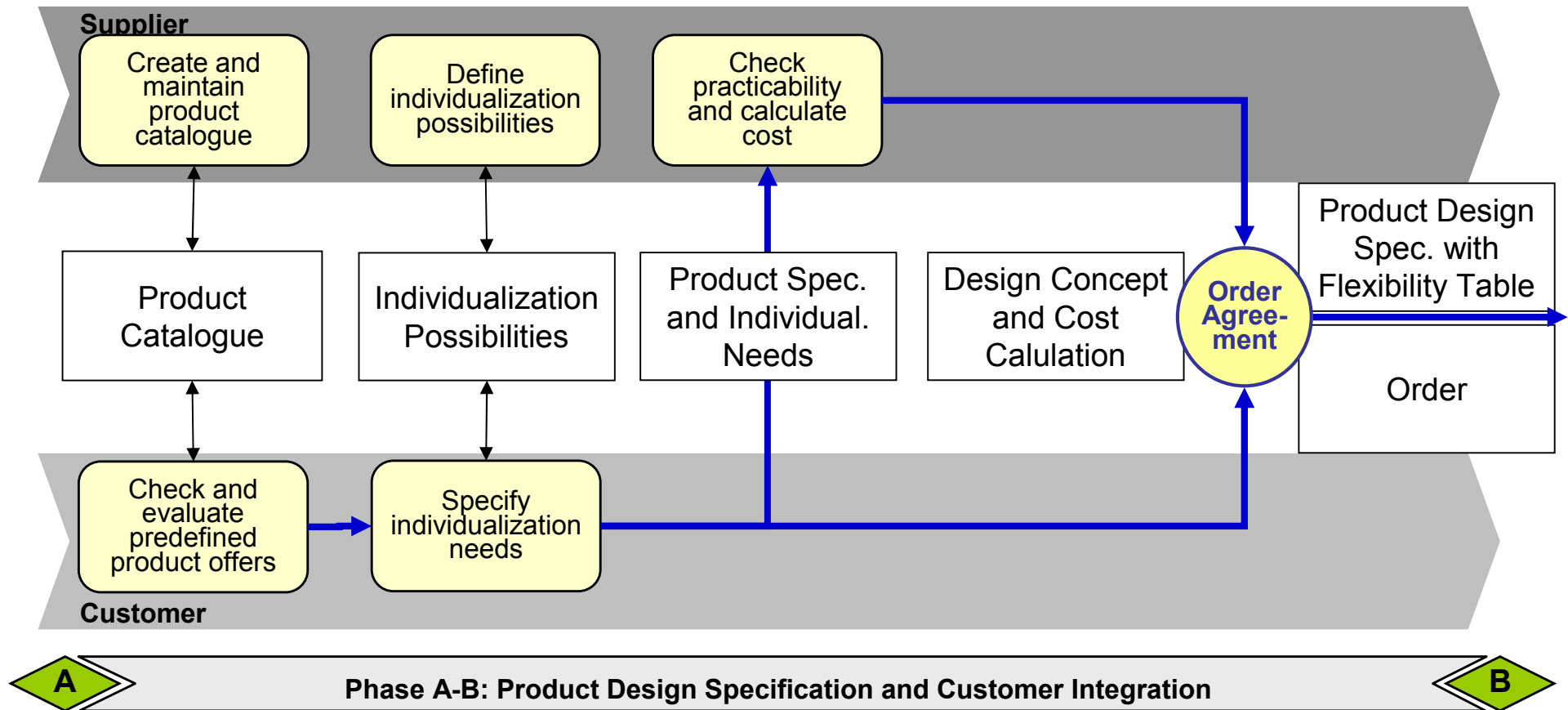
Process-Coordination and Controlling by Synchronization Points



Synchronization Point Information Exchange



Process Modules and Synchronization Points (1 of 4)



Product Need

Approval Design Spec. and Order

Legend: Milestone Synchronization Point
 Process Shared Information Item

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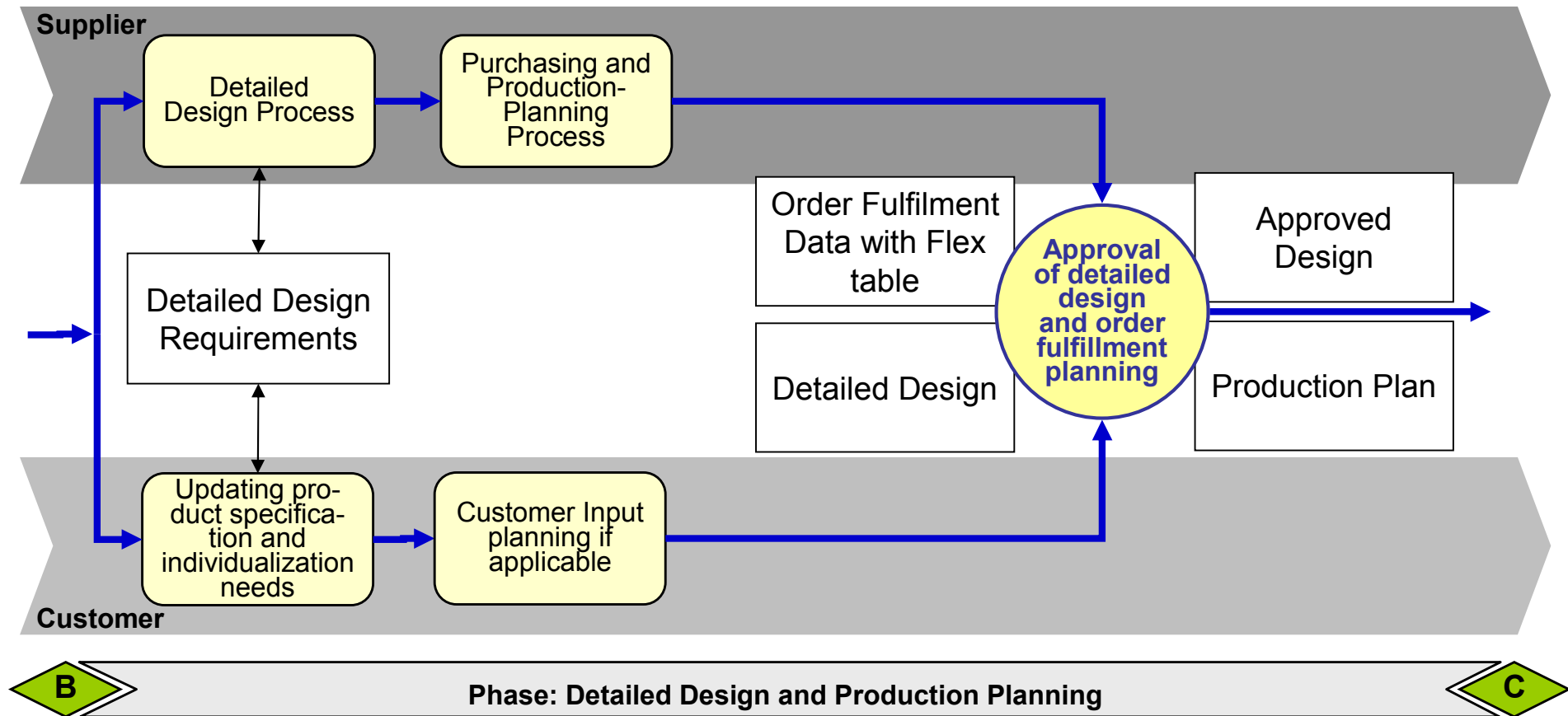
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Process Modules and Synchronization Points (2 of 4)



Approval Design Spec. and Order

Legend: Milestone Synchronization Point
 Process Shared Information Item

Approval of Design and Production Plan

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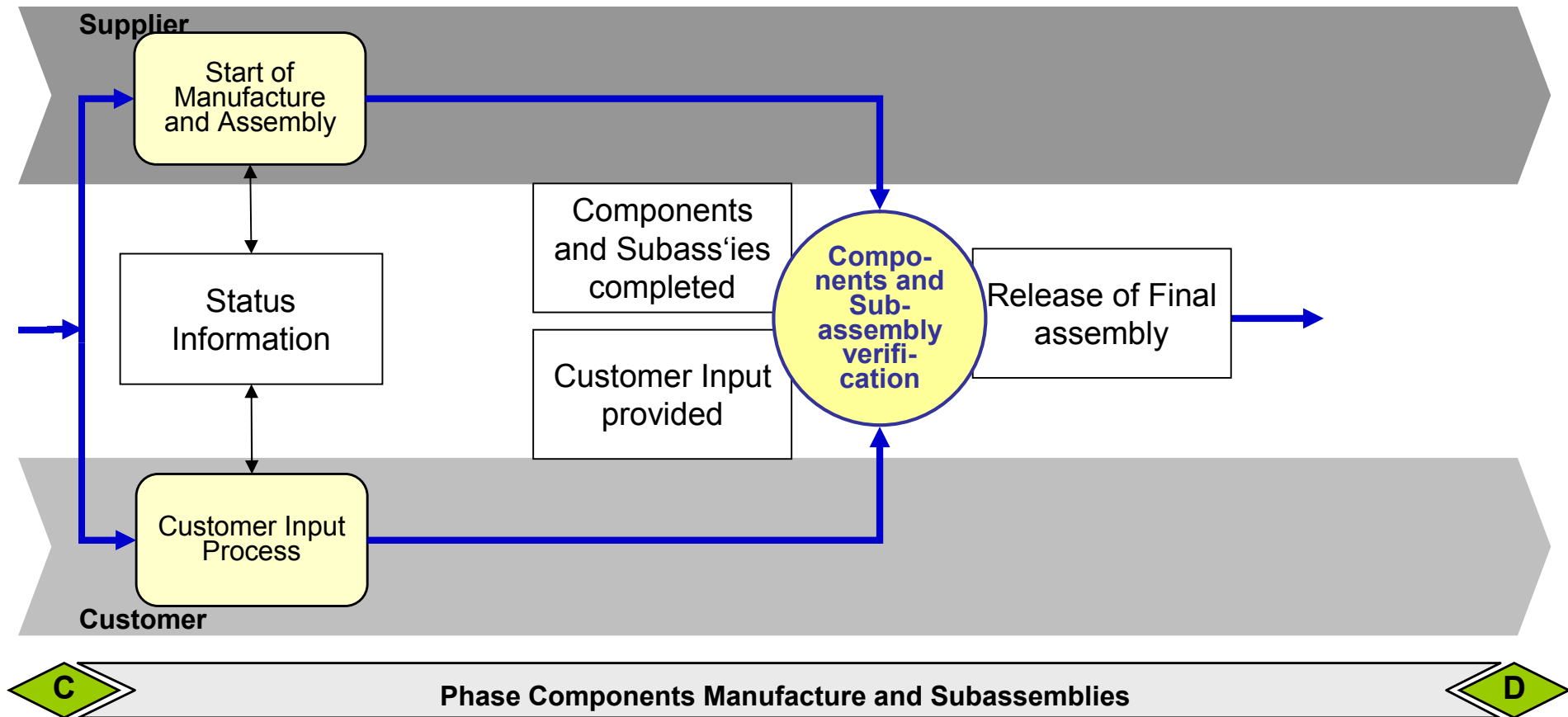
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Process Modules and Synchronization Points (3 of 4)



Approval of Design and Production Plan

Release of Final Assembly

Legend: Milestone Synchronization Point
 Process Shared Information Item

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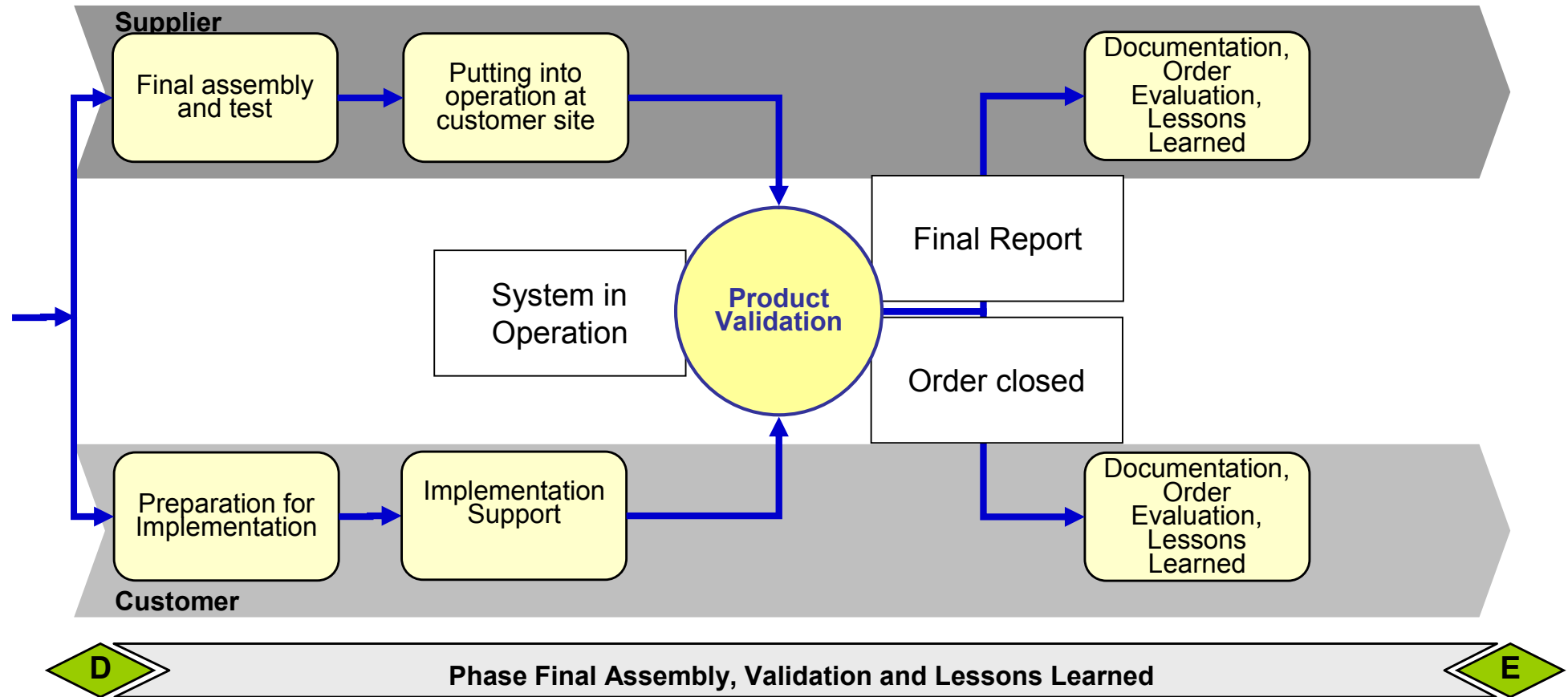
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Process Modules and Synchronization Points (4 of 4)



D
Release of Final Assembly

E
Order closed, Lessons Learned

Legend: Milestone Synchronization Point
 Process Shared Information Item

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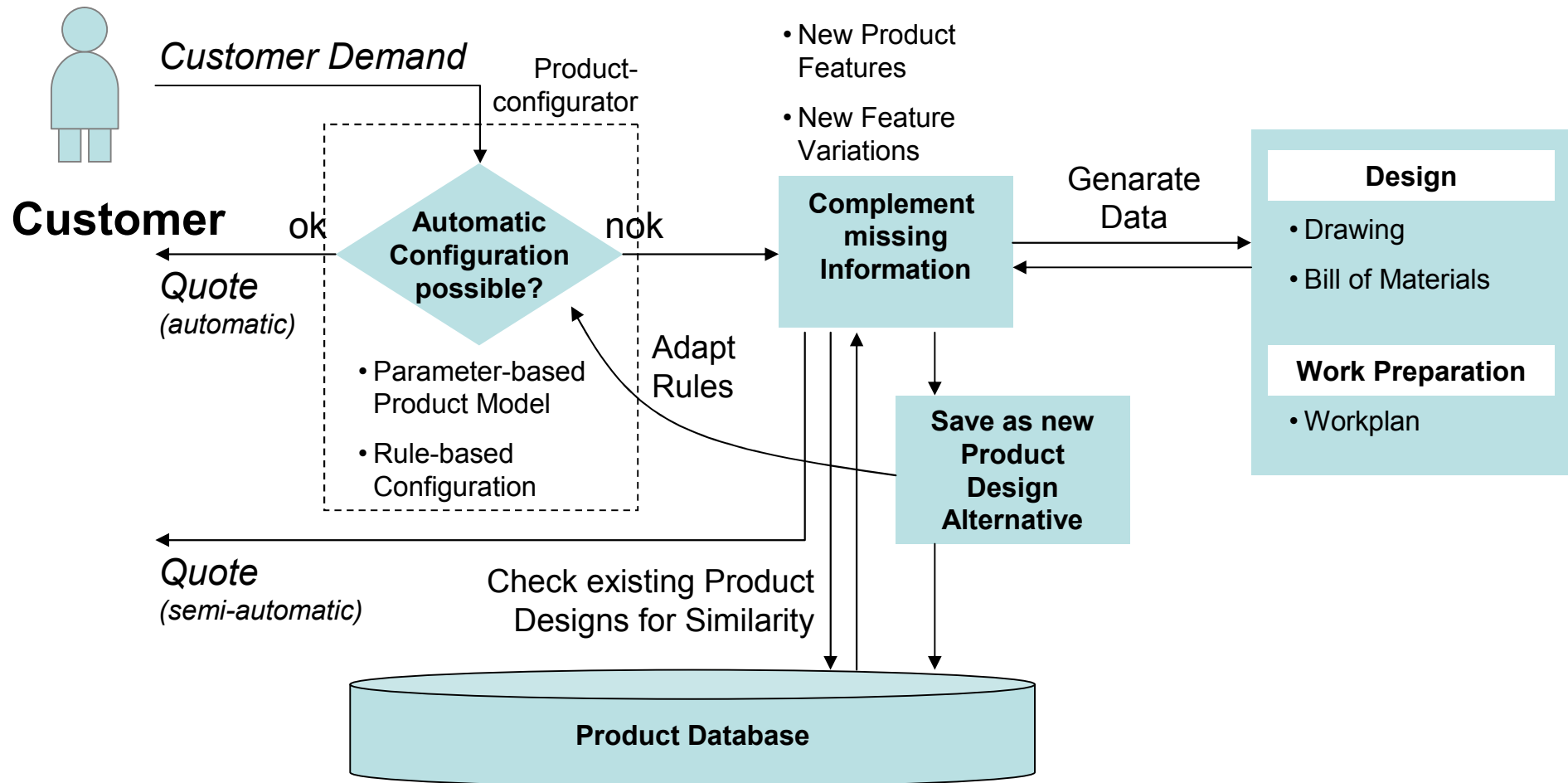
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Product Configuration Support System



Source: MUSKIM Progress Report by Rimpau, C. and Wiedemann, M.; iwb, 2006

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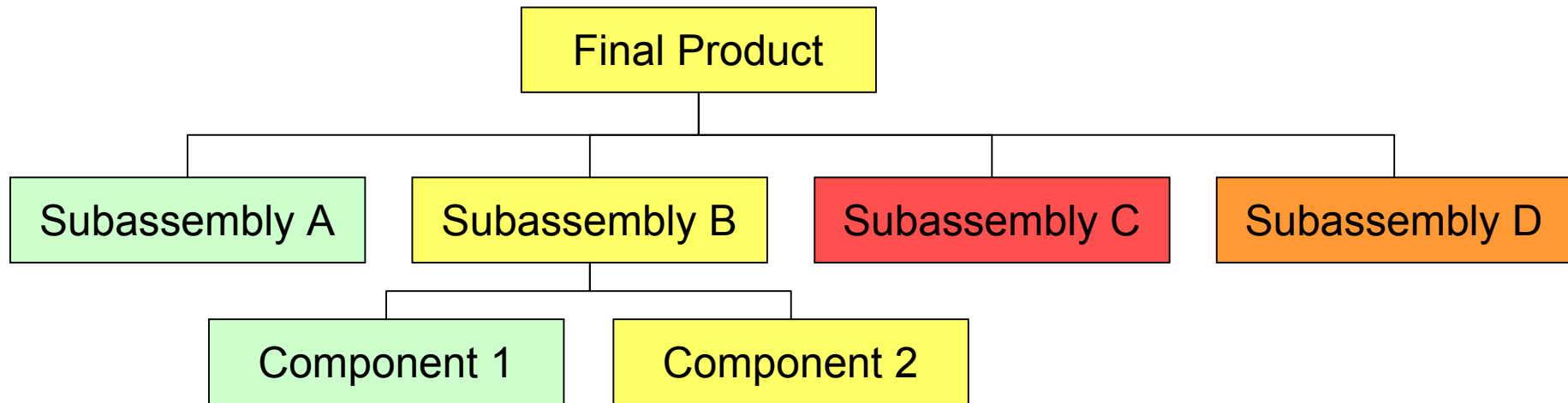
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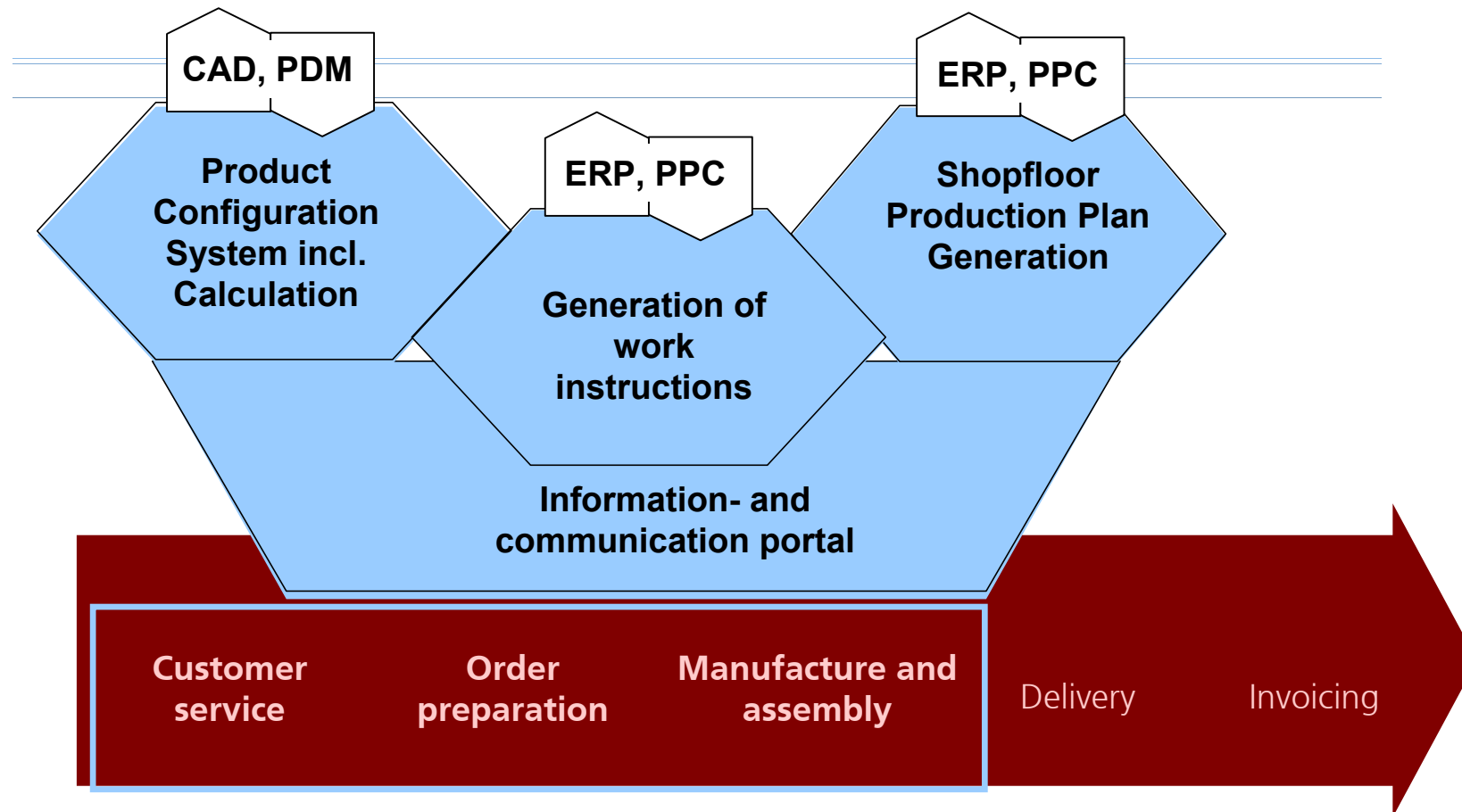
Flexibility Tables



Flexibility Table

Product Structure	Status	Comment	Ass'y Impact	Cost Impact
Final Product	Flexible			
Sub A	Fixed		-	-
Sub B	Flexible			
Comp 1	Fixed		-	-
Comp 2	Flexible	Variant Selection open	No	No
Sub C	Open	Individualized Design	Yes	Yes, high
Sub D	Open	Provided by Customer	Yes	Yes, low

Interfaces of the Product Configuration and Work Planning Support System



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Conclusions

- Individualized products will grow in market share, especially in equipment supply industry
- Current project management methods in individualized product order fulfilment should be replaced by process management approach
- Customer integration should be supported by a systematic methodology
- Information and communication tools have to be designed for cooperative business process between customer, order management and shop-floor operation
- The MUSKIM project will provide prototype solutions