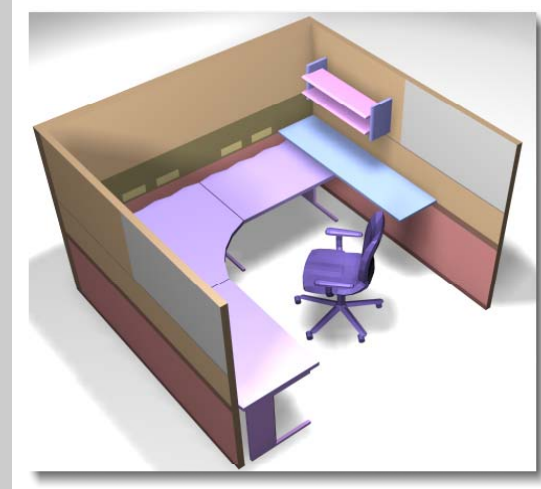


What Makes Product Configuration Viable in the Business?



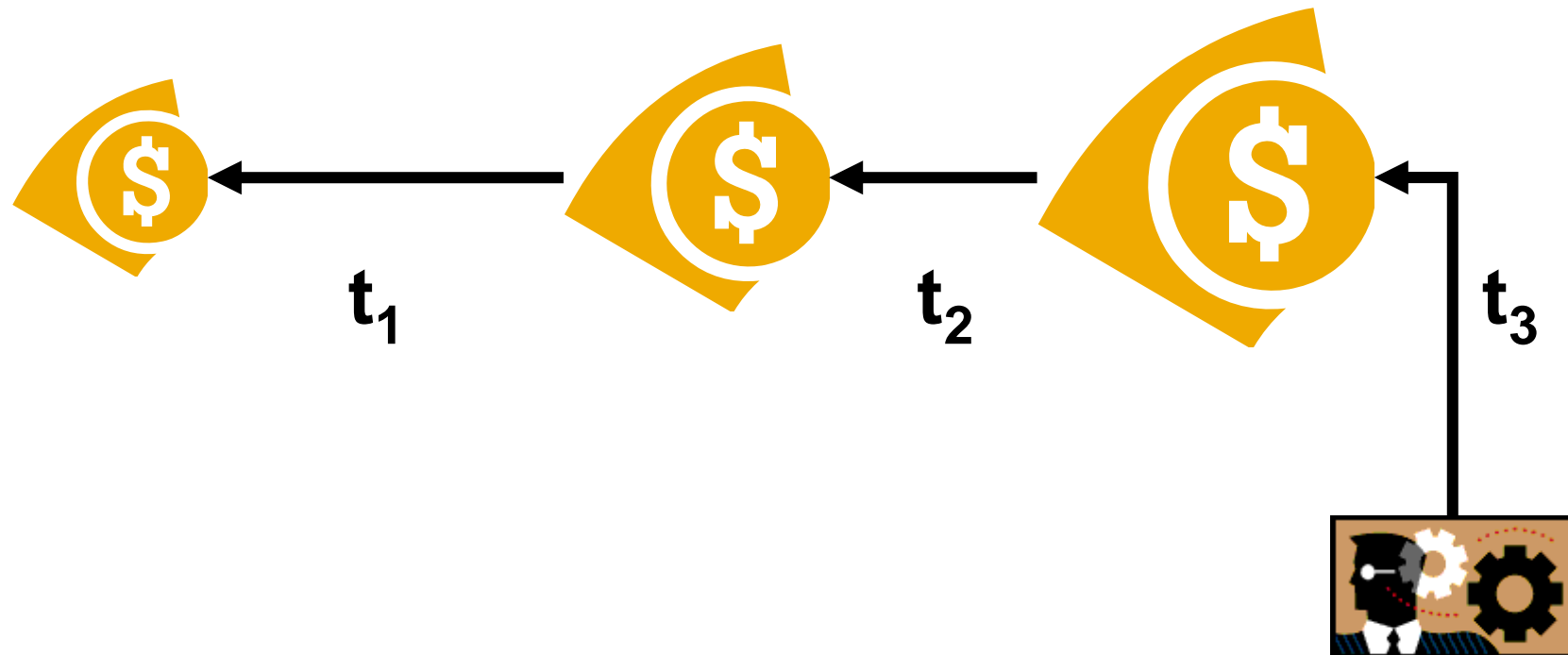
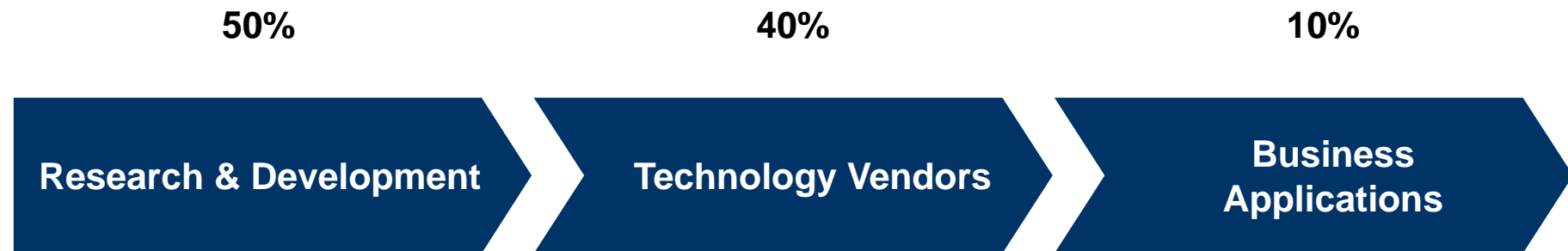
Albert Haag, Development Architect, SAP AG

Workshop on Configuration,
ECAI-08, Patras, Greece,
Jul 22, 2008

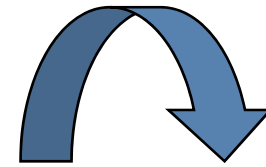
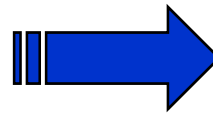
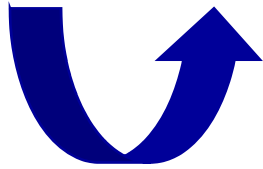
Research and Development Value Chain



Participants at AI CFG Workshops (Estimate)

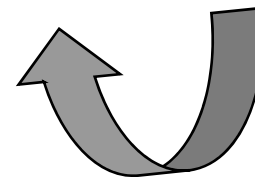


Wherefore?



"42"

"?"



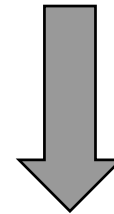
**Discuss
problem setting
with application
experts**



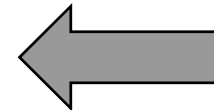
**Translate to
interesting
technical
framework**



**Demonstrate
solution to
technical
problem**



**Evangelize
deployment of
solution**



!!!?

Agenda



1. **Commercial Expectations**
2. Exemplary Business Scenarios
3. Commercial Obstacles
4. Outlook

Vision for Configuration— 1985 (PLAKON)



Commercial (Use-Cases)

Visual diagnostics (configuration of algorithm)

- Automatic inspection of assemblies (cars)
- Automatic analysis of x-rays in quality inspection of materials
- Projected impact: overcome expertise bottle-neck

Airliner cabin layout

- Projected impact: efficiency gain in sales negotiations

Make to Specification

- Electrical transformers based on
 - Environmental constraints
 - Functional requirements
 - Engineering heuristics
- Projected impact: cost reduction due to efficiency gains

Configuration of Complex Systems

- Control system for power plants
- Projected impact:
 - cost reduction due to efficiency gains
 - overcome expertise bottle-neck
 - Improve quality assurance for critical processes

Technological

Configurator as Expert System

- Constraints as part of model but do not express human expertise
- Need to express engineering heuristics
 - “Control strategies”
 - “Soft constraints”
- Desire to configure “bottom-up”

Planning as temporal configuration

Current Mainstream



Commercial (Application Areas)

Mass automation in manufacture of variants

- Example:– processing sales orders for computer servers
- Impact: utilization of production capacity

Enabling complex products

- Example: modular office furniture
- Impact: Overall viability of a complex product

Sales-channel internet

- Examples:
 - direct configuration of a car by end-customer
 - Financial services
 - Custom kitchens
 - ...
- Increased market share; competitiveness

Entertainment

- Examples: computer games contain configurable equipment, strategies, etc.

Technological

Configurator model-driven

- Constraints primary part of model
 - Limit user choices
 - Explain inconsistencies
- Support for heuristics
 - Preferences and defaults
- Not an expert system
- Primarily top-down, not bottom-up



“Production Automation”: Manufacturing a Computer



Many orders/ day: High throughput

Automate logistics planning and execution

- Ensure that only valid orders are accepted into back-end ERP system
- Create bills-of-material and routings
- Enable fuller utilization of production capabilities

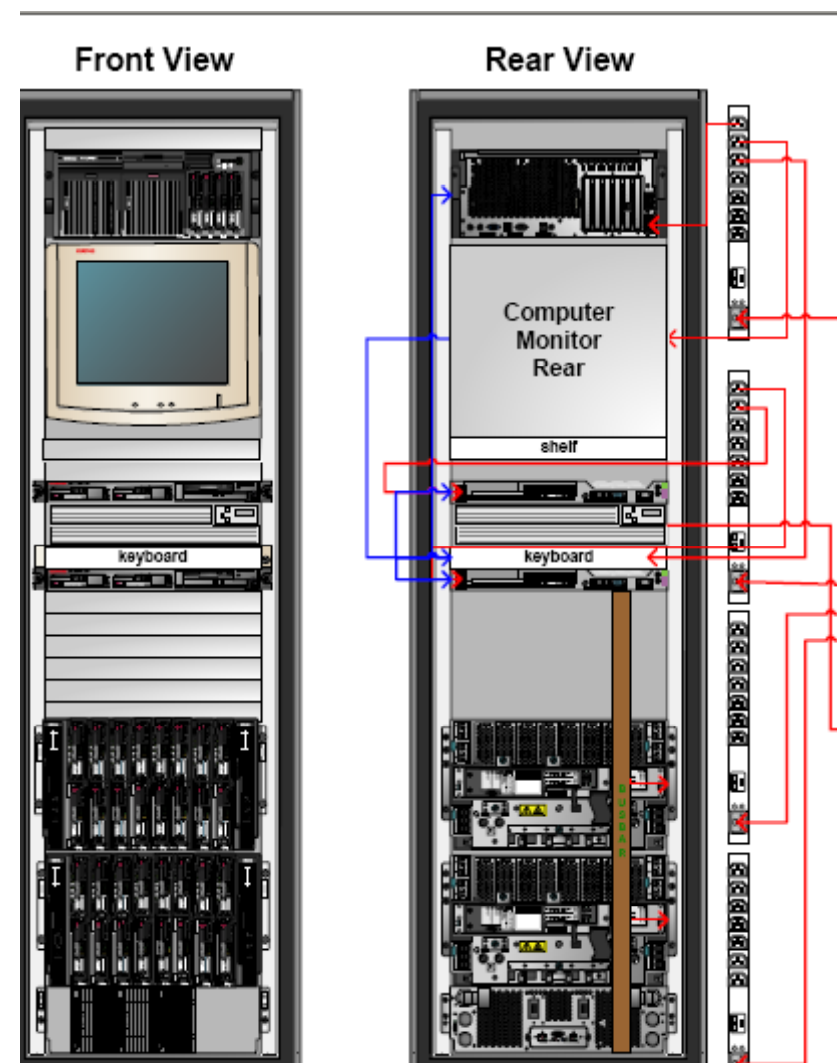
Challenges

- Potentially high project cost
- Integration is the central aspect

Remarks:

- Successful implementation of SAP ERP Variant Configurator (1995 – present)

Computer (Server)



“Enabling”: Selling Modular Furniture Solutions



Challenges:

- Without being able to sell the solution to customers plant that produces components not utilizable
- Requires integration of configurator, CAD, and ERP



Remarks: Based on projects with SAP configurator



“Sales-Channel Internet”: Buying a Car



Many orders/ day: High throughput

Channel enabling

- Consistent orders from dealers
- Direct end-customer orders through internet

Also: Automate logistics planning and execution

Additional challenges :

- Ensure sales configuration translates into manufacturing configuration consistently
- Provide adequate user guidance and explanations



Remarks on choosing German Renault web site:

- Not using SAP
- User cannot visit inconsistent states



Summary: Original Commercial Expectations Not Yet Met



Do have an increasing amount of companies specializing in configuration

- 400,000 hits and 10 sponsored links when searching Google for “product configuration”
- 360.000 hits but no sponsored links when searching Google for “mass customization”
- 23,200 hits when searching for combination

Impediments to a more pervasive deployment of the technology:

- Undesirably high total cost of ownership (TCO)
 - Continual project costs
- Lower-than-expected return-on-investment (ROI)
 - Partly related to TCO issue
- Technology gaps impede envisioned project solution
- Ill-defined problems don't admit working project solution
- Disregard to integration issues blocks business success

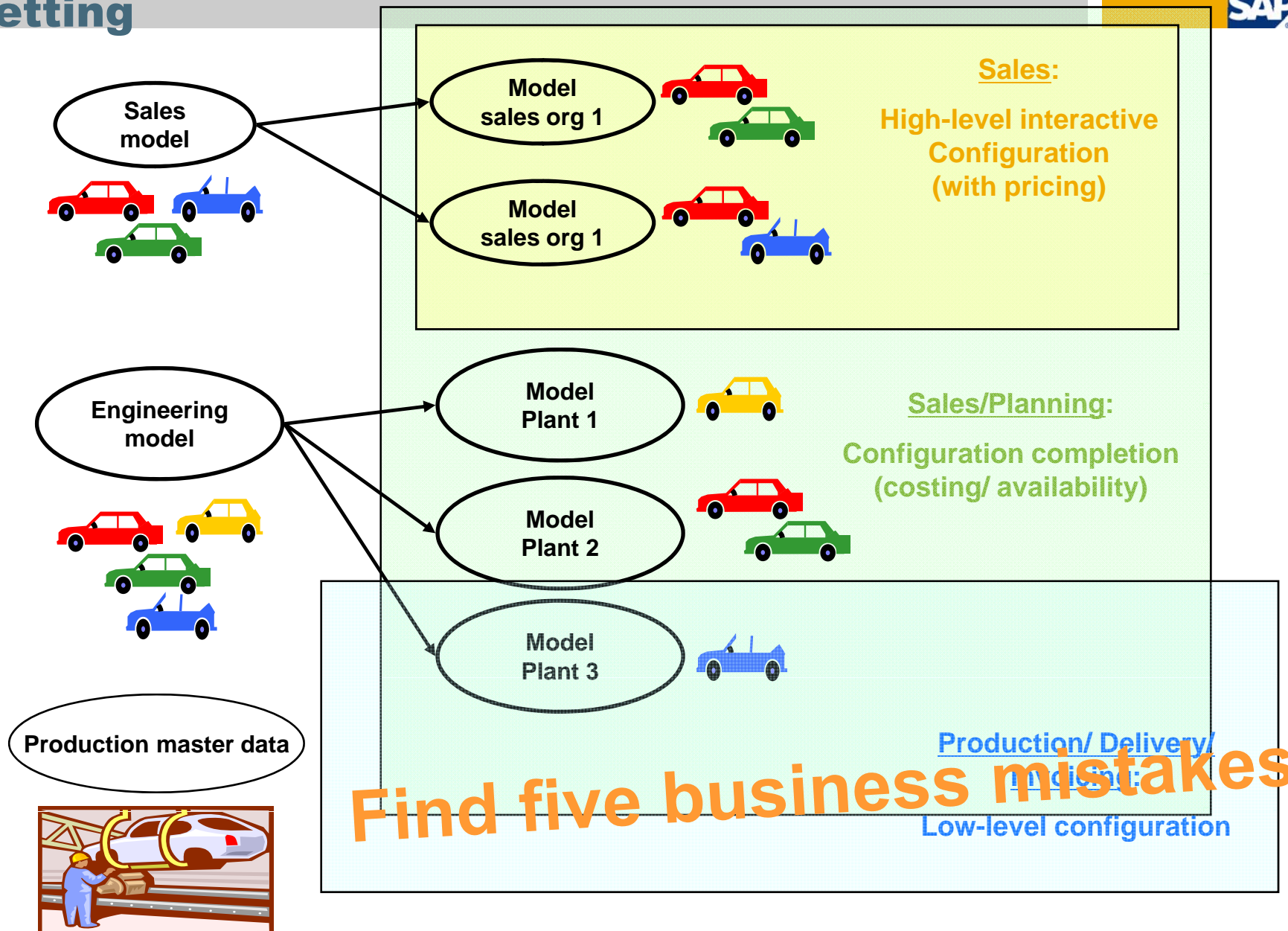
Configuration is widely viewed as “difficult” and to be avoided if possible

Agenda



1. Commercial Expectations
2. **Exemplary Business Scenarios**
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Make-to-Specification: Basic Business Setting



Business Considerations



Pricing usually required closely integrated with sales configuration

Costing/ availability needs to be performed “on request”

Forecasting/ planning needs to be derivable from product model

Policy for handling returns must be supportable

Invoice needs access to original sales configuration

Parts substitution must respect sales contract



Predefined Variants

- All variants of product are predefined from the sales side

Order Set

- Configuration result is a set of predefined components that are assembled into the sought solution outside the manufacturing plant
 - Dealer's site
 - Customer's site

Mixed Scenarios

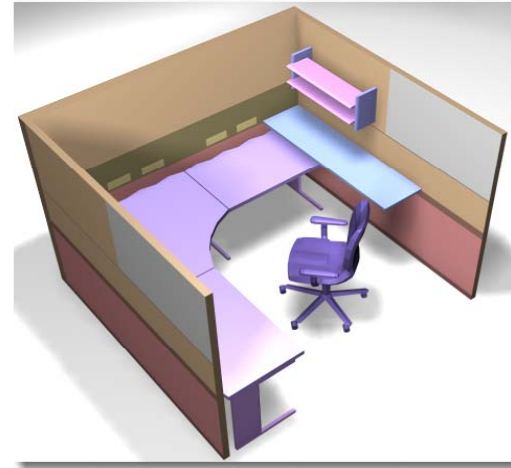
- Predefined variants with limited additional variability ("mass customization"?)

Engineer-to-Order

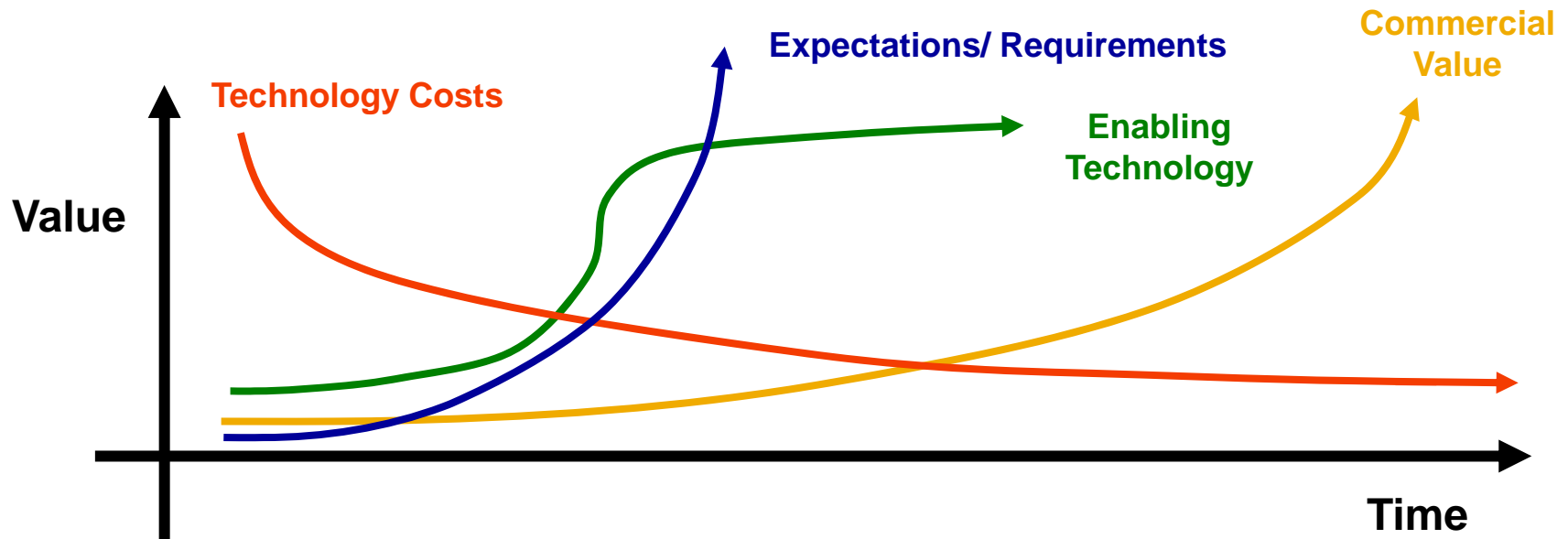
- Some customized processing required in fulfillment as well
- Some customer specific constraints must be met

Agenda

1. Commercial Expectations
2. Exemplary Business Scenarios
3. **Commercial Obstacles**
4. Outlook



Commercial Factors to be Considered



Observables:

- Total Cost of Ownership (TCO)
- Experienced utility
- Return on Investment (ROI)
- Perceived relevance may exceed actual ROI

$$u(t) = \text{benefit}(t) - \text{TCO}(t)$$
$$\text{ROI} = \int u(t) dt - \text{Investment}$$

Costs

- Keep it simple (which in itself is not simple)

Integration

- Weak link in Chain limits overall success

Commercial relevance

- Focus on measurable utility gains
- Automating something people can do equally may be too abstract a consideration
- Configuration should be enabling not enhancing

Ensure mature technology fits problem at hand

- **More precise definitions of problem categories needed**
 - ATO, MTO, ETO, ...
 - Simple, complex, and network solutions

General

- Ensure user experience (UI) matches audience
 - Technical in-house sales people differ from internet end-users
- Don't accept all requirements at face value
- Focus not only on Technology but TCO

Simplify Problem and Approach



Complex Problem:

- All components potentially interact

Simpler Problem

- Components arranged in a hierarchy with only top-down interactions

Simple Problem

- No (or only very weak) interactions between components

Example: two ways of selling a PC with a printer

- Choice of printer depends on features of PC
- Any printer with USB interface will do

Technical simplification

Business simplification

- Do all components need to interact?

Don't accept all requirements at face value

Focus not only on Technology but TCO

Agenda



1. Commercial Expectations
2. Exemplary Business Scenarios
3. Commercial Obstacles
4. **Outlook**

Emerging Trends



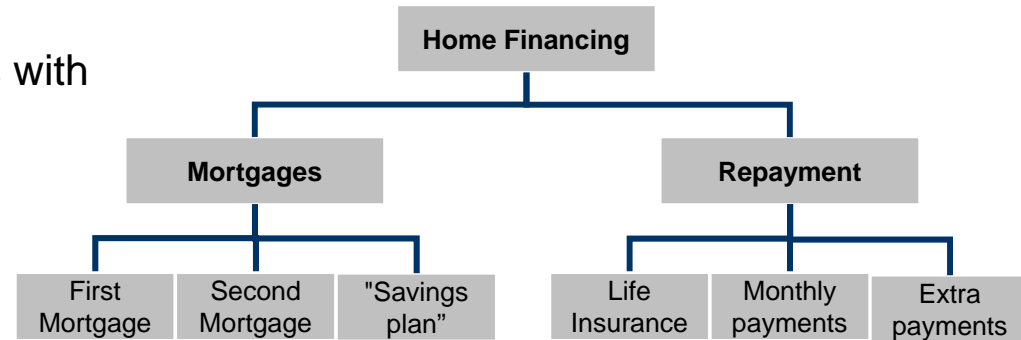
Configurable services & bundling services with materials

Channel enabling

- Direct end-customer orders through internet

Upgrade configuration

Engineer to order



Enabling of New Business Processes



Repair/ recycling of products

- Currently it is often cheaper to buy a new product than to repair an existing one.

More highly configurable personal transportation

- Providing solutions with a better mix of public and private transportation would make the former more viable.

Purchasing-by-specification.

- Low volume production (such as producing quilts, say, or harvesting individual trees) is currently handled by informal manual interaction.
- Means of collaborating by collaborating on specifications might open new markets here.

Questions?

Thank you!

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APPENDIX

Personal Profile



Battelle Institute Frankfurt (1985 - 1991)

- Configurator technology research projects
- Development of configurator (expert system shell)

SAP AG (1992 - 1995)

- Development of configurators for SAP/R2 and SAP/R3 integrated business software suites

SAP Labs Palo Alto (1996 - 1999)

- Development of “advanced” standalone Java configurator

SAP/SAP Markets (2000 - 2002)

- Integration and refinement of the business process “Sales of Configurable Products”

SAP AG (2003 - present)

- Stabilization and modularization of business integration

SAP Configurators Overview

SAP ERP Variant Configurator

- Provides high-level configuration in mySAP ERP systems (R3)
- Since 1994

SAP IPC (Internet Pricing and Configuration)

- Includes standalone configurator engine

~ 1800 customers use configurator functionality

Remarks:

- Constraints and procedural dependencies both supported
- Manufacturing completion step not clearly separated
- Low-level completion step clearly separated
- Fully integrated into a multitude of business processes
- Modeling integrated into normal master data maintenance
- Some further “advanced” features in SCE

Contact & References

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- <http://www.sap.com>
- <http://help.sap.com/>

