BMW AG: The Digital Car Project

Sung Joo Bae
Assistant Professor of
Operations and Technology Management

Leipzig – Postmodern Factory Building

Open Space – Open Communication

Plant Mgr – Peter Claussen
Goal: Flexible and efficient plant for 30 to 40 years

Body Shop

Communal Eating and Problem-solving

Keeping an Eye on Problems

Automotive Competition (1980s/early 1990s)

Average Development Times
(in months; not adjusted for complexity)

Late 1980s (n=29)	Japan	US	Europe
Total Lead Time (months)	**43**	**62**	**61**
• Planing	14	23	20
• *Engineering*	*30*	*40*	*42*
• Plan./Engr. Overlap	1	1	1
Early 1990s (n=27)			
Total Lead Time (months)	**51**	**55**	**58**
• Planing	18	19	23
• *Engineering*	*32*	*40*	*42*
• Plan./Engr. Overlap	-1	4	6

No changes (Engineering, Europe: 42 → 42)

Engineering Lead Time: Months from start of detailed design engineering to market introduction.

Source: Clark and Fujimoto, Product Development Performance, Harvard Business School Press, 1991; D. Ellison, Dynamic Capabilities in New Product Development: The Case of the World Auto Industry, Unpublished PhD Thesis, Harvard University, 1996.

Competition in the mid-90s and beyond

- *In the mid-90s, several Japanese firms have started to reduce* ***engineering*** *lead times from 30 to around 20 months.*
- ***Example****: Nissan announced that it will develop all new models after 1997 with 19 months engineering lead times.*
- *Most automotive firms around the world now have programs that aim at reducing development lead time significantly.*
- *Computer technologies play an integral role in these programs.*

Why shorter development time?

Direct Benefits

- *First-to-market (can charge price premium).*
- *Better match between product concept and rapidly changing market need ("closer to markets").*
- *More frequent product releases.*

Indirect Benefits

- *More rapid and frequent learning cycles for process and product improvements.*
- *Automotive research has shown that faster firms also tended to be more productive with their resources.*

Risk of reducing development times too fast...

- *If the required organizational capabilities are not in place, firms risk potential product quality and performance problems.*
- ***Example**: The reduction of major prototype generations with the aid of computer-aided technologies (from 3 to 1). What is the right number?*
- *A deep understanding and careful deployment of rapidly advancing computer technologies can lead to dramatic changes without compromises in quality.*

Building development capabilitites

Technology

- *How can old and new technologies be leveraged to reduce development time without changing product quality and performance?*

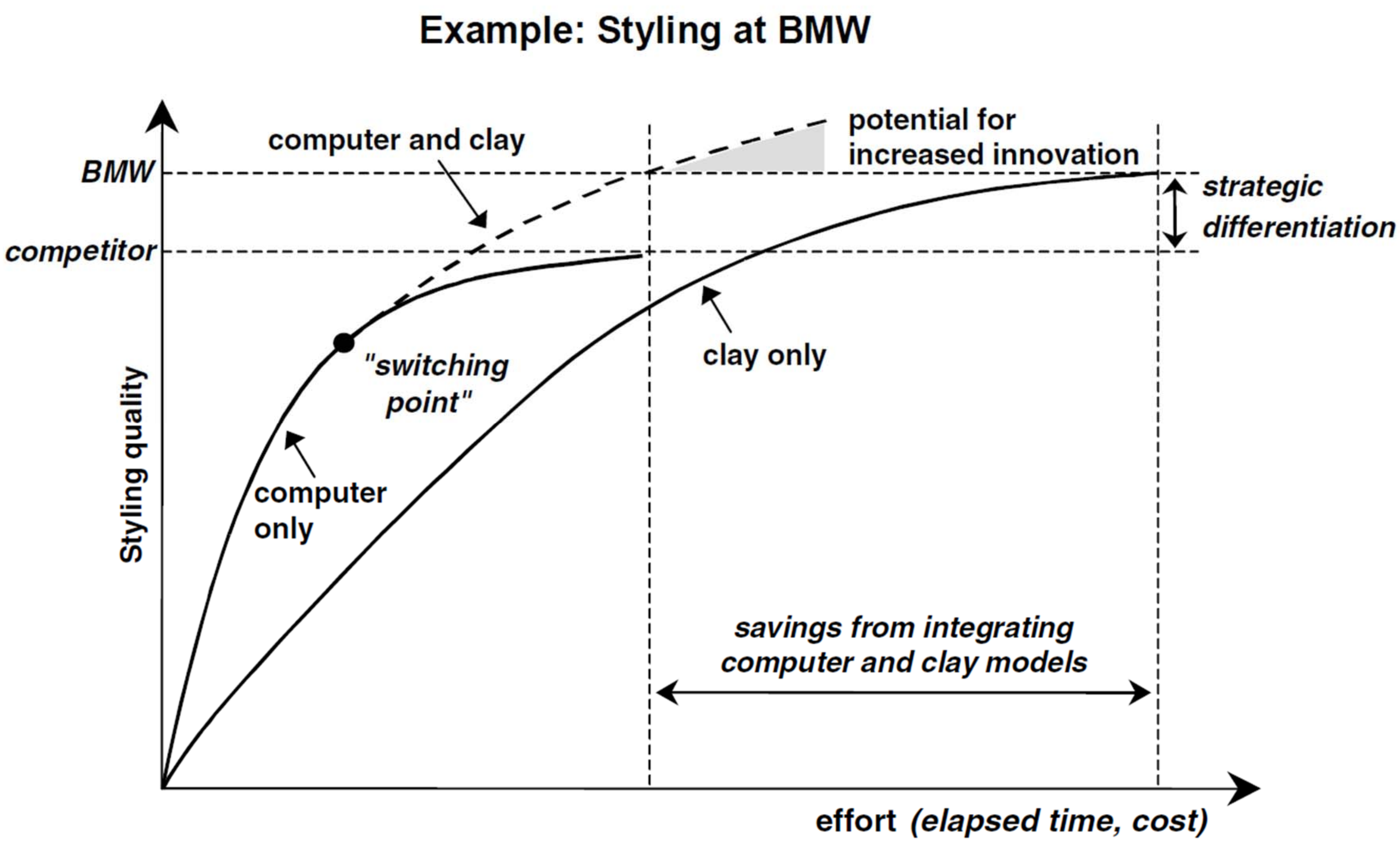
Process

- *How can development problems be identified and solved earlier in the process when changes are less costly and time-consuming (i.e."front-loaded"?)*

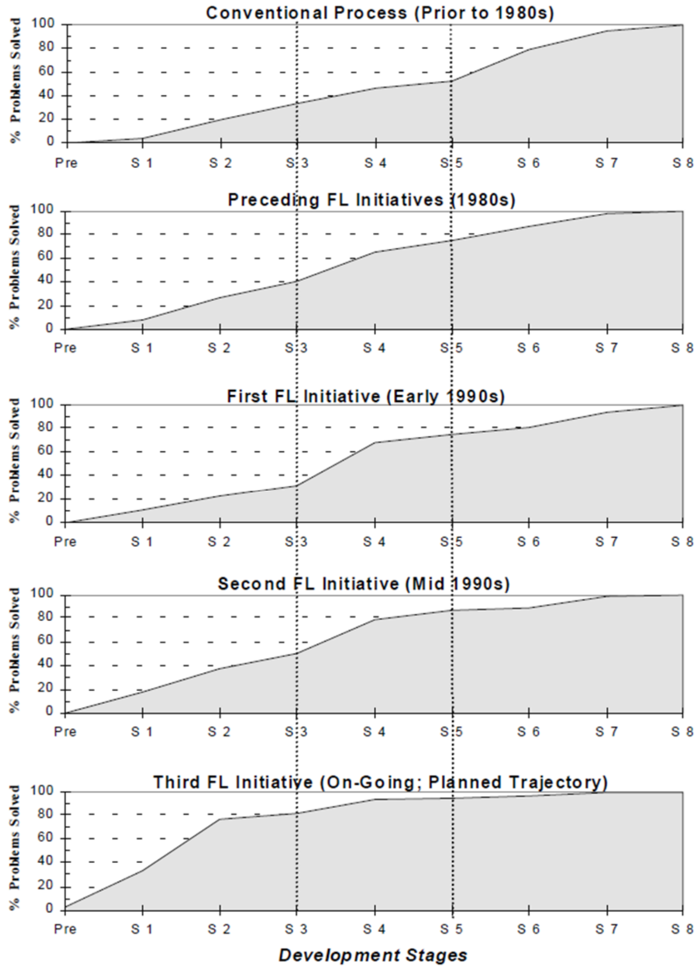
Organization

- *How quickly can a development organization learn and change? How do we know that the capabilities are in place to dramatically cut lead times?*

Combining technologies at BMW



The effect of front loading (Toyota)



- Over 50% of problems solved after S5 (start of pilot runs)

- Improved communication between body engineering and die shops.
- Few improvements in other areas.

- Formal and systematic efforts to do joint problem-solving.
- Major improvement between S3 and S4 (S3 = first engineering prototypes).

- Company-wide move towards three-dimensional CAD to identify interference problems.

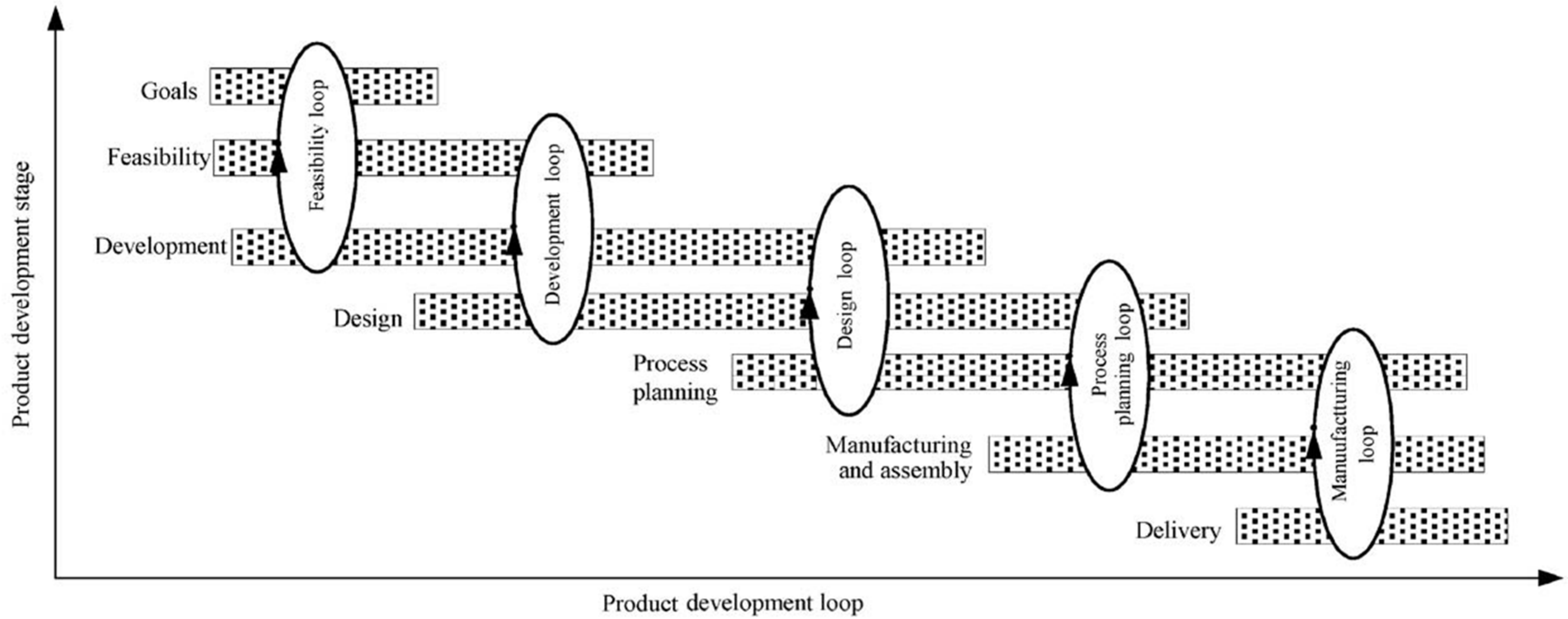
- CAE to identify and solve functional problems (~ 80% before S3).
- Knowledge transfer from previous projects to the front of new projects.

Compression vs. Experiential Strategy

Characteristic	Compression	Experiential
Key Assumption	Certainty	Uncertainty
Image of product innovation	Predictable series of well-defined steps (Usually works for mature industry)	Uncertain path through foggy & shifting markets and technologies
Strategy for speed	Rationalize, then squeeze the process	Quickly build understanding and options while maintaining focus and motivation
Tactics for speed	Planning Supplier involvement Cut step time through CAD Overlapping development steps Reward for meeting schedule	Multiple iterations Extensive testing Frequent milestones Powerful leader Multifunctional teams

(Source: Eisenhardt & Tabrizi, 1995)

Reducing development time (compression)



(Source: J. Kus&ar et al., 2003)

Product Development Systems of High-Performing Volume Producers