Supply chain design
and production systems
Lesson 6: Variety Management

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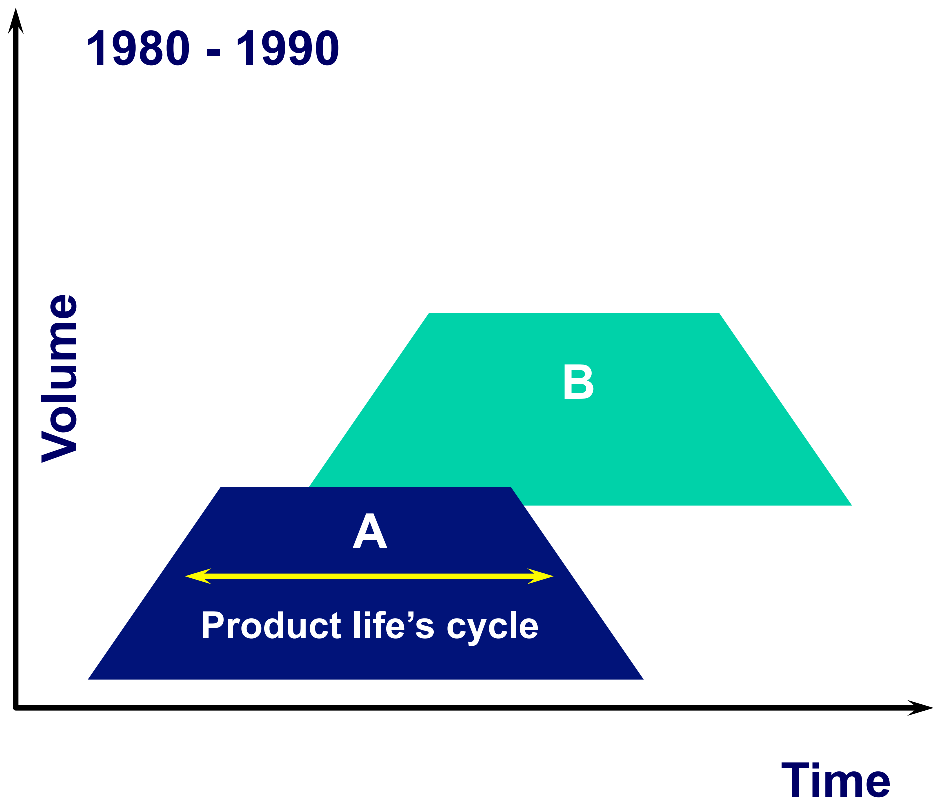
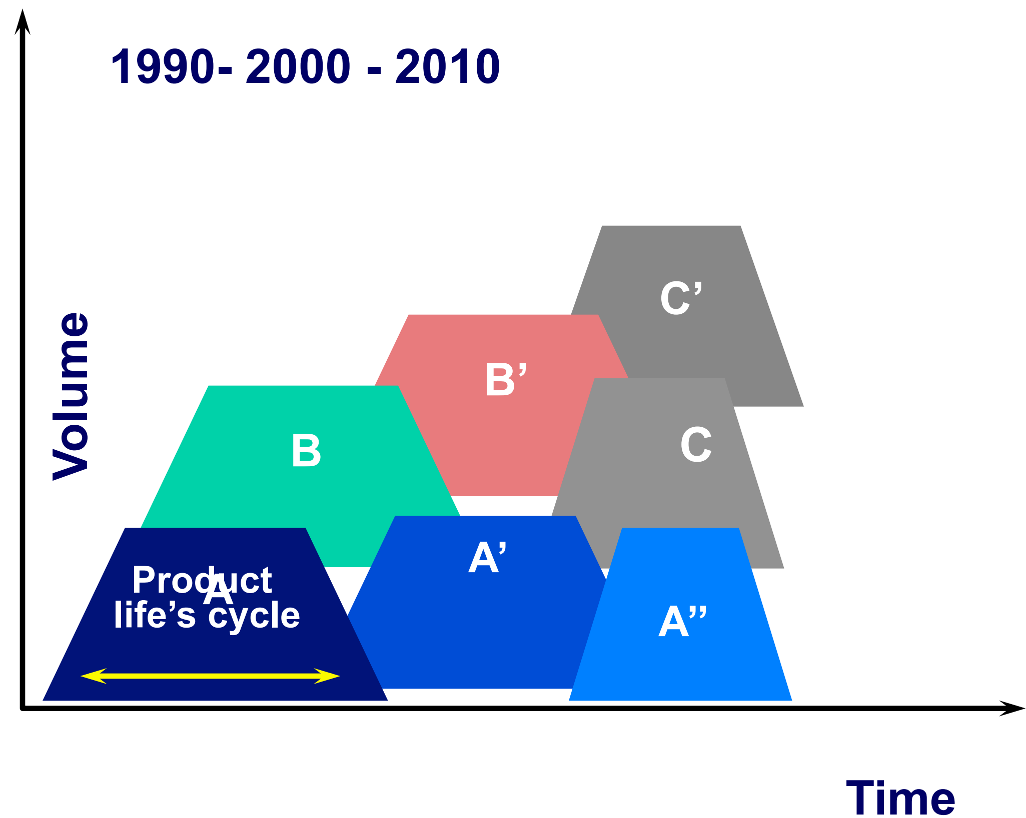
Variety Management

Life cycle and variety



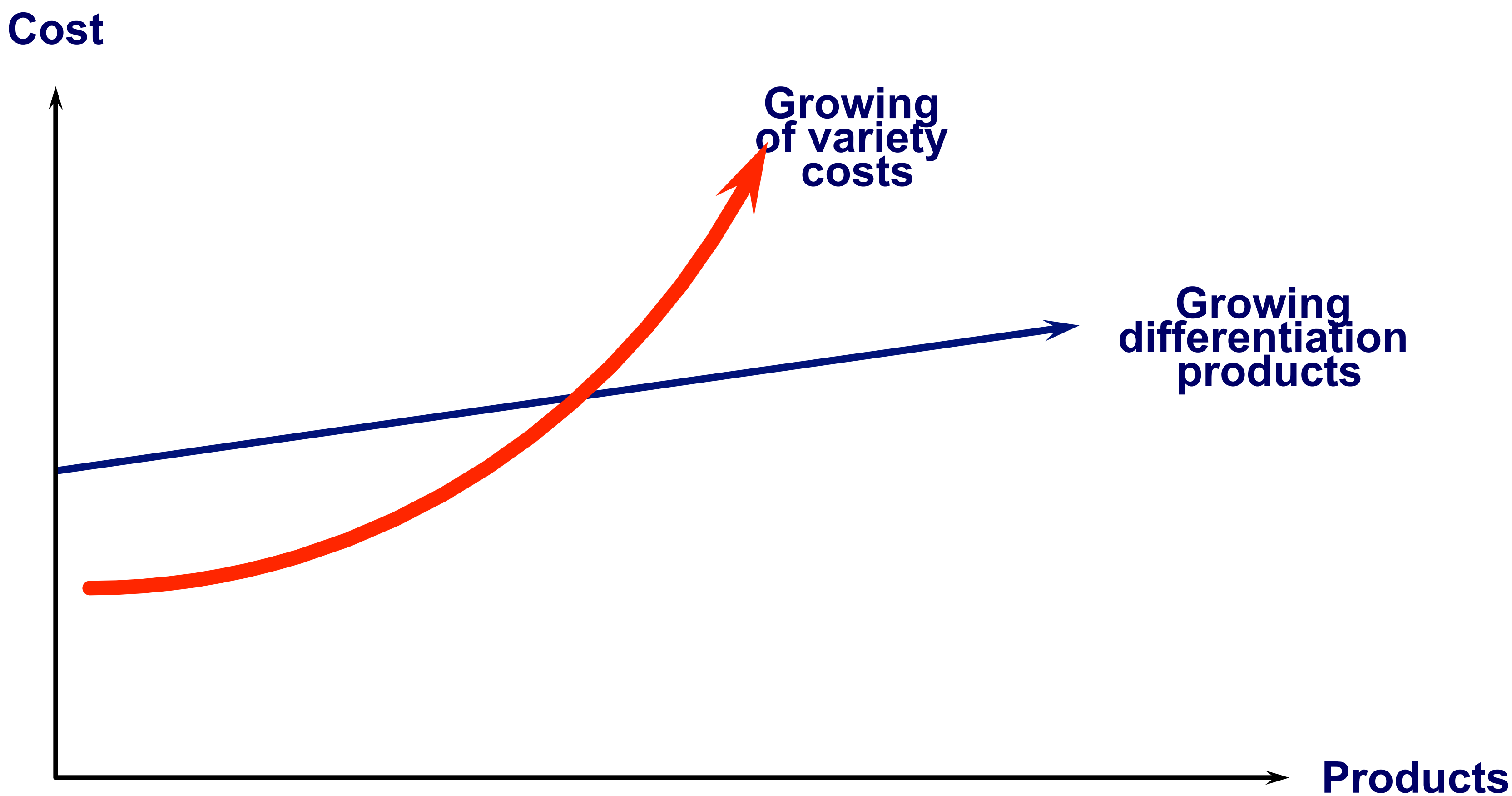


What is Mass Customization and How can you do it?

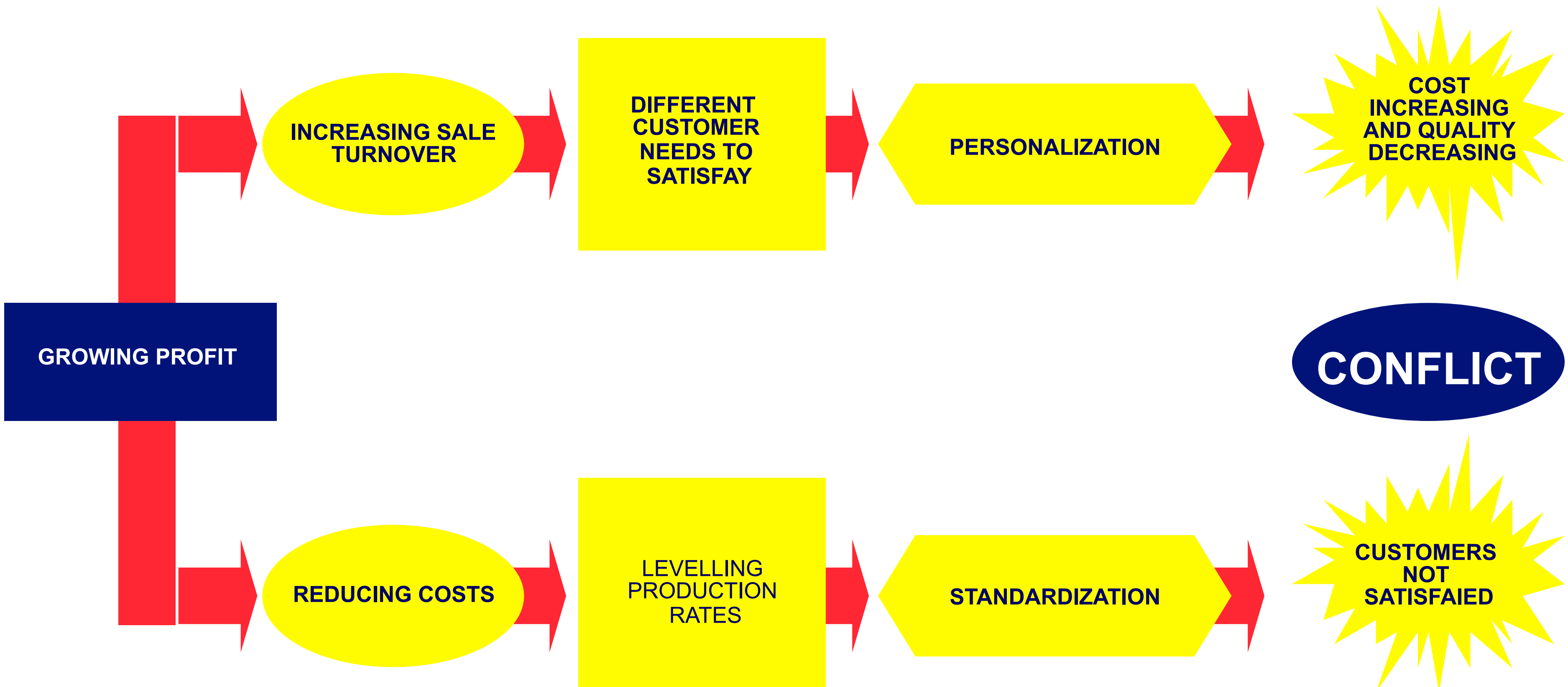
- The concept is often :
  - ✓ Mass Customization: the competitive advantage
  - ✓ Modularization: strategy of new product architecture
  - ✓ Postponement: strategy of new production process architecture

- Every strategy require the following key issues
  - ✓ Flexibility
  - ✓ Agility
  - ✓ Lean Organization

Increasing the costs of the product variety



Standardization and variety are conflictual targets



VRP (Variety Reduction Program)

Product Family

VRP (Variety Reduction Program): the key issues

F COSTS

- Functional Costs are based on the technical requirements on the production or assembly of each component

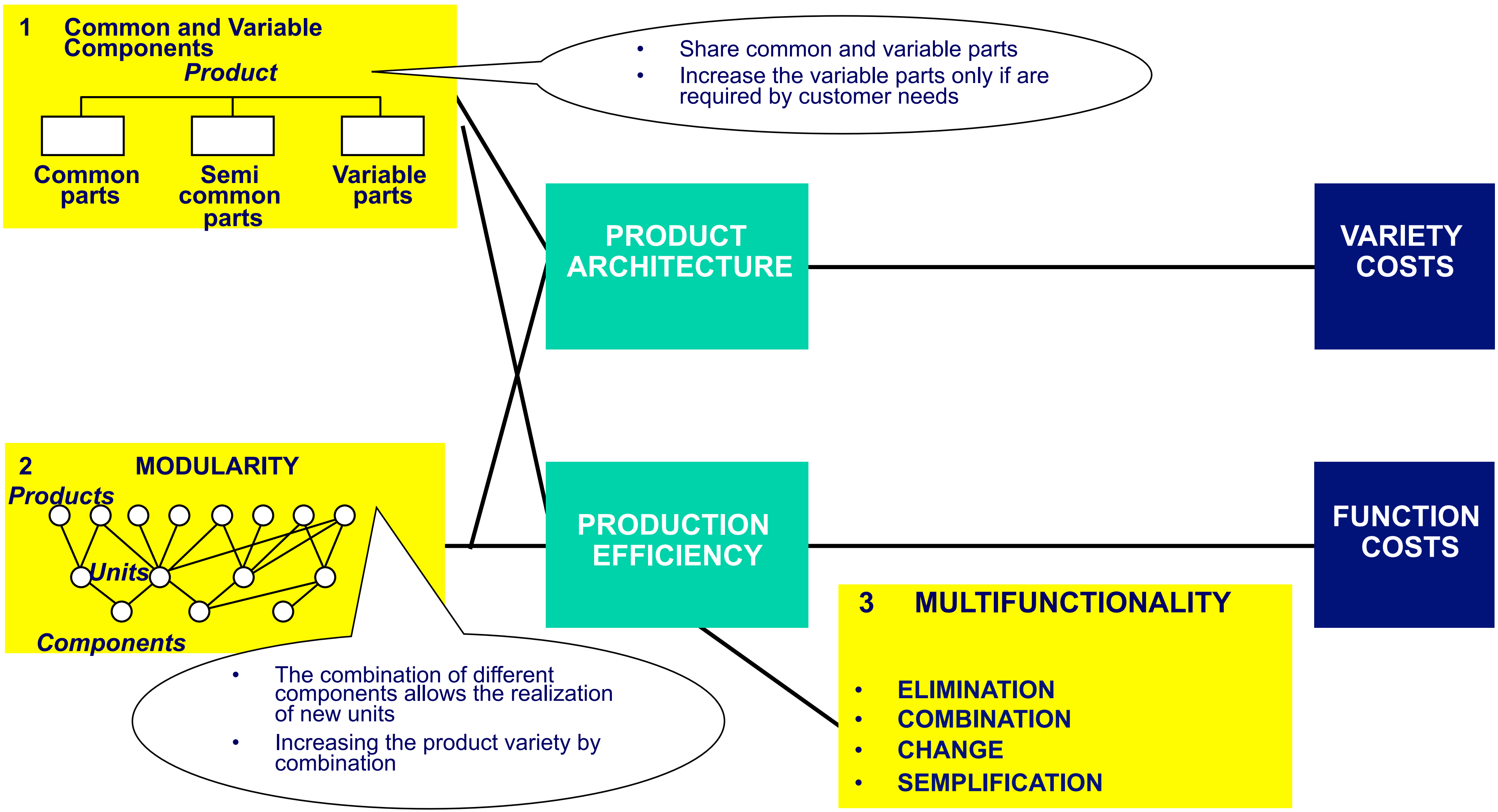
V COSTS

- Variety and Volume Costs are based on production quantity of each product or each production process

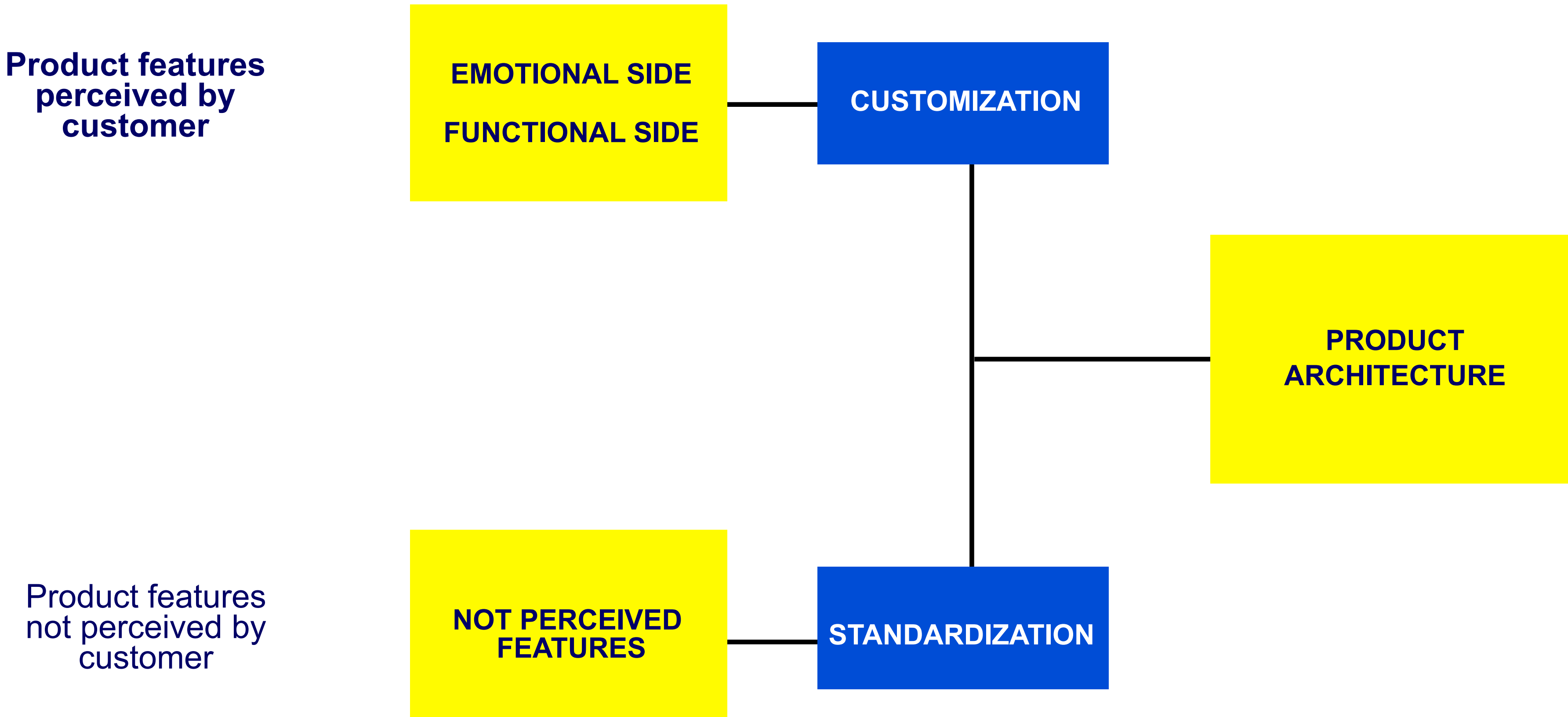
- Planning and Control Costs are based on total quantity of components, production processes and control points

C COSTS

VRP (Variety Reduction Program): the basic tools



Customer needs and production needs are not always the same but it is possible an integration



Choosing the right architecture of products

Product variety increasing

Choosing the best production technology and the best product architecture to fit the variety requirements

FLAT ARCHITECTURE	VERTICAL ARCHITECTURE	
Increasing the product references by combination of existing modules and components Focus to PRODUC VARIETY	Increasing the variable components only for increasing the product references Focus on STRONG UNIFICATION	PRODUCT DESIGN
Supplying parts and modules to assembly working stations	Assembly line for common parts and final assembly line for personalization (Manufacturing Postponement)	PRODUCTION

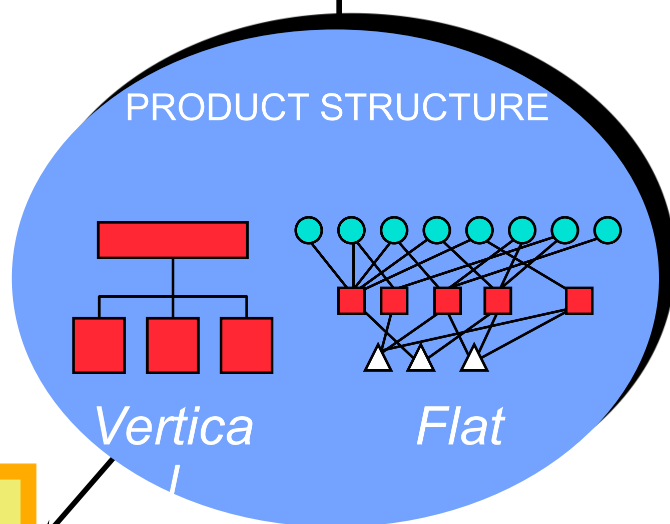
The lean design method “Henshu”

New Product development based on vertical or flat approach

New product planning (product architecture)

"HENSHU KIKAKU"

Planning of product family



Variety reduction
Cost reduction

Efficient design
Information management

"VRP"

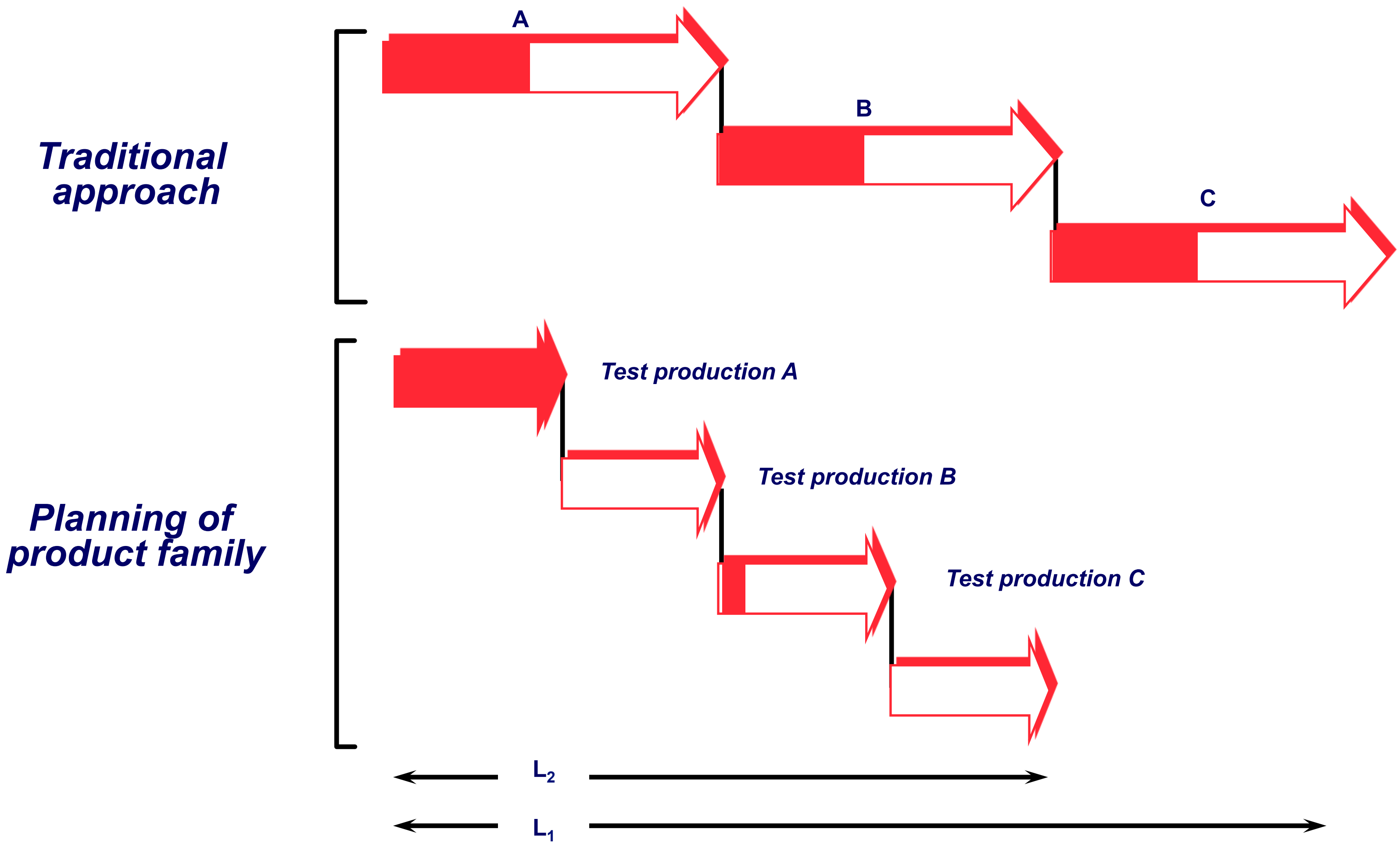
Variety Reduction Program

"HENSHU SEKKEI"

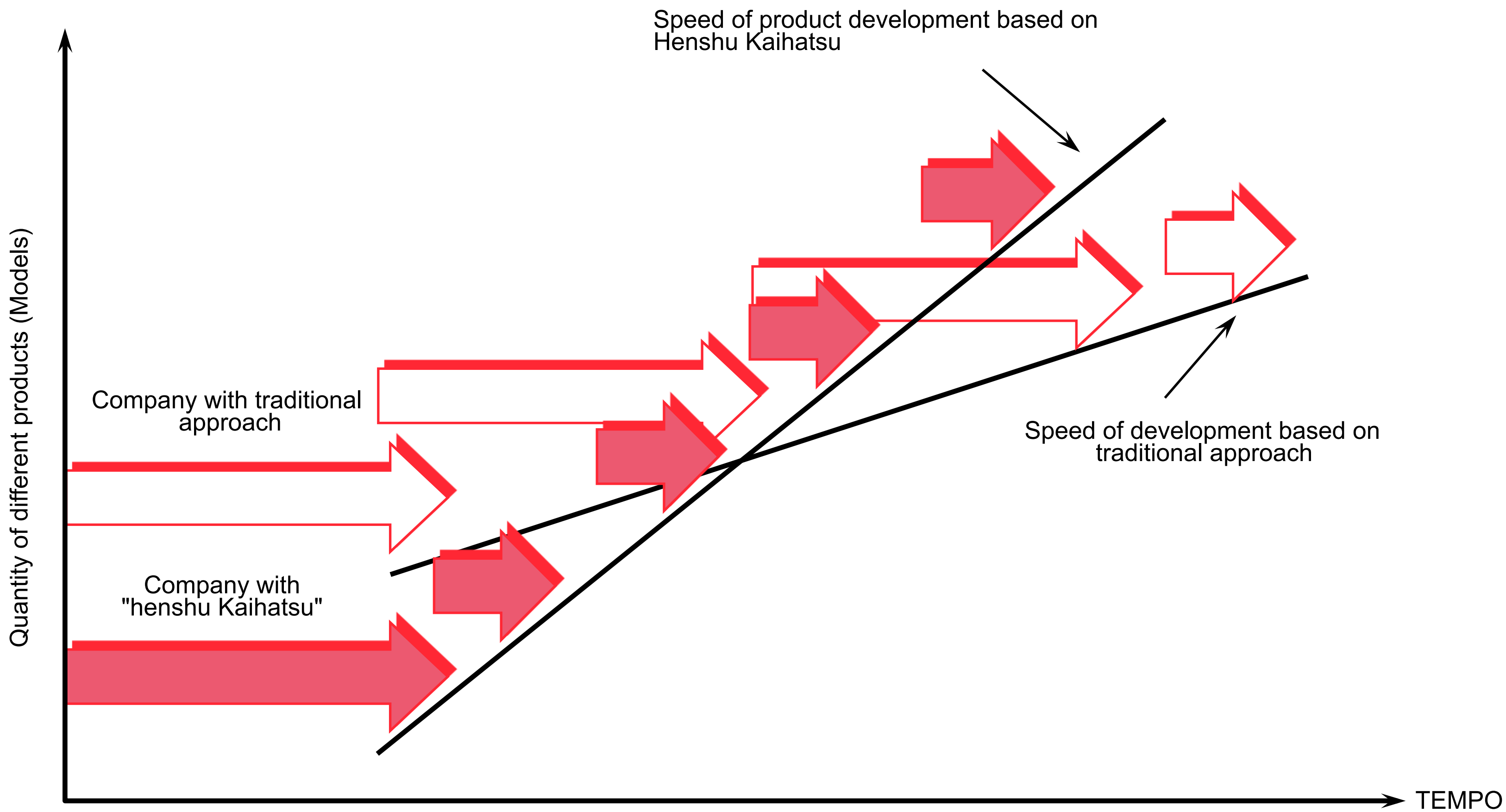
“Collage” Design

Planning and Development of new product family based on VRP

(in Japanese "Henshu Kikaku")



Development performances (speed) of traditional approach and planning of product family approach



The system of Planning and Development of product families

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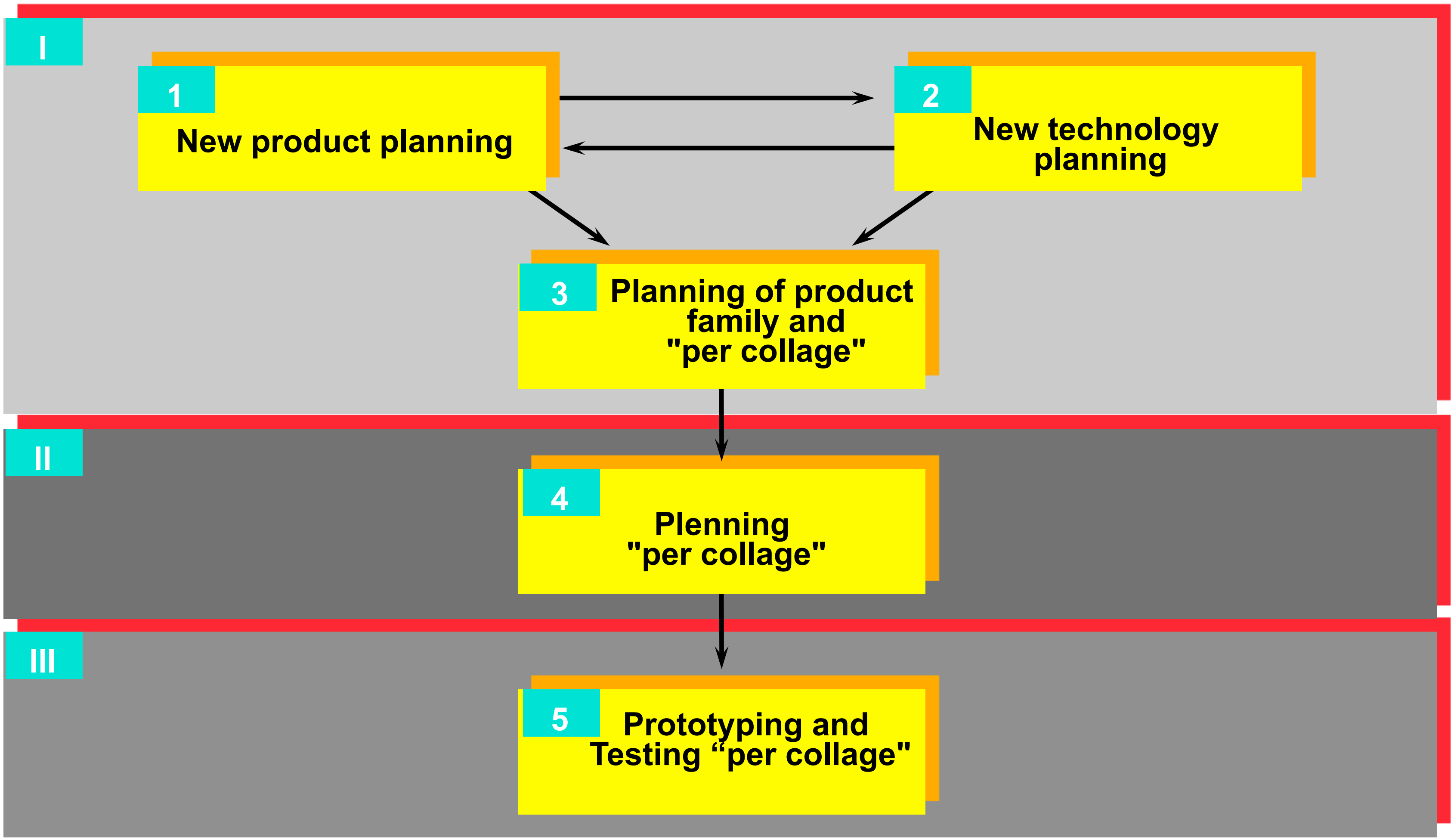
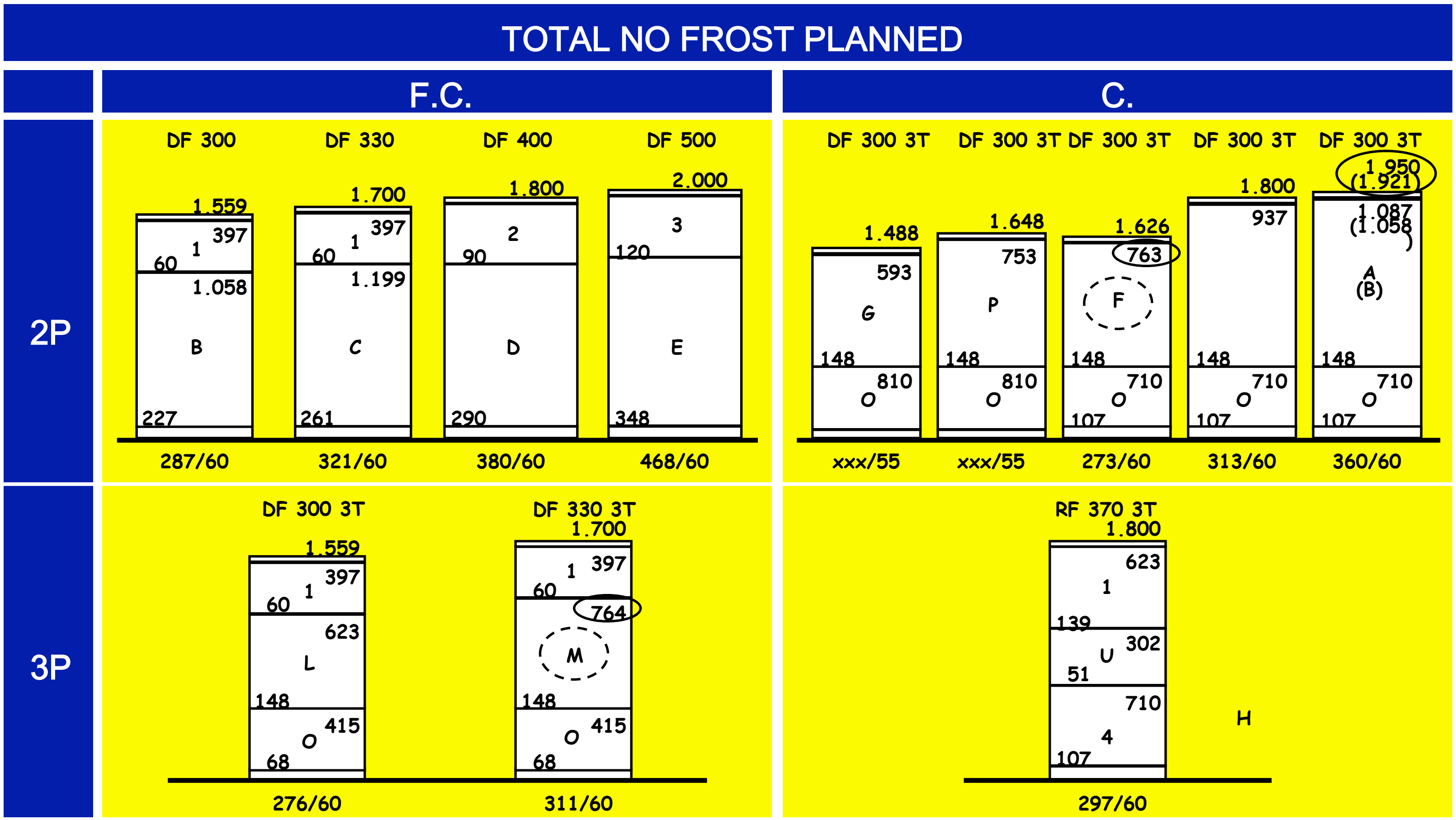


Example: Company M



Product planning and architecture

Tipi / Capacità / Struttura		COMBINATI	DOPPIA PORTA	DOPPIA PORTA – TRE PORTE
		Piccolo 320 ↔ *Grande 400*	*Piccolo 300* ↔ *Grande 500*	*Piccolo 285* ↔ *Grande 330*
ARMADIO	I A S	F ↕ / ↔ V	F ↕ / ↔ V	F ↕ / ↔ V
PORTA	I A S	V ↕ / ↔ V	V ↕ / ↔ V	V ↕ / ↔ V
MONTAGGIO GRUPPO NO-FROST	I A S	F ↕ / ↔ V	F ↕ / ↔ V	F ↕ / ↔ V
ACCESSORI INTERNI	I A S	S.V ↕ / ↔ V	↕ / ↔ V	↕ / ↔ V
ACCESSORI ESTERNI	I A S	S.V ↕ / ↔ V	↕ / ↔ V	↕ / ↔ V
COMPRESSIONE CONDENSATORE	I A S	F ↕ / ↔ V	F ↕ / ↔ V	F ↕ / ↔ V
DOCUMENTA-ZIONE IMBALLO	I A S	F ↕ / ↔ V	F ↕ / ↔ V	F ↕ / ↔ V

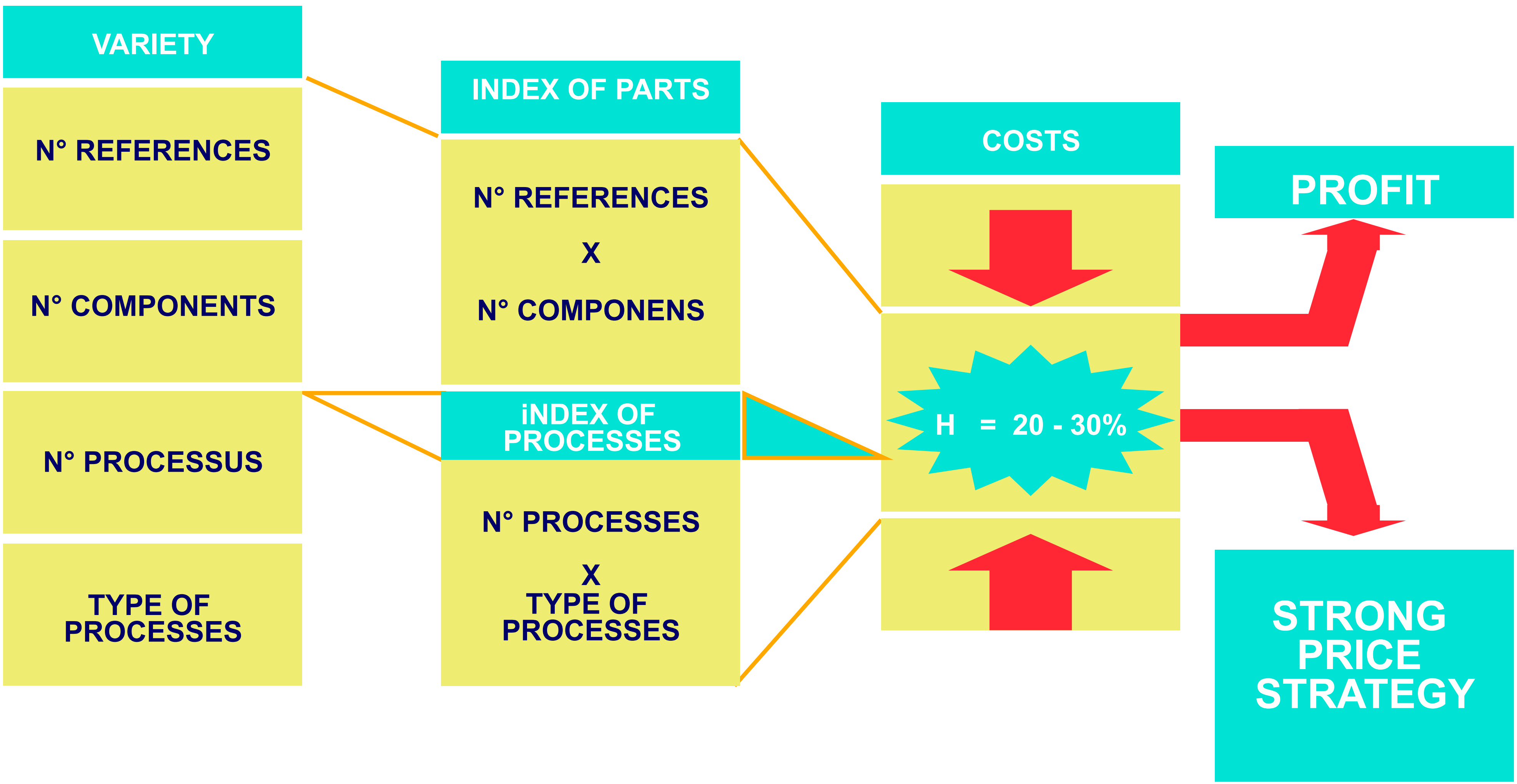
Company M. most relevant issues

•Time to Market: -33% (since 18 months to 12 months)

•Direct Costs of production of “no frost”: - 5%

•Variety Management: - 20% of tools

Reducing variety means reducing costs



Implementation experiences of Variety Reduction Program

	Industrial Sector	Industrial vehicle	Industrial vehicles	Building Machineries	Electric	Electric	Car
	Product	Infrastructure Preparation	Stackers	Mini excavators	Photocopier	Digital measurement of pressure	Car seat
	Production quantity	Basic Model; 7 600 vehicles/year	400 models 10.000 vehicles/year	Basic Model ; 6 4.700 vehicles/year	Basic model; 17 12.000 vehicles/year	Basic Model; 5	Basic Model; 30 1.200.00 kit/year
Results	N° items	1.700 ë 1.150 (² 33%)	1.800 ë 1.000 (² 44%)	570 ë 310 (² 45%)	200 ë 140 (² 36%)	360 ë 160 (² 56%)	823 ë 282 (² 66%)
	N° components	5.500 ë 3.600 (² 35%)	2.300 ë 2.000 (² 13%)	2.400 ë 2.000 (² 16%)	1.700 ë 1.450 (² 15%)	1.600 ë 745 (² 54%)	222 ë 181 (² 19%)
	N° processes	900 ë 540 (² 40%)	Welding 300 ë 240 (² 20%)	700 ë 350 (² 50%)		Assembly 1.350 ë 400 (² 70%)	
	N° workers	Assembly line 32 ë 15 (² 53%)	270 - 170 (² 37%)	86 ë 40 (² 53%)		Assembly line 6 ë 4 (² 33%)	
	Cost Reduction	² 23%	² 20%	² 22%	² 23%	² 36%	² 36%
Design	Project scheduled time	10 months (basic design Detailed Design)	10 months (basic design)	6 months (basic design)	7 months (basic design)	1 year (basic design - implementation)	7 months (basic design)
	Working group	16 workers	8 workers	6 workers	5 workers	4 workers	7 workers

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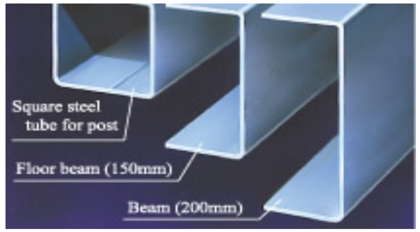
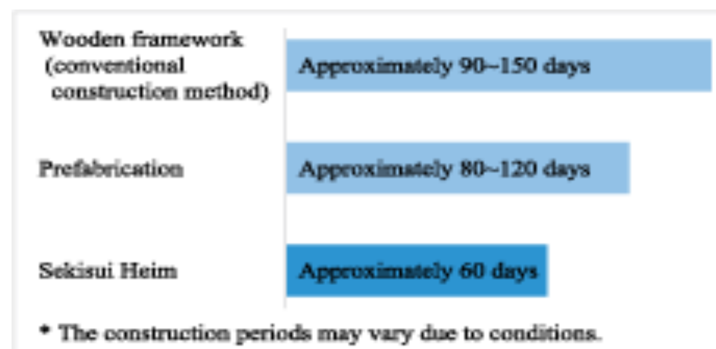
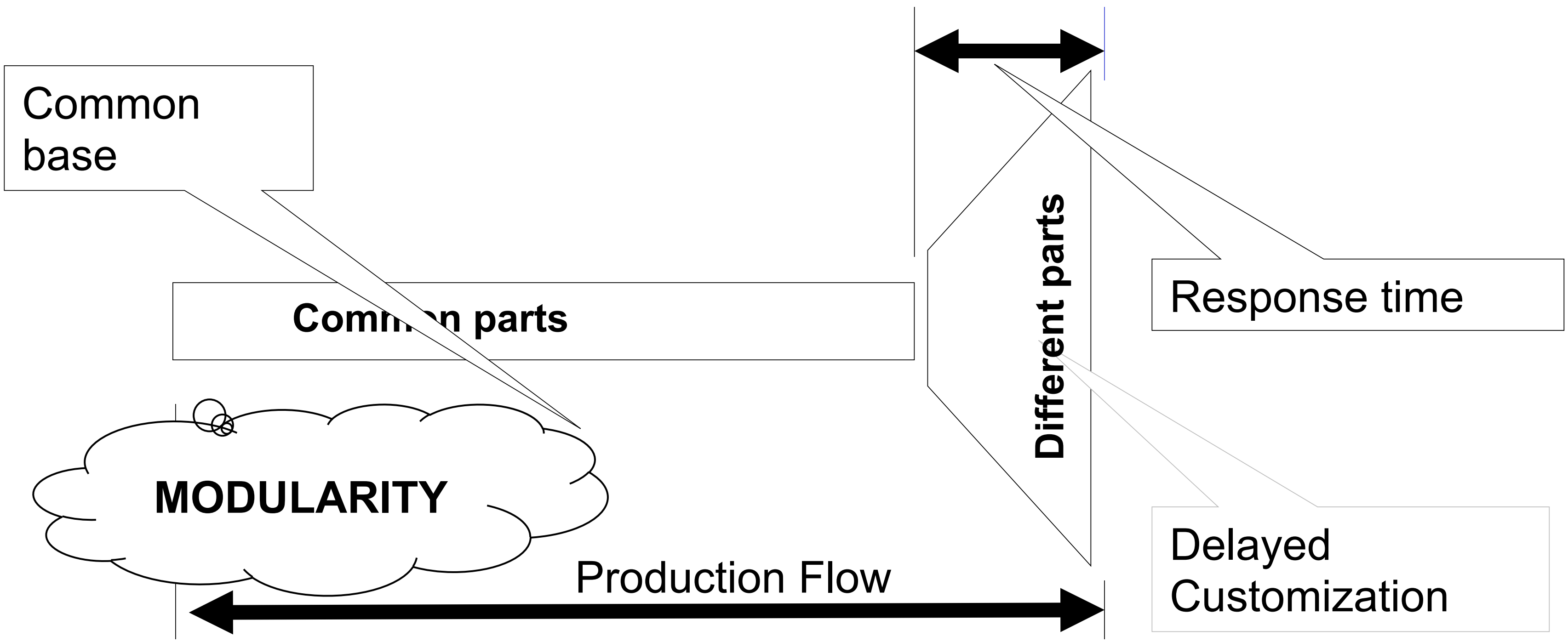
Mass Customization: Sekisui

Modular architecture of product





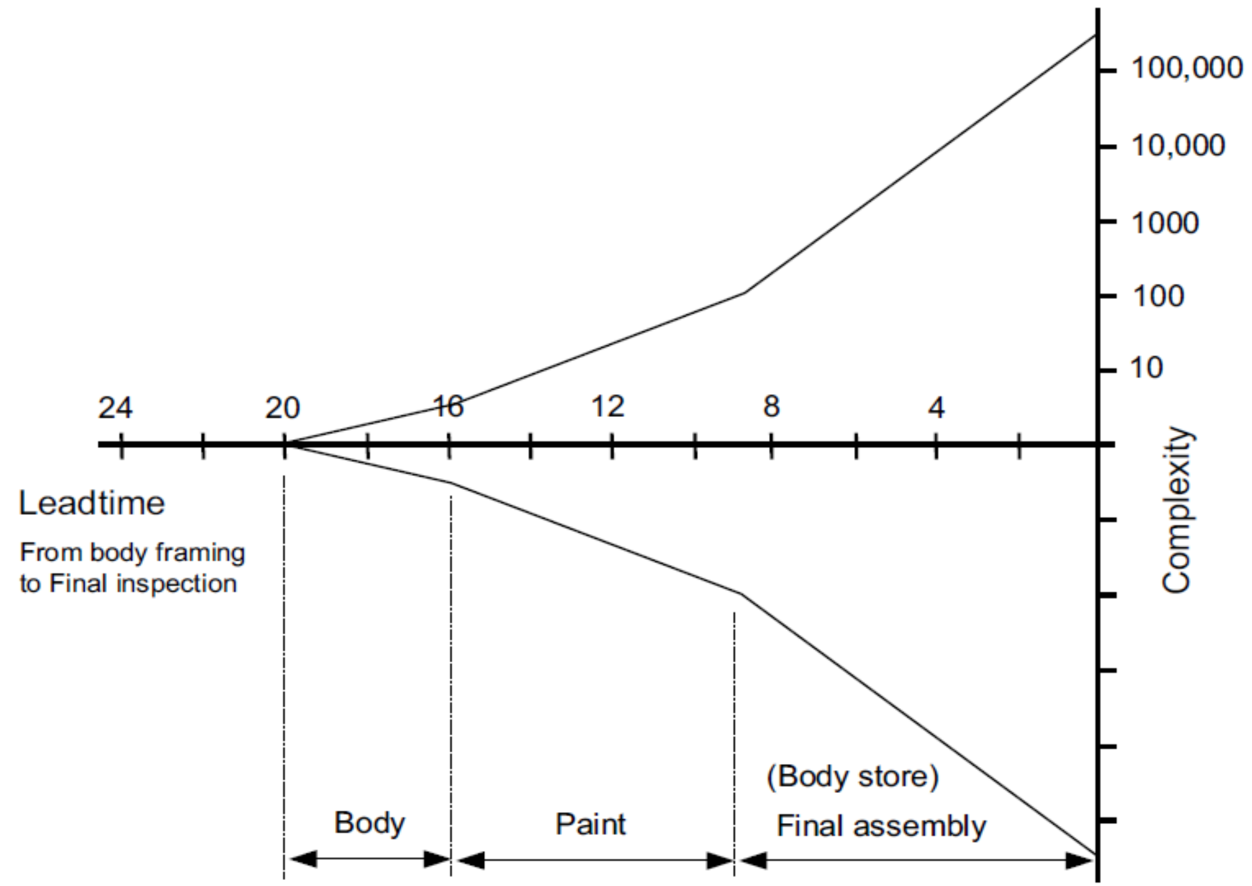
Manufacturing and Logistic Postponement: key issues



Mushroom concept

Manufacturing and Logistic Postponement: the variety

Figure 1 The Product variety funnel: typical profile of a small / medium class vehicle

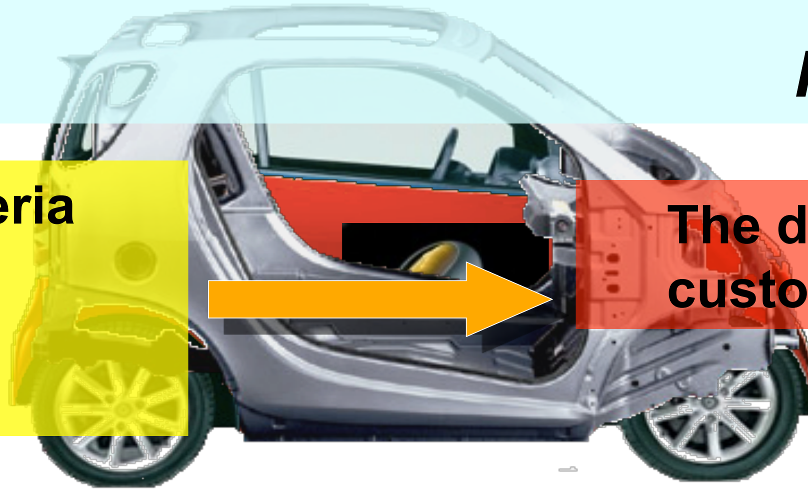


Adapted from Hines & Rich 1997

Mass Customization and postponement: MCC Smart

Real implementation of:

Modularity ***Postponement***



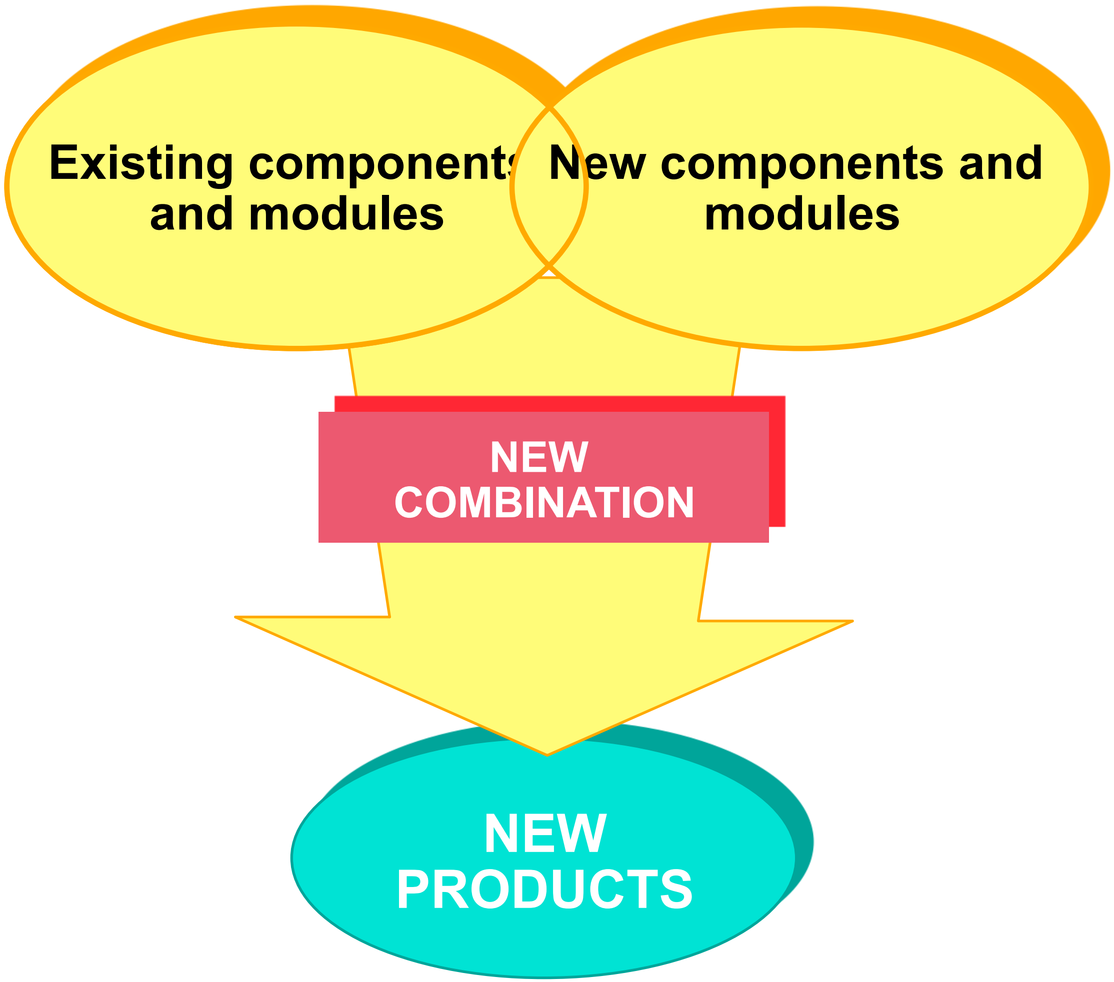
- ✓ **Pannelli carrozzeria**
- ✓ **Car seats**
- ✓ **Gear shift**

The dealers are able to customize the car

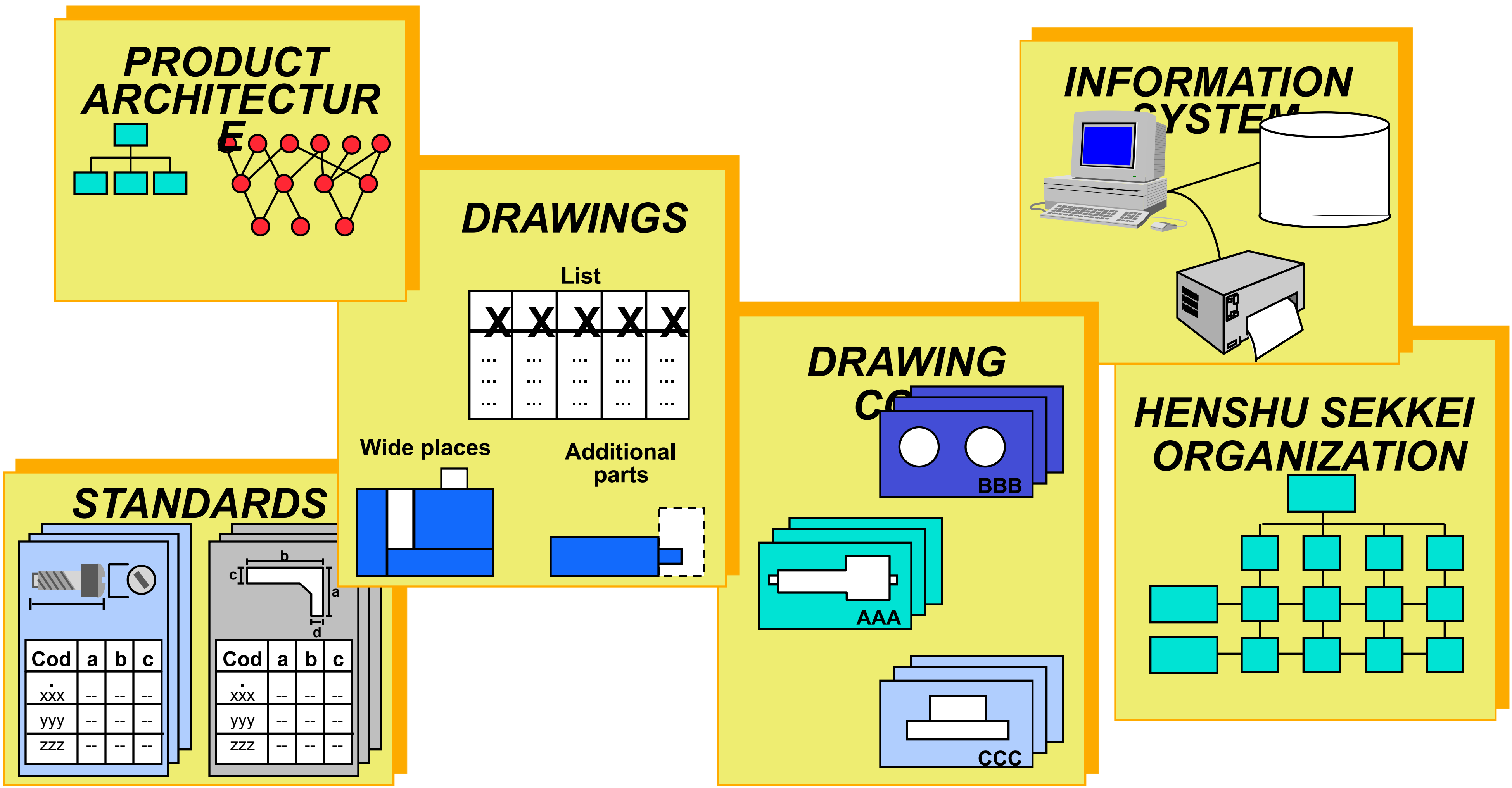
Final results:

- ✓ ***Strong variety but not expensive***
- ✓ ***Sort Lead time***
- ✓ ***Effective response time***

Designing "per collage"
(in Japanese "Henshu Sekkei")

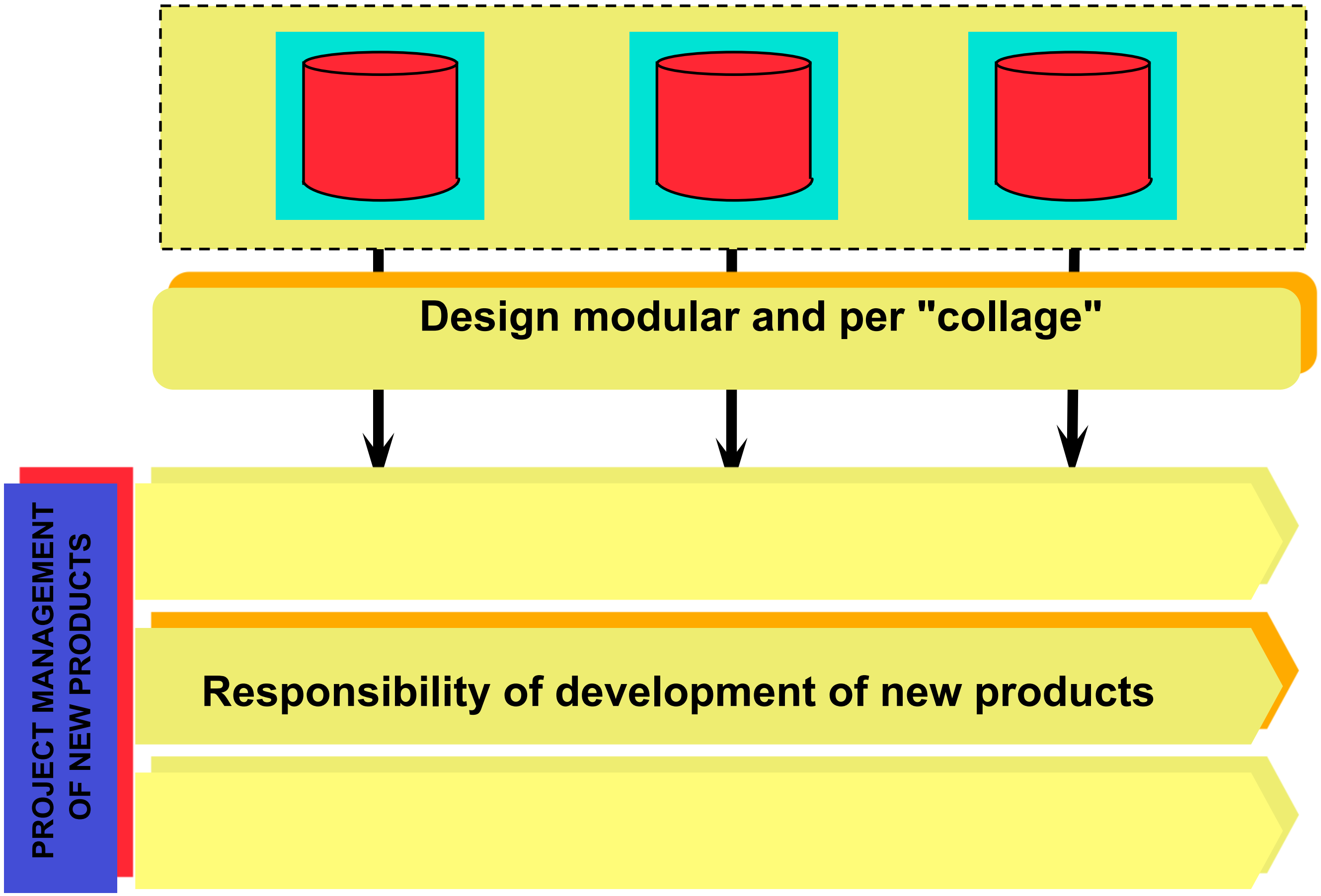


Methodological Steps of “Henshu Sekkei”



Organization structure to implement “Henshu Sekkei”

RESPONSIBILITY OF DEVELOPMENT OF COMPONENTS AND MODULES



DATABASE OF STANDARD COMPONENTS AND STANDARD MODULES

Responsibilities of design department

- Design Standard
- Searching and Storing Methods
- Method of "collage"

Some results of "Henshu Sekkei" implementation

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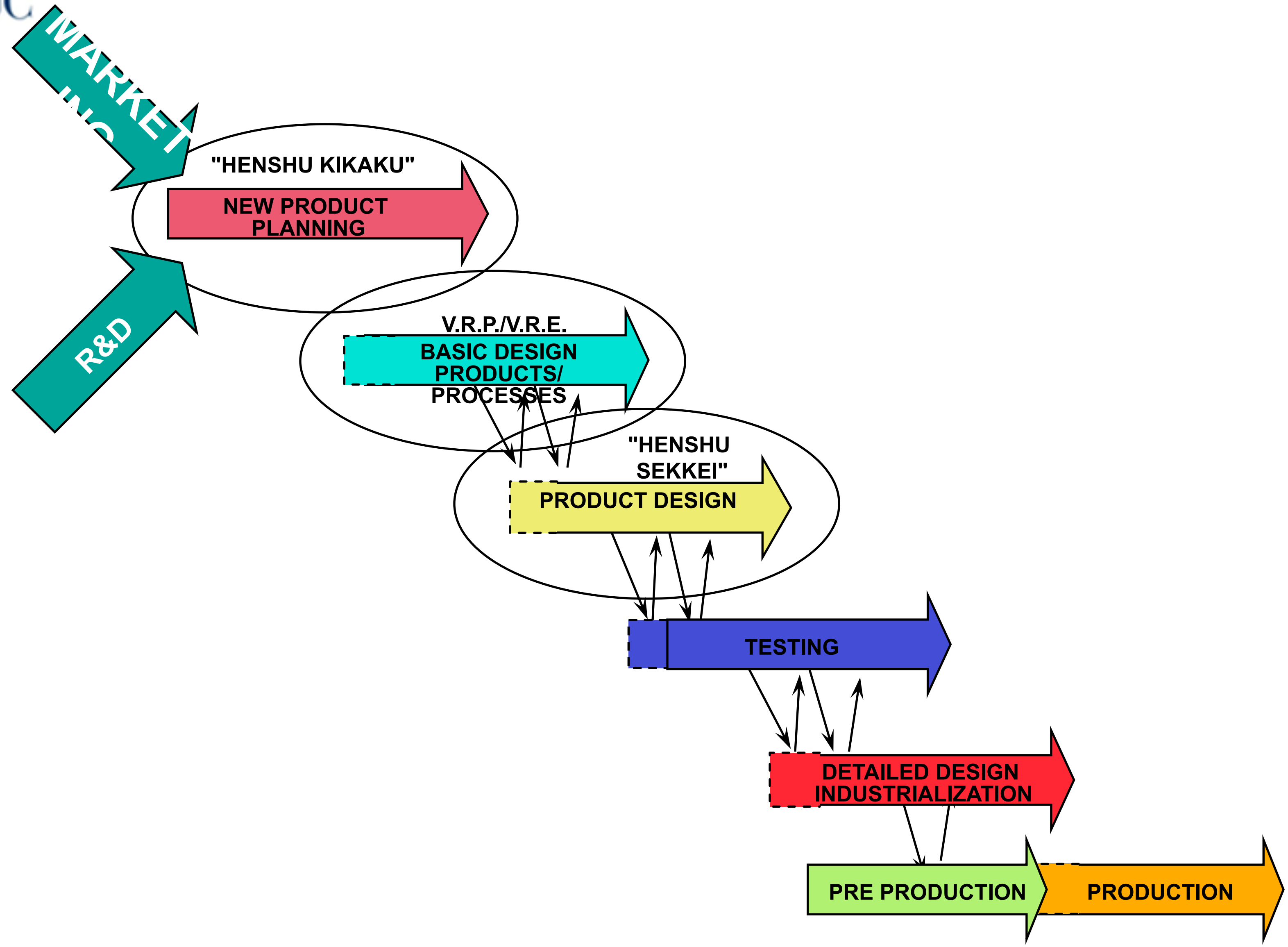
Products	Machine Centers	Car components	Control Systems	Tools for Production Plants	Tools for Office Automation	Motorcycle
Turnover	6 billion Yen	100 billion Yen	3 Billion Yen	1 billion Yen	5 Billion Yen	40 billion Yen
N° drawings	100.000	50.000	50.000	10.000	20.000	40.000
FTE of Design Department	60	120	30	30	20	200
Targets of Henshu Sekkei	• Increasing the efficiency of CAD	• New product development time reduction	• Introduction of best CAD	• Increasing the efficiency of CAD	• Design times and costs reduction	• Component standardization and cost reduction
Improvements issues	• Standardization • Drawing with options • Improvement of drawing coding • "data base" CAD	• Standardization • Drawing with options • Improvement of drawing coding • "data base" CAD Planning • G.T. coding	• New CAD introduction	• Standardization • Drawing with options • Improvement of commercial system	• Standard structure of BOM • Improving component table • "data base" CAD • Improving drawing coding • Improving tests	• Improving drawing coding • Searching similar components • CAD best utilization
Results	Design FTE: -30% Lead-time: -50%	Design FTE: -30%	Design FTE: -20%	Design FTE: -50% Poor quality litigations: 1/10	Design FTE: -50%	FTE Product Development: -20%
Working team	2 FTE Steering Committee	4 FTE Steering Committee	1 FTE Steering Committee	2 FTE 2 consultants	2 FTE 2 consultants	2 FTE 3 consultants
Project Time	8 months	1 year	6 months	2 years	2 years	2 years

Methods “henshu” during the different phases of new product development



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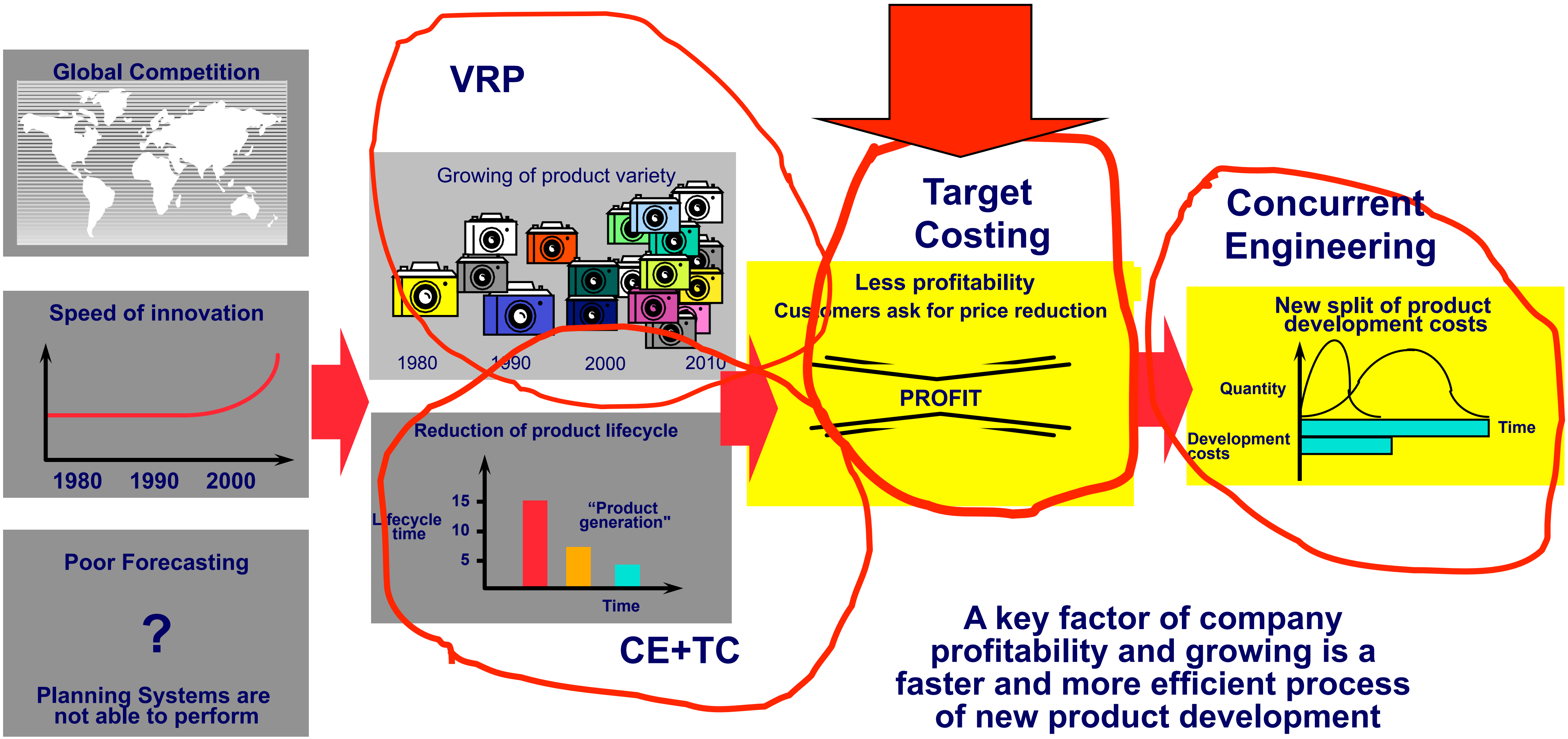
Evolution of competition



A key factor of company profitability and growing is a faster and more efficient process of new product development