Mass Customization

Comparison of MP and MC Paradigms

	Mass Production	Mass Customization
Focus	Efficiency through stability and control	Variety and customization through flexibility and quick responsiveness
Goal	Developing, producing, marketing, and delivering goods and services at prices low enough that nearly everyone can afford them	Developing, producing, marketing, and delivering affordable goods and services with enough variety and customization that nearly everyone finds what they want
Key Features	• Stable demand • Large, homogenous markets • Low-cost, consistent quailty, standardized goods and services • Long product development cycles • Long product life cycles	• Fragmented demand • Heterogeneous markets • Low cost, high quality, customized goods and services • Short product development cycles • Short product life cycles

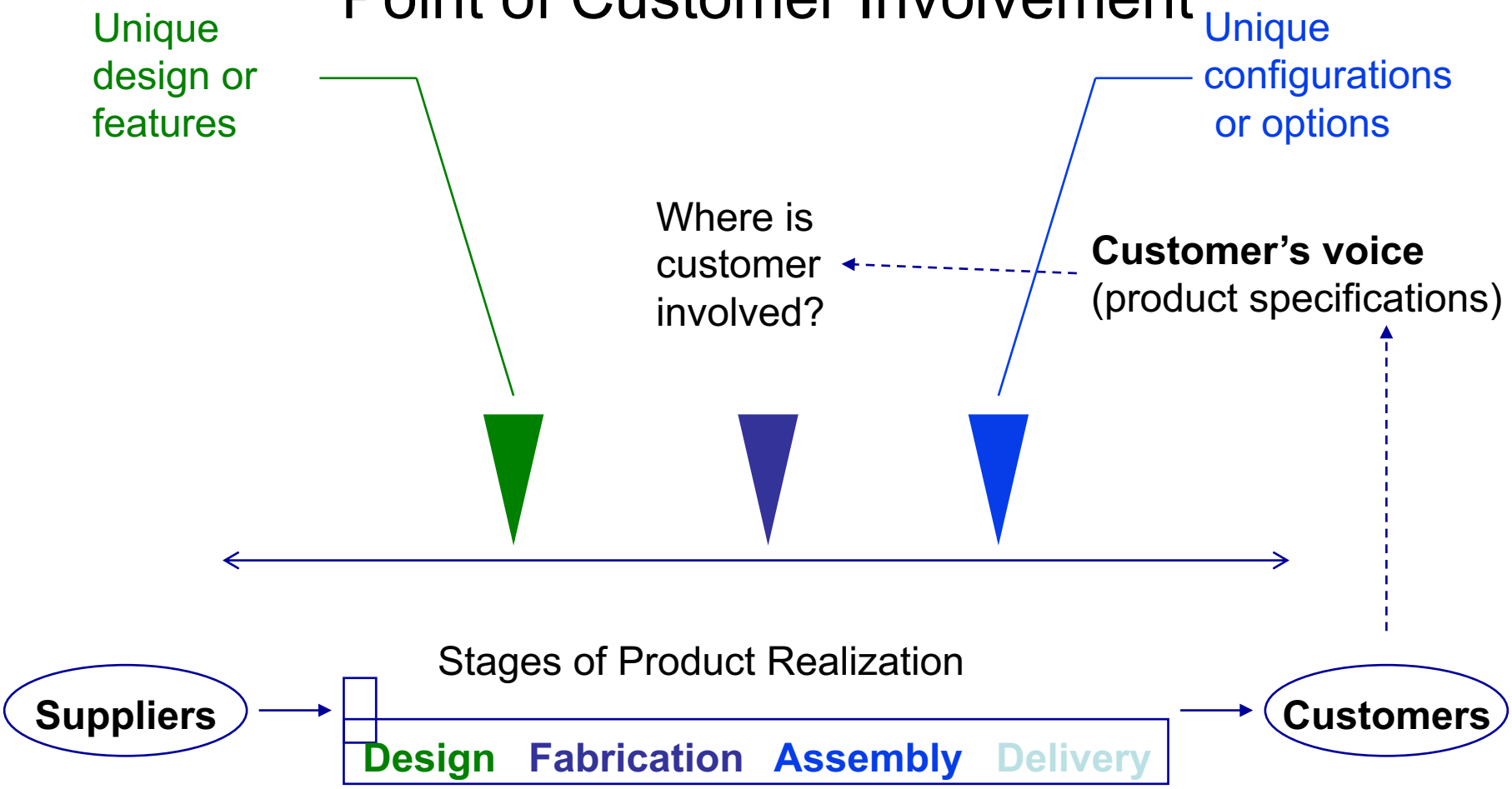
Mass Customization

- Mass customizers seek to:
  - Provide personalized, custom-designed products at prices so close to those traditionally offered only for mass-produced merchandise
  - Give customers exactly what they want, at the price they want, and at the time they want it
  - Provide sufficient variety in products and services so that virtually every customer is able to purchase a customized product for a price near the mass-produced item

- Customization = product variety

- Customized products are uniquely produced for each customer; therefore, customers must be involved in the process at some point!

Point of Customer Involvement



Adapted from:

- Duray, R., and Milligan, G. W., 1999, "Improving Customer Satisfaction through Mass Customization," *Quality Progress*, Vol. 32, No. 8, pp. 60-66.

http://www.cannondale.com/cgi-bin/custbike

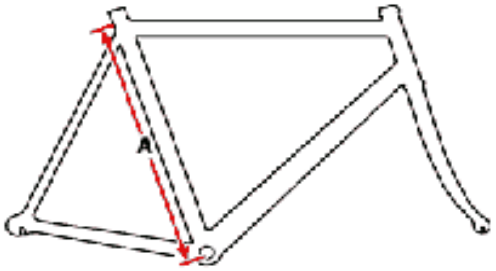
Search

- LATEST WORD
- PRODUCTS
  - Bicycle Models
  - Select a Bike Tool
  - Warranty Registration
  - Custom Road Frame
  - HeadShok Suspension
- DEALER LOCATOR
- TECH CENTER
  - Innovation
  - Cannondale Tech
  - Factory Tech Room
  - Kit List
- CHAIN GANG
  - Join Now!
  - Contest
  - Chain Gang Team

custom CAAD5

Begin ordering process **Seat tube length sizing process** (step 1 of 5)

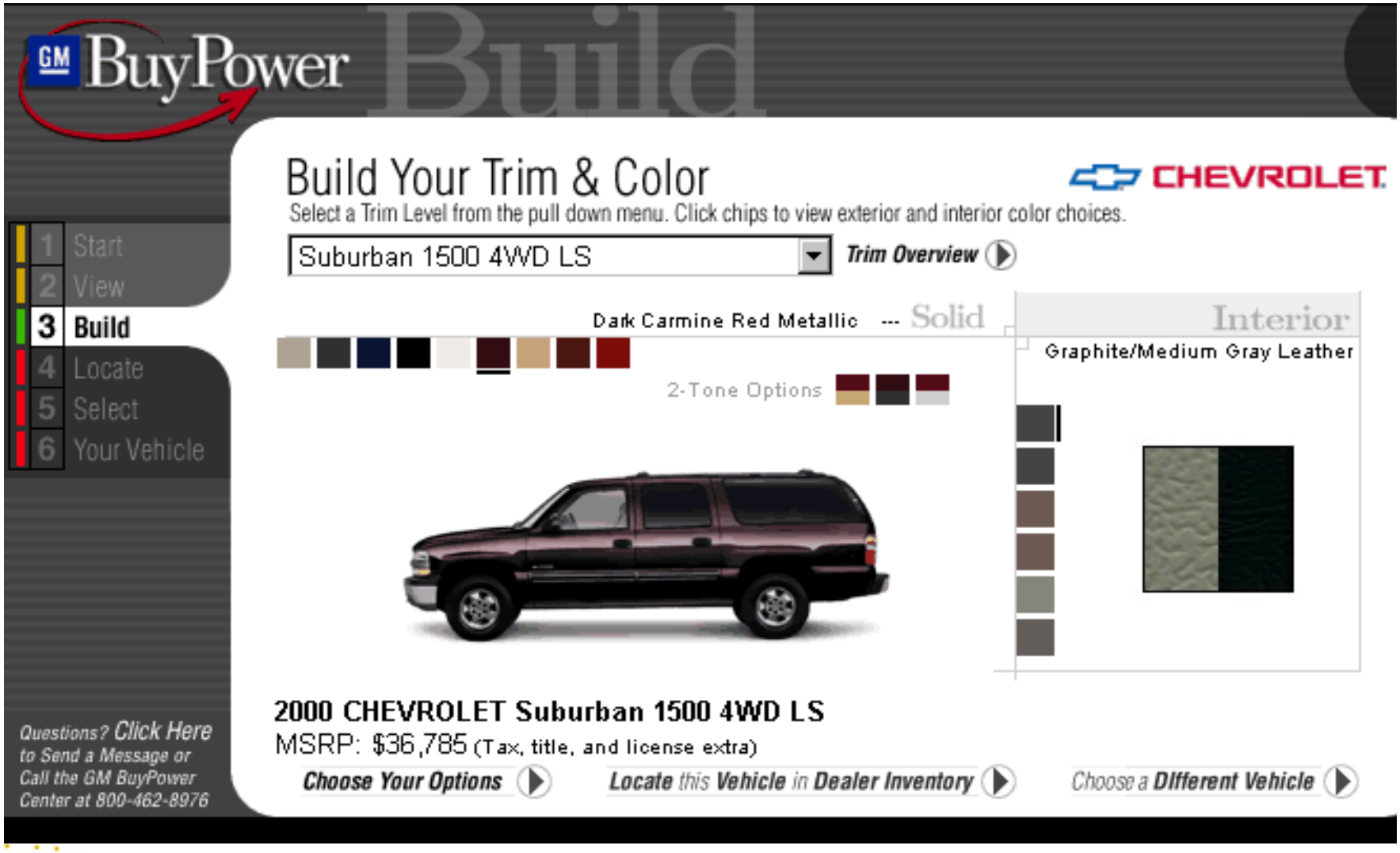
47.0 cm | Continue



Selecting the proper seat tube length is the first step in the design process. Seat tube length and seat post height work together to establish one of the more critical dimensions on your bicycle: the distance between the top of your saddle and your pedals. Seat tube length also has some effect on the "feel" of a

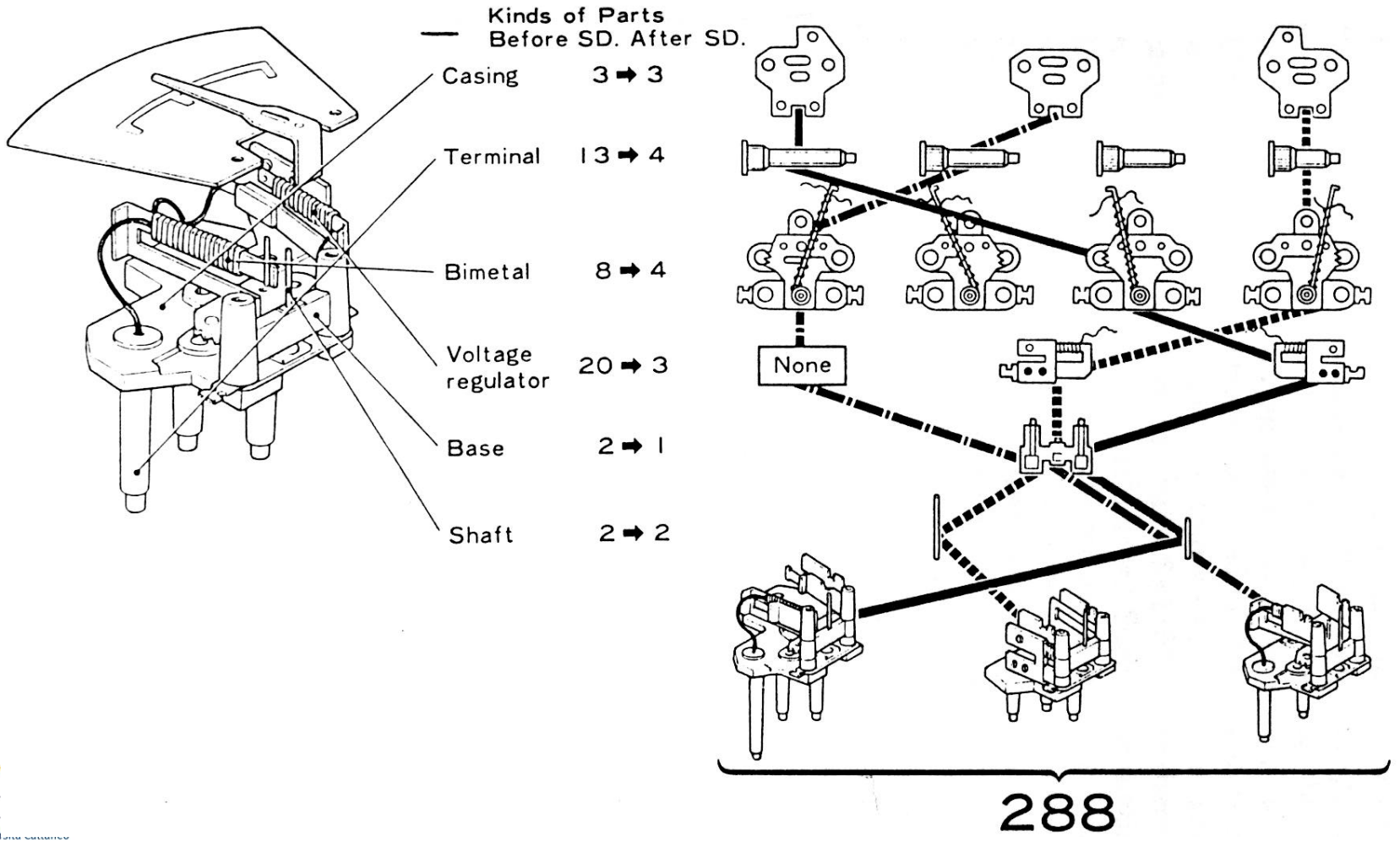
http://www.dell.com/

http://www.gm.com/



Combinatorial Approach at Nippondenso

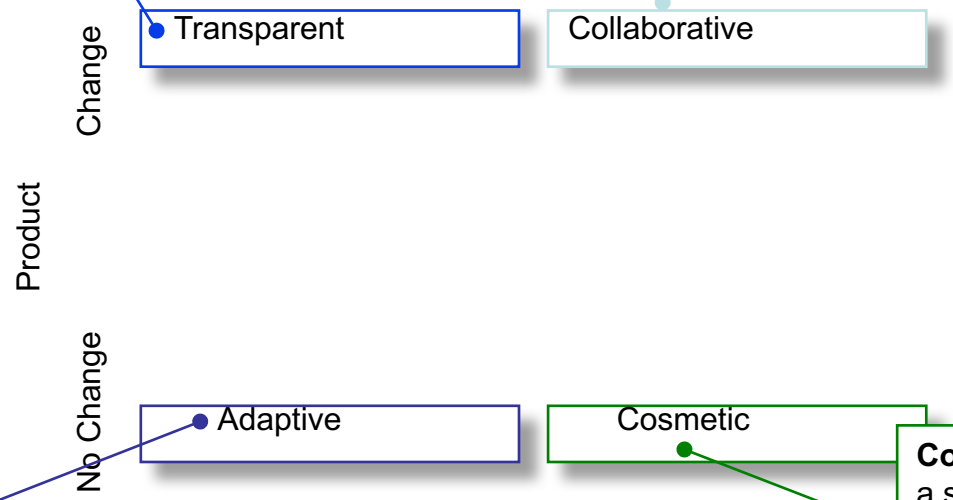
- Nippondenso can make 288 different panel meters from variations of 8 modules (17 different parts)



Four Types of Mass Customization

Transparent customizers use standard packaging but provide customers with unique products and services without letting them know explicitly that those products have been customized for them

Collaborative customizers work directly with customers to help them articulate their needs and make customized products



Adapted from:

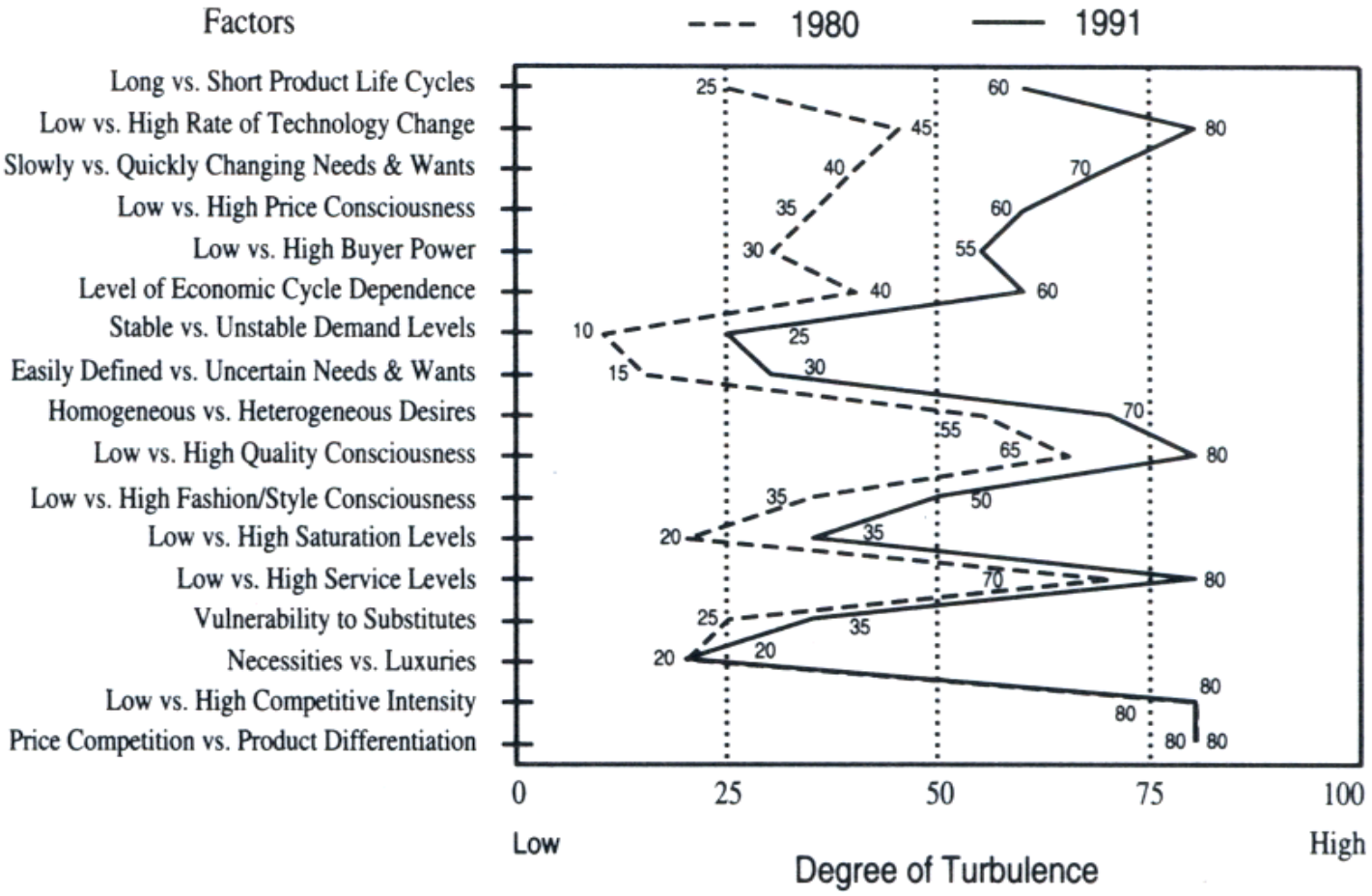
- Gilmore, J. H, and Pine, J. B., II, 1997, "The Four Faces of Mass Customization," *Harvard Business Review*, Jan-Feb., pp. 91-101.

Adaptive customizers offer a standard, but customizable product that is designed so that customers can alter it

Cosmetic customizers present a standard product to different customers but individually customize packaging, advertising, etc.

Pine's Degree of Market Turbulence

- Pine (1993) introduces the Market Turbulence Map to assess when to shift to MC

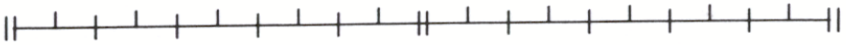


Market Turbulence Survey

- Pine surveyed 250 people in 164 different companies to evaluate market turbulence in a variety of industries

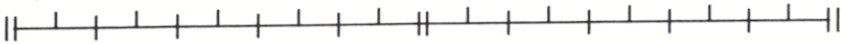
1. To what extent are the demand levels of your business unit's products unstable and unpredictable?

To No Extent — To a Great Extent



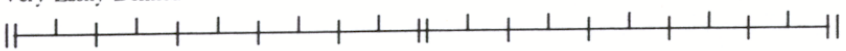
2. Do your products fill very basic needs, or are they complete luxuries in the minds of your customers, or are they somewhere in between?

Very Basic Necessities — Complete Luxuries



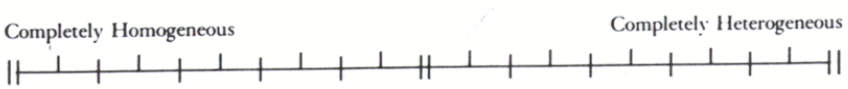
3. Are your customers' needs and wants easily defined and understood, or are they uncertain and difficult to ascertain, or are they somewhere in between?

Very Easily Defined — Totally Uncertain



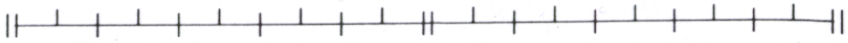
4. Do all of your customers desire basically the same products (completely homogeneous), or do they demand something unique (completely heterogeneous), or do they lie somewhere in between?

Completely Homogeneous — Completely Heterogeneous



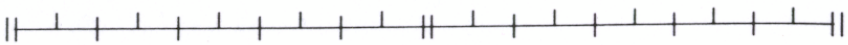
5. At what rate are the needs and wants of your customers changing?

Very Slowly — Very Quickly



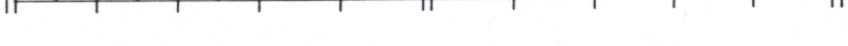
6. To what extent do the prices of your products influence your customers in their decisions to buy your business unit's products?

To No Extent — To a Great Extent



7. To what extent does the quality of your products influence your customers in their decisions to buy?

To No Extent — To a Great Extent



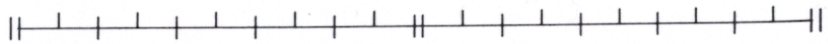
8. To what extent do fashion and style influence your customers in their decisions to buy?

To No Extent — To a Great Extent

Market Turbulence Survey (cont.)

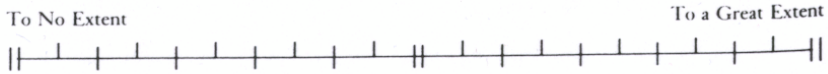
9. To what extent does the level of pre- and postsale service influence your customers in their decisions to buy?

To No Extent — To a Great Extent



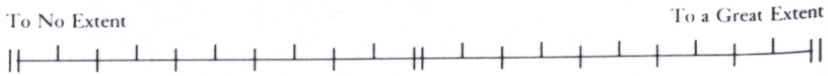
10. To what extent can your customers dictate the prices, conditions, and features of your business unit's products?

To No Extent — To a Great Extent



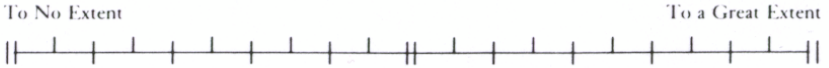
11. To what extent are your business unit's sales affected by economic cycles (recession, recovery, and expansion)?

To No Extent — To a Great Extent



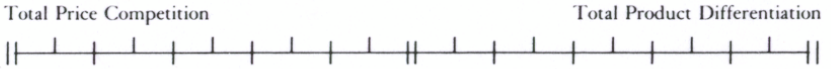
12. To what extent do you and your competitors battle for market share in your business unit's markets?

To No Extent — To a Great Extent



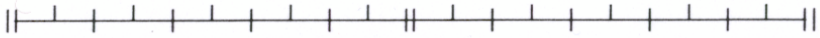
13. Is competition in your industry based totally on product differentiation, totally on price competition, or is it somewhere in between?

Total Price Competition — Total Product Differentiation



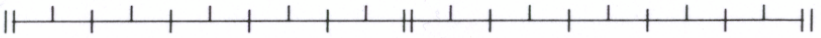
14. Are your business unit's markets completely unsaturated (all sales are to entirely new customers), completely saturated (all possibilities of sales are replacements of or additions to existing products), or somewhere in between?

Completely Unsaturated — Completely Saturated



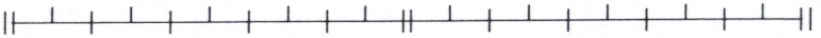
15. To what extent are your existing products vulnerable to being replaced by substitute products that are of a different nature but perform similar functions?

To No Extent — To a Great Extent



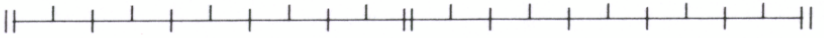
16. Are the product life cycles (first shipment to replacement or withdrawal) of products in your business unit's industry very long and predictable, very short and unpredictable, or somewhere in between?

Very Long, Predictable — Very Short, Unpredictable



17. To what extent is the rate of product technology changing in your business unit's industry?

To No Extent — To a Great Extent

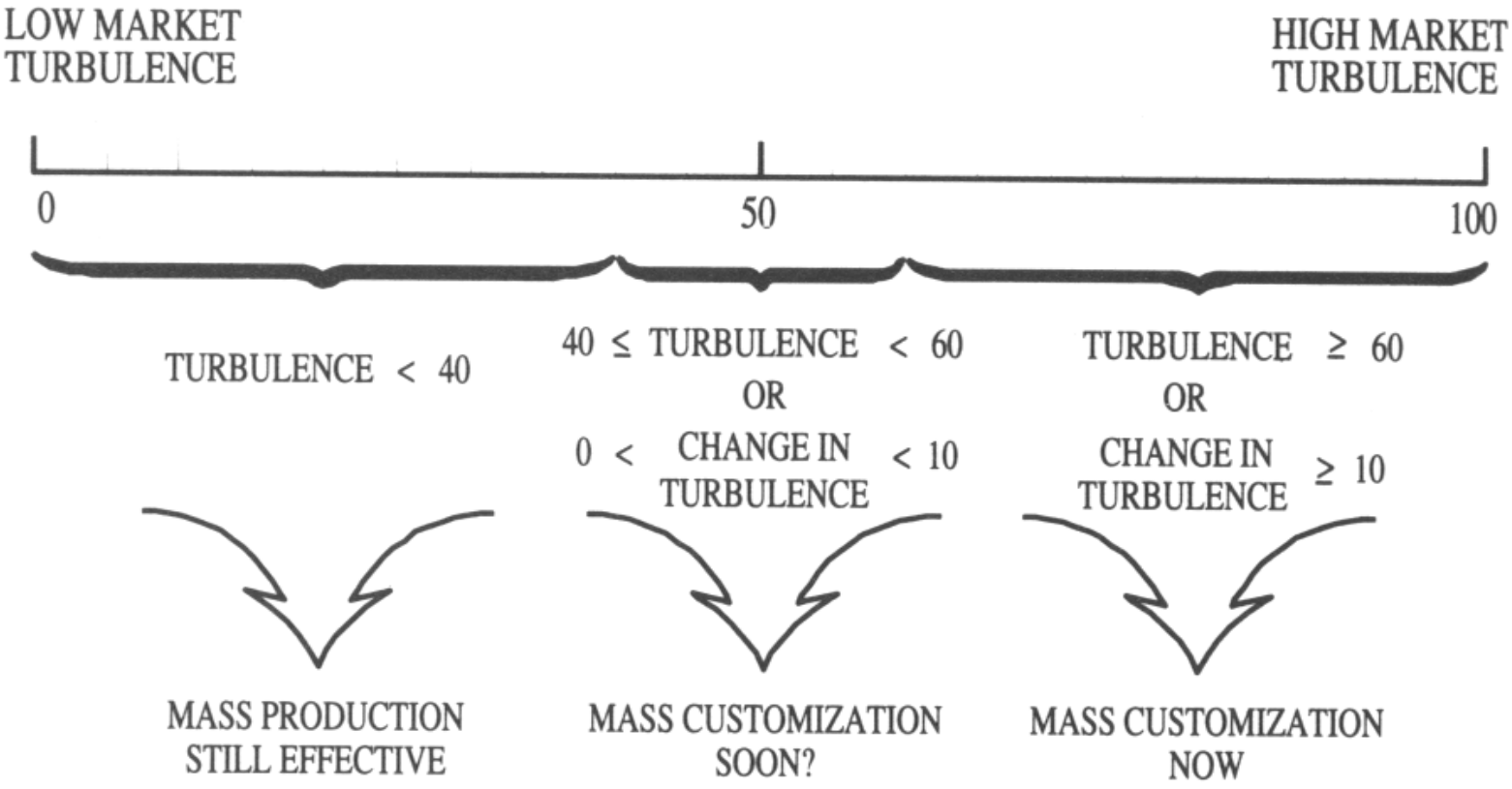


Importance of Individual Market Factors

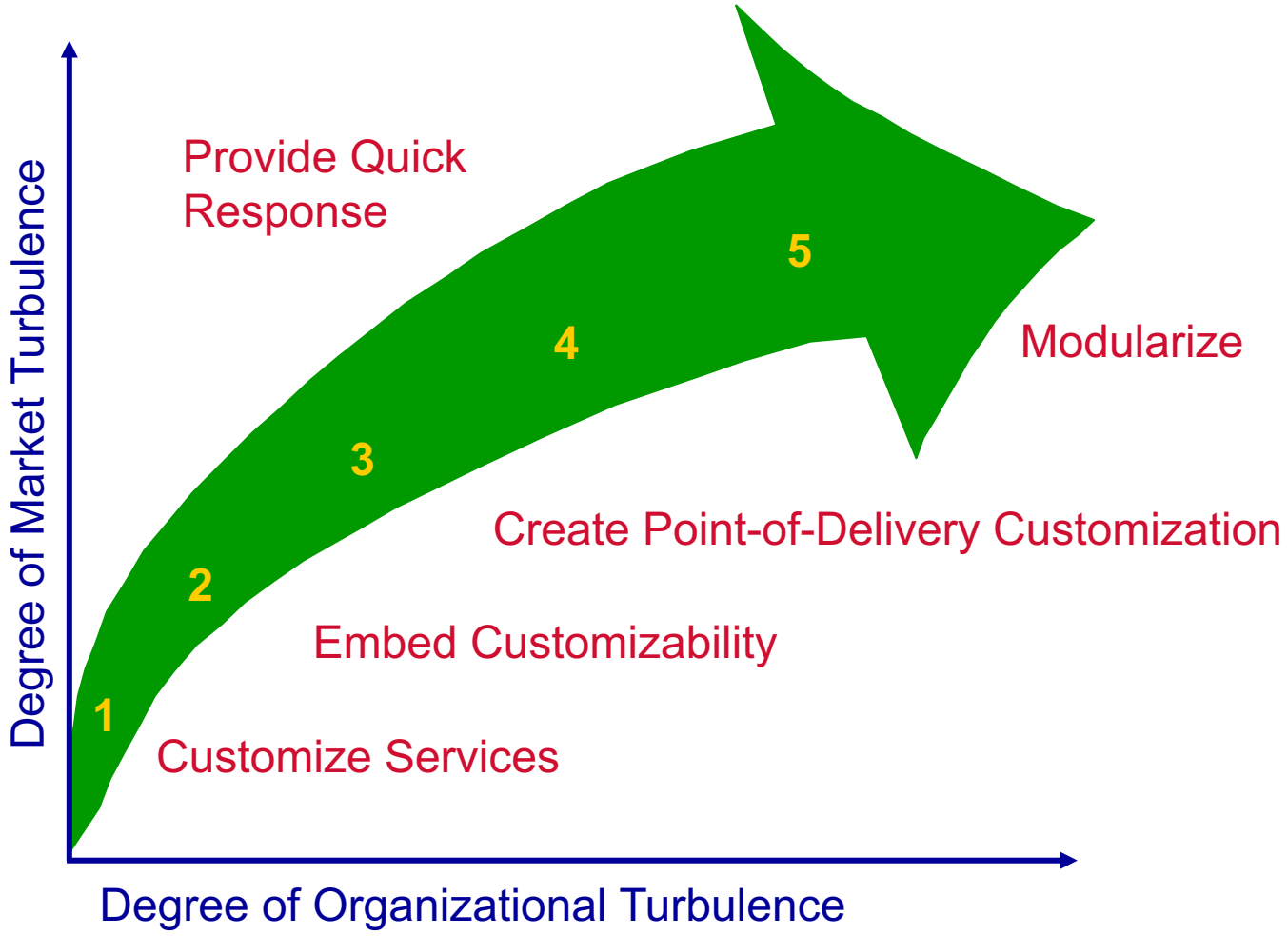
Market Environment Factor	Importance
Slowly vs. Quickly Changing Needs & Wants	0.750
Long vs. Short Product Life Cycles	0.626
Low vs. High Rate of Technology Change	0.610
Homogeneous vs. Heterogeneous Needs & Wants	0.559
Low vs. High Service Levels	0.440
Low vs. High Quality Consciousness	0.406
Low vs. High Competitive Intensity	0.357
Level of Economic Cycle Dependence	0.242
Stable vs. Unstable Demand Levels	0.231
Necessities vs. Luxuries	0.228
Price Competition vs. Product Differentiation	0.217
Low vs. High Price Consciousness	0.204
Easily Defined vs. Uncertain Needs & Wants	0.197
Few vs. Many Substitutes	0.180
Low vs. High Buyer Power	0.162
Low vs. High Fashion/Style Consciousness	0.156
Low vs. High Saturation Levels	0.022

To MC or Not MC?

- Multiplying each factor by its importance rating and summing over all factors yields a measure of market turbulence, an indicator for when to shift to MC



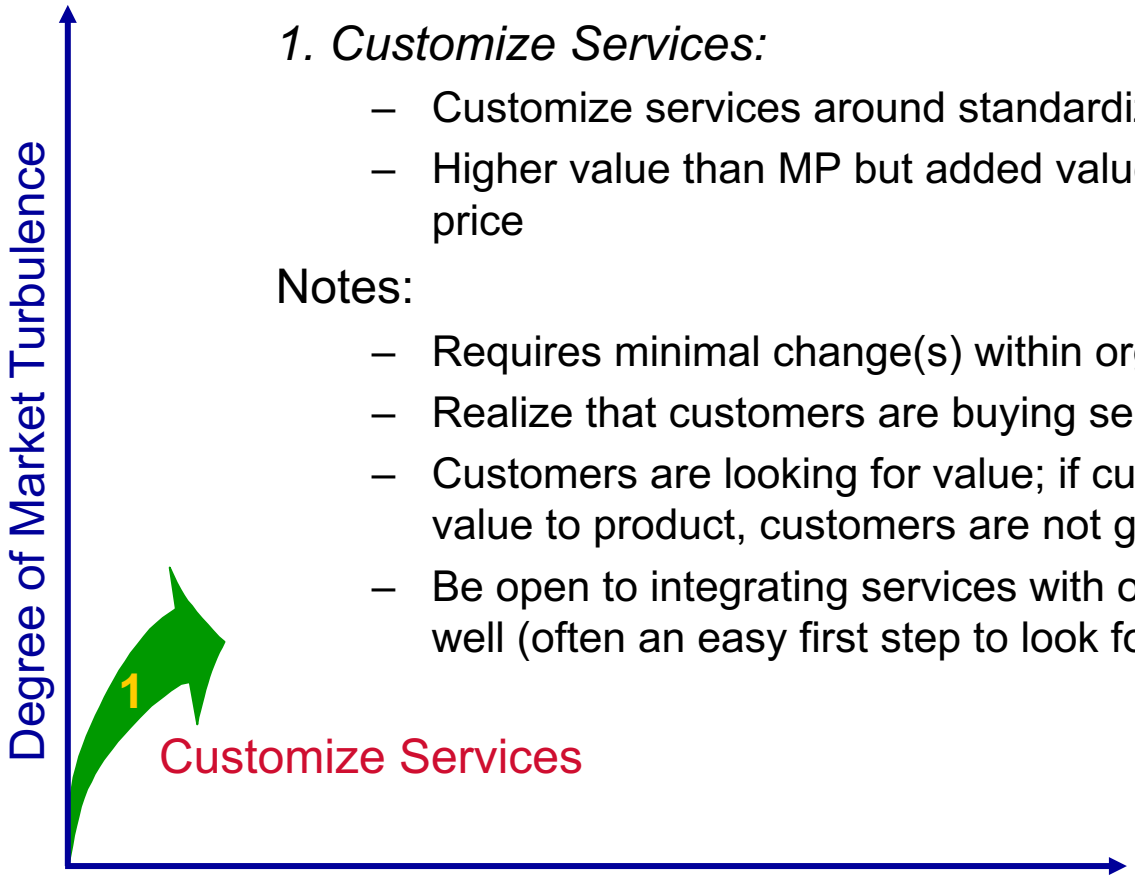
Pine's Five Steps to Mass Customization



Sources:

- Pine, B. J., II, 1993, "Mass Customizing Products and Services," *Planning Review,* Vol. 22, No. 4, pp. 6(8).
- Pine, B. J., II, 1993, Mass Customization: The New Frontier in Business Competition, Harvard Business School Press, Boston, MA.

Step 1: Customize Services



1. Customize Services:

- Customize services around standardized products
- Higher value than MP but added value typically allows a premium price

Notes:

- Requires minimal change(s) within organization (i.e., service dept.)
- Realize that customers are buying service, not technology
- Customers are looking for value; if customized service does not add value to product, customers are not going to pay for it
- Be open to integrating services with other services and products as well (often an easy first step to look for customized service)

Warning: The competitive advantage through customized service is not sustainable. Anyone can do it, and you must be ready to adapt/move

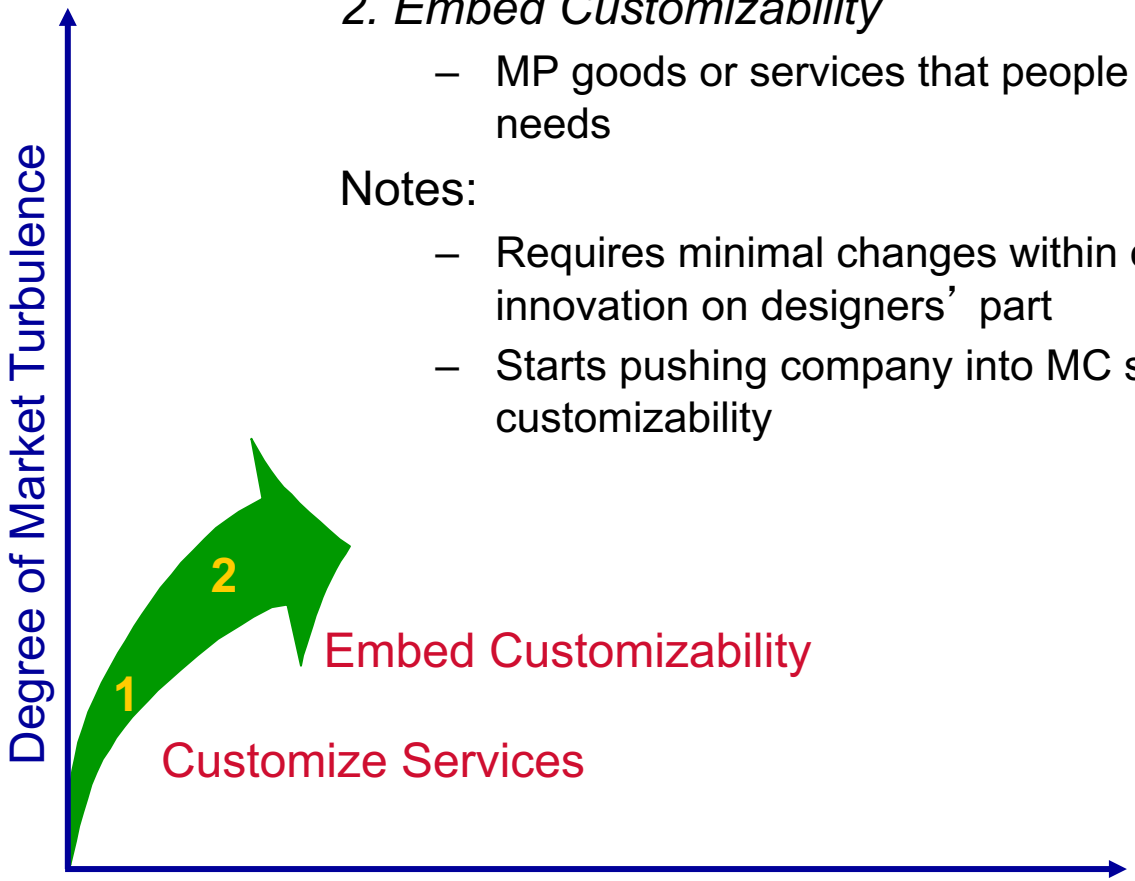
Step 2: Embed Customizability

2. Embed Customizability

- MP goods or services that people can adapt to their individual needs

Notes:

- Requires minimal changes within organization, but creativity and innovation on designers' part
- Starts pushing company into MC since designers must embed customizability



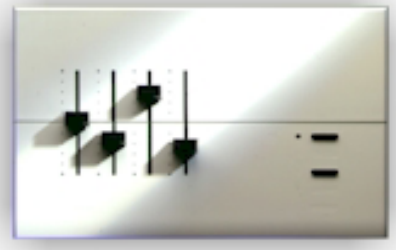
Warning: Can over-design a product, and it becomes difficult to charge a premium since someone else can provide precisely what user wants for less cost

LUTRON®

THE WORLD LEADER IN LIGHTING CONTROLS SINCE 1961

- Lutron makes customizable lighting control systems for commercial and residential applications including hotel lobbies, ballrooms, conference rooms, and exec offices.

- Lutron has rarely shipped the same lighting system twice.
  - Work with individual customers to extend the product line until they have 100+ models from which to choose.
  - Engineering and production redesign the product line with 15-20 standardized components that can be configured into the same 100+ models.



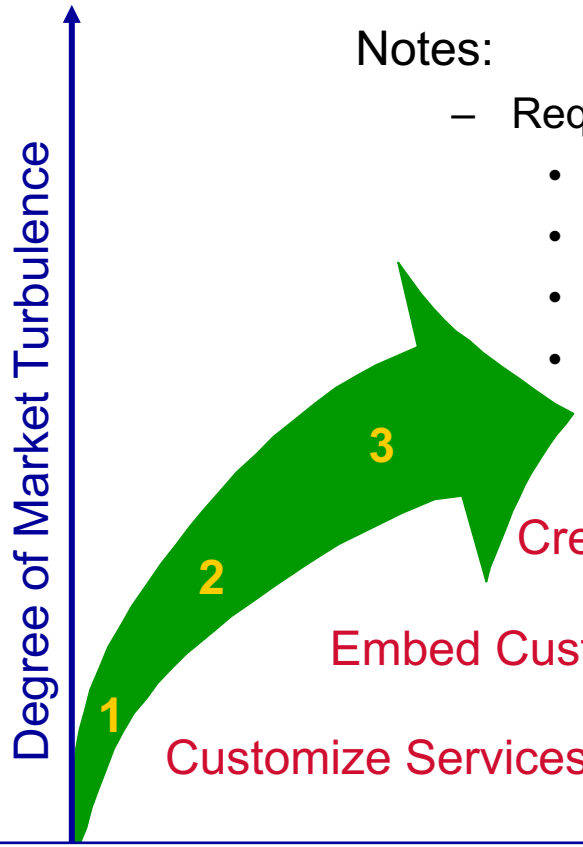
Step 3: Point-of-Delivery Customization

3. Create Point-of-Delivery Customization

- Customize product at point of sale

Notes:

- Requires small changes within organization:
  - Marketing: must focus on personalization and convenience
  - Designers: creative and innovative solutions
  - Delivery: must have capability to perform last MC operations
  - Production: not affected, still MP
    - Sustainability of competitive advantage depends on degree of successful transformation within organization



Warning: (1) Production and delivery must be integrated and well coordinated, and designer must consider impact of point-of-delivery on product
(2) requires lots of IT to speed response and know/understand customers

Product Postponement at HP

2100

4050

5000

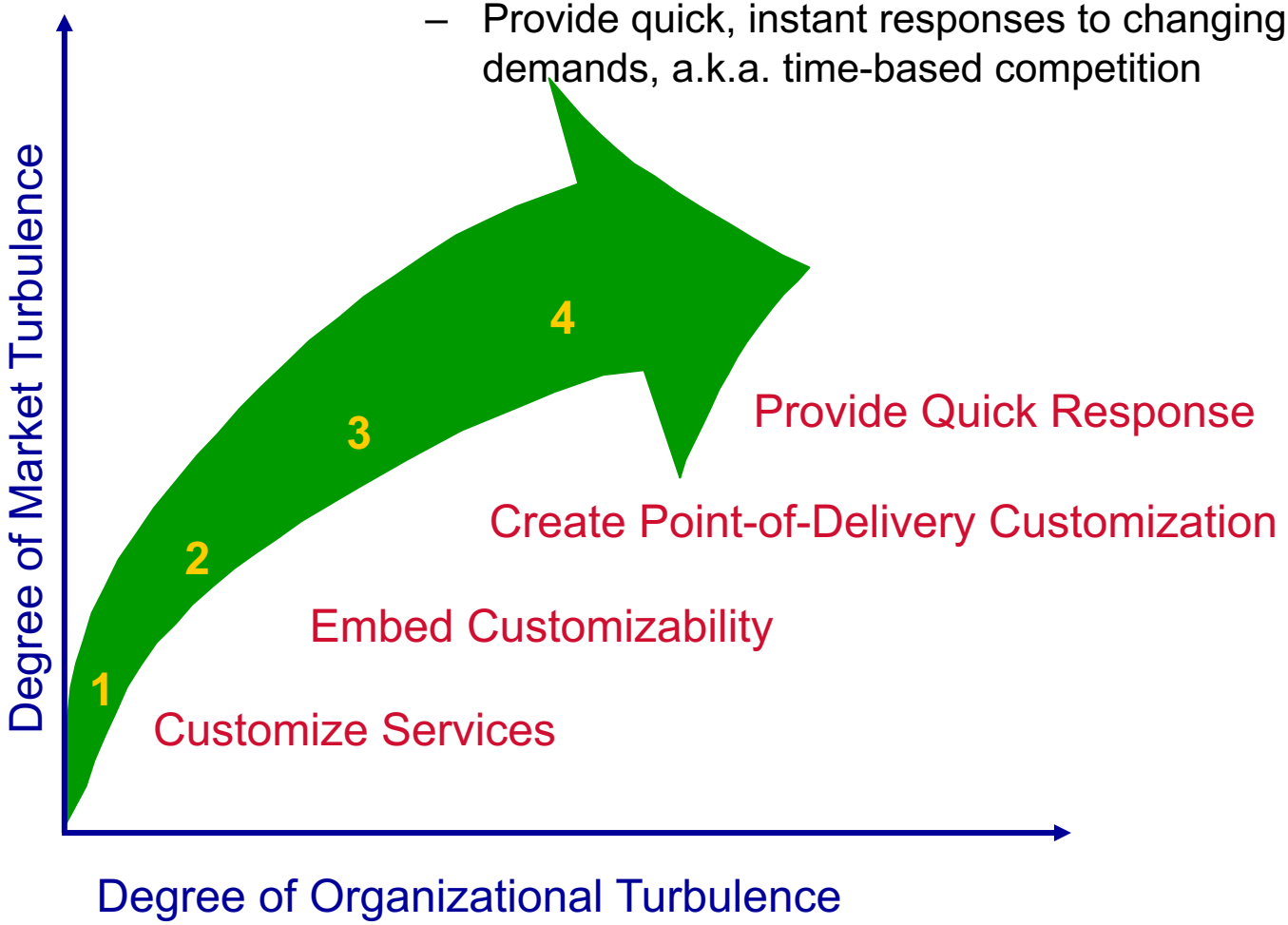
8100

- Distribution Problem:
  - Printers are manufactured for countries with varying voltages
  - Elapsed time b/n distributor's order entry and receipt: ~1 month
  - Demands often changed during transit
  - Factory shipped to three distinctly different markets
- Distribution Solution:
  - Customization shifted to distribution centers
  - Power supply was modularized to allow for postponement
  - Resulted in reduction of transportation lead time and unit costs
  - Backorders and excess inventory were virtually eliminated

Step 4: Provide Quick Response

4. Provide Quick Response

- Provide quick, instant responses to changing customer demands, a.k.a. time-based competition



Step 4: Provide Quick Response (cont.)

Notes:

- Must shorten product development process
- Reduce tool set-up times in manufacturing
- Shorten order-to-delivery cycle
- Sustainability of competitive advantage depends on degree of successful transformation within organization

Warning:

- Lots of organization changes are required for success
- Large capital investments for Computer Aided Manufacturing (CAM), Flexible Manufacturing Systems (FMS), Agile Manufacturing Systems (AMS), or Reconfigurable Manufacturing Systems (RMS)
- Large inventories needed in order to response quickly
- Requires lots of IT to speed response and know/understand customers

National Bicycle Industrial Company (NBIC)

- Kotha (1995) examines three key issues in MC firms:
  - Are mass production and mass customization strategies really as incompatible as suggested by Pine and his co-authors?
  - How does a firm that derives a major portion of its revenues from mass production implement mass customization?
  - How does knowledge creation enable strategic flexibility in the context of mass customization?

- Kotha examines National Bicycle Industrial Company:
  - NBIC is Japan's second largest manufacturer of bicycles and one of Japan's premier MC firms
  - NBIC is also a mass producer of bicycles, deriving over 90% of its sales revenues from mass production

NBIC

- Produces bicycles under three different brand names:
  - *Panasonic* - high quality, high-priced sports and fashion bicycles (top of the line)
  - *National*
  - *Hikari* - basic transportation bicycles from home to work

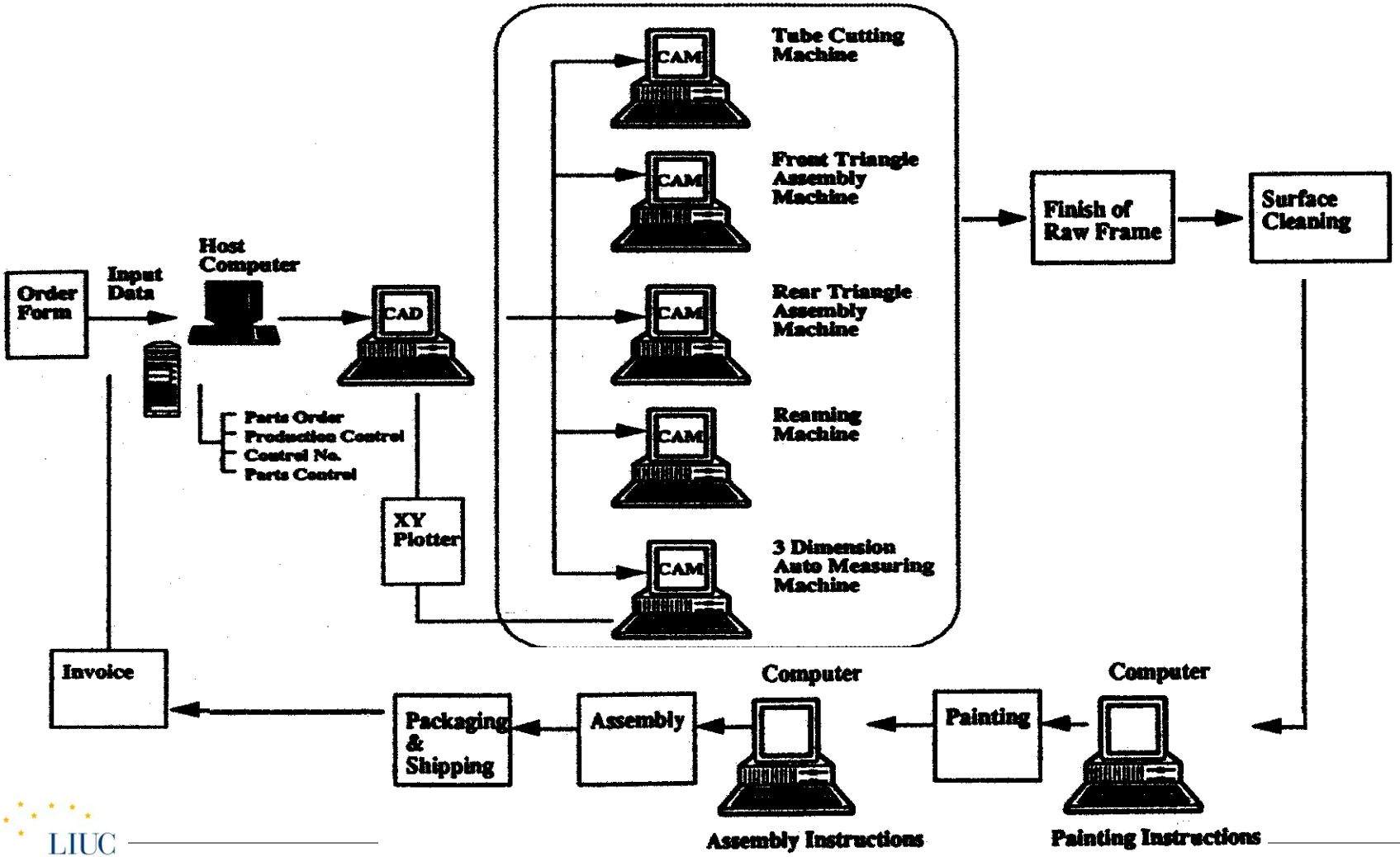
- NBIC has two factories located next to each other:
  - mass production
  - mass customization

- High-end Panasonic bicycles are produced in *both* the MP and MC factories
  - MP factory employs more line workers
  - MC factory employs best skilled workers

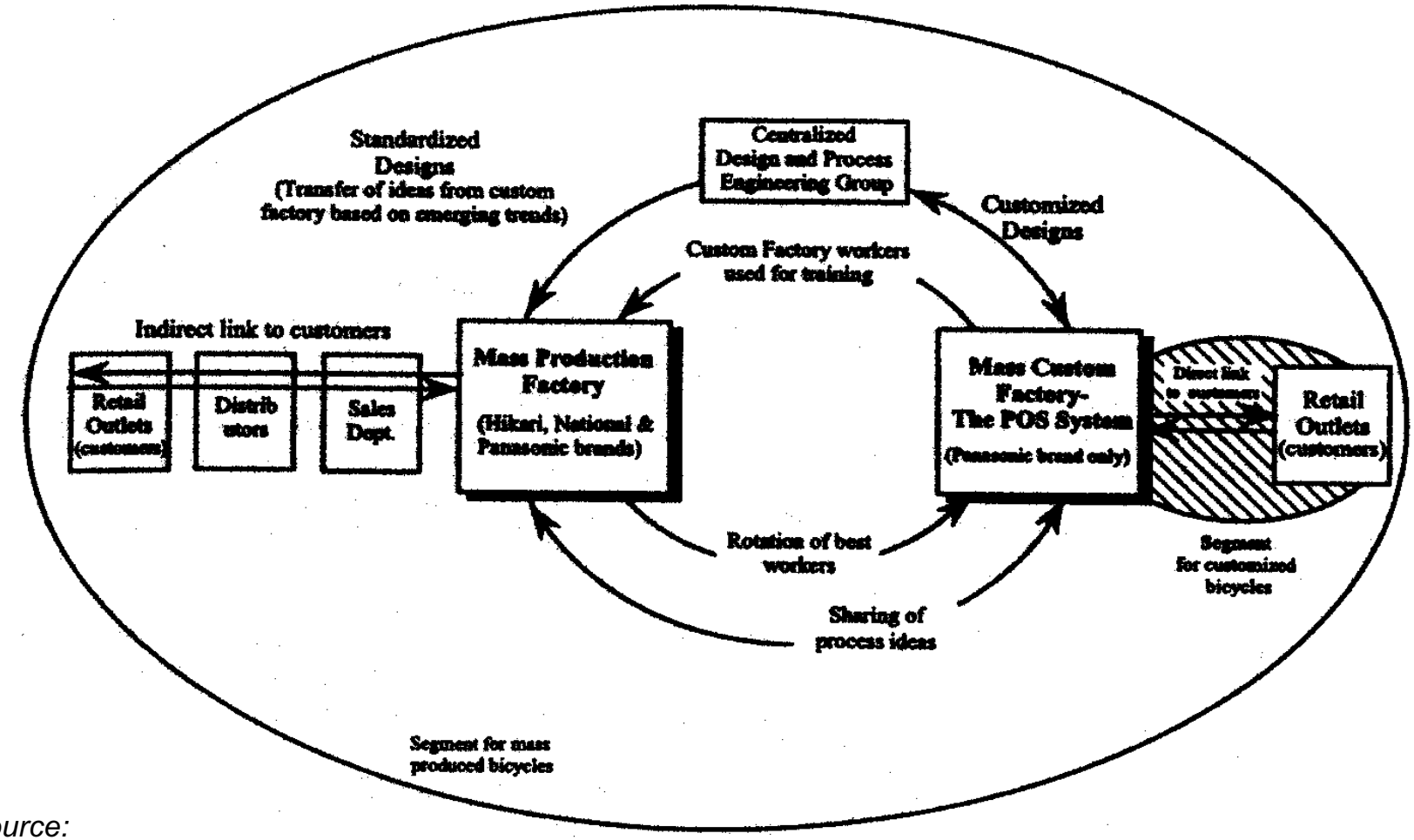
NBIC's Shift to MC

- MC idea originated after NBIC's president visited a famous department store in Osaka and noticed that women could custom order dresses which were delivered in 2 weeks
- Despite opposition, MC factory was fully operational 7 months after department store visit
- Panasonic Ordering System (POS)
  - choose from over 8 million possible variations based on model types, color, frame size, and other features
  - delivered in 2 weeks, not a day more or a day less
  - priced only 20-30% higher
  - production begins after arrival of customer order and specs

Production Process at MC Factory



Interaction Between MP and MC Factories



Source:

- Kotha, S., 1995, "Mass Customization: Implementing the Emerging Paradigm for Competitive Advantage," *Strategic Management Journal*, Vol. 16 (Summer), pp. 21-42.

Advantages of MC Factory at NBIC

- MC workers train MP workers, improving MP processes
- Innovation at MC firm adopted by MP firm
  - 3-D automated measuring machine
  - software for CAM systems
  - robots for painting
- Lot sizes in MP factory have decreased from 50 units to 20 units
- Customer feedback through MC process used by MP factory to create new and innovative designs (i.e., “fringe awareness”)
- Enjoy first mover advantage: MC = Panasonic
- Since Panasonic = MC, Panasonic MP enjoys premium pricing due to brand “image”

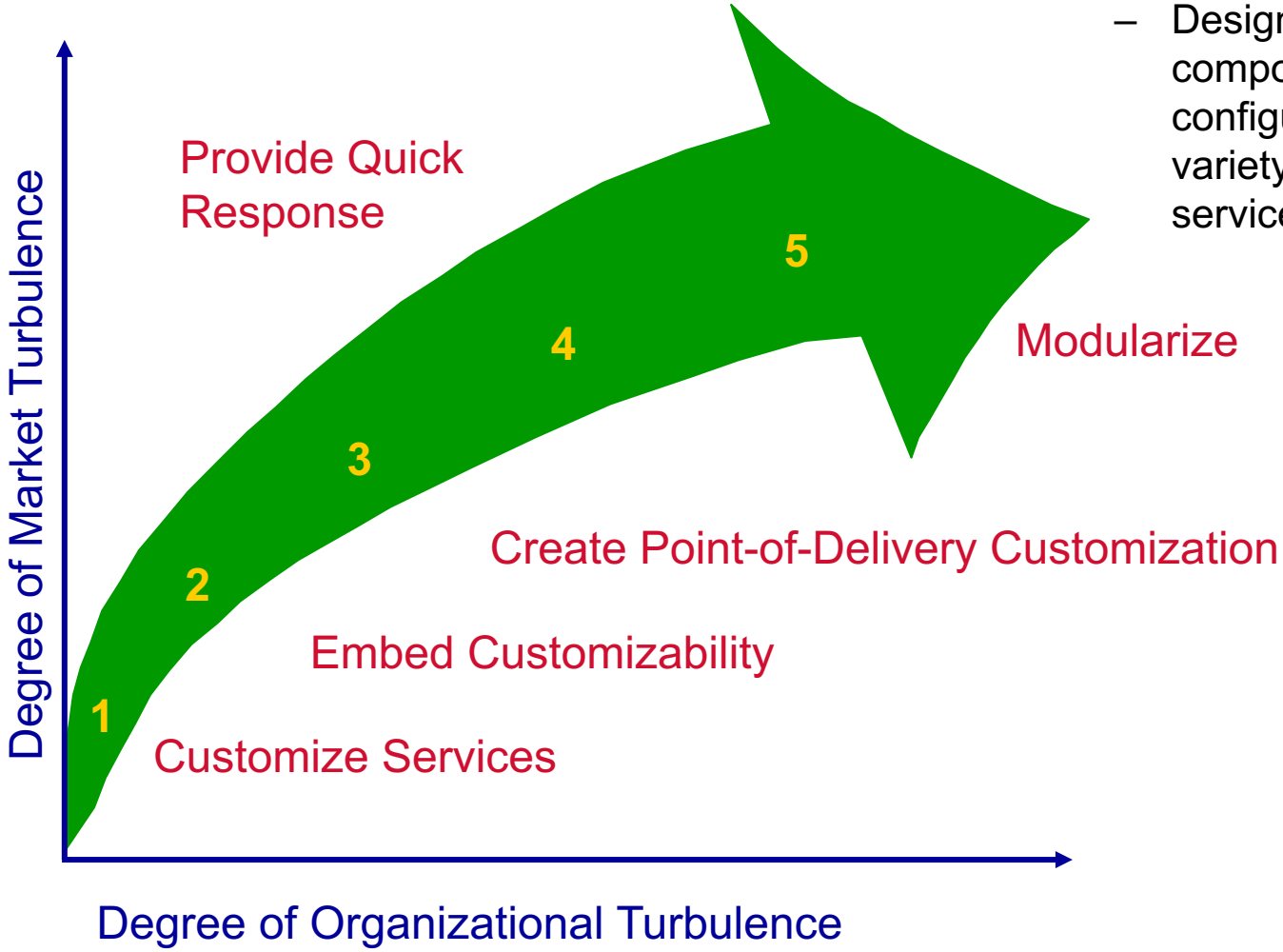
Information Technology in Mass Customization

- There are several ways that IT can foster MC:
  - Value Chain Integration
    - connect entire value chain, both internal and external
  - Experience Warehouse
    - maintain electronic database of company knowledge
  - Embedded Customization
    - embed microprocessors to customize products
  - Segment-of-One Marketing
    - use electronic databases to store and track customer info
  - Precision Pricing
    - price products and services for individual customers

Step 5: Modularize

5. Modularize

- Design modular components that can be configured into a wide variety of end products and services



Step 5: Modularize (cont.)

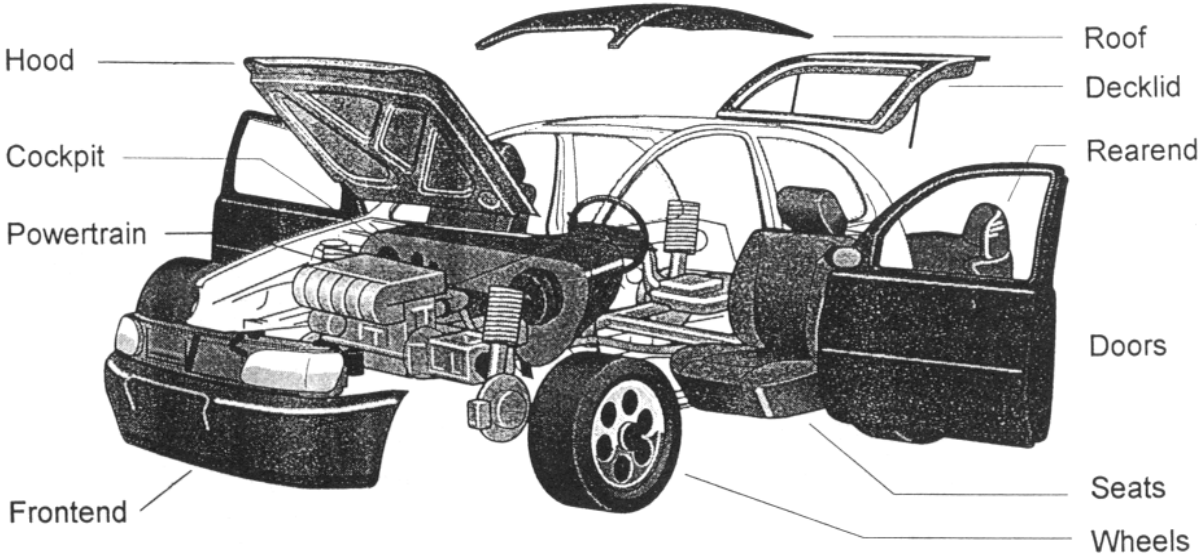
Notes:

- Economies of scale maintained at component level
- Economies of scope at module level since they are used over and over again in different products
- Organization changes:
  - Marketing must figure out how to sell products without overwhelming customers with choices
  - Designers must modularize designs
  - Production must provide low cost manufacturing

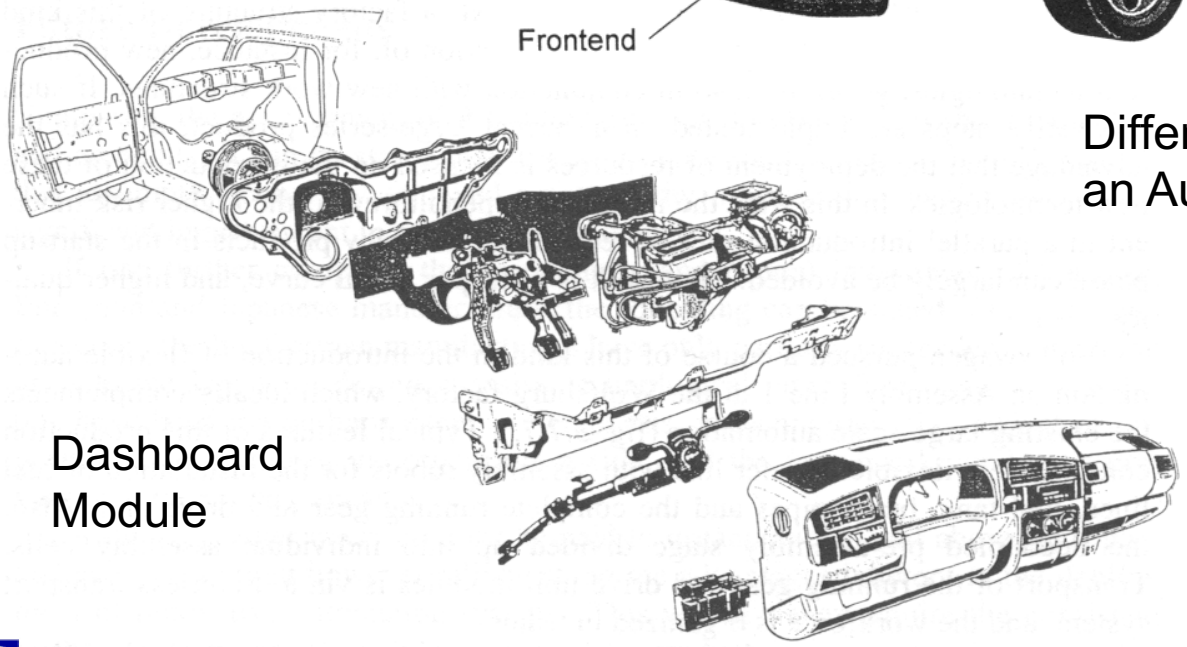
Warnings:

- Modular products are much easier to reverse engineer
- Product is not optimized since competitor can lower cost by reducing modularity; however, this is only for a single product or service
- Modular designs can lead to less innovative solutions over time

Modularity in Automobiles



Different Modules in an Automobile

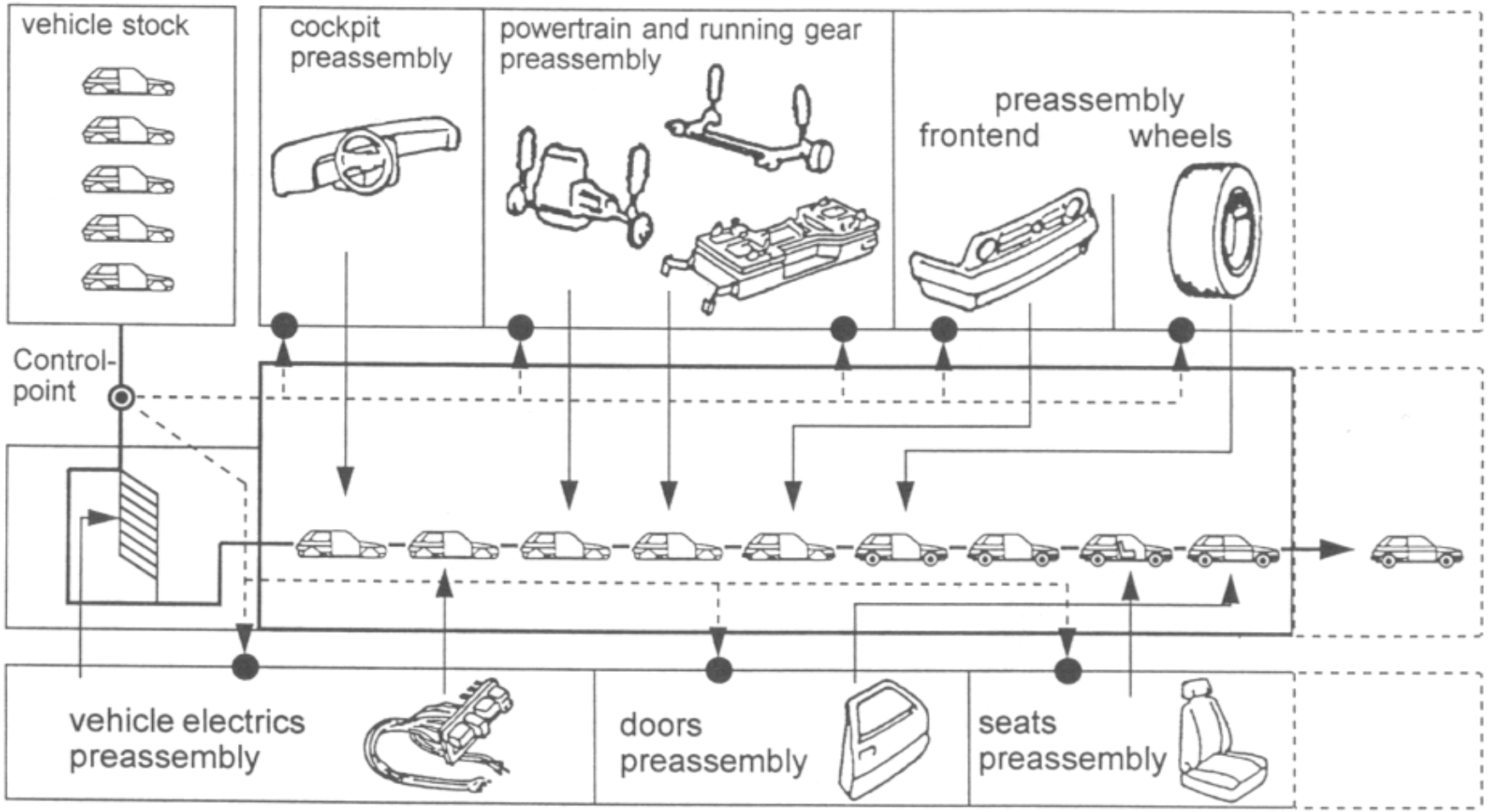


Dashboard Module

Source:

- Shimokawa, K., Jurgens, U., and Fujimoto, T. (Eds), 1997, Transforming Automobile Assembly, Springer, New York.

Modularity Facilitates Automated Assembly



Source:

- Shimokawa, K., Jurgens, U., and Fujimoto, T. (Eds), 1997, Transforming Automobile Assembly, Springer, New York.

In Summary

- Many factors influence the transition from MP to MC
- Pine advocates 5 steps to MC:
  - Customize services
  - Embed customizability
  - Create point-of-delivery customization
  - Provide quick response
  - Modularize
- Customization = product variety
  - Customized products are uniquely produced for each customer; therefore, customers must be involved in the process at some point
- There are different types of MC:
  - Transparent, cosmetic, adaptive, and collaborative