## Lecture No. 24: Summary

1. Total System of Mono-Zukuri : Example of Toyota

2. Messages of This Lecture

# Takahiro Fujimoto

**Department of Economics, University of Tokyo** 

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### 1. Total System of Mono-Zukuri : Example of Toyota

The total system of Mono-Zukuri: to view it as "system of design information."

To extract various factors of Toyota-type systems of production/development/purchasing: <u>Production</u>: Kanban, TQC, automation <u>Development</u>: HWPM, overlap-type development <u>Purchasing</u>: multi-layer structure, design-in...

They altogether constitute a uniform system which generates a competitiveness.

To read Toyota-type capability in product development/ production as an information system format

### **Capability in Product Development**

<u>Market information linkage</u> : to directly link information from market to a concept development department

 <u>Accumulated concept creation</u> : to refine concept information of continuous and cumulative nature throughout the whole period of a project development

 Internal information linkage : to directly and continuously link information among concept development, product planning, and product development

 <u>Early information exchange inside company</u> : to exchange information between up-stream and down-stream within the company in an early stage of development, for a joint problem solving

 <u>Early information exchange outside company</u> : to exchange information between suppliers/others in an early stage of development, for a joint problem solving

<u>Overlap-type problem-solving</u> : overlapping among cycles of problem solving

 <u>Cycle for prompt individual problem-solving</u>: to haste solution cycle per se for each problem, assisting flexible responses to changes



Takahiro Fujimoto, Clark K.B. 'Product Development Power' DIAMOND, Inc. 1991

#### **Production** (Productivity and Production Period)

 <u>Emphasis on density of information transcription</u>: to prioritize density over speed of information transcription between production resources, which includes the minimization of such situations as a production resource in the down-steam not receiving information (inventory) and one in the up-stream not sending one (waste in waiting)

<u>System design prioritizing receiver side</u>: to improve the system for enhancing density of receiving/sending information, in a sequence of starting from the receiving side of information (process design), and then, to the sending-out side (work design)

 <u>Regulation on timing of receiving/sending</u>: to design a total production system in a manner that information transcription from the up-steam to the down-stream is consistently conducted in as much a regular rhythm as possible (equalization, synchronization)

 <u>Redundancy of information stock</u>: to let each production resource on sending-out side have a redundancy by assigning more information stock (generalization of workers, facilities, etc.)

Resulting from these is to simultaneously attain a shortening of production period and an enhancement in productivity (labor productivity, in particular).



Takahiro Fujimoto 'Introduction to Production Management' Nihon Keizai Shimbun, Inc. 2001 (II 337 figure.18.2a)

### Production (Manufacturing Quality)

 <u>System design to prioritize sending side</u> : in each step of information transcription,

to firstly design an enhancement in accuracy of information transmission (build in) on the sender's side,

and next to consider an information accuracy check (inspection) on the receiver's side

• Feedback of defect information :

to secure a loop for promptly and surely feeding back defect (incorrect transmission) information in process to the original sender

#### Organizational Capability of Toyota-type Production System: Conformance Quality



Takahiro Fujimoto 'Introduction to Production Management' Nihon Keizai Shimbun, Inc. 2001 (II 338 figure.18.2b)

#### **Improvement Capability of Production Site**

(i) <u>Device to enforce problem discovery</u> : device to enforce a production site to discover problems through elicitation and visualization of problems, as, for example, in eliciting waste in waiting through a reduction of in-process products' inventory (JIT), and in visualizing defect problem in real time by automation with humanity (machine that stops automatically with its detection of defects) and andon/line stop, and in an early detection of disorder by thorough implementation of arrangement, tidying, cleaning, etc.

(ii) <u>Transfer of problem-solving authority to work site</u> : to implement a transfer of authority on improvement to a management layer at the front line (e.g., the group-leader level in Toyota Motor), and workers' participation in improvement activities (suggestion system, small group activities, etc.)

(iii) <u>Standardization of problem-solving tools</u>: to disseminate, for example, "TQC 7 Tools" "QC Story" "Standardized Revision of Works" throughout the company

(iv) <u>Prompt experiment/execution of improvement ideas</u> : "to be executed before suggested", i.e., many improvement ideas presented from work sites to result in immediate experiments after an informal approval by the management level at site (group/team leaders)

(v) <u>Cumulative revision of standards</u> : to emphasize skills of tacit knowledge not written in the manual in non-routine works, while the portion of repetitive works ought to be thoroughly standardized and compiled in manual, and be frequently revised under the leadership of managers at work site



one-by-one production arrangement / tidying management by eyes Improvement consciousness at site

Problem discovery initiated by site Practical use of cause and effect Experiment encouragement

Drawing work re-distribution proposal

Transfer authority on improvement Site foreman tries himself and

Frequent revision of work standard **Multiskilled worker** 

#### Total Picture of Production / Development System

- Consistency as total system
- Transcription and creation of design information in a smooth and highly precise manner (circulation of knowledge)
- Quick problem-solving cycle (improvement, product problem)
- Hidden production strategy



#### History of Toyota Production System





#### JIT-TQC integrated model of Shorn Burger



# Toyota Production/Development System Viewed as Information System (conceptual diagram)





## 2. Messages of This Lecture

- Development and production are as one.
- Gods dwell in details.

- A penny saved is a penny gained.
- If you run after two hores, you might catch both.
- A success is a mother of failure.
- Lucky mistake (evolution capability)
  - One cannot live if not strong. One doesn't deserve life if not gentle.
- Out of academia and advance.