Instructors School of Human Resources and Manufacturing of Japan

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Business Strategies Born at Manufacturing Sites

"Manufacturing" in a broader sense – Creating **design information = added value** in the form of **artificial objects,** transferring such information, and spreading it, while creating the **flow** of the information down to customers in order to meet customer satisfaction. Not just "making objects," but "**giving shape to design information**."

Artificial object – Something **designed** in advance. Tangible or intangible.

Manufacturing Sites= The world at an "altitude of 5m"
Business Strategies at the main office = The world at an "altitude of 100m." (Perspectives from the top management)
-- A huge gap between the two.

What truly exists in manufacturing sites? Not a thing, but a **design**.

Thus, "**strategies spawned at manufacturing sites**" should:
hold on to the "design information" omnipresent at "altitude of 5m," start off with watching both products and processes from every viewpoint, and rebuild **the whole system.**

〔1〕 **Manufacturing organization's capabilities** = The business organization's own "**skills in communicating design information**"
〔2〕 **Architecture** = **Vision inherent in the design info** of a product or a process (design concept)

Views and Recognitions with Strategies Born at Manufactering Sites

Discussions on industries from altitude of 5m – Starts off with observing sites of work and real objects once again

→ More unexplainable phenomena are emerging with industry categorization defined at the "traditional" altitude of 1,000m. Reconsider categories of industry from the viewpoint of each product's of (1) design concept and of (2) media characteristics. Architectures and spectra of integration (harmonizing) and modules Many of the existing "post-manufacturing" arguments are already outmoded, since they stand on the dichotomy of manufacturing and services.

No vision, without a view of history -- See 1950 through 2050 as a single century.

→ The first half saw confusing 50 years of "building up capabilities" and "regulations and negotiations? bid-rigging?." Double-structure of organizational abilities. Starting off with these, where are we going in "the second half" ?

Strategies and organizations too carry their history – They cannot easily start over, even when a new century dawns on them.

→ Different histories tend to let different types of organizational abilities prevail in each nation. Prevailing in Japan is the type "integrated manufacturing" (teamwork and multi-skill workers) There, "thoroughly competitive sectors" and "imperfectly competitive sectors" coexist, with a great gap in productivity between them.

Strategies Born at Manufacturing Sites-- They require flexible ups and downs in "altitude."

Discussions across different altitudes have not been working well.

→ Overreactions

Altitude of 30,000m – Theories of economy of Japan and the world	Economic journalists (Page 1 of the Nihon Keizai Shimbun) Economy bureaucrats Macro economists Presidents (Nikkei enthusiasts)
Altitude of 1,000m – Theories of respective industries, trades	Industrial paper journalists (Page 1 of the Nikkei Sangyo Shimbun) Industrial bureaucrats Business executives (enthusiastic readers of US business books) Strategy-led scholars of business administration
Altitude of 100m – Theories of business administration and strategies	Industrial paper journalists (Page 15 of the Nikkei Sangyo Shimbun) Field-led economists and scholars of business administration
Altitude of 5m – Theories at manufacturing sites	
Altitude of 1.5m – Values and lifestyles of individuals at sites	People at sites (Many of them are withdrawn into their sites.)

Seen from Altitude of 30,000m (Arguments on Japan's Economy)

高度3万
高度1
高
高
高度1

(1) Improving productivity

The nation's population should diminish in the future, and its labor population already is.

To maintain its economic size, Japan must improve its productivity of added value. (Material productivity profitability)

Added value resides in design information. – The nation's only hope lies in innovations and "manufacturing in a broader sense.

(2) Considering Japan's industrial competence once again

The US seems to say "No more manufacturing"? Compare its auto industry between 1980 and 2006.

East Asia has highly developed manufacturing. Yet it is facing the limitation of the "full-set" industrial model of the 1980s.

We are in an age when we import industrial products as well as raw materials, fuels, and provisions, while at the same time export industrial products.

So, what should we export? We have to reconsider "comparative advantages of Japan as a nation dependent on foreign trades."

Japan to be the only major nation of "integrating-type manufacturing that gives a meticulous shape to design concepts" in the Pacific Rim.

This should complement the two giants of "assembling-type manufacturing," namely the US and China. And such complementation should establish Japan's presence in the world.

Seen from Altitude of 1,000m (Theories of Respective Industries)

(1) Double-structure of productivity

① **Thoroughly competitive sectors**, highly sophisticated through international competition. Estimated to account for several tens of % of the whole industries. (Auto, electronics, steel, chemical, some service, etc.)

Been improving competitive capabilities, productivity, quality, delivery timing, and flexibility simultaneously.

② **Imperfectly competitive sectors** that have not competed in capability building. Estimated to account for several tens of % of the whole industries.
(Financial, construction, transportation, utilities, distribution, much of service, universities, public services, mass media, etc.)

Been improving quality, but not productivity. Competition in capability building in terms of QCDF (Quality, Dependability, Price Cost, Flexibility) has not been evident.

(2) "Structural reforms" and "manufacturing innovations"

What was called "**structural reforms = deregulation and privatization**" was a measure taken to improve the imperfectly competitive industries.
・・・ Yet just privatizing them and putting them in competition make them stronger? Actually, it is not that easy.

The thoroughly competitive industries, which have been "innovating manufacturing" through competition in capability improvement, have to transfer their know-how in competition and knowledge in manufacturing over to the imperfect industries.

Seen from Altitude of 100m (Business Strategies)

Shortage of defining strategies. Many Japanese businesses of thoroughly competitive industries were known for their "competitive plants and incompetent head offices." Thus, they were very able, but did not make much money.

A long-term task for many Japanese businesses is to have both "competitive operations" and "competitive strategies."

To achieve that, strategically, a business needs the two kinds of people:

① Engineers (technology) who understand strategic concepts.
② Office people (humanities or social science) who can have meaningful conversations with engineers.

Still, not many businesses have the right human resource training system and a good framework for collaboration between industries and universities.

"Education of manufacturing management and skills" – Provided at universities and in businesses, covering both humanities and technology

→ "'Earthly' (led by problem finding) elite education" based on that

-- Yet many people in their 30s and 40s are overused and unable to join training sessions?

Many businesses do not even have basic directions as to how to take advantage of collaboration between industries and academics, how to educate young employees and core personnel, how to re-educate experienced manufacturing people in their 50s and --.

高度3万
高度10
高
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Altitude
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Seen from Altitude of 5m (From Sites of Manufacturing)

Many of experienced people, who have been carrying on Japan's manufacturing, are now facing retirement ages. They have gone through many different situations, from the nation's rapid economic expansion to overseas production. Their retirement can affect quality, productivity, delivery timing, etc. – how?

They are human resources with multiple capabilities, raised in "enclosures." Should the management ask them to stay in their companies as instructors after their retirement? "Enclosures" after their retirement?

They insist on their own specific skills (of welding, for instance) – yet this alone does not provide what is demanded.

Businesses had better resort to "knowledge to improve sites" and "manufacturing skills" that serve a broader range of purposes.

-- Actually, they can do so, but many wrongly believe "they are good enough at their own sites of work alone."

As a result, many retire completely, wasting their potentials as "manufacturing instructors."

Those thoroughly competitive industries are resorting to shifting their production sites overseas and hiring irregular employees, but this has brought in a crisis in succession of organizational capabilities. Also, more overseas production facilities are just used up and discarded. Many in their 30s and 40s are overused, while some in their 20s are unused --

At the same time, there is a desperate shortage of "manufacturing instructors" who can help the imperfectly competitive industries improve their productivity.

How can we solve this complex of problems? The clue is to raise, in great volume, "manufacturing instructors who can prove their might in many different lines of manufacturing." – And the major source of them is those experienced manufacturing people in their 50s. We have abundance of them!

Seen from Altitude of 1.5m (Life of Experienced Manufacturing People)

Many graduates of high schools, universities, and graduate schools joined the manufacturing world, back in the age of rapid economic expansion (1965 to 1974).

They were engaged in launches of new domestic plants, as "young hands." They overcame many hardships. Later on, domestic production facilities slimmed down. They strived hard for "improvement of QCD without growth."

Also, since the 1980s, they have instructed launches of overseas plants. Recently, they are engaged in innovations of domestic production, instructions to irregular employees, support to overseas production, re-launch of plants that returned to Japan, and --

Many of them reached their retirement age 60 around 2007. What are they going to do in the years ahead?

Spend the last phase of their lives in the countryside at ease and comfort? Or in major cities? Or local community activities in suburbs?

Still, many of them do hope to contribute to society with their manufacturing experiences.

Many are happy to work for a half of the income they used to receive. Rather, they want to have pride in themselves and something to live for. They can soon have their pension money.

How many of them? Some 1 million of them a year are available for production, including some 200,000 in manufacturing. If 10% of them have such intentions and capabilities, we have 20,000 of such people each year. How many of them want to and can work as instructors?

Conclusion: How To Raise Human Resources So That Japan's Manufacturing Sites Can Remain Alive and Kicking

- We have to terminate vicious cycle in raising manufacturing human resources.

- One key to do so is reuse of Japan's baby-boomers.

- In this, many major businesses, smaller ones, local financial institutions, municipal governments, and the national government are watching one another to see what others are doing. Some initiatives by the national government to break this ice can be effective.

- Too many of the current industry innovation policies focus on "small physical facilities" standing alone.

- The proposed instructors should lead the efforts to "improve the trends" with local communities and small businesses. In short, it's critical to invest first in human resources (instructors), not in physical facilities.

Human Resources To Support Knowledge Exchanges across Industrial Borders

- Manufacturing technologies are knowledge that "creates flows of added value," which can serve many purposes across industrial borders.

- Both manufacturing technologies and proprietary technologies are necessary to keep the manufacturing sites going.

- Proprietary technologies are kept in secrecy (in black boxes). Yet manufacturing technologies are to be shared by many.

- Some clues to innovations of manufacturing are held by other businesses and industries as well. Manufacturers who learn well from them and those who do not should reach different ends. (C Inc. employs production in cells, W Inc. replenishes after the stock runs short, M Inc. cuts out a product when the stock runs out, etc.) Even a standard method in another industry can be one-of-a-kind, if it is transplanted in and adjusted to another industry.

- Then, how can a manufacturer learn from other industries and businesses? The following three level are involved:

  - Level 1: Passive learning.. T Inc. Instructions from consultants, etc. The goal is to establish efforts for continued improvement.
  - Level 2: Autonomous learning. Learning from others with one's own manufacturing methodology established.
  - Level 3: Teach and learn. While teaching other businesses and industries, one learns from the students as well, at the very sites of production.

- To reach Level 3, where one teaches and learns from others manufacturing technologies, a business has to have enough instructors in it, who are able to teach other industries.

- Yet the core human resources at sites of manufacturing (aged in the 30s and 40s) are occupied with improving and instructing their own domestic plants (accommodating both regular and irregular employees), overseas production bases, collaborating companies, etc.

- So, manufacturers should re-educate those experienced people in their 50s, so they can instruct and train others across industrial borders. To do this, they need to have inside organizations to train "manufacturing instructors."

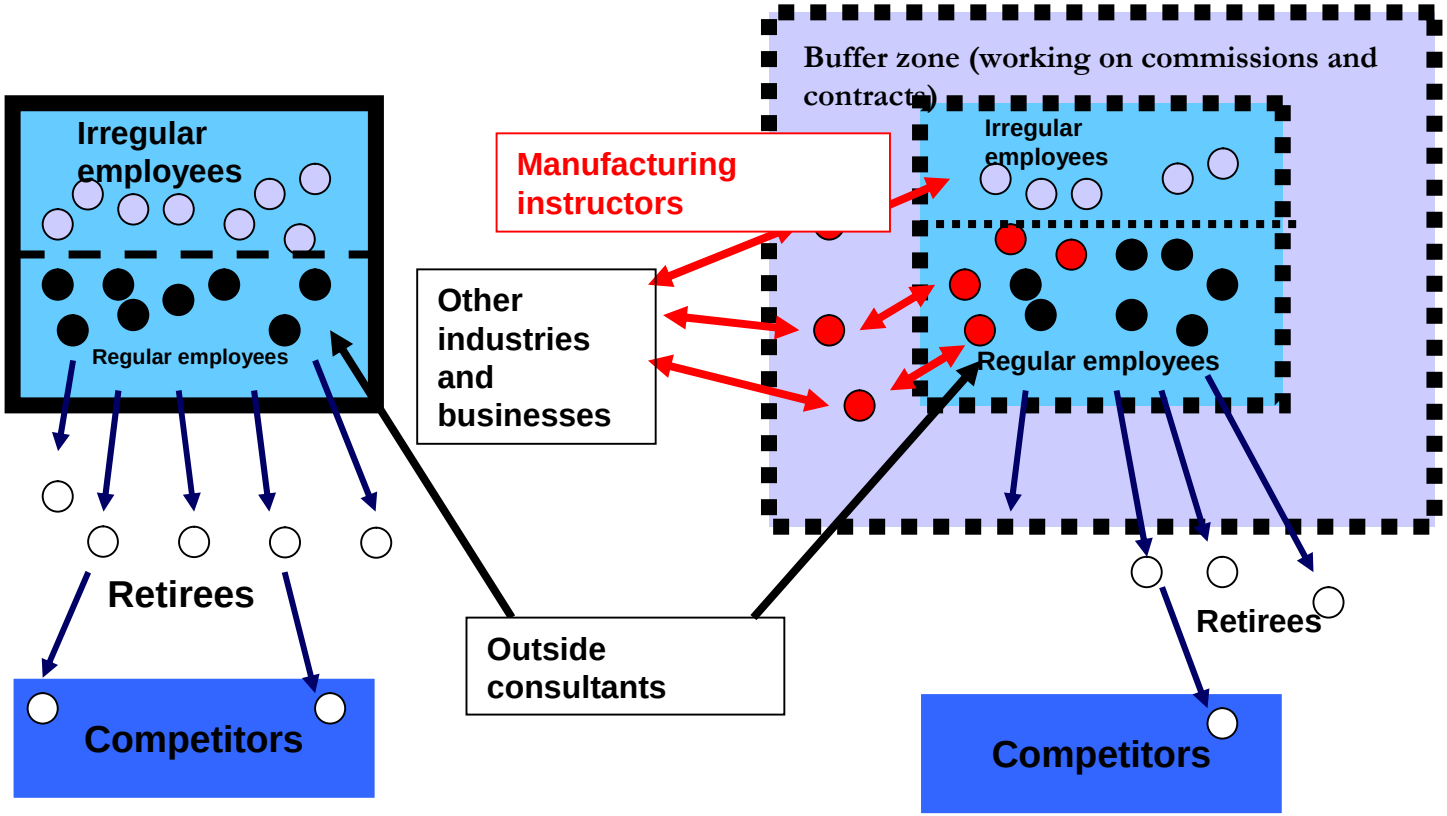
“Open Manufacturing Sites” and Innovations of Manufacturing

A typical “closed site” today

A line between the inside and the outside – after all, some brain drains will happen.

An example of an “open” site of manufacturing of the future

The organization should have “osmotic” membranes around it, to activate mutual learning and instructions with other industries.
-- The key to this is held by “manufacturing instructors”?



A Viewpoint on Raising Human Resources: How To Create a Benevolent Cycle

- 2007 marked the beginning of the social problem of baby-boomers retiring. Can we hand their knowledge over to successors?
  - Currently, many businesses are hiring them after their retirement ages to avoid expected problems --
  - Yet, before it is too late, they have to create mechanisms for continued further development of their operations.

- For the whole economy of Japan as well, spread of "manufacturing technologies" across business and industrial borders is crucial. And "manufacturing instructors" are the key players in it. Raising them is a national task.

- But who become those instructors? The current core people (aged in their 30s and 40s) are too busy to teach others!

- And those in their 20s are too inexperienced. Many of irregular employees lack skills. Those in their 30s and 40s have to spending much of their time taking care of those. Yet those in their 50s lack enthusiasm facing their future uncertainties.

  -- We might see a "vicious cycle in raising human resources." – What should we do first to turn this into a benevolent cycle?

- The fact is that the major source of "manufacturing instructors" is those waiting for retirement in their 50s.
  - If left unattended, many of them will retire and not join subsidiaries of their current employers. Of course, they have the right to enjoy complete retirement.
  - Or some might teach at competitors abroad. Again, they have all the right to do so. But their current employers should know better, as businesses.

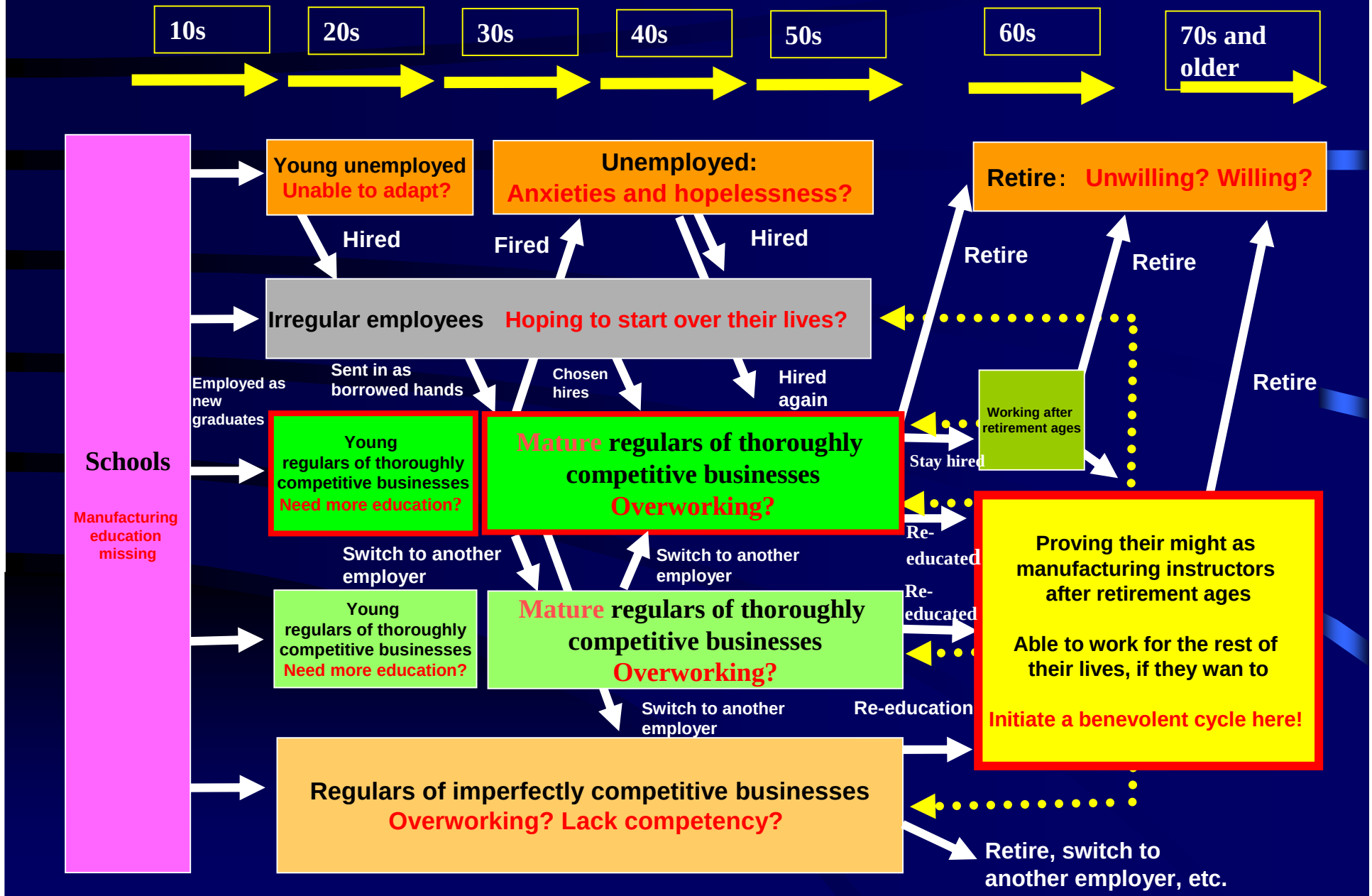
  Many in this age group actually want to serve industries with their knowledge.

- What is holding them back? The wrong belief that they know how to get most jobs done in their own plants, but cannot teach people of other companies. We need to break down this wrong belief and establish in them a new belief that "good manufacturing knowledge can be spread across industrial borders."

- Why can't we create, in cooperation between academics and industries, "new, open places where new knowledge of manufacturing is communicated and created"?

  -- This is what the "manufacturing instructors school" plan is all about.

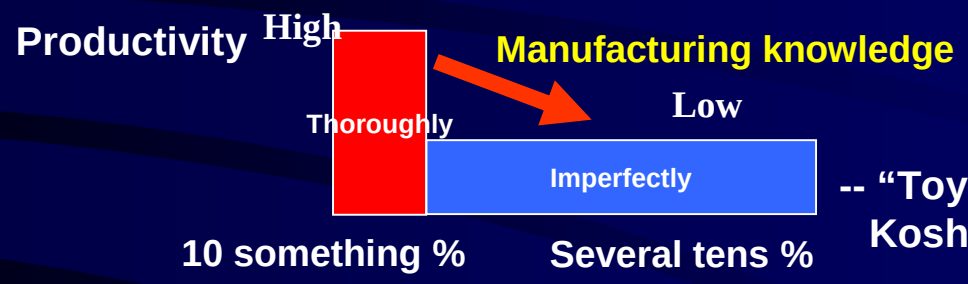
Road Map to Manufacturing Site People: Older, Experienced People Can Initiate a Way out of the Current Vicious Cycle?



Summarizing What Has Been Discussed So Far -- Re-educate Experienced Human Resources into "Manufacturing Instructors"

To maintain the nation's capabilities with its population aging,, the only way available is to improve the average productivity.

Massive transfer of manufacturing knowledge from those "thoroughly competitive sectors" to those "imperfectly competitive ones" should be a major national task over the coming decade or more.



-- "Toyota people teaching at Koshigaya (Saitama) Post Office"

Seen this way, the "2007 (retirement) issue" is a great opportunity.
-- Highly experienced "manufacturing masters" retire from the thoroughly competitive sectors.

Though they wrongly believe "they only know their own plants," they can be re-educated into manufacturing instructors. This takes some formal reeducation systems, namely, "instructors schools" and "instructors' textbooks."

Why Not Create a "Passport" Table of Multiple Skills and Cover Temporary and Sent-in Workers As Well?

Efforts by Japan's Ministry of Health, Labor and Welfare and the Japan Vocational Ability Development Association

Auto Manufacturing Task Force, Comprehensive Vocational Abilities Evaluation System Preparation Committee (Chaired by this author)

First, an ability evaluation sheet set to the industry's standard is wanted. (In case of auto assembly work)

Depth: Work, detection and fixing of abnormalities, finding improvement tasks and carrying them out, instructing others in work, equipment maintenance, business ethics and compliance, cooperation with parties involved, safety and health

X

Width: Supply and acceptance of components, interior and exterior work, piping and wiring, engine mechanisms, Tires and wheels, grease systems, inspection at the end of the assembly line

When a manufacturing employee retires, his or her boss should sign a "certificate" for him/her. The retiree can use the certificate as a kind of professional "passport," which he/she shows as he/she searches for a position in another employer or returns to his/her former position.

Temporary and sent-in workers too should have their career plans. They need to have long-term motivations and experience of growing up. They should not "wait for a restart" of their lives.

Table of Multiple Skills, Based on Industry Standard (An Example of Auto Assembly)

Multi-skill engineer 1 (Standard jobs)

Multi-skill engineer 2 (Handling abnormalities, etc.)

■能力診断シート例（簡略版）：レベル1－2対応例

判定項目	能力細目	判定基準	組立ライン作業 内装例） 自己評価	所属長評価	自己評価	所属長評価	自己評価	所属長評価
実作業	①作業の準備と理解	作業マニュアルと対象部品機能を理解している	○	○				
		作業マニュアルに基づき、作業準備を適切にできる						
		作業に必要な材料・部品の品数を間違えず取り揃え、作業に取り掛かっている	○					
		作業に関する治工具・設備の稼動方法と使い方を習得している	○					
	②作業の実施	対象車両、部位構造、部品の機能を理解し、作業を行っている	○	○				
		作業マニュアルに基づき、担当持ち場でタクトタイム内に正確に作業を行っている						
		タクトタイム内に作業が終わらない場合には決められたルールに従って適切に行動している	○					
		チーム内の工程で複数の作業を適切に行っている	○					
	③作業の検証と設備の点検	作業マニュアルに基づき、担当作業について簡単な検査・確認を行っている	○					
		誤品・欠品など間違った作業を発見した場合に決められたルールに従い、適切な処置を行っている	○					
		治具・工具・設備・機器・部品・組織機構の法令・規・設備内自部点検・概念を知っている						
異常発見・処置	①異常発見・処置に対する理解と行動ルールの学習	担当作業について正常な状態を正確に理解している	○	○				
		日ごろの作業で、正常な状態と異なることがあるか、常に確認、意識して業務を行っている	○					
		製品・設備の異常発見時の行動マニュアルを正確に理解し、マニュアル通りに行動する準備ができている						
		異常発見・処置に関する職場内教育に積極的に参加し、異常発見・処置能力の向上に努めている						
	②異常発見・処置の推進	異常発見した場合、マニュアルにしたがって自分で処理できることは速やかに処置を行っている	○	○				
		マニュアル外のことが生じた場合、上司に速やかに報告し、指示に従って適切に行動している	○					
		作業中に治工具・設備に異常が生じた場合、速やかに上司に報告し、ルールに従い適切に対応している						
	③処置の検証と評価	異常発見・処置で間違った行動があった場合、速やかに上司に報告している	○					
		異常発見・処置の検証と評価を誠実に受け止め、さらなる異常発見・処置能力の向上に活かしている						
改善活動の推進	①改善活動の理解	改善活動の意義を理解し、業務遂行において常に意識している	○	○				
		担当作業の改善活動が生産性や品質にどのように寄与するのかを正しく理解している	○					
		生産活動の組織編成の中で、自分の担当作業の役割を正しく理解している	○					
		担当作業の標準作業を把握し、正しい方法で作業を行っている	○					
	②改善課題の発見、目標の明確化	担当作業において、品質向上と生産効率アップの観点から、改善課題を発見している	○	○				
		部門方針及び上司の助言に従い、改善すべき課題を発見し、適切な目標設定を行っている	○					
	③改善活動の推進	社内・部門内のスケジュールに沿って改善活動を推進している	○					
		改善すべき課題が予定通りに進んでいるか、常に気を配っている	○					
		トラブルや情勢変化で計画通りに進まなくなった場合、上司の判断を待たから、計画変更等速やかに対応している						
		作業マニュアルに現状にそぐわない点を発見した場合、上司に意見具申、改善提案を行っている						
		小グループ活動等の改善活動に積極的に参加している	○					
作業指導	①作業指導の推進	担当作業について、作業の流れや品質目標を理解し、作業指導している	○	○				
		担当作業の設備や治工具について使用条件・基準を理解し、上司の指示に従い、作業指導している	○					
		製品のスペックの違いによる作業変更の訓練案を正しく理解し、作業指導している						
		作業指導に関する指導手順を理解し、曖昧な点は上司や先輩に質問している	○					
	②作業指導に関する	より分かりやすい作業指導を行うために、課題を発見し、上司に報告している	○					
設備保全	①設備保全業務の理解	設備保全の基本的概念と役割を理解し、職務遂行している	○					
		設備保全に関する全社・職場・設備ごとのルールを正しく理解し、職務遂行している	○					
		設備・治工具の機能を理解し、正しい使用方法を守りながら職務遂行している	○					
	②設備保全業務の推進	自工程の設備・治工具の名称と役目がわかり、操作基準を理解している	○	○				
		自工程の設備・治工具の日常点検項目を熟知し、決められた作業手順に従い作業を行っている	○					
		自工程の設備・治工具の自主保全の内容を理解し、決められた作業手順に従い作業を行っている	○					
		設備に異常が発生した場合、上司に速やかに報告し、ルールに従った行動を遂行している	○					
		設備災害の防止についた、安全レベルの向上、新設設備の安全チェックリスト項目等を理解し、適切に対応している	○					
		設備保全に関する実施手順、事務手続き等を理解し、曖昧な場合には上司等に質問し、解決を図っている	○					
	③設備保全業務に関する創意工夫の推進	自工程の設備・治工具についての実用的知識、スキルの向上に取り組んでいる	○					
		自工程の日常点検・自主保全に関する作業手順やルールについて改善すべき点を上司等に意見具申している	○					
		設備保全で満足できた点、不足していた点を自己評価し、改善点を整理し、上司等に意見具申している	○					

判定項目	能力細目	判定基準	自己	所属
企業倫理と企業の社会的責任	①諸ルール・法令内容の把握	職業人としての自覚や社会的責任感を持って仕事に取り組んでいる	○	○
		企業の社会的責任についての知識と自覚を有している	○	
		会社の企業理念、経営方針、社訓・社是、倫理憲章、行動ガイドラインの所在と概要を把握している	○	
		会社の就業規則や諸ルール、企業の社会的責任に関する問題を理解している	○	
		日常業務に関連する法的・倫理的・社会的責任に関する事項について、過去に問題となった事例を知っている	○	
	②諸ルール・法令の遵守	会社の倫理規定や諸ルールを遵守している		○
		公私の区別は明確にしている	○	
		業務上で知り得た秘密を他に漏らしたり、盗用したりしない	○	
		日常業務上で倫理的・社会的責任に関わる問題に直面した場合は、上司に相談し、問題解決策を模索している	○	
関係者との連携	①上司や同僚との連携による職務の遂行	自分が所属している職場の組織構造、所掌範囲・業務分担の構造等を理解している	○	
		余力がある場合には、進んで周囲の仕事を手伝っている	○	

From an activity report of the Auto Manufacturing Task Force, Comprehensive Vocational Abilities Evaluation System Preparation Committee, the Japan Vocational Ability Development Association (2005)

Our Recognition of the Current State of Raising Human Resources: Need To Raise "Manufacturing Instructors" in Great Quantity

- **Demand for manufacturing instructors exist in huge abundance.**
  - **Succession of skills inside a company**
  - **Instructions at sites to sent-in and temporary workers, whose numbers are on the rise**
  - **Instructions at sites of increasing production bases abroad**
  - **Instructions at sites on request from contracted suppliers**
  - **Instructions at sites on request from other industries (For instance, Toyota → Koshigaya Post Office)**

- **Although proprietary technologies can be applicable to limited uses alone, site management skills are applicable to many industries.**

- **And in fact, there is huge supply of such instructors as well. Many of those engineers in their 30s and 40s are too busy to instruct others. Yet how about those in their late 50s and 60s?**

  They went through abundance of experiences when they were younger and their companies were smaller. They have more knowledge than their younger counterparts, in terms of both quality and quantity. Thus, the "2007 (retirement) problem" can be made into a 2007 opportunity.

- **(Working as instructors) helps those experienced engineers make some additional money besides their pensions. And they can have something to live for. Thus, this proposed system can improve the morale of those aged in their late 50s. They carry great potentials and teach younger ones for non-burdensome hourly wages. For the time being, those experienced manufacturing experts should lead Japan's way to better productivity.**

- **To achieve this, full-fledged "education for manufacturing instructors" should develop all over the nation!**

"Manufacturing Business Administration Research Centers" and "Manufacturing Instructors Education Schools"

- Many of the baby-boomers are retiring, and many manufacturing businesses are facing a serious issue of how to keep their manufacturing sites running and competent.

- To maintain competency of manufacturing sites, having many more "**manufacturing instructors**" is a must. They should be highly experienced and help younger and core engineers grow better, including those temporary and sent-in workers. **To raise human resources, one must first raise instructors**.

- Those "manufacturing instructors" do not just help a single company maintain highly developed skills but also play important roles in **spread of manufacturing skills across industry borders**.

- In short, "**raising manufacturing human resources**" is an urgent necessity to the whole of Japan , which is currently facing aging, diminishing population as well as crises in succession of skills, deteriorating manufacturing sites, the double-structure in organizational capabilities (the thoroughly competitive and the imperfectly competitive), and other problems.

- Standing on the recognition described above, **the Manufacturing Management Research Center, University of Tokyo**, has launched the "**Monodukuri Instructors Yosei School**" (literally, **Manufacturing Instructors Education School**), which has been educating experienced manufacturing engineers since 2005.

Outline of the "Basic Course" To Raise Manufacturing Instructors

・Based on the chapter structure of a book by this author, "Seisan Management Nyumon" (An Introduction to Production Management)

・Each chapter is roughly divided into two parts, "basics" and "instruction procedures," and the course follows the order of chapters in the book.

・The "basics" part defines the major concepts and explains the major system of management and improvement methods.

・The "instruction procedures" part explains the "tried tactics," categorized into several patterns, to let the students combine those concepts and methods with their specific diagnoses, planning, instructions, etc. at sites of manufacturing.

・Those "tried tactics" should be prepared in at least some abundance and help the students as they instruct others at sites. These tactics must be based on actual situations at sites. And it must be always supposed that an instructor enters the site as a consultant, not as an executive of the plant with authority.

・Each tried tactics should be explained, in accordance with the PDCA cycle, in the order of: (1) signs of a problem at a site, (2) "what should be done" to those signs, (3) control items to track, measurement indices, and approximate target values to achieve, (4) true causes, (5) measures to take, (6) procedures of instructions at the site, (7) control of progress and achievement, (8) corrective actions and follow-up activities, and so on.

・All the above should be provided in a standardized format (a template) as far as possible.

A Matrix of QCDF + 3Ms and PDCA

	C (Manu-facturing)	D (Manu-facturing)	Q (Manu-facturing)	F	Mn (Manu-facturing)	Mc (Manu-facturing)	Mt (Manu-facturing)	C (Develop-ment)	D (Develop-ment)	Q (Develop-ment)
Plan Diagnosis of problems What should be done Items, indices, targets Planning of measures to take										
Do Procedures of instructions at sites										
Check Control of progress										
Action Corrective measures and follow-up activities										

Basic Course Description

（1）Basic concepts of manufacturing

（2）Competency and corporate performance: Basics (3) Competency and corporate performance: Actual measurement

(4) Cost and productivity: Basics (5) Cost and productivity: Instruction procedures

(6) Delivery timing and inventory control: Basics (7) Delivery timing and inventory control: Instruction procedures

(8) Quality control: Basics (9) Quality control: Instruction procedures

(10) Flexibility: Basics and Instruction procedures (11) Summary of instructions on QCD

(12) Personnel and labor management: Basics (13) Personnel and labor management: Instruction procedures

(14) Equipment control: Basics and Instruction procedures

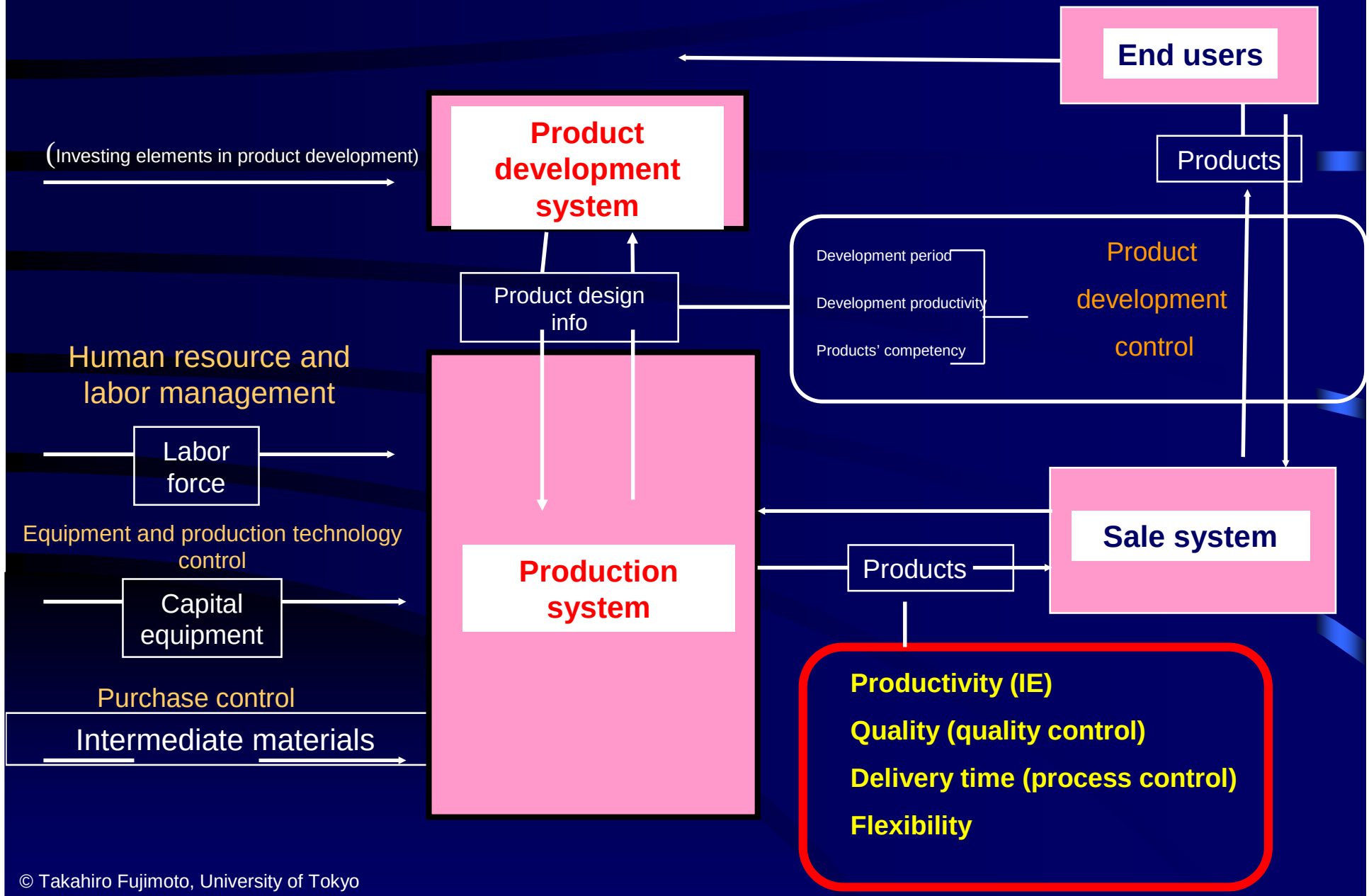
(15) Purchase control: Basics (16) Purchase control: Instruction procedures

(17) Development periods, productivity, and control: Basics (18) Development periods, productivity, and control: Instruction procedures

(19) General product competency: Basics (20) General product competency: Instruction procedures

(21) Summary and presentations

Manufacturing (Development and Production) Systems



A Class Scene

A Class Scene

On-site Training

“Open Sites” and Innovations of Manufacturing

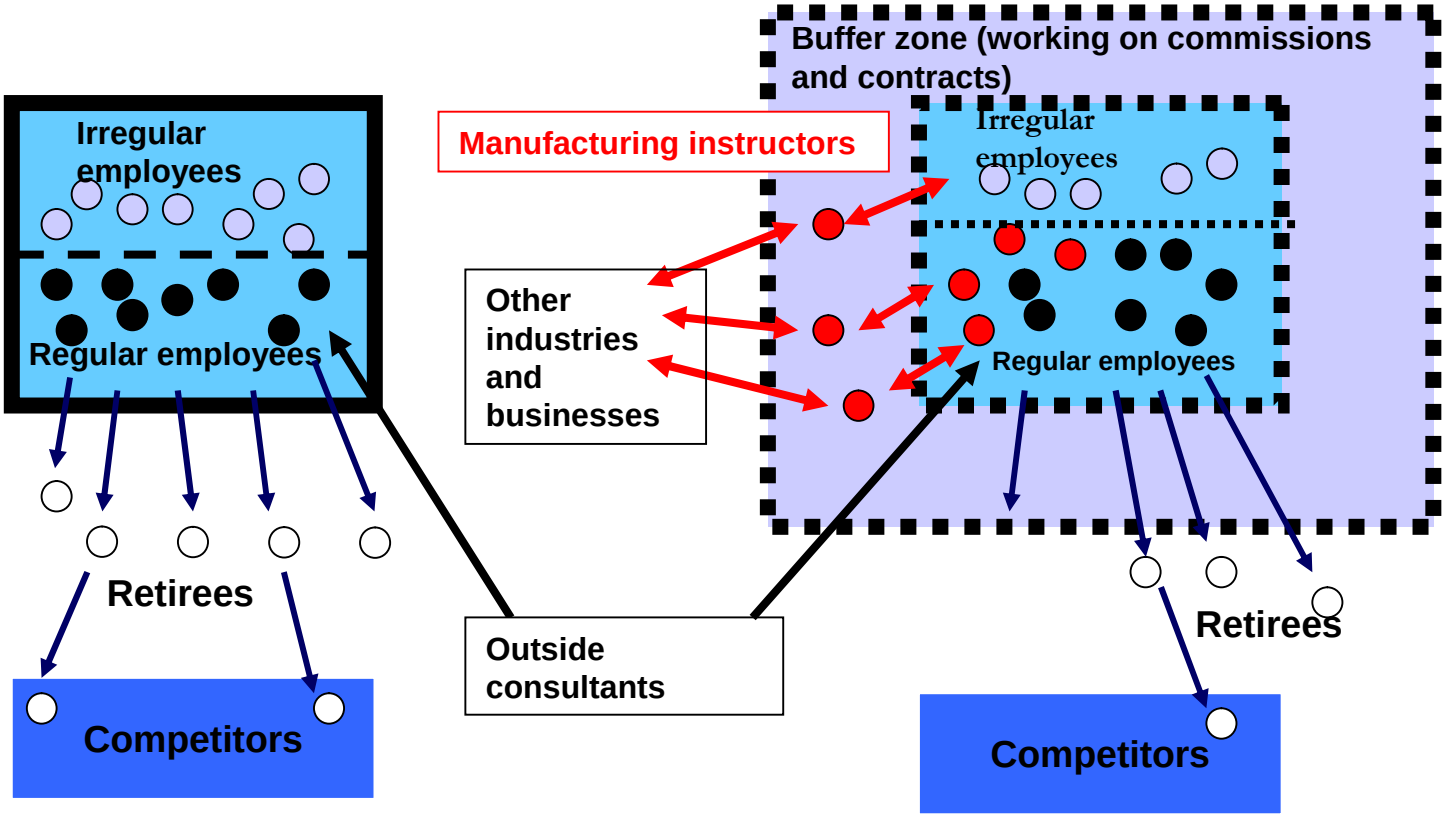
A typical “closed” site of today

“Us and them” – brain drains, eventually

An example of an “open” site of manufacturing of the future

The organization should have “osmotic” membranes around it, to activate mutual learning and instructions with other industries.

-- The key to this is held by “manufacturing instructors”?



Collaborations in Manufacturing, Raising Human Resources, and Innovations
More local collaborations needed among industries, administration, and academics!

- **Major businesses should launch internal schools of manufacturing instructors.**
  Internally educate those instructors who can teach how to start "good trends" across industry borders.
  Those instructors can help their companies and others by instructing them for improvements, after their retirement ages.
  Teaching outside their companies, they can bring in knowledge from outside to their companies. Educate such instructors before they reach the retirement ages.

- **Major businesses should provide new options of after-retirement employment, other than "five days a week or complete retirement."**
  For instance, "three days a week as an instructor." Such work options might have good potential demand? ?

- **Multinationals should consider carefully their overseas production bases. Have the right bases at the right places.**
  Leave some "evolving manufacturing sites" inside Japan. And secure enough regular employees to keep such sites running.

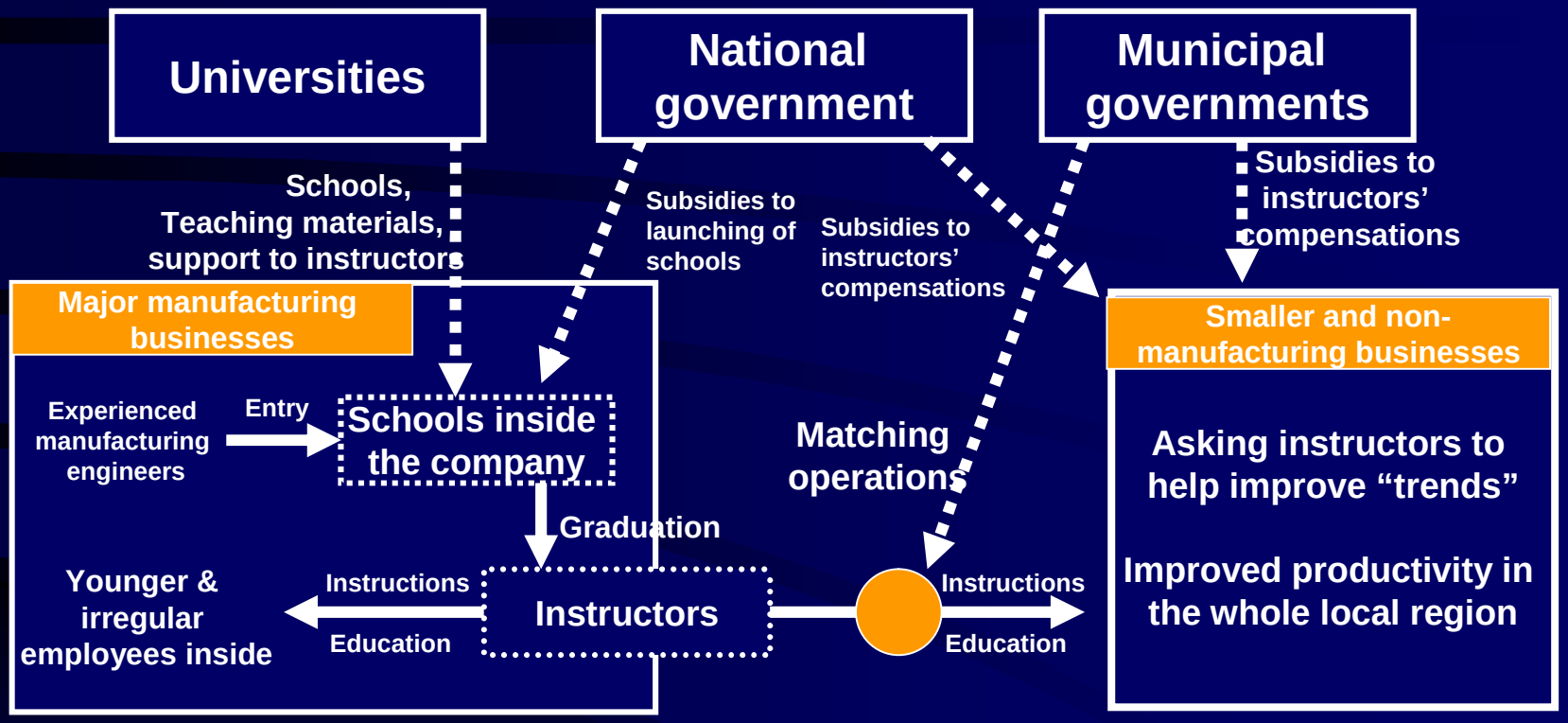
- **Small businesses should start off "good trends" and aggressively hire people from outside, to improve productivity of added value.**
  For instance, ask "instructors" from major companies for help in manufacturing and educating people.

- **The national government should support small businesses "start off good trends," "raise people," and "use instructors."**
  Abolish the "standalone technology" policy, which places too much emphasis on proprietary and leading-edge technologies.
  Grant subsidies to finance compensations to instructors, etc.

- **Municipal governments should enhance operations to "match demand for and supply of" instructors in their respective localities.**

- **Universities should enhance their education in "manufacturing" technologies and management, combining technologies and humanities.**
  And develop such efforts into experimental studies original to Japan.

Collaborations among Industries, Administration, and Academics in Raising Human Resources



A Plan for Local Instructor Schools: What Municipal Governments Can Do

① Preparation to found local schools

② Hiring candidates to local school instructors (experienced manufacturing people in the local region)

③ Sending candidates to the instructors school of the University of Tokyo (Opens in October to November) Graduates can form the core of their local schools (head instructors, etc.)

④ Opening local schools. – The students should mainly consist of those experienced manufacturing people of the region. (For instance, several courses offered a year, with one course lasting for a couple of months and the class meeting on 7 to 20 days)

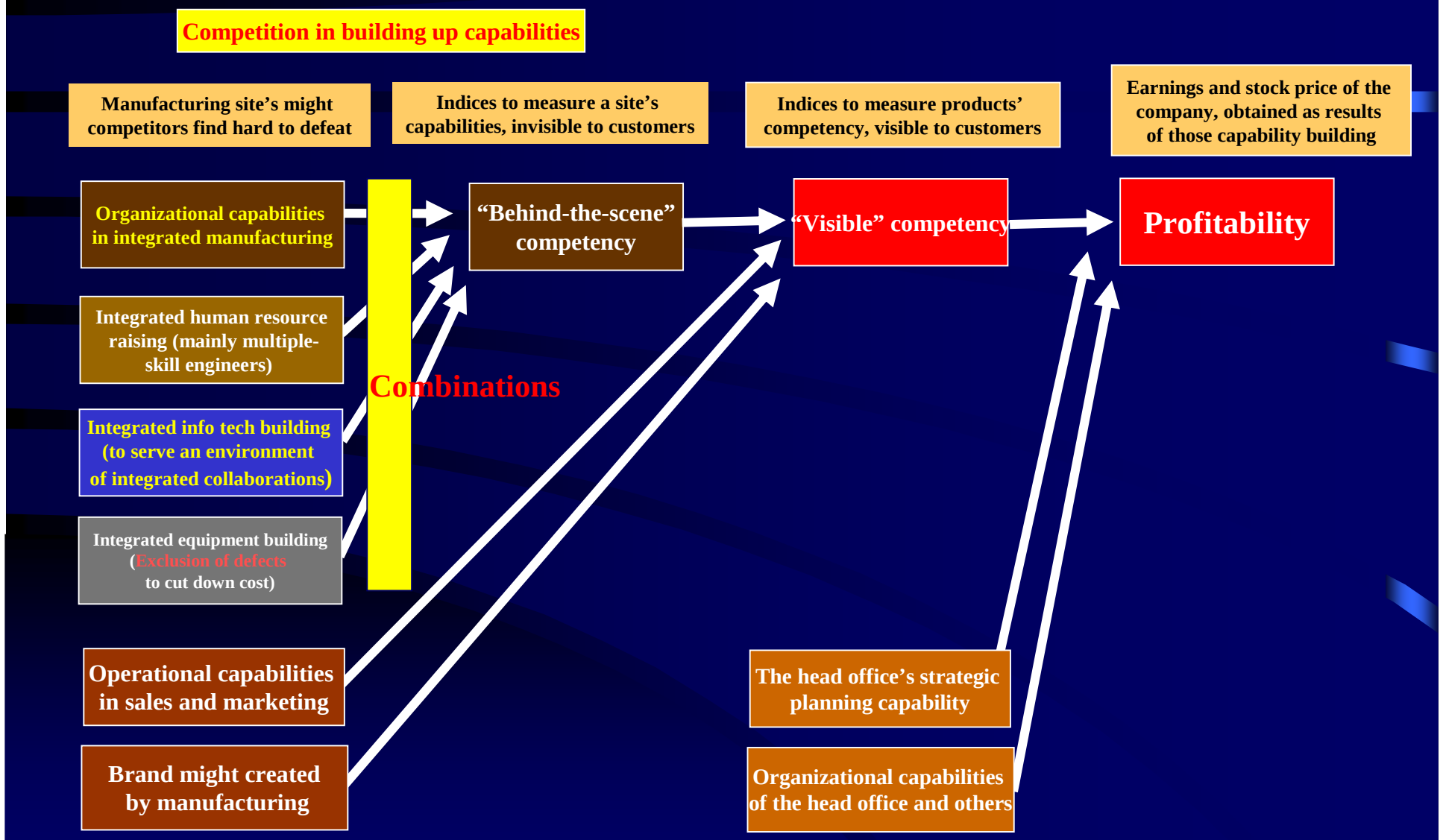
⑤ Graduation from a local school → Appointed local instructors

⑥ Establish and secure networks of local instructors – Managed by the municipal governments, or privately?

⑦ The national, prefectural, and municipal governments should send instructors to the manufacturing sites of small businesses in the respective regions. (Secure the places where the instructors can work.)

⑧ The national, prefectural, and municipal governments should cover a half or the whole of each instructor's compensation. (Consider also cooperation with local financial institutions.)

"Muscle Work" Strategies To Begin the Work with Enhancing Capabilities at Manufacturing Sites



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“Manufacturing Management Research Center” Established in 2003

Its missions include:

- Proposing “manufacturing in broader senses,” based on the recognition that manufacturing is giving shape to design information
- Systematizing knowledge related to “organizational capabilities in integrated manufacturing” original to Japan
- Promoting collaborations between academics and industries related to this knowledge, transfer of the knowledge across industry borders, and spread of the knowledge abroad
- Considering measures to turn competency in “integrated manufacturing” into profitability
- Proposing “industrial theories of architectures” based on sites of manufacturing, which are necessary to achieve the above
- Contributing to re-education of “manufacturing instructors”