

Historical Significance and Suggestions on Future Works of Software process Improvement in Japan

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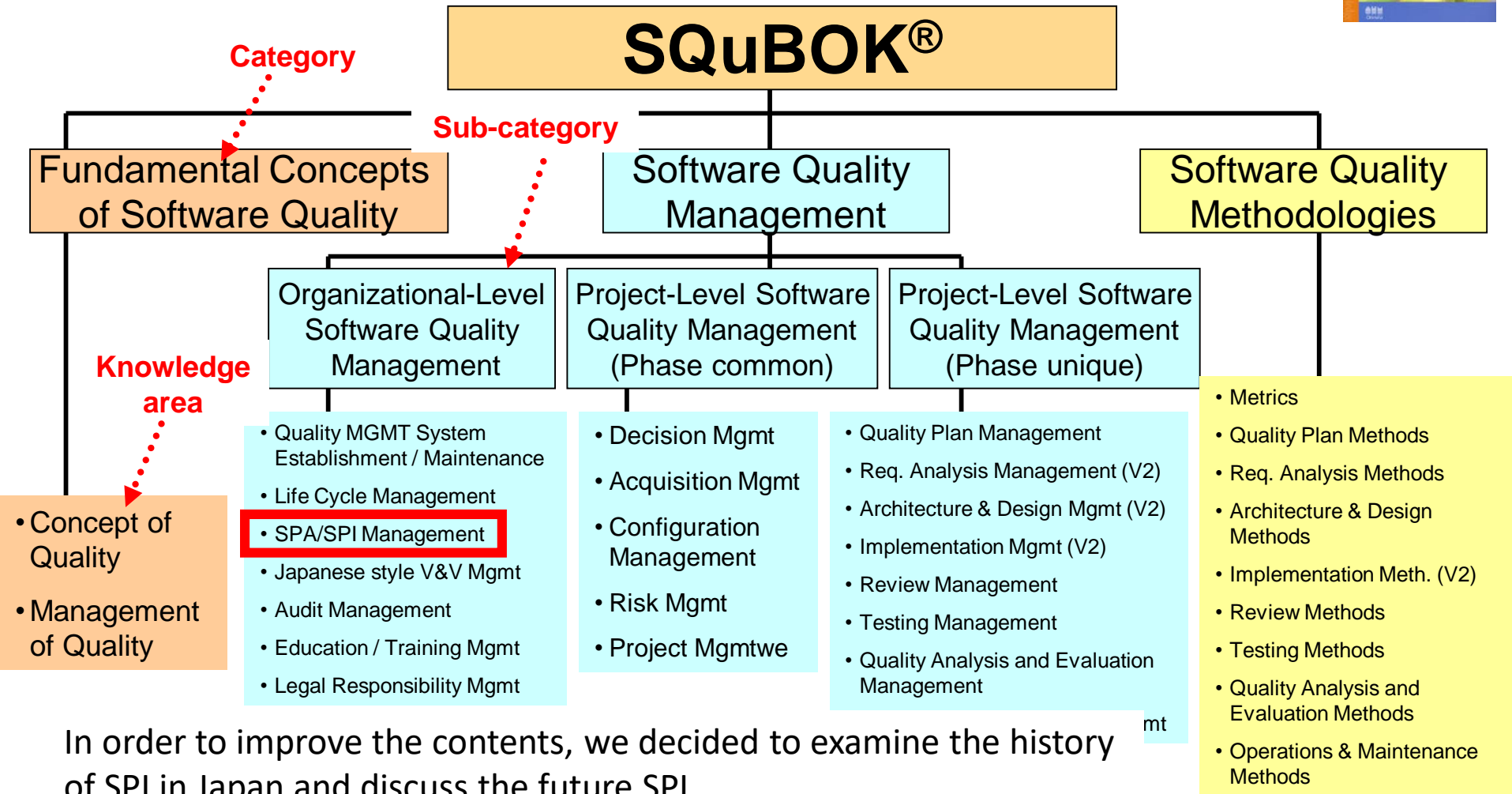
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Outline

1. Background
2. SPI in Japan
3. Purpose
4. SPI Periods in Japan
5. Evaluation method
6. Evaluation results
7. Future SPI in Japan

1. Background

1st edition : 2007
2nd edition : 2014
3rd edition : 2020



In order to improve the contents, we decided to examine the history of SPI in Japan and discuss the future SPI.

English version:

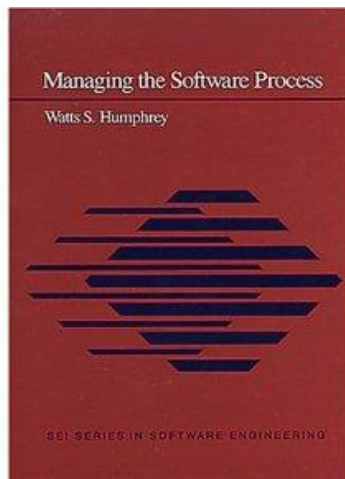
https://www.juse.or.jp/sqip/squbok/file/squbok_eng_ver1.pdf

2. SPI in Japan

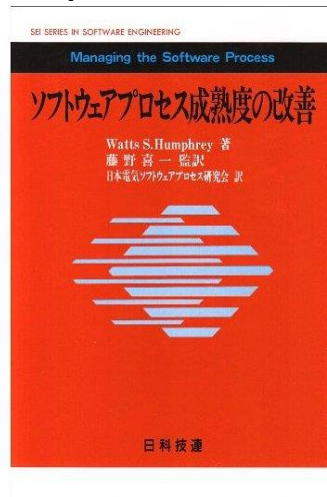
Concept of SPI has been recognized since 1991.

Influenced from Japanese Software Quality Control

1991 Japanese Version

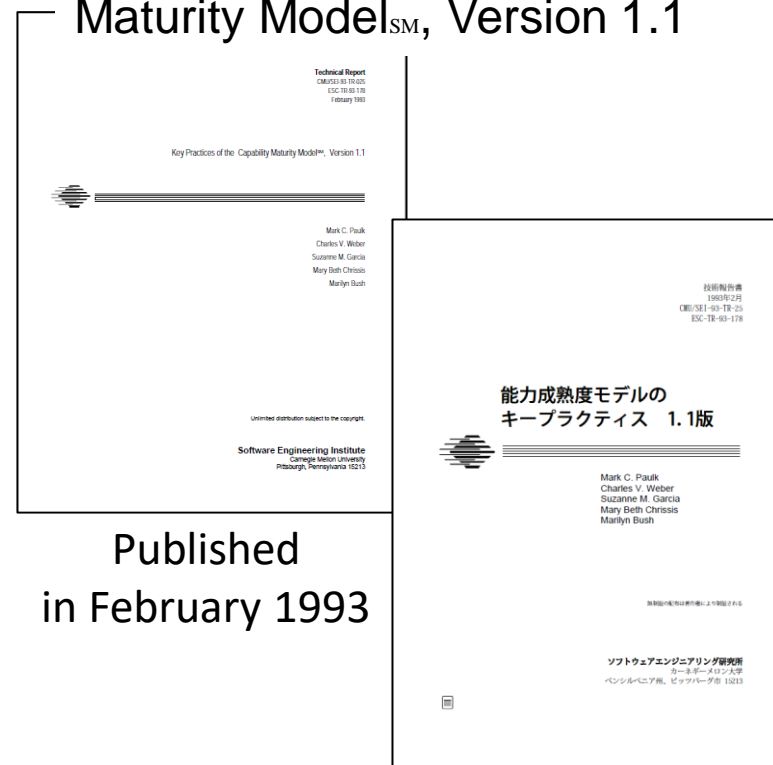


Published in September 1989
ISBN: 0201180952



SW-CMM / CMMI boom took place in Japan from the late 1990s to the mid-2000s

Key Practices of the Capability Maturity ModelSM, Version 1.1



Published
in February 1993

能力成熟度モデルの
キープラクティス 1.1版

Mark C. Paulk
Charles V. Weber
Suzanne M. Garcia
Mary Beth Chrissis
Marilyn Bush

ソフトウェアエンジニアリング研究所
ペンシルベニア州、ピッツバーグ市 15213

Published
in May 1999

JASPIC (Japan Software Process Improvement Association)

- Birth
 - Non-Profit Organization, Founded...
 - In October 2000
 - One of the purposes was translating CMMI.
- Objectives
 - Make the opportunity of exchange between members
 - Study the technologies, methods and models of SPI and SPA
 - Contribute to the community of SPI and SPA internationally
- Activities
 - Research Meeting
 - Special Interest Group
 - SPI Twilight forum
 - SPI conference (SPI Japan)



Current situation

There are few papers which satisfied both of effectiveness and conformity

Effectiveness

+

Conformity

SPI Japan 2019 - ソフトウェアプロセス改善カンファレンス 2019 - 「つなげる」～ 共通性を見つけて取り組みを体系化しよう! ～ ■日程: 2019年10月 9日(水) 13: ...
詳しくはこちら

SPI Japan 2018 - ソフトウェアプロセス改善カンファレンス 2018 - 「挑む」～ Chance Challenge Change ～ ■日程: 2018年10月10日(水)13 ...
詳しくはこちら

SPI Japan 2017 - ソフトウェアプロセス改善カンファレンス 2017 - 「楽(かな)でる!」～共に楽しみ、共に創る!～ ■日程: 2017年10月11日(水) 13:30 ～ 16 ...
詳しくはこちら

SPI Japan 2016 - ソフトウェアプロセス改善カンファレンス 2016 - 「はじめる!」～その力がここにある!～ ■日程: 2016年10月12日(水) 13:00 ～ 10月14日(...
詳しくはこちら

SPI Japan 2015 - ソフトウェアプロセス改善カンファレンス 2015 - 「発見!」～出会ってワクワク! さあ、次のステージへ!～ ■日程: 2015年10月21日(水) 13:00 ...
詳しくはこちら

SPI Japan 2014 - ソフトウェアプロセス改善カンファレンス 2014 - 「伝わる」～“カイゼン”の想いを感じ、その輪を広げよう～ ■日程: 2014年10月15日(水) 13:30 ...
詳しくはこちら

SPI Japan 2012

SPI Japan

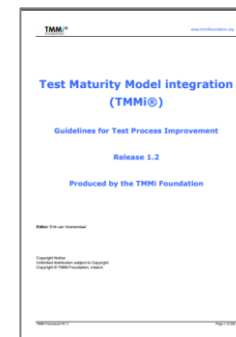
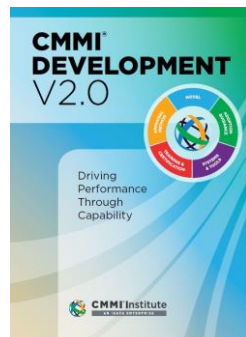
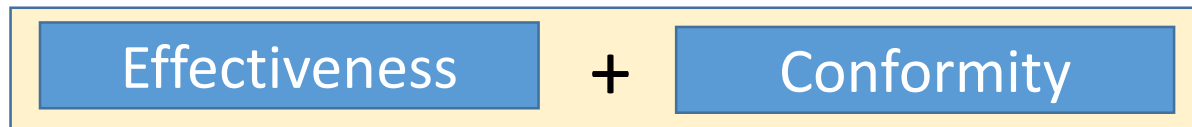
These results also show that SPI activities are continuing in Japan

- Every October
- 30 papers
- 200 persons





3. Purpose

- ① Examine the reasons for not achieving this ideal state from the history of SPI in Japan and specify the cause
- ② Discuss how to overcome the cause and show the future direction of SPI in Japan

Many companies have not yet reached to **IDEAL state** satisfied both of effectiveness and conformity.



4. SPI Periods in Japan

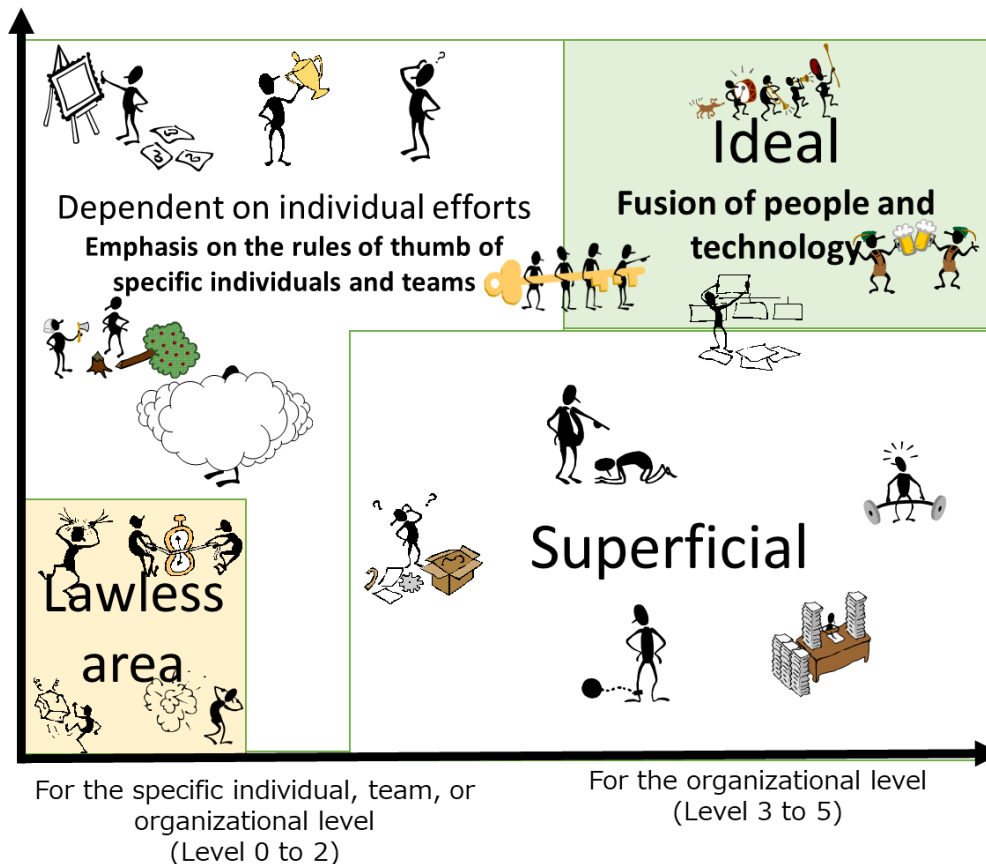
Phase1	Phase2	Phase3
1971-1990	1991-2006	2007-
QC/TQC-based	Model-based	Mixture of Model-based and Problem-based
<p>Japanese Software Factory</p> <p>TQM concept and methods was applied to the software business domain.</p> 	<p>1991</p>  <p>Japanese version was published</p>  <p>ISO9000-3 was also issued</p>	<p>2007</p> <p>First year for which the number of ISO 9001 certification decreased</p>  <p>IPA/SEC published Software Process Navigation Guide</p>

5. Evaluation method

For each phase,

- (1) Summarized the characteristics of improvement methods
- (2) Mapped main results achieved on this figure

Effectiveness

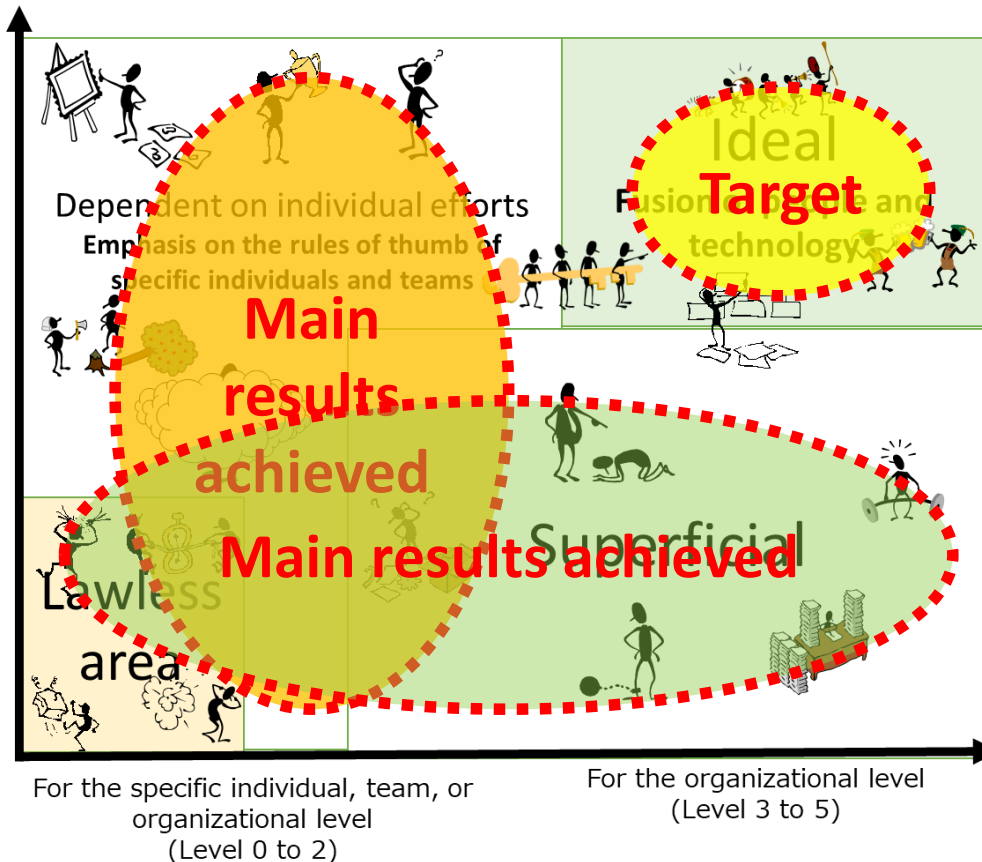


**Conformity
with various
process models**

6. Evaluation results

- Main results achieved
 - Phase1 (1971-1990) : Depending on individual's efforts
 - Phase2 (1991-2006) : Superficial
 - Phase3 (2007-) : Mixture phase of phase1 and phase2

Effectiveness



Conformity with various process models

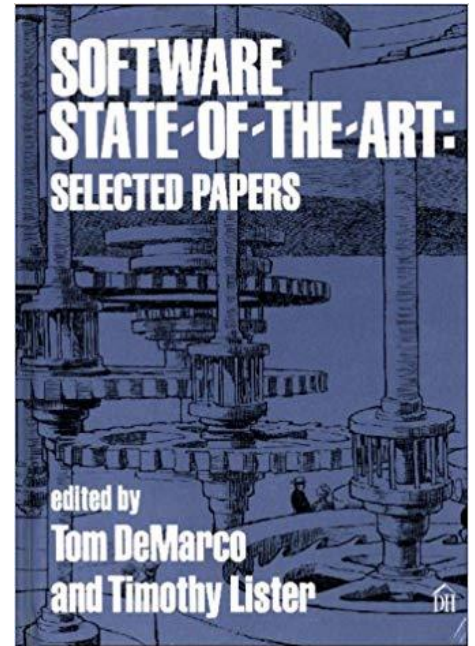
Phase1: Analysis (1)

DeMarco and Lister said

It was so huge and so fast and so functional. It was, in fact, the very online teller system that our largest bank were still trying and failing to build almost a full decade later.

Lately, we have begun to take it for granted that there is much to learn from Japan about software.

「Software state-of-the-art: Selected Papers」by Tom DeMarco and Timothy Lister (P.75)



Published in June 1990

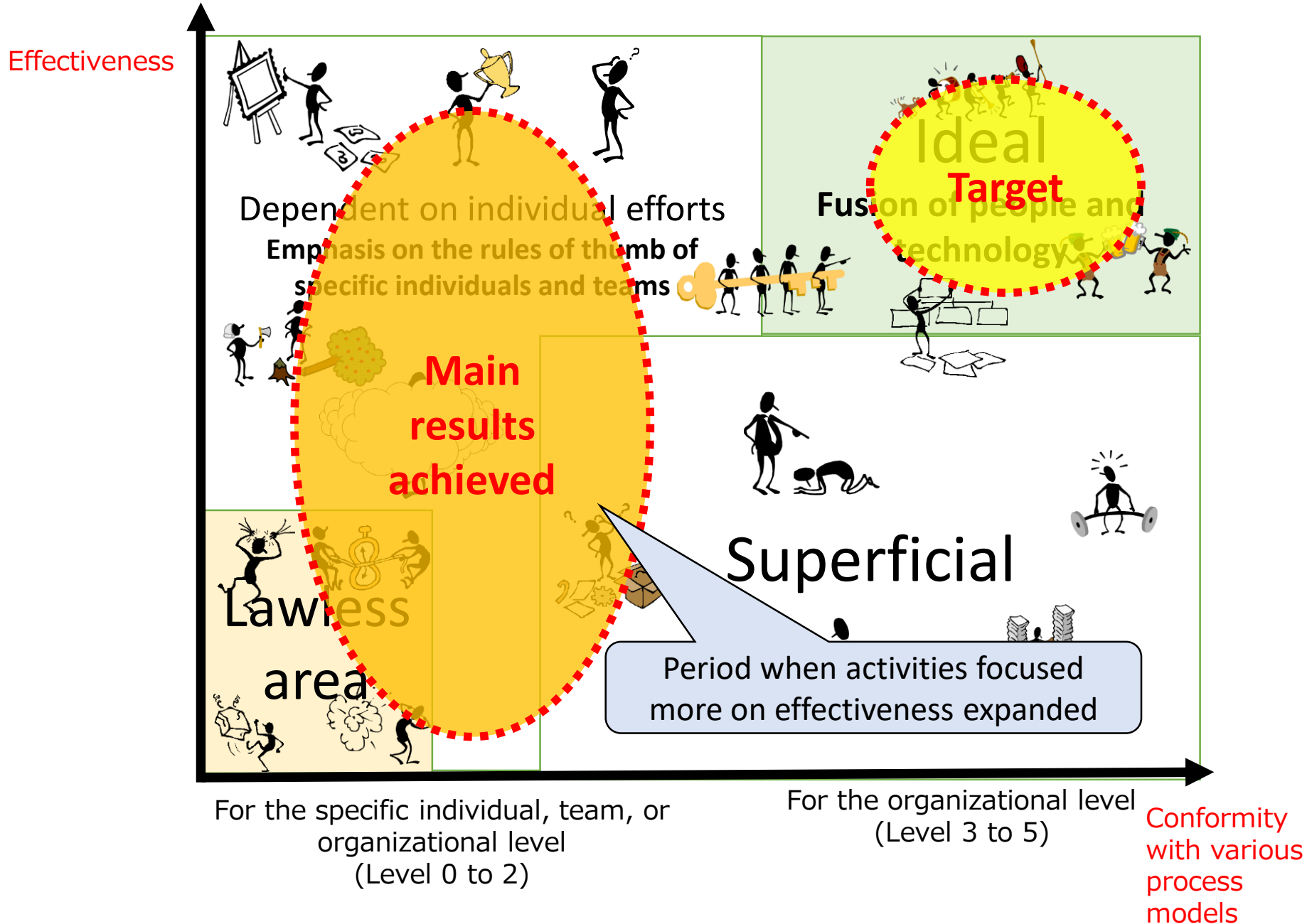
Phase1 : Analysis (2)

- Japanese Software Factory
 - Manufacturers such as Hitachi, NEC, Fujitsu, and Toshiba were famous as software factories in Japan.
- The software factory is a center for domain specific software in the manufacturers.
 - It is the center of competence of domain specific software development.
 - Engineers from different companies often work together as a team.
- The software factory was said to be the best.
 - Cusumano reported it was the most productive and matured organization in the world.

Phase1 : Analysis (3)

- For the Japanese Software Engineer
 - Good environment which can obtain the stable salary and can raise technology
- The software factory is the place of work as well as the place to learn the lessons.
 - Engineers are educated, trained and learning lessons as professionals in the organization.
 - Engineers are given a mission to challenge and work together as a team with different people.
- Japanese software engineers did not move.
 - Software engineers were hired, educated and promoted in their software factories.

Phase1 : Evaluation result



Phase2 : Analysis (1)

- Time has changed
- After 1990's, everything has changed
 - Business environment
 - Technologies
 - User community
- Difficult to keep up Japanese quality management based on Japanese culture

Phase2 : Analysis (2)

- What is Japanese Strength?
- “High Quality” is key to success
- No other countries can compete with Japanese in manufacturing precision
- Same with software development

The word “Ne-O-Da-Ma” was often used.
Windows spread at a stretch.

- We need not only precision, but good enough for customers

Phase2 : Analysis (3)

- Japan did not change

The quality of software was maintained at a certain level

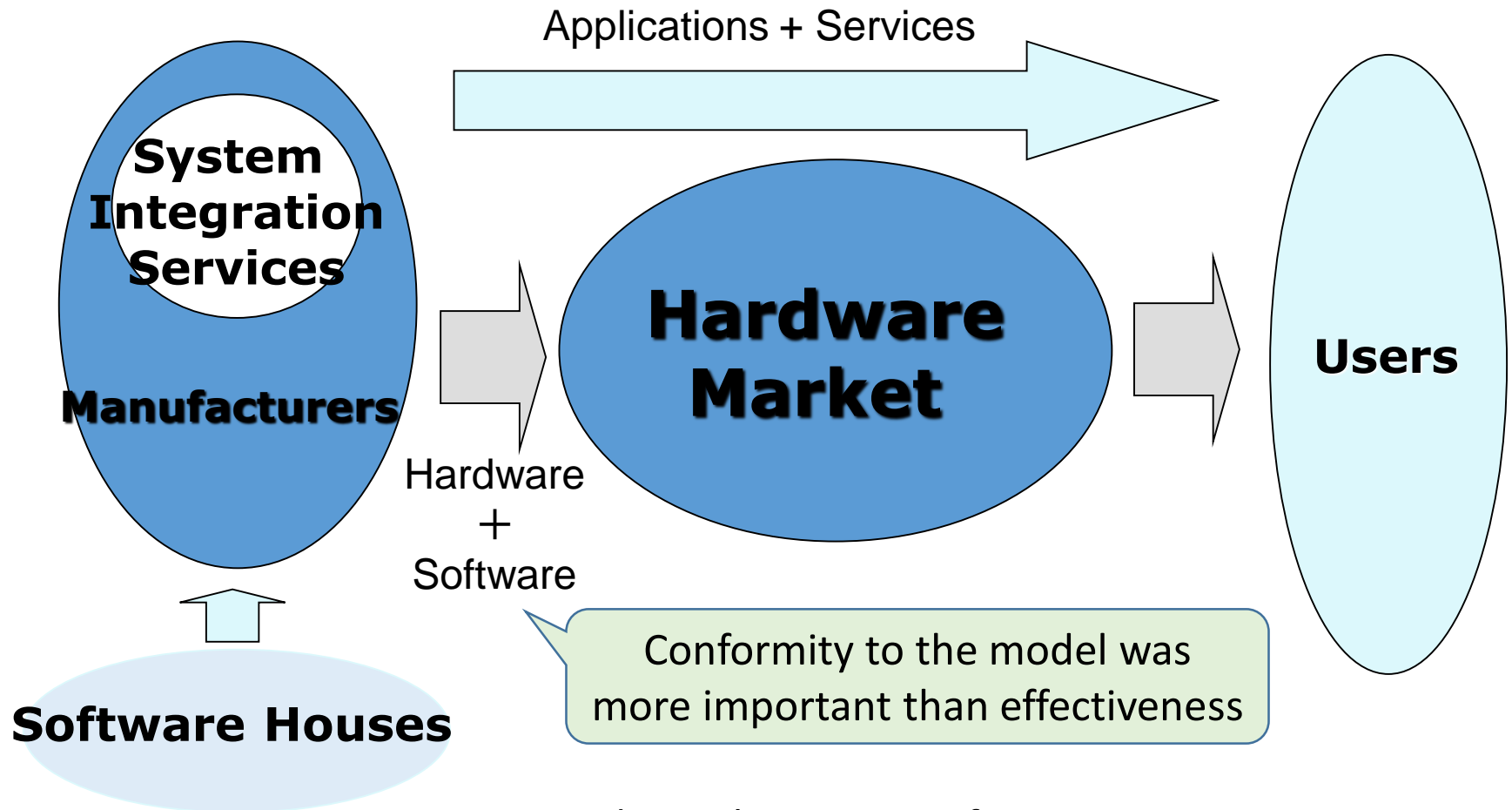
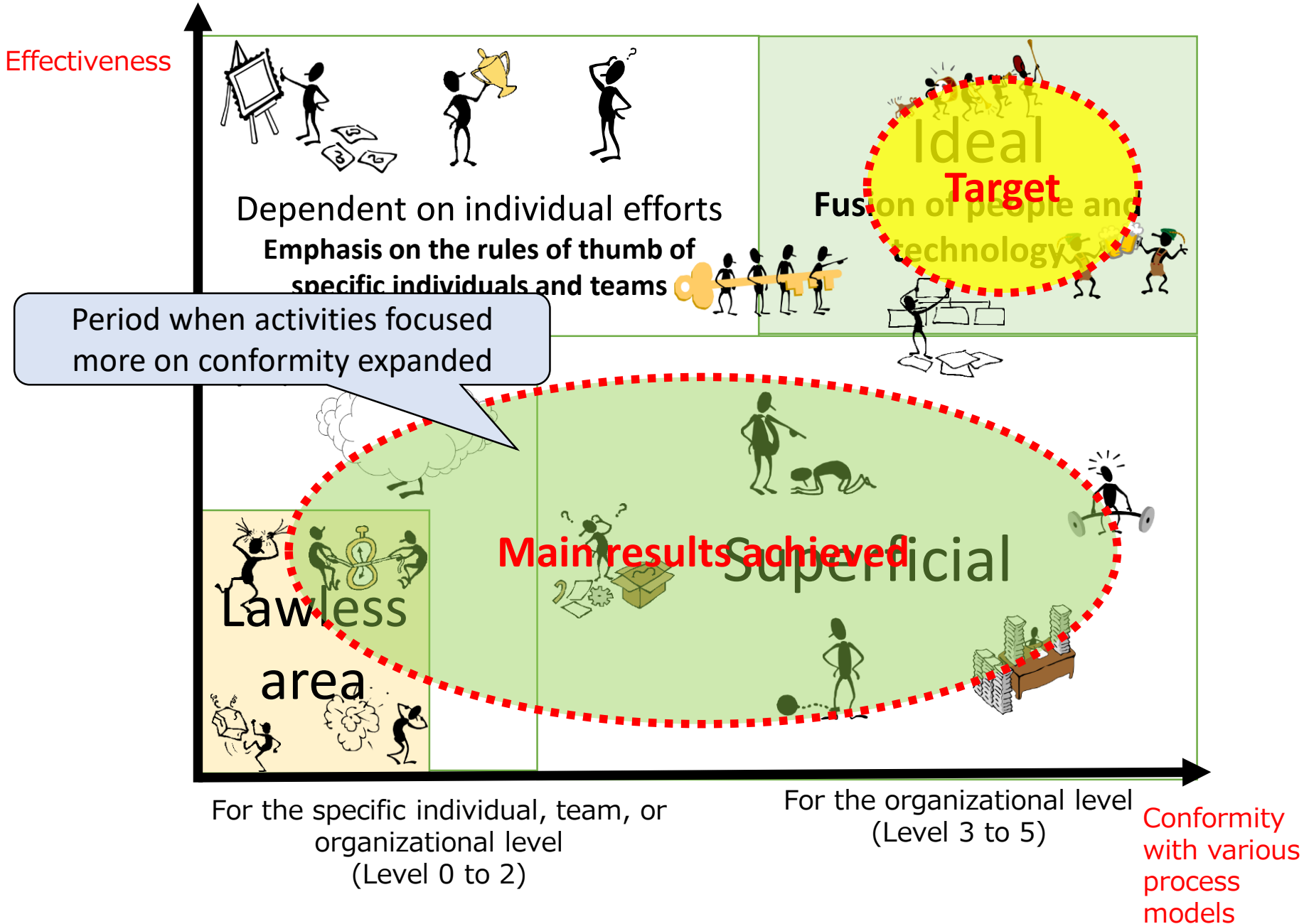


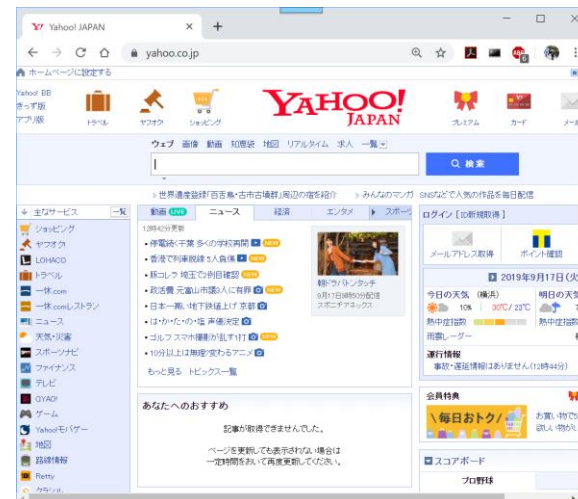
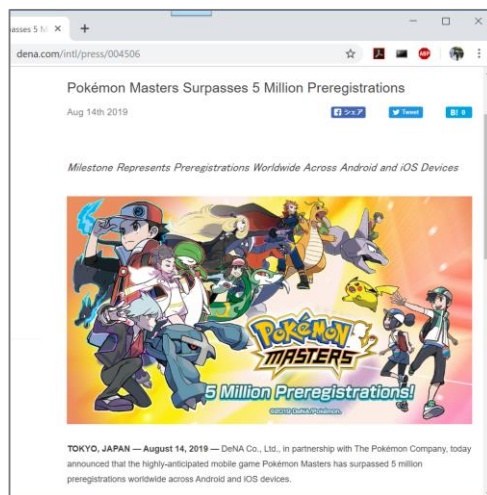
Fig. Industrial Structure of Japan

Phase2 : Evaluation result



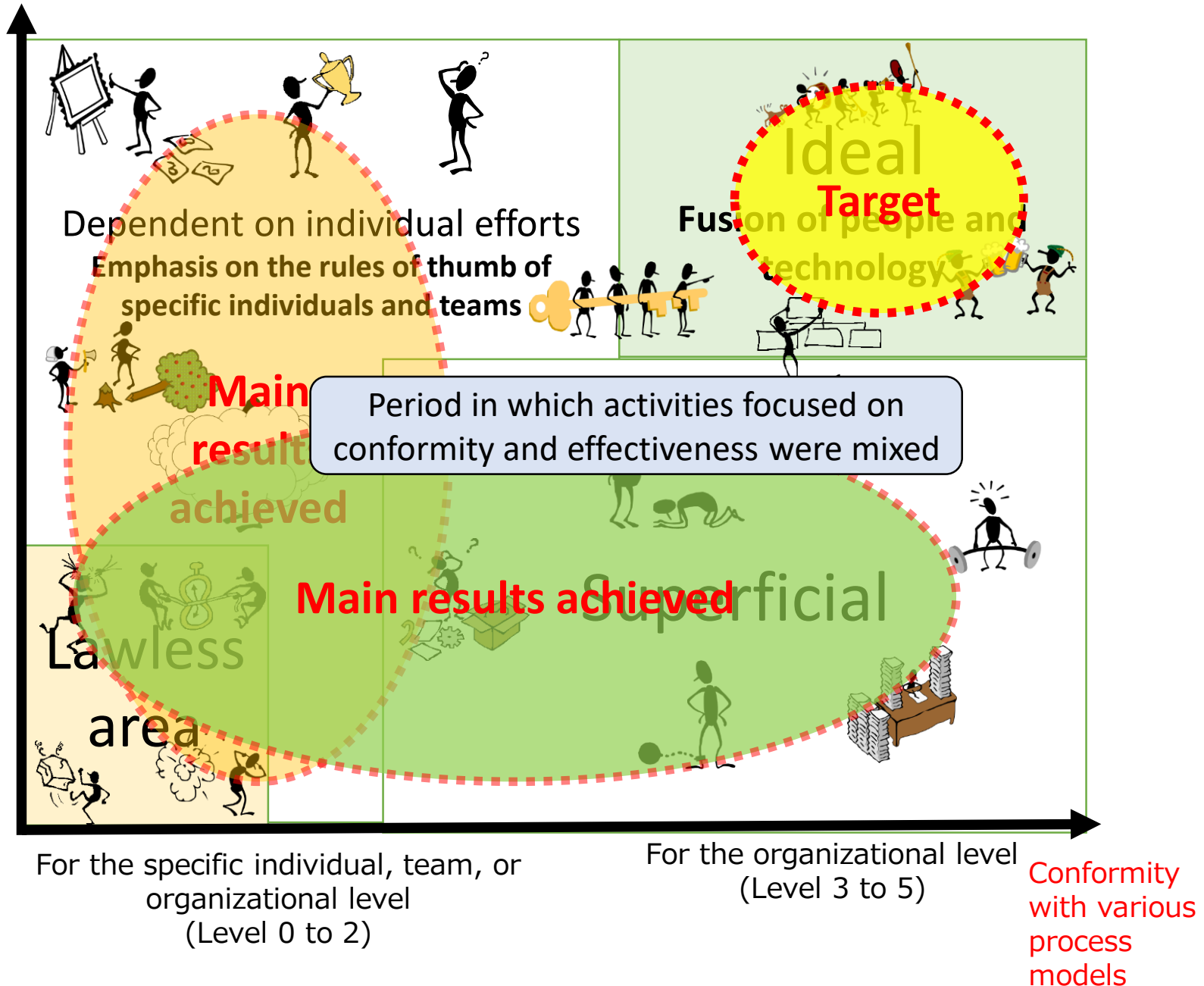
Phase3 : Analysis (1)

- One major characteristic of phase 3 is that organizations started returning to the QC/TQC problem-based improvement approach from model-based activities.
- On the other hand, the challenge to the process improvement activity is expanding in the enterprise which develops and manages **game** and **EC site** of which organization scale rapidly increases.



Phase3 : Evaluation results

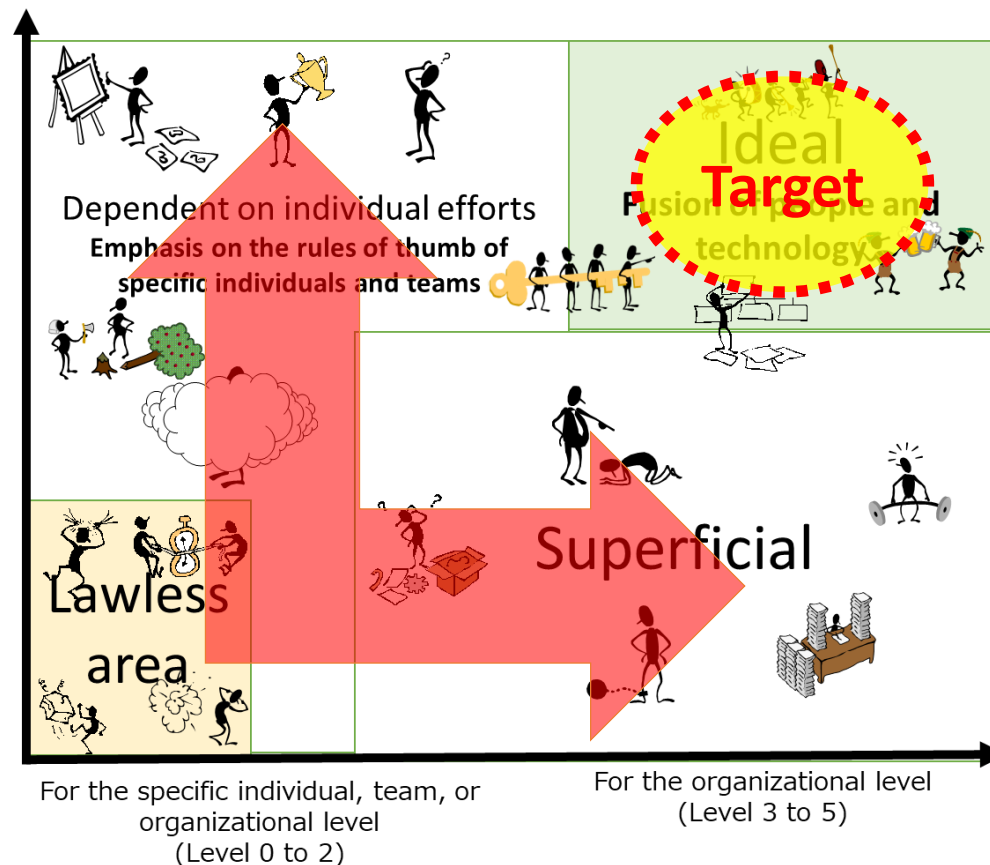
Effectiveness



Summary of evaluation results

When we look back on SPI's activities in Japan, we found that SPI activities focused on either effectiveness or conformity. At the result, many organizations were unable to reach targeted ideal state.

Effectiveness



**Conformity
with various
process models**

Common problems in process improvement

- (1) Alternatives that have not been resolved
 - After all, aren't we just going back and forth?
- (2) It became a mere formality (objectification of means)
 - There are many cases where the original purpose is lost and become mere formalities.
- (3) Loss of sense of purpose and switching objectives
 - The model is not for use but for achievement

Alternatives that have not been resolved

Top-down	↔	Bottom-up
Following internal norms, in-house activities	↔	Following external norms, external certification
Organizations	↔	Individuals
Model-based	↔	Issue and problem-based
Control, tightening	↔	Leaving things alone, freedom and autonomy
Technology	↔	People
Conformity, formalization	↔	Goal achievement, flexibility
Quality	↔	Costs, periods

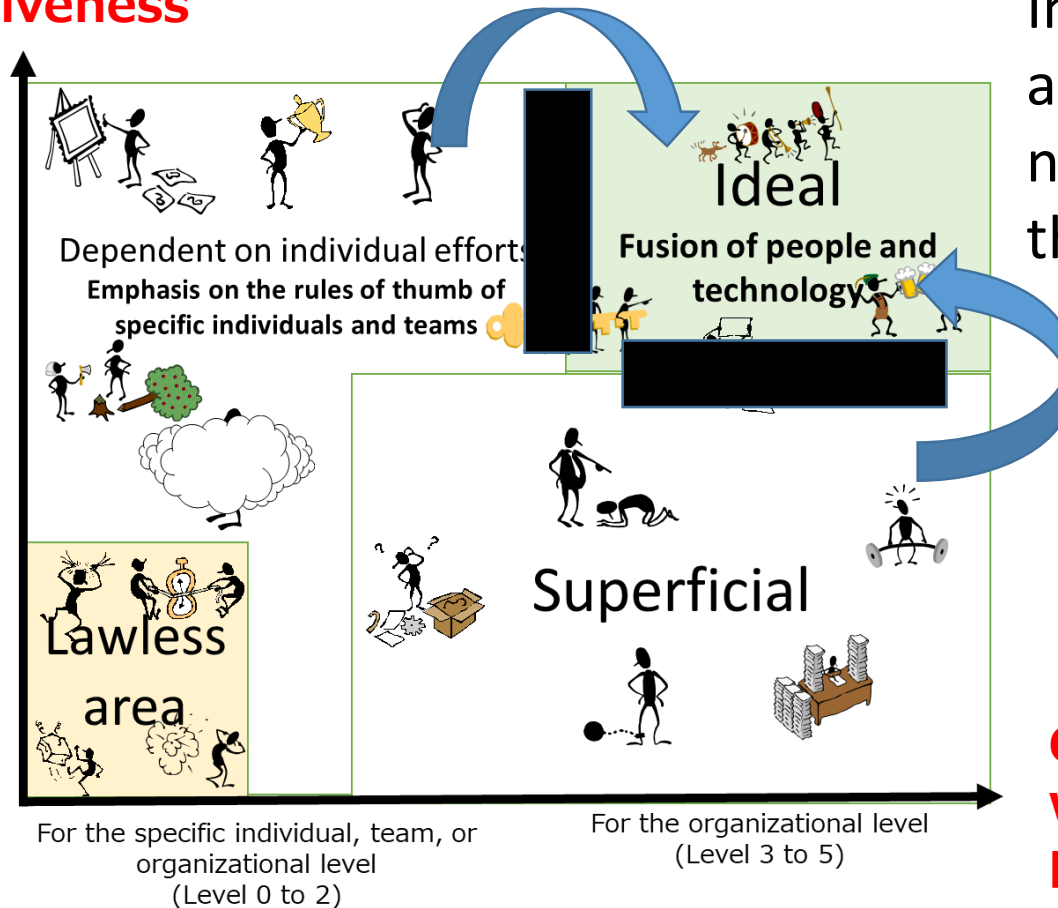
Future SPI will need to resolve these alternatives

7. Future SPI in Japan

There are 2 barriers which to block reaching this ideal state.

In order to improve SPI activities in Japan, we need to overcome these barriers.

Effectiveness



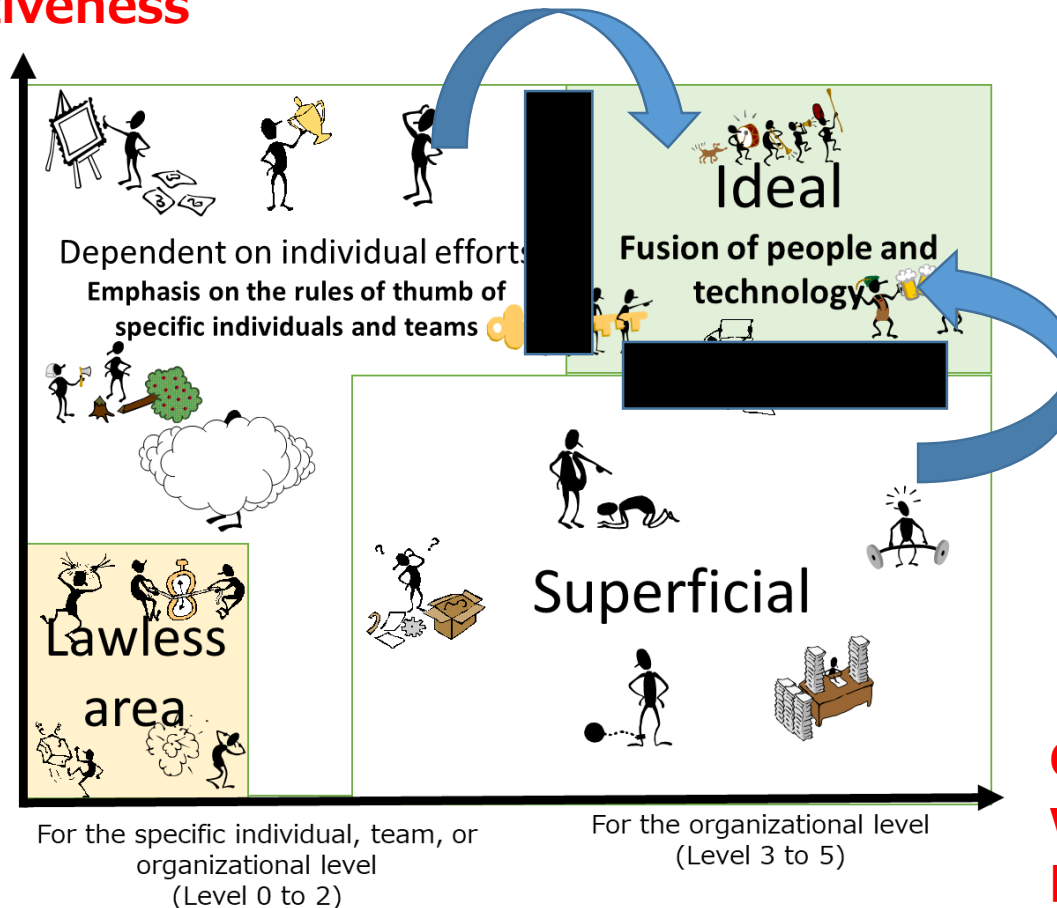
Conformity with various process models

To overcome barrier

- Concept of optimizing the whole
- Technologies for organizational deployment

System thinking

Effectiveness



Increase motivation

Put technology into practice

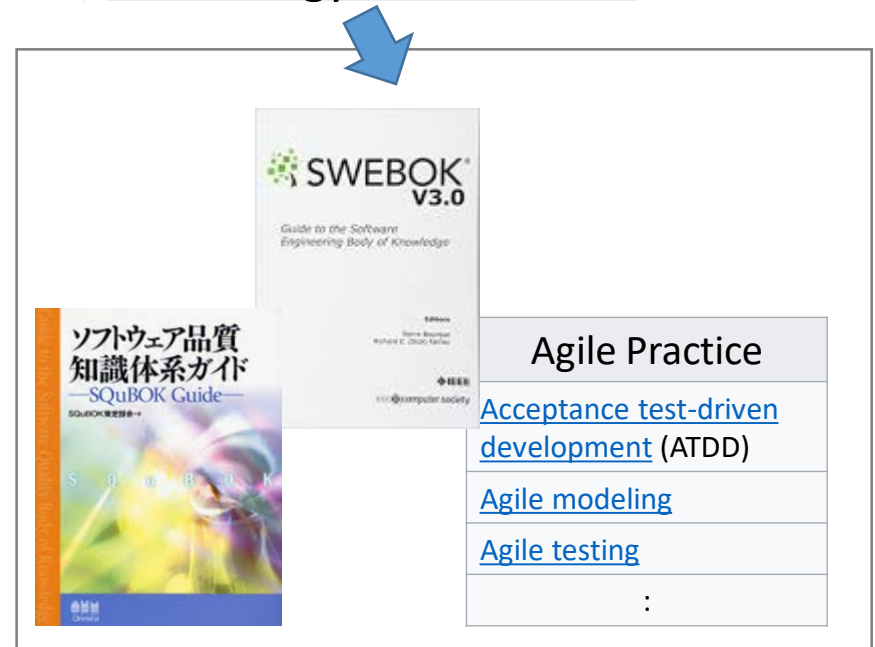
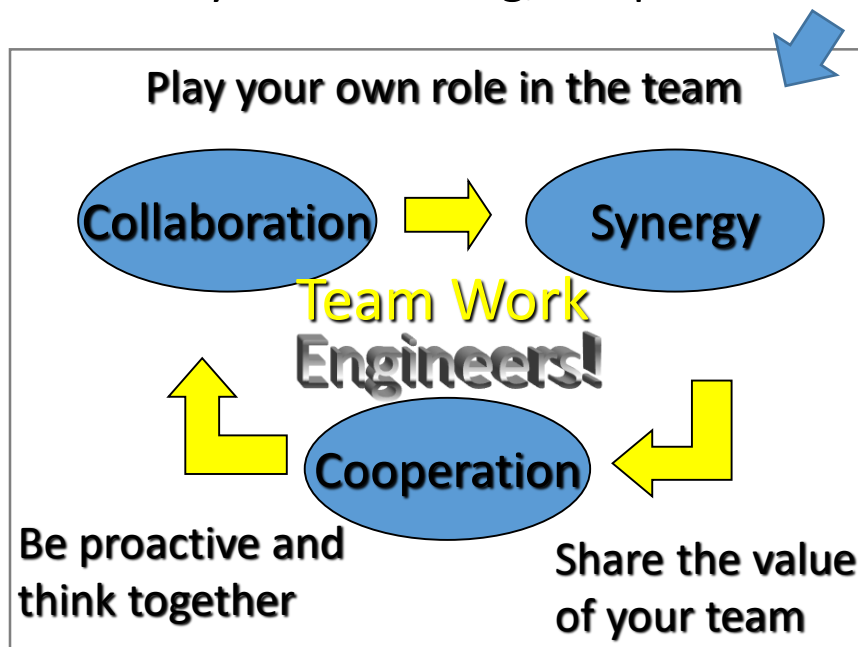
Technology-Centered

Conformity with various process models

To solve common problems

(1) Alternatives that have not been resolved

- We need to overcome the barriers.
- Chose an appropriate approach based on the status of SPI activities
 - System thinking, People-centered SPI, Technology-centered SPI



(2) It became a mere formality (objectification of means)

(3) Loss of sense of purpose and switching objectives

- The answer to these old and new problems is actually at our feet.

SPI MANIFESTO

VALUES

We truly believe that SPI

A | People | **Must involve people actively and affect their daily activities**

NOT to show-off or be focused on management alone



B | Business | **Is what you do to make business successful**

NOT to live to deploy a standard, reach a maturity level, or obtain a certificate



C | Change | **Is inherently linked with change**

NOT continuing as we do today

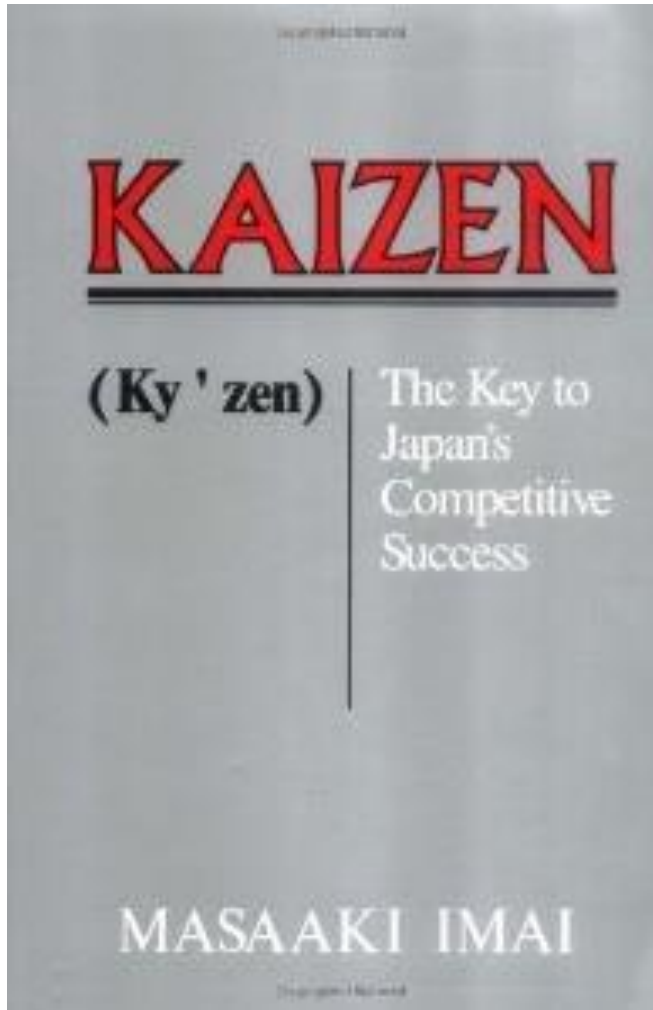


Thank you!
Arigatoo

Supplementary materials

- KAIZEN
- Problem Solving Capability
- An Example: “SWQC” in NEC
- Process Approach: Process Network Diagram
- The role of JUSE
- Japanese Software Market
- Software Market in the World
- The Age of Open Source
- Japanese Quality Control
- The Discipline: Working as a Team
- Collaboration and Synergy
- XDDP
- SQuBOK
- SPI framework
- Toshiba’s SPI framework

“Kaizen”: Continuous Improvement (1)



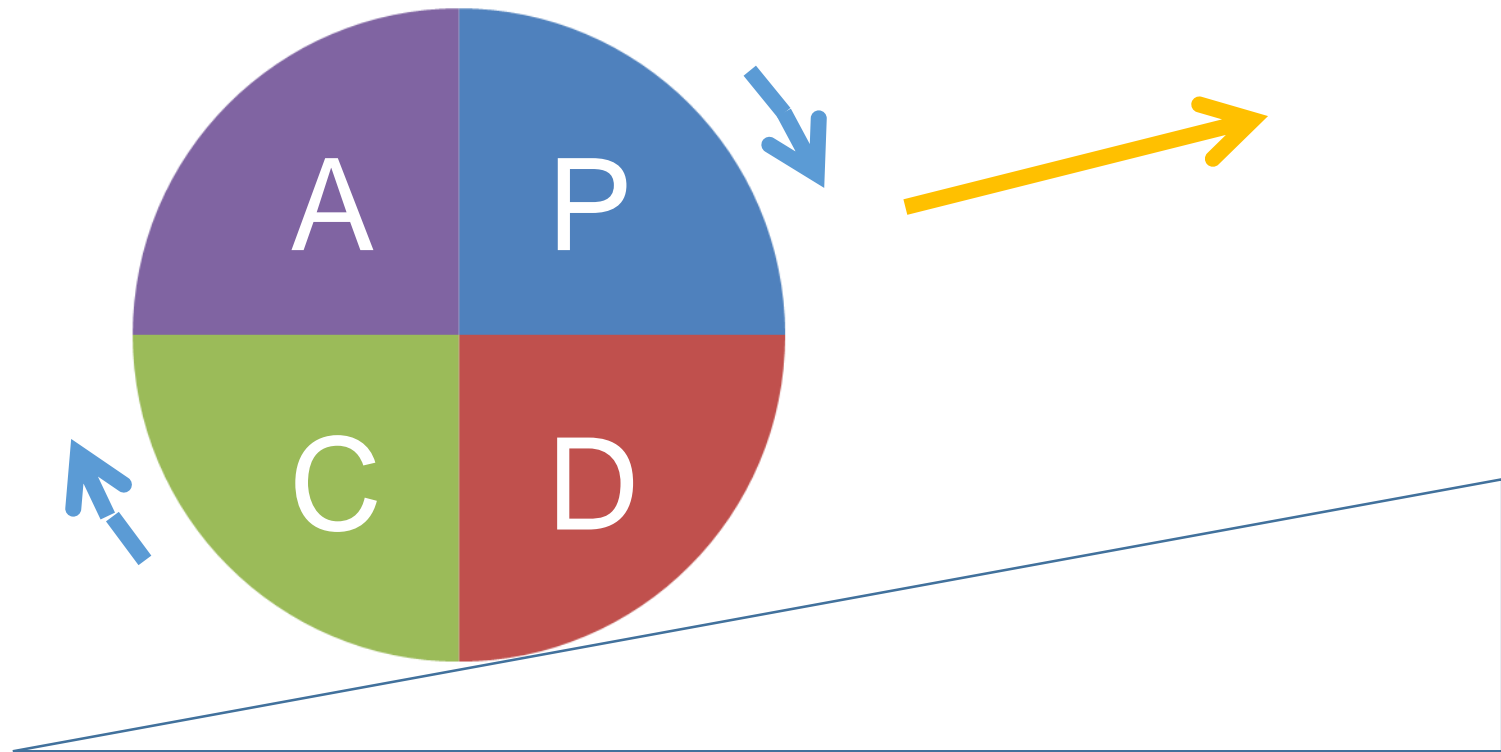
Kaizen: The Key To Japan's Competitive Success

Book written by Masaaki Imai in 1986

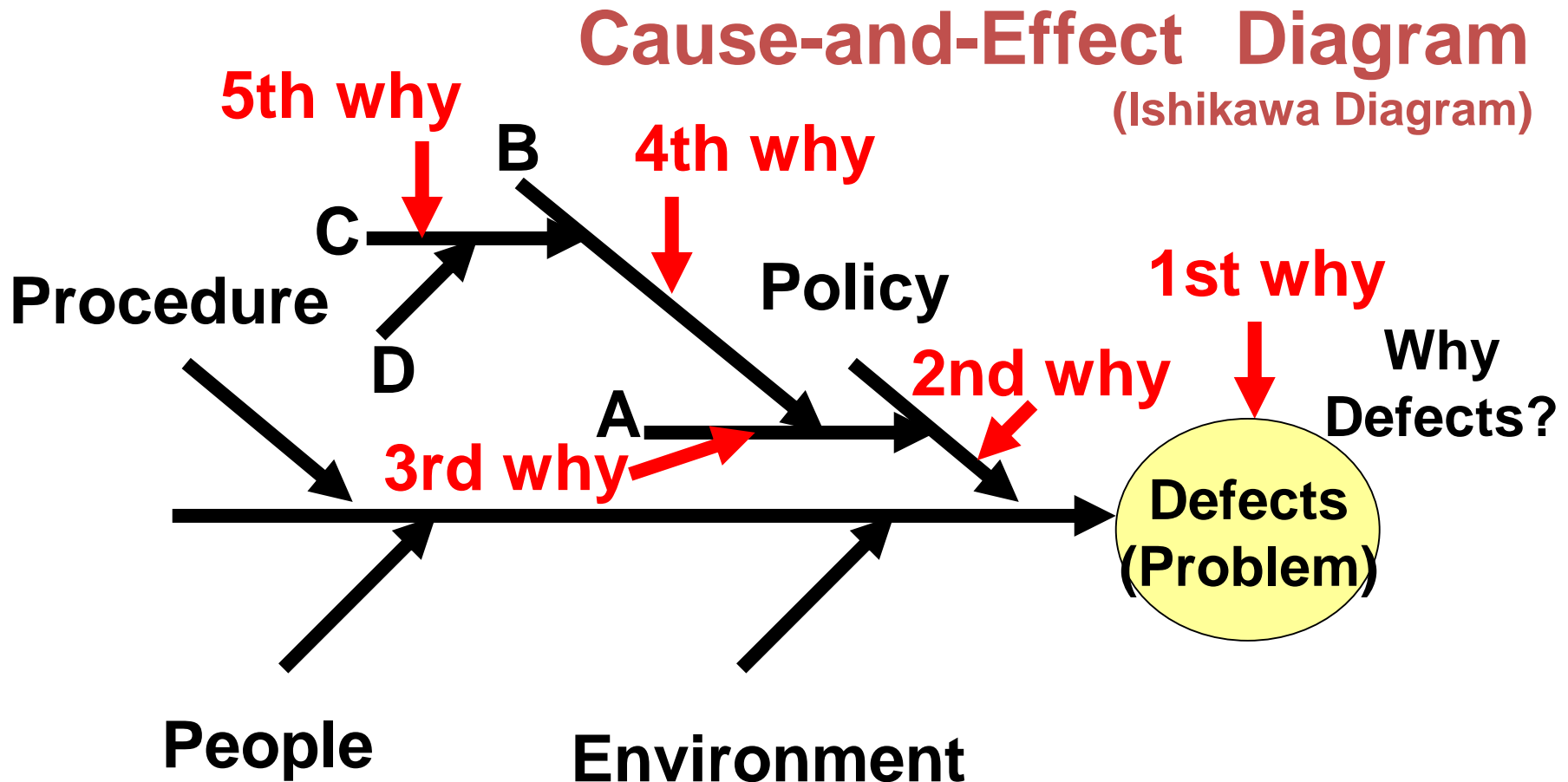
“Kaizen”: Continuous Improvement (2)

Rolling of PDCA cycle:

(Plan – Do – Check – Act)



Problem Solving Capability



Source: A New American TQM, Shoji Shiba, et al, 1993

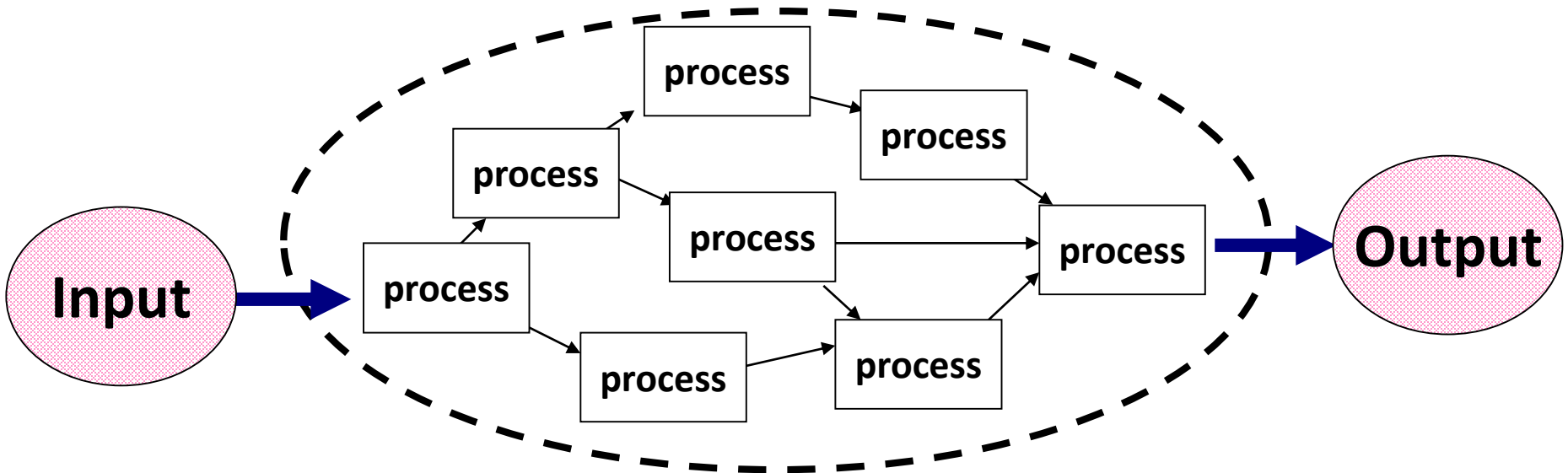
An Example: “SWQC” in NEC



- NEC launched a company-wide software quality improvement activities called “SWQC” in 1981.
- TQM concept and methods already developed in the company was applied to the software business domain.
- Case studies and practices of the SWQC were published in 1990.

Process Approach: Process Network Diagram

- A set of tasks that, when properly performed, produces the desired result.



System view with Process Network clarifies:

- Responsibility and right (Scope & relations of activity)
- Input specification (entry criteria)
- Resource and Technology (process parameter)
- Release (exit criteria)

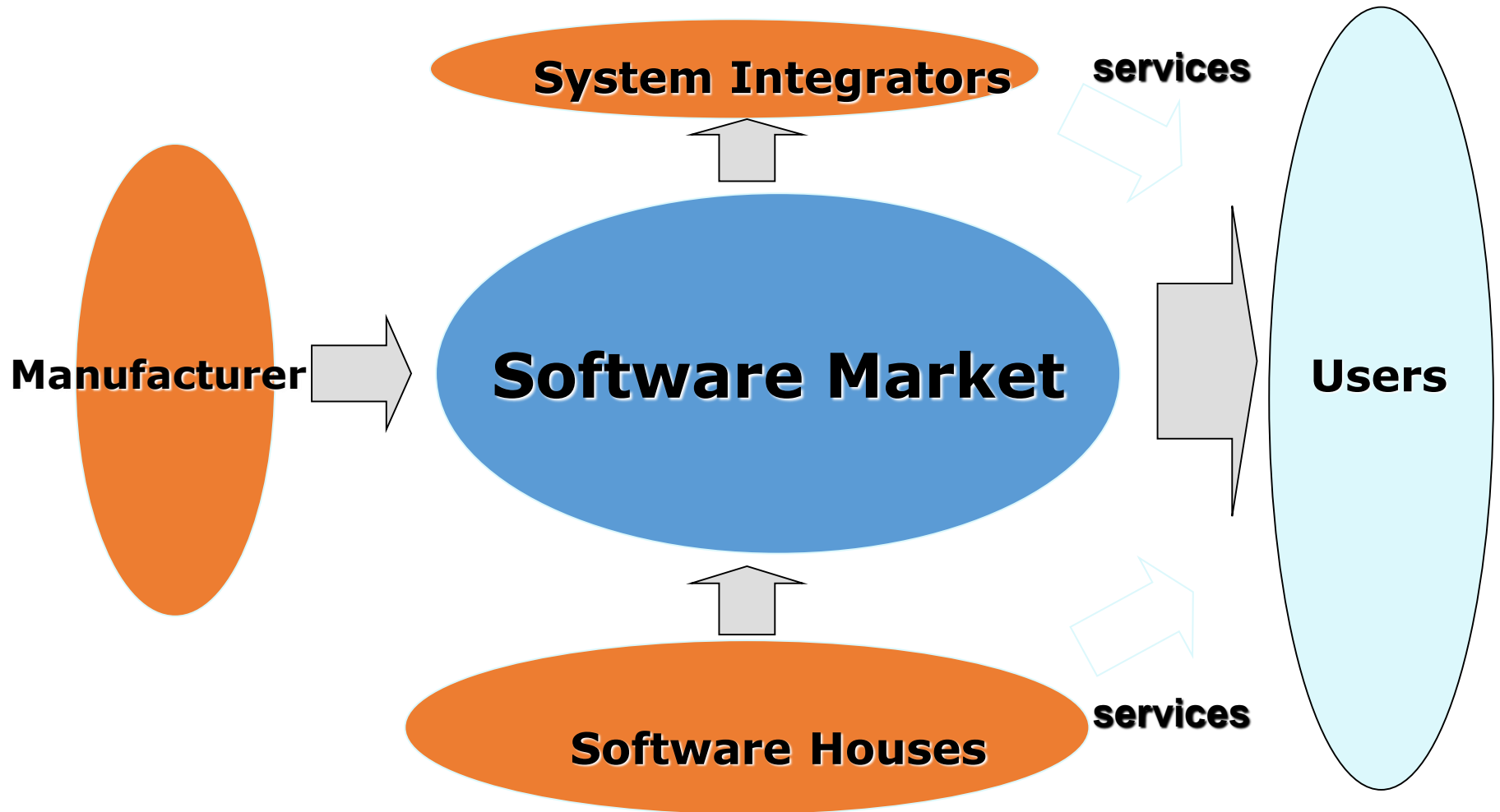
The role of JUSE

- JUSE (Union of Japanese Scientists and Engineers) has served for the engineers as a mechanism to exchange experiences and lessons learned since 1946.
 - Engineers can exchange their experiences and lessons learned through the organization.
 - The concept of “Quality Control” is the first thing that they have to learn.
- The SPC (Software Production Control) study group was formed in 1980.
 - The SPC group of JUSE was established to promote engineers of software factories to study and apply the TQM method to software.

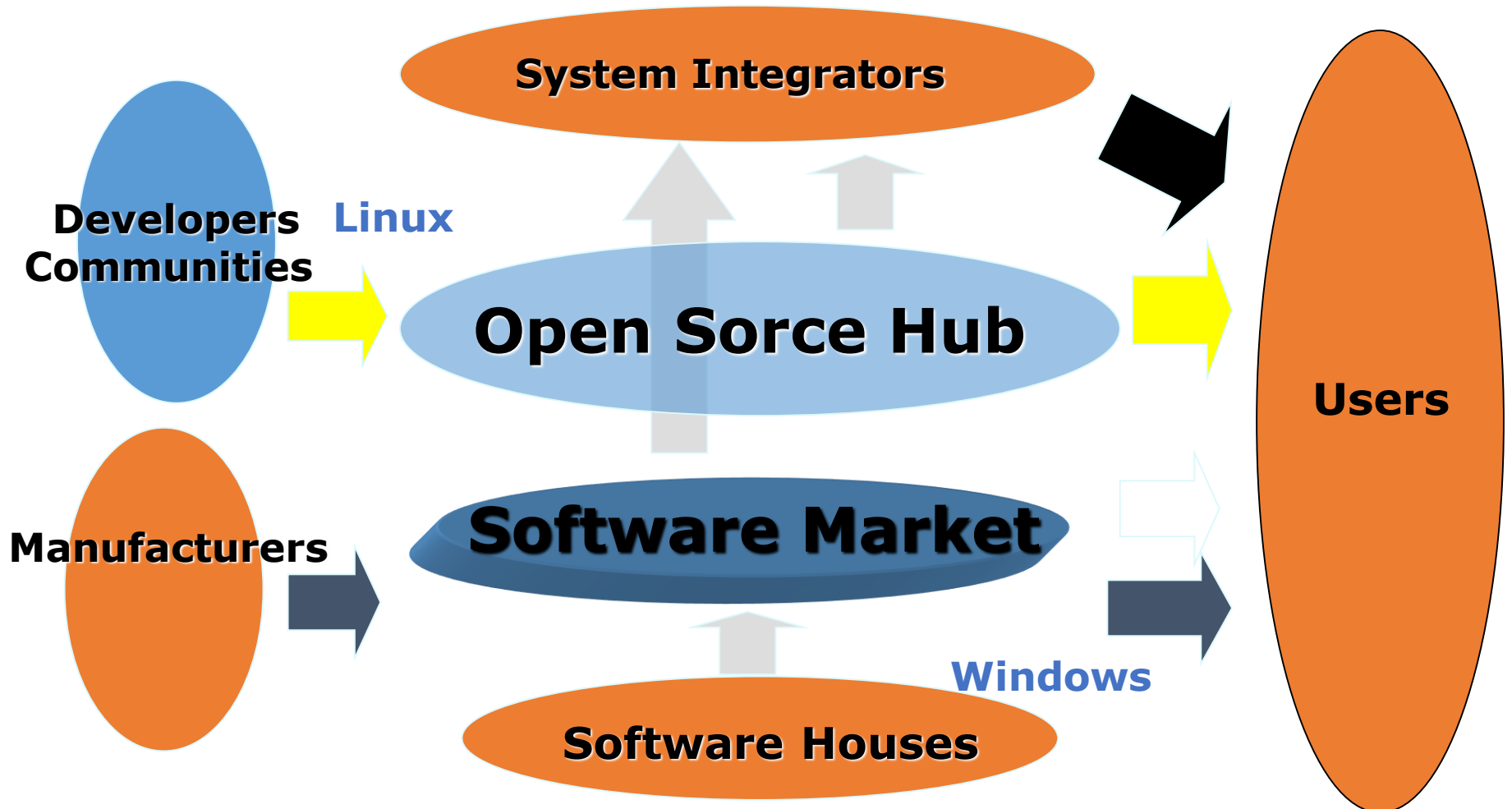
Japanese Software Market

- Manufacturers have dominated the market.
 - Computer manufacturers provide hardware, software and related services.
 - The major system integrators are mostly the computer manufacturers, except for NTT.
 - Software houses mostly provide software development services under the manufacturers.
- Users are still immature.
 - Users rely on the computer manufacturers' and system integrators' proposals.

Software Market in the World



The Age of Open Source



Japanese Quality Control History(1)

- 1960's – 1980's: Japanese economical growth was a miracle.
- Quality of manufacturing was best in the world
- “Made in Japan” meant “High Quality”
- The driving force of growth was Japanese-style management:
 - Lifetime employment and seniority
 - TQC

Japanese Quality Control History (2)

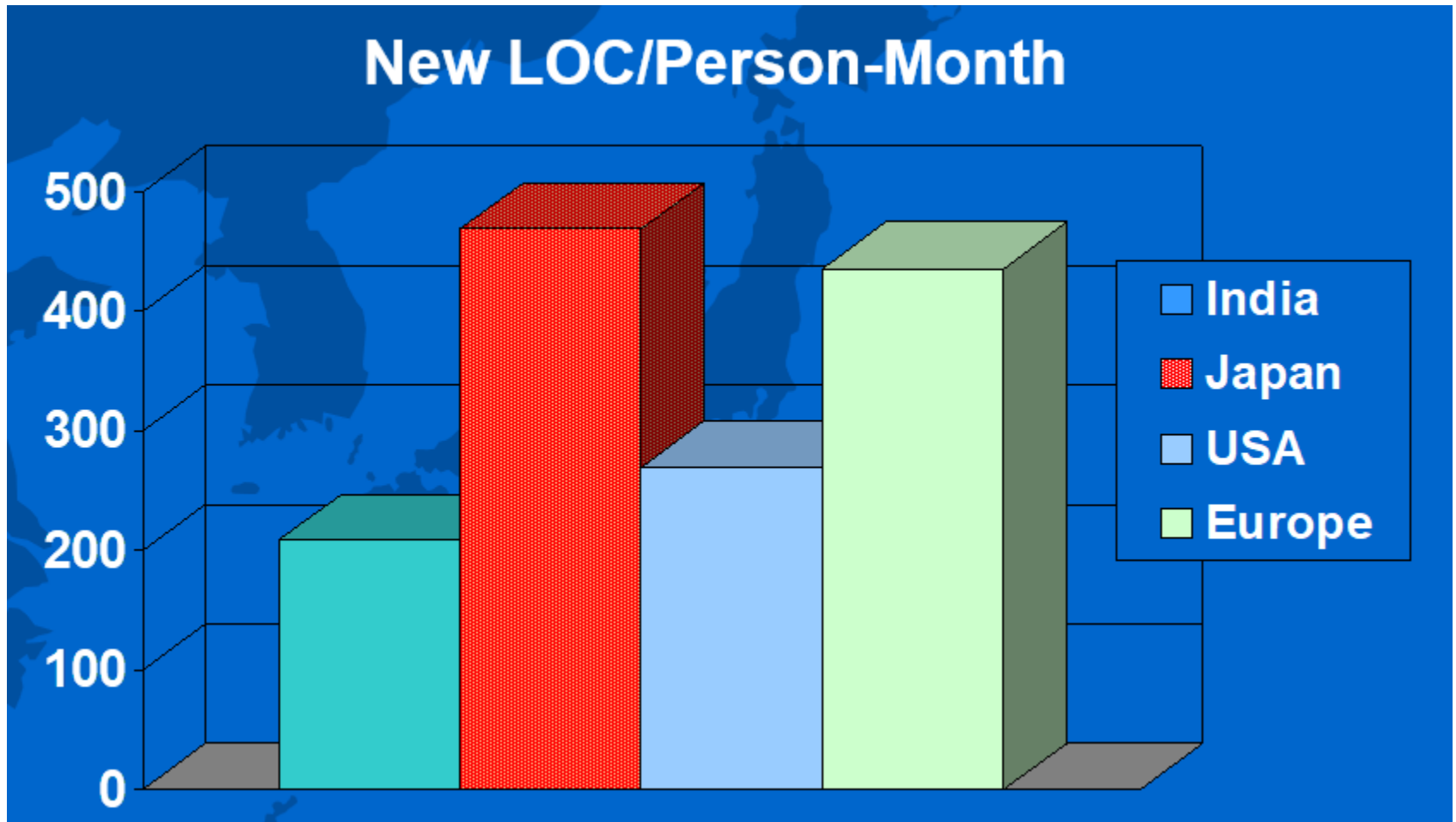
- Statistical Quality Control (SQC)
- → Total Quality Control (TQC)
- → Total Quality Management (TQM)
- QC group activities
 - Zero Defect
 - QC Circle

Japanese Quality Control History (3)

- 1980, SPC committee of JUSE
 - Applied TQC to software development
- Powerful approach to software quality control
- Influenced to CMM developed by Dr. Humphrey

Japanese Quality Control

Productivity of software Development



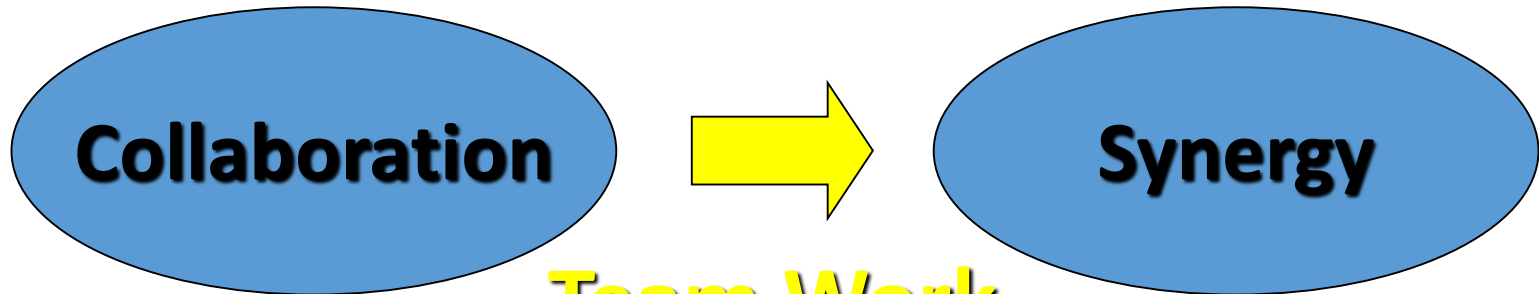
M. Cusumano, Software Development Worldwide : The State of Practice,
IEEE Software, Vo. 20 No.6, 2003

The Discipline: Working as a Team

- Think and act as if you were another member.
 - Observe the people around you.
 - Imagine the difficulties that others are facing.
 - Be proactive and cooperate with your colleagues.
 - Do not be late to act until a problem prevails.
- Learn from your colleagues and teach other team members: collaboration and synergy.
 - Teach your colleagues what you can teach; you are the mentor of your team.
 - Learn from your colleagues; they are your mentors.

Collaboration and Synergy

Play your own role in the team



Engineers!

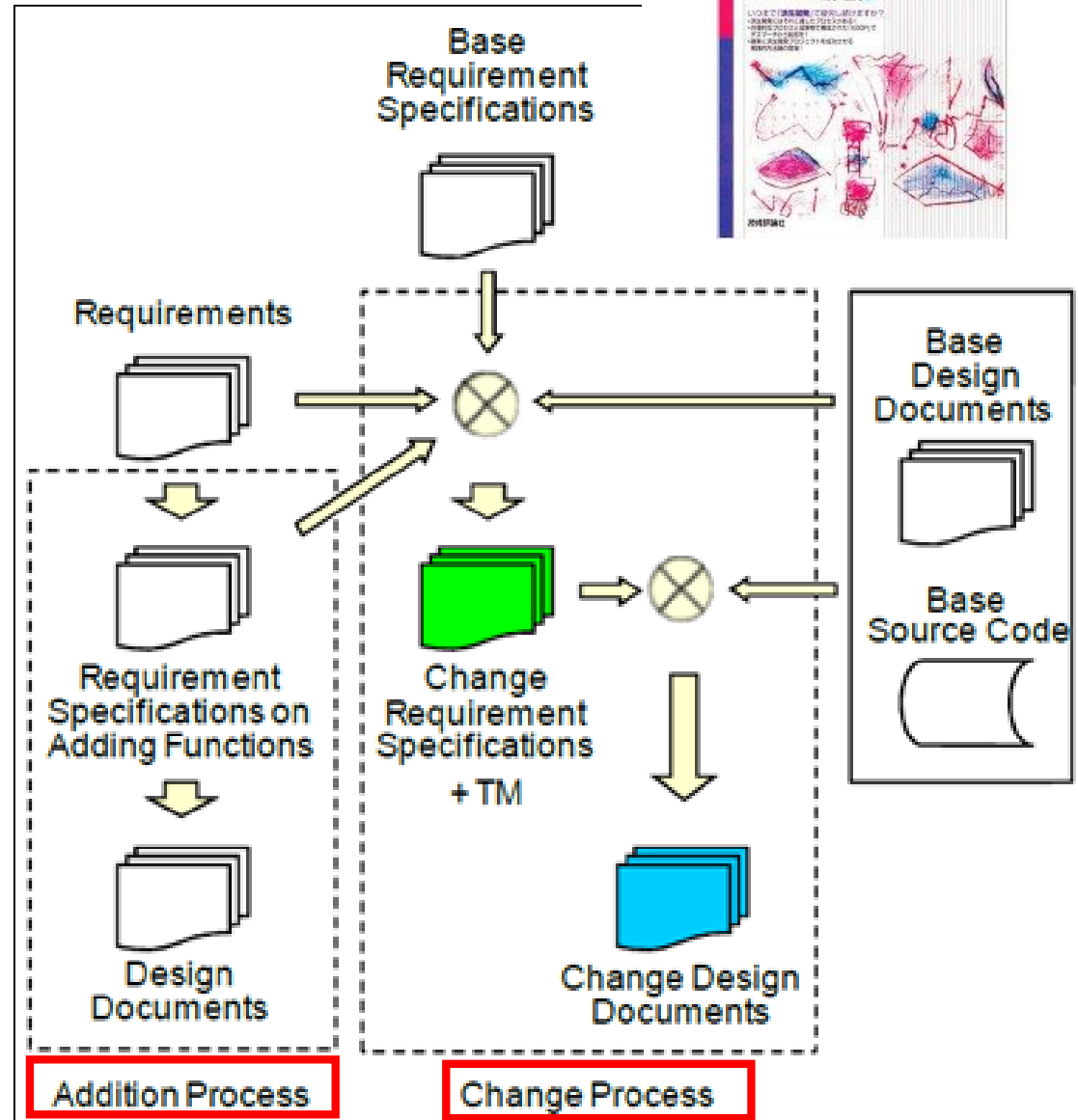


**Be proactive and
think together**

**Share the value
of your team**

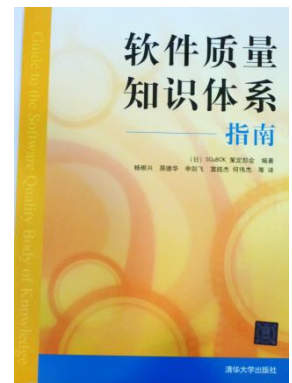
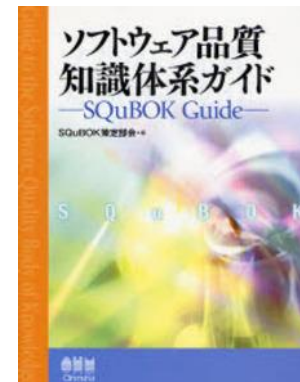
XDDP

- XDDP, developed by a Japanese consultant, Yoshio Shimizu in 2007, is an enhancement-based development process.
- XDDP consists of two independent processes to make the documents easily; one is for adding functions “addition process” and the other is for changing base source code “change process”.

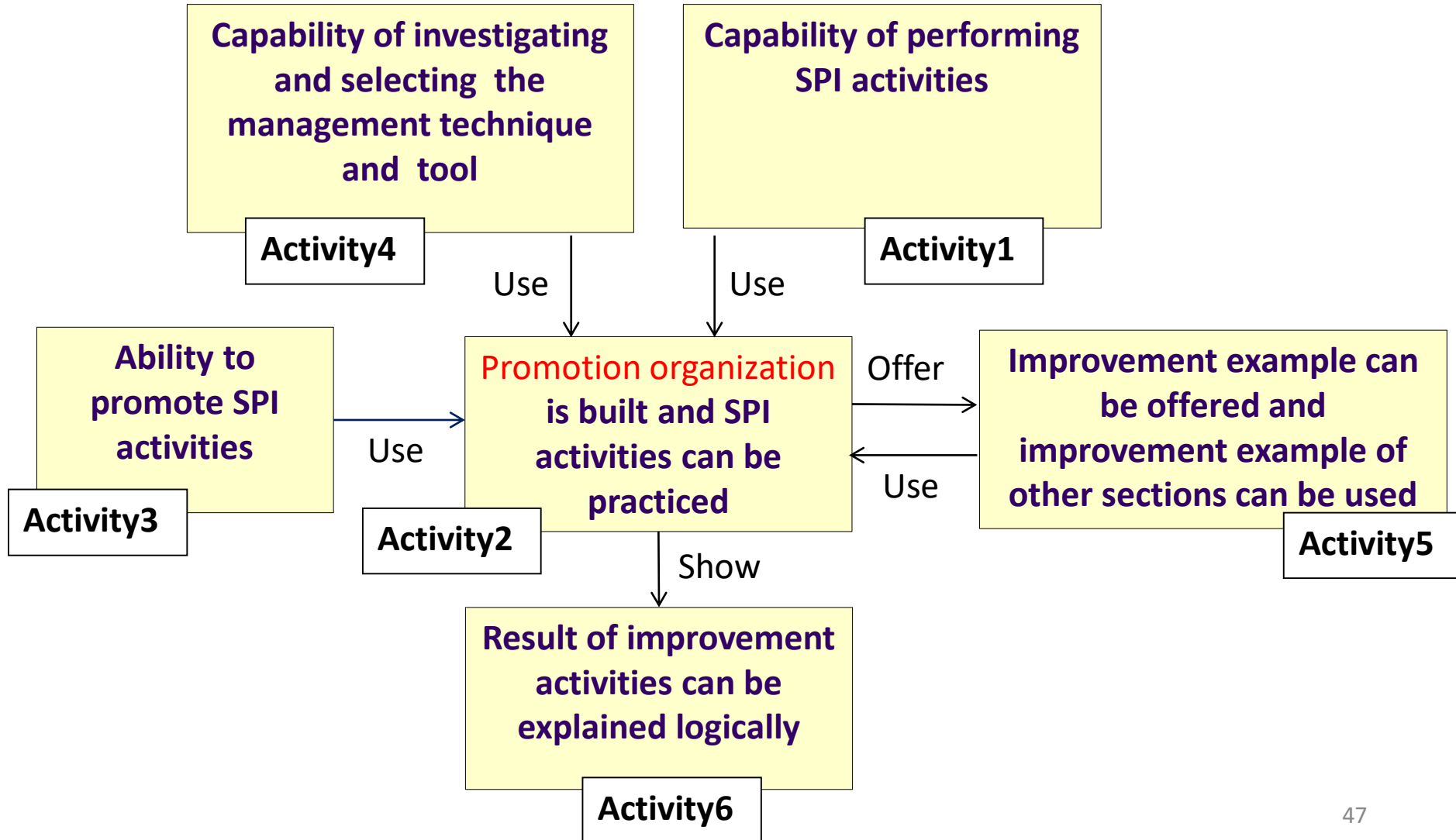


SQuBOK®

- SQuBOK® = Software Quality Body of Knowledge
 - A systematic collection of practical knowledge on software quality and software process improvement accumulated in software industries both in Japan and worldwide.
 - It includes some quality management tips which have been applied in leading IT companies in Japan and have not been published ever before.
- Publications
 - So far, 8,000 books sold.
 - Chinese version was published 3 years ago.
 - English translation (in progress)



SPI framework



Toshiba's SPI framework

