



Japan-Oriented: Creative Monozukuri with **TRIZ**

Sep. 9, 2010

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The images selected from NASA image gallery.

Agenda:

1. Motivation

- Questions on Japanese Strong Monozukuri

2. Another example on the questions

3. Utilize TRIZ to make Monozukuri stronger

“Monozukuri” is usually translated into “production” or “manufacturing”, because “mono” means “goods” and “zukuri” means “production”. But it has broader and comprehensive meaning, including development, manufacturing, procurement, service and other efforts. It is truly Japan-oriented word, which means artistic efforts to create and produce goods by Japanese.

1. Motivation

← Questions on Japanese Strong Monozukuri

The Japanese products
made through strong monozukuri

However, they have some problems currently, such as:

High Quality

→ Recall problems by major automobile manufacturers
Conflict between quality and delivery date of products

Lower Cost

→ Excessive functions with mobile phones, to make Japanese manufacturers isolated from global market

Excellent technologies have produced many products, but are not enough to compete in the global market.



Why?

Japanese manufacturers have advantages with technologies, but are losing businesses.



Kenichiro Senoh, Diamond, 2009

the title means

計画的に創られるイノベーションの競争モデル
インテル・インサイド型 アップル・アウトサイド型
勝利の方程式を解き明かす
技術だけで勝つ時代ではない

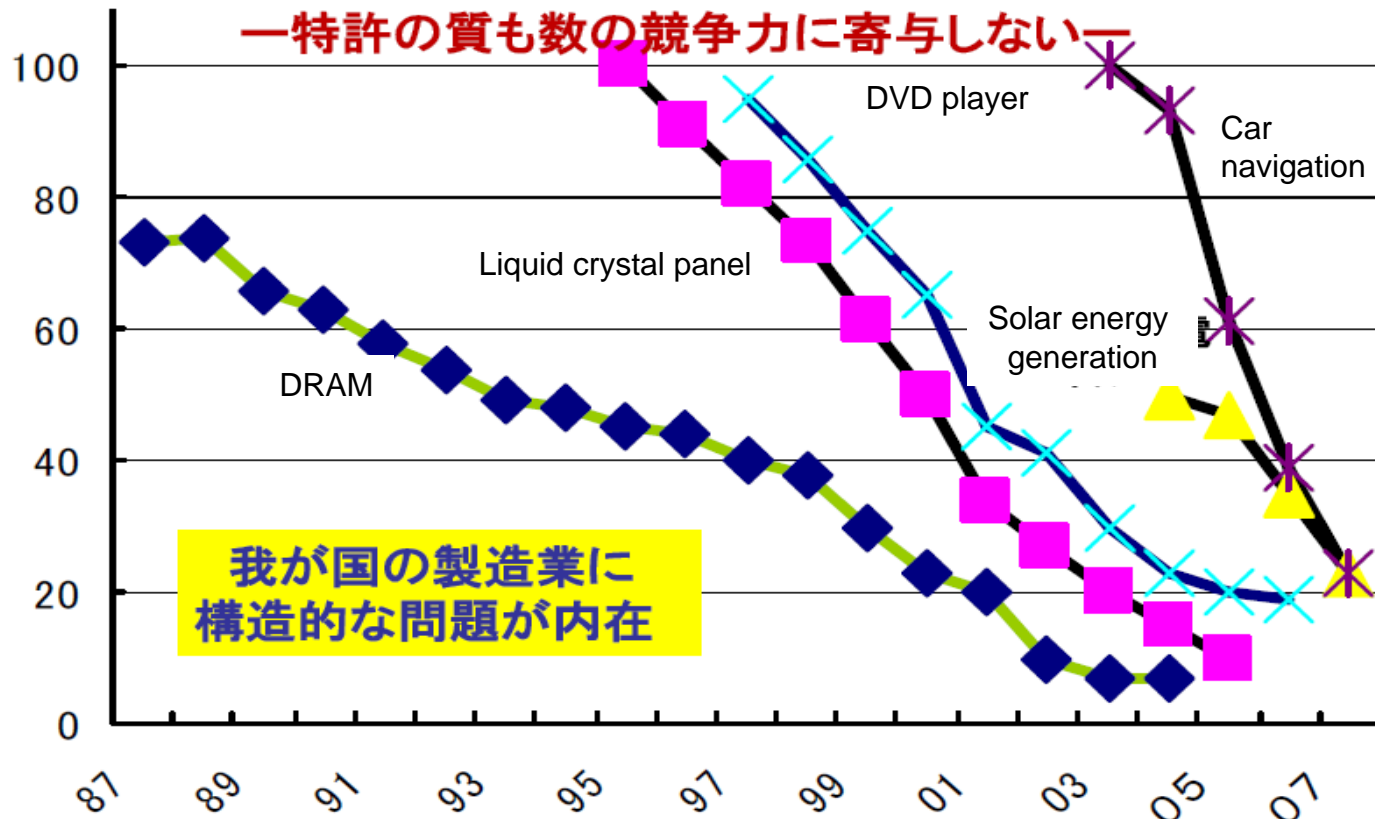
三位一体経営
• 事業戦略
• 研究開発戦略
• 知財戦略
} **連動する経営**

Technologies are advanced, but businesses run down rapidly

source:

<http://www.kantei.go.jp/jp/singi/titeki2/tyousakai/kyousouryoku/dai3/siryous3.pdf>

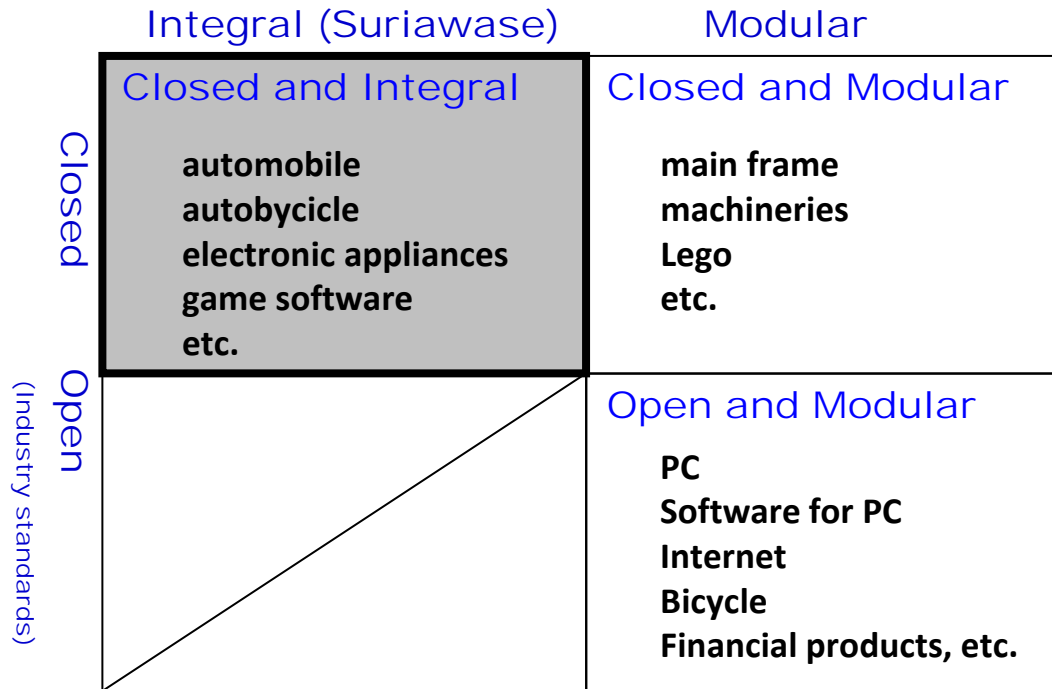
At the growing stage of the following products in the global market, Japanese manufacturers withdraw from it.



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We believe Japanese monozukuri is very strong,
but

Basic types of monozukuri architecture are:



Electronic vehicle:
•parts will decrease drastically
•Integral efforts will not be needed



source: 「日本のものづくり哲学」 Takahiro Fujimoto,
Nihon Keizai Shinbunsha, 2004, p.132

Suriawase approach should be applied to make software



Software is essential parts
of monozukuri today and tomorrow



日機連21標準化－4

平成21年度
擦り合わせ型指向による組込みシステム開発
のプロジェクトマネジメント基盤の調査研究報告書

平成22年3月

社団法人 日本機械工業連合会
特定非営利活動法人 日本プロジェクトマネジメント協会



この事業は、競輪の補助金を受けて実施したものです。
<http://ringring-keirin.jp/>



**The title is “Research report on the
infrastructure of project
management for embedded
software development through
suriawase approach”**

source:

http://www.jmf.or.jp/japanese/houkokus-ho/kensaku/2010/21hyojun_04.html

Suriawase can make it stronger to make software?

- *Require new features*
- *Differentiate products*



*Realize them with software
at lower cost and in shorter time*

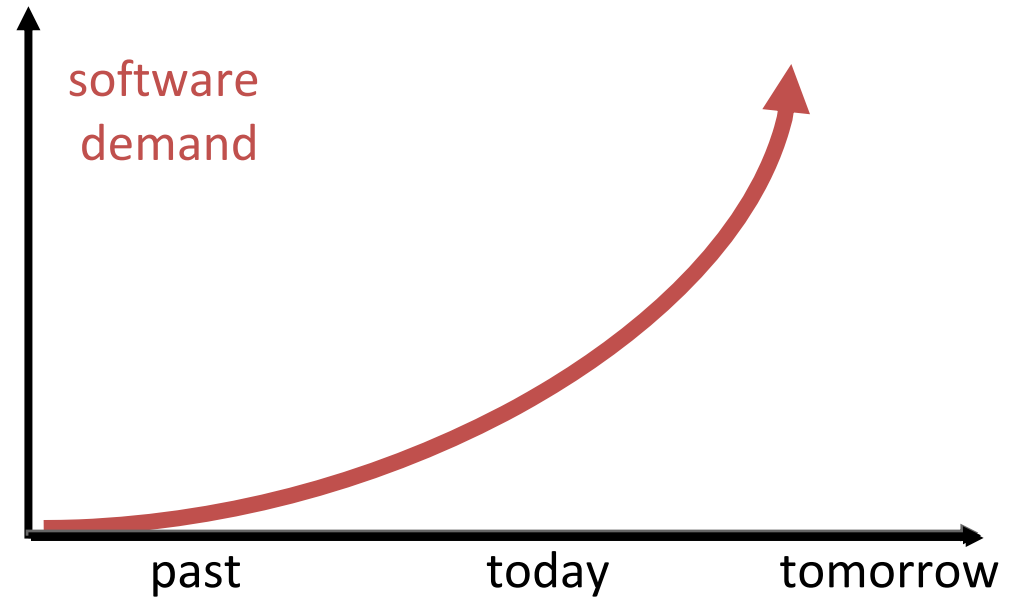


*To produce any products,
software are essential.*



*High demand to develop software
causes larger and more complicated
software.*

*Software monozukuri has been harder.
But software is essential.*



What large-scaled and complicated software causes in consequence?

Per capita productivity of software engineers decrease drastically !



- ***Increase development cost***
- ***Increase ad hoc measures***
- ***No time to develop new ideas and products***



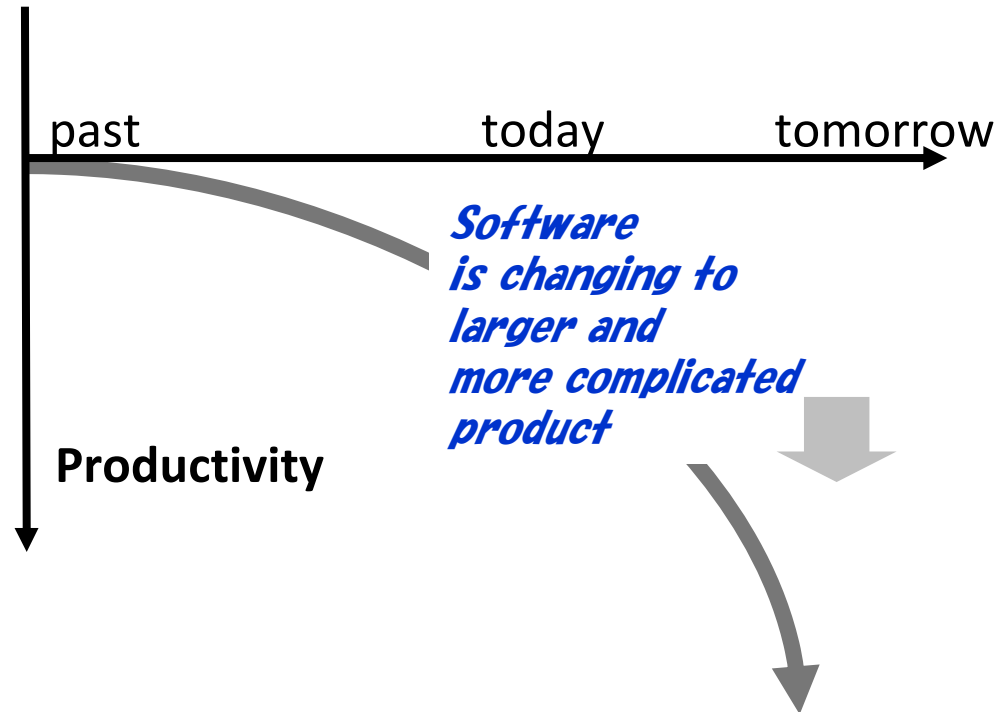
- ***Increase human resources***
- ***Oversea outsourcing***
- ***Reduce to re-work (negative suriawase)***
- ***Improve the process with CMMI***
- ***Employ more productive tools***

:

Enough measures to the future?

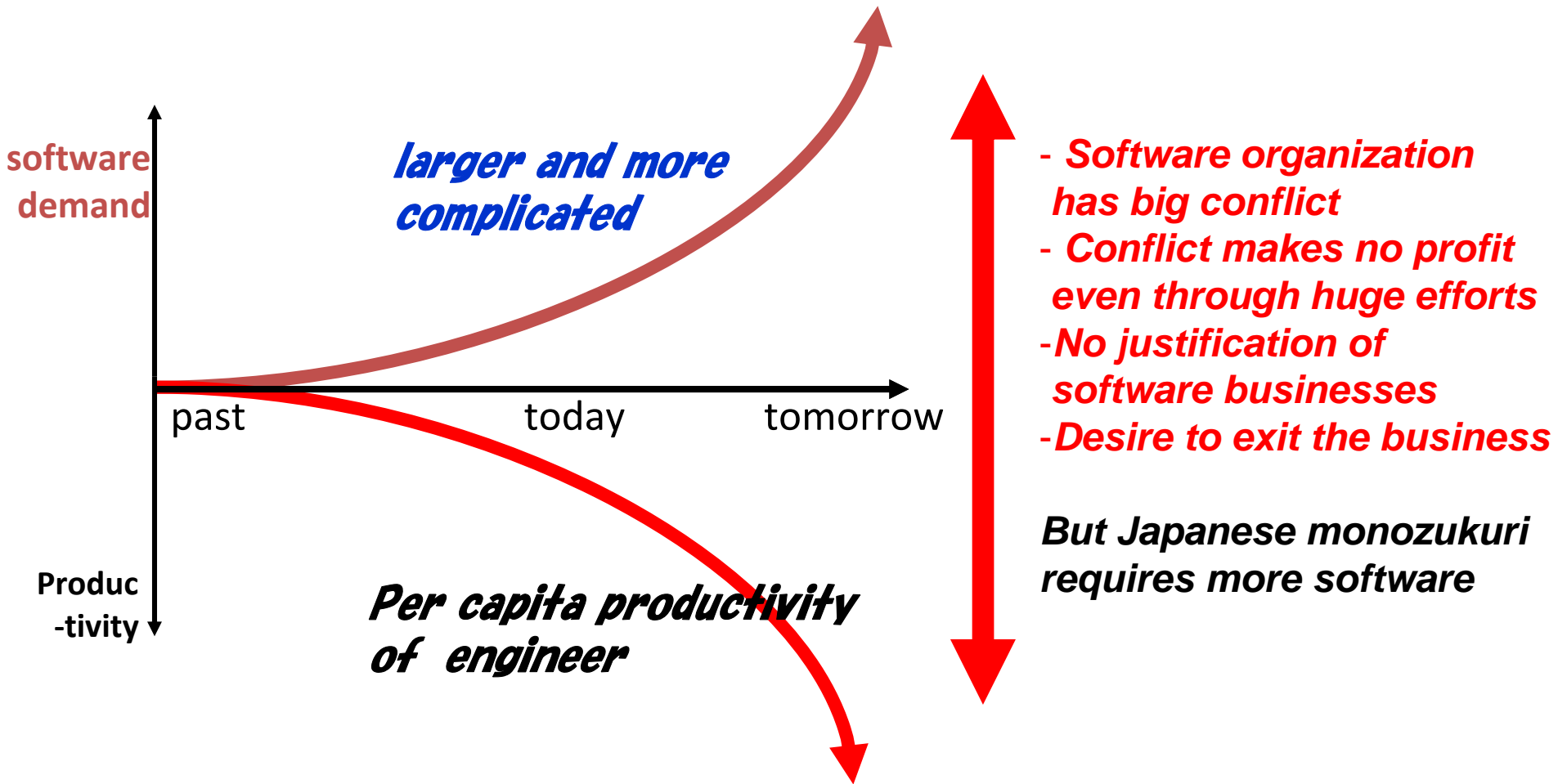


- ***However, we cannot see effective changes***
- ***Require fundamental innovation***



Software Business Crisis

Big gap between software demand and supply
→ Software businesses are failing !

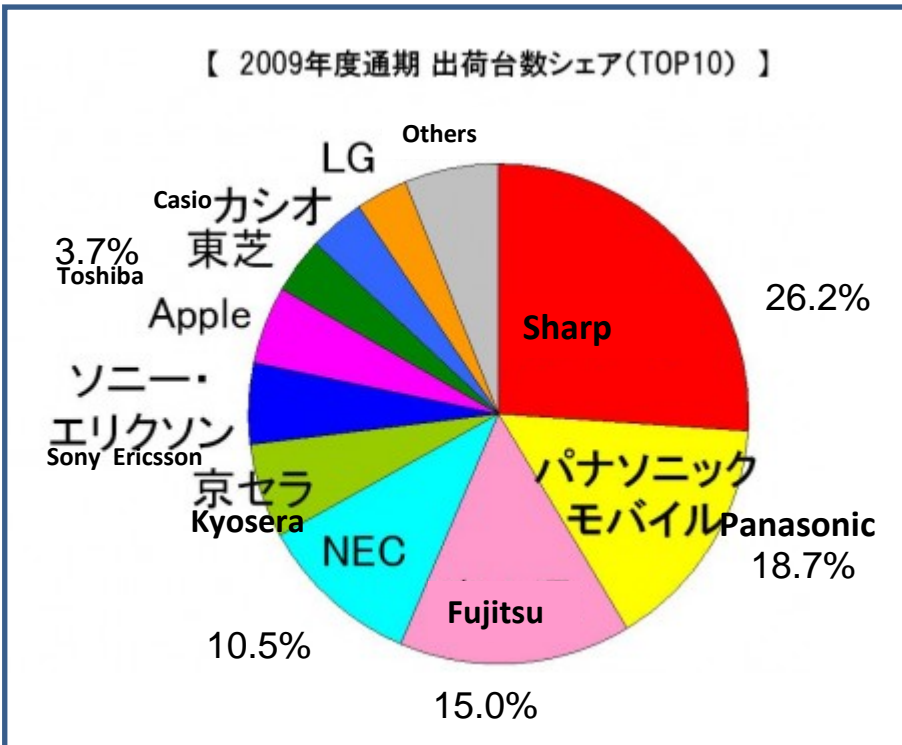


Examples: Manufacturers of Mobile Phones

Volume of domestic shipment in 2009: **34 Millions**

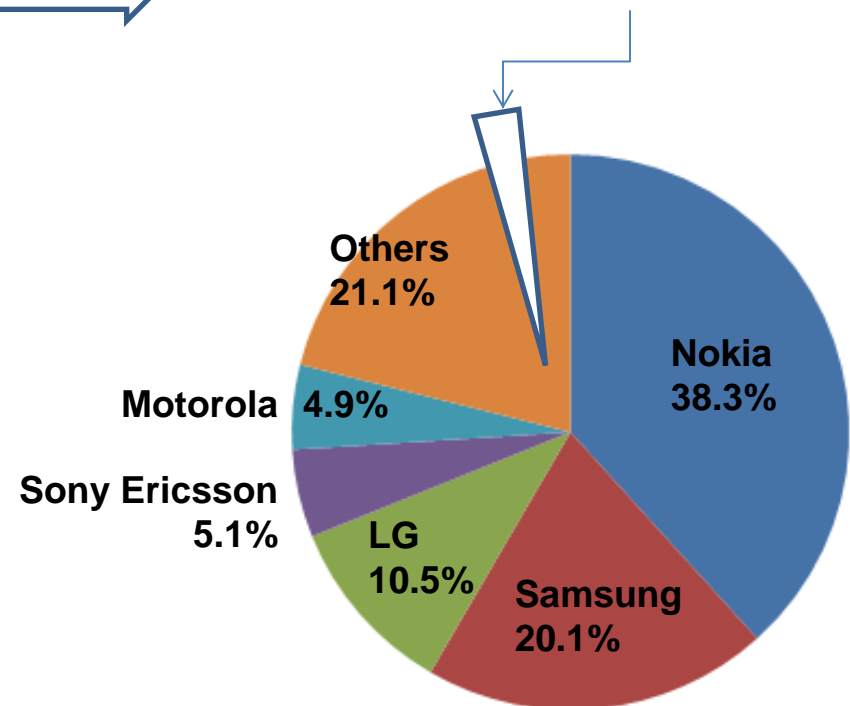
Fujitsu and Toshiba integrated
to the second manufacturer (share 18.7%)

Source: <http://www.m2ri.jp/newsreleases/main.php?id=010120100422500>



Global shipment in 2009: **1100M**

Total share of all the
Japanese manufacturers: **3%**



No competitive standing in the global market!

Some characteristics of software business are:

Characteristics:

1. 開発プロダクトとプロセスが人の頭のなかに形成され外部から見えない
2. プロダクトとプロセスのエンジニアリングが、はっきりしないまま開発が進む
3. 開発コストの大半が人件費である
4. ハードウェア製品に占めるソフトウェア部分の割合が大幅に増加している
5. Cost to reproduce software is proximate to zero
6. ネットワークで容易にソフトウェア成果物を移動させることができる
7. ソフトウェア開発のあり方は、欧米の考え方が支配的である
8. 要求がよく追加される、また変更される（要求は無限にある）
9. ソフトウェアテストの組み合わせは無限である（すべてのケースをテストすることは不可能）
10. オンデマンドによりソフトウェアを出荷することも可能である
11. 技術者の時間を在庫することができない
12. 核となる技術者が常に不足している
13. 技術者の考え方・開発活動によって、成果に著しい差が出る

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In order to make software (-intensive) business successful, it is needed to understand their characteristics.



In case of shipping the same size of software, the more shipping volume is, the less cost per embedded- software product.

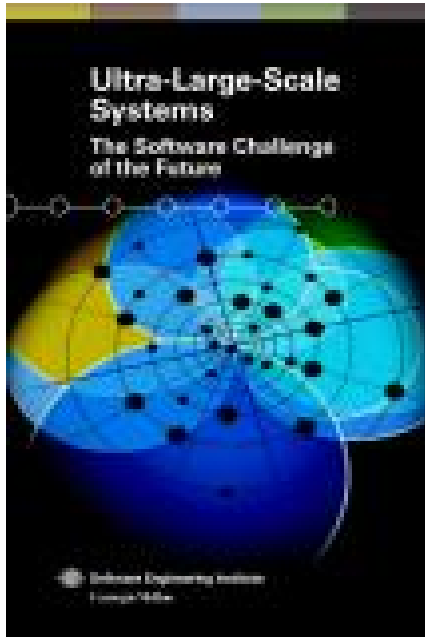
Nokia is larger ten times in the shipping volume than all the Japanese manufacturers

Comprehensive source: <http://j-net21.smrj.go.jp/develop/jit/entry/004/20071130-18.html>

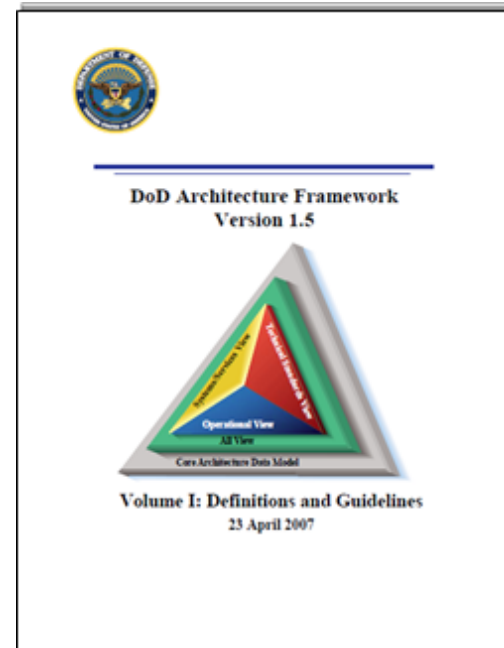
(this fully translated page can be asked to the e-mail address at the final page)

Software is becoming larger and more complicated

Ultra-Large-Scale Systems: The Software Challenge of the Future By Linda Northrop, SEI



DoD Architecture Framework



Software businesses are more and more difficult from now on!

Methods and tools to develop software has been evolving

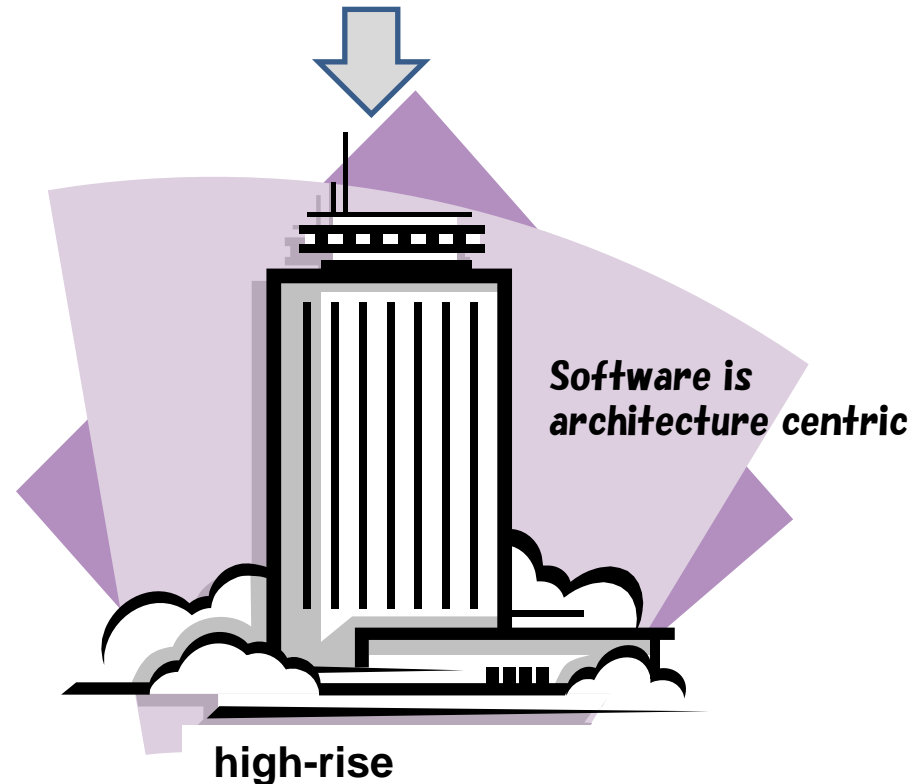
Learn how to develop software from older members, then build



cave

Learn software development and business theoretically and systematically

- management strategy / portfolio/program/project
- Domain engineering
- Systems engineering / software engineering



2. Another example on the questions

→ Car navigation system

カーナビ ランキング ※掲載情報は、2010年08月01日 16時31分 の情報です

順位	売れ筋ランキング	注目ランキング	満足度ランキング
1位	<input type="checkbox"/> 三洋電機 GORILLA NV-SE570DT 最安値: ¥47,500	<input type="checkbox"/> 三洋電機 GORILLA NV-SE570DT 最安値: ¥47,500	<input type="checkbox"/> クラリオン クラスヴィア NX809 最安値: ¥145,663
2位	<input type="checkbox"/> 三洋電機 GORILLA NV-SD740DT 最安値: ¥58,775	<input type="checkbox"/> 三洋電機 GORILLA Lite NV-LE50DT 最安値: ¥29,323	<input type="checkbox"/> パナソニック ストラーダポケット CN-MP150D 最安値: ¥37,900
3位	<input type="checkbox"/> PIONEER エアーナビ AVIC-T07 最安値: ¥47,579	<input type="checkbox"/> PIONEER エアーナビ AVIC-T07 最安値: ¥47,579	<input type="checkbox"/> ECLIPSE AVN779HD 最安値: ¥143,040
4位	<input type="checkbox"/> パナソニック ストラーダ CN-MW200D 最安値: ¥82,900	<input type="checkbox"/> パナソニック ストラーダ CN-MW200D 最安値: ¥82,900	<input type="checkbox"/> エイ・アイ・ディー MANDO JM-HT700NE 最安値: ¥143,040
5位	<input type="checkbox"/> SONY nav-u NV-U35 最安値: ¥29,280	<input type="checkbox"/> 三洋電機 GORILLA NV-SD740DT 最安値: ¥58,775	<input type="checkbox"/> 三洋電機 GORILLA NV-SD740DT 最安値: ¥58,775

売れ筋ランキンガー一覧 注目ランキンガー一覧 満足度ランキンガー一覧

※製品にチェックを入れて“比較”ボタンを押すと製品比較ができます。

- Very competitive domestically and globally
- Larger and more complicated software required
- The same consequence may happen as mobile phones

Overseas competitors:



source: http://kakaku.com/car_goods/car-navigation/?lid=mag054_01

http://gpsmagazine.com/2007/06/garmin_vs_magellan_vs_tomtom_which_gps_picks_the_best_routes.php

Current market :

	Asia				Africa	America		Europe	Australia	Total
	Japan	China	India	Total		North America	South America			
Population (Million)	130	1350	1200	4170	1030	550	390	730	40	6910
Estimated Number of Vehicles (Million)	0.8	>0.5	>0.2	>1.9	>0.1	>3.0	>0.4	>2.9	>0.2	>9.8
High Grade	P社									
PND	S社									
Hand-set Navi										

PND: Portable Navigation Device

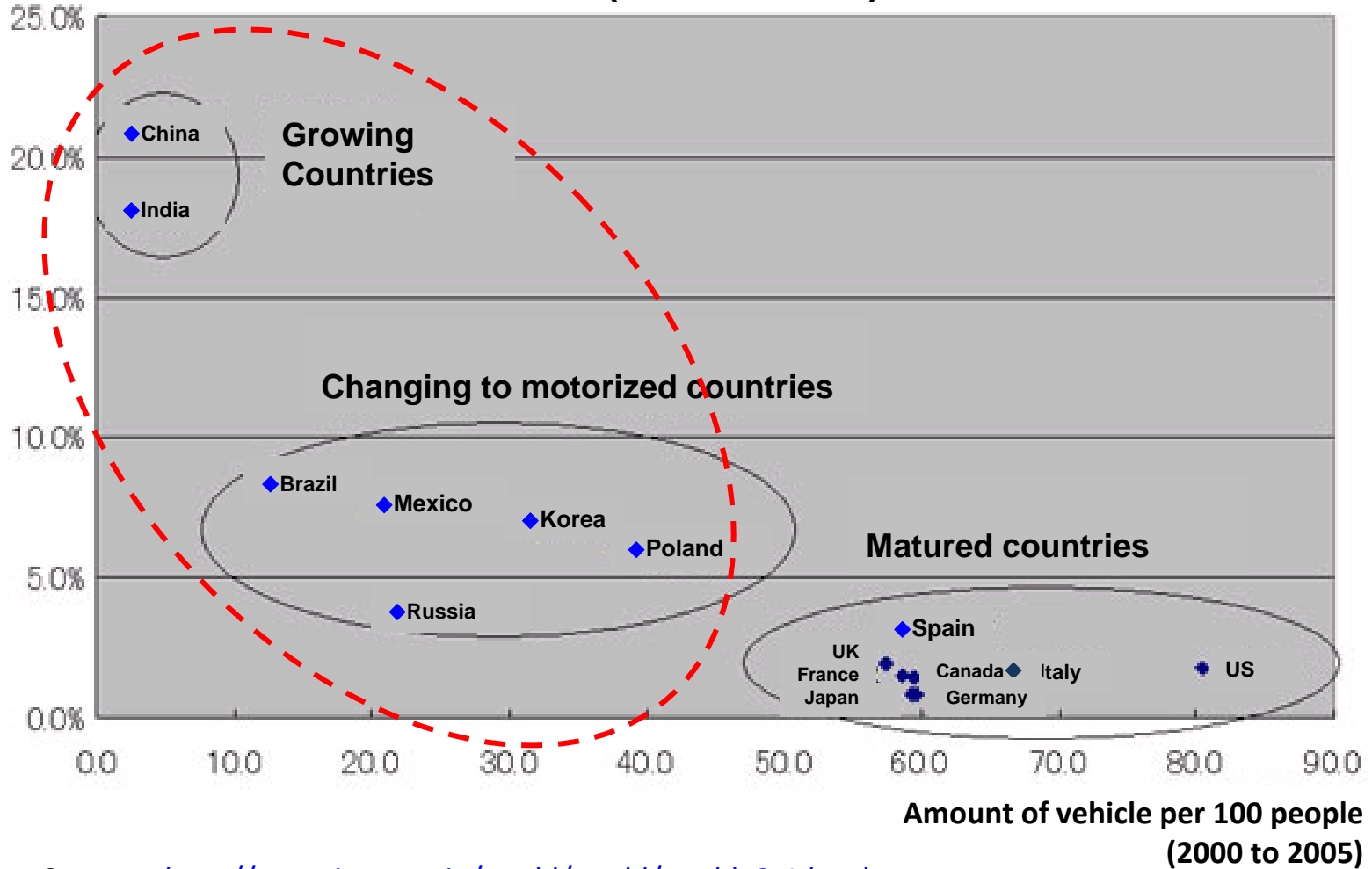
Type of product: OEM product (genuine parts of vehicle) and openly marketed product

Source of "Estimated number of Vehicle in region" : http://www.jama.or.jp/world/world/world_2t1.html

Potential market :

Increasing rate
(2000 to 2005)

Amount of vehicle per 100 people and Increasing rate
(2000 to 2005)



Source : http://www.jama.or.jp/world/world/world_2t1.html

Potential of (Car) Navigation:



[A] Increase functionalities of the product

[B] Develop business information systems and link to navigation product

[C] Develop business information systems on the external value chain with navigation product, to innovate business processes

[D] Develop interrelations with social (information) systems with navigation product

Hugh potentials of new products, services, and more

Common efforts to realize potentials:

- ***Increase features***
- ***Higher quality***
- ***Lower cost***
- ***shorter delivery time***



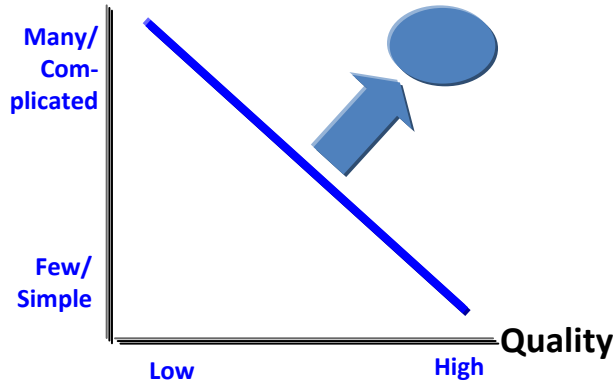
Customers' Satisfaction



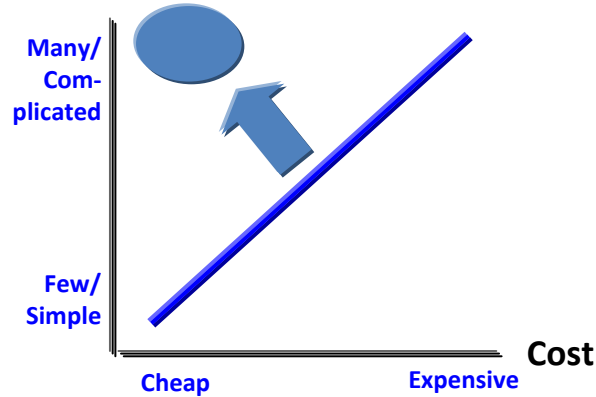
Enough?

3. Utilize TRIZ to make monozukuri stronger

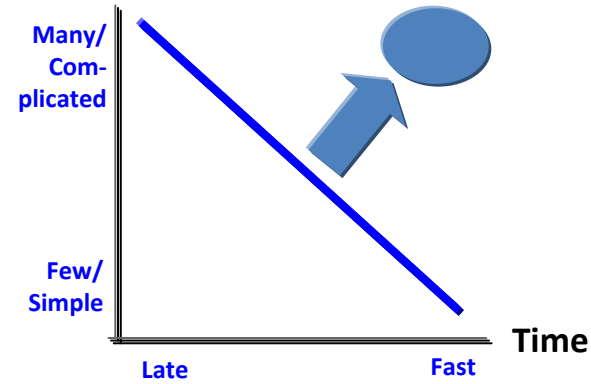
Functionalities



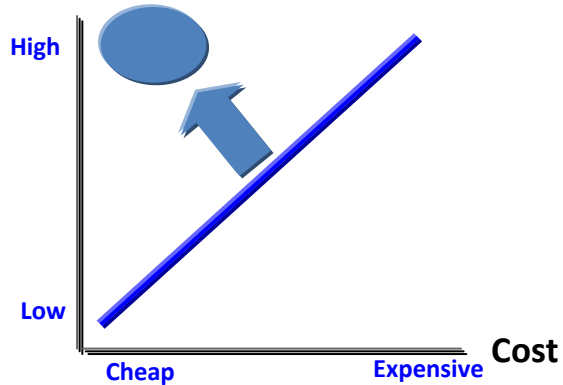
Functionalities



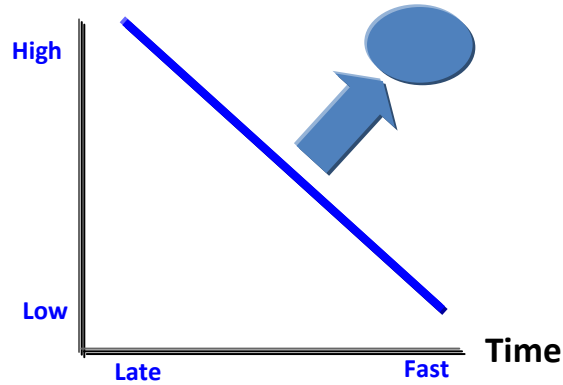
Functionalities



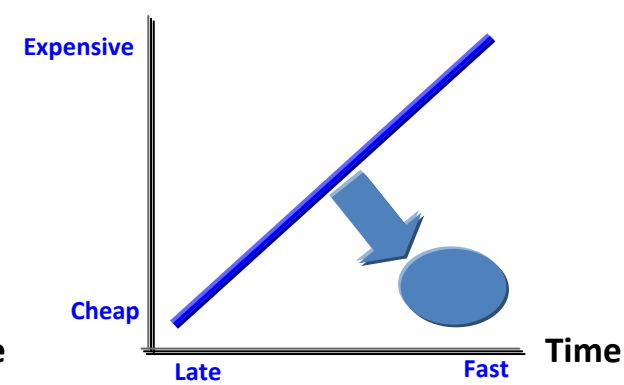
Quality



Quality



Cost



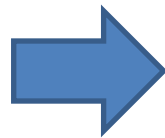
 : Ideal relationship  : usual relationship

TRIZ parameters to solve software problems:

TRIZ Concept



Systematic (Software) Innovation
by Darrell Mann



1. Size (Static)
2. Size (Dynamic)
3. Amount of Data
4. Interface
5. Speed
6. Accuracy
7. Stability
8. Ability of Detect/ Measures
9. Loss of Time
10. Loss of Time
11. Harmful Effects Generated By System
12. Adaptability/Versatility
13. Compatibility/Connectivity
14. Ease Of Use
15. Reliability/Robustness
16. Security
17. Aesthetics/Appearance
18. Harmful Affects On System
19. System Complexity
20. Control Complexity
21. Automation

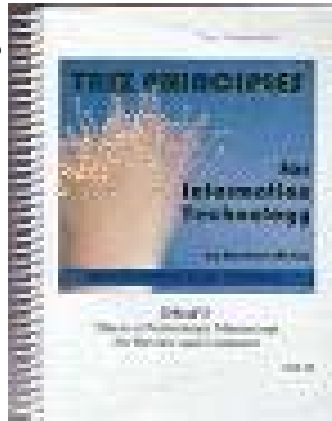
Contradiction Matrix for Software



解決したいパラメータ	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
パラメータ	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1 サイズ(静的)		2, 4, 13, 19	1, 10, 24, 35, 13	10, 24, 35, 13	24, 35, 13	24, 35, 13	24, 35, 13	24, 35, 13	24, 35, 13	24, 35, 13	24, 35, 13	24, 35, 13	24, 35, 13	24, 35, 13	24, 35, 13	24, 35, 13	24, 35, 13	24, 35, 13	24, 35, 13	24, 35, 13	24, 35, 13
2 サイズ(動的)	25, 35, 2, 7		35, 12, 25, 24, 10	24, 10, 35, 12	24, 10, 35, 12	24, 10, 35, 12	24, 10, 35, 12	24, 10, 35, 12	24, 10, 35, 12	24, 10, 35, 12	24, 10, 35, 12	24, 10, 35, 12	24, 10, 35, 12	24, 10, 35, 12	24, 10, 35, 12	24, 10, 35, 12	24, 10, 35, 12	24, 10, 35, 12	24, 10, 35, 12	24, 10, 35, 12	24, 10, 35, 12
3 データ量	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13		1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13
4 インタフェース	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13		1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13
5 速度	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13		1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13
6 正確性	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13		1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13
7 安定性	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13		1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13
8 検出力/測定能力	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13		1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13
9 時間損失	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13		1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13
10 データ損失	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13		1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13
11 システムによる有害効果	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13		1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13
12 検出力/測定能力	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13		1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13
13 互換性/接続性	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13		1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13
14 使いやすさ	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13		1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13
15 信頼性/耐久性	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13		1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13
16 セキュリティ	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13		1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13
17 美しさ/見栄え	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13		1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13
18 システムへの悪影響	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13		1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13
19 システムの複雑性	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13		1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13
20 制御の複雑性	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13		1, 10, 17, 2, 10, 13
21 自動化	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	1, 10, 17, 2, 10, 13	

Physical Contradiction

Cases



TRIZ Principles - for Information
Technology by Umakant Mishra

40の発明原理

- 1 分割 Segmentation
- 2 取り出し Taking Out
- 3 局所的性質 Local Quality
- 4 非対称 Asymmetry
- 5 併合 Merging
- 6 汎用性 Universality
- 7 入れ子 Nested Doll
- 8 約り合い Counterweight
- 9 優先 Prior
- 10 先取り反作用 Prior Action
- 11 事前防衛 Cushioning
- 12 等価性 Equitativity
- 13 逆転 Reverse
- 14 曲率 Curvature
- 15 ダイナミックな変化 Dynamicize
- 16 局所的な性質 Local Quality
- 17 局所的な性質 Local Quality
- 18 局所的な性質 Local Quality
- 19 局所的な性質 Local Quality
- 20 局所的な性質 Local Quality
- 21 局所的な性質 Local Quality
- 22 局所的な性質 Local Quality
- 23 局所的な性質 Local Quality
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- 35 局所的な性質 Local Quality
- 36 局所的な性質 Local Quality
- 37 局所的な性質 Local Quality
- 38 局所的な性質 Local Quality
- 39 局所的な性質 Local Quality
- 40 局所的な性質 Local Quality

Big Question:

What TRIZ (Theory of inventive problems solving) seeks is:



To solve problems and realize products/services to be ahead from competitors

However, even if we take a lead in specific technologies, we are losing businesses.



We should be aware that leading of technologies is not enough.

Why?

It is not enough to make efforts to take advantages of TRIZ?

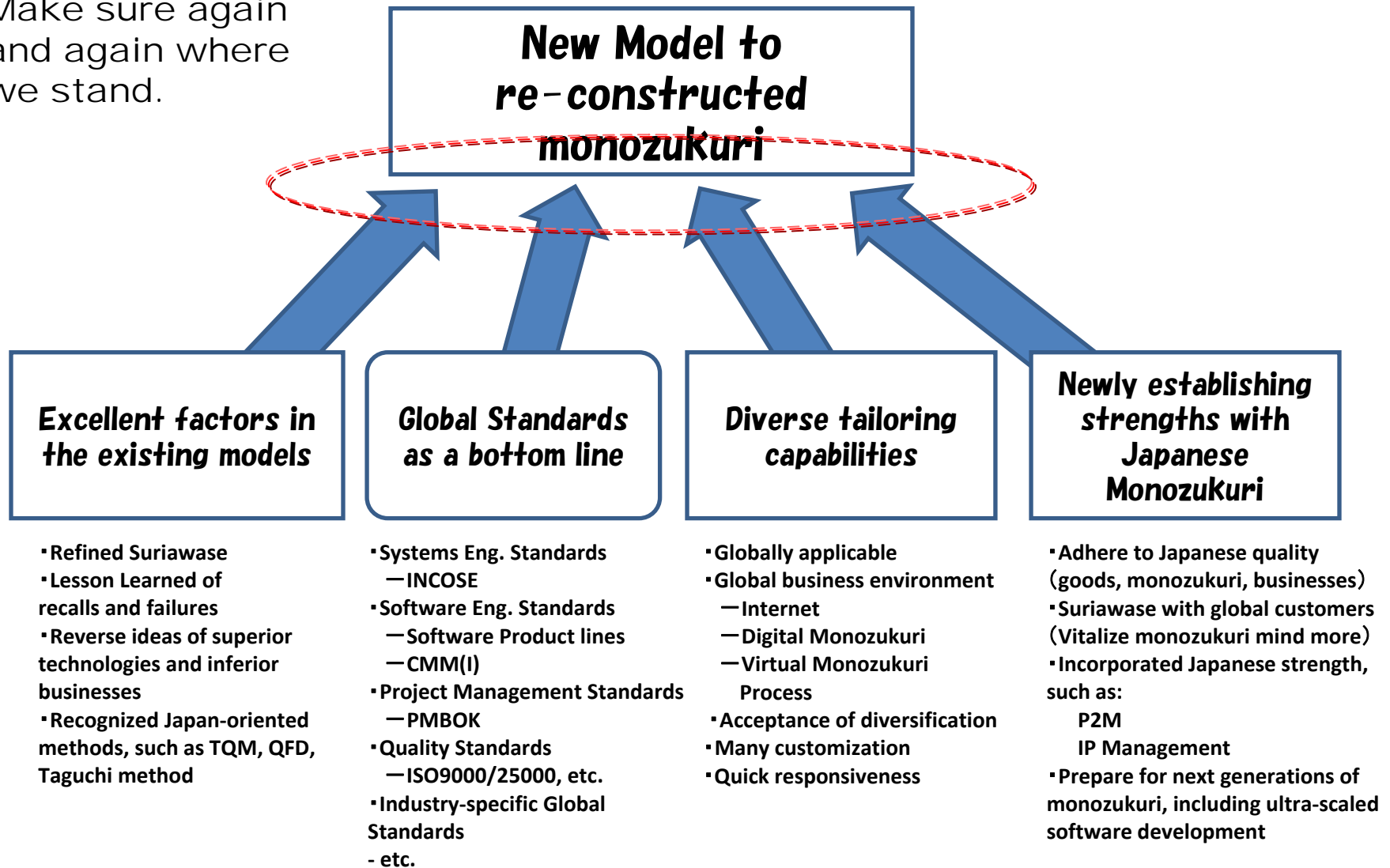
Or, TRIZ could not solve complicated problems mixed technologies and businesses?

Factors for stronger monozukuri

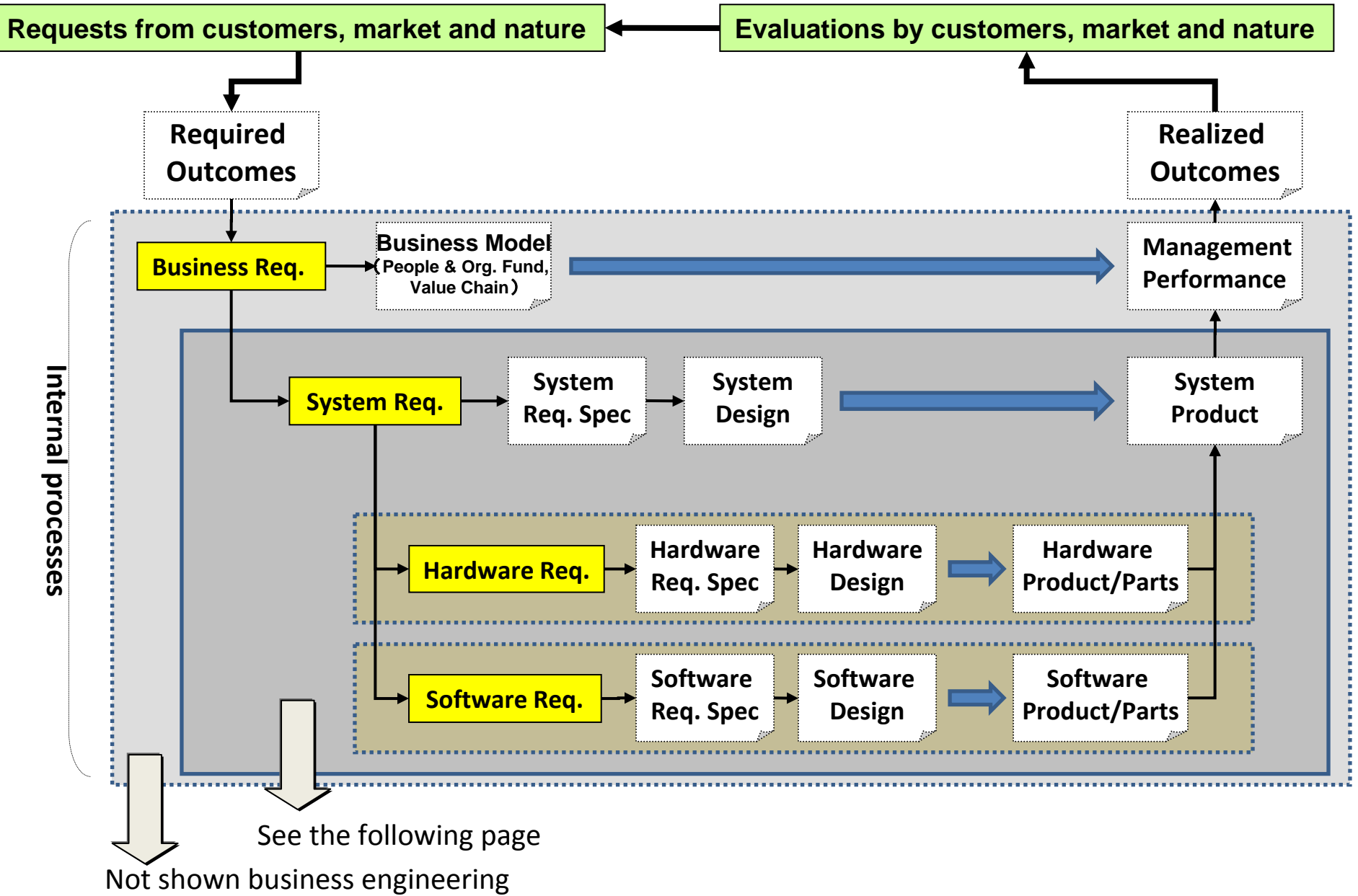


Make sure again
and again where
we stand.

"Survival of the fittest"
C. Darwin



Basic Framework for Monozukuri



Systems Engineering Process by INCOSE

Major Three Processes:

▪ Technical Processes

→ see the following page

▪ Project Processes

- Project Planning
- Project Assessment
- Project Control
- Decision-Making
- Risk and Opportunity Management
- Configuration Management
- Information Management

▪ Enterprise and Agreement Processes

- Enterprise Environment Management
- Investment Management
- System Life Cycle Processes Management
- Resource Management
- Quality Management
- Acquisition Management
- Supply

▪ Enabling Systems Engineering Process Activities

- Decision Management
- Requirements Management
- Risk and Opportunity Management

▪ Systems Engineering Support Activities

- Acquisition and Supply
- Architectural Design
- Configuration Management
- Information Management
- Investment Management
- Project Planning
- Quality Management
- Resource Management
- Validation
- Verification

▪ Speciality Engineering Activities

- Design for Acquisition Logistics
- Electromagnetic Compatibility Analysis
- Environmental Impact Analysis
- Human Systems Integration
- Mass Properties Engineering Analysis
- Modeling, Simulation and Prototyping
- Safety & Health Hazard Analysis
- Sustainment Engineering Analysis
- Training Needs Analysis

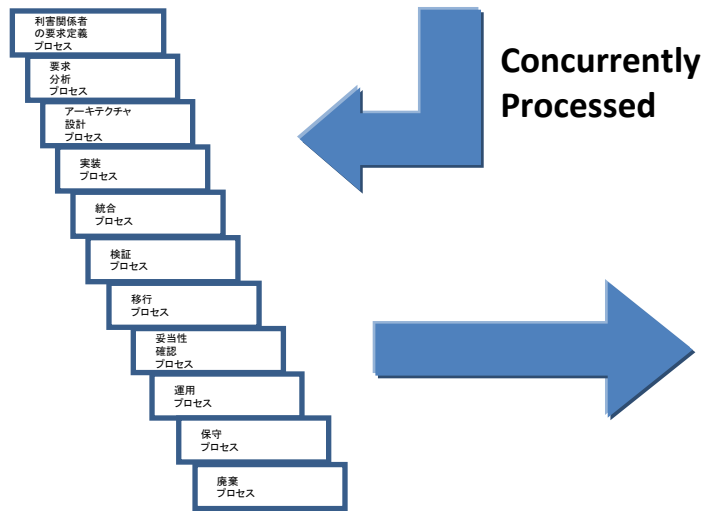
▪ Tailoring

- Tailoring Process
- Traps in Tailoring

source: Systems Engineering Handbook Ver. 3.1

Technical Processes:

Stakeholder Requirements Definition	Requirements Analysis	Architectural Design	Implementation	Integration	Verification	Transition	Validation	Operation	Maintenance	Disposal
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Through three innovations
Samsung became the largest company in
the world

Three Innovations are:

- Process
- Organization and People
- Product

According to the book titled “**危機の経営**”
Hatamura and Yoshikawa, Kodansha, 2009

Innovated simultaneously
multiple product lines

If TRIZ is useful for business innovation,
it will be applied to innovate management including
processes, organizations, people as well as
products/services.

Views on Suriawase-oriented software development (1/2)

○Importance of Suriawase

In order to keep sustaining business growth, it is required to take a lead through suriawase efforts

○Suriawase Processes

①Suriawases in technical processes

To develop systems requirements, requirements analysis, architecture design, hardware and software design, implementations (among processes / inside of process)

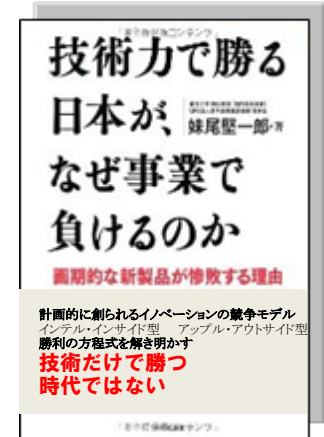
②Suriawases in management processes

Suriawase with business policy and plan, at the kick-off stage, planning stage, production and maintenance stage and other stages

○Types of Suriawase

Two types: 「Positive」 and 「Negative」

source: Chapter 1 of the research report shown at the page 7



「Through pushing to improve existing models, an innovation will never happen.」
(Senoh's Innovation Principle 1)

「Innovation drives out existing model and makes its effectiveness nothing.」
(Senoh's Innovation Principle 2)

2)

Views on Suriawase-oriented software development (2/2)

-Types of Suriawase (continued)

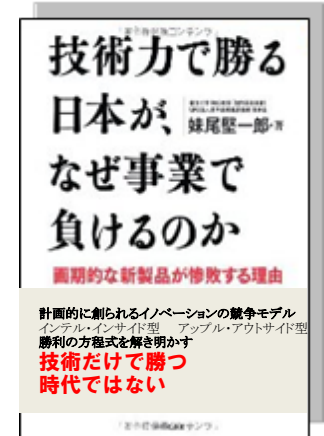
- ① Objectives-driven, such as
Direct the future, Establish Objectives, Solve Issues
- ② Specific-issue-focused, such as
Designs, Operations, Improvement
- ③ Problem-focused, such as Problem-solving, Eliminating not-accomplished issues, Correct errors (Keep control)

①、②: 「**Positive** Suriawase」

③ : 「**Negative** Suriawase」

- Suriawase done very often in the development of embedded software
- Improve and eliminate negative suriwase
- Increase positive suriwase in the right way

source: Chapter 1 of the research report shown at the page 7



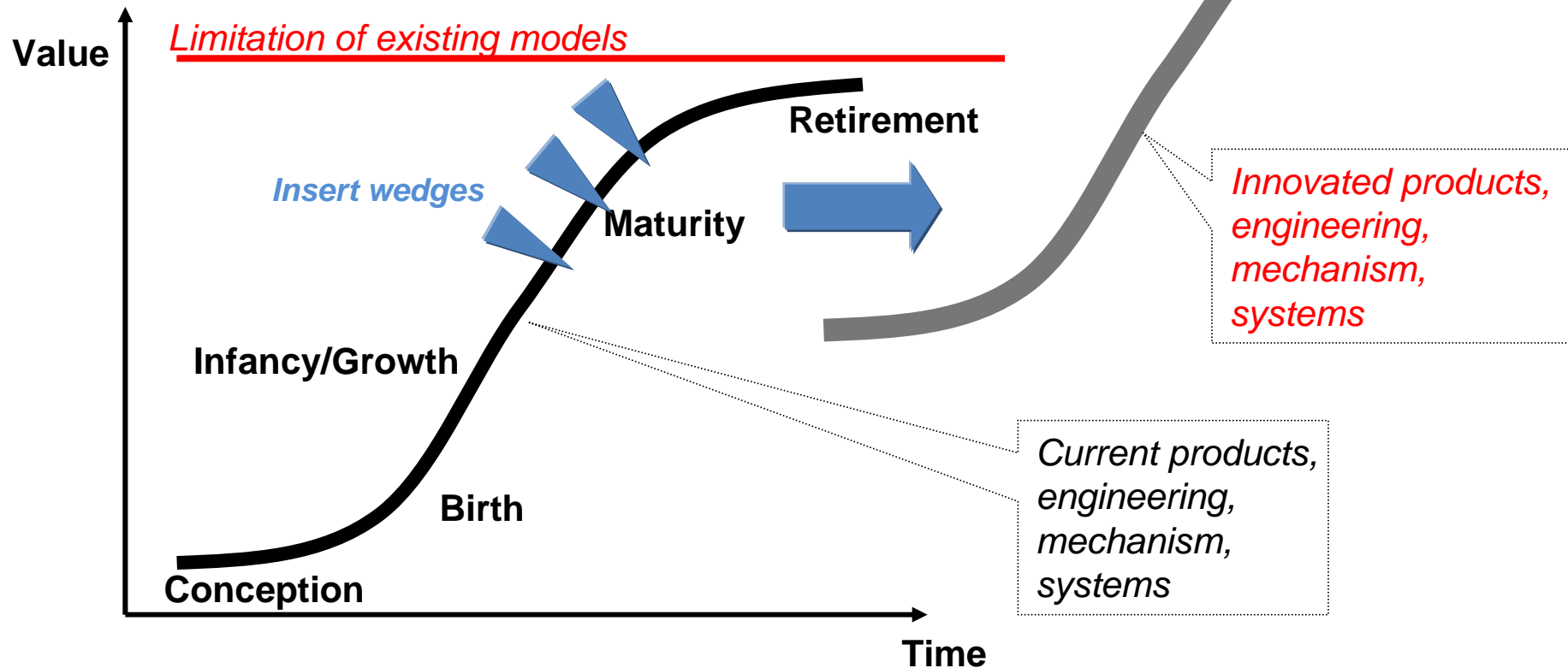
「Innovation on higher model has
always a competitive
advantage」
(Senoh's Innovation Principle 3)

Contrive to innovate

「The competition among the same models is done through improvement, but the one among the heterogeneous models through innovation.」
(Senoh's Innovation Principle 6)

Someone (something) survives only through creating models continuously.

「Product innovation is stronger than process innovation」
(Senoh's Innovation Principle 5)



Source: "Hands-On Systematic Innovation" Darrell Mann, CREA Press, 2003

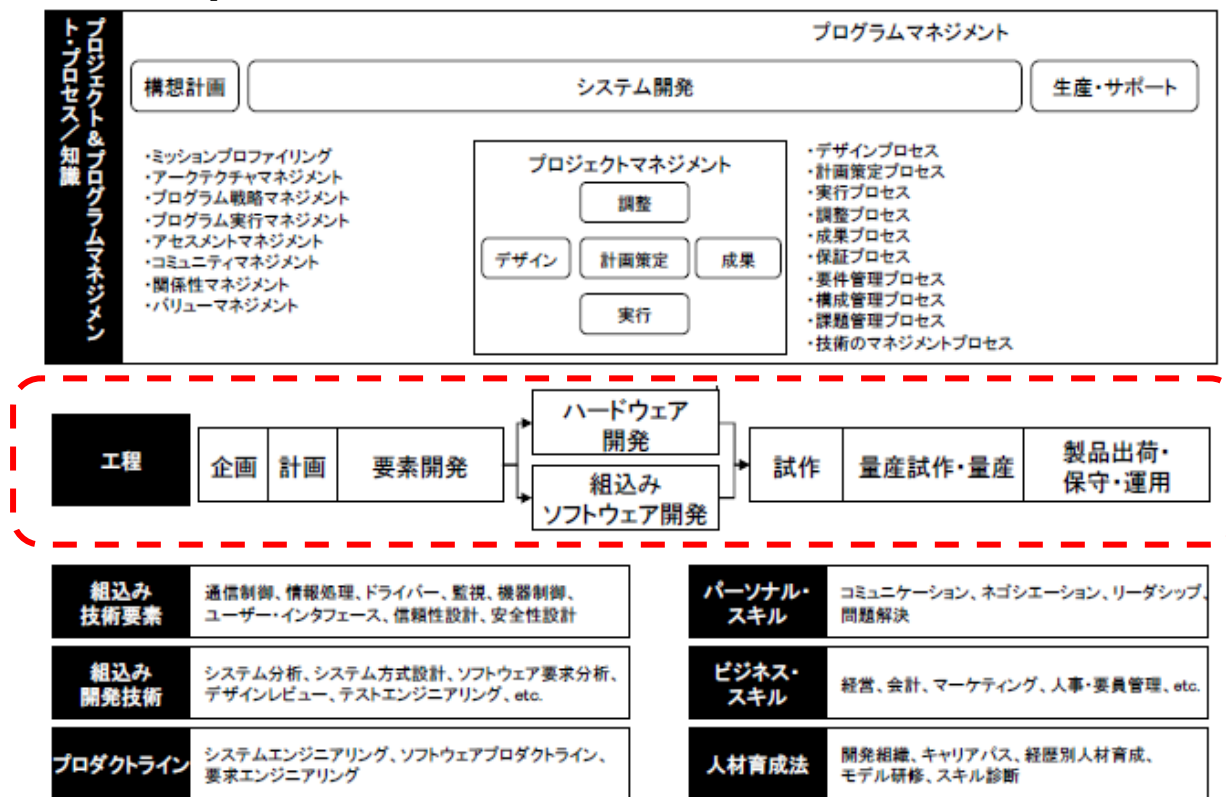
My environment required to innovate very often

Dilemma of innovation: We don't want to take the risks of the innovation, but do want to take a lead. How?

- Concentration in Core Competence
→ Resource Management
- Portfolio Management

- Make TRIZ more practical
- Share and utilize practical information on TRIZ

For example:



One of Japanese strengths is a practical method called P2M (Project and Program Management), which focuses on much broader view of dynamic management to make Japanese .

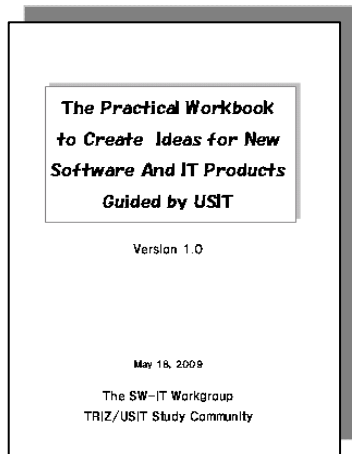
図表 1-4 プロジェクト&プログラムマネジメント・フレームワーク概要

source: Chapter 1 of the research report shown at the page 7

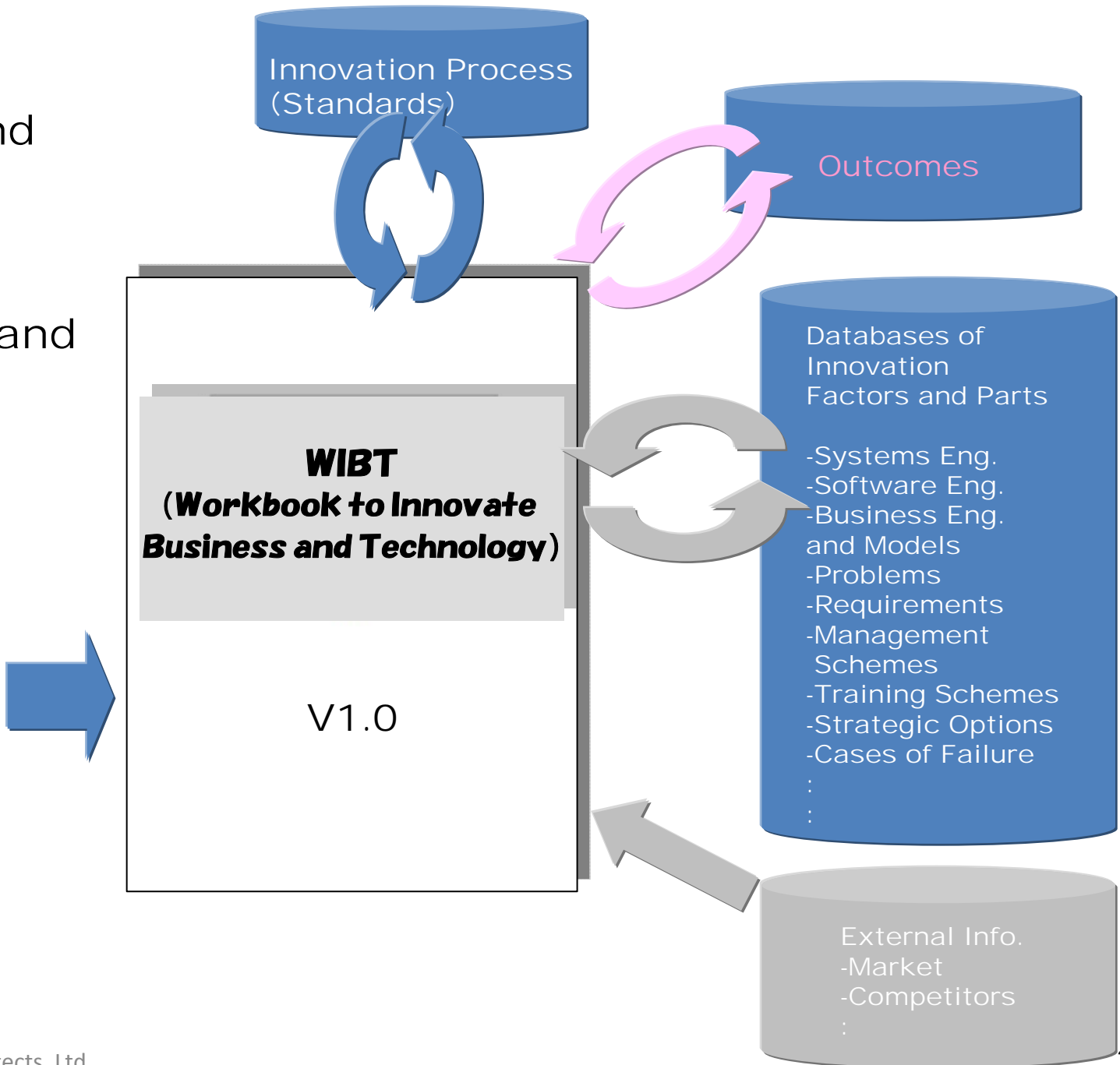
Engineers
apply TRIZ
concepts and
tools daily



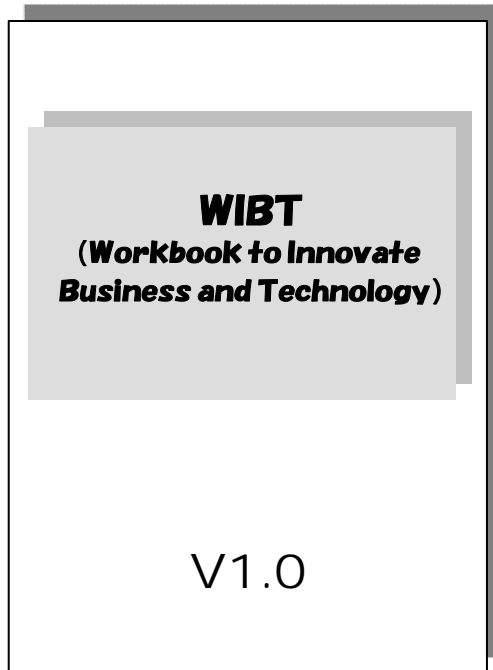
Make them and
monozukuri
stronger



TRIZ Symposium 2009



WIBT Innovation Process



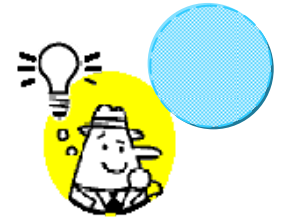
§ 1 Define the specific opportunity

- Look at potentials
- Locate opportunities
- Select and define specific opportunities



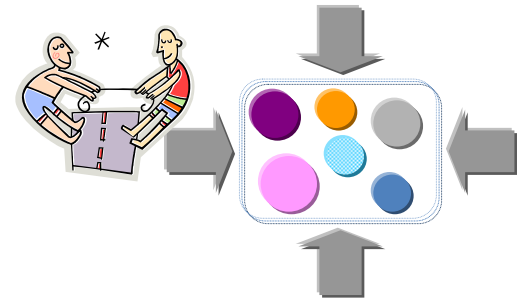
§ 2 Define the specific value

- Assure customers' and businesses' values
- Create business models
- Make successful scenario



§ 3 Evaluate the specific value

- Assure competitiveness
- Establish innovated business strategy
- Define exit strategy



§ 4 Realize the specific value

- Synchronize with comprehensive management strategy
- Take the leadership to realize agreed values
- Get management involved



***Thank you for your attention
and hope your success with TRIZ !***

Please feel free to ask any inquiries.

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