EDGE Program funded by MEXT

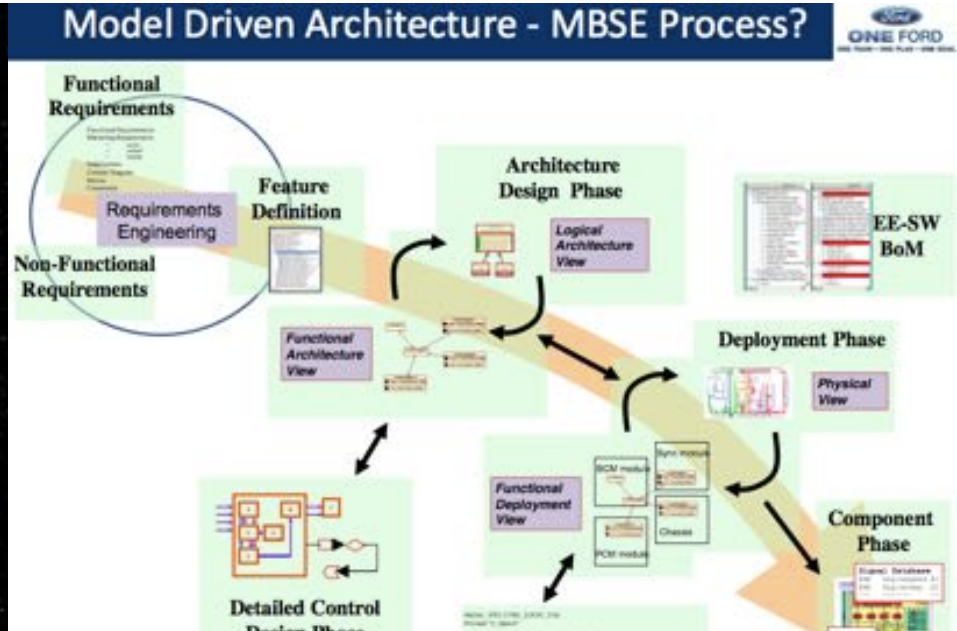
Keio University Global Innovator Acceleration Program 2015

Day 3 Systems Thinking

Graduate School of System Design and Management
EDGE Program Team

Keio SDM has strong background: **Systems Engineering** Master's Degree

- Nations **only** university to provide degree program in Systems Engineering.
- Offers training programs for many **companies**: JAXA, NEC, MELCO, HONDA, NISSAN, more



Systems Thinking and Systems Approach

Systems Thinking

a discipline for **seeing wholes** ...
a framework for **seeing interrelationships** rather than things ...
a process of discovery and diagnosis ...
and as a sensibility for the **subtle interconnectedness** that gives living systems their unique character.

(Senge, P.M. 1990, 2006. The Fifth Discipline: The Art and Practice of the Learning Organization. New York, NY, USA: Doubleday Currency, 68-69)

Systems Thinking and Systems Approach
(e.g. Systems Engineering)

The systems approach is a way of tackling real world problems and **making use of the concepts, principle and patterns of systems thinking to enable systems to be engineered and used**.

(INCOSE Systems Engineering Body of Knowledge, http://www.sebokwiki.org/wiki/What_is_Systems_Thinking%3F)

Systems Thinking

- As a **whole** and a **part**
- **Interrelationship**

- **MECE** boundaries
- Multiple **viewpoints**
- Level of **abstraction**

Systems Thinking

- As a **whole** and a **part**
  - example of biggest system?
  - example of smallest system?
  - what are contexts?
- **Interrelationship**
  - examples of interrelationships with you and a person next to you?

- **MECE** boundaries
  - how do you divide people in this room?
- Multiple **viewpoints**
  - with what perspective do you dive people in this room?
- Level of **abstraction**
  - at what level of abstraction are you talking about?

Why Systems Approach beneficial for entrepreneurs in global context?

Systems approach is

- to understand ***exactly what you need to do***.
- to provide a ***valid solution***.
- to ***leverage*** on existing solutions.
- to deal with ***complexity, scale,*** and ***dynamics***.
- to tackle ***domain free***.
- to ***design and implement*** your solution ***right***.

What is a “system”?

Image from <http://www.spacekids.co.uk/>

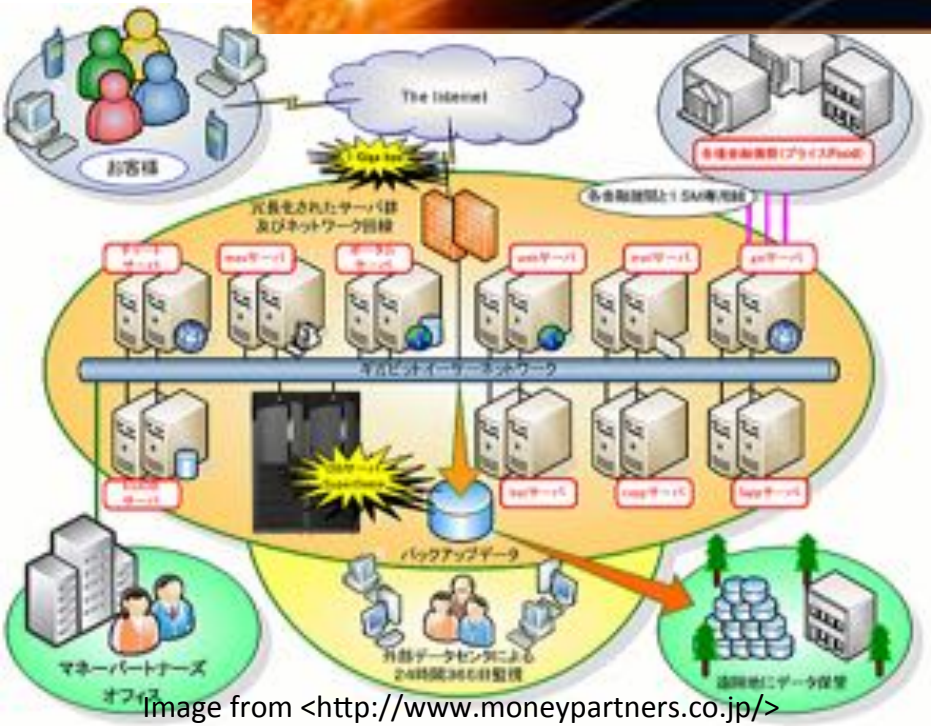


Image from <http://www.moneypartners.co.jp/>

Image from <http://www.tamoshop.com>

System

- Definition of “system”
  - “An **interacting combination of elements to accomplish a defined objective**. These include hardware, software, firmware, people, information, techniques, facilities, services, and other support elements.”
    （INCOSE* Systems Engineering Handbook v2)
  - “An aggregation **of end products** and **enabling products** to achieve a given purpose.”
    （ANSI/EIA-632 Processes for Engineering a System 1998）

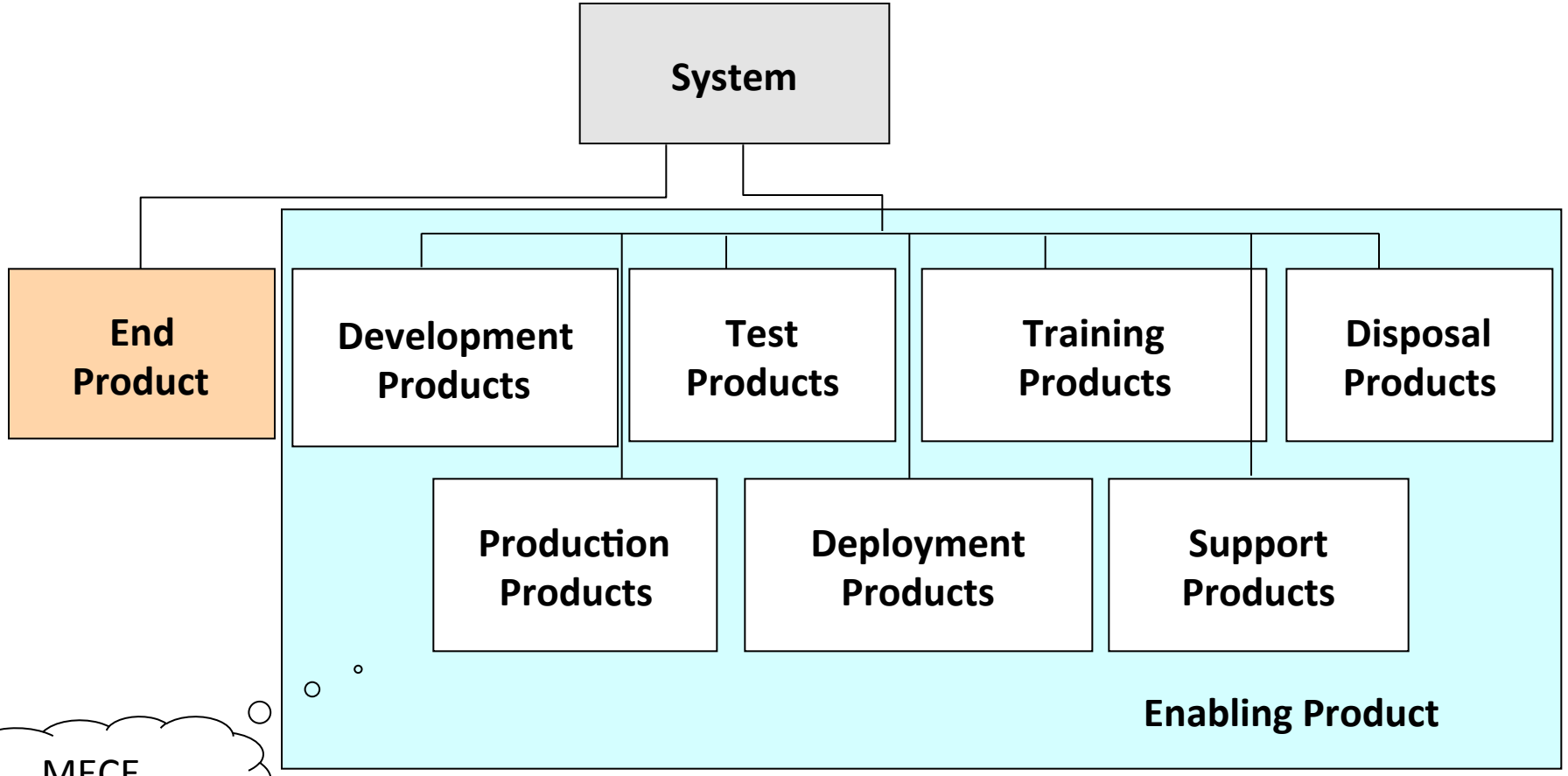
(*INCOSE : International Council on Systems Engineering http://www.incose.org)

Some Keywords in Systems Approach

- All system consists of "**end product**" and "**enabling product**".
- All system has "**subsystem(s)**".
- All system has its "**life cycle**".

End Product and Enabling Product

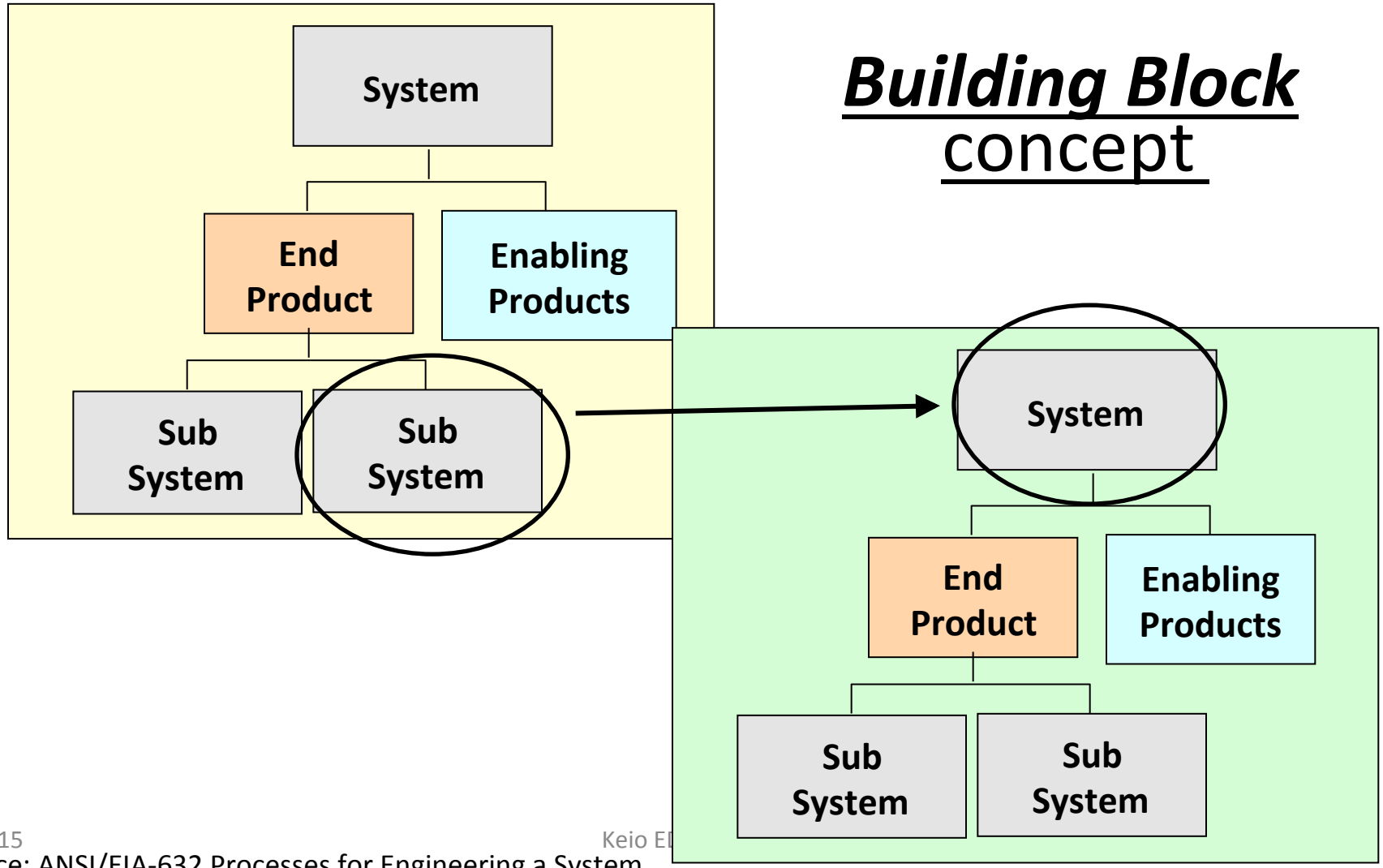
- All system consists of "**end product**" and "**enabling product**".



Reference: ANSI/EIA-632 Processes for Engineering a System

System and Subsystem

- All system has "**subsystem(s)**".



Building Block concept

Reference: ANSI/EIA-632 Processes for Engineering a System

Life Cycle

- All system has its "**life cycle**".

Reference: ISO/IEC 15288 General Life Cycle Definition

<table>
<tr><td rowspan="2">Concept Stage</td><td rowspan="2">Development Stage</td><td rowspan="2">Production Stage</td><td>Utilization Stage</td><td rowspan="2">Retirement Stage</td></tr>
<tr><td>Support Stage</td></tr>
</table>

LIFE CYCLE STAGES	PURPOSE	DECISION GATES
CONCEPT	*Identify stakeholders' needs* *Explore concepts* *Propose viable solutions*	*Decision Options* *– Execute next stage* *– Continue this stage* *– Go to a preceding stage* *– Hold project activity* *– Terminate project*
DEVELOPMENT	*Refine system requirements* *Create solution description* *Build system* *Verify and validate system*	
PRODUCTION	Produce systems Inspect and test [verify]	
UTILIZATION	*Operate system to satisfy users' needs*	
SUPPORT	*Provide sustained system capability*	
RETIREMENT	*Store, archive, or dispose of the system*	

Systems Approaches we talk about today

- **Function and Physical Architecture**
  - function and physical viewpoints
  - functions and physical structures
- **Value Graph (upper half)**
  - purpose and alternative viewpoint
  - higher purposes/value and alternative ideas
- **Causal Loop Diagram**
  - cause-and-effect viewpoint
  - causes and effects
- **Customer Value Chain Analysis (CVCA)**
  - value chain viewpoint
  - stakeholders and their values

[Pop QUIZ]

What do you think this is?

便利な
紙パック
クリップ
3個入
Convenient PAPER PACK CLIP
Produced for DAISO JAPAN
クリアタイプなので賞味期限がはっきりわかる！
DAISO


調理器
使い方は裏面に！
レンジでめだま焼き
[角型]
A-79
忙しい朝も簡単玉子料理


—レンジでめだま焼き［角型］—
使用方法
ステップ1
・容器をかるく水にぬらします
・卵を割って、くぼみ部分におとします
※破裂防止の為、黄身の中央につま楊枝等で数ヶ所、穴をあけます
ステップ2
・フタをしっかり閉めます。
容器の、取っ手部分と先端部分の2ヶ所にフタを固定する為のツメがあります。
フタを閉める時は横にスライドさせ、
「カチッ」としっかりはめてからご使用下さい。
※フタがしっかりはまっていないと、中身が飛び散る等の恐れがあります。フタの取り扱いには十分注意してください。
・600W弱の場合なら約50秒～1分、電子レンジにかけます。
※危険ですので、600W以上の電子レンジには使用しないで下さい
※加熱時間は機種によって異なります
ステップ3
・ひっくり返してフタに乗せ、器に盛って完成です！
《取っ手部分》
カチッ
《先端部分》
カチッ


DAISO
日本製
3個
レトルトしぼり
SQUEEZER FOR
PREPARED FOOD
抗菌
加工
Good Point 1
取り出す
Pinch out
熱いパックも
はさんでOK
Good Point 2
絞り出す
Squeeze out
最後まで絞り
出せる優れ物
缶のプルタブも
開けられる


Good Point 1
取り出す
Pinch out
熱いパックも
はさんでOK
Good Point 2
絞り出す
Squeeze out
最後まで絞り
出せる優れ物

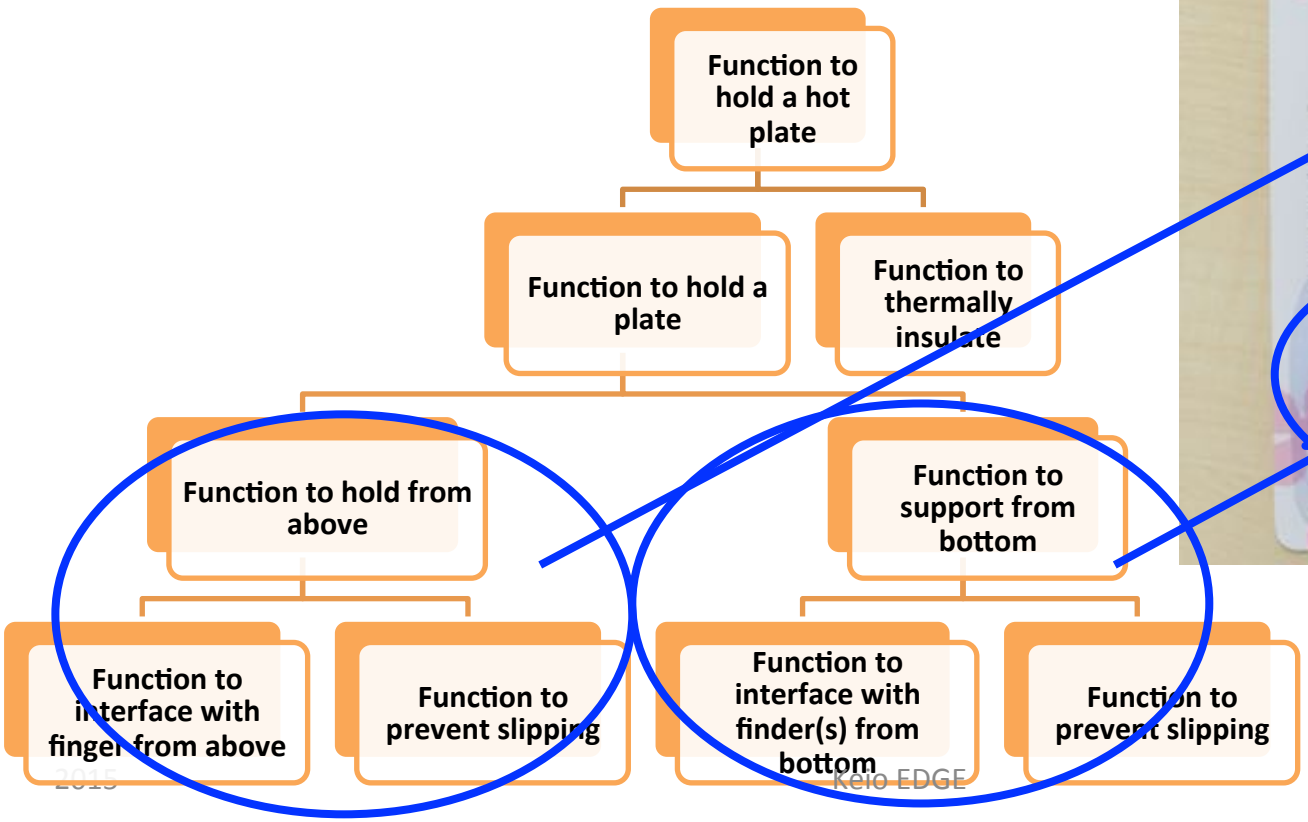

やわらか素材で
らく〜につかめる!!
Easy to grip soft holder
電子レンジ用
パクパク
皿キャッチ
熱くなったお皿がすぐつかめる!
Comes with suction cup hanger.
収納に便利な
吸盤フック付
open
E001
レンジグッズE1
1

What **functional element** is it consist of?

(looking at a system from **Functional Viewpoint**)

What **physical element** is is consist of?

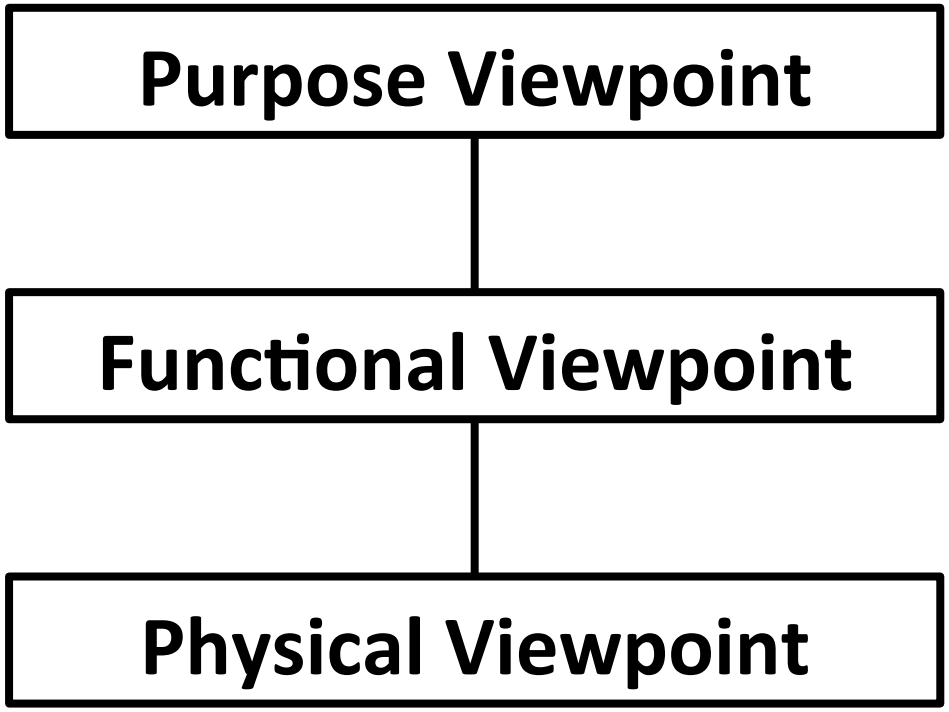
(looking a t a system from **Physical Viewpoint**)



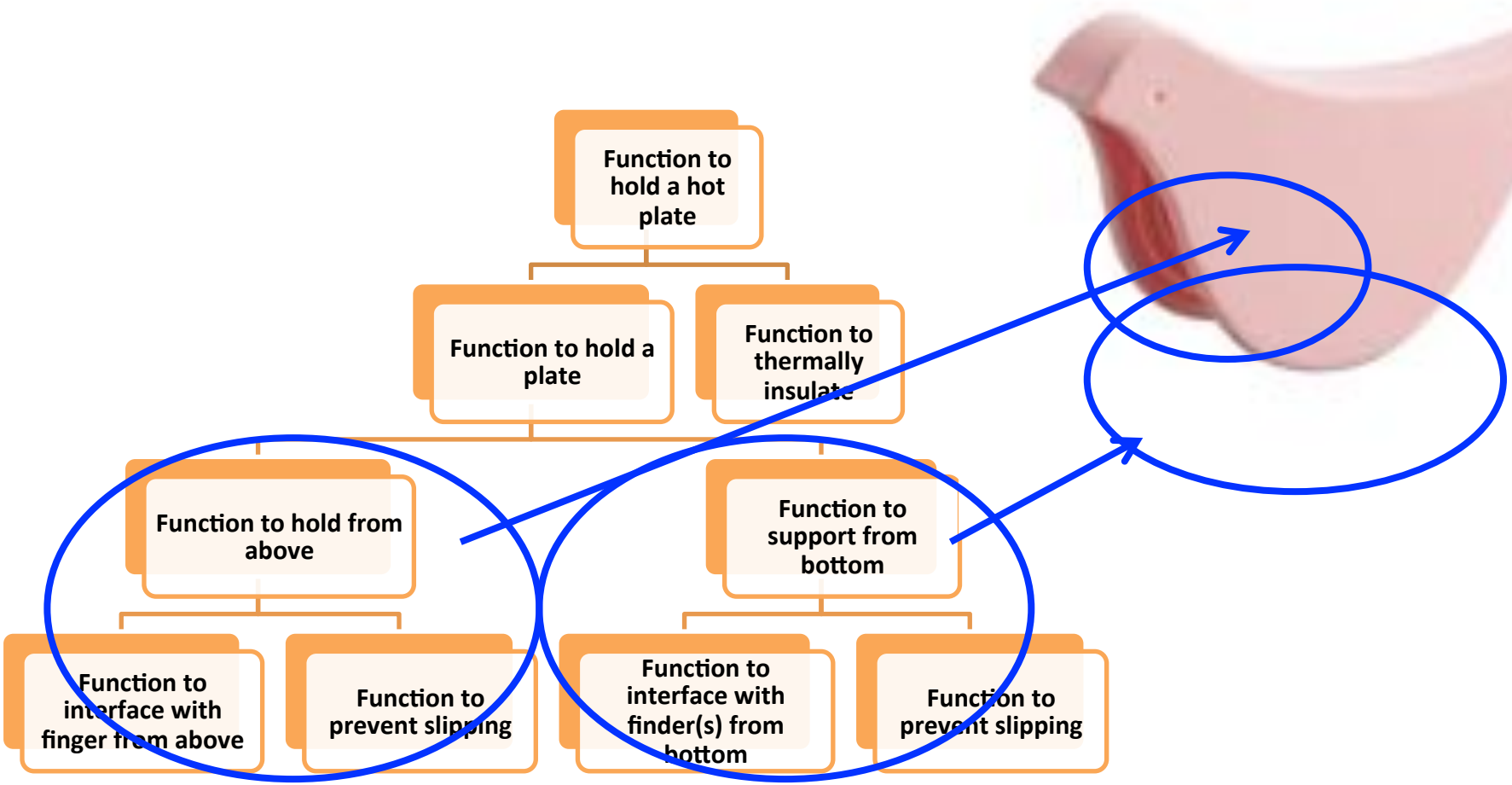
[Pop QUIZ]

to **see** things as a **System**

- One example

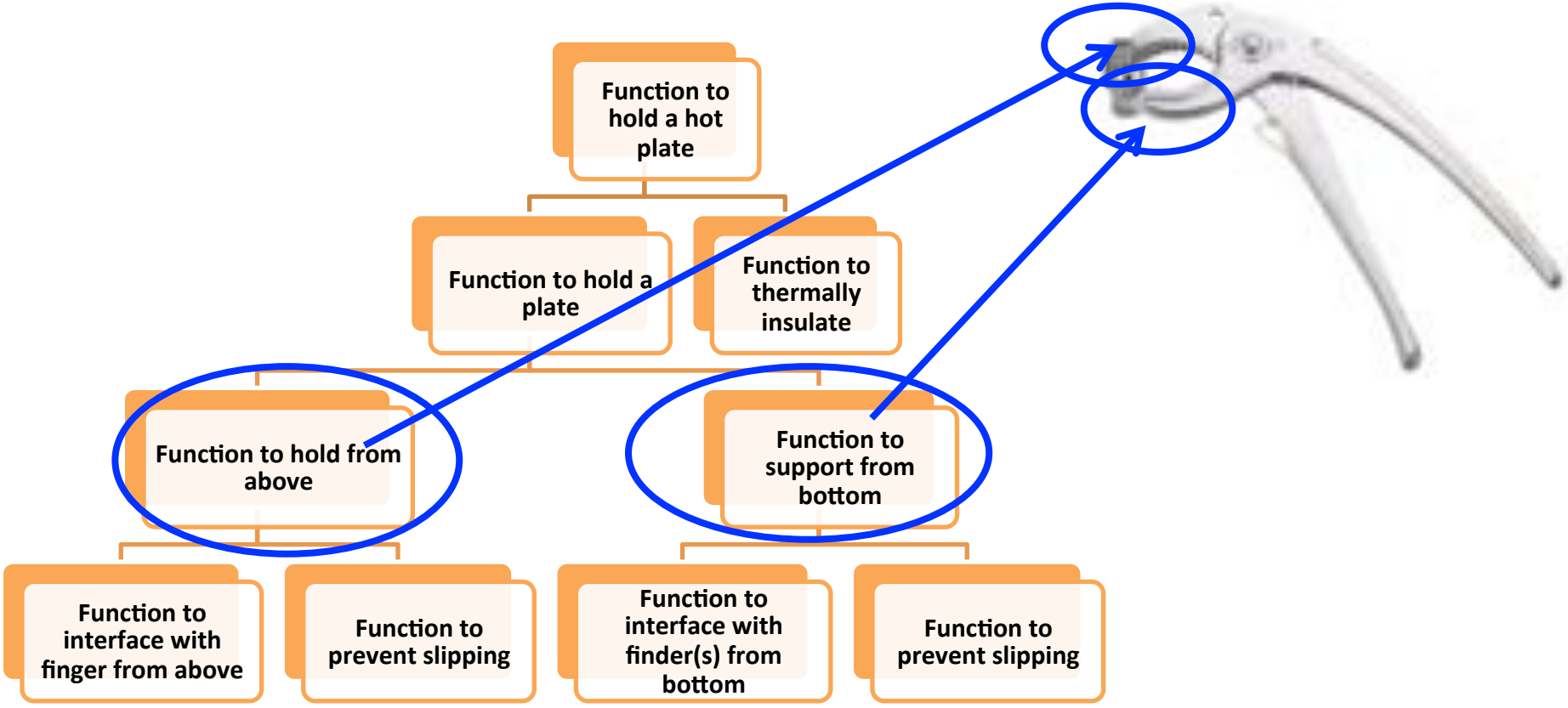


The same **functional element** but different **physical element**



The same **functional element** but different **physical element**

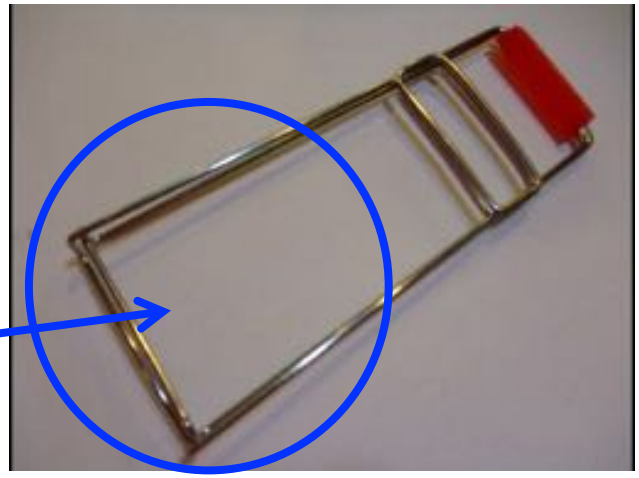
Same **functional element** but different **physical element**

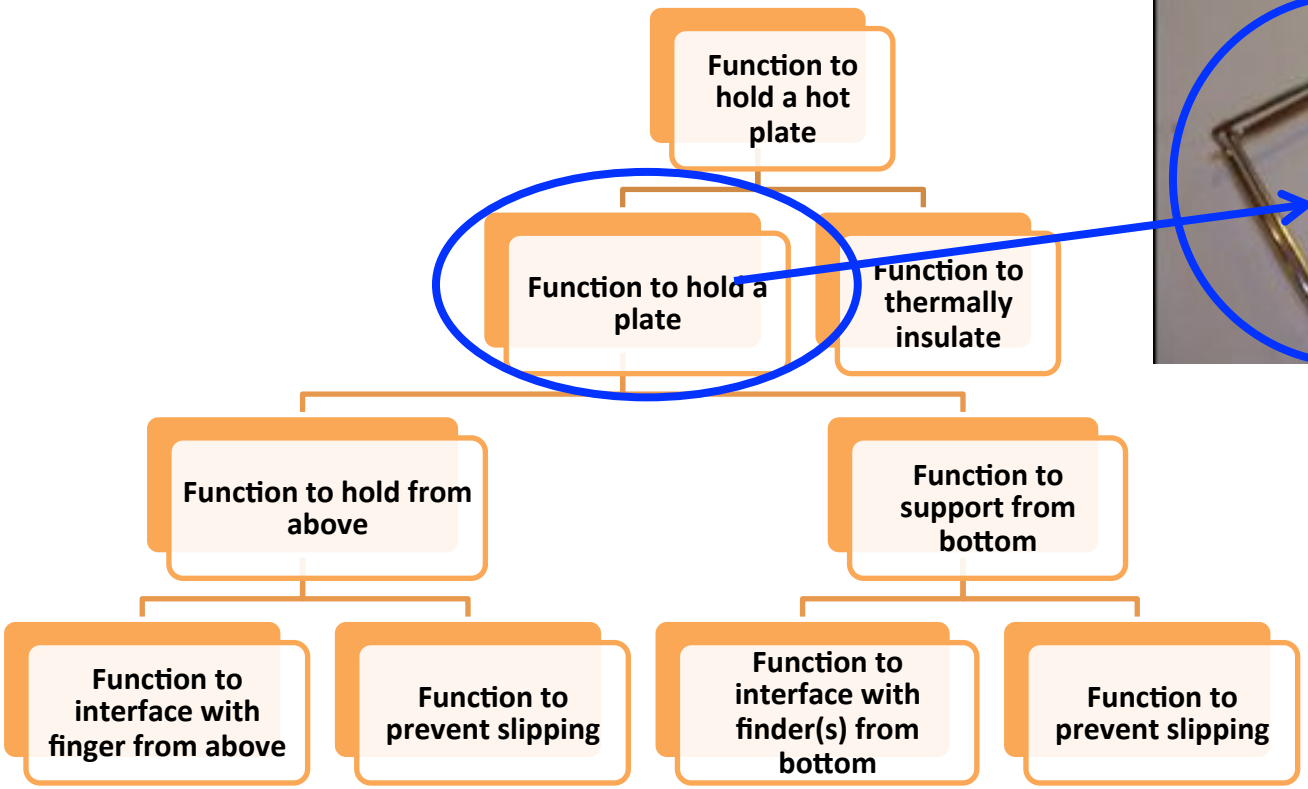


Same **functional element** but
differ

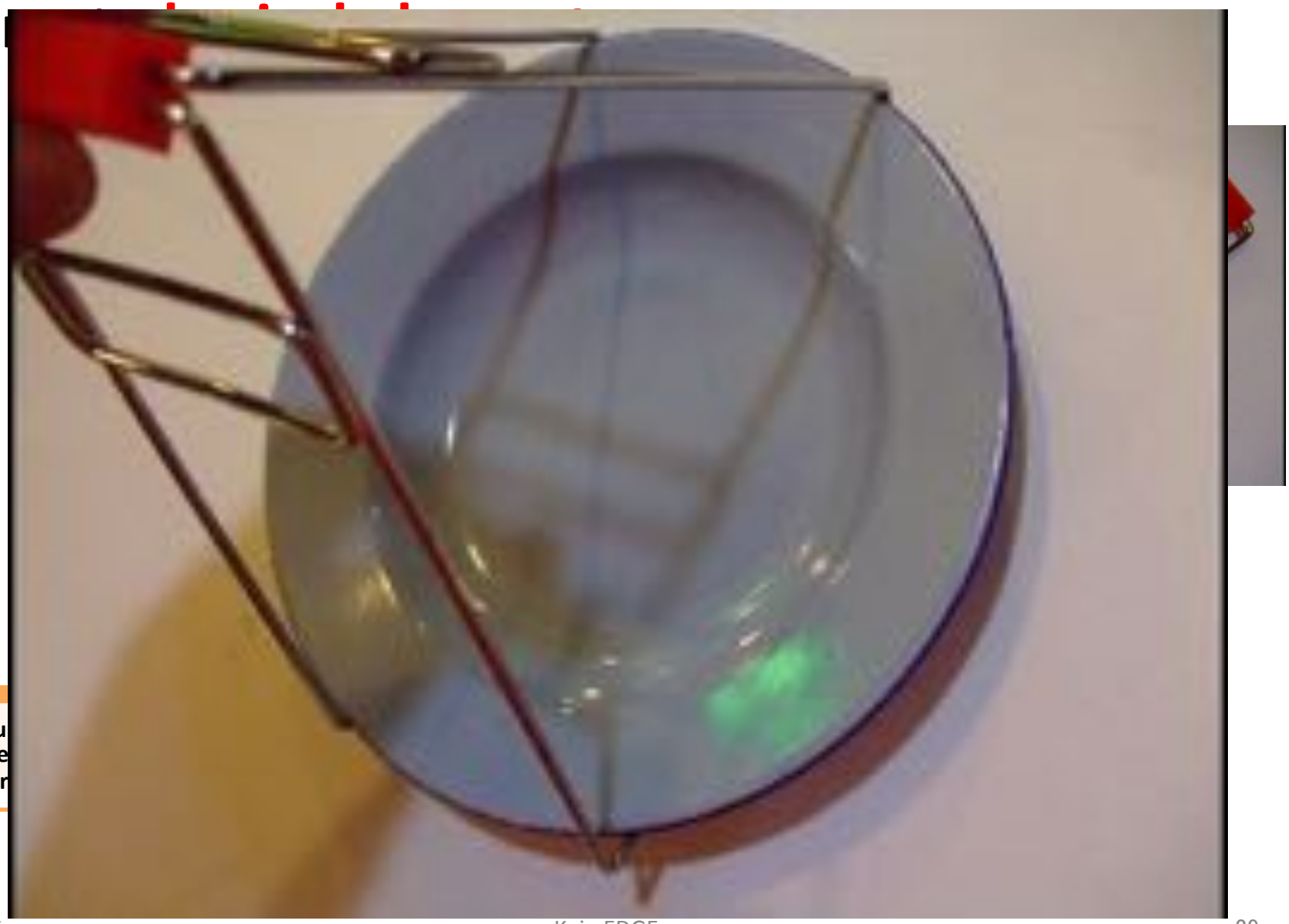
Fur
inter
finger

Same **functional element** but different **physical element**





Same **functional element** but



Fu
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finger

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