THE HONG KONG POLYTECHNIC UNIVERSITY
香港理工大學

KMIRC 知識管理及創新研究中心
Knowledge Management and Innovation Research Centre

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Innovative Experience

Knowledge Elicitation and Mapping in Cynefin Framework

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Introduction

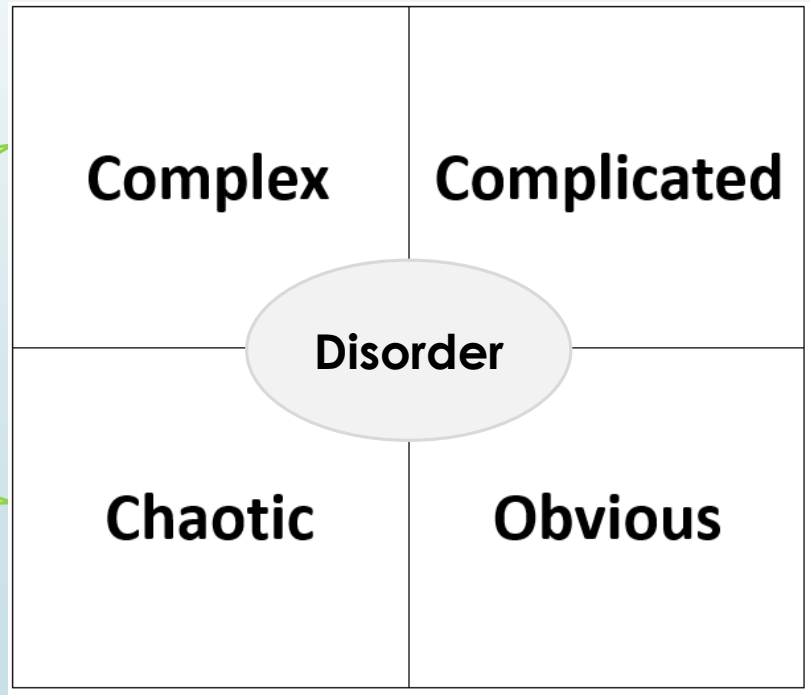
No "one-size-fits-all" solution

What is the Cynefin framework?

- Developed by David J. Snowden, founder and chief scientific officer of Cognitive Edge

- Complex **un-order**
- Cause & effect coherent in retrospect

- **Hidden** order
- Cause & effect exists but **has to be discovered**
- Multiple causes may exist



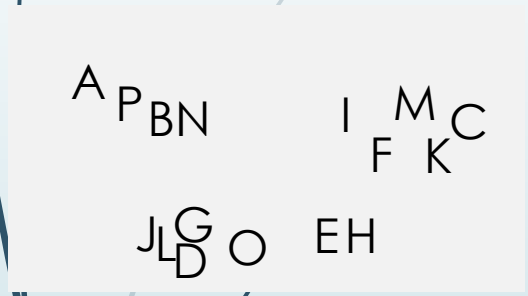
- Chaotic un-order
- **No perceivable** cause & effect

- **Known**/Stable
- Visible order
- Cause & effect readily **apparent**

(Snowden 2005; Snowden & Boone, 2007 – Harvard Business Review)

Concept Mapping in Cynefin framework

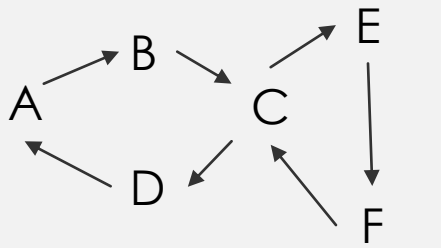
Mental Map (Sensemaking)



Risk management

Complex	Complicated
• **Probe** • **Sense** • Respond	• Sense • **Analyze** • Respond
Chaotic	**Obvious**
• **Act** • **Sense** • Respond	• Sense • **Categorize** • Respond

Causal loop diagram/ Cyclic Cmaps (non-linear)

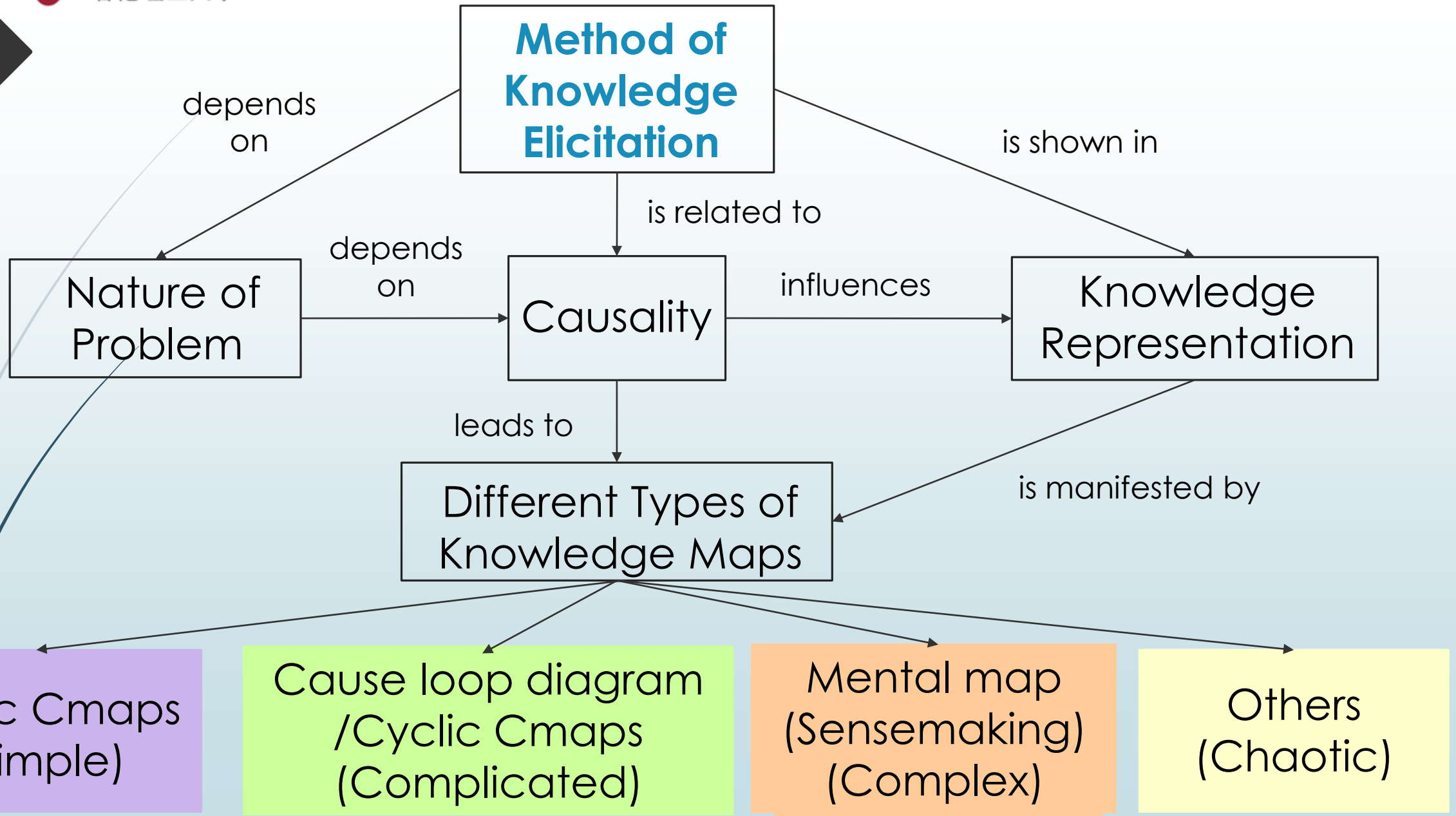


Static Cmaps (linear)

A → B → C

(Snowden 2005; Snowden & Boone,2007)

What is knowledge elicitation and mapping in Cynefin framework?


Method of Knowledge Elicitation
depends on
is related to
is shown in
Nature of Problem
depends on
Causality
influences
Knowledge Representation
leads to
Different Types of Knowledge Maps
is manifested by
Static Cmaps (Simple)
Cause loop diagram /Cyclic Cmaps (Complicated)
Mental map (Sensemaking) (Complex)
Others (Chaotic)

What have we done?

- Case 1: **Managing reliability** in an airline company
- Case 2: **Managing production problem** in an electronic goods manufacturing company
- Case 3: **Mapping team mental model** in a battery manufacturing company

Case 1: Managing reliability in an airline company

- Business objective:
  - To collect (best) practices for identifying faults in failure components

Case 1: Managing reliability in an airline company

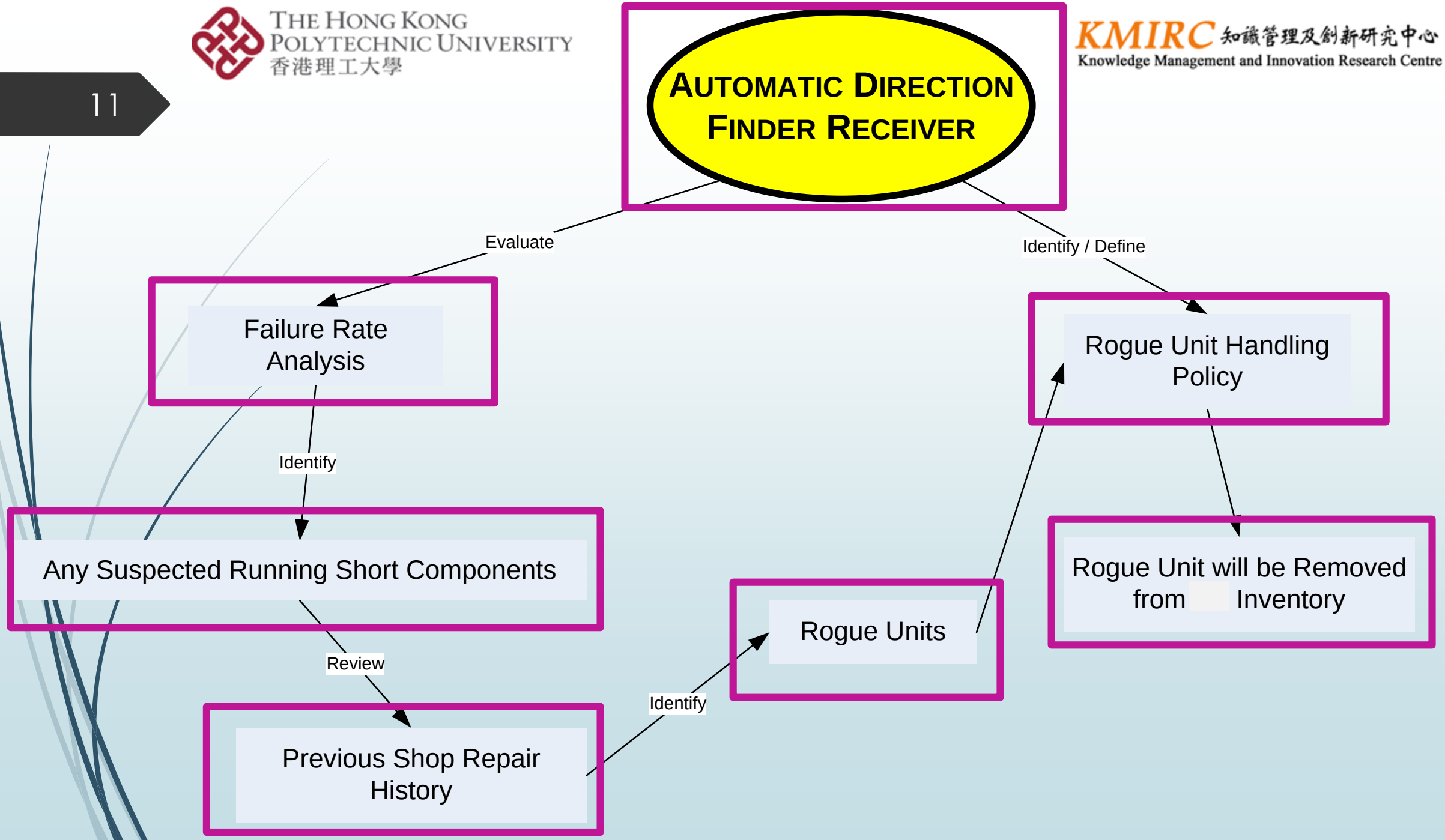
Complex	**Complicated**
Chaotic	**Obvious** • Sense • **Categorize** • Respond

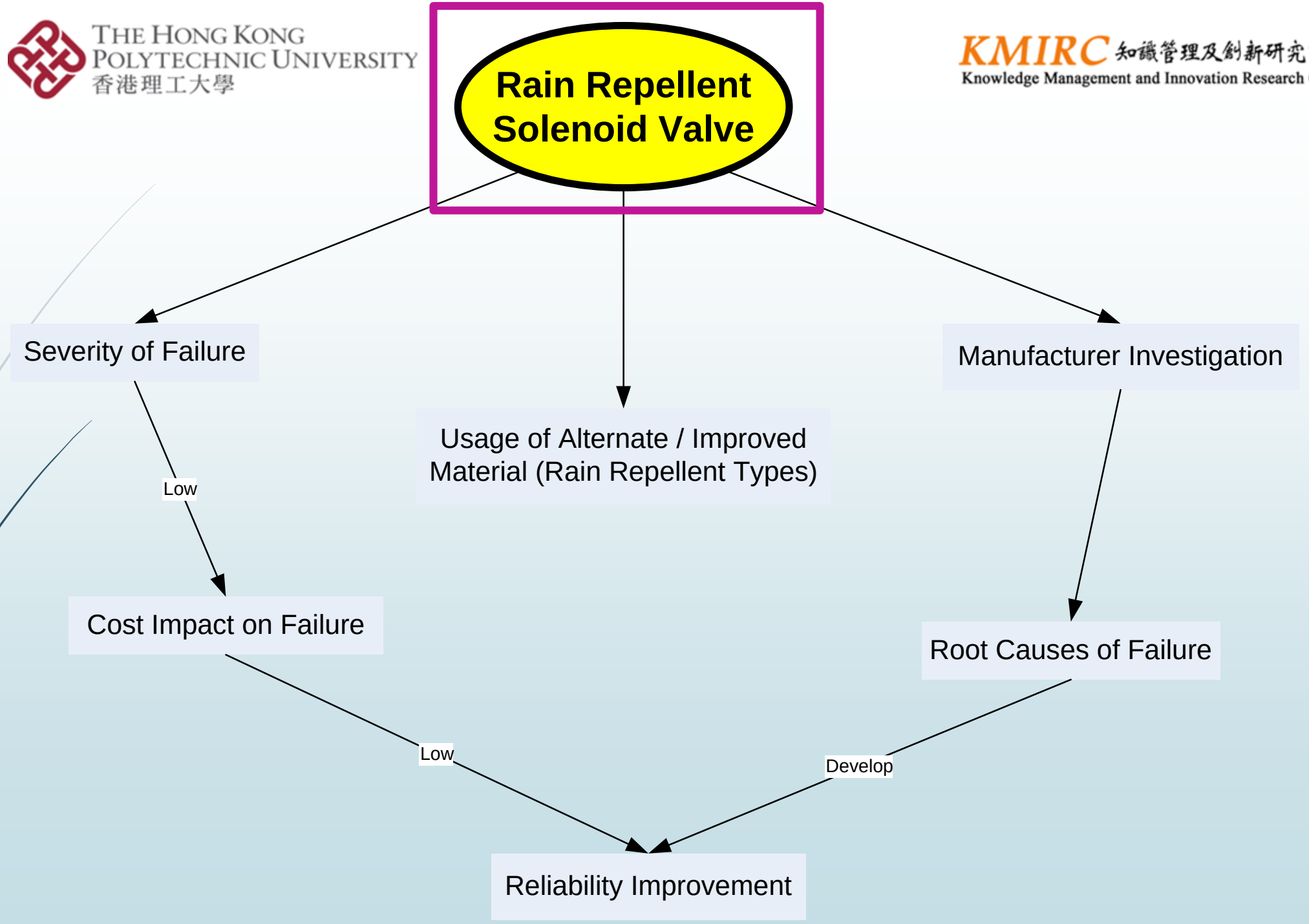
Cause & effect readily **apparent**

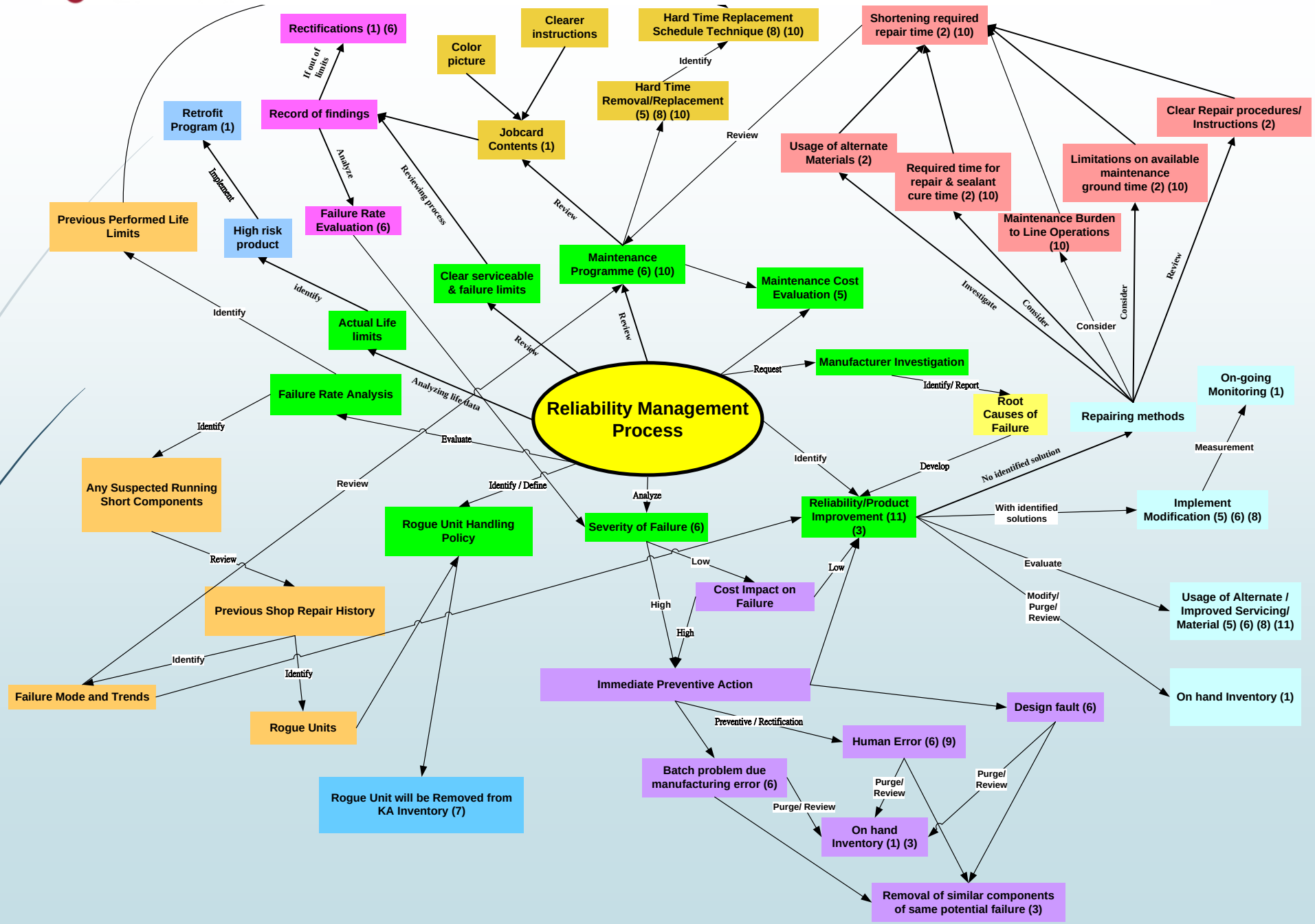
Static CMaps

Case 1: Managing reliability in an airline company

- Steps involved:
  - Frame questions for interview
  - Conduct **narrative interview**
  - Extract key points
  - Build **static Cmaps**
  - **Aggregate** static Cmaps
  - Validate data

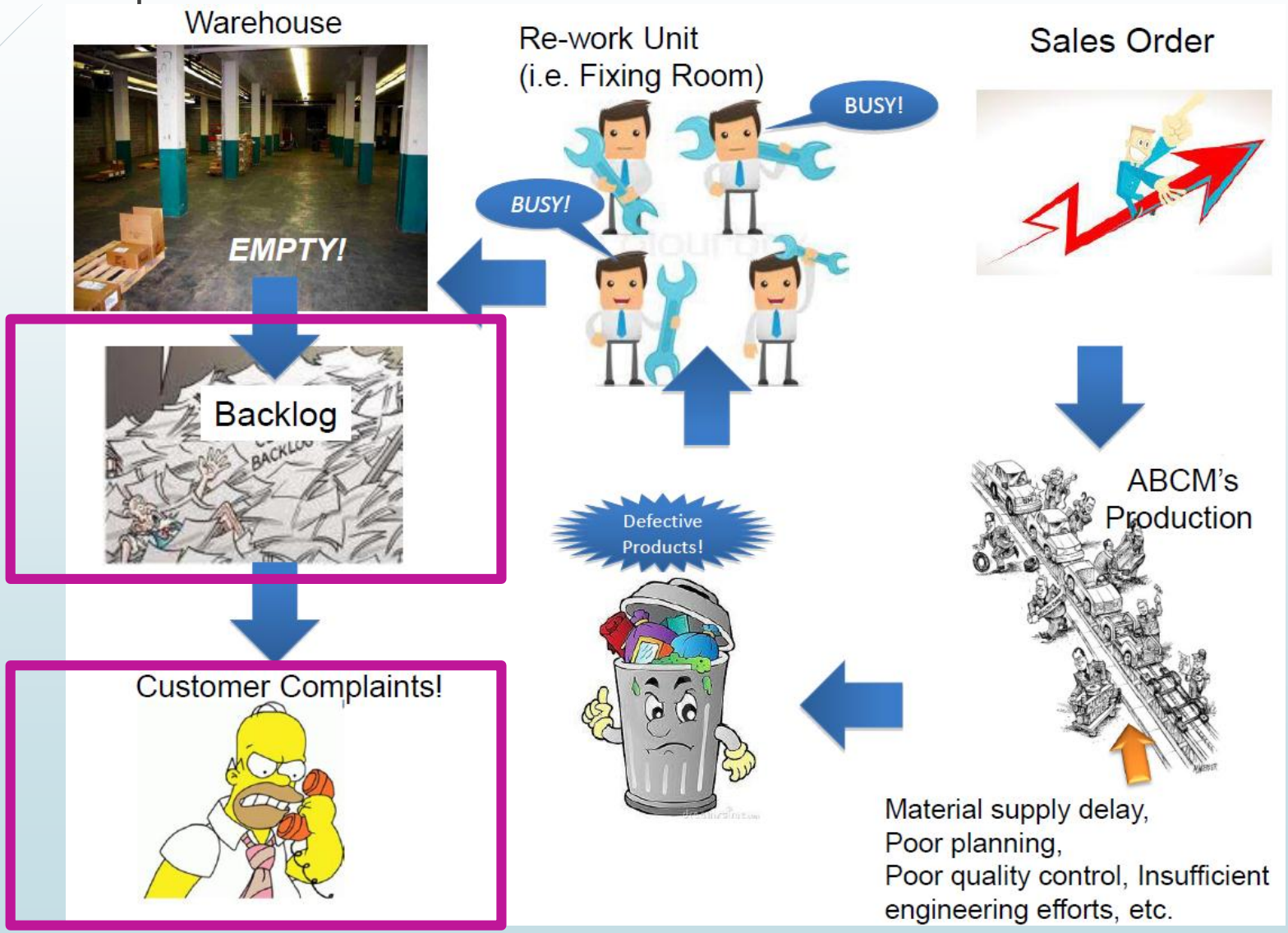

AUTOMATIC DIRECTION FINDER RECEIVER
Evaluate
Identify / Define
Failure Rate Analysis
Rogue Unit Handling Policy
Identify
Any Suspected Running Short Components
Rogue Unit will be Removed from Inventory
Review
Rogue Units
Identify
Previous Shop Repair History


Rain Repellent Solenoid Valve
Severity of Failure
Usage of Alternate / Improved Material (Rain Repellent Types)
Manufacturer Investigation
Low
Cost Impact on Failure
Root Causes of Failure
Low
Develop
Reliability Improvement


Reliability Management Process
Rectifications (1) (6)
If out of limits
Color picture
Clearer instructions
Hard Time Replacement Schedule Technique (8) (10)
Identify
Shortening required repair time (2) (10)
Retrofit Program (1)
Record of findings
Jobcard Contents (1)
Hard Time Removal/Replacement (5) (8) (10)
Review
Clear Repair procedures/ Instructions (2)
Usage of alternate Materials (2)
Required time for repair & sealant cure time (2) (10)
Limitations on available maintenance ground time (2) (10)
Implement
Analyze
Reviewing process
Review
Previous Performed Life Limits
High risk product
Failure Rate Evaluation (6)
Maintenance Burden to Line Operations (10)
Consider
Consider
Review
Investigate
Consider
Clear serviceable & failure limits
Maintenance Programme (6) (10)
Maintenance Cost Evaluation (5)
identify
Identify
Actual Life limits
Review
Review
Request
Manufacturer Investigation
Identify/ Report
Root Causes of Failure
Repairing methods
On-going Monitoring (1)
Failure Rate Analysis
Analyzing life data
Identify
Evaluate
Measurement
Identify
Develop
No identified solution
Any Suspected Running Short Components
Review
Identify / Define
Analyze
Reliability/Product Improvement (11) (3)
With identified solutions
Implement Modification (5) (6) (8)
Rogue Unit Handling Policy
Severity of Failure (6)
Low
Low
Evaluate
Review
Cost Impact on Failure
Modify/ Purge/ Review
Usage of Alternate / Improved Servicing/ Material (5) (6) (8) (11)
Previous Shop Repair History
High
High
Identify
Identify
Failure Mode and Trends
Immediate Preventive Action
On hand Inventory (1)
Design fault (6)
Rogue Units
Preventive / Rectification
Human Error (6) (9)
Rogue Unit will be Removed from KA Inventory (7)
Batch problem due manufacturing error (6)
Purge/ Review
Purge/ Review
Purge/ Review
On hand Inventory (1) (3)
Removal of similar components of same potential failure (3)

Case 2: Managing production problem in an electronic goods manufacturing company

- Business problems:



Case 2: Managing production problem in an electronic goods manufacturing company

Complex	**Complicated** • Sense • **Analyze** • Respond
Chaotic	**Obvious**

Multiple causes may exist

Causal loop diagram/ Cyclic CMaps

Case 2: Managing production problem in an electronic goods manufacturing company

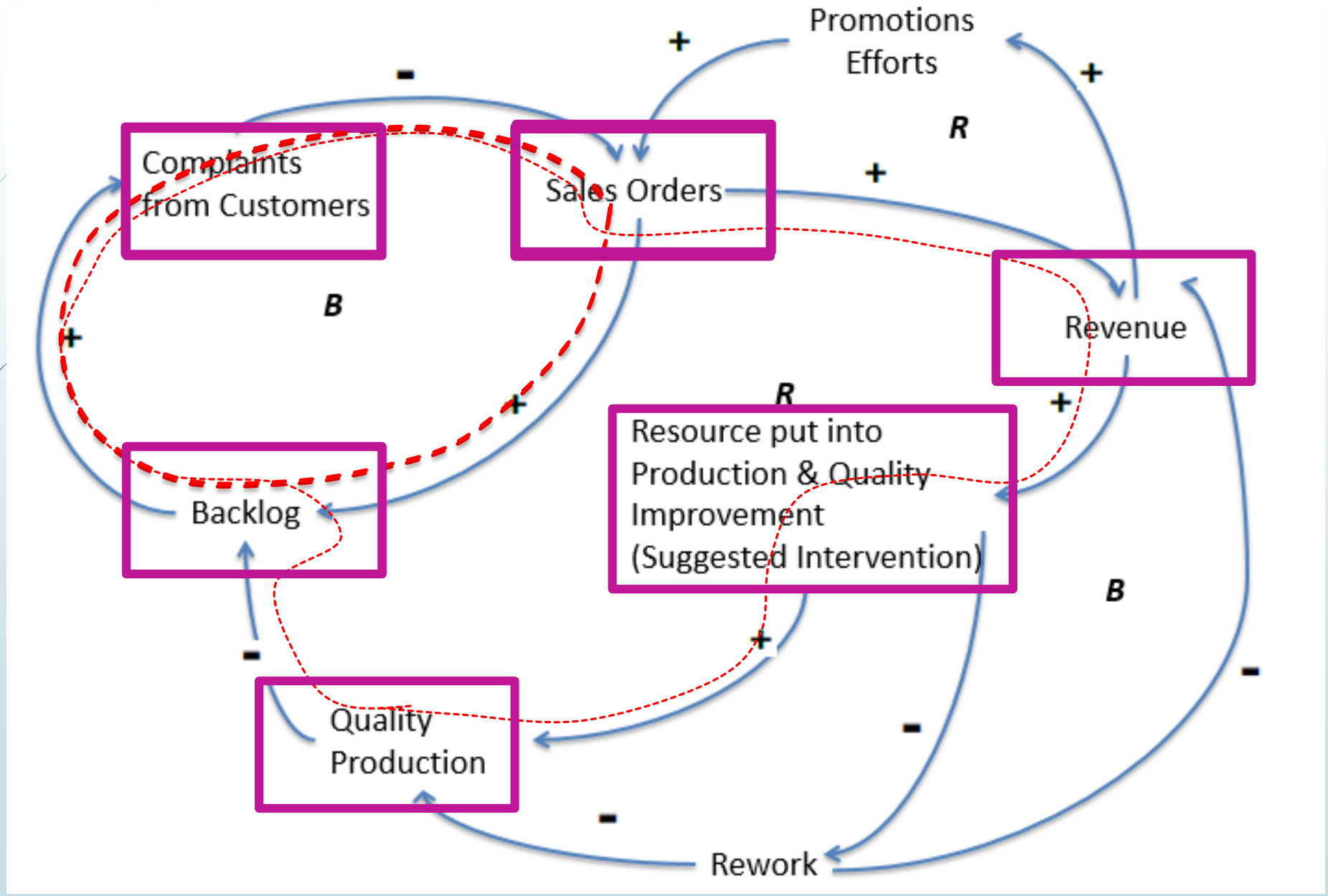
- Business objective:
  - To identify good practices of solving backlog to decrease customer complaints

Case 2: Managing production problem in an electronic goods manufacturing company

- Steps involved:
  - Investigate the **reasons** causing the issues
  - Identify **variables** involved
  - Identify **relationship** between variables
  - Develop a **casual loop diagram**

Case 2: Managing production problem in an electronic goods manufacturing company

- Investigate the **reasons** causing the issues:
  - Late delivery of material supply
  - Poor quality control (defective products are found only at the final stage of testing) etc.
- Identify **variables** involved
  - Sales orders
  - Number of complaints from customers
  - Revenues
  - Backlog etc.


Promotions Efforts
R
Complaints from Customers
Sales Orders
B
Revenue
R
Resource put into Production & Quality Improvement (Suggested Intervention)
B
Backlog
Quality Production
Rework

Case 3: Mapping team mental model in a battery manufacturing company

- Business objective:
  - To map a team mental model for six sigma teams

Case 3: Mapping team mental model in a battery manufacturing company

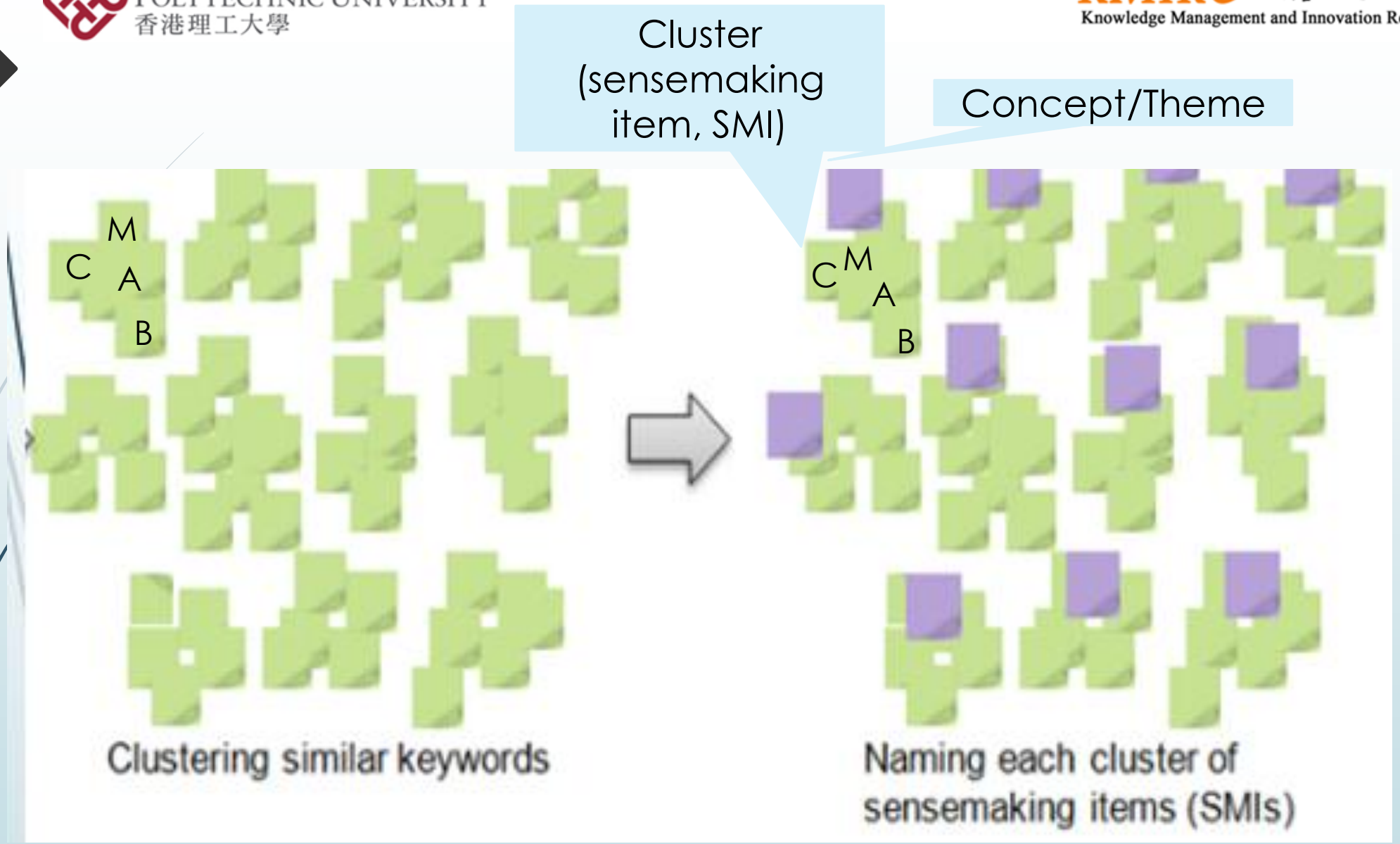
Complex
un-order

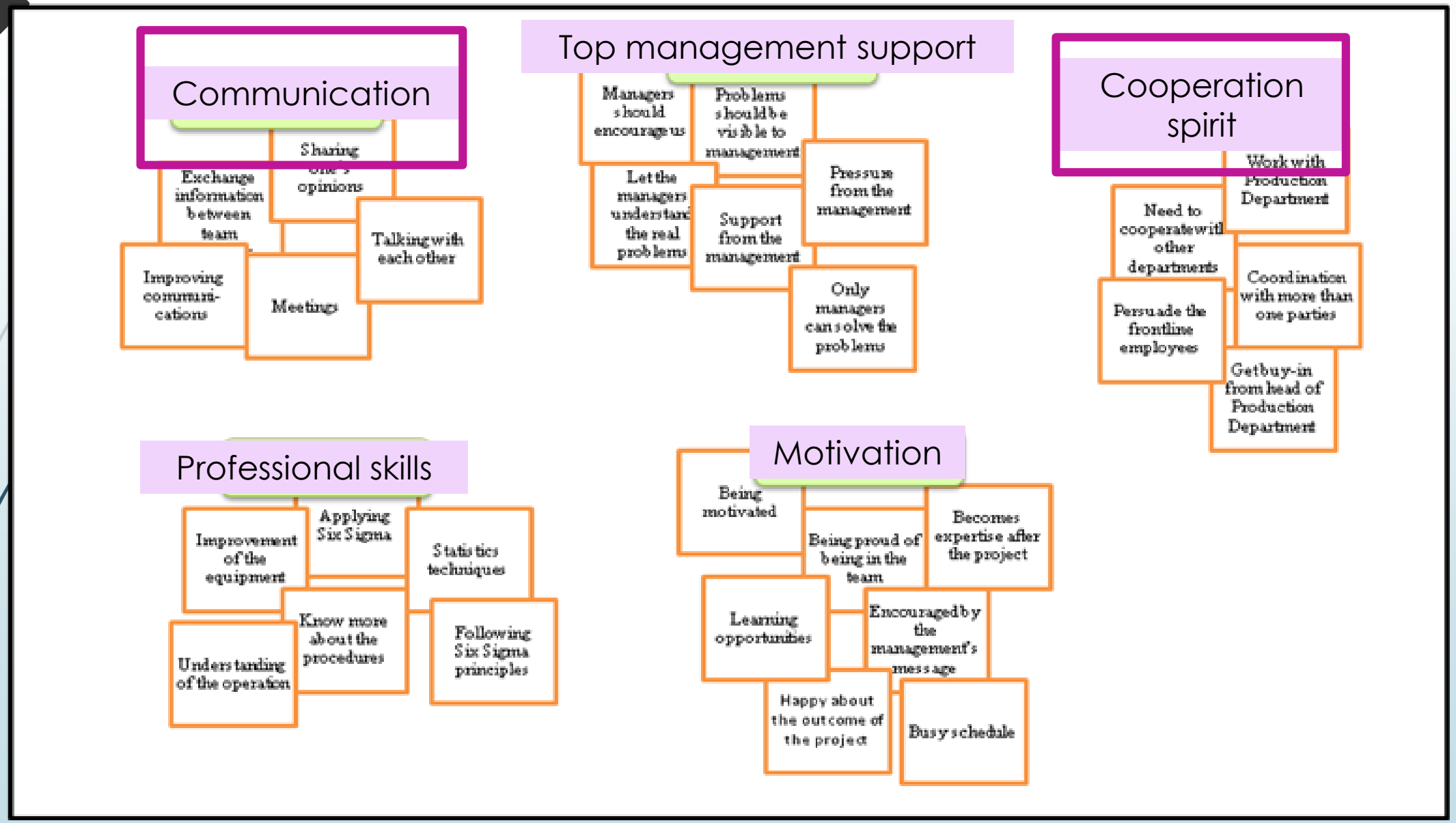
Mental map
(Sensemaking)

Complex • **Probe** • **Sense** • Respond	**Complicated**
Chaotic	**Obvious**

Case 2: Mapping team mental model in a battery manufacturing company

- Steps involved in the sensemaking workshop:
  - Free discussion among staff
  - Storytelling
  - Identify keywords from stories
  - Group keywords into meaningful clusters
  - Name each cluster


Cluster (sensemaking item, SMI)
Concept/Theme
C
M
A
B
Clustering similar keywords
Naming each cluster of sensemaking items (SMIs)


Communication
Exchange information between team
Sharing opinions
Improving communi-cations
Meetings
Talking with each other
Top management support
Managers should encourage us
Problems should be visible to management
Let the managers understand the real problems
Support from the management
Pressure from the management
Only managers can solve the problems
Cooperation spirit
Work with Production Department
Need to cooperate with other departments
Coordination with more than one parties
Persuade the frontline employees
Get buy-in from head of Production Department
Professional skills
Improvement of the equipment
Applying Six Sigma
Statistics techniques
Know more about the procedures
Following Six Sigma principles
Understanding of the operation
Motivation
Being motivated
Being proud of being in the team
Becomes expertise after the project
Learning opportunities
Encouraged by the management's message
Happy about the outcome of the project
Busy schedule

What have we learnt from the cases?

- Case 1 – **Managing reliability** in an airline company:
  - Static Cmaps can help
    - **document** the information and decision flow
    - **visually present** the relationships and dependencies
    - assist the **standardization** of reliability management process

What have we learnt from the cases?

- Case 2 – **Managing production problem** in an electronic goods manufacturing company:
  - Avoid **linear** thinking
  - Every variable are **inter-related**.
  - There can be **multiple causes** leading to a single event.
  - Cause-and-effect relationships can be **cyclic**.

What have we learnt from the cases?

- Case 3 – **Mapping team mental model** in a battery manufacturing company:
  - Sometimes one can only make sense of an event in a **given context**.
  - In many social & cultural events, solutions **have to be collectively agreed** by participants.
  - There is **no unique right or wrong** answer.

Conclusion

- Concept maps and related tools/techniques are **powerful visualization tools** to analyse different situations in the Cynefin framework for knowledge elicitation.

References

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- Snowden, D. (2005). Strategy in the context of uncertainty. *Handbook of Business Strategy*, 6(1), 47-54.
- Snowden, D. J., & Boone, M. E. (2007). A leader's framework for decision making. *Harvard business review*, *85*(11), 68.

Note:

The presentation materials of the 3 cases were based on/extracted from:

- Kwong, E., & Lee, W. B. (2006). Knowledge elicitation on reliability management in the airline industry. The 3rd Asia-Pacific International Conference on Knowledge Management. Department of Industrial and Systems Engineering of The Hong Kong Polytechnic University and Department of Information Systems of The City University
- Zou, X. T., & Lee, W.B. (2010). A study of the similarity in mental models and team performance. In *International Conference on Intellectual Capital, Knowledge Management & Organisational Learning*. Academic Publishing Limited.