

# REVERSE LOGISTICS IN SUPPLY NETWORKS: STATE-OF-THE-ART AND CHALLENGES



Anand Kulkarni, Ajith Parlikad and  
Duncan McFarlane  
ak426@cam.ac.uk

**Cambridge Auto-ID Labs**  
University of Cambridge UK

# OVERVIEW

- Background of Reverse Logistics
- Key issue: Lack of product information
- Current information collection methods in reverse logistics
- Challenges for managing product information
- The role of RFID technology in managing product information
- Discussion session - Examining the potential benefits of RFID in Reverse Logistics Management

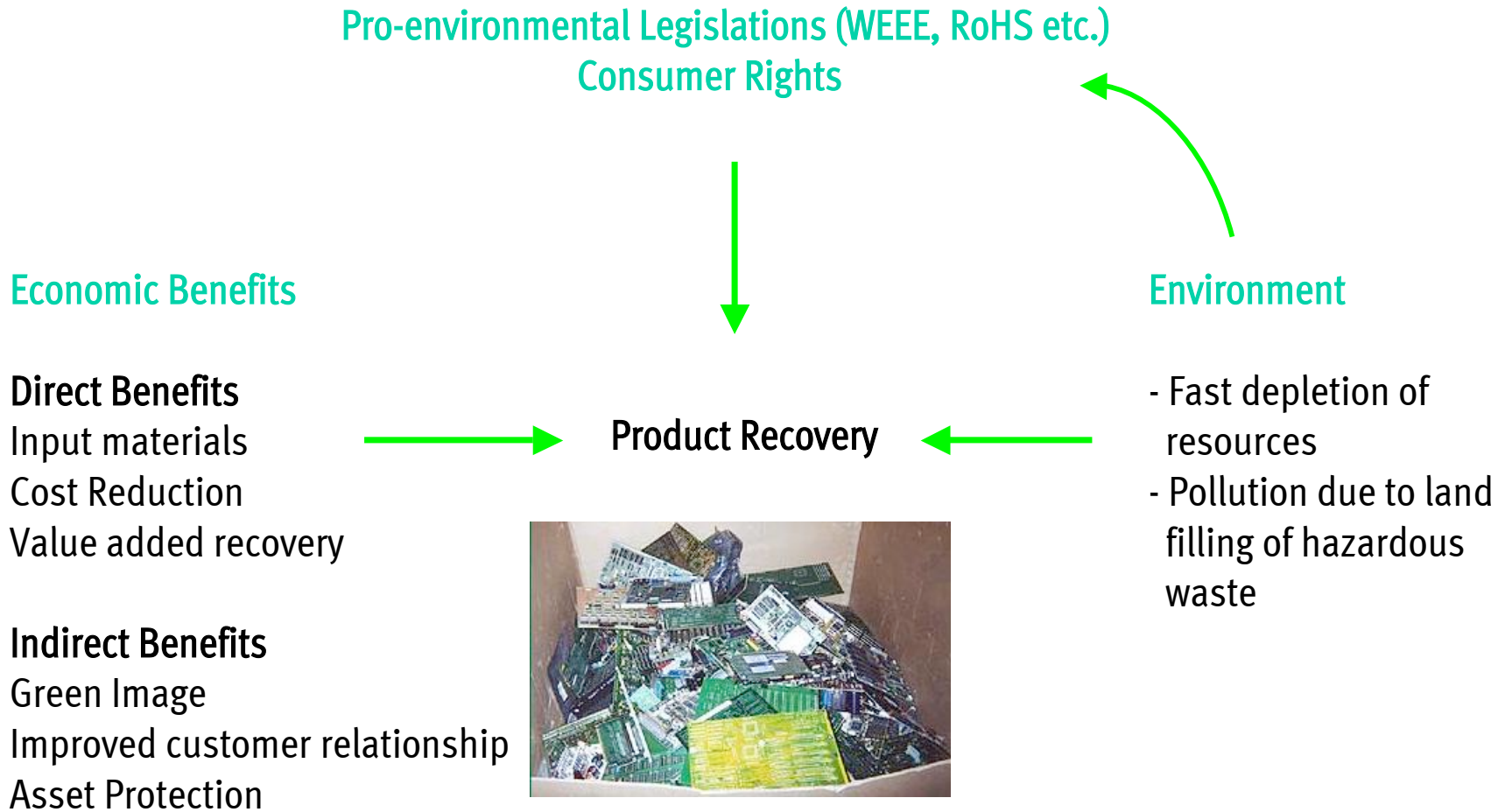
# WORKSHOP FOCUS



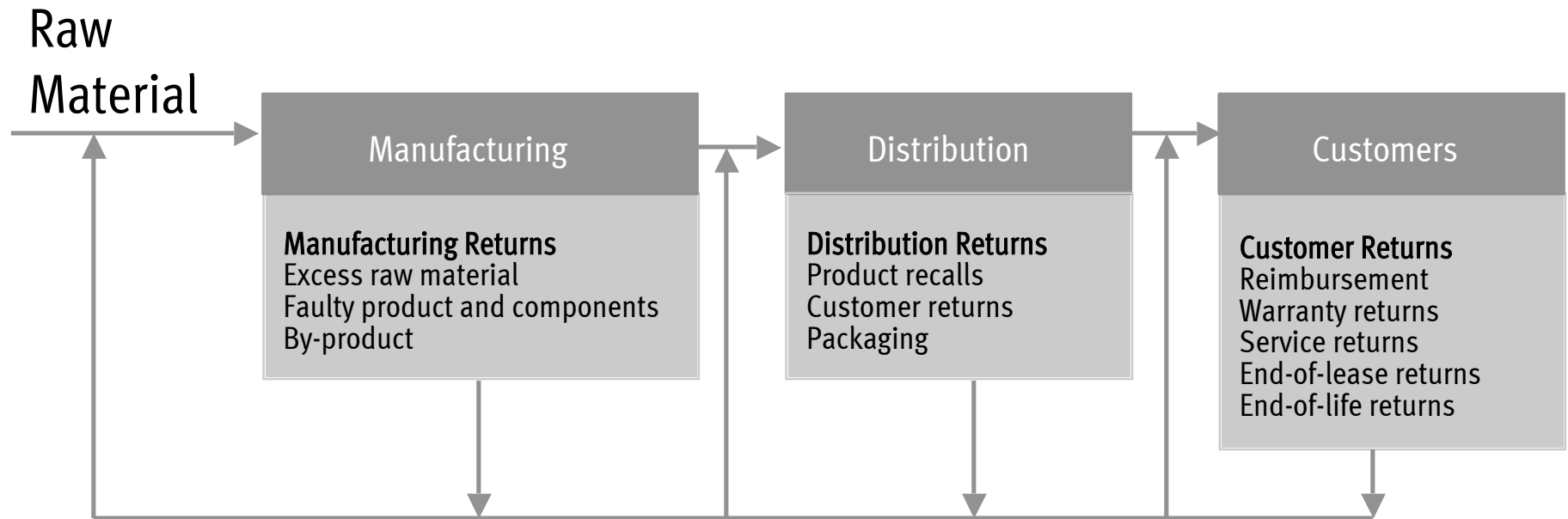
**Reverse Logistics Management -**

**Managing material and information flows of trash!**

# WHY TO MANAGE RETURNED PRODUCTS



# TYPE OF RETURNED PRODUCTS



# WHAT HAPPENS TO RETURNED PRODUCTS

Discarded products

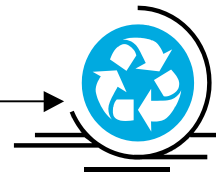


Collection



Separation

Recycling facility



Raw material reuse



Dispose



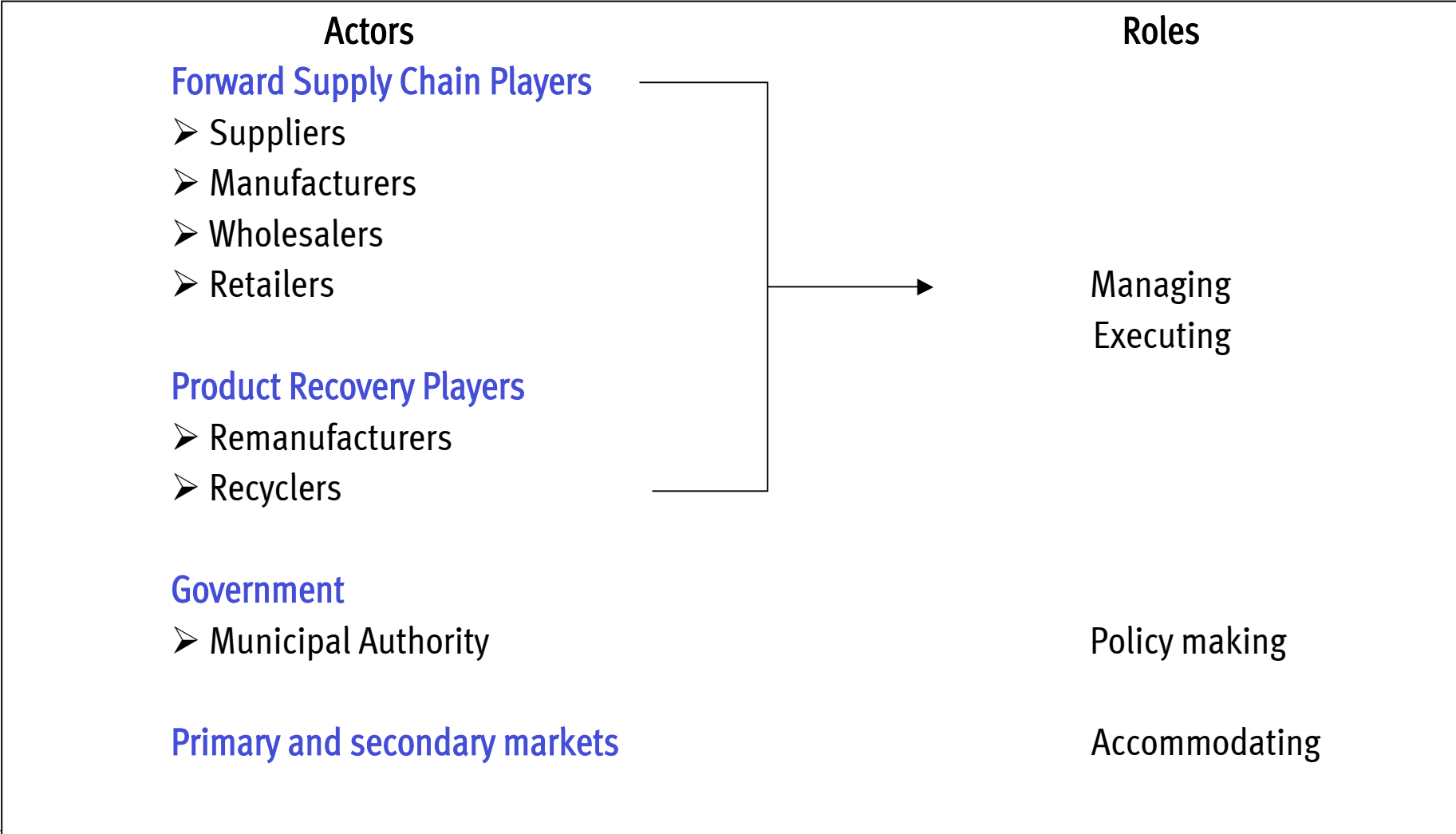
Reprocessing facility

Redistribution

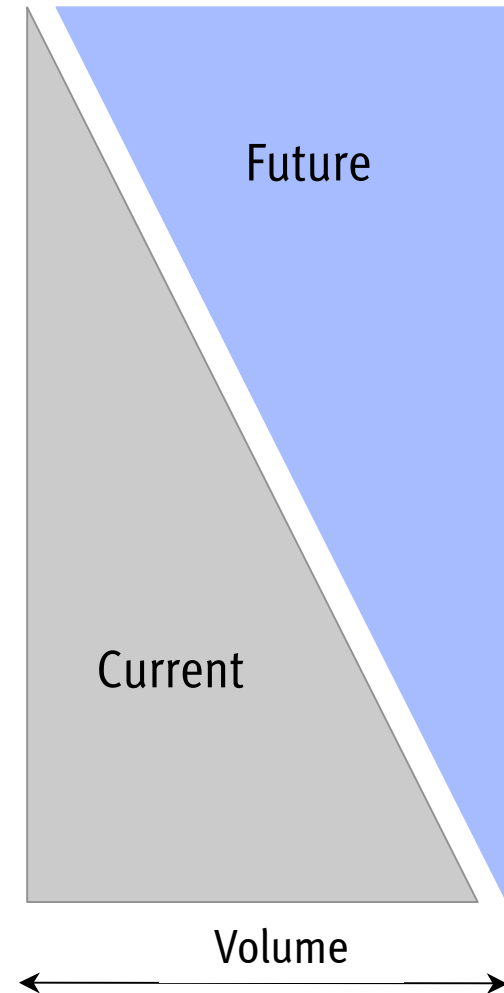
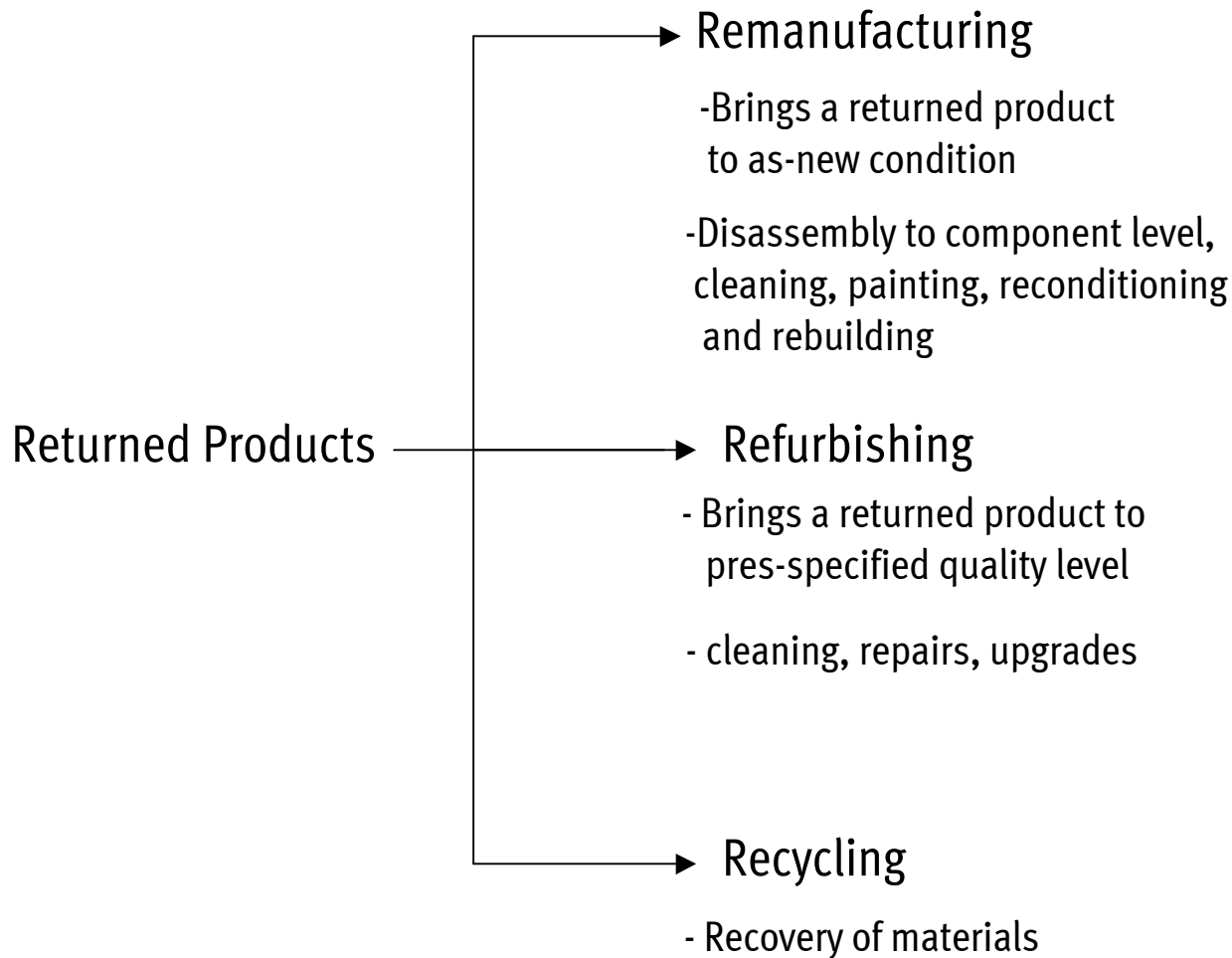


Secondary Market

# WHO MANAGES RETURNED PRODUCTS

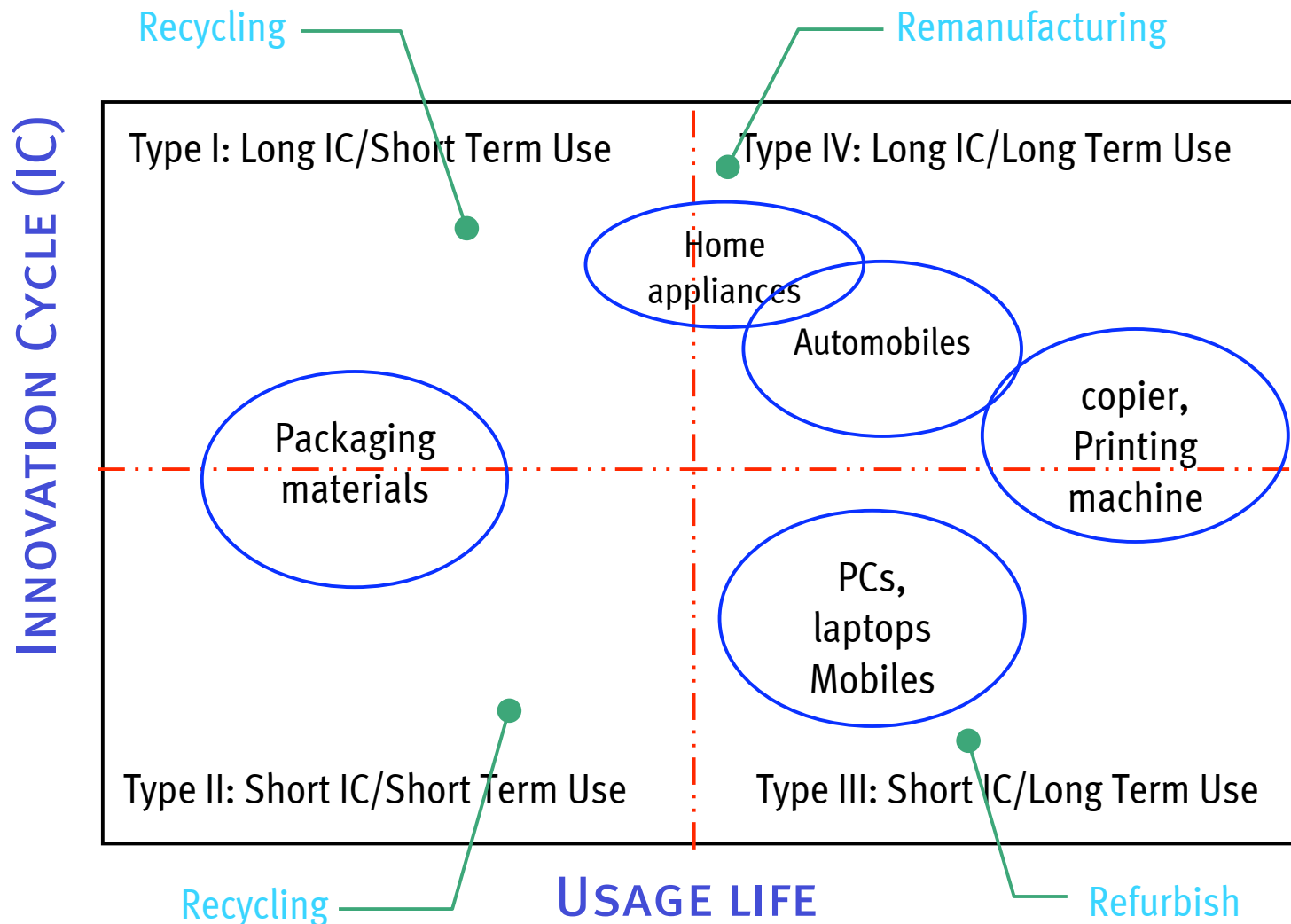


# PRODUCT RECOVERY OPTIONS

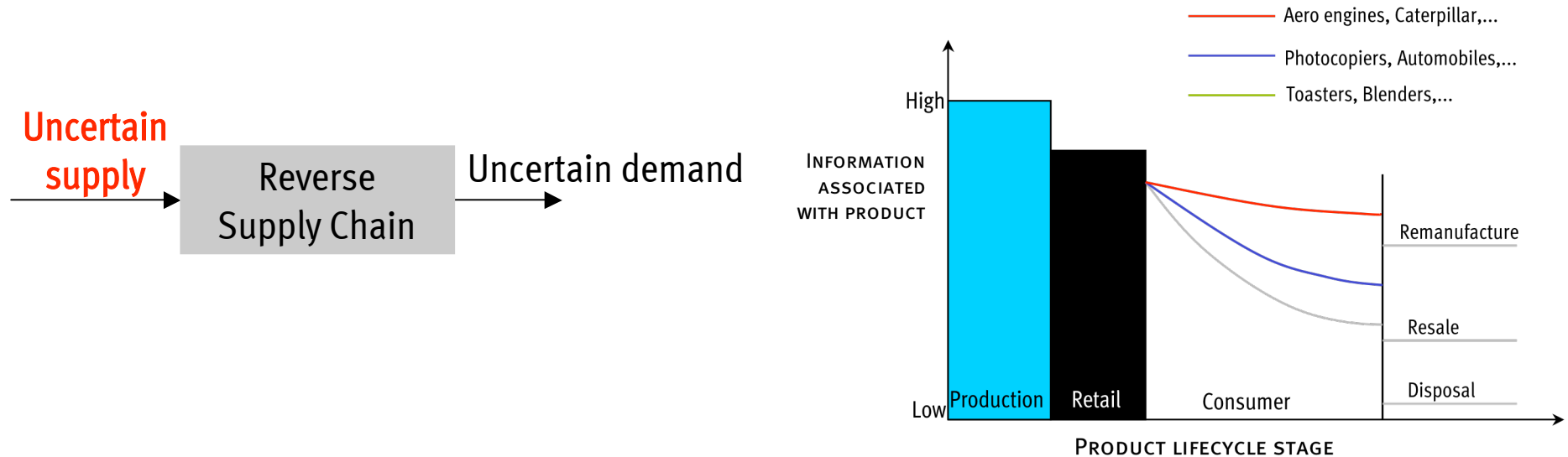




# PRODUCT CHARACTERISTICS AND PRODUCT RECOVERY OPTIONS



# KEY REVERSE SUPPLY CHAIN ISSUE: LACK OF RETURNED PRODUCT INFORMATION



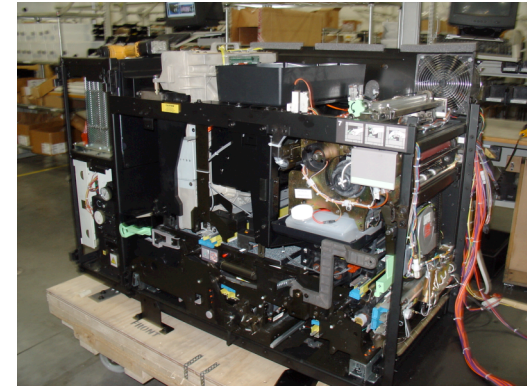
- Supply Uncertainties in terms of timing, quantity, composition and quality of returned products
  - lack of ready availability of information about returned products



A look at the European product recovery industry in order to understand current product information management issues

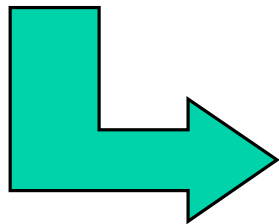
# PROFILE

- 11 companies
  - 4 computer refurbishers (UK, Germany)
  - 2 copier remanufacturer (Ireland, Netherlands)
  - 3 computer dismantlers (UK)
  - 2 fridge recyclers (UK)



# PRODUCT RECOVERY FACILITY OWNERS

- Who
  - Manufacturers
  - Third party
  - Independent

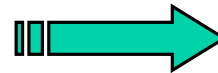


– Information availability

# TYPE OF RETURNED PRODUCTS HANDLED



- Leasing companies
- Consumer/business disposals
- Retailer/Manufacturer take back
- Warranty returns
- Municipal council collection facilities



- Quality of products
- Information availability



# WHERE AND HOW PRODUCTS ARE SOLD

- Who buys it?
  - Second-hand market
  - Schools
  - Third-world countries
  - Metal recyclers
  - Manufacturers (reuse/refurbish)
  - Leasing companies
  - Primary market
- Marketing channels used
  - Company web site
  - Internet auctions (eBay)
  - Business contacts



# Information collection

Laptop

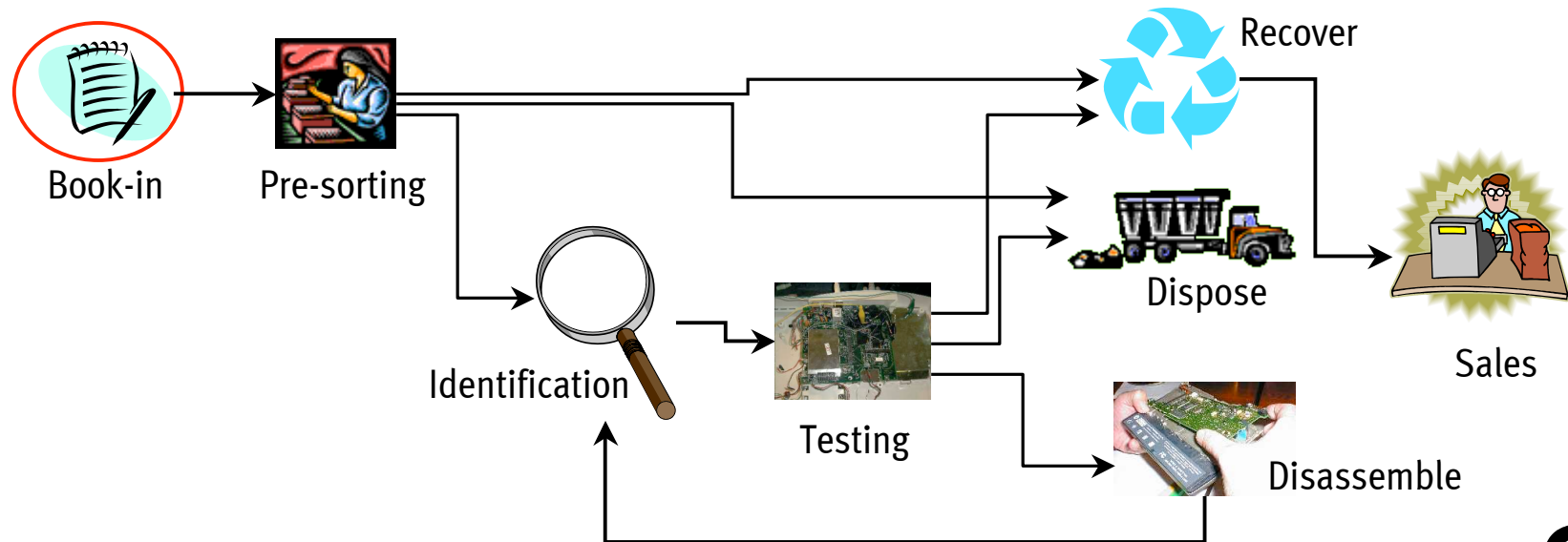
Brand: {Dell, IBM, Compaq,...}

Model: i386 ~ P4

Speed: 133Mhz ~ 4.2 GHz

HDD: 60MB ~ 200GB

Condition: {Good, Bad}





# Information collection

Laptop

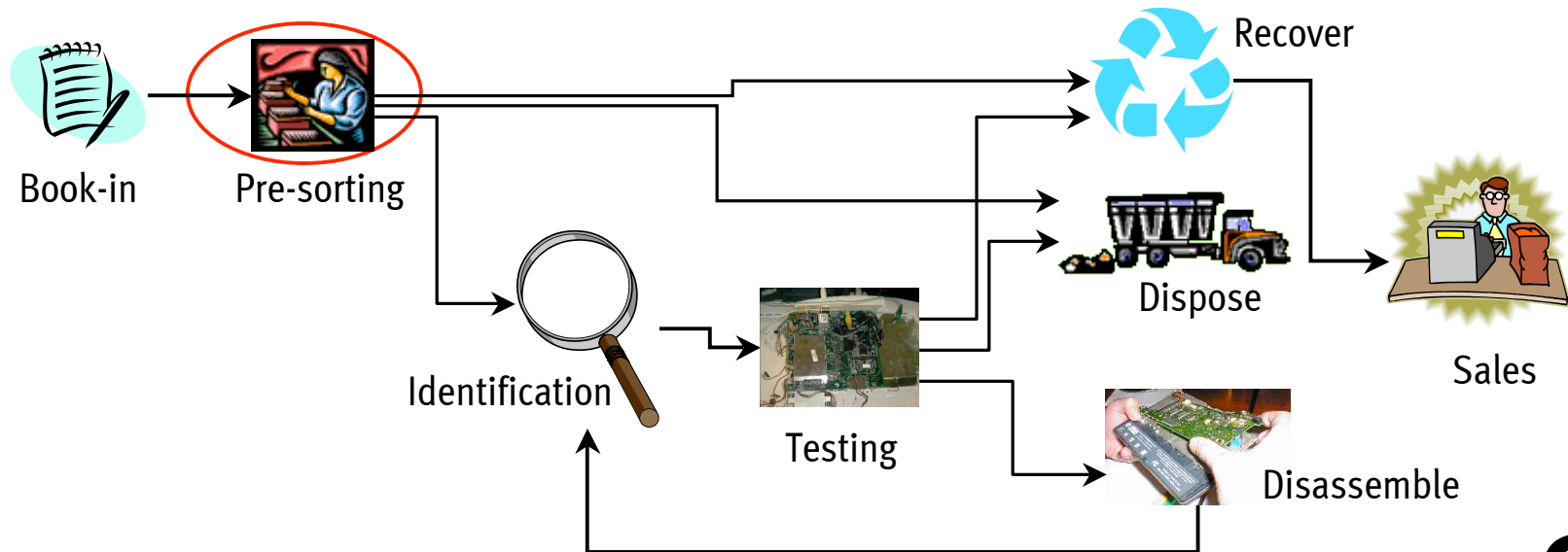
Brand: Dell

Model: P2

Speed: 200Mhz ~ 500 MHz

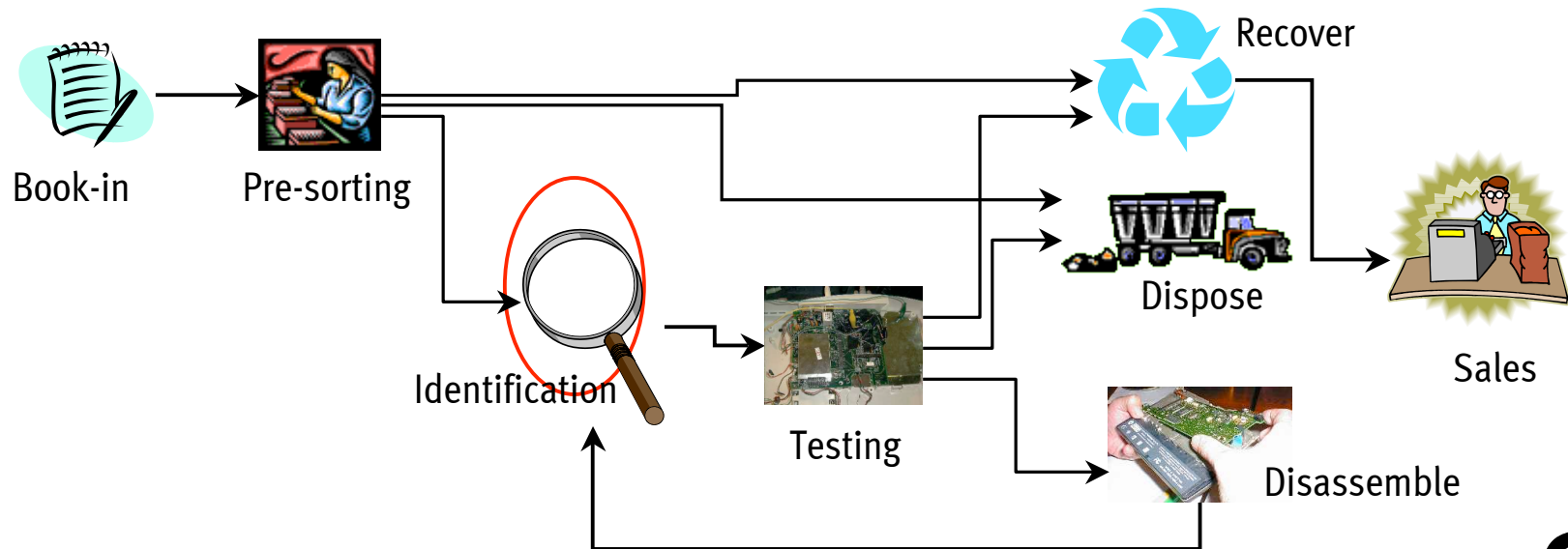
HDD: 1GB ~ 20GB

Condition: {Good, Bad}



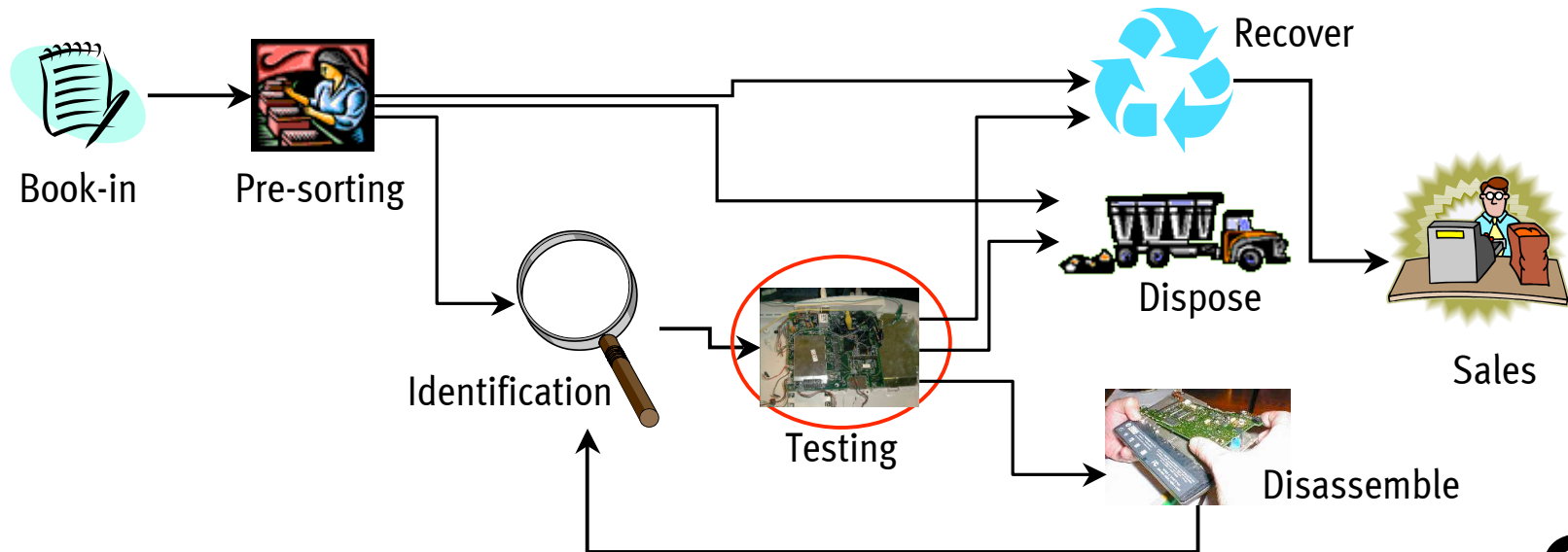
# Information collection

Laptop  
Brand: Dell  
Model: P2  
Speed: 500MHz  
HDD: 100GB (!!)  
Condition: {Good, Bad}



# Information collection

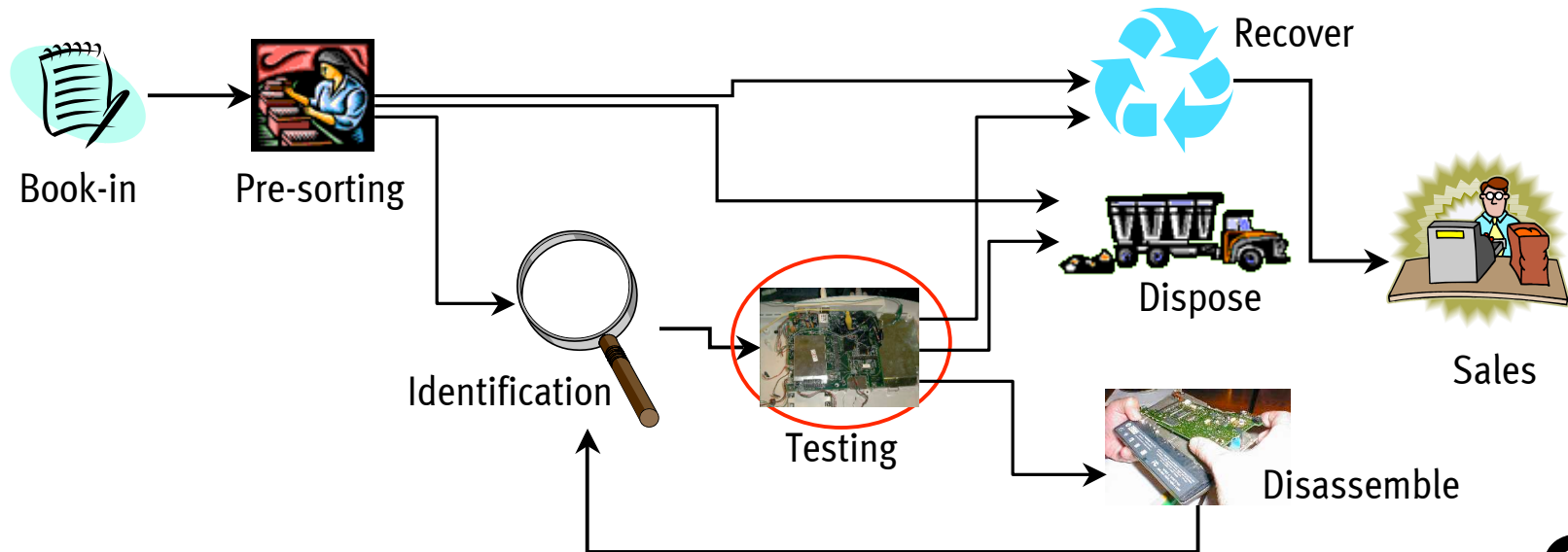
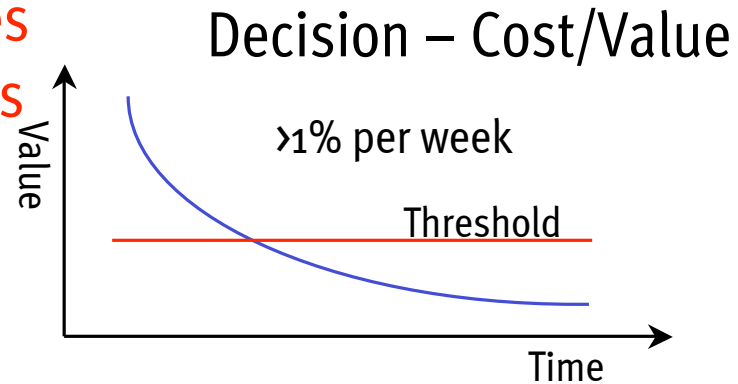
Laptop  
Brand: Dell  
Model: P2  
Speed: 500MHz  
HDD: 100GB (!!)  
Condition: Good



# Information collection

- Inefficient processes
- Ineffective decisions

Laptop  
Brand: Dell  
Model: P2  
Speed: 500MHz  
HDD: 100GB (!!)  
Condition: Good



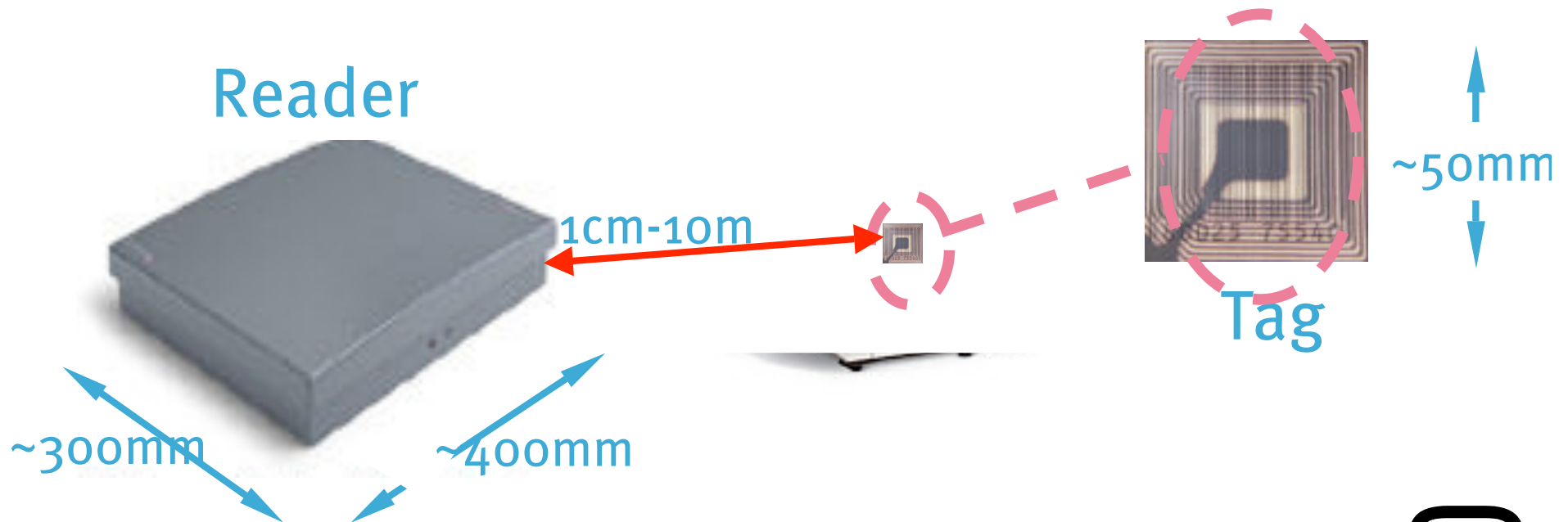
# Information Management Challenges for Returned Products



- Identifying each item uniquely
- Identifying constituent parts and materials
- Maintaining and updating information at unique item level throughout product lifecycle(manufacturing to end-of-life stages)
- Maintaining accurate information
- Accessing information easily, quickly and automatically

# RFID?

- *Radio frequency* identification
- Means of automatically identifying objects
- Two elements to RFID



# Why RFID?

- Alternative technologies
  - Barcodes (traditional and 2D)
  - Magnetic strips
  - Vision systems
- ✓ ‘Simultaneous’ identification
- ✓ Robust, reasonable operating distance
- ✓ No line of sight; automated reads
- ✗ Not as cheap as some alternatives
- ✗ Some problematic items



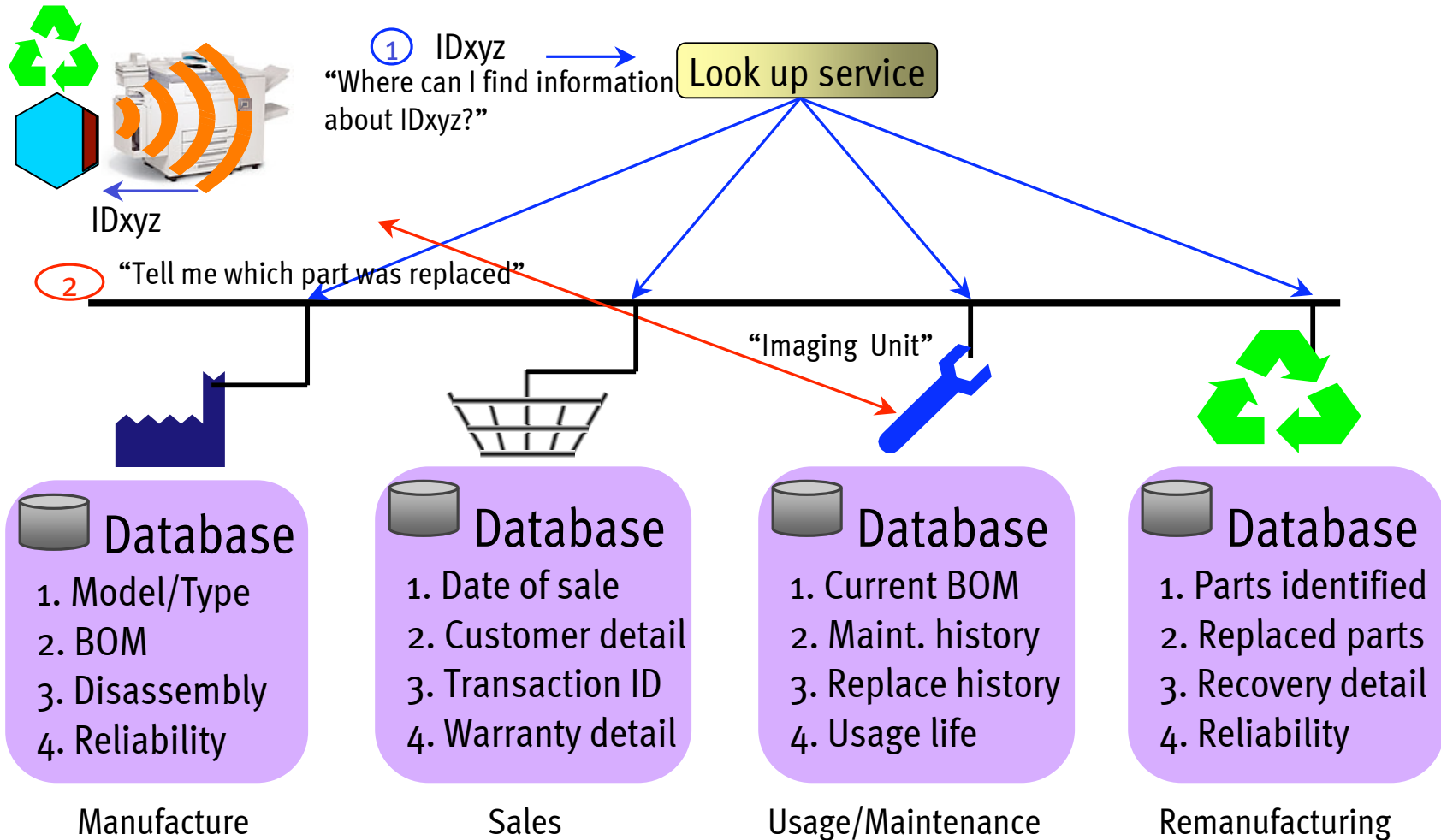
# NETWORKED RFID FOR PRODUCT LIFECYCLE INFORMATION MANAGEMENT



 RFID Tag

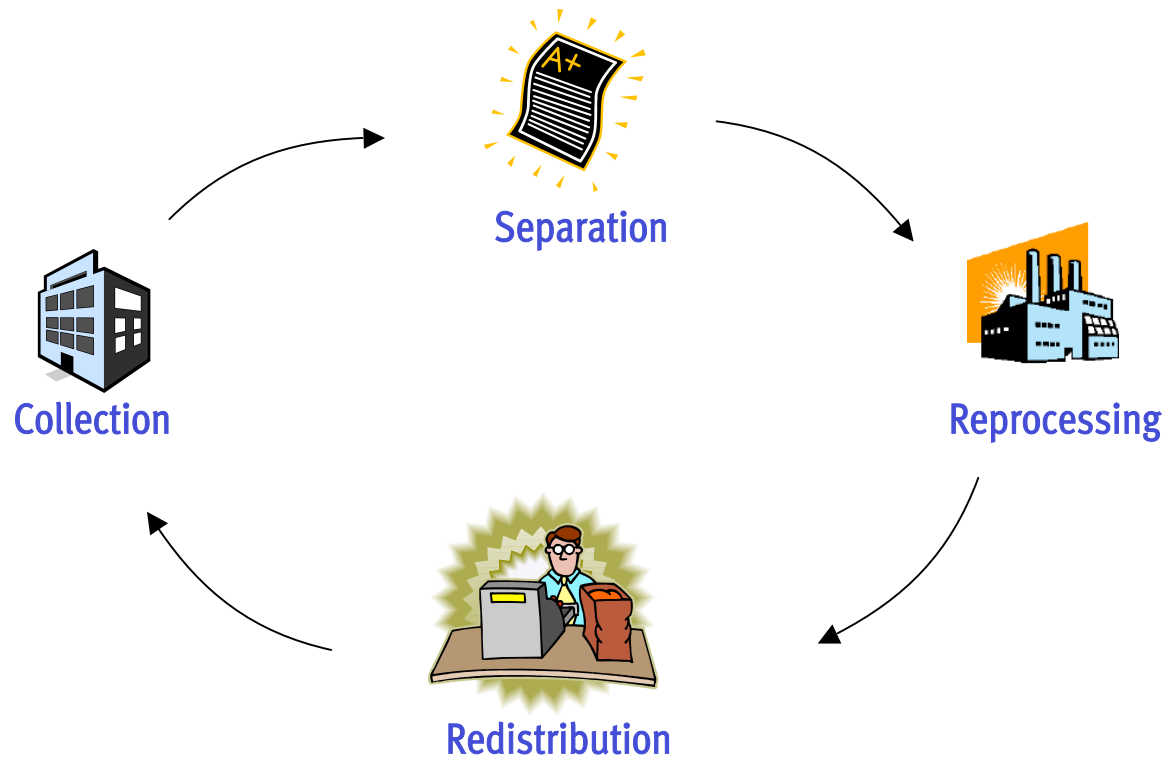


# NETWORKED RFID FOR PRODUCT INFORMATION MANAGEMENT



# Discussion session

- Theme
  - Identifying key benefits of RFID in Reverse Logistics Management



# One Possible Way

- Identify requirements of product information quality in reverse logistics
- Understand characteristics of RFID
- Map characteristics of RFID onto requirements
- Identify key benefits of RFID in collection, separation, reprocessing and redistribution

