
Improving product recovery decisions through enhanced product information

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OVERVIEW

- Introduction to the problem
- Linking product information with product recovery decisions
- Enhancing product information with “networked RFID”
- Improving product recovery decisions with enhanced product information
- Conclusions

THE PROBLEM



Government Regulations

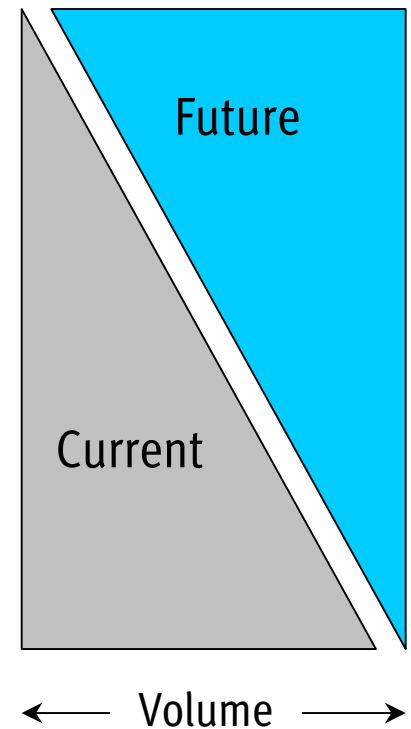
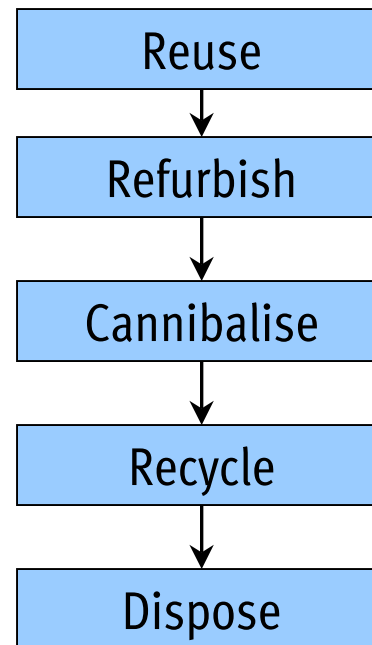
- WEEE Directive
- RoHS Directive

Other financial benefits...



WHAT CAN BE DONE?

- Recycle
 - Not cost-effective
 - Not environment-friendly
- Refurbish/Reuse
 - Desired option
 - Problem: Information availability



RESEARCH QUESTION

How does **ready** availability of product information affect the effectiveness of product recovery decisions?

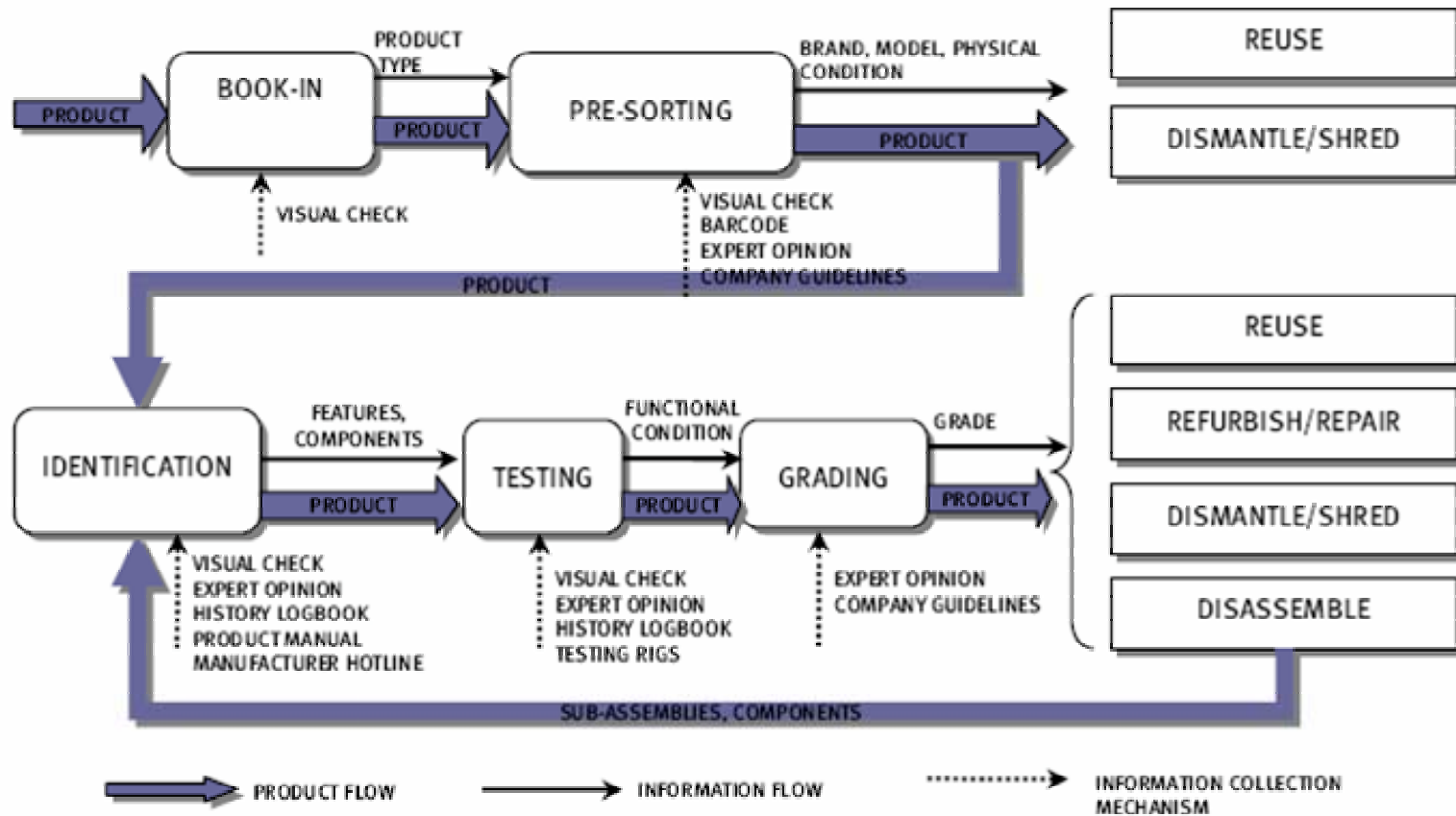
How can we quantify the impact of information availability on product recovery decisions?

CASE STUDIES

- 12 companies
 - 3 computer remanufacturers
 - 3 photocopier remanufacturers
 - 1 phone remanufacturer
 - 3 computer dismantlers
 - 2 white goods recyclers



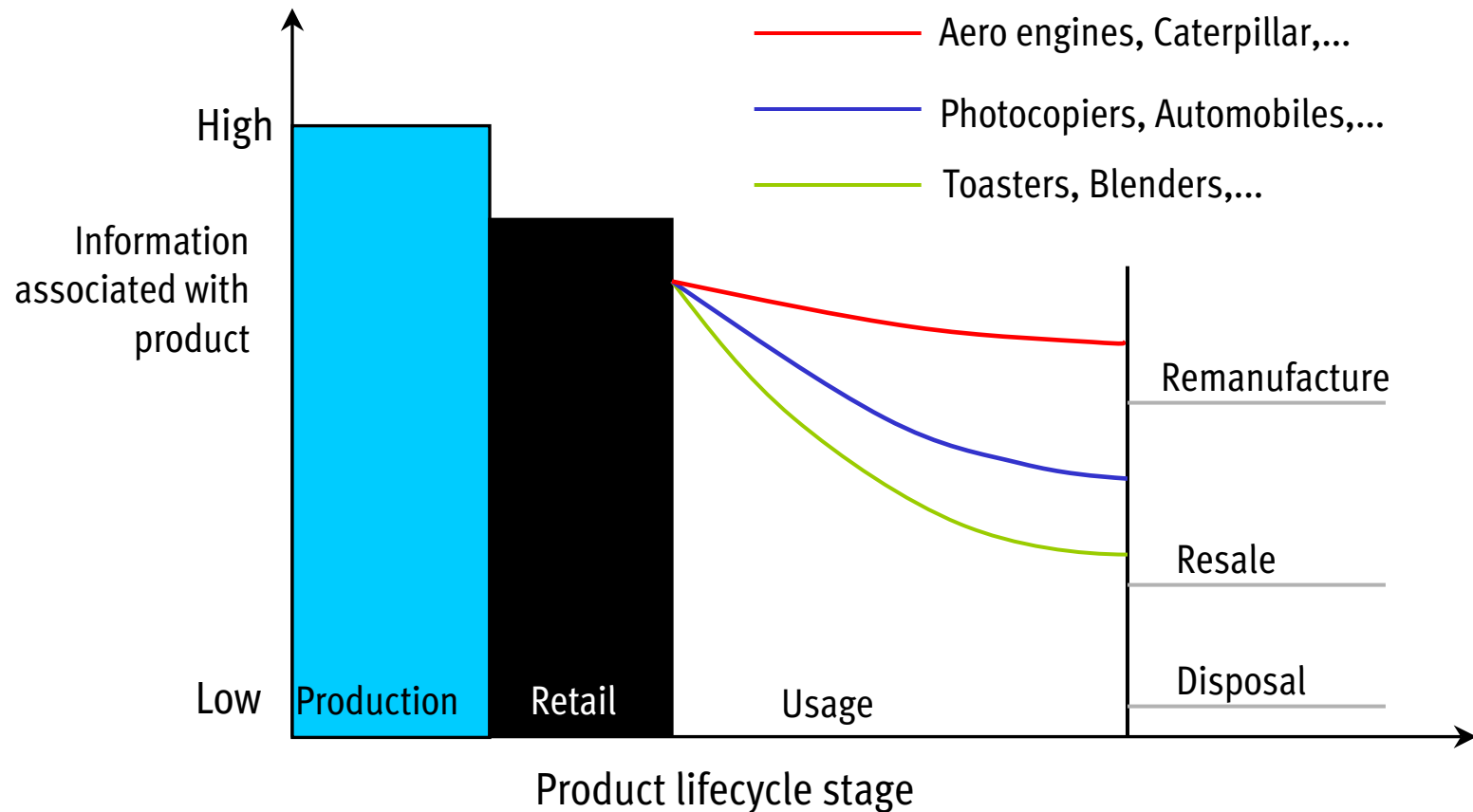
PRODUCT RECOVERY OPERATIONS



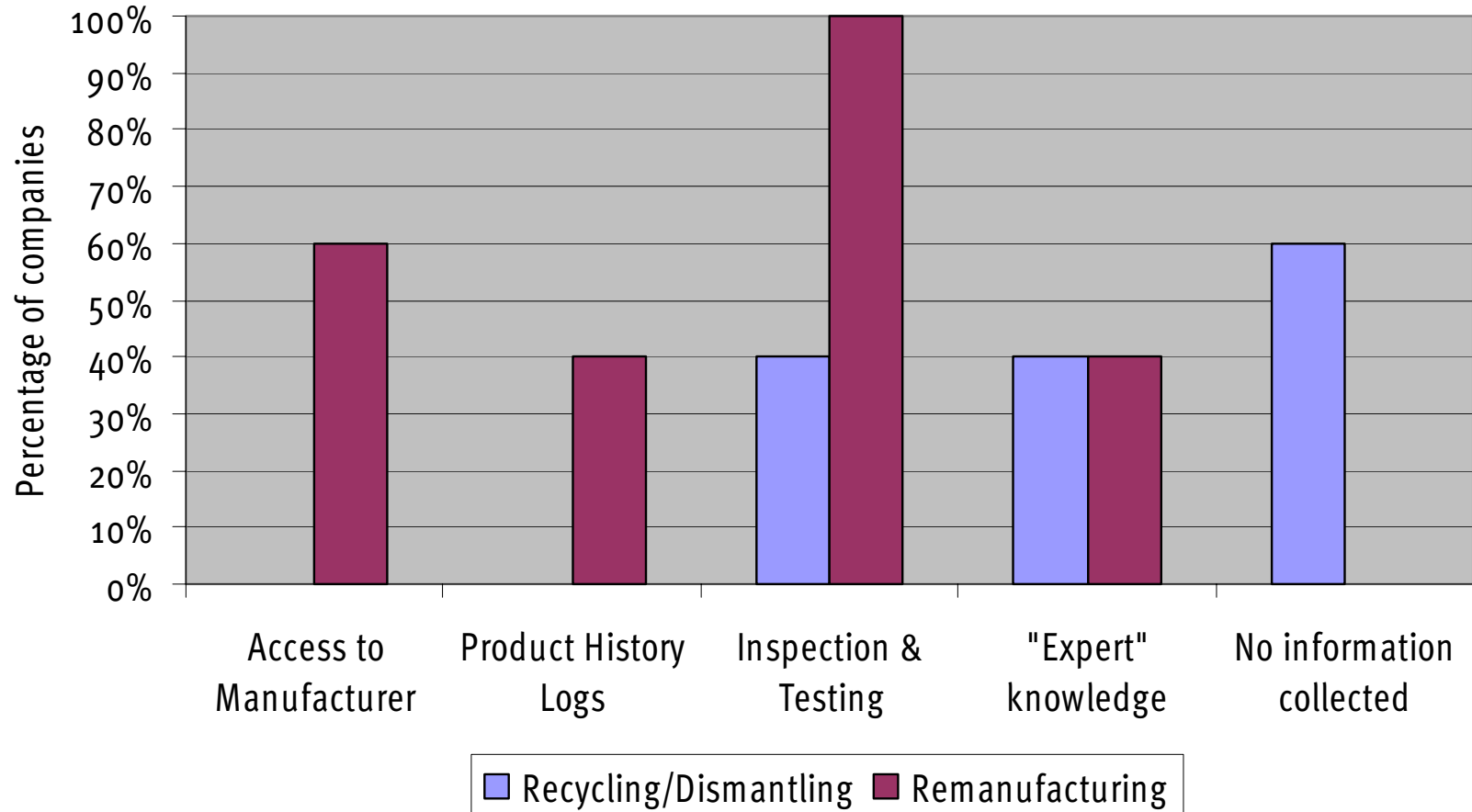
INFORMATION REQUIREMENTS

- Current specifications ('Decision enablers')
 - Material content
 - Original specifications
 - Later modifications
- Residual life ('Decision verifiers')
 - Reliability
 - Age
 - Usage
 - Maintenance
 - Current condition

INFORMATION “LOSS”



PRODUCT IDENTIFICATION



INFORMATION AVAILABILITY

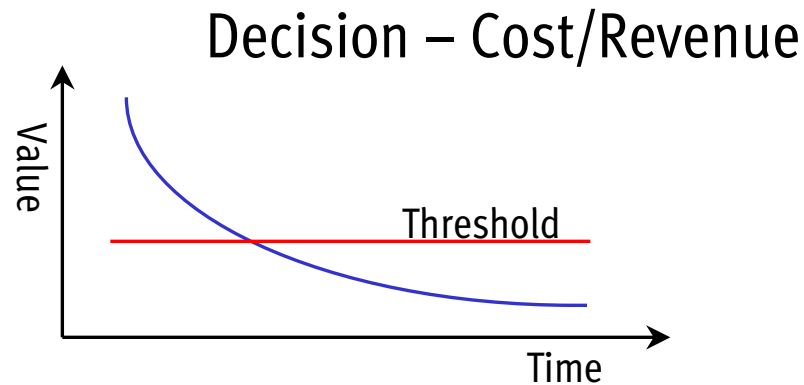
Information Required	Information availability	
	Pre-sorting	Grading
Material content	✗	depending on access to design data
Original specification	✓	✓
Later modifications	✗	✓
Reliability	✗	depending on access to design data
Age	✗	depending on access to sales & maintenance data
Current condition	✗	✓
Usage	✗	✗
Maintenance	✗	depending on the availability & accuracy of maintenance logs

LINKING PRODUCT RECOVERY DECISIONS TO INFORMATION QUALITY



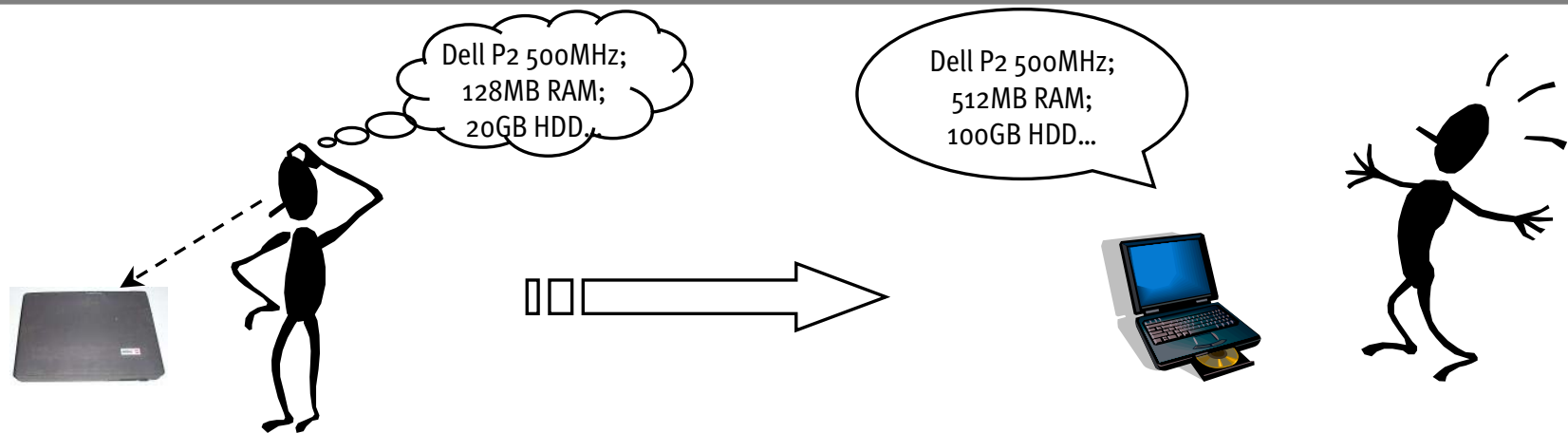
- Uniqueness
 - to enable individual information trails for each unique object throughout its lifecycle and across the whole supply chain.

LINKING PRODUCT RECOVERY DECISIONS TO INFORMATION QUALITY



- Timeliness
 - to ensure that information is readily available for decision-making and execution process with minimal need for manual inspection or testing.

LINKING PRODUCT RECOVERY DECISIONS TO INFORMATION QUALITY



- **Completeness**
 - to ensure that all relevant information is available for optimising decisions.
- **Accuracy**
 - to reduce or eliminate inaccurate representations of current and historical product information.

A NETWORKED RFID SOLUTION FOR PLM

D584.S421.CC21.AA21



F127.C238.DF1B.C7CC



CD135.EEA2.DCF5.12DD

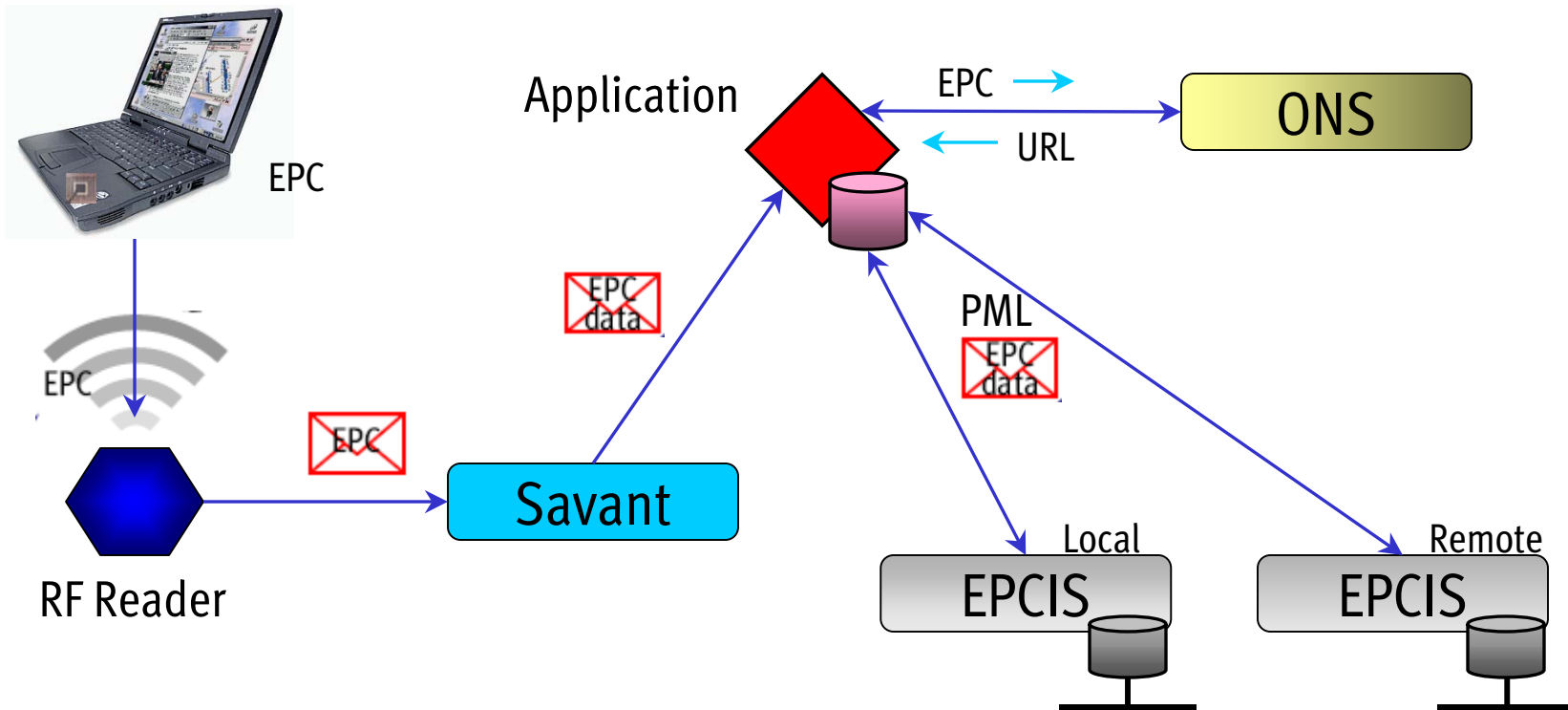


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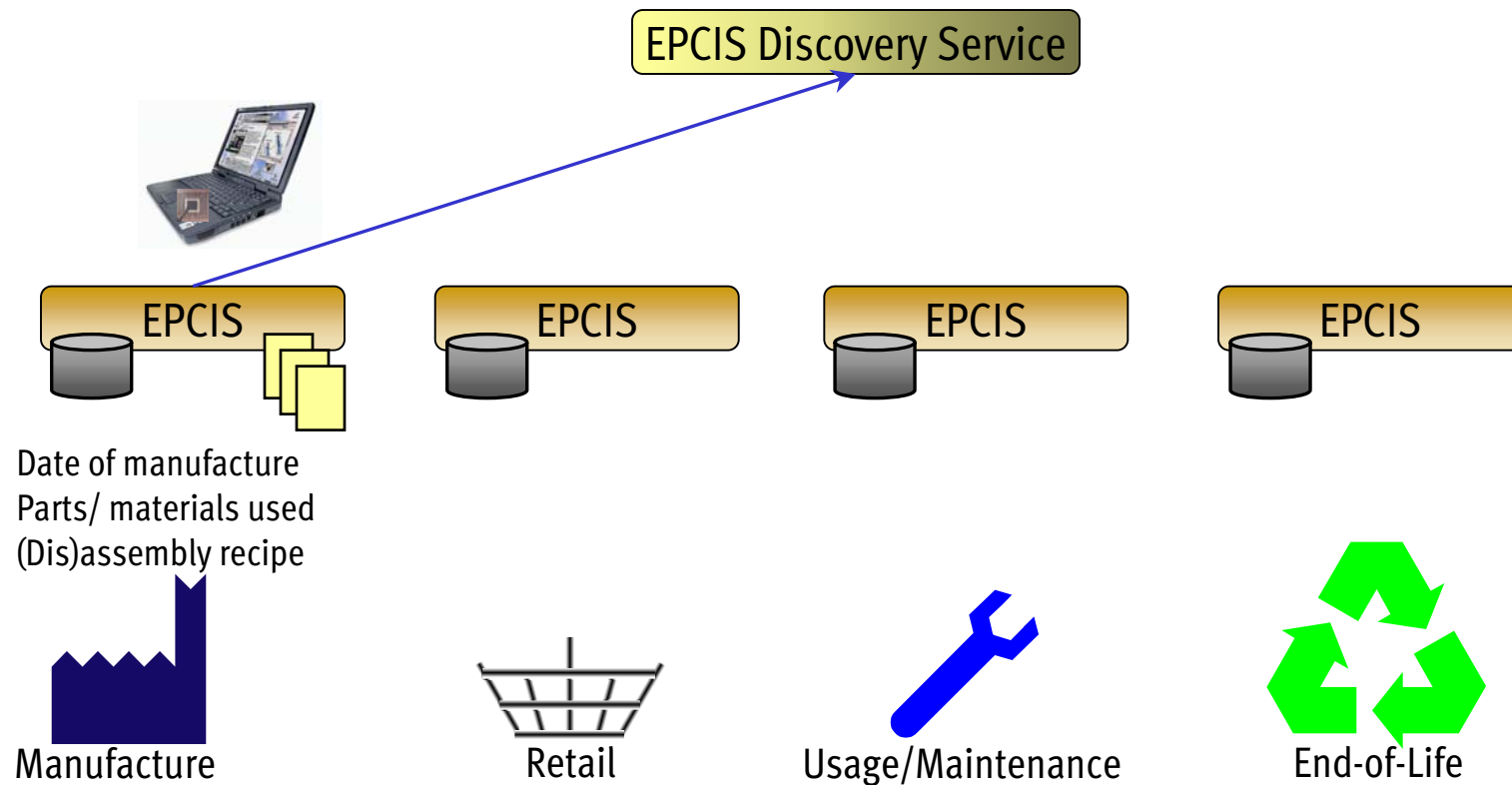
EPC™ NETWORK TECHNOLOGY BUILDING BLOCKS



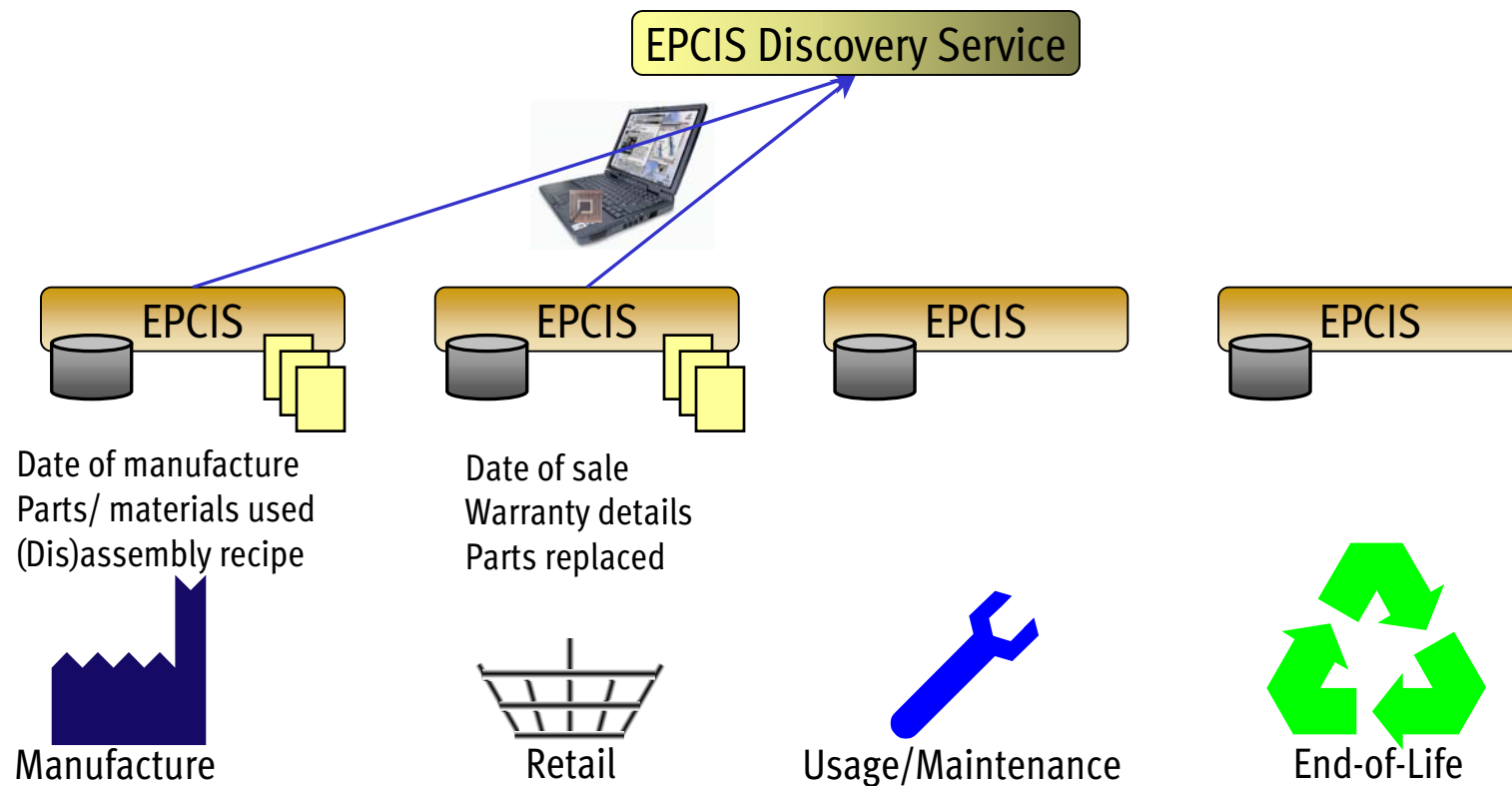
INFORMATION QUALITY <-> EPC

- Uniqueness
 - Enable unique product “footprint” ---> EPC
- Completeness
 - Ensure availability of relevant product info ---> EPCIS/ONS/XML
- Timeliness
 - Ensure “ready” availability of product info ---> RFID/Filtering
- Accuracy
 - Reduce/eliminate errors in info management ---> RFID/XML

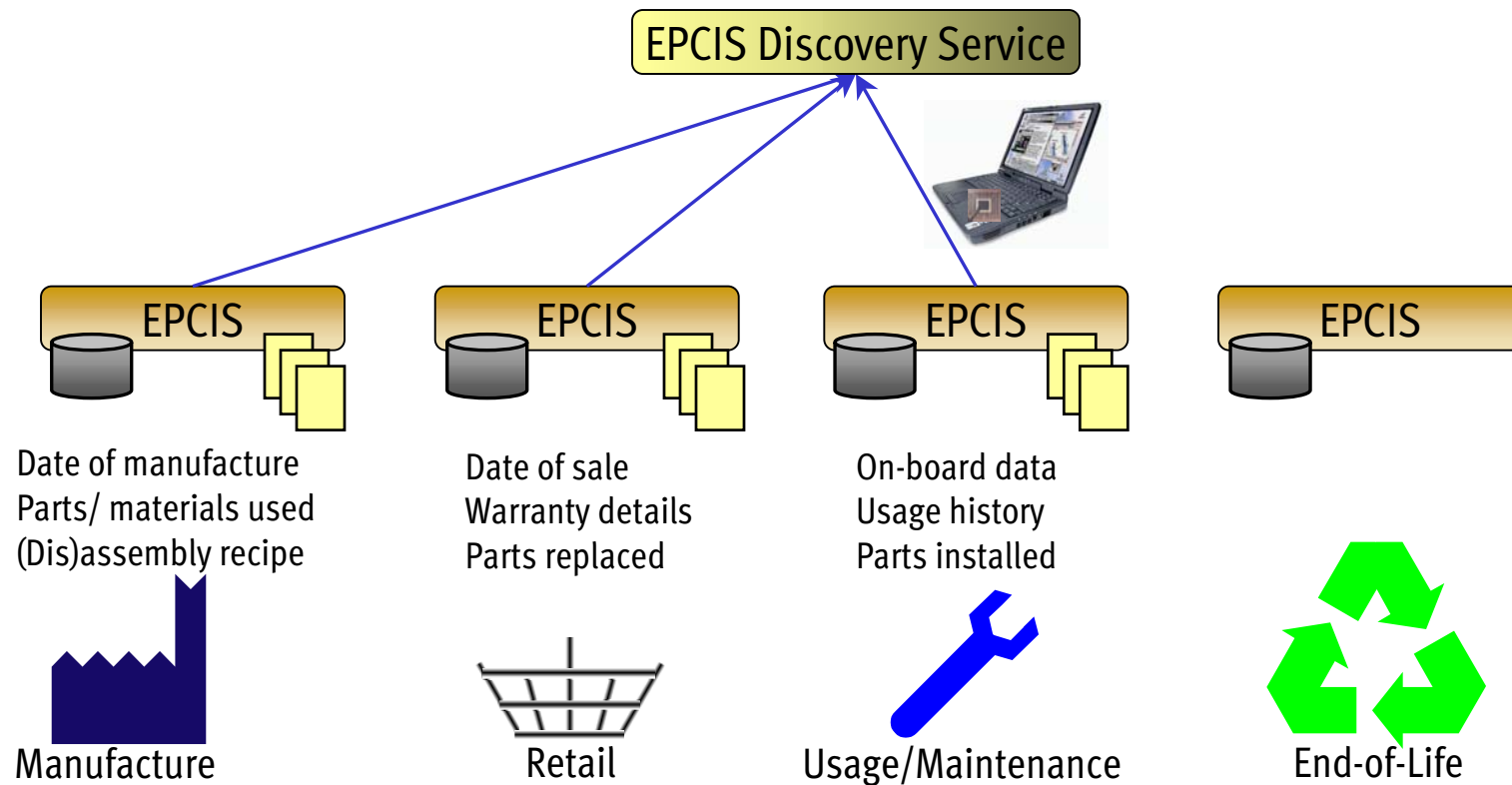
NETWORKED RFID FOR PLM



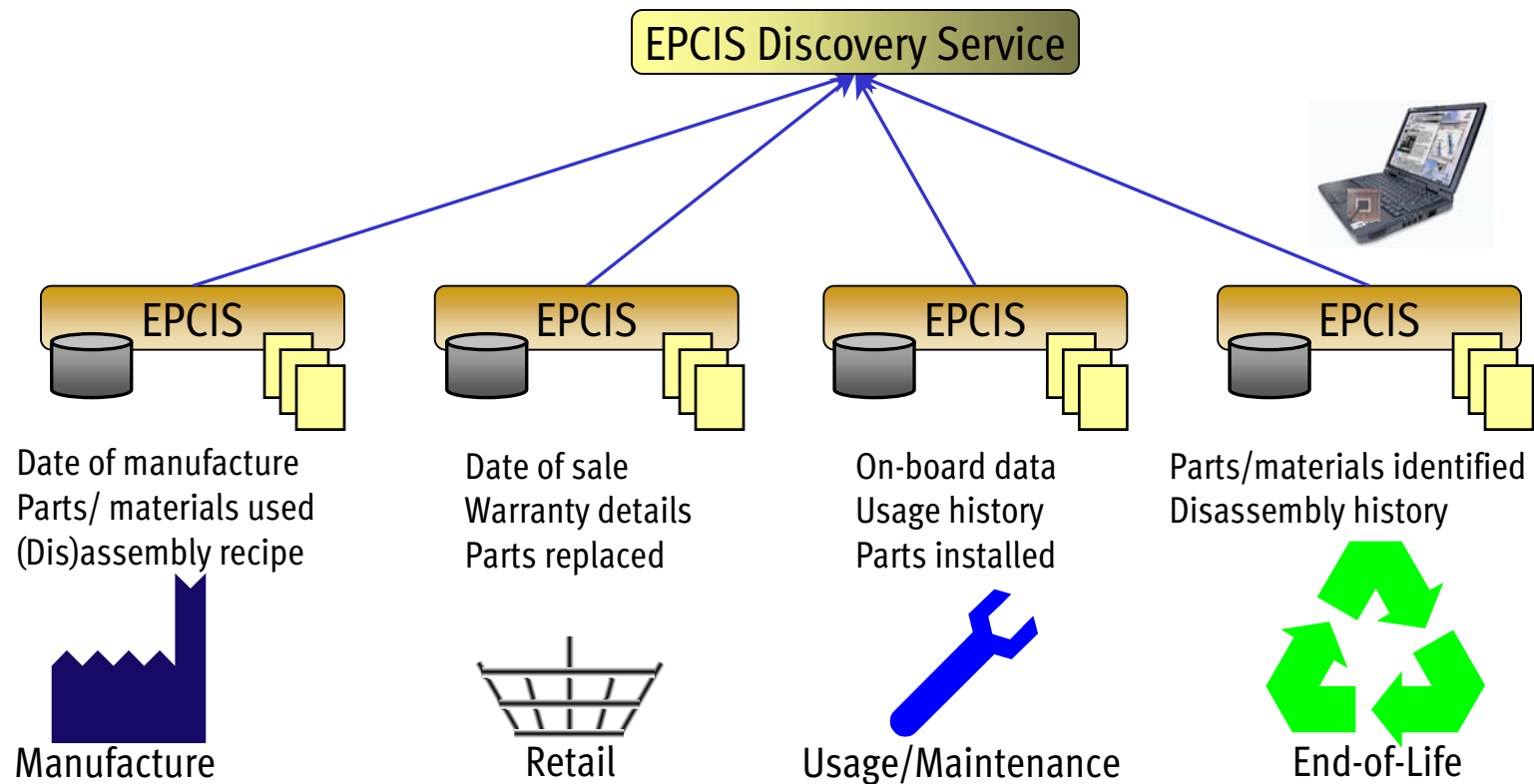
NETWORKED RFID FOR PLM



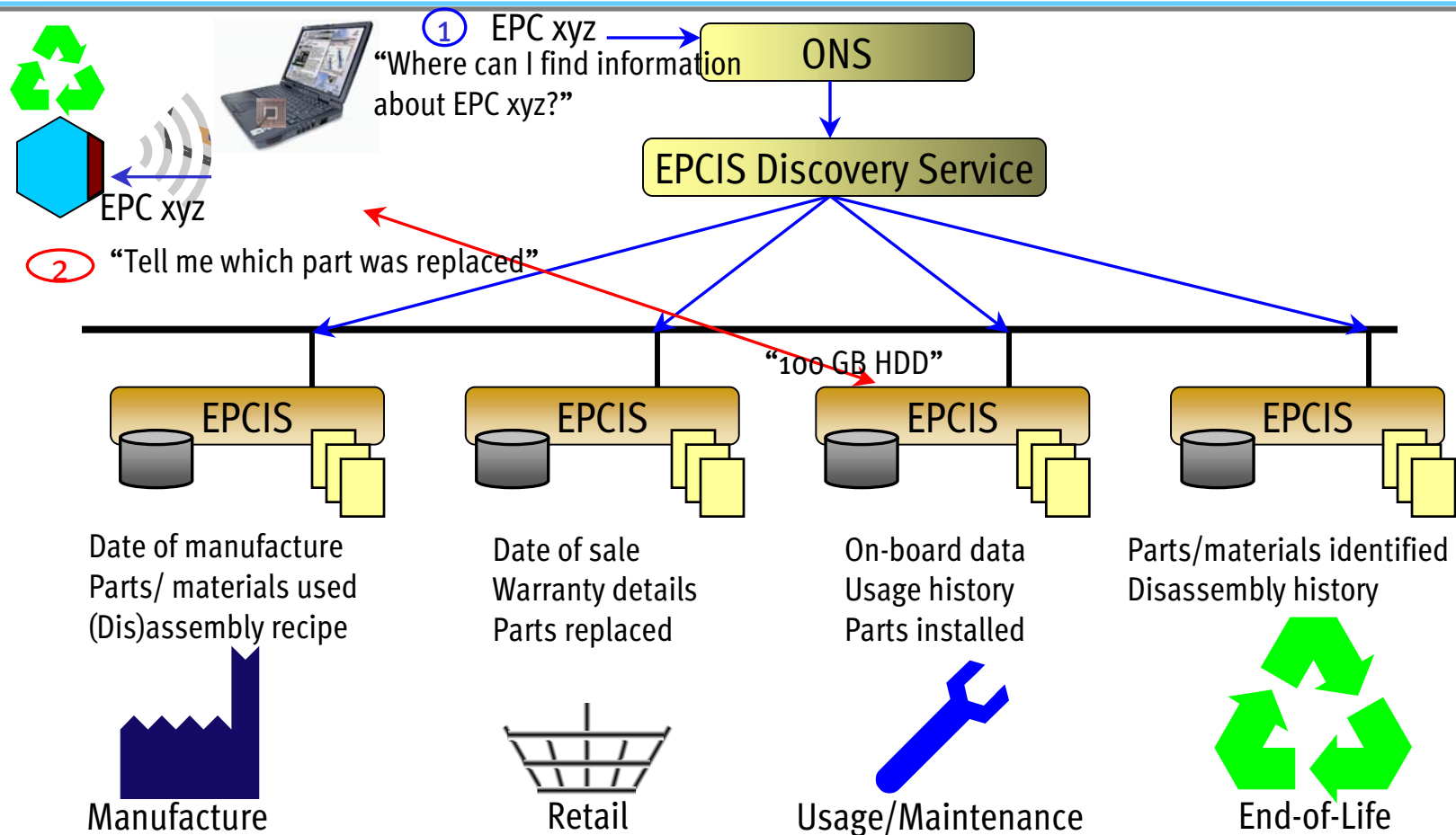
NETWORKED RFID FOR PLM



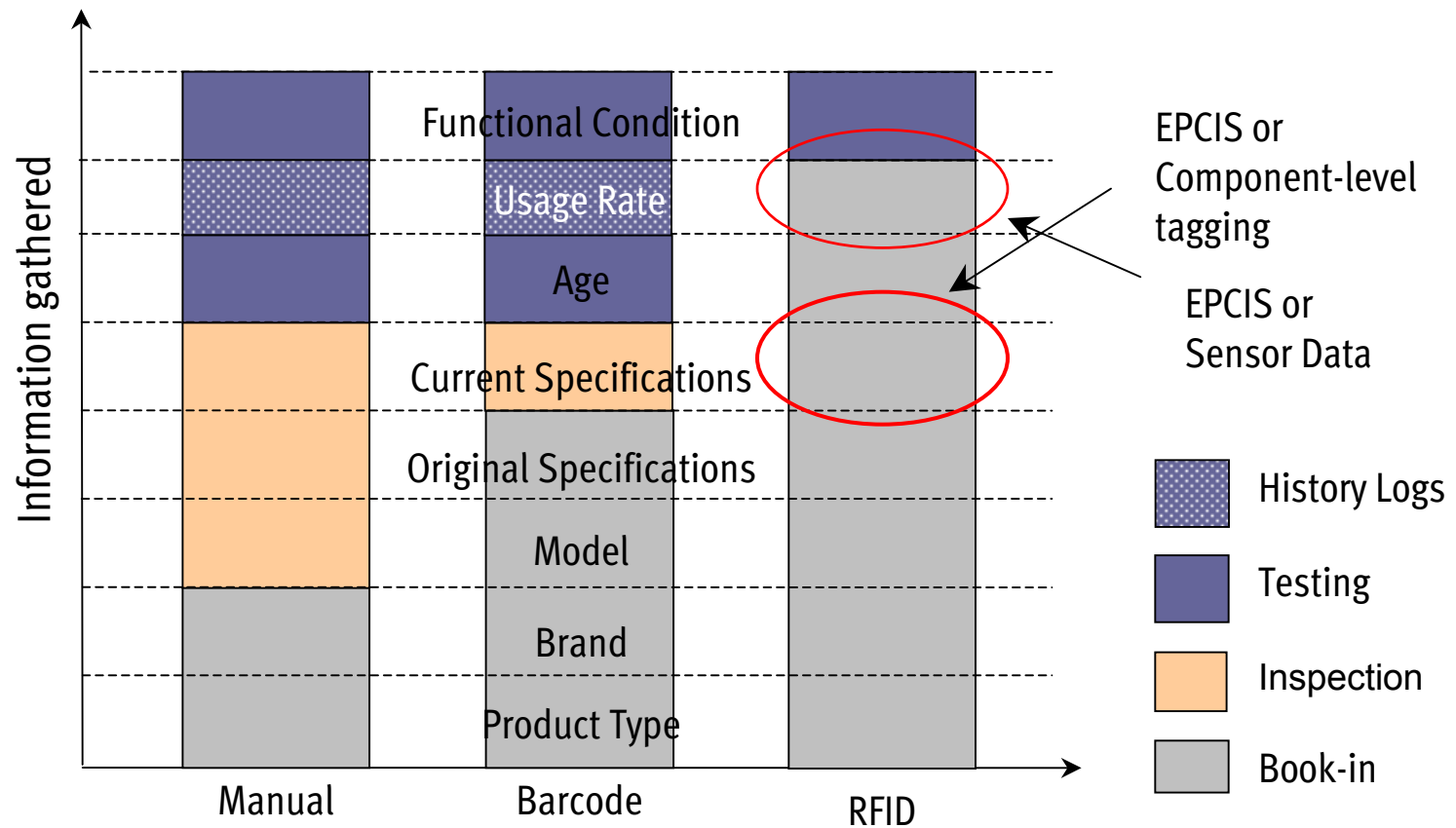
NETWORKED RFID FOR PLM



NETWORKED RFID FOR PLM

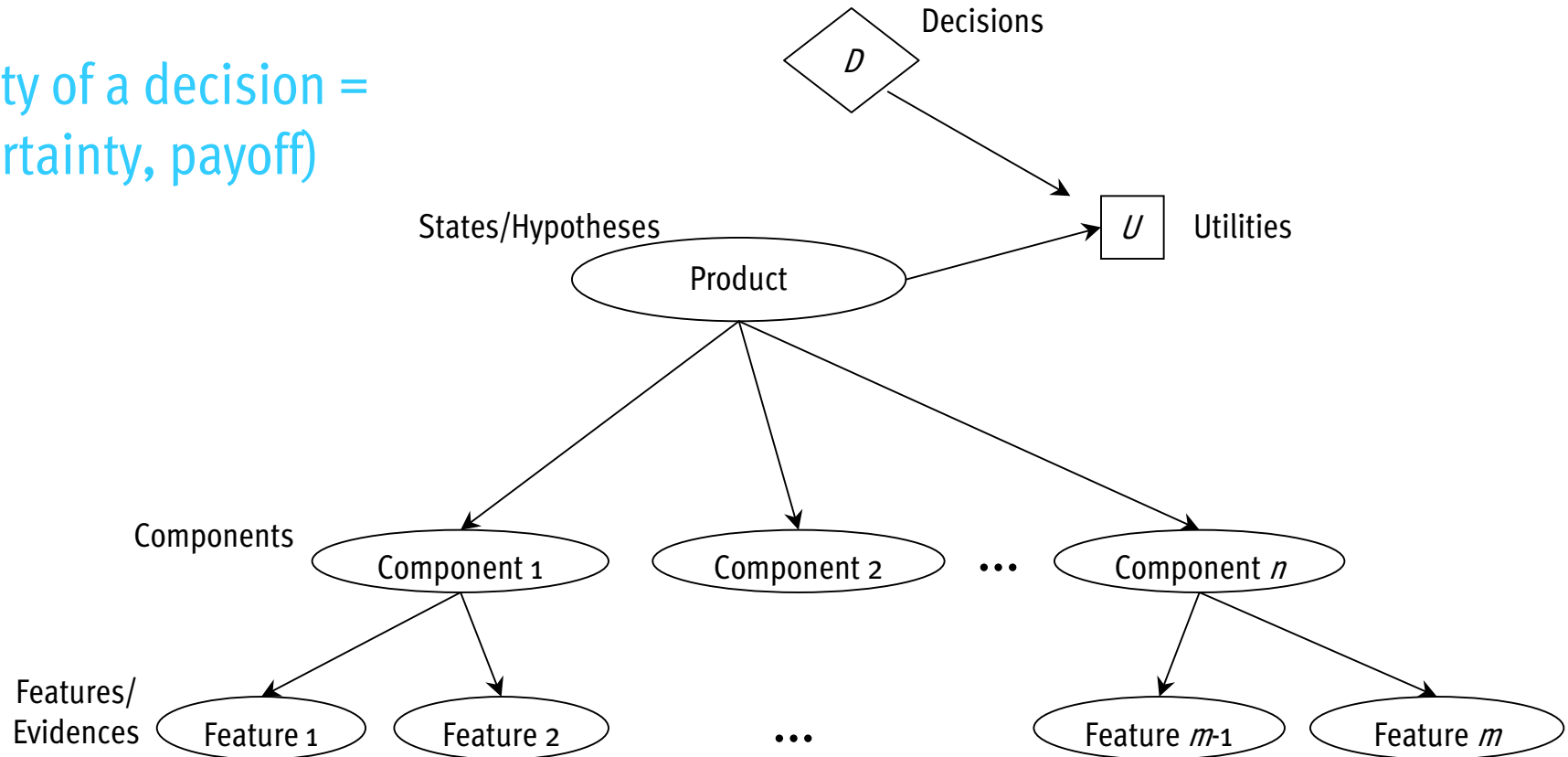


RFID-ENABLED PRODUCT RECOVERY

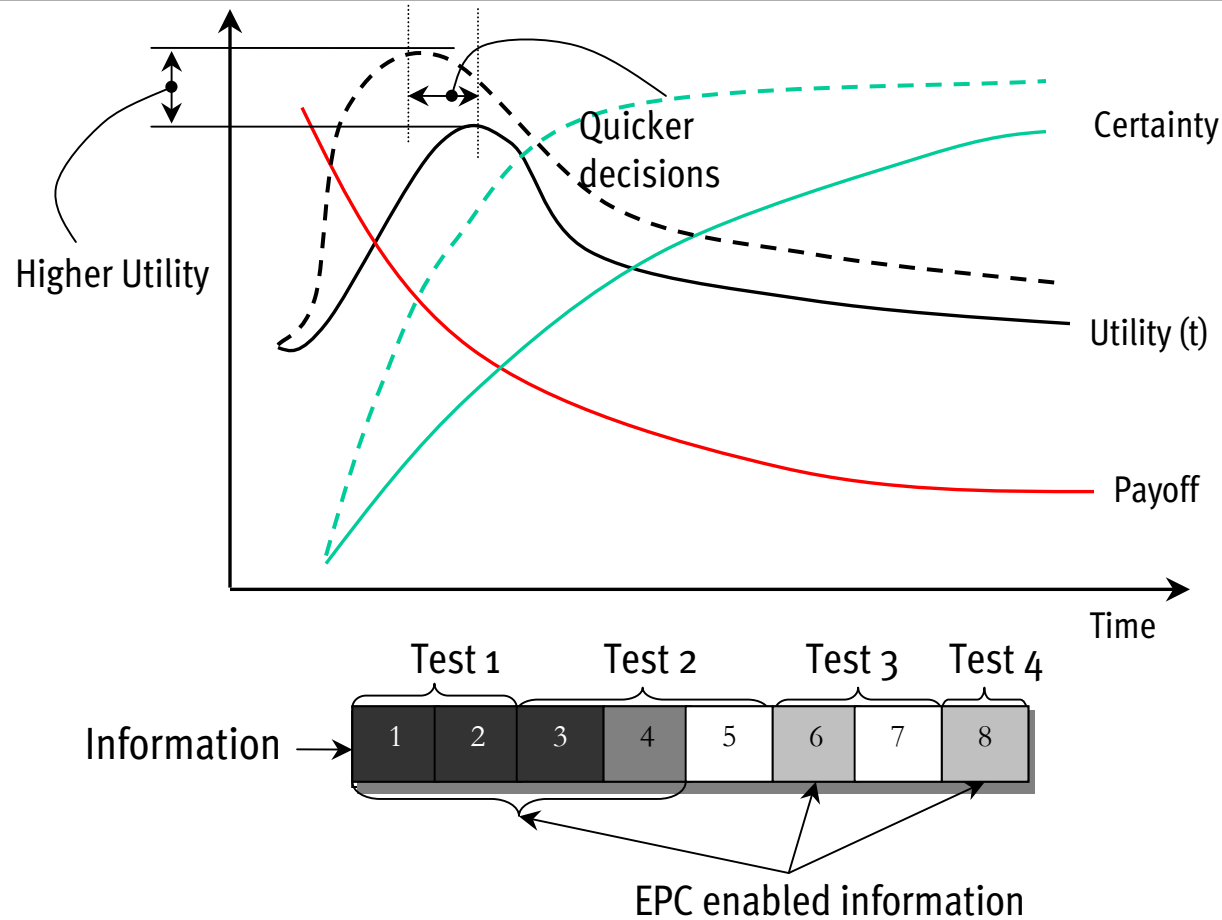


A BAYESIAN PRODUCT RECOVERY DECISION MODEL

Utility of a decision =
 $f(\text{certainty, payoff})$



EPC ENHANCED PRODUCT RECOVERY DECISIONS



CONCLUSIONS

- Process improvements
 - Quick and possibly automated identification & sorting
 - Error reduction
- Decision improvements
 - Better estimation of residual life and value
 - Better estimation of recyclable material content
 - Rich information leads to better decisions

Thank You

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