

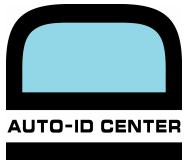
**CAMBRIDGE AUTO-ID CENTRE**

# **SHELF REPLENISHMENT POLICIES**

**C. Y. WONG**

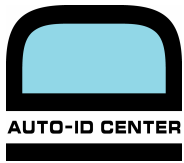
**1<sup>ST</sup> ANNUAL RETAIL FORUM SUMMIT**

**22 OCTOBER 2003**



# PRESENTATION OVERVIEW

- BACKGROUND
- THE HISTORY AND THE FUTURE
- ON-GOING RESEARCH



# BACKGROUND

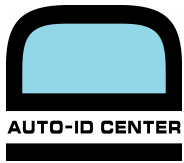
- “8.3% of items are out-of-stocks at any one time around the world”
- “25% percent of out-of-stocks are caused by poor shelf management”

– GMA, Food Marketing Institute and CIES (2002)

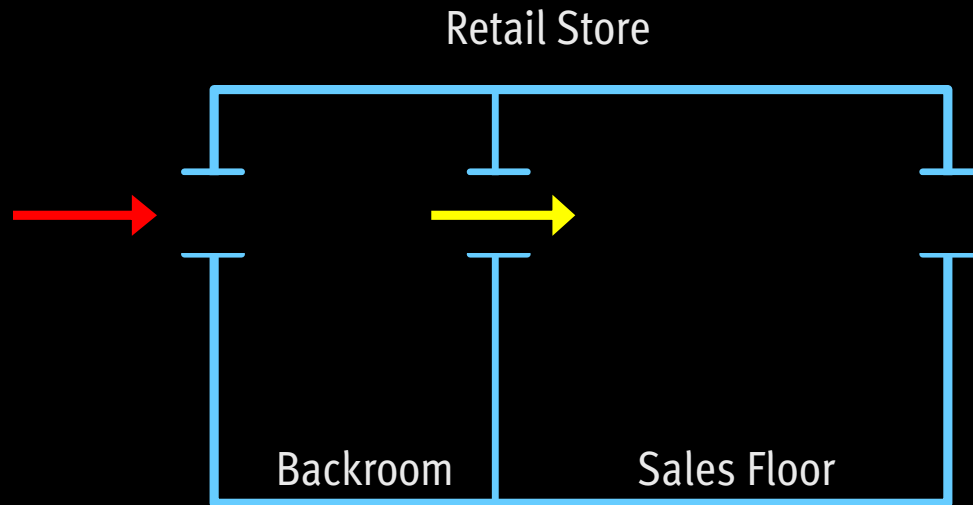
## SERVICE LEVEL ALONG THE SUPPLY CHAIN



ECR Europe (2003)



# STORE REPLENISHMENT VS SHELF REPLENISHMENT

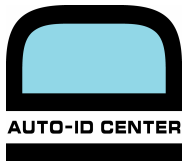


→ Store replenishment

Out-of-stock

→ Shelf replenishment

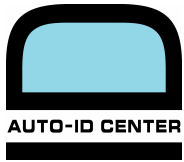
Off-Sales



# THE HISTORY AND THE FUTURE

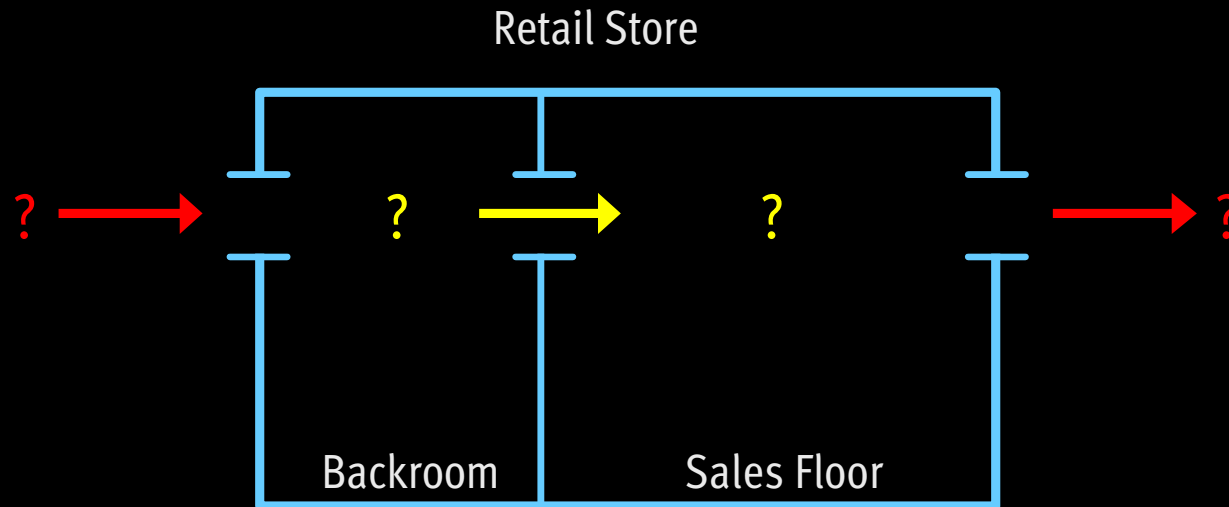
1900

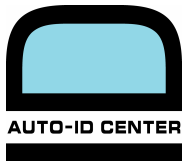
- Manual Shelf Replenishment



## BEFORE POINT-OF-SALE SYSTEM

- Detachment of physical and virtual system
- From the perspective of near-real-time virtual inventory system



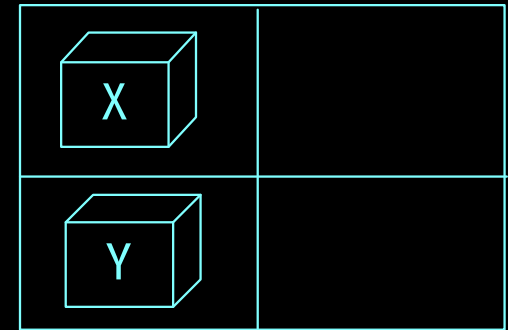


# BEFORE POINT-OF-SALE SYSTEM

Backroom



Shelf



Identify

Count

Track

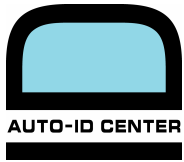
Decide

Move

Verify



Staff



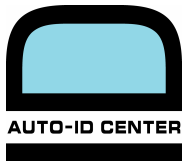
# THE HISTORY AND THE FUTURE

1900

- Manual Shelf Replenishment

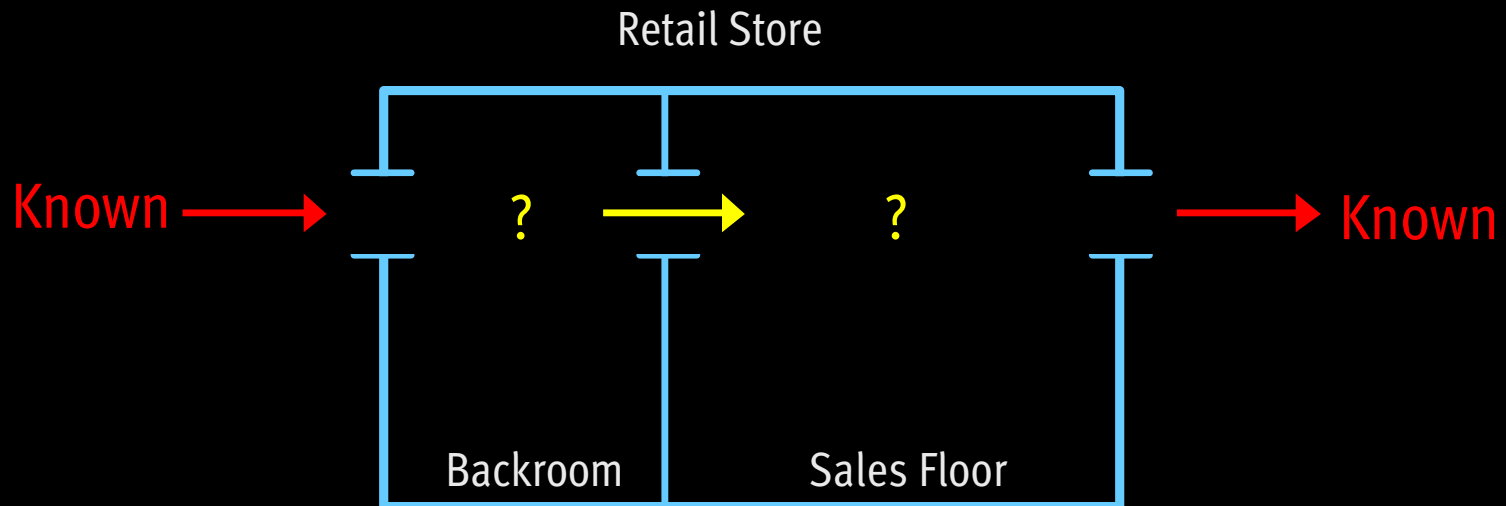
1980

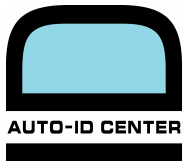
- POS Enhanced Shelf Replenishment



## WITH POINT-OF-SALE SYSTEM

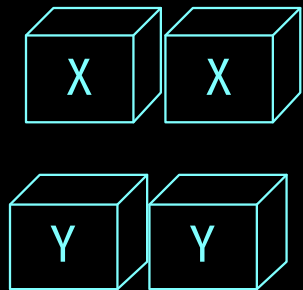
- First step towards exploiting virtual inventory system
- From the perspective of near-real-time virtual inventory system



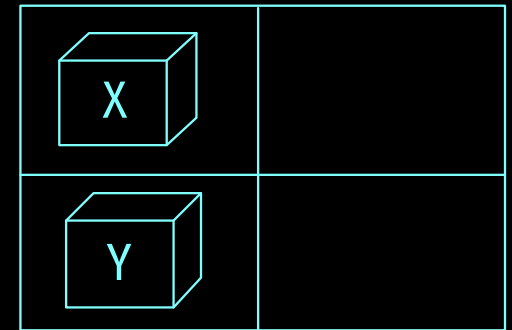


# WITH POINT-OF-SALE SYSTEM

Backroom



Shelf



Identify

Count

Count

Track

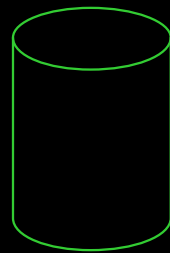
Track

Decide

Decide

Move

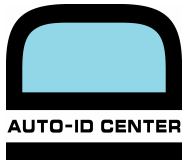
Verify



POS



Staff



# THE HISTORY AND THE FUTURE

1900

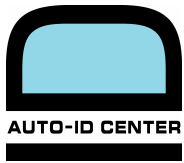
- Manual Shelf Replenishment

1980

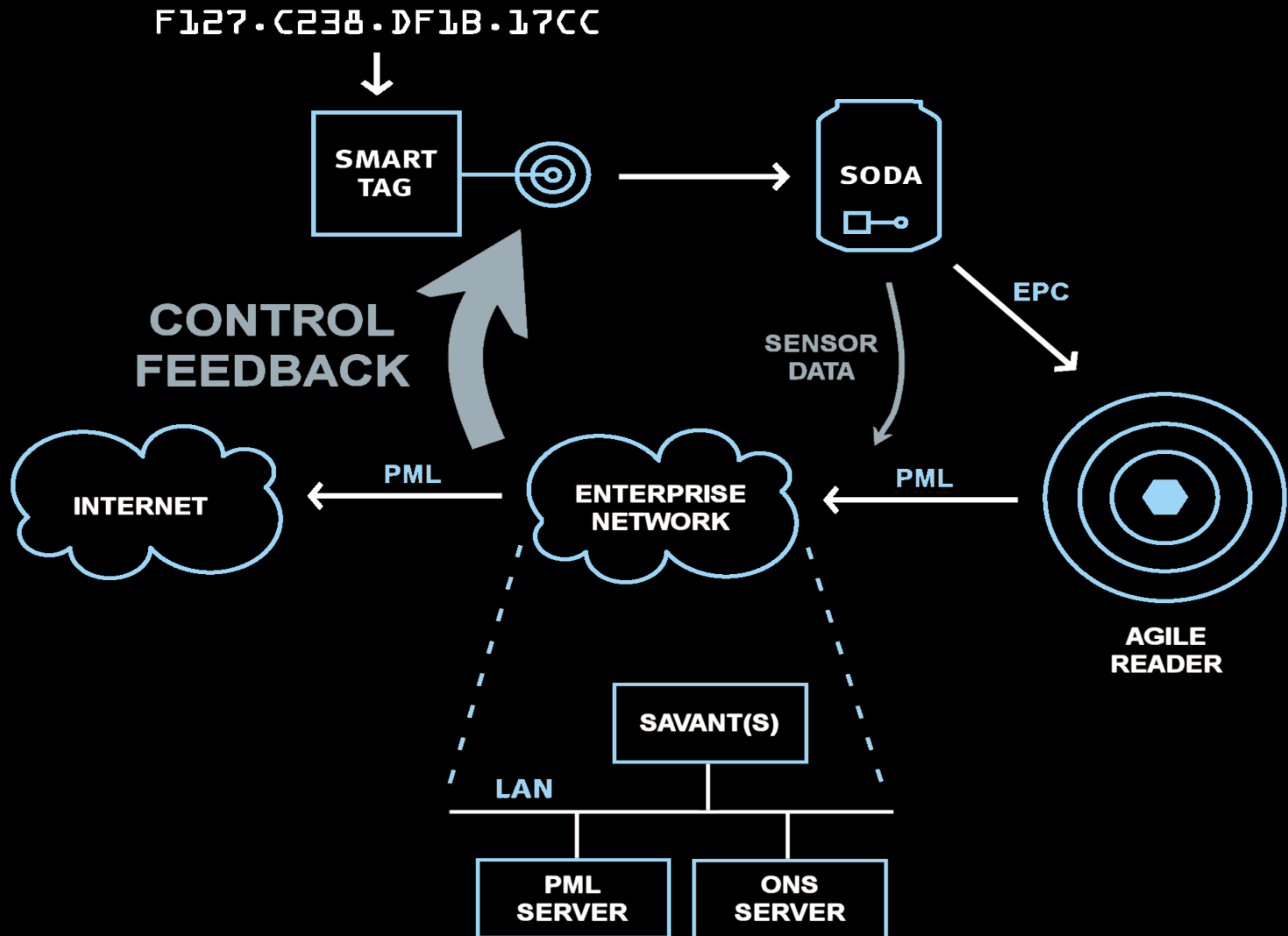
- POS Enhanced Shelf Replenishment

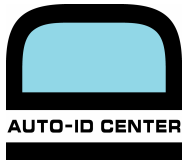
2003

- Auto-ID Enhanced Shelf Replenishment



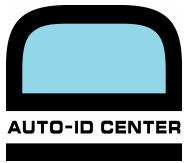
# WHAT IS AUTO-ID





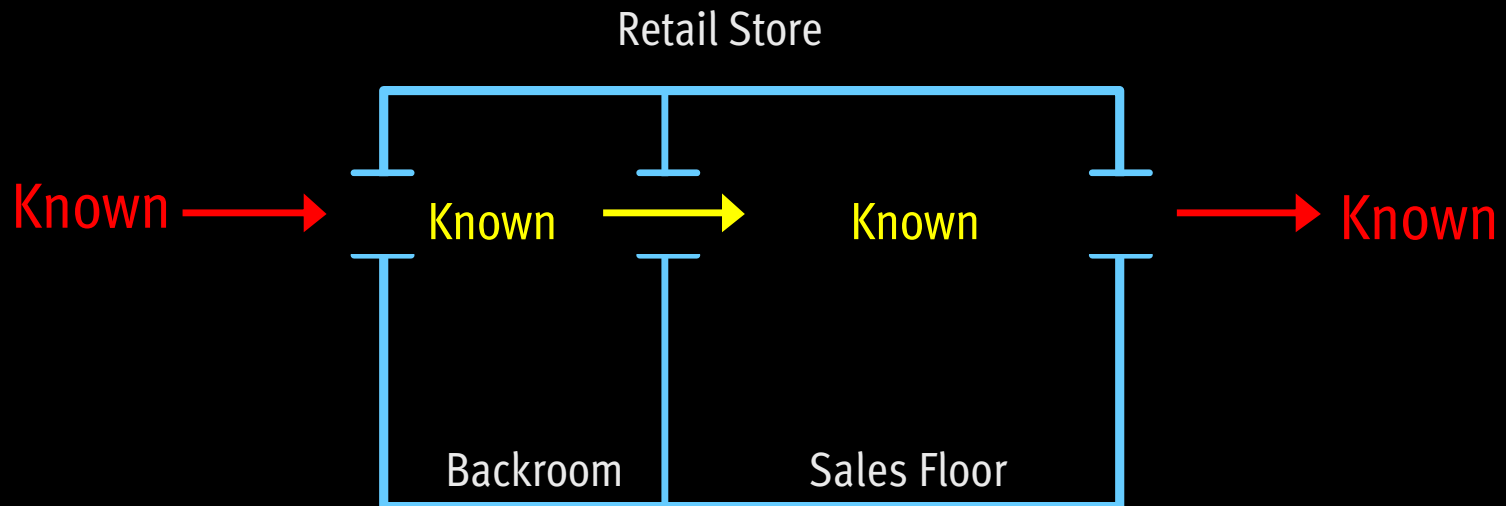
## MAYBE SOONER THAN EXPECTED

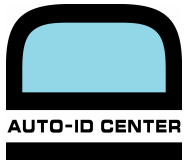
- “Top one hundred suppliers to tag pallets and cases with RFID by 1st January 2005” – Wal-Mart
- “All of our suppliers will be using RFID at pallet and case level by the end of 2006” – Wal-Mart
- “Top suppliers to RFID tag conveyances by January 2005” – US Department of Defense



## WITH AUTO-ID SYSTEM

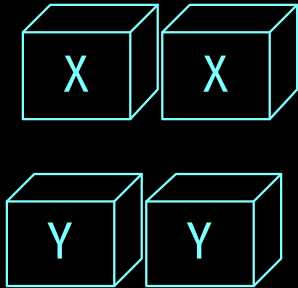
- Merging physical and virtual world
- From the perspective of near-real-time virtual inventory system



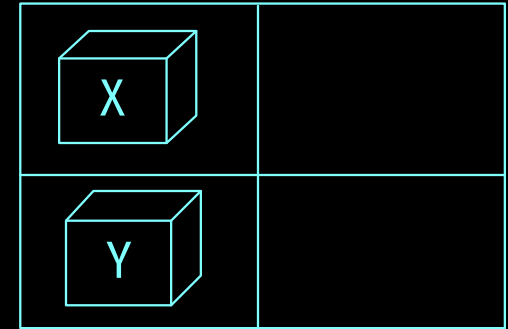


# WITH AUTO-ID SYSTEM

Backroom



Shelf



Identify

Count

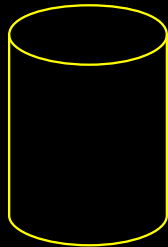
Track

Decide

Decide

Move

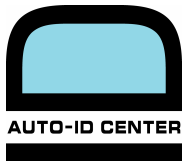
Verify



Auto-ID enhanced  
Retail Inventory System



Staff



# THE HISTORY AND THE FUTURE

1900

- Manual Shelf Replenishment

1980

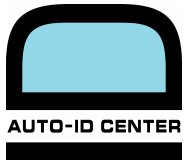
- POS Enhanced Shelf Replenishment

2003

- Auto-ID Enhanced Shelf Replenishment

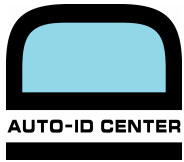
2007

- Intelligent Product Driven Shelf Replenishment



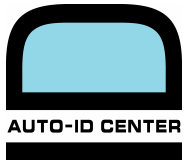
# FUTURE OF SUPPLY CHAIN?

- Network of distributed intelligent products
- Products capable of making and executing decisions
- Find the best way through the entire supply chain



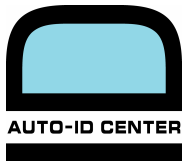
# LEVEL 1 INTELLIGENT PRODUCT CAPABILITIES

- Production
  - Improve Manufacturing Process Flow
  - Better Quality Control Management
- Distribution Centre/Warehouse
  - Automated Proof of Delivery and On-Hand Inventory
  - Improve Pick and Place
- Retail
  - Accurate Near Real-time Inventory Information
  - Higher Security and Authentication
- Consumer
  - Proof-of-Purchase On Product
  - Detailed Information About Product Retrievable
- End of Life
  - Full Product History For Recycling
  - Accurate Service Information



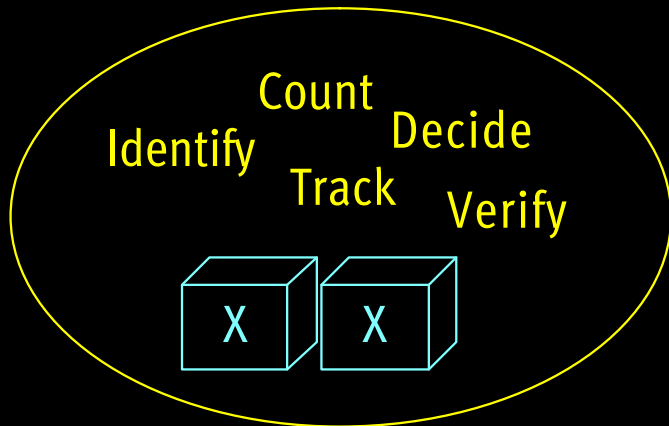
# LEVEL 2 INTELLIGENT PRODUCT CAPABILITIES

- Production
  - Self-Organizing Production Schedules
  - High Customization Capability
- Distribution Centre/Warehouse
  - Self-Organizing Distribution Schedules
  - Self-Organizing Inventory
- Retail
  - Advanced demand management
  - Stock Rotation Based On Due-By-Dates
- Consumer
  - Ensure Correct and Automated Usage
  - Capability To Search Inventory And Trigger Production Instantly
- End-of-Life
  - Product Near End-Of-Life Can Trigger Collection
  - Automated Sorting of Components

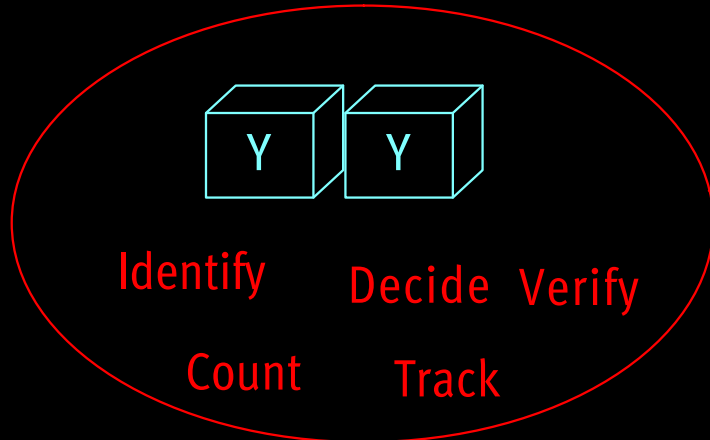


# INTELLIGENT PRODUCT DRIVEN SHELF REPLENISHMENT

Backroom

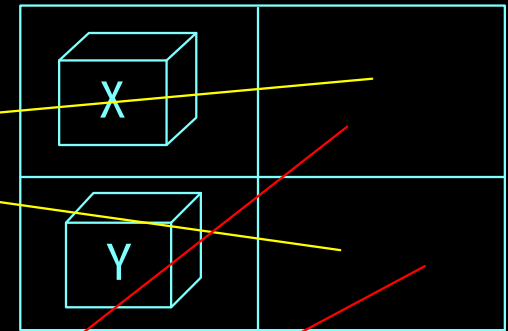


Intelligent Products of Manufacturer X



Intelligent Products of Manufacturer Y

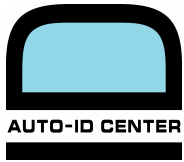
Shelf



Move



Staff



# RESEARCH AIMS

1900

- Manual Shelf Replenishment

1980

- POS Enhanced Shelf Replenishment

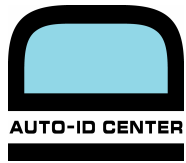
2003

- Auto-ID Enhanced Shelf Replenishment

2007

- Intelligent Product Driven Shelf Replenishment

Value ?



# RESEARCH AIMS

## What:

To analyze the impact of accurate and timely item level information on current shelf replenishment policies

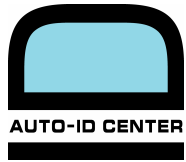
## Why:

- Reduce shelf space allocation
- Improve on-shelf-availability
- Reduce out-of-stock

## How:

- Examine current retail shelf replenishment processes
- Identify information useful for improving the process
- Develop a new inventory control model
- Compare new models with different replenishment policies





# CAMBRIDGE AUTO-ID CENTRE

[www.autoidcenter.org](http://www.autoidcenter.org)

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[cyw20@cam.ac.uk](mailto:cyw20@cam.ac.uk)

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University of Cambridge