RFID Based Supply Chain Management

한국항공대학교 항공교통물류학부
•
장 윤 석 교수

RFID Based Supply Chain Management

한국항공대학 항공교통물류학부 교수 (email: yoonchang@hau.ac.kr)
KAIST 산업공학과 겸직교수 (email: yoonchang@hau.ac.kr)

School of Air Transportation & Logistics
HanKuk Aviation University

Agenda

- Issues of Current SCM practice
- RF-ID system: Tag & Readers, Read Range, Memory, Frequency examples
- SCM: Conventional Versus RF-ID Based
- RF-ID based SCM
- Conclusion

Issues of Current SCM practice

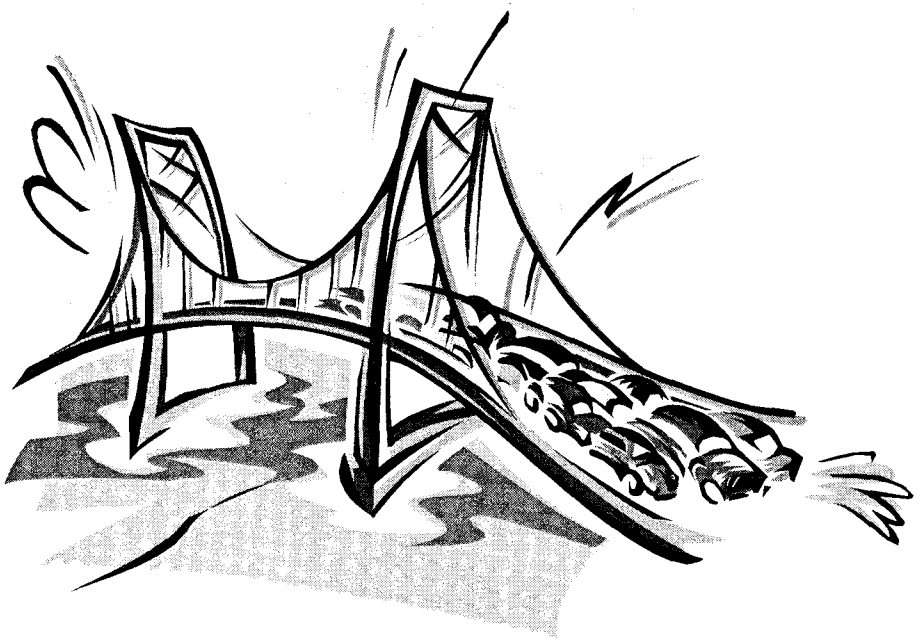
- State of the art SCM systems have been widely introduced to improve supply chain processes. However, due to some systematic problems and the gaps existing between an “idealized” stable environment and a real, dynamically changing implementation environment, disappointing results are encountered industry wide on a frequent basis.

Issues of Current SCM practice – Execution, Data collection

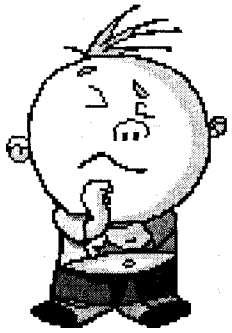
- Gaps between planning and execution in the supply chains:
  - –Manual read, and inability to perform batch read and write.
  - –Non real time or shift based inventory data input- Back flush (or data input policy).
  - –Line of sight issues.
  - –Lot sizing.
  - –Impossible to peg orders to physical product
  - –Hard to trace the movement of orders/materials across supply chains.

Any Solution ?

Planning



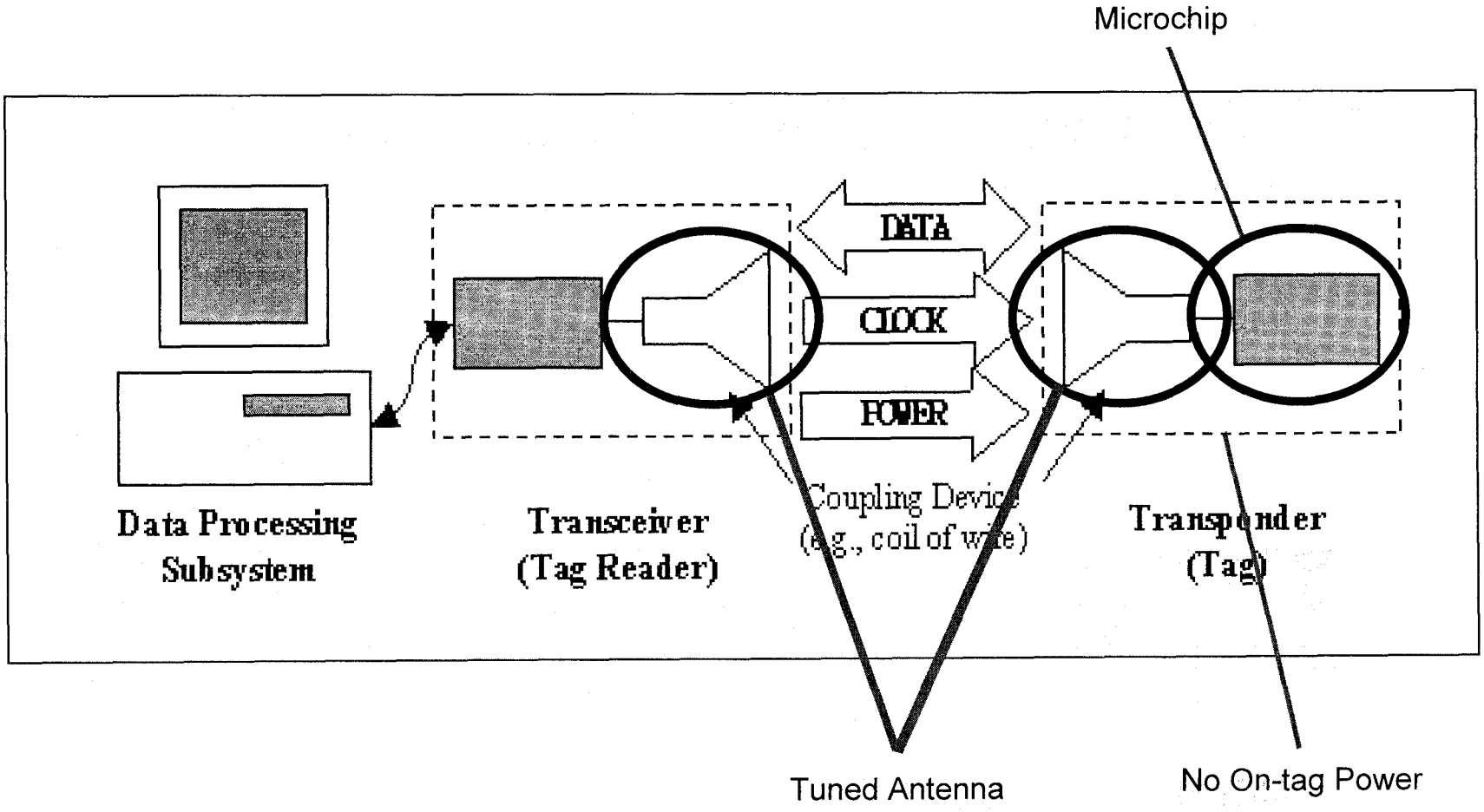
Execution



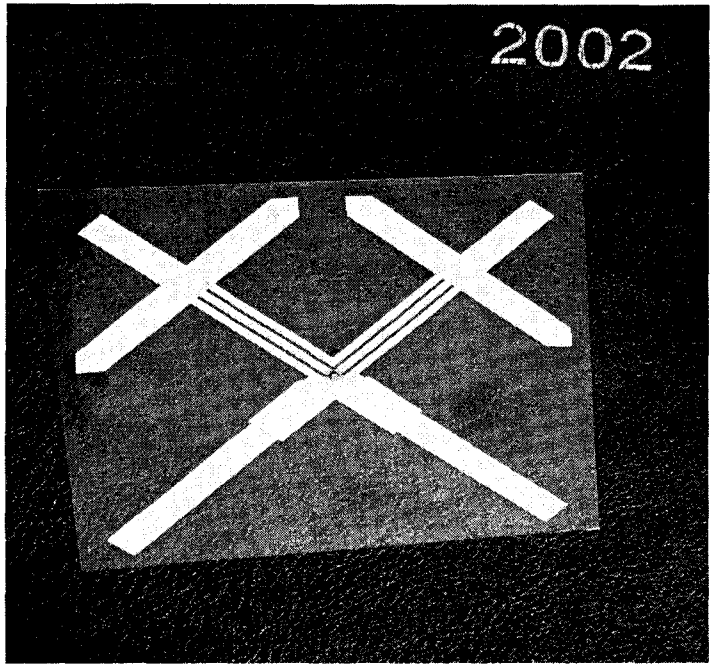
Terms- Ubiquitous

- Mark Weiser –Xrox Palo Alto Lab used the term, " Ubiquitous" 1993 ("*Computing access will be everywhere*"). The idea started 1988.
- Pervasive Computing – IBM. With "Carrier" planned and tested a remote controllable air conditioner since 2001.
- TRON (The Real Time Operating System Nucleus) project, Intelligent house: Initiated by Professor Sakamura Ken – University of Tokyo in 1984. Use the same OS for all computers.

RF-ID Systems : Tag and Reader (ex. Passive Tag)



RF-ID Systems: Tag (Example)



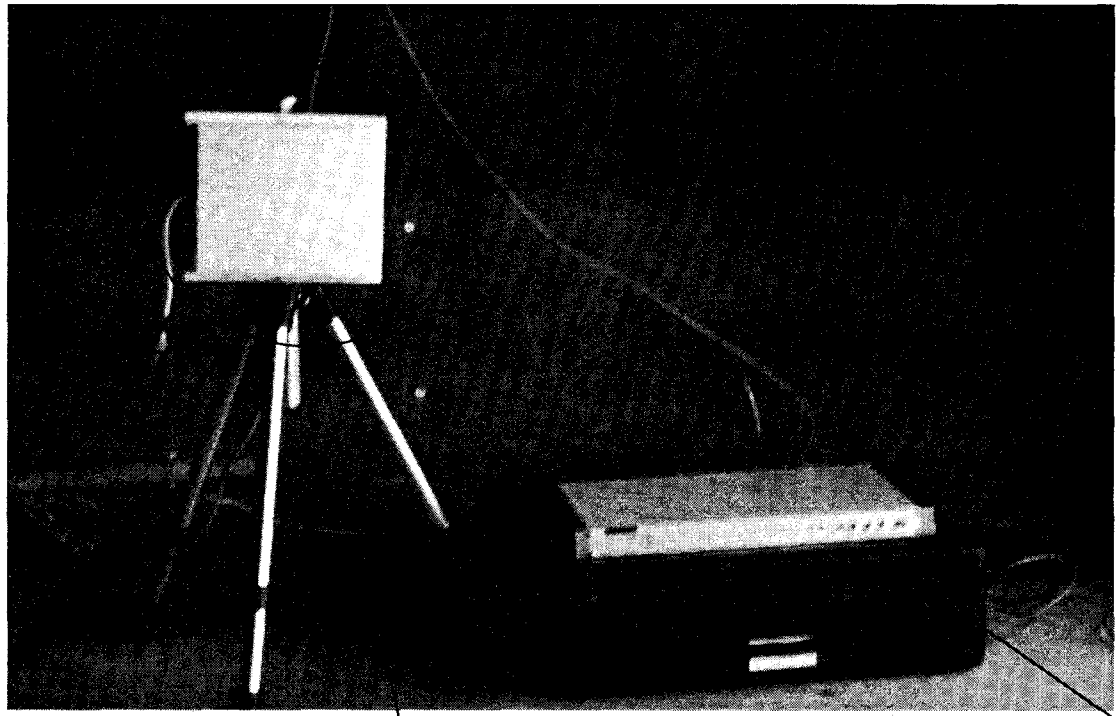
Passive Tag

- Short read range
- Cheap
- Read/write

Active Tag
(with battery)

- Relatively long read range
- But could be bigger than passive tag
- Read/Write
- Could have bigger memory

RF-ID Systems: Reader (Example)

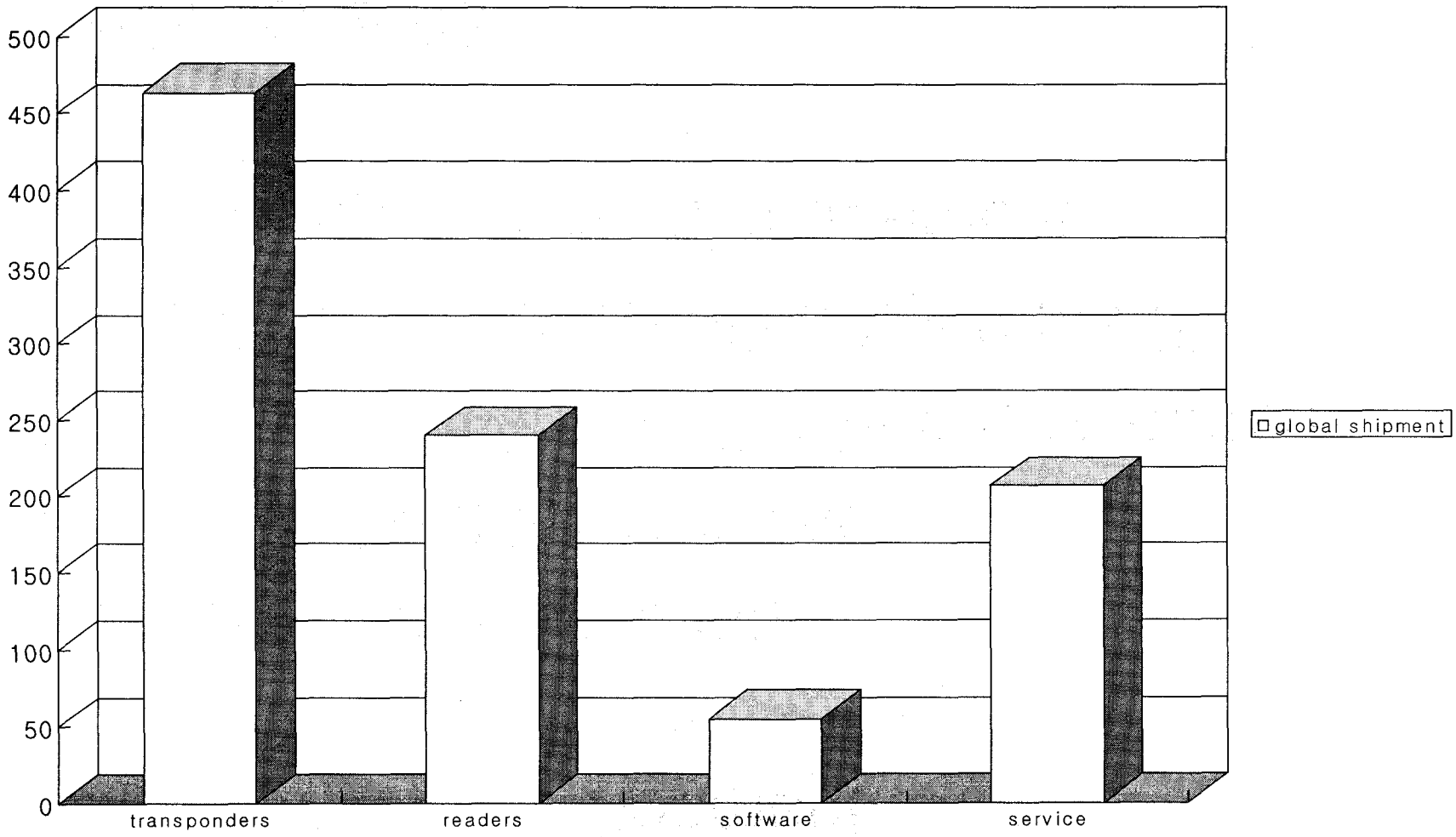


RF-ID Systems: Frequency Examples SCM

- 135 KHZ, 13.56 MHZ: Works with liquid or wooden materials (problem with metal), noise issue. Read range: ~30 cm (~70 cm), e.g. IC card, Italian post, Currently
- 433 MHZ: long read range (Read range: ~30m/100 m and over). Savi for container tracking
- 868 MHZ: ISM in EU
- 900 MHZ: Some problems with water. Read range: ~ 3m (not available in EU). Suitable for SCM application.
- 2.45 GHZ: Potential confliction with wireless LAN, Bluetooth
- 1~135 KHZ: Not ISM (Industrial-Science-Medical) frequency. For military purpose wireless service or (navigation) wireless service.
- Also other frequencies
- Standard: RFID for animal (ISO 11784, 11785: 10~150 KHZ). Tagging at ear or inside stomach

NB. Read ranges could changes by powering, and by makers etc

Global Markets for RFID systems (millions of dollars)



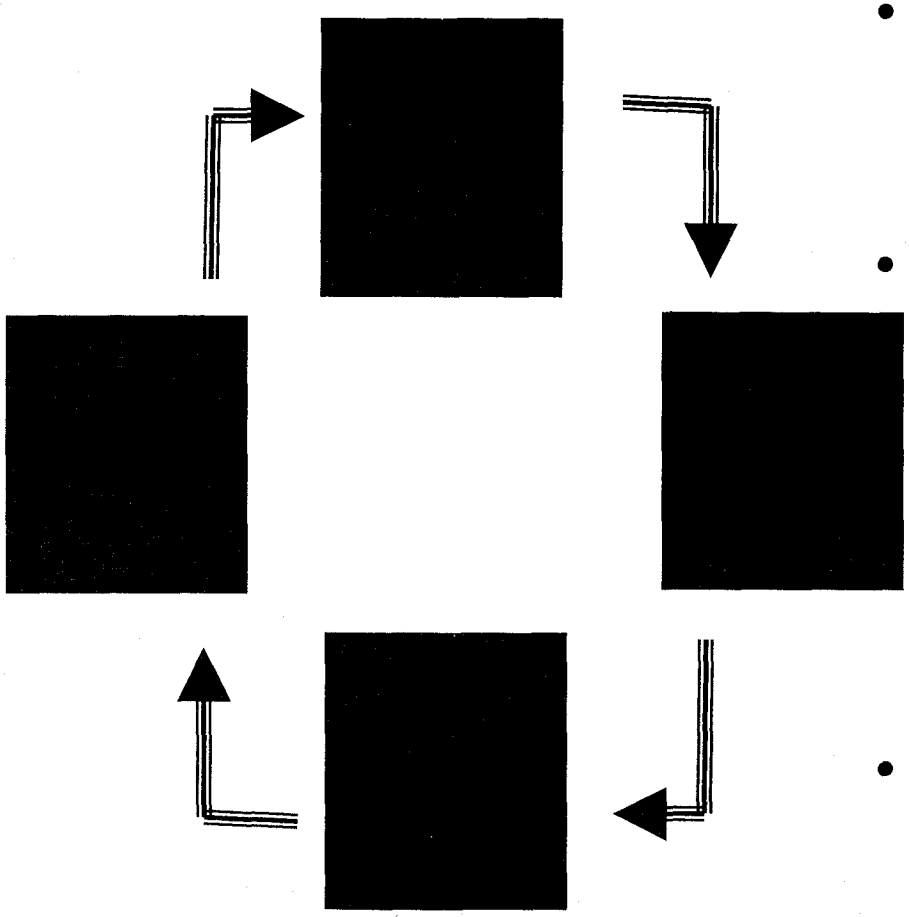
VDC 2003

Top Five Fastest Growing RFID Application Segment

- No1: Baggage Handling
- No 2: Rental Item Tracking
- No 3: Point of Sales (POS)/m-Commerce
- No 4: Real-Time Location Systems (RTLS)
- No 5: Supply Chain Management

From VDC 2003

SCM application example: automated retail shelf management

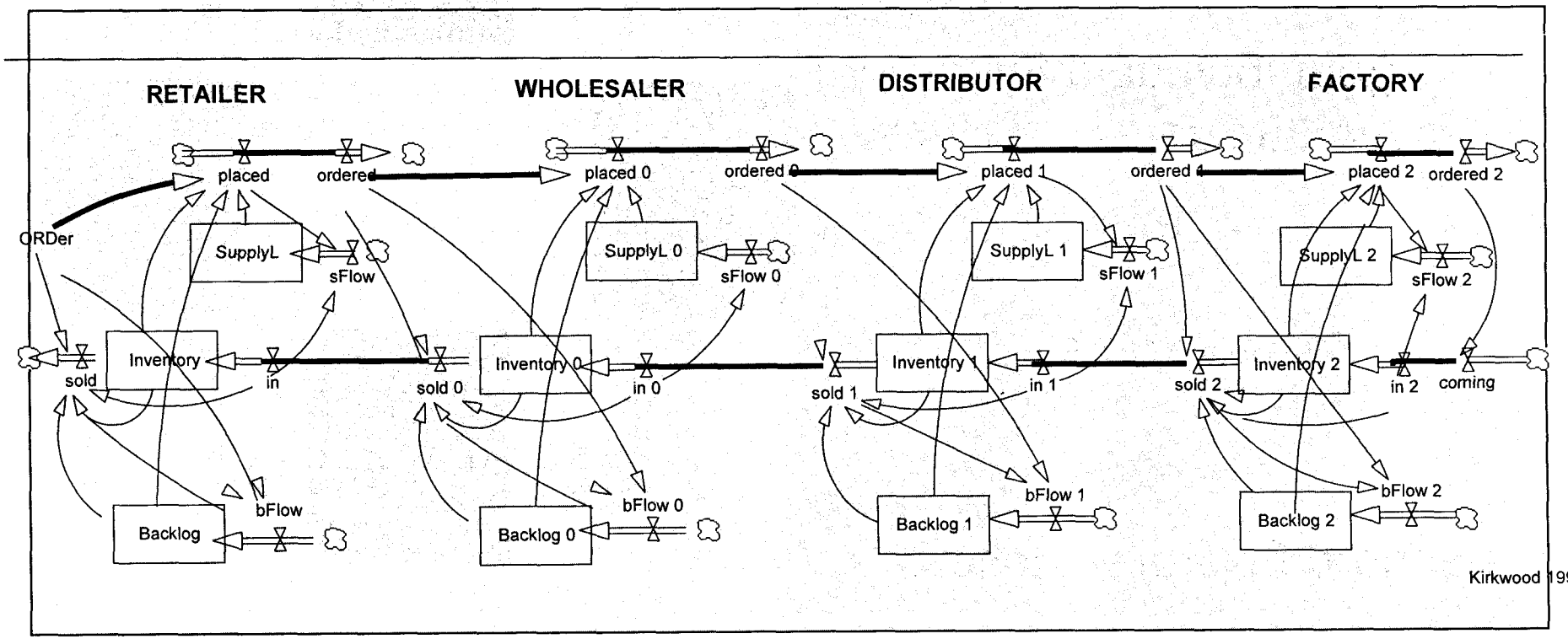


- "Operation" – having products available on shelves
- Sensing – stock levels, removal rates, POS data

Decision – replenishment & reordering planning, theft detection

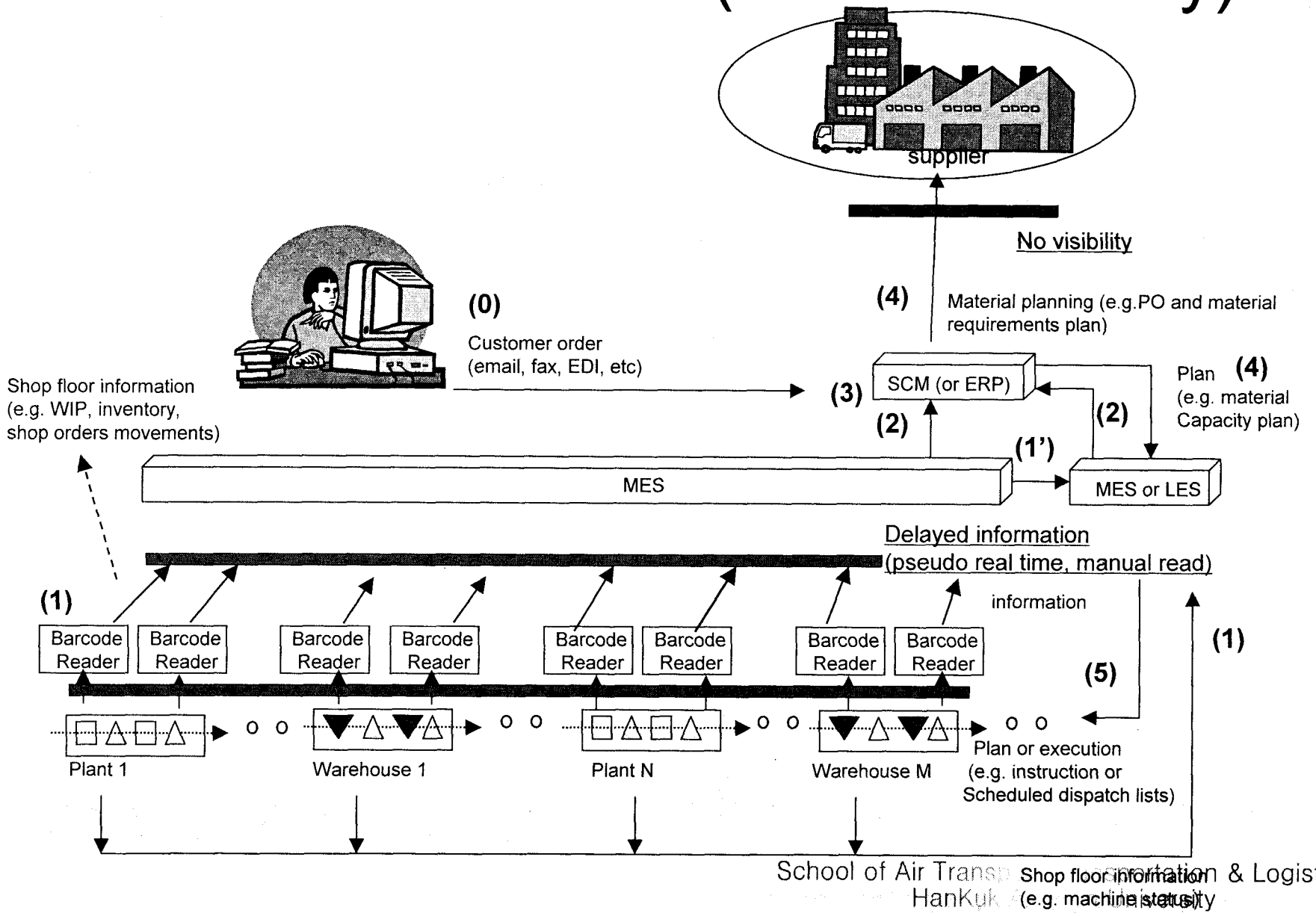
- Action – replenishment, security alert

SCM: Bull-Whip (Conventional SCM)

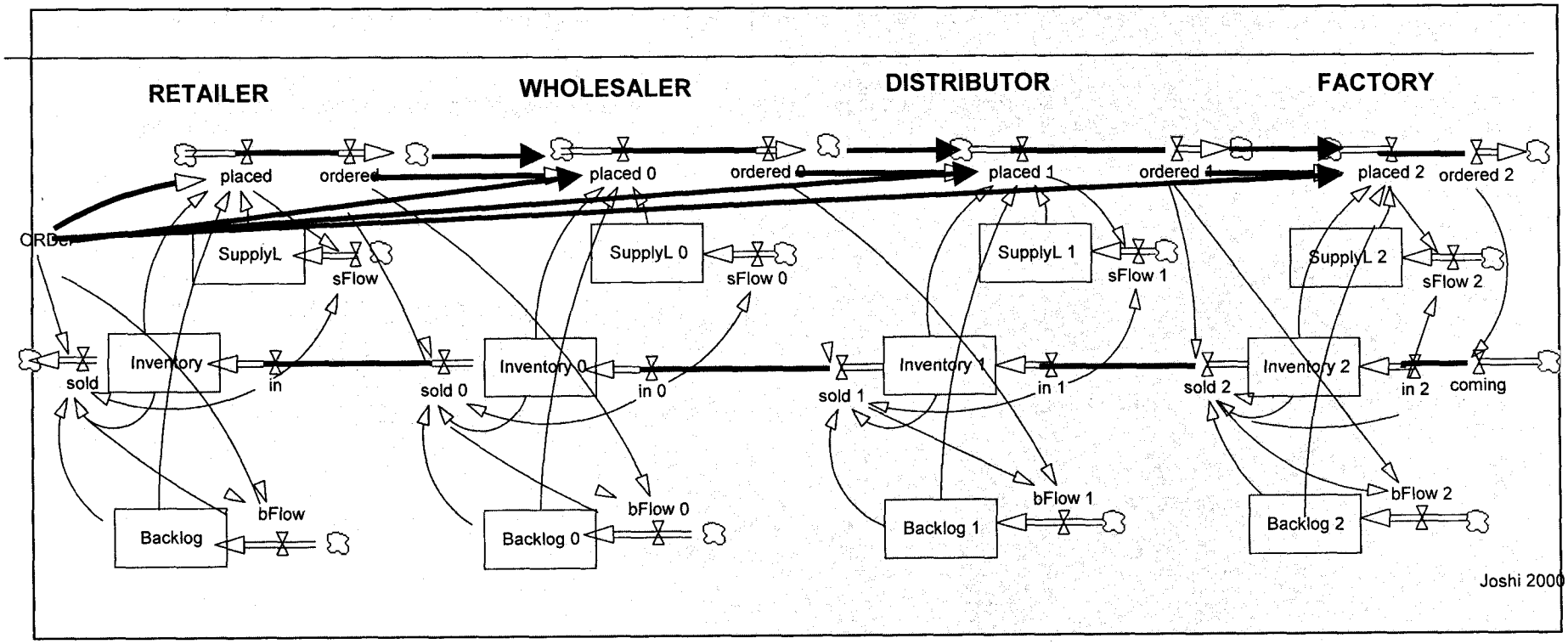


From "*Adaptive Value Networks*" *Dr. Shoumen Datta et al.*
In *Evolution of Supply Chain Management*, By Y. Chang, H. Makatsoris, H. Richards
Kluwer Academic Publisher, USA, 2004. March

SCM: Conventional (without visibility)

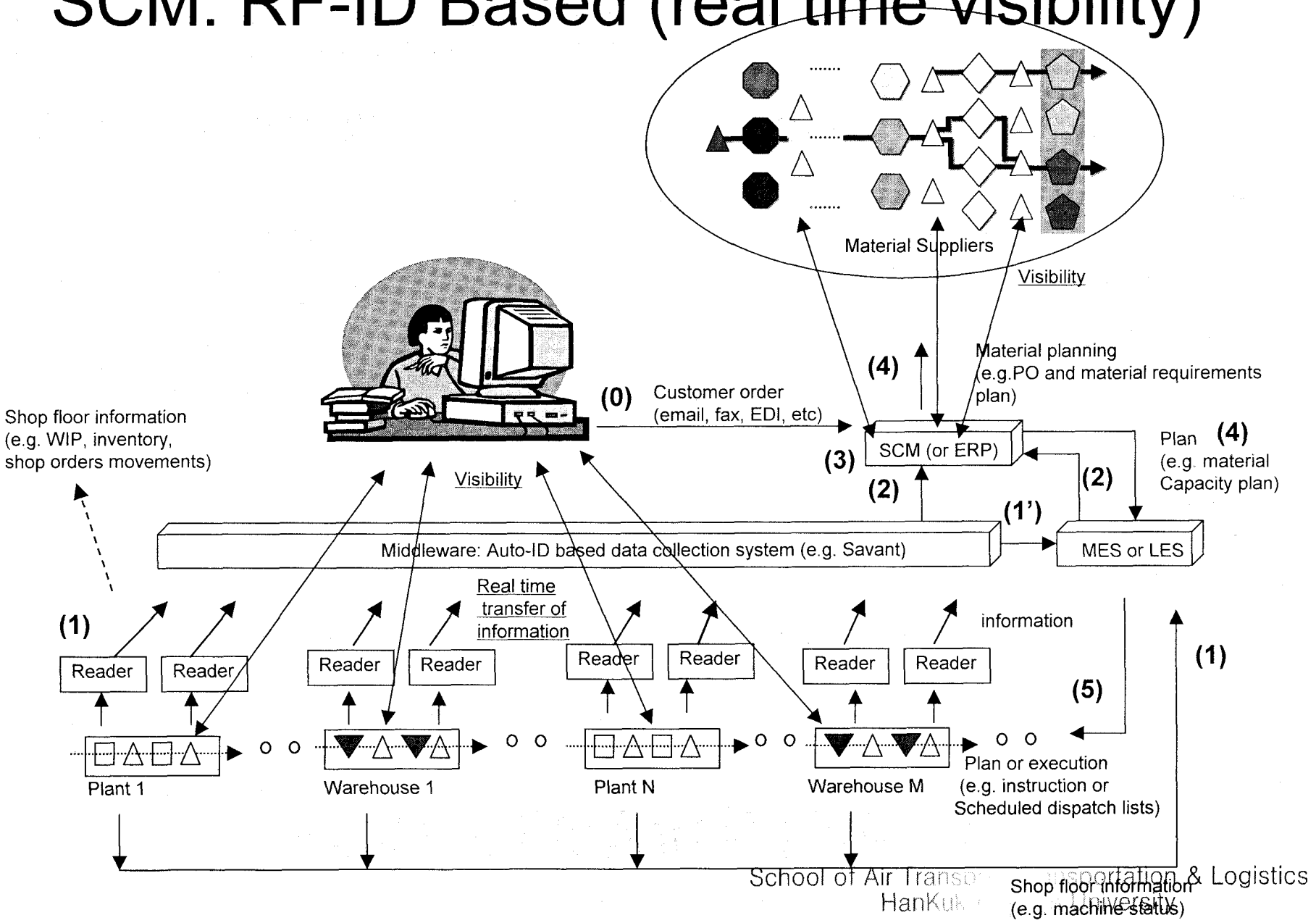


SCM: Removing Bull-Whip (RF-ID Based SCM)

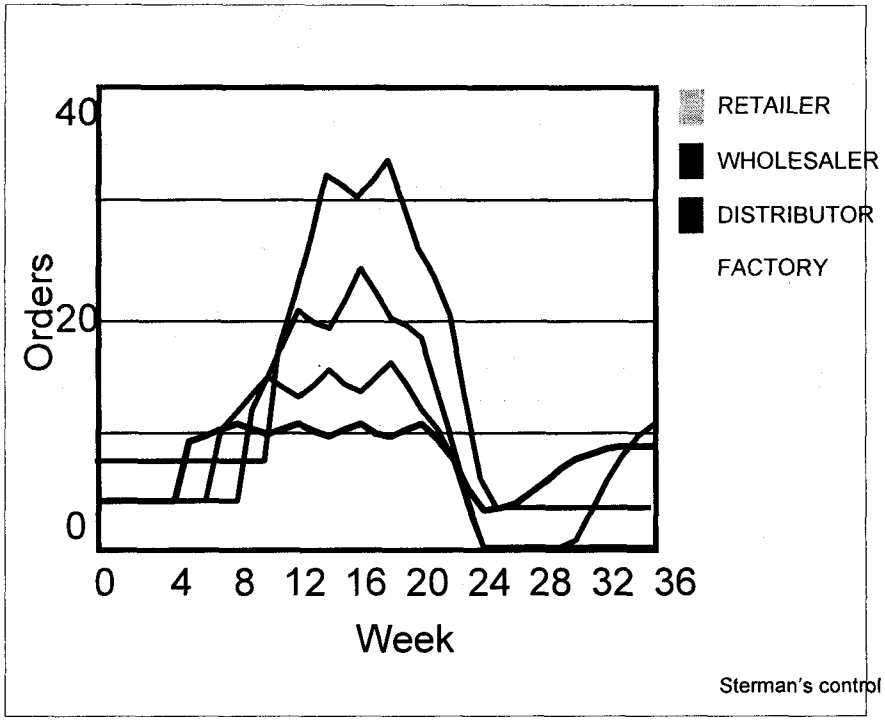


From "*Adaptive Value Networks" Dr. Shoumen Datta et al.*
In *Evolution of Supply Chain Management*, By Y. Chang, H. Makatsoris, H. Richards
Kluwer Academic Publisher, USA, 2004. March

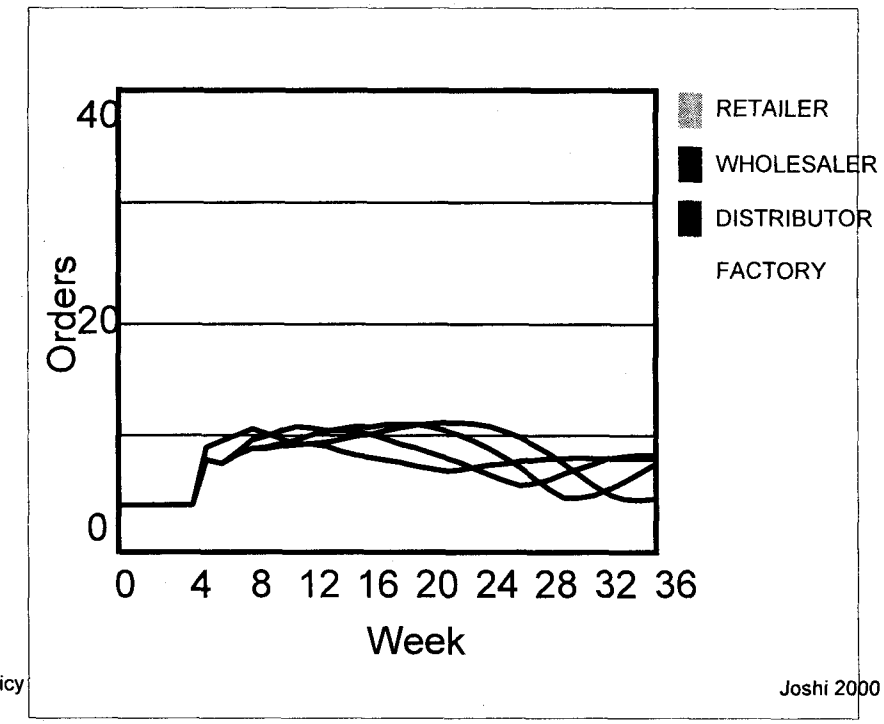
SCM: RF-ID Based (real time visibility)



SCM: Bull-Whip Effects



Conventional SCM



RFID Based SCM

From "*Adaptive Value Networks" Dr. Shoumen Datta et al.*
In *Evolution of Supply Chain Management*, By Y. Chang, H. Makatsoris, H. Richards
Kluwer Academic Publisher, USA, 2004. March

Things to consider for successful adoption

- Item (to trace) type:
  - e.g. Pallet, case, item
  - Material type. Metal?
- Data: Data Storage in the Tag
- Tag style or structure: e.g. label, IC Card style
- Where to Tag: Where to mount
- Reader and Tag capabilities: e.g. read range
- Application Software and Middleware

Things to consider for successful adoption: Read Ranges, Memory

- Read Ranges:
  - –Location of transponder
  - –Minimum distance between transponder (e.g. Card for transportation, Assembly process etc)
  - –Processing speed of transponder within read range

- Memory Size: consider memory size based on the application.