RFID를 이용한 컨테이너 추적 시스템

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Introduction

- RFID(Radio Frequency Identification) and Logistics
  - Radio frequency identification (RFID) is perceived as an emerging potential tool that has been increasingly used in logistics and supply chain management (SCM) in recent years (Finkenzeller, 2003; Singh, 2003).
  - With more and more organizations having a strong interest in RFID, RFID tools have assumed an important role in supporting logistics and supply chains.
  - However, very little has been reported on how RFID systems for container logistics and shipping business are designed and developed.
  - We proposed RFID applications for container tracking in shipping business.
    - We found out that the innovative use of RFID technology can help a container tracking and gain competitive advantages through achieving better service quality, greater visibility of data, and higher speed over competitors.
    - The application system can track the containers and freights and automate the manual processes executed in shipping business.

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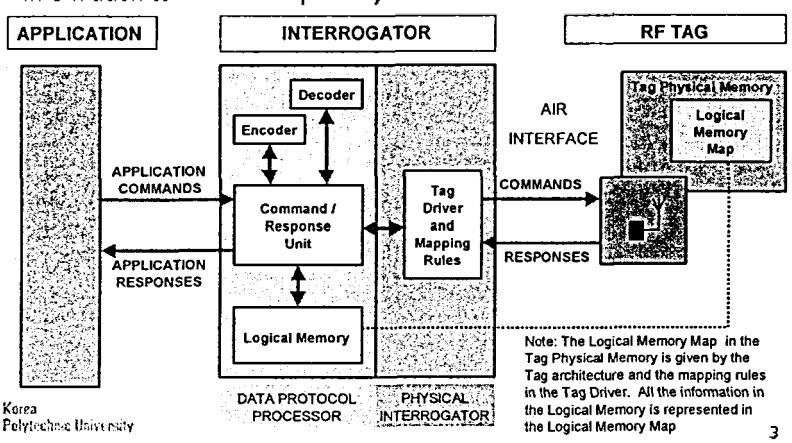
RFID System

- RFID system consists of three major components – RF tag (transponder), Interrogator (reader), and Middleware that record and transmits the tag information to a central repository.



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Issues in RFID Application Development

- How to promote RFID Applications in industry?
  - Technology itself(High Reliability, Low cost ...)
  - Capable of creating values in business
  - Etc
- Limitations intrinsic to current RFID applications
  - Imitations of known applications adopted by top class companies
  - Simple ideas derived from function-oriented approach
  - Insufficient ROI Analysis
  - Feasibility

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Consideration in RFID Applications

- IT enabler
- Technology is critical
- Meet business requirements
- Applicable in SCM(Cross organizations, Cross division, cross-company)
- Need to link business processes in multiple organizations, companies
- Need to create, update and change business process
- Need to integrate to legacy(current or old) systems
- Need an integrated and systematic approach which covers from business analysis to system development

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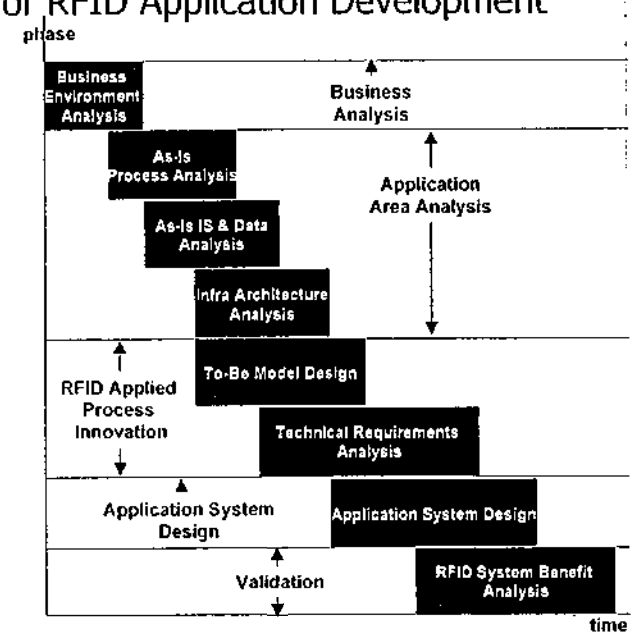
Methodology for RFID Application Development

- 8 Phase Framework
- Including the System design & implementation phase
- Application Requirement profiles.



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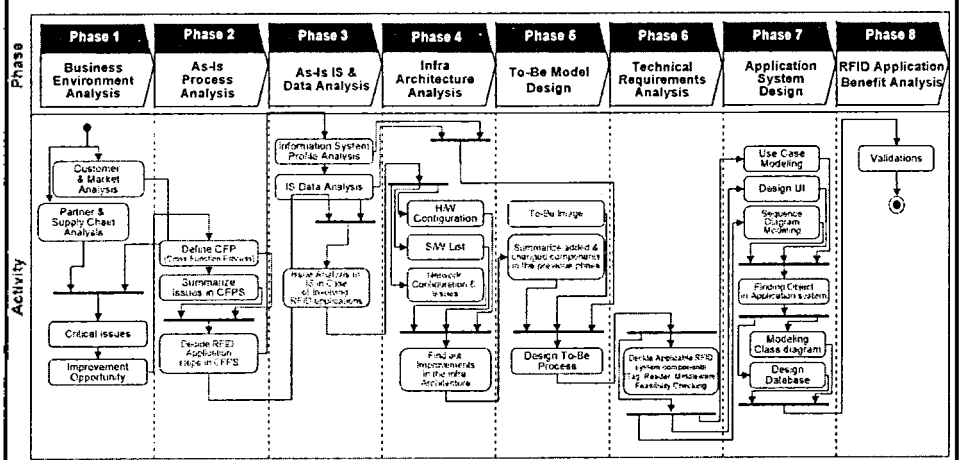
Methodology for RFID Application Development (Cont.)



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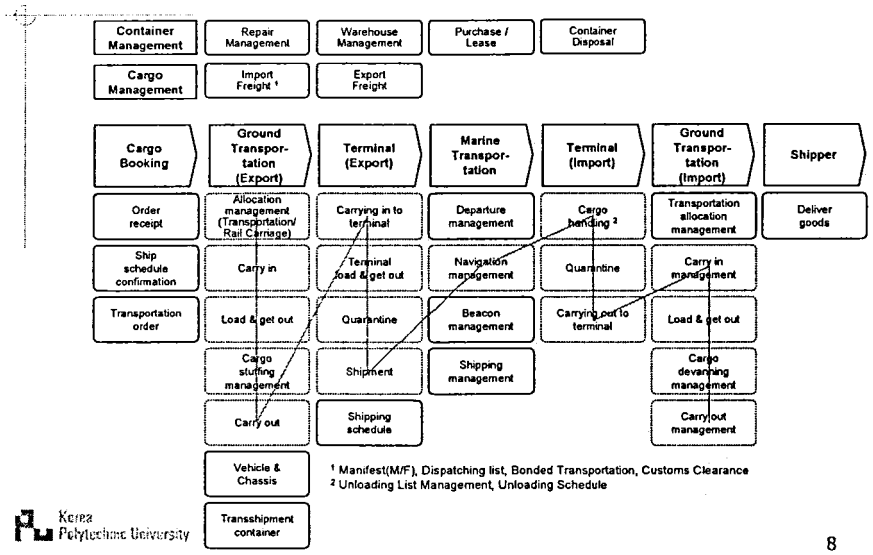
Overall Container Tracking Processes



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As-Is Process and Issues Analysis

- Difficulties to cope with an consignor's inquiries about freight location during transportation
- Considerable work burdens to confirm and to register carrying-in(or carrying-out) operations when a container is carried in to(or carried out from) a shipping terminal or a container depot
- Container misplacement happens in a container depot or shipping terminal, because the drivers of the stackers register the position of the placement of the container using a input device like a touch screen kiosk, after they change the location of containers or stock containers. This increases the chances of human errors in dealing with information on the containers.
- After (un)loading containers (from) on the ship, cargo workers and transporters both should double-check the loading/unloading containers. This is not only time consuming but also redundant.
- There is no information matching a transportation vehicle to the container chassis which the vehicle carries. Only vehicle and container matching information is managed. This has led to the problem where it is difficult to find out the chassis location sometimes.

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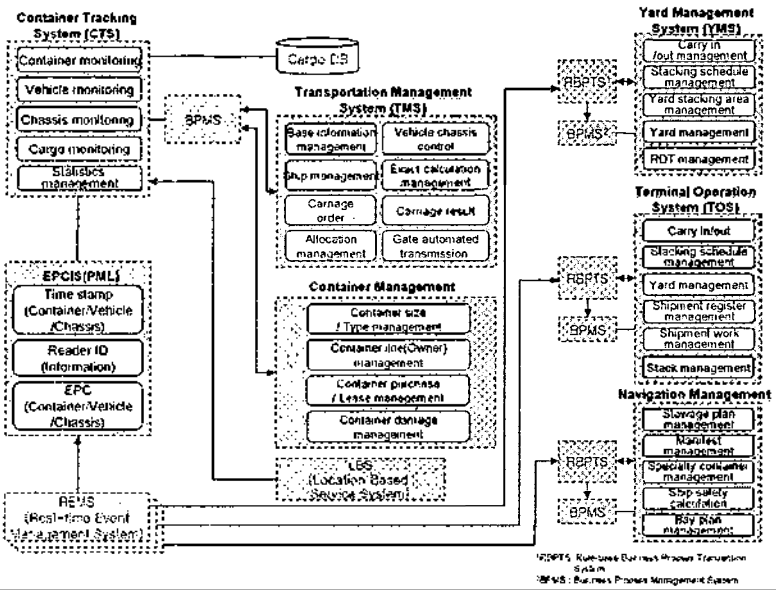
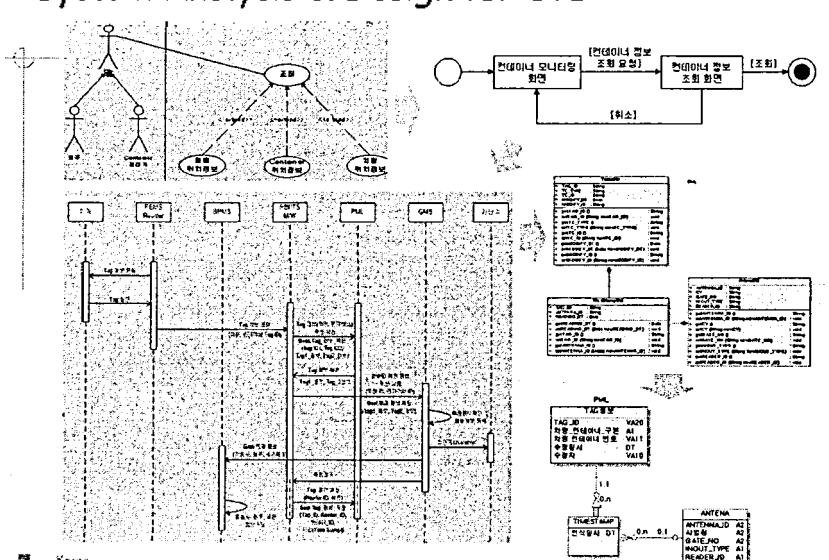
Process redesign & applying RFID Technologies

Process Name	Activity	Process change	Performance Measure
		RFID application	
Carry-in process	Container number recognition	Recognizing the truck, chassis, container on GATE simultaneously	• Issuing lead time • Waiting time at GATE • Processing time at GATE
		Sticking RFID tag to truck, chassis and container	
Carry-out process	Container number recognition	Recognizing the truck, chassis, container on GATE simultaneously	• Issuing lead time • Waiting time at gate • Processing time at GATE
		Sticking RFID tag to truck, chassis and container	
Loading & unloading	Container number recognition	Reducing the information registration time of the loading (unloading) and transferring container using automatic reorganization of the container number	• Container location grasping time in YARD • Container transfer rate
		Sticking RFID tag to container and fitting reader in equipment	
Transportation	Acquisition location information	Acquisition location information of transporting vehicles using communications component such as GPS/A and sending the information to the control center	• Location grasping time • Customer's satisfaction
	Acquisition location information at tollgate	Reading truck and container ID at freeway tollgate and sending the location to the control center	
		Sticking RFID tag to truck and container and fitting RFID reader in freeway tollgate	
Carry-in (into terminal)	Container number recognition	Recognizing and confirming the truck, chassis, container ID on terminal GATE	- Processing time at GATE
		Sticking RFID tag to truck, chassis and container	
Carry-out (from terminal)	Container number recognition	Recognizing and confirming the truck, chassis, container ID on terminal GATE	- Processing time at GATE
		Sticking RFID tag to truck, chassis and container	
Shipment	Container number recognition	Recognizing and confirming the container ID when it was moved to gantry crane to make a shipment	- Loading time
		Sticking RFID tag to container and fitting RFID reader in gantry crane	

Information Architecture related to CTS



System Analysis & Design for CTS



Discussion

Although the RFID application system has an advantageous move for container tracking in shipping business, there are issues that need to be further addressed. Because the container tracking involves different parties from container manufacturers and suppliers to maintenance contractors and users, it is possible that the entire industry is not technologically advanced enough to incorporate RFID. The major issues of implementation are described below.

- **Physical issues**: For the tagging of RFID, the containers are metals which reflect radio wave. Water absorbs radio waves so it is difficult for RFID to track products with high water content, or that are in metal. The performance of the system will be adversely affected by both factors. A careful design in placing the tags is required to overcome this limitation.
- **Business process issues**: As is the case with most breakthrough technologies in container transport, implementing RFID can require the fundamental redesigning of business processes if optimal benefits from using RFID are to be obtained.
- **Standardization issues**: There is lack of standardization on codes. Some may use ISO or EPC standards. Code conversion may be required for implementation.
- **Security issues**: RFID could make possible an omnipresent state of surveillance. The security and integrity of information and the privacy of consumers are always primary issues surrounding the adoption of RFID.
- **Resistance to change**: The implementation of information systems is affected by the way people perceive these systems and how people behave. RFID systems are no exception. Resistance to change is another important issue. It is a major behavioral factor that can have a significant impact on the implementation of RFID systems.

Conclusions

- We developed an RFID application for container tracking in shipping business.
  - Use of RFID technology can help a container tracking and gain competitive advantages through achieving better service quality, greater visibility of data, and higher speed over competitors
  - CTS can track the containers and freights and replaces the manual processes in the shipping company. It is the visibility of the position of each container and truck in container transport. It give the container manager proper asset management, shipping planner improve planning accuracy and the customers advanced service such as accurate delivery estimation, status of freight and etc.
- Further research area is
  - to solve the several problems in adding of RFID tag, to redesign business process of the container management, standardization of codes and security,
  - to examine suitable models for the adoption of RFID in organizations and investigating the managerial and business implications of adopting RFID technology in an organization,
  - the integration of the RFID application system, the legacy system and business process management system to inter-organization process automation.