

Ubiquitous & Pervasive Commerce

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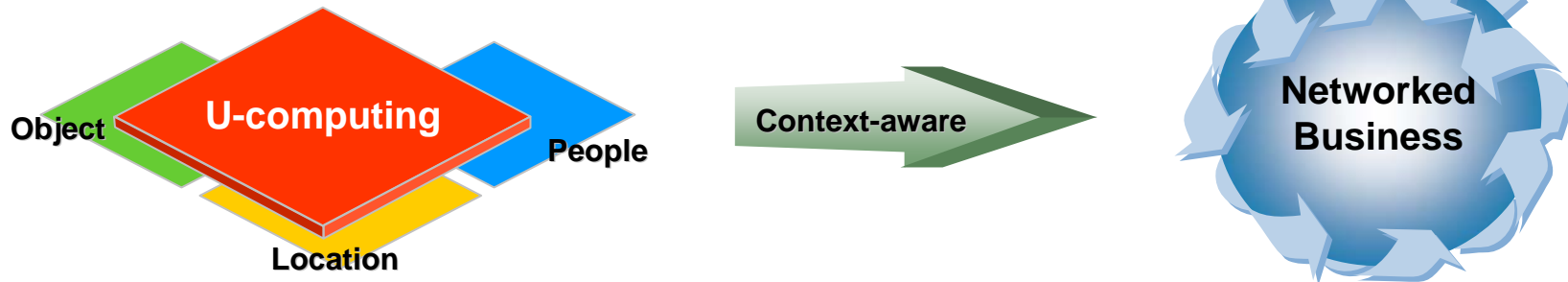
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Ubiquitous Computing and Networked Business

- **Ubiquitous computing : The next wave of information and communications technology**
 - 유비쿼터스 컴퓨팅이 기존의 패러다임과 차별화되는 점
 - Computation and communication capability embedded into object, location, people
 - It becomes possible to interact freely with digital resource at any time and everywhere
 - The physical and the digital worlds intimately related, and they open up numerous possibilities for new computing interactions

- **Ubiquitous computing technologies를 이용하여 context-aware 개념의 지능적 환경을 구축**
 - Context-aware 환경 하에서는 물리적 환경, 시간, 개인적 정보, 사회적 정보 등을 모두 인식

- **Implications of new Ubiquitous computing paradigm for business**
 - Automatic identification of product items fuels production planning applications
 - Stocking and inventory control does not require human intervention
 - The information can be used to optimize enterprise resource planning



Ubiquitous Commerce Technology

▪ Automatic Identification

- RFID tags (small enough to be embedded in objects and living organism)
 - Passive RFID : doesn't need an integrated battery, low cost, need RFID reader
 - Active RFID : on-board battery, doesn't need RFID reader



▪ Sensor and Actuator Networks

- It can provide other context information collected via mechanical, chemical, or biological sensors
- Within a few years sensor node size will fall below 1 mm³ in volume, which will allow for it to be embedded in objects of any form or size
- Challenges : Limited life span, limited system robustness, security



▪ Location sensing

- GPS : By using satellite, GPS receivers can get the estimated location in terms of longitude and latitude
- Reference point : cell ID, RFID reader

▪ Service provision

- Automatic identification and context sensing produces massive data. Necessary to control data streams proactively at the local level and to have standards regarding the semantics of the data moving across organizational boundaries.

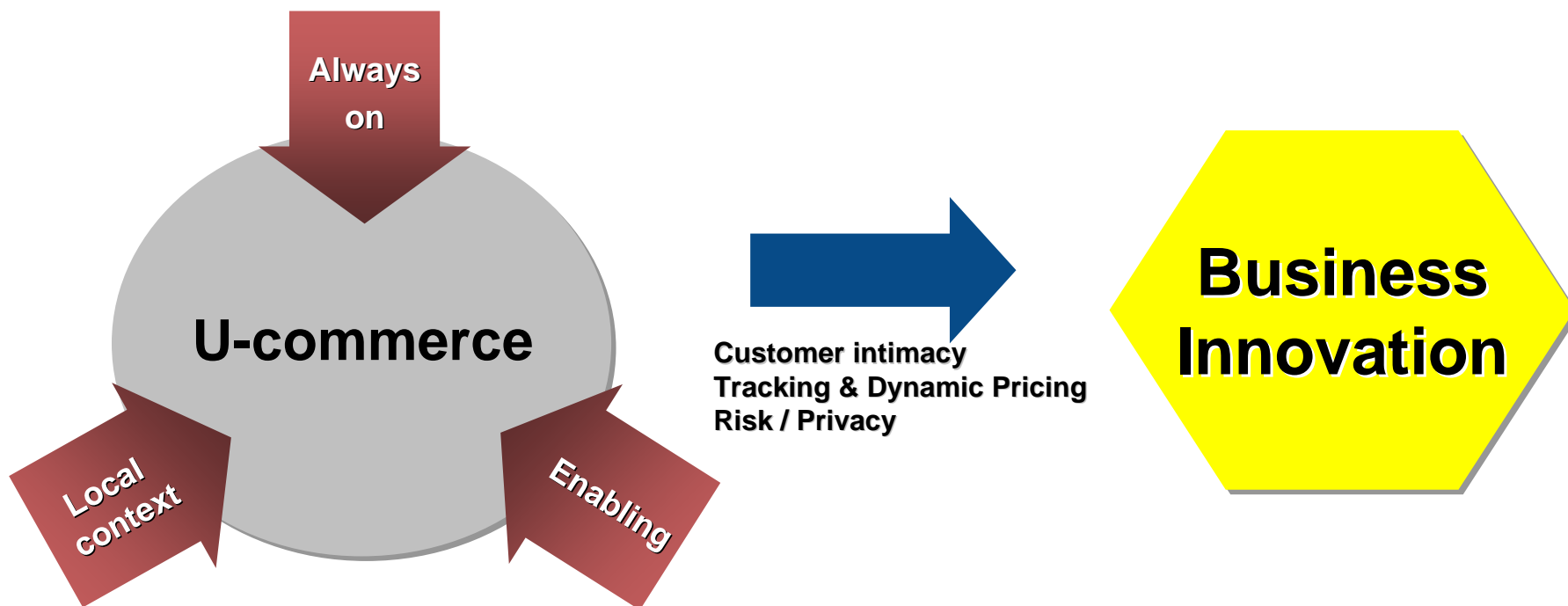
→ Re-conceptualization of our established interaction paradigm with IS

Ubiquitous Commerce and Business Innovation

▪ Three primary capabilities lead business innovation

- To provide a service channel for remote service providers through “Always on” connection
- To inform these services about the local of the user through an array of sensors
- To enable these services to affect things in the user environment through actuators and local communication links.

→ *Rethink and redesign of business process including CRM and SCM*



Integration of the real and the virtual worlds

- **lack of integration** in Today's information systems
- Today problems: **product availability, shrinkage, counterfeiting, inventory accuracy, recalls, and recycling**
- **Low data quality** currently limits enterprise computing. Better data quality and digital management control loop can help to solve these problems.
- Why cannot retail chains simply collect the corresponding data or derive it **from their barcode-based check-out systems?**
- **The current high cost of integrating the real with the virtual world** results in decisions which are based on low-quality information.
- Managers rely heavily on statistics based on **historical data**.

The EAN.UCC System

▪ Unique Identifiers

- provide unambiguous numbers to identify goods containers, services, companies, locations, and assets worldwide
- can be represented in **bar code symbols** or stored in **RFID tags**

EAN code	Electronic Product Code
<ul style="list-style-type: none"> ■ the company prefix number (manufacturer) ■ global trade item number(GTIN) ■ global location number(GLN) ■ serial shipping container code(SSCC) ■ global returnable asset identifier(GRAI) ■ global individual asset identifier(GIAI) ■ global service relation number(GSRN) 	<ul style="list-style-type: none"> ■ higher data capacity ■ item-level tagging ■ header (bits 0-7): the information of EPC ■ manager number (bits 8-35):the supplier of the product ■ object class (bits 36-59):SKU(Stock keeping units) or a lot number ■ serial number (bits 60-95):the specific instance of the particular product within its object class → item-level tagging

- **EAN code: the product** (one can of orange juice made by the Squeezed Juice company)
- **EPC code: a particular instance of the product** (the can of Squeezed Juice orange juice I hold in my hand at this moment)

The EAN.UCC System

▪ Data Communication

- messaging vocabularies, languages to describe business processes, electronic catalogues, global data exchanges, repositories of global scale (map codes to specific product items)
- **ebXML**
- **Global Data Synchronization (GDS) repository**
 - DB for products, prices, promotions and locations across a supply chain.
 - the basis of a shared e-catalogue

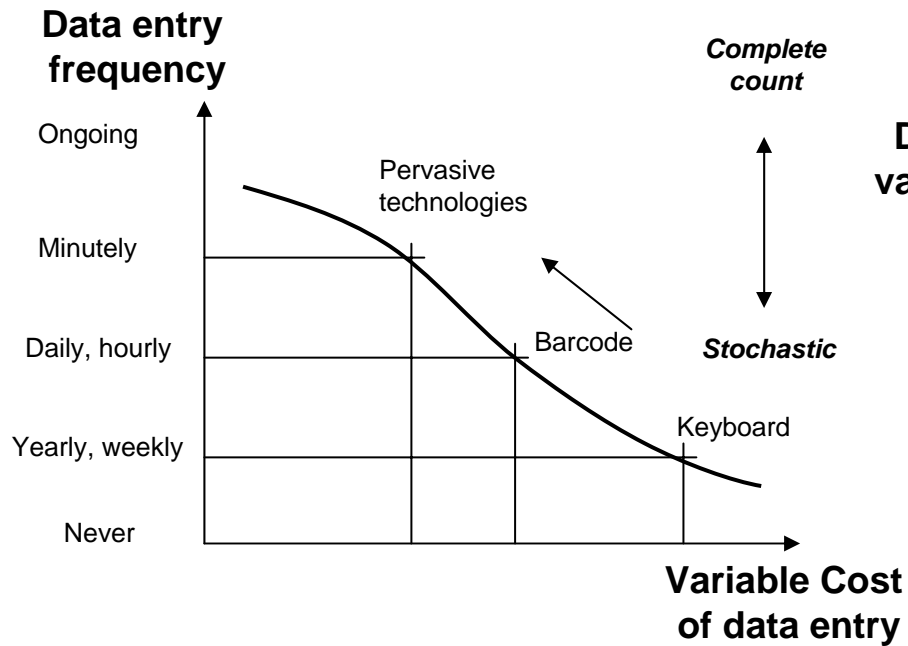
▪ The Role of Standardization for U-Commerce

- Standard are a critical component for business automation in the supply chain
- U-commerce system are fully **dependent on machine-to-machine communication** to carry out even the simpler transactions.

Integration of Real and Virtual Worlds

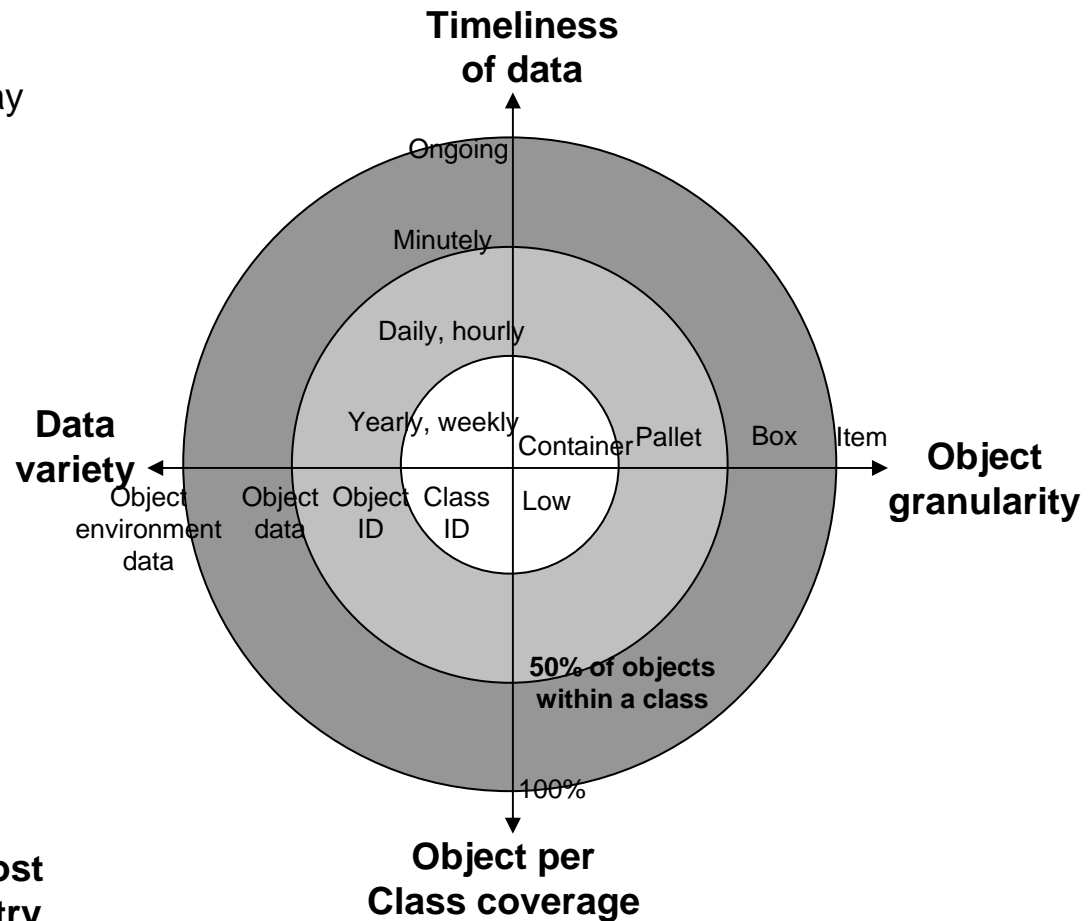
Ubiquitous computing

- Definition: Integration of real and virtual worlds
- Lack of Integration of real and virtual world today
- Because of expensive data collecting cost



Ubiquitous computing increase data timeliness

4 dimensions of data quality



How ubiquitous computing affects data quality in business applications

Two Technologies for Ubiquitous Service

▪ Ubiquitous Computing (makes everyday objects smart and connected)

■ Ubiquitous devices as a Service channel

- “always on” connections by ubiquitous computing

→ a new marketing channel for services (e.g. wine store- barcode number into cell camera phone)

→ develop “always on business”

■ Ubiquitous devices as a Sensor

- Until recently, most mobile devices were essentially deaf, dumb, and blind.

- Ubiquitous devices with GPS, Biometrics, Tracking tech.(RFID), Temperature, humidity and other environmental sensors, Chemical & radiation sensors, Cameras & microphones

■ Ubiquitous devices as a Effectors

- Deliver mobile services for personal devices & Control environments (objects) (e.g. like automobile: traffic lights-parking lots-gas station-drive-in movies/bank/restaurants)

- E.g. PDA that receive TV listings should be able to control our TV or video recorder.

▪ Web Services (as a common Language and common architecture)

- Web services are standardizing the component of service.

- Services of layers of standards: XML, SOAP (simple object access protocol), WSDI(web services description language), UDDI (Universal description, discovery, and integration), etc.

- With web services, finding, linking, communicating and paying can all happen among applications based on smart objects automatically.

The EAN.UCC System

Physical Representation

EPCglobal Network for RFID

- **Store basic information RFID tag, search for physical description, product information detail by Internet.**
- Object Name Service (ONS): a directory service which maps **EPC code to Uniform Resource Identifier (URI)**, an encoding of the name and address of objects on the Internets
- EPC Information Service (EPC IS): Store detail information.
- Combining with GDS repositories provides more powerful capability: full product traceability information

→ **Visibility of the supply chain**

: Cost reduction, productivity improvement, sales increase



Re-thinking Biz Functions and Location

- **New ubiquitous devices (a service channel, sensor and effectors combined with the web services platforms) will change the way of biz functions**
 - e.g. Package delivery shifted from being address-centric to being user-centric so that the package is delivered efficiently at a time and place convenient to the user. (Accenture Tech lab)
- **The location of your customer will become the location of your business**

Tomorrow, you will be able to conduct your business at your competitor's location.

 - e.g. Pocket bargain finder (cell phone-bar scanner), online PDA equipped with an RFID reader (Real world show room)
- **Your product become channel for your services**

The whole range of products from cars to refrigerators to be communicated through pervasive networks to their manufactures and other service providers.

e.g. software products updating automatically

The Case Studies

“Customer intimacy ?”

- Online magic medicine cabinets:

 - a situated portal to online health information embedded in a medicine cabinet

- Online wardrobe:

 - with built-in RFID reader and an LCD screen, based on machine learning techniques.

- Ability to capture salient features of customers' behavior and to provide recommendations :

 - “the customer is in danger”, “the customer is in a hurry”, “the customer is unhappy”.

Three “always on” commandants

1. To be always on and connected to their customers

2. To be always aware of their customers' real-time context

 - (where the customers are, what they are doing, what is around them)

3. To be always proactive, taking advantage of the real-time opportunities to satisfy customer needs.

Ubiquitous Commerce

Seller Side

- Possibility of Combining Context, historical, location Data
- Price Discrimination : Dynamic Pricing
 - Pervasive computing environment (ubiquitousness & invisibility) is new powerful tools to implement such dynamic pricing strategy

Customer Side

- Trade off between convenience and privacy
- Negative effect to customer
 - Intrusive information policies
 - Price discriminating strategies

Interactions between two sides -> Tracking and Price discrimination

Sellers use tracking info. (e.g, cookies)

Customer use strategies (delaying purchase, selecting a different vendor, adopting anonymizing or privacy technologies) to avoid being tracked.

New Challenge and Opportunity in the new era

▪ Creating Consumer Value

- Improve supply chain inefficiencies – direct collecting data on the shelves - thru upstream chain inefficiencies
 - Efficient Consumer Response (ECR)
 - : To raise performance levels across the entire retail sector
 - Vendor Managed Inventory (VMI) with EDI & UPC – EPCglobal
 - : Collaborative relationships for all participants
- Improve demand forecasting accuracy – necessary consumption data early - thru downstream inefficiencies

▪ Creating New Consumer

- Enable retailer to concentrate on developing the end-to-end attractive shopping experience, aiming to win customer loyalty
 - Through controlling store ambience, service quality, store perceived image and situation elements such as crowding, time and budget availability

▪ Improving efficiency in the total value chain

- Increase considerably the accuracy of predictive replenishment strategies to a degree that is well beyond what is possible today

Enacted view of ubiquitous commerce

Three principles

1. Reciprocity and Understanding

Trust relationship: Privacy protection, Personalization,
Consumption monitoring

2. Context and Locality

Not restricted only to shopping activities
but extended into their home.

3. Communication and Interaction

Effective aspects of interaction between ubiquitous
services and the customer and the emotional impact
of system usage

Evidence of Accountability

- Data from ubiquitous computing applications can also provide evidence of accountability.
- Who gave the patient the wrong medicine?
- Who replace the bumper with the counterfeit product of minor value that led to a mass collision on a motor way?
- Who let the frozen oysters warm up, causing food poisoning?

- Who is accountable for value added or value lost?
- Who has to pay for the consequences?

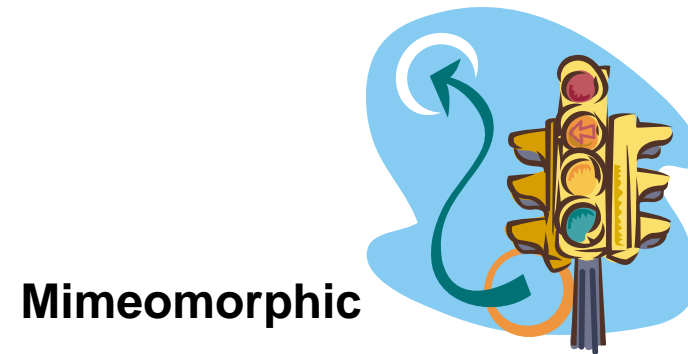
Polimorphic VS. mimeomorphic

■ Polimorphic actions

- are those that can only be understood by other people who are functionally members of the same society
- are defined such that only the enculturated(문화가 체화된) can see sameness

■ mimeomorphic actions

- Are defined such that enculturated and non-enculturated both can see sameness
- Are those that if replicated by someone who didn't understand that action would still look the same as if someone who did understand was performing the actions



It doesn't matter who's doing the job, one of the teenagers or lifetime road crew workers – it would look the same to you !!

Agency

- **The ability of new-era workers to act appropriately but relatively unencumbered by the dictates and wishes of the establishment and by engaging in a greater proportion of polymorphic actions as compared with mimeomorphic actions**
- **Can be bounded and constrained in various ways**
 - Agency in Saturday Market
 - The fish sculptor can decide without repercussion to give away the salmon leaping over the falls
 - Relatively unbounded
 - Agency in Big Red
 - The inventory system is aligned with the times when there is an expectation of having the fewest customers in the store
 - The system informs the clerk not only of when to stock the shelves
 - Information system is doing bounding

It remains for us to consider the types of technological innovations that explicitly support polymorphic action in ubiquitous environments

Shift our perspective

To design **s**ystems that support **a**gency

One must explicitly consider

the **r**ole of the human

in the human-machine system

Re-Conceptualization of our Paradigm of IS

- RTE realization from Virtual world with Always-on Sensing**
- Evaluation of Biz Value prior to introducing New technology**
- Rethink and Redesign of biz function/process**
- Mass data controlling and Global standardization**
- Partnership with emerging technologies**