UI Design and Information Visualization

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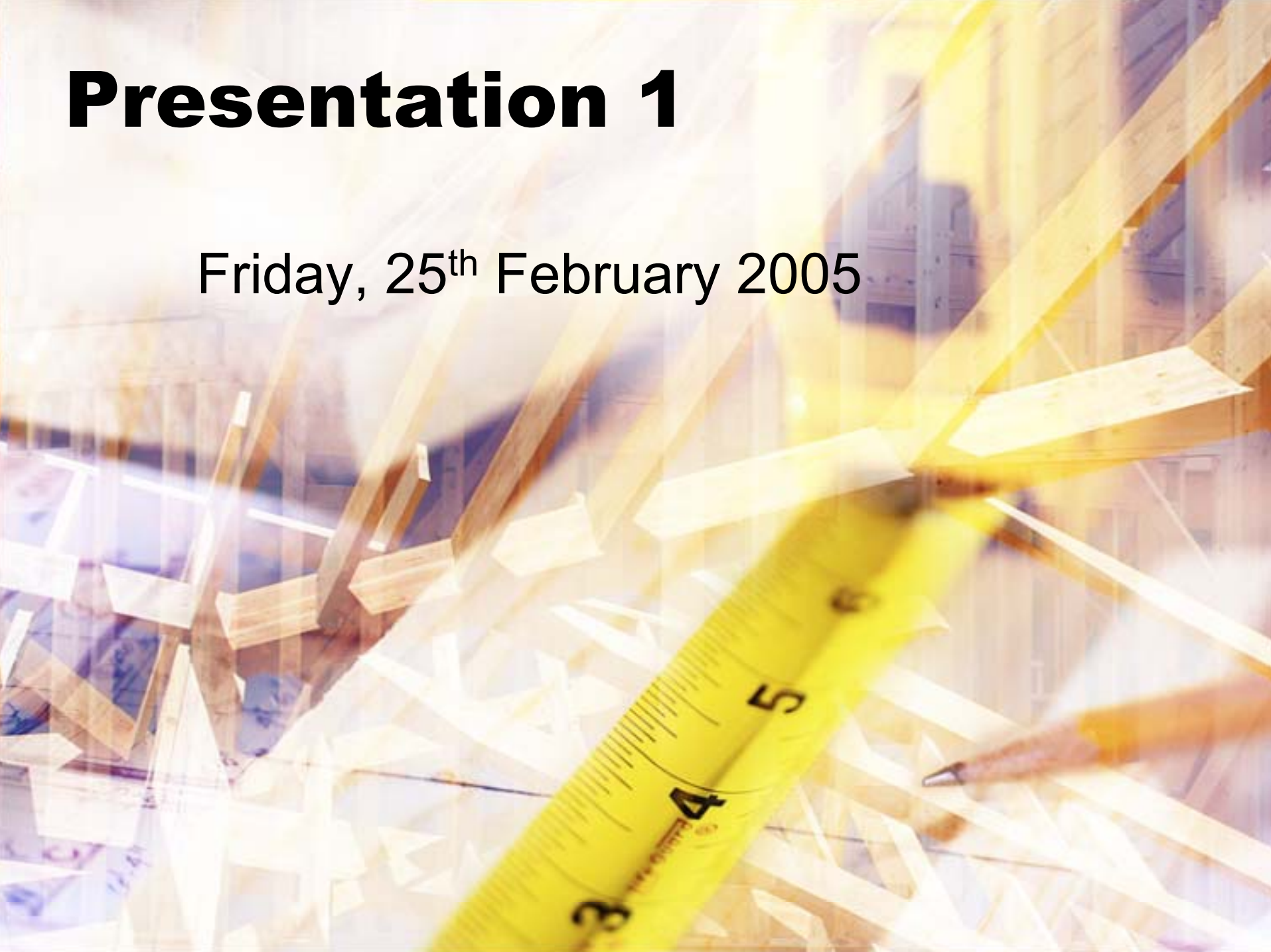
AUTO-ID LABS



Presentation 1

Friday, 25th February 2005

Agenda

1. Motivation
2. Role of User
3. User Capabilities
4. Data Perspective
5. UI Design

Motivation: User-Centric View

- Human-Computer Interfaces satisfying the needs and requirements of the end-user

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  - Data access process
  - Collection of events

Motivation: User-Centric View

- Human-Computer Interfaces satisfying the needs and requirements of the end-user
- User Interface definition drives lower layers
  - Data storage process
  - Data access process
  - Collection of events
- Lack of attention to UI design can lead to loss of man-hours, ideas and data interpretation

Role of the User

- Representation of a relationship between a kind of user and a system, characterized by those users' needs, interests, expectations, behaviors and responsibilities

User Capabilities

- Simplification through symbols, icons and color
- Limitation on the number of components and elements per visual screen
- Hierarchy of Data: Number of levels drilled down
- Interaction of the user with interface
  - Similar to familiar systems

User Classification

- Goals: business, operation of part, technical working
- Skills/experience in Domain: Novice, Intermediate, Expert
  - Young vs. old
  - Skilled vs. unskilled
- Experience with system
- Needs:

User Metrics

- Possible metrics
  - Retention of system-related skills (over time)
  - Time to learn
  - Time to complete task
  - Amount of assistance
  - Number of touchpoints (eg. Clicks)
  - Number of widgets on the screen
  - User satisfaction (Frustrating Fun)
- Measurements made across user level (novice, occasional, expert)

Usability Metrics

Usability objective	Effectiveness: Percentage	Efficiency: Time	Satisfaction: Rating scales
Suitability	Of goals achieved	To complete a task	Satisfaction
Learnability	Of functions learned	To learn criterion	"ease of learning"
Error Tolerance	Of errors corrected	Spent on correcting errors	Error handling

Rules of UI Design

- Support: Support not hinder user's work
- Context: Suitable for environment of use
- Access: Be usable w/out instruction to domain expert new to the system
- Efficacy: Not impede use by system expert
- Progression: Facilitate novice -> expert

Principles

- Metaphor: Use behavior from familiar systems
- Feature exposure: See clearly what features are available without overwhelming
- Coherence: Internal and external consistency
- State visualization:
- Shortcuts: Concrete and abstract ways – useful for expert user
- Focus: Animated vs. static
- Help: Goal-oriented, descriptive, procedural, navigational

Users in the Supply Chain World

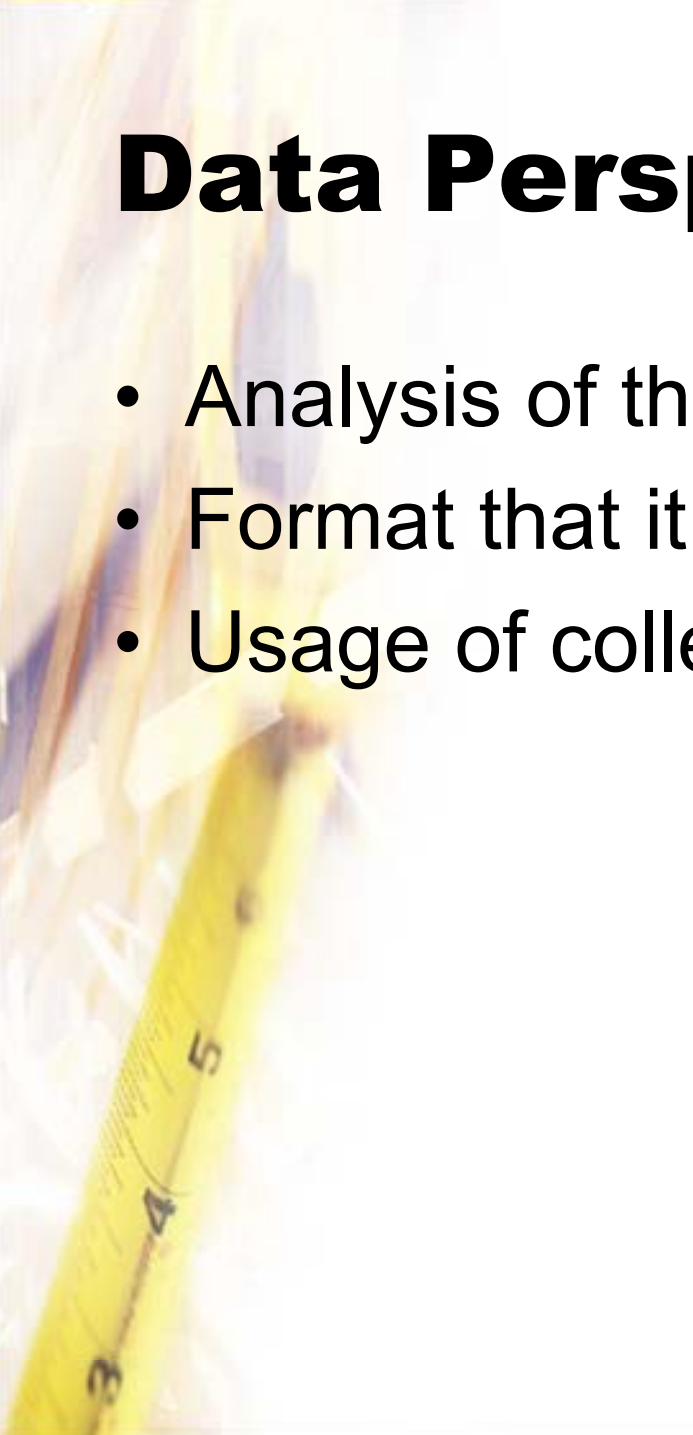
- Suppliers – Different tiers
  - Tier-1 Supplier = Raw material supplier
  - Tier-2 Supplier = Parts supplier
  - Manufacturer/Assembler
  - Packager
- Distributor
- Retailer
- Logistics Provider
- Consumer
- Recycle or waste manager

Functions in SCM

- Management of various systems
- Sourcing and procurement
- Production scheduling
- Order processing
- Inventory management
- Warehouse management
- Customer service
- After-market disposal of packaging and materials

Data Perspective

- Analysis of the kind of data present
- Format that it is available in
- Usage of collected data



Data in the AutoID world

- Entity (individual or batched) flow
  - Temporal
  - Location
  - Environment (ambient)

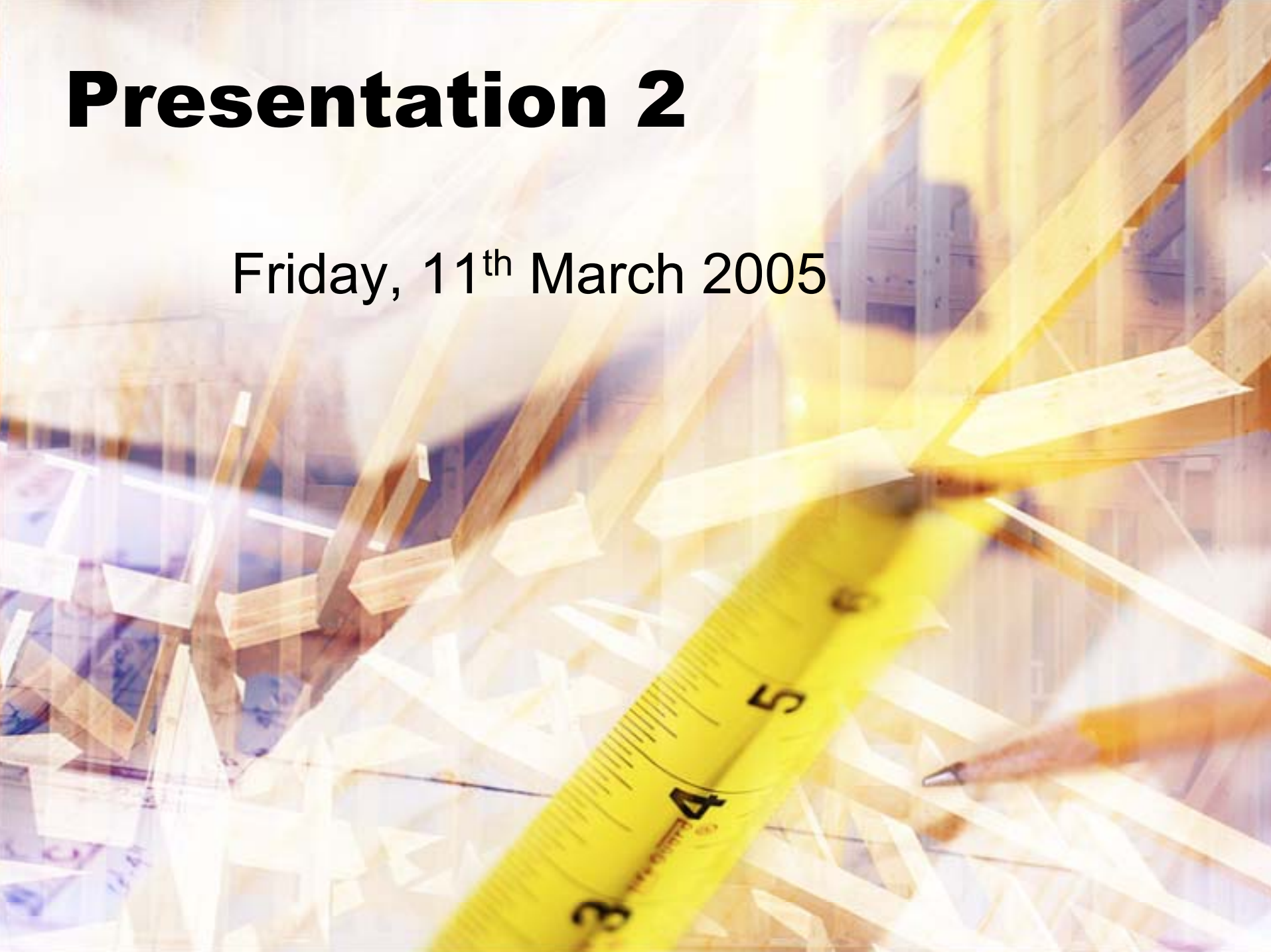
User Interface

- Dynamic Interface

- Usage of the interface
- Effectives of the interface

Presentation 2

Friday, 11th March 2005



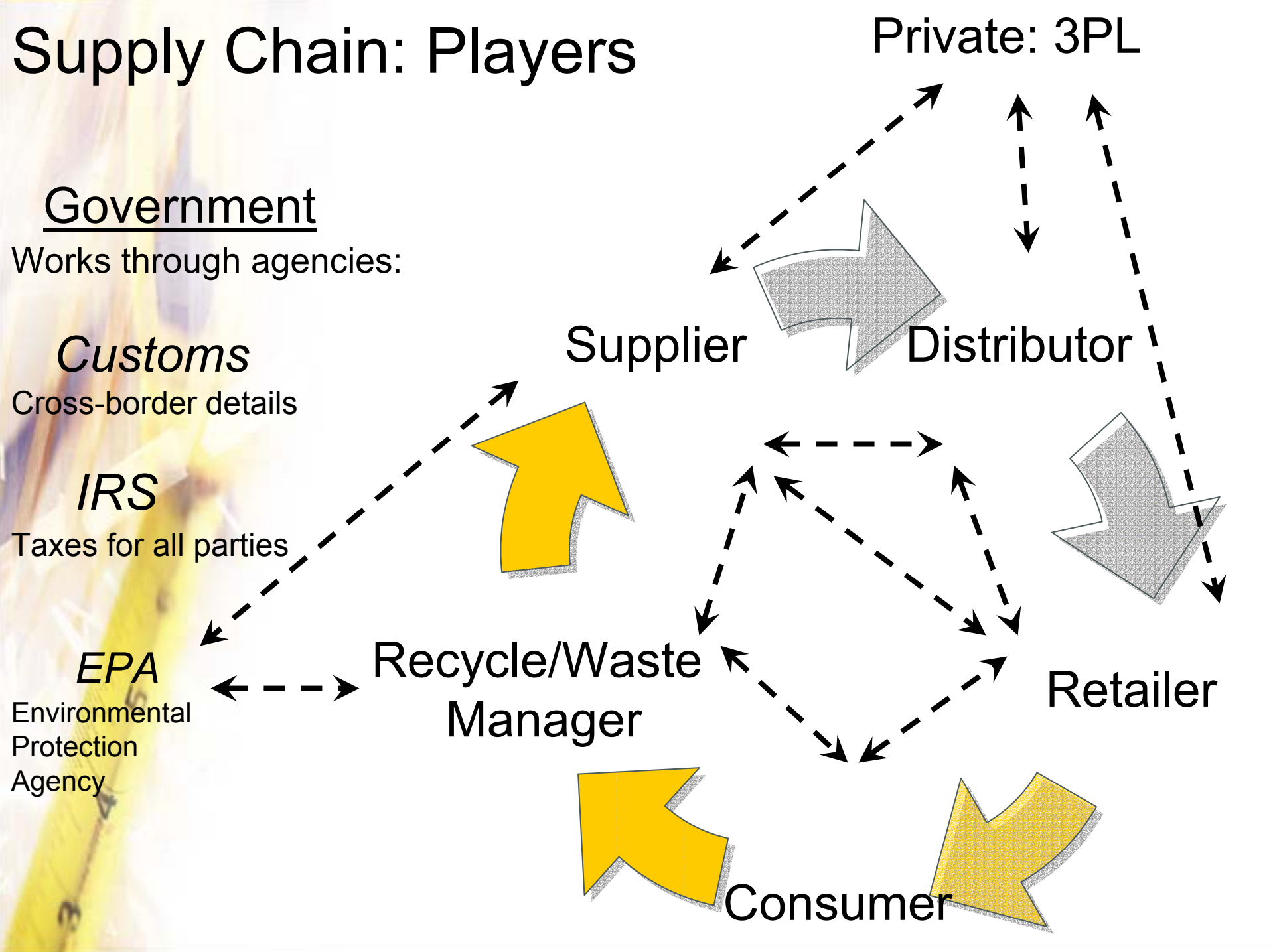
Agenda

1. Overview of Users in the SC
2. User Capabilities
3. Data Perspective
4. Next Steps

Players in the Supply Chain

- Supplier
- Distributor
- Retailer
- Consumer
- Recycle/Waste Manager
- Third Parties
  - Government [through its agencies]
  - Logistics Providers [3PL]

Supply Chain: Players



‘Cognitive’ Fit Hypothesis

- Vessey – relationship b/w viewer, task characteristics and representation format
- “a cost-benefit characteristic that suggests that, for **most effective** and **efficient** problem solving to occur, the **problem representation** and any tools or aids employed should all **support** the strategies (methods or processes) required to **perform** the task”

Visualization and Cognition

- Visualization -> Perceptualization
- Short-term vs. Long-term memory
  - Short-term: 7 (+/- 1 or 2 items)
  - Long-term: interference between similar functions/programs/representations
- Anchoring: Preference to work with familiar representations
  - Decision analysis: Decisions based on initial value than exploration of entire range of alternatives

Types of Users

- Users use different representation formats
- Decision makers
  - Day-to-day interaction [usually real-time]
  - Higher level management [final results]
- Type of problem
  - Mathematical/scientific view
  - Problem-solving view

Dimensional Representations

- Text: Linear representation
- Tabular representation: 2D +
- Graphics: 2D representation
- Volume visualization: 3D effect
- Animation: movement either in 2D or 3D

Graphics: Color vs. Shape

- Color is generally superior to shape to search for a given item
- Number of colors
  - Limited < 10
  - In line with 7 (+- 2) short term memory limit
- Color models
  - Tri-stimulus model (RGB, CMY, HLS)

Relationships between Objects

- Gestalt Psychology
  - Interrelationships among objects in an image
  - Principles
    - Foreground vs. background
    - Grouping items with similar characteristics
    - Grouping according to proximity
    - Continuity [eg. completing non-existent edges]

Alternate Approaches

- Bertin
  - Separation of information into “components”
    - Analogous to dimensions in mathematics
    - Eg. Time, plant locations, products, etc.
  - Type of the component or “level”
    - Qualitative, ordered, quantitative
  - Translate into graphical variables
    - Size, value, texture, orientation, shape, color

Alternate Approach 2

- Tufte
  - Use graphics only for large quantities of data
  - Integrate text with graphics
  - Use different levels of detail for complex information
  - Do not distort

Other Modes

- Sound
- Touch
- Hypermedia
- Virtual Reality

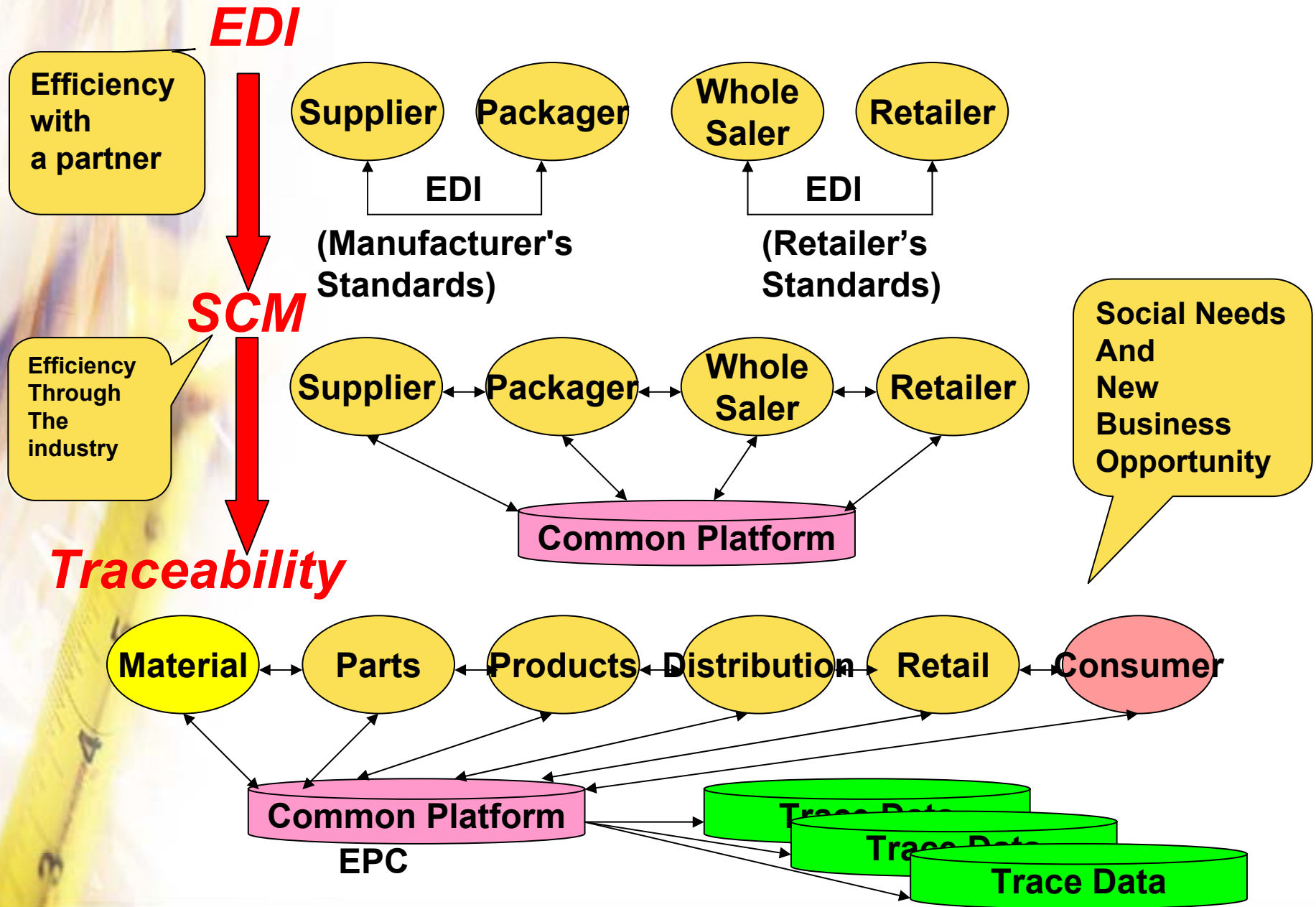
Traditional SCM Data

- Order information and processing
- Inventory information
- Information about containers and other collections of items

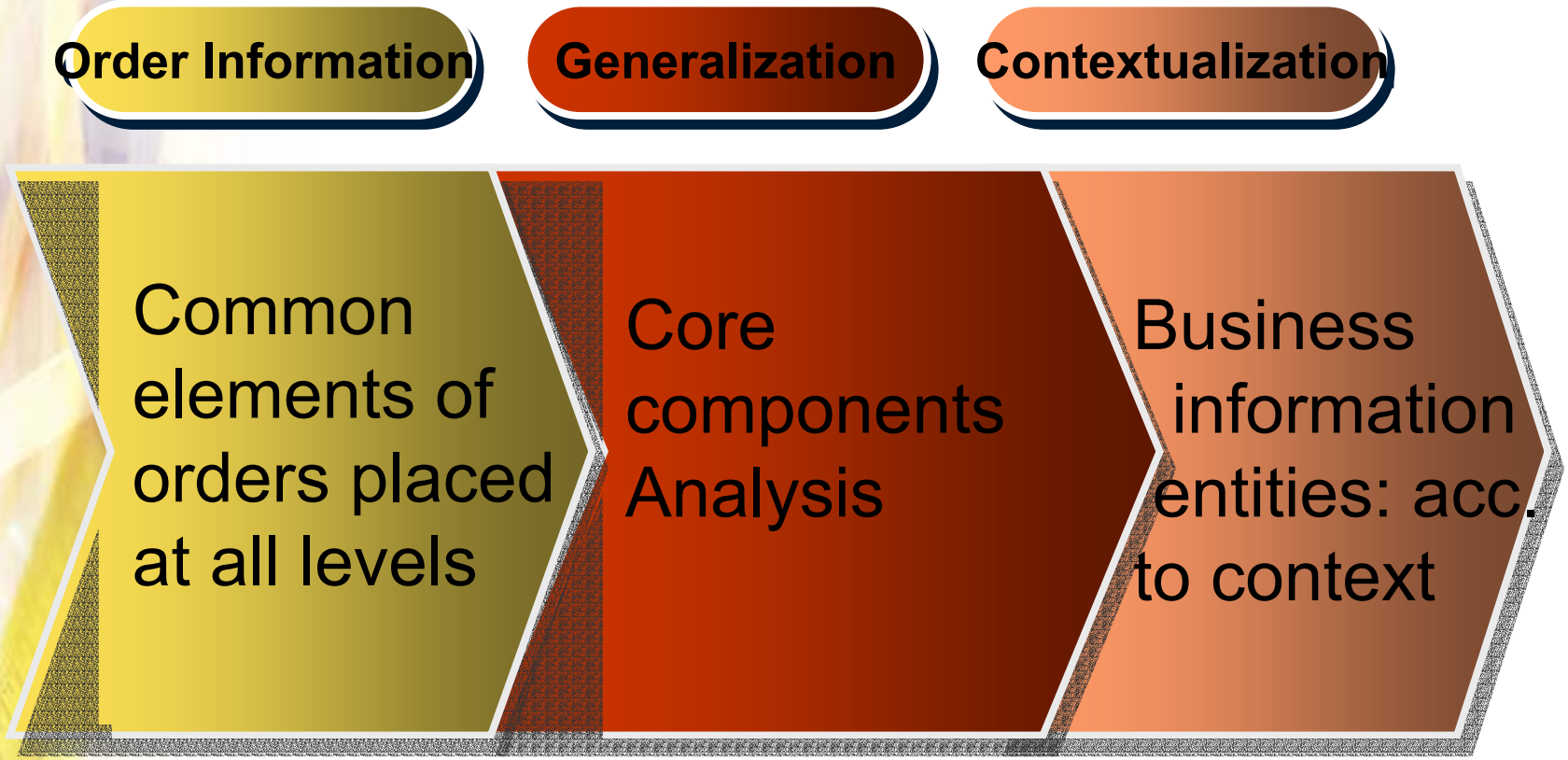
Data in the AutoID world

- Characteristics
  - Quantitative
  - Dimensions
    - Identity
    - Time
    - Location
    - Value
  - Item-level
- Types
  - EPC information
    - What
    - When
    - Where
  - State information from sensors
    - Temperature
    - Pressure
    - Vibrations
    - etc

Trend of Information Exchange



Business Processes



Next Steps

- User analysis
  - Survey of existing SC users for representation types at different levels
  - Survey of existing SCM software: IBM Global Services, Accenture, Atos Origin, Unisys, T-Systems, SeeBeyond
- Data Analysis
  - Look at case study: Samsung SC