UI Design and Information Visualization

- Chaitra Chandrasekhar
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
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
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 (e.g. Clicks)
  – Number of widgets on the screen
  – User satisfaction (Frustrating Fun)

• Measurements made across user level
  (novice, occasional, expert)
# Usability Metrics

<table>
<thead>
<tr>
<th>Usability objective</th>
<th>Effectiveness: Percentage</th>
<th>Efficiency: Time</th>
<th>Satisfaction: Rating scales</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Suitability</strong></td>
<td>Of goals achieved</td>
<td>To complete a task</td>
<td>Satisfaction</td>
</tr>
<tr>
<td><strong>Learnability</strong></td>
<td>Of functions learned</td>
<td>To learn criterion</td>
<td>&quot;ease of learning&quot;</td>
</tr>
<tr>
<td><strong>Error Tolerance</strong></td>
<td>Of errors corrected</td>
<td>Spent on correcting errors</td>
<td>Error handling</td>
</tr>
</tbody>
</table>
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

**Government**
Works through agencies:

**Customs**
Cross-border details

**IRS**
Taxes for all parties

**EPA**
Environmental Protection Agency

**Supply Chain: Players**

- Private: 3PL
- Distributor
- Supplier
- Recycle/Waste Manager
- Retailer
- Consumer
‘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

EDI

Efficiency with a partner

Supplier -- Packager -- Whole Saler -- Retailer

EDI

(Manufacturer's Standards)

EDI

(Retailer’s Standards)

SCM

Efficiency Through The industry

Supplier -- Packager -- Whole Saler -- Retailer

Common Platform

Social Needs And New Business Opportunity

Traceability

Material -- Parts -- Products -- Distribution -- Retail -- Consumer

Common Platform

EPC

Trace Data
Business Processes

Order Information

Common elements of orders placed at all levels

Generalization

Core components Analysis

Contextualization

Business information entities: acc. to context
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