



## Plan for Today's Lecture(s)

- Identifying information components
- Resource identifiers and names
- Smart resources



UNIVERSITY OF CALIFORNIA, BERKELEY  
SCHOOL OF INFORMATION

# **INFO 202**

## **“Information Organization & Retrieval”**

### **Fall 2013**

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17 September 2013  
Lecture 6.1 – Identifying Information Components;  
Document Analysis



# Adapting the Classical Modeling Approach to TDO – 2

- In some Organizing System contexts we start with a collection of resources to organize
- So we analyze the domain and the resources to determine appropriate properties to use in descriptions and organizing principles as we would in any other modeling activity
- But sometimes we concurrently design the Organizing System and the resources it will contain
- Systematic modeling of information components and documents to enable efficient reuse and transformation is essential



## Information Components

- Information components - especially standardized ones - are semantic building blocks that can be assembled into different document types
- A component architecture for information is essential to enable efficient reuse, integration and operation of information-intensive organizing systems



## Identifying Information Components

- Any piece of information that can be addressed and manipulated by a person or process as a discrete entity
- Any piece of information with a unique name or identifier
- Any piece of information that is self-contained and comprehensible on its own



# Separating Content from Structure and Presentation

- An essential goal of modeling is to separate what something means from its structure and presentation
- We're expressing a distinction between information as conceptual or as content: and the physical container or medium, format, or technology in which the information is conveyed
- Separating content from its structure and presentation is the most important principle of Information Architecture



# Three Types of "Stuff" or Kinds of Information

- Content - "what does it mean" information
- Structure - "where is it" or "how it is organized or assembled" information
- Presentation - "how does it look" or "how is it displayed" information



# The Document Type Spectrum

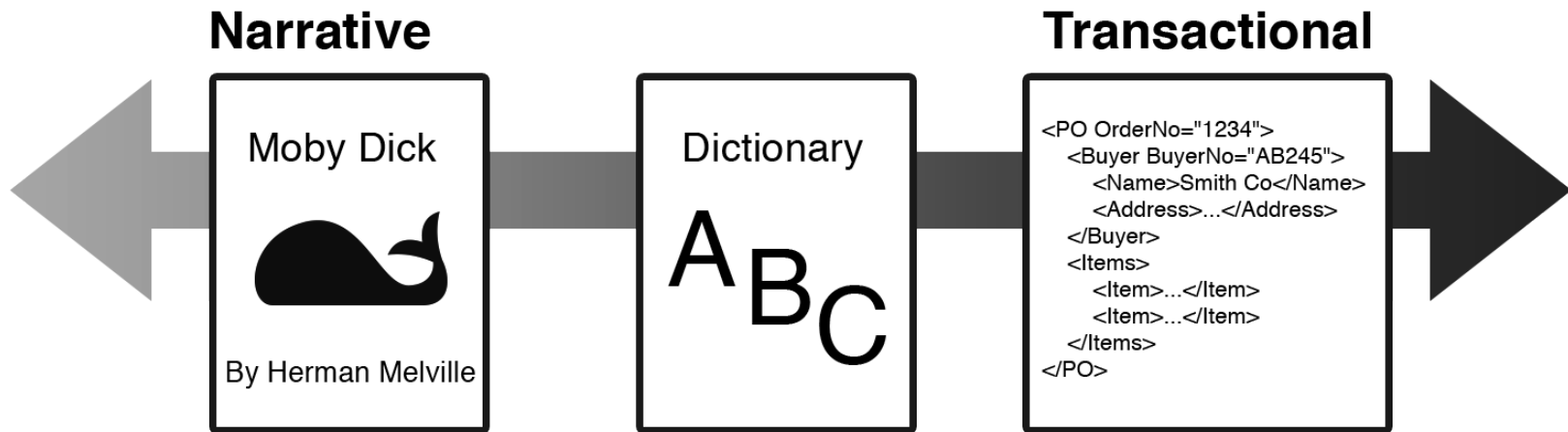
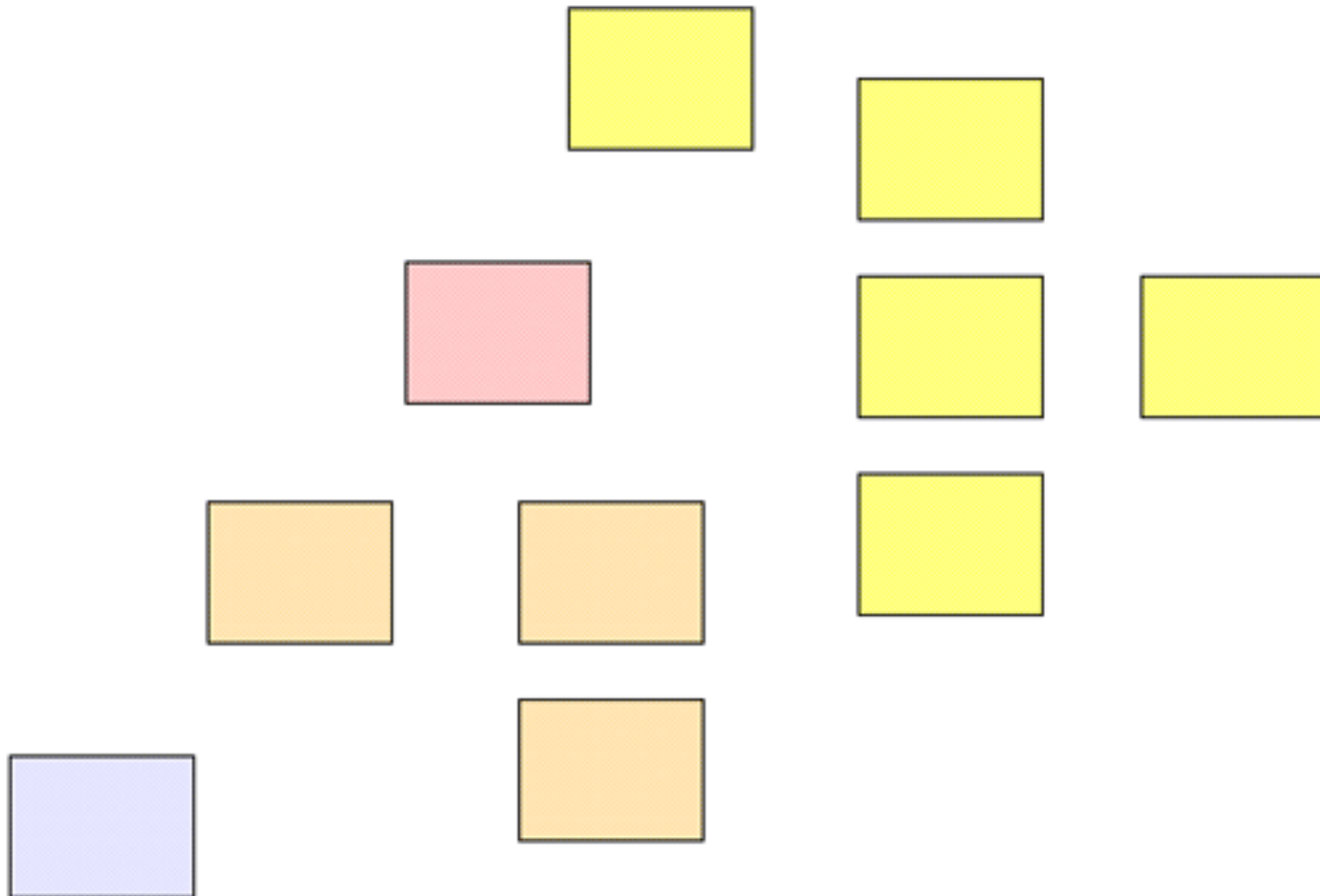


Figure 3.2 in TDO





# Content Components





## Structural Information

- Physical piece of a document or user interface (e.g. table, section, header, footer, panel, window)
- Embodies the rules on how content components fit together, often hierarchical
- Often driven by context of document use
- Most applications and web sites are organized with a small set of structures



## Applying Structure

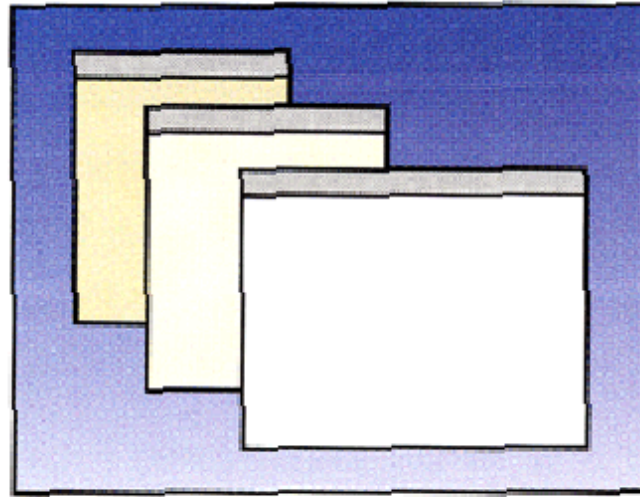
- The structural components provide the hierarchical "skeleton" or "scaffold" into which the content components are arranged; the structure remains fixed when the content changes
- Frequently a close relationship between structural and presentation items, especially in a paper document. This goes some way to explaining why document designers emphasize structural components

# The Independence of Structure and Content

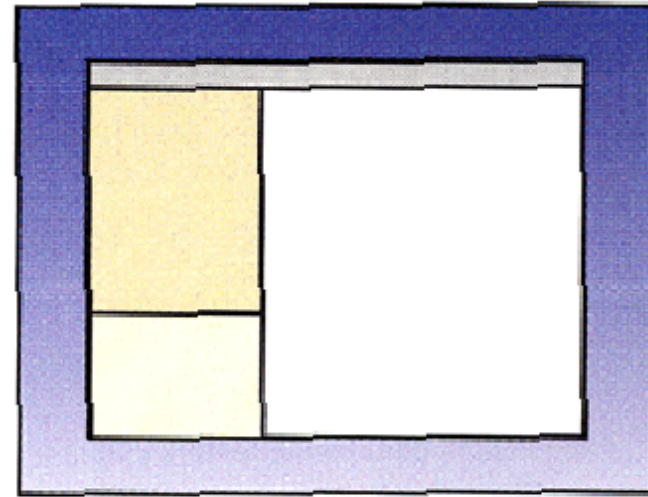
The image shows a screenshot of the ala website. The page layout is organized into several distinct sections, each highlighted with green brackets to illustrate the independence of structure and content. The sections are:

- Header:** Contains the 'ala' logo and navigation links such as 'Home', 'About', 'Contact', 'Services', and 'Partners'.
- Section 1: A Better Image Retriever**
  - Sub-section: **Introduction**
  - Text: "The new image retriever made it easy to generate a better image or a web page. With it you can create content with HTML pages. The new, more powerful tool will allow you to create pages with a single configuration file to create content files, all tags, HTML, and even CSS pages for each image. This is made differently than image retrieval using a single page."
- Section 2: Enhance Usability by Highlighting Search Terms**
  - Sub-section: **Introduction**
  - Text: "Search engines often return a page of your website with their search results highlighted. You can do this with HTML and make it easier for users to find what they're looking for. Whether they're looking for an individual search engine or your entire site, by making their search results more visible to you."
- Section 3: Better Images for Better Business**
  - Sub-section: **Introduction**
  - Text: "Images that attract attention, encourage sales, and create a positive image can be a valuable marketing tool for all parties. Images that are attractive, professional, and well-organized can help you help 'sell' the idea" by making your website more visible to a state department, thereby increasing the number of sales."
- Section 4: Copyright in Images and Text**
  - Text: "Copyright in images and text requires reporting results and the authors. **Copyright** and the authors."
- Section 5: Navigation**
  - Text: "Navigation is a key element of a website. It is the way that users can find their way around the site. It is the way that users can find their way around the site. It is the way that users can find their way around the site."

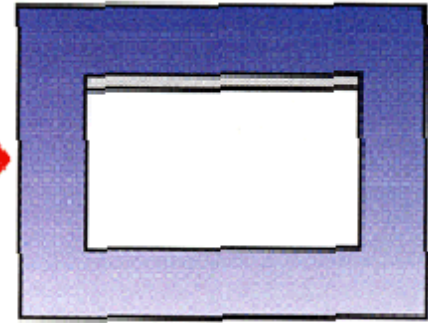
# Different Physical Structures for Same Content Model



Multiple windows

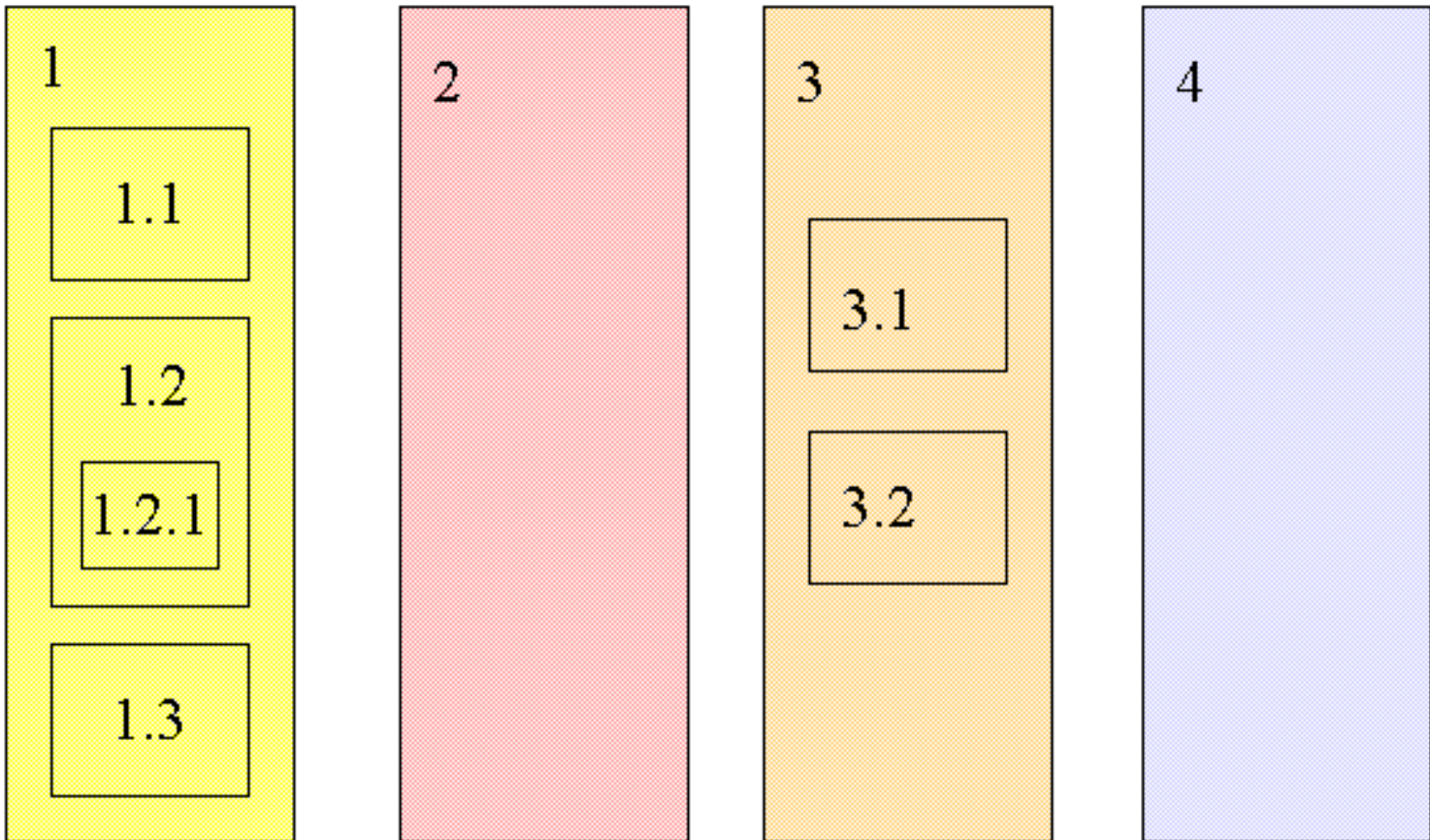


Tiled panes

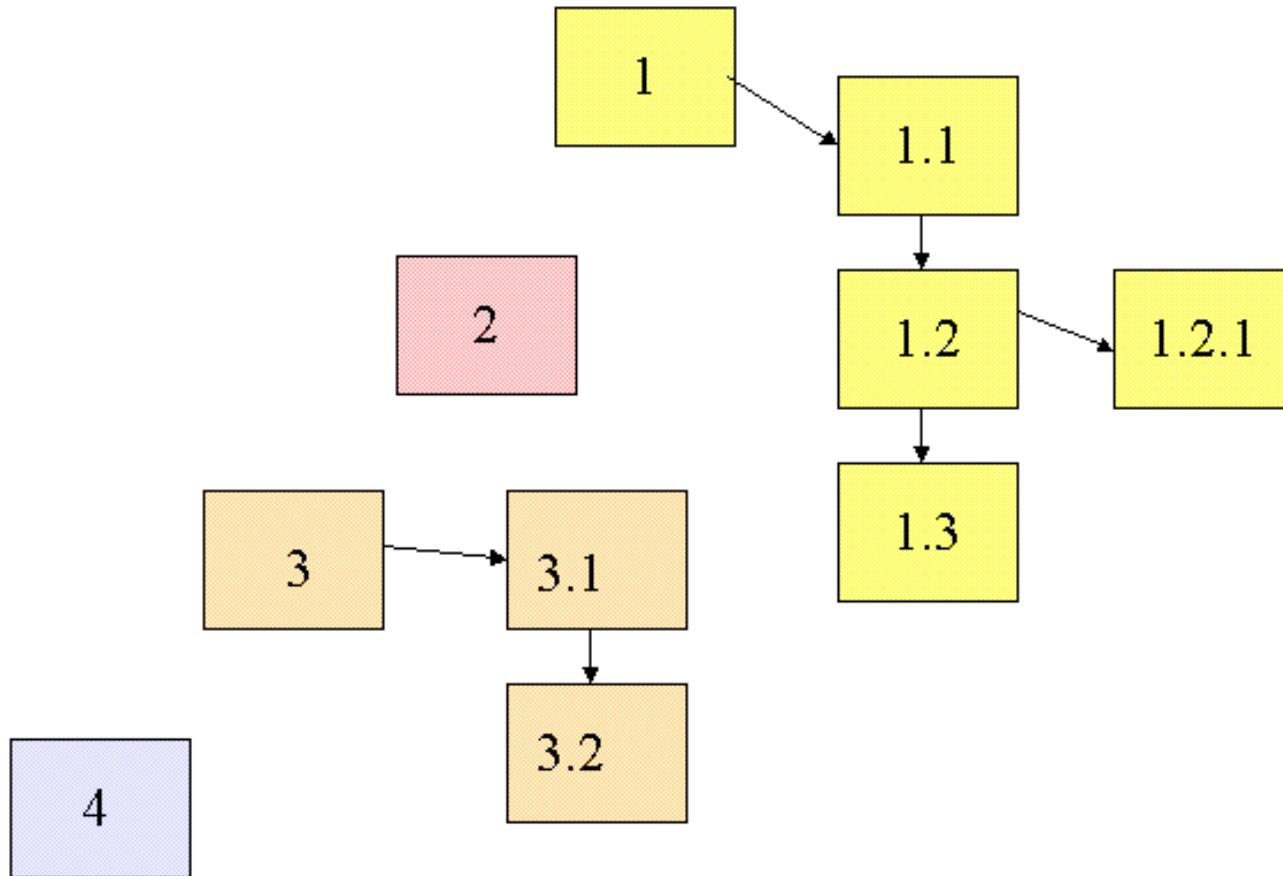


One-window paging

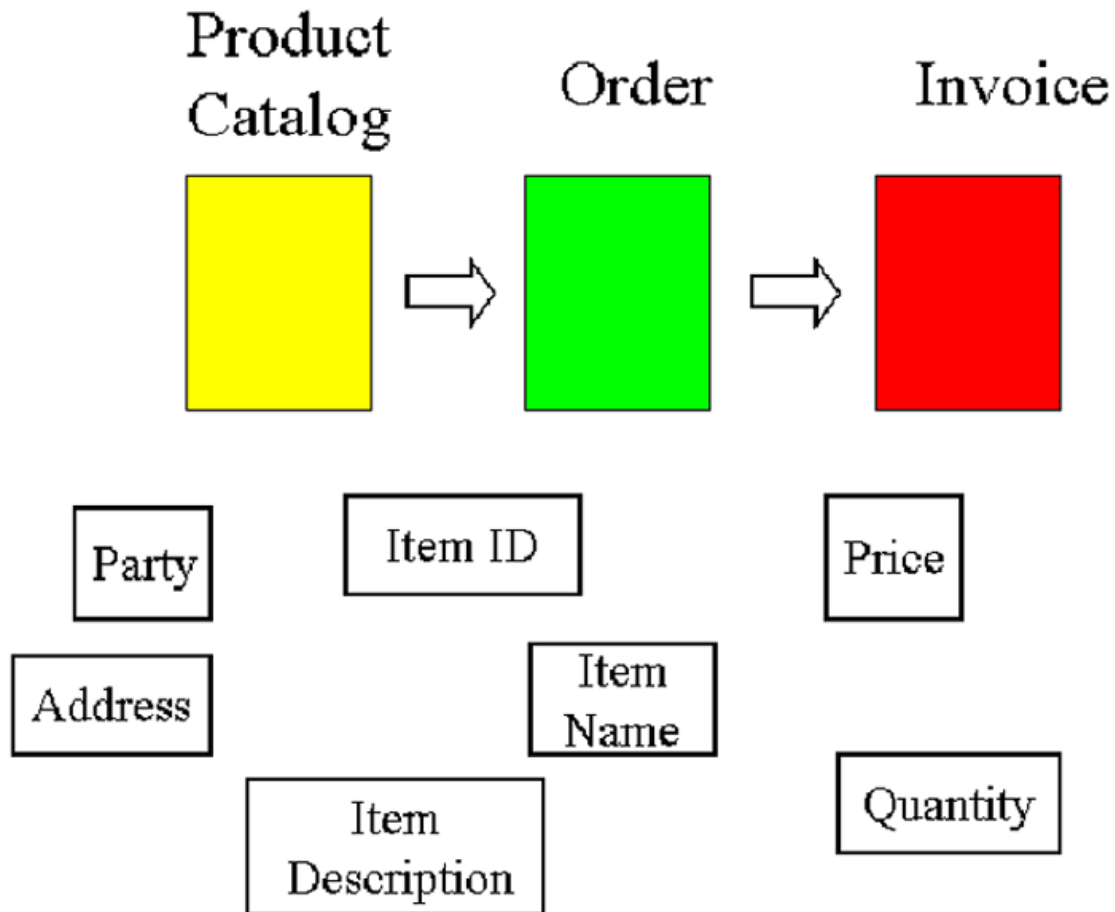
# Structural Relationships Among Components Expressed as a Hierarchy



# Structural Relationships Among Components Expressed as a Network



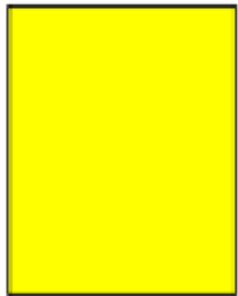
# Component Architecture in Documents





# Overlapping Components as “Process Glue”

Product  
Catalog



+ items  
+ quantity  
+ buyer  
- description

Order



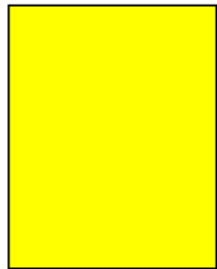
+ available  
items  
+ price

Invoice



# Component / Model-Driven Application Architecture

Product  
Catalog



+ items  
+ quantity  
+ buyer  
- description

Order

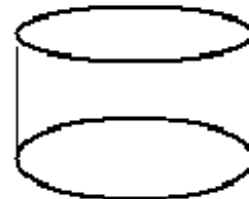
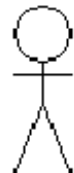


+ available  
items  
+ price

Invoice



Information  
From User



Information  
From DB or  
Application

# Document Analysis to Find Information Components

Saturday 

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## Music: Dan Zanes and Friends play family-favorites

November 29-30, times vary, Zellerbach Hall | [Tickets](#)

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Performing updated versions of traditional American folk songs, dance classics, and an ever-increasing number of originals, Brooklyn-based musicians Dan Zanes and Friends are coming to UC Berkeley to play two shows of exuberant roots music for the entire family.

Formerly the lead singer of alternative 80s rock band The Del Fuegos, Dan Zanes has found a second calling creating his own style of rock and folk music for young people. Called "a leading light in the recent movement of underground rockers making cool children's music" by the Chicago Sun Times, Zanes began recording "family-style" music in the late 90s. In 2000, his new band, Rocket Ship Revue, released their first

Figure 13.1 from Glushko & McGrath, Document Engineering

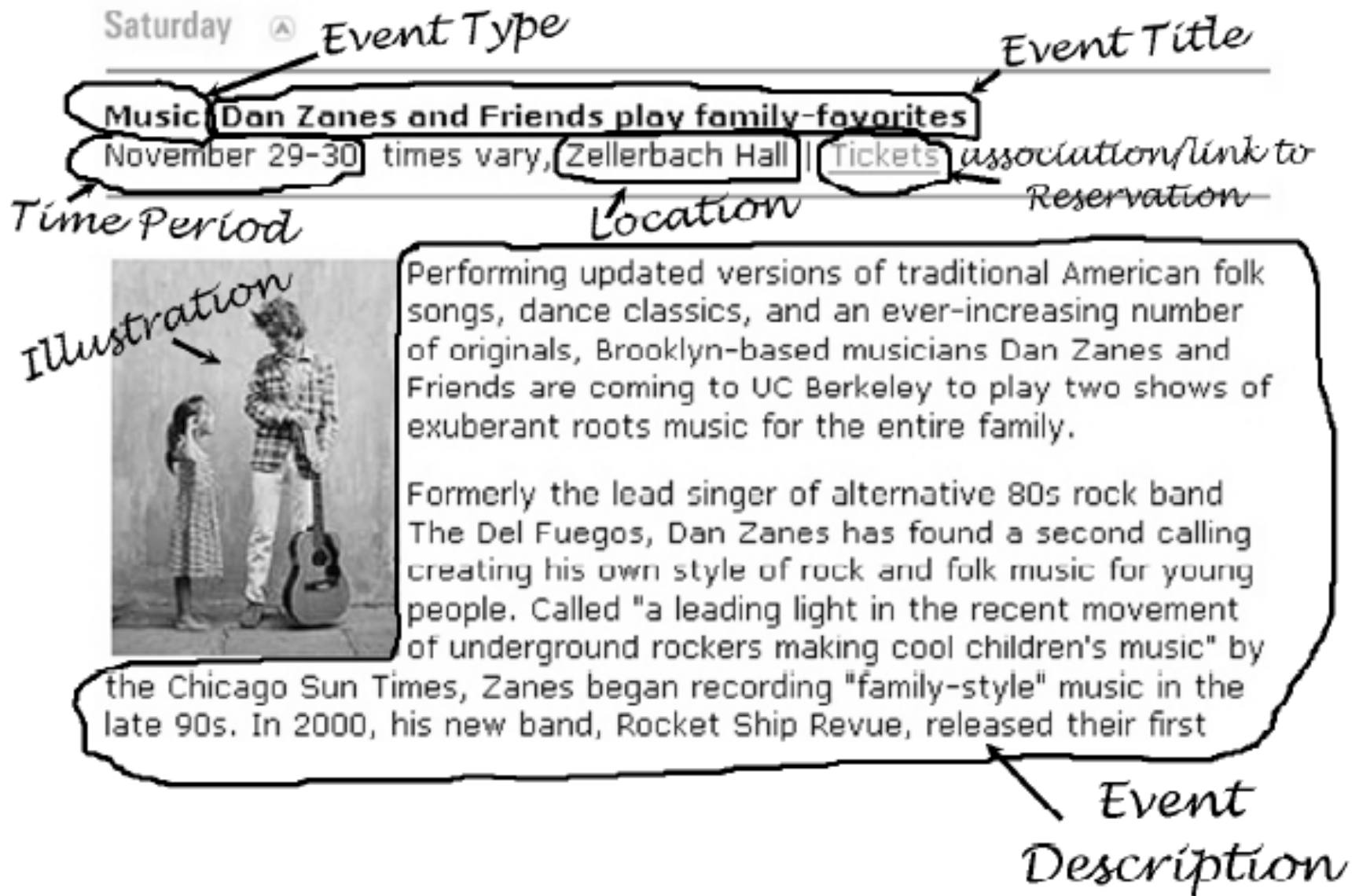


Figure 13.2 from Glushko & McGrath, Document Engineering

# Webster's Dictionary: What are the Information Components?

information

723

ingenuousness

manner of a pauper] as a poor person; i.e., without paying court costs [to initiate litigation *in forma pauperis*]

**in-for-ma-tion** (in'fər mā'shən) *n.* [ME. *informacioun* < OFr. *information* < L. *informatio*, a representation, outline, sketch] 1. an informing or being informed; esp., a telling or being told of something 2. something told; news; intelligence; word 3. knowledge acquired in any manner; facts; data; learning; lore 4. a person or agency answering questions as a service to others 5. in information theory and computer science, a precise measure of the information content of a message, measured in bits and ranging from zero when the entire message is known in advance to some maximum when nothing is known of its content 6. any data that can be stored in and retrieved from a computer 7. *Law* an accusation, under oath, of a criminal offense, not by indictment of a grand jury, but by a public officer, such as a prosecutor —**in'for-ma'tion-al** *adj.*

**SYN.**—**information** applies to facts that are gathered in any way, as by reading, observation, hearsay, etc. and does not necessarily connote validity [*inaccurate information*]; **knowledge** applies to any body of facts gathered by study, observation, etc. and to the ideas inferred from these facts, and connotes an understanding of what is known [*man's knowledge of the universe*]; **learning** is knowledge acquired by study, especially in languages, literature, philosophy, etc.; **erudition** implies profound or abstruse learning beyond the comprehension of most people; **wisdom** implies superior judgment and understanding based on broad knowledge —**ANT.** **ignorance**

**information theory** the study of processes of communication and the transmission of messages; specif., the study dealing with the information content of messages and with the probability of signal recognition in the presence of interference, noise, distortion, etc.

**in-form-a-tive** (in'fōr'mə'tiv) *adj.* [ML. *informativus* < L. *informatus*, pp. of *informare* (see **INFORM**)] giving information; educational; instructive: also **in-form'a-to'ry** — **in-form'a-tive-ly** *adv.*

**in-formed** (in'fōrmd') *adj.* having much information, knowledge, or education

**in-form-er** (in'fōr'mər) *n.* a person who informs; esp., a person who secretly accuses, or gives evidence against, another, often for a reward

**in-fra-** (in'frā) [*<* L. *infra*, *adv.* & *prep.*, below: for IE. base see **INFERIOR**] *a prefix meaning below, beneath* [*infrared*]

funnel < *infundere*: see **INFUSE**] *Anat.* any of various funnel-shaped organs or passages, as *a*) the extension of the third ventricle of the brain to the pituitary body *b*) the calyx of a kidney *c*) the ovarian end of a Fallopian tube

**in-fu-ri-ate** (in fyoor'ē āt'; *for adj.* -it) *vt.* -at'ed, -at'ing [*<* ML. *infuriatus*, pp. of *infuriare*, to enrage < L. *in-*, in + *furiare*, to enrage < *furia*, rage, **FURY**] to cause to become very angry; enrage —*adj.* [Archaic] furious; very angry; enraged —**in-fu'ri-at'ing-ly** *adv.* —**in-fu'ri-a'tion** *n.*

**in-fus-cate** (in fus'kit, -kāt) *adj.* [L. *infuscatus*, pp. of *infuscare*, to make dark, obscure < *in-*, in + *fuscare*, to darken < *fuscus*, dark: for IE. base see **FURY**] darkened or tinged with brown, as the wings of an insect: also **in-fus'-cat-ed** (-kāt id)

**in-fuse** (in fyōōz') *vt.* -fused', -fus'ing [ME. *infusen* < L. *infusus*, pp. of *infundere*, to pour in < *in-*, in + *fundere*, to pour: see **FOUND**³] 1. formerly, to pour (a liquid) in, into, or upon 2. to put (a quality, idea, etc.) into, as if by pouring; instill; impart 3. to fill (*with* a quality, feeling, etc.); imbue; inspire 4. to steep or soak (tea leaves, etc.) so as to extract flavor or other qualities —**SYN.** see **INSTILL** — **in-fus'er** *n.*

**in-fu-si-ble** (in fyōō'zə b'l) *adj.* [*IN-*² + **FUSIBLE**] that cannot be fused or melted —**in-fu'si-bil'i-ty** *n.*

**in-fu-sion** (in fyōō'zhən) *n.* [*<* Fr. or L.: Fr. *infusion* < L. *infusio*] 1. the act or process of infusing 2. something infused; tincture; admixture 3. the liquid extract that results from steeping a substance in water 4. *Med.* the slow introduction of a solution into the body, specif. into a vein

**in-fu-sion-ism** (-iz'm) *n.* *Theol.* the doctrine that the pre-existing human soul enters the body by divine infusion at conception or birth —**in-fu'sion-ist** *n.*

**in-fu-sive** (in fyōō'siv) *adj.* tending or able to infuse

**in-fu-so-ri-al** (in'fyoo sōr'ē əl, -zōr'ē-) *adj.* of, consisting of, containing, or having the nature of, infusorians

**in-fu-so-ri-an** (-ən) *n.* [*<* ModL. (*animalcula*) *infusoria*, neut. pl. of *infusorius*, pertaining to infusions (< L. *infusus*: see **INFUSE**) + *-AN*] 1. any of a former large group (Infusoria) of microscopic organisms consisting of those found in infusions of decayed organic matter and in stagnant water 2. any of a former class (Infusoria) of protozoans found in most water, characterized by cilia which permit free movement, as paramecia, stentors, etc. —*adj.* of this group or class

# Oxford English Dictionary: What are the Information Components?

**Abbreviate** (ăbrī'vi,et), *v.*, also 5-7 **abreviate**. [f. ABBREVIATE *ppl. a.*; or on the analogy of *vbs.* so formed; see -ATE. A direct representative of L. *abbreviāre*; as ABRIDGE, and the obs. ABBREVI, represent it indirectly, through OFr. *abregier* and mid. Fr. *abrévier*. Like the latter, *abbreviate*, was often spelt *a-breviate* in 5-7.] To make shorter, shorten, cut short in any way.

1530 PALSGR., I abrevyate: I make a thynge shorte, *Je abrege*.  
1625 BACON *Essays* xxiv. 99 (1862) But it is one Thing to Abbreviate by Contracting, Another by Cutting off.

† l. *trans.* To make a discourse shorter by omitting details and preserving the substance; to abridge, condense. *Obs.*

a 1450 *Chester Pl.* I. 2 (Sh. Soc.) This matter he abbreviated into playes twenty-foure. 1592 GREENE *Conny catching* III. 16 The queane abreviated her discourse. 1637 RALEIGH *Mahomet* 34 Abreviated out of two Arabique writers translated into Spanish. 1672 MANLEY *Interpreter* pref., I have omitted several Matters . . . contracted and abbreviated Others.

† b. To make an abstract or brief of, to epitomize. *Obs.*

c 1450 TREVISA *Higden's Polychr.* I. 21 (Rolls Ser.) Trogus Pompeius, in hys xliiiij. bookes, allemoste of alle the storyes

(2) The system has a means of communication by private or available public facilities (such as telephone, telegraph, or radio) to monitor the progress of each flight with respect to its departure at the point of origin and arrival at its destination, including intermediate stops and diversions therefrom, and maintenance or mechanical delays encountered at those points or stops.

(b) The supplemental air carrier or commercial operator must show that the personnel specified in paragraph (a) of this section, and those it designates to perform the function of operational control of the aircraft, are able to perform their required duties.

#### Subpart G—Manual Requirements

##### § 121.131 Applicability.

This subpart prescribes requirements for preparing and maintaining manuals by all certificate holders.

(Doc. No. 6258, 29 FR 19196, Dec. 31, 1964)

##### § 121.133 Preparation.

(a) Each domestic and flag air carrier shall prepare and keep current a manual for the use and guidance of flight and ground operations personnel in conducting its operations.

(b) Each supplemental air carrier and commercial operator shall prepare and keep current a manual for the use and guidance of flight, ground operations, and management personnel in conducting its operations.

(c) For the purpose of this subpart, the certificate holder may prepare that part of the manual containing maintenance information and instructions, in whole or in part, in printed page form or microfilm.

(2) Be in a form that is easy to revise;

(3) Have the date of last revision on each page concerned; and

(4) Not be contrary to any applicable Federal regulation and, in the case of a flag or supplemental air carrier, any applicable foreign regulation, or the certificate holder's operations specifications or operating certificate.

(b) The manual may be in two or more separate parts, containing together all of the following information, but each part must contain that part of the information that is appropriate for each group of personnel:

(1) General policies.

(2) Duties and responsibilities of each crewmember and appropriate members of the ground organization and in the case of supplemental air carriers and commercial operators, management personnel.

(3) Reference to appropriate Federal Aviation Regulations.

(4) Flight dispatching and operational control, including procedures for coordinated dispatch or flight control or flight following procedures, as applicable.

(5) En route flight, navigation, and communication procedures, including procedures for the dispatch or release or continuance of flight if any item of equipment required for the particular type of operation becomes inoperative or unserviceable en route.

(6) For domestic or flag air carriers, appropriate information from the en route operations specifications, including for each approved route the types of aircraft authorized, the type of operation such as VFR, IFR, day, night, etc., and any other pertinent information.

(7) For supplemental air carriers or

Regulation:  
What are the  
Information  
Components?

# Utility Bill: What are the Information Components?

99901457995791200000155500000015550

Account Number	Bill Date	Amount Due	Due Date	Amount Enclosed
[REDACTED]	09/16/2009	\$155.50	10/07/2009	

6001.38.893.183525 1 AV 0.335



ROBERT GLUSHKO

PG&E  
BOX 997300  
SACRAMENTO CA  
95899-7300

200.0337

Please return this portion with your payment. Thank you.

**Telephone Assistance**

1-800-743-5000  
Assistance is available by telephone 24 hours per day, 7 days per week.

**Local Office Address**

1919 WEBSTER ST  
OAKLAND CA 94612



September 2009

**ACCOUNT SUMMARY**

<u>Service</u>	<u>Service Dates</u>	<u>Amount</u>
Gas	08/15/2009 To 09/16/2009	\$27.49
Electric	08/15/2009 To 09/16/2009	115.33
Energy Commission Tax		0.13
Gas PPP Surcharge		1.84
Utility Users' Tax		10.71
<b>TOTAL CURRENT CHARGES</b>		<b>\$155.50</b>
Previous Balance		157.62
09/03 Payment - Thank You		157.62-

**TOTAL AMOUNT DUE \$155.50**  
**DUE DATE - 10/07/2009**



# Moby Dick: How Many Information Components?

## Chapter i

### LOOMINGS

Call me Ishmael. Some years ago -- never mind how long precisely -- having little or no money in my purse, and nothing particular to interest me on shore, I thought I would sail about a little and see the watery part of the world. It is a way I have of driving off the spleen, and regulating the circulation. Whenever I find myself growing grim about the mouth; whenever it is a damp, drizzly November in my soul; whenever I find myself involuntarily pausing before coffin warehouses, and bringing up the rear of every funeral I meet; and especially whenever my hypos get such an upper hand of me, that it requires a strong moral principle to prevent me from deliberately stepping into the street, and methodically knocking people's hats off -- then, I account it high time to get to sea as soon as I can. This is my substitute for pistol and ball. With a philosophical flourish Cato throws himself upon his sword; I quietly take to the ship. There is nothing surprising in this. If they but knew it, almost all men in their degree, some time or other, cherish very nearly the same feelings towards the ocean with me.

There now is your insular city of the Manhattoes, belted round by wharves as Indian isles by coral reefs -- commerce surrounds it with her surf. Right and left, the streets take you waterward. Its extreme down-town is the battery, where that noble mole is washed by waves, and cooled by breezes, which a few hours previous were out of sight of land. Look at the crowds of water-gazers there.

Circumambulate the city of a dreamy Sabbath afternoon. Go from Corlears Hook to Coenties Slip, and from thence, by Whitehall northward. What do you see? -- Posted like silent sentinels all around the town, stand thousands upon thousands of mortal men fixed in ocean reveries. Some leaning against the spiles; some seated upon the pier-heads; some looking over the bulwarks

# Marked-Up “Mixed Content” Moby

## THE CARPET-BAG

II

I STUFFED a shirt or two into my old carpet-bag, tucked it under my arm, and started for Cape Horn and the Pacific. Quitting the good city of old Manhatto, I duly arrived in New Bedford. It was on a Saturday night in December. Much

☐ <Section title="The Carpet- Bag">

☐ <Para>I stuffed a shirt or two into my old carpet-bag, tucked it under my arm, and started for <Location>Cape Horn</Location> and the </Location>Pacific</Location>. Quitting the good city of old <City>Manhatto</City>, I duly arrived in <City>New Bedford</City>, It was on a <Day>Saturday</Day> night in <Month>December</Month>...

# Marked-Up “Mixed Content” Moby

## THE CARPET-BAG

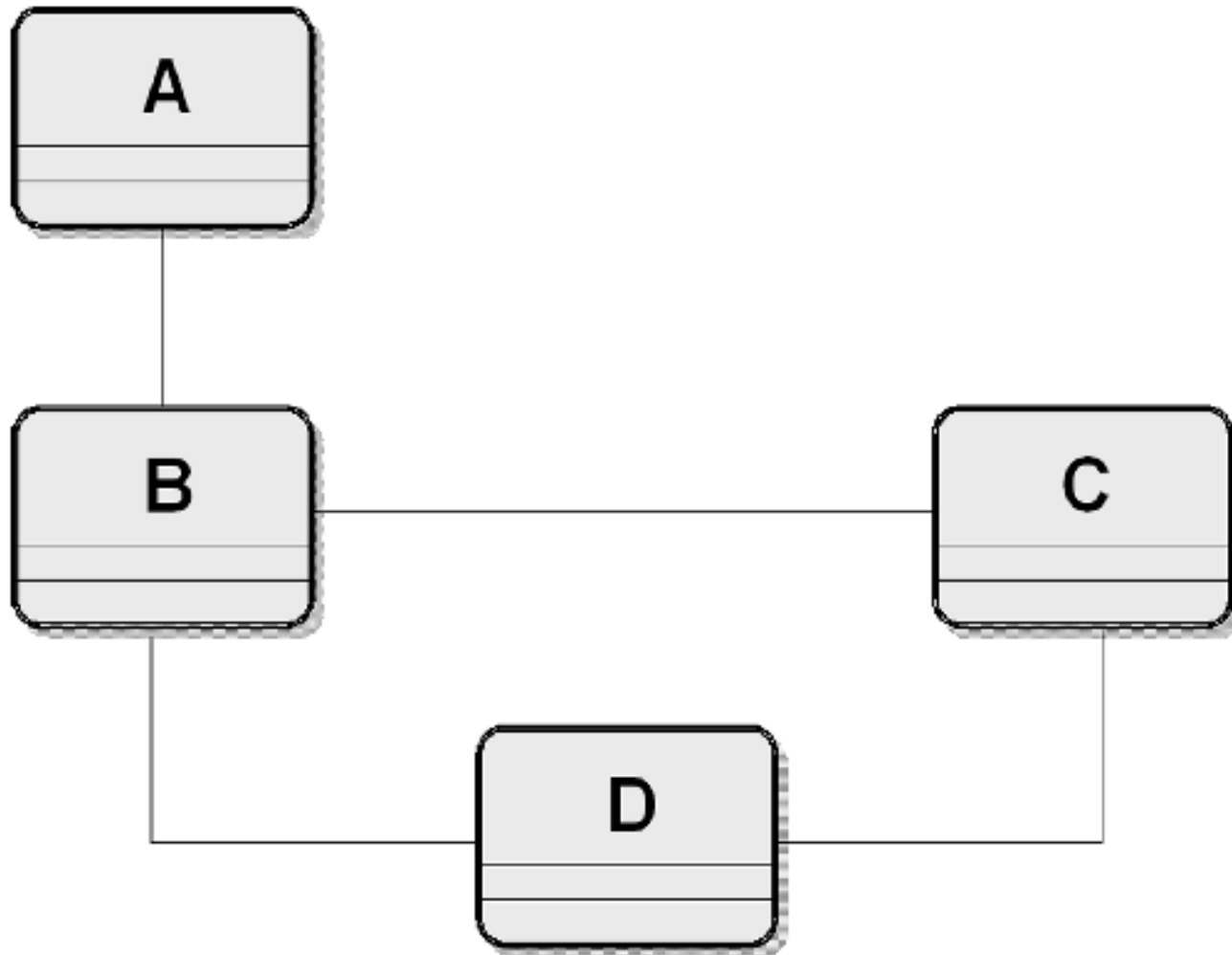
II

I STUFFED a shirt or two into my old carpet-bag, tucked it under my arm, and started for Cape Horn and the Pacific. Quitting the good city of old Manhatto, I duly arrived in New Bedford. It was on a Saturday night in December. Much

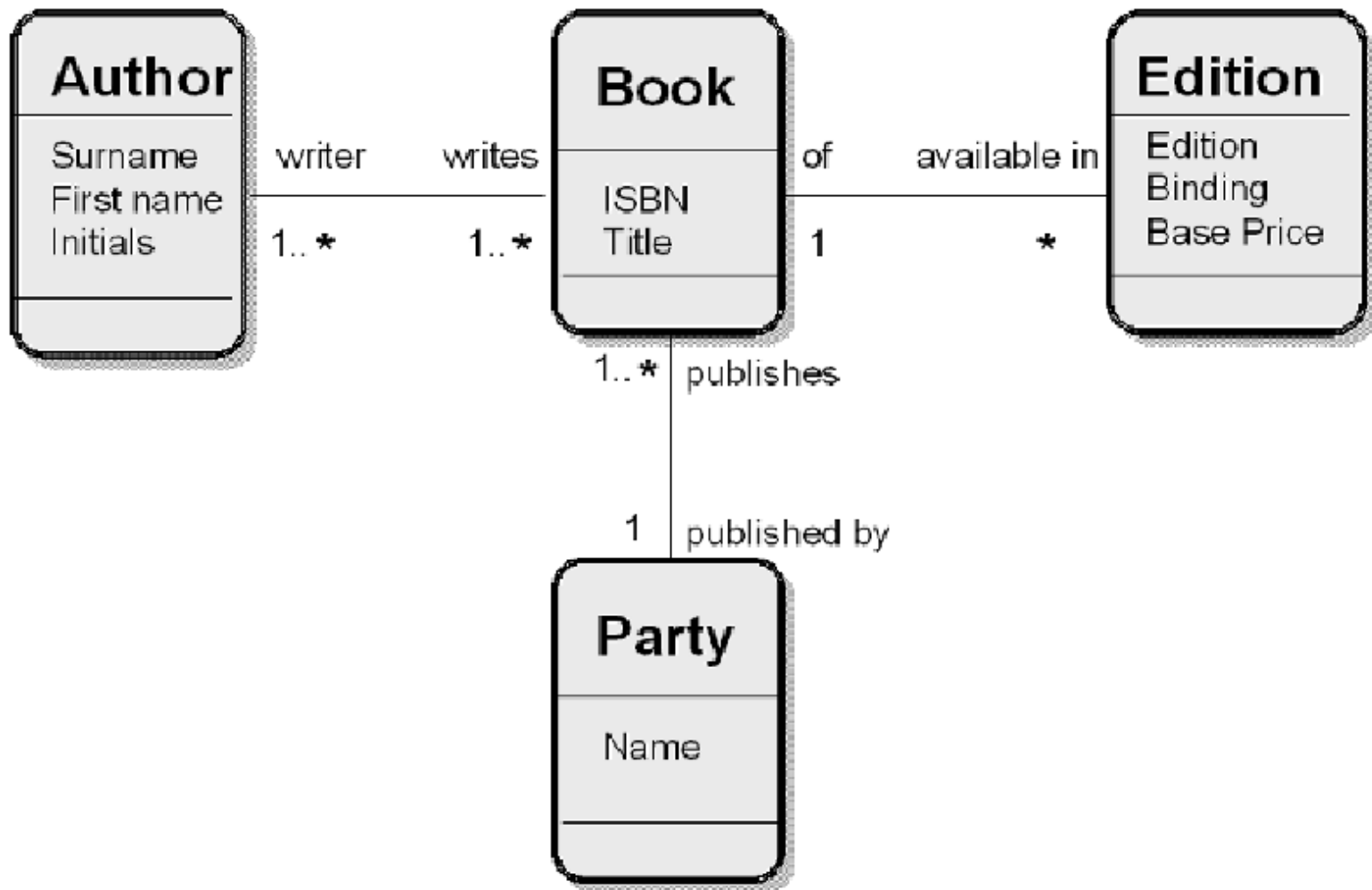
☐ <Section title="The Carpet- Bag">

☐ <Para>I stuffed a shirt or two into my old carpet-bag, tucked it under my arm, and started for <Location>Cape Horn</Location> and the </Location>Pacific</Location>. Quitting the good city of old <City>Manhatto</City>, I duly arrived in <City>New Bedford</City>, It was on a <Day>Saturday</Day> night in <Month>December</Month>...

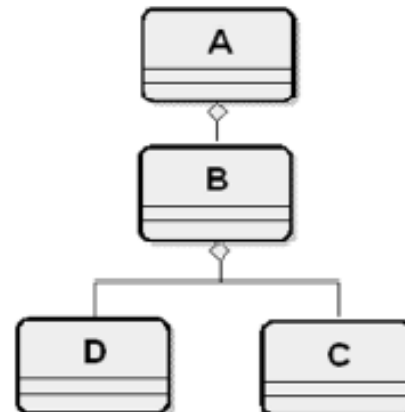
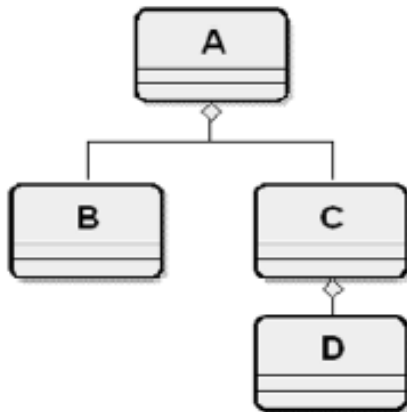
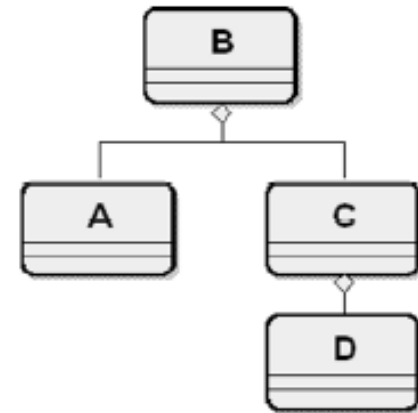
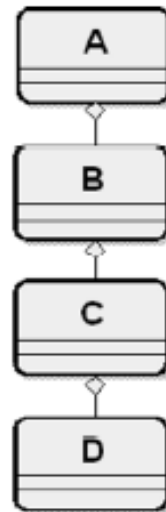
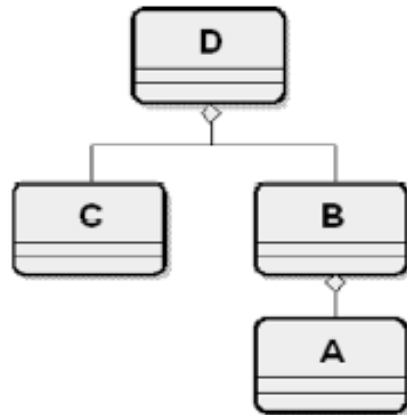
# Document Component Model



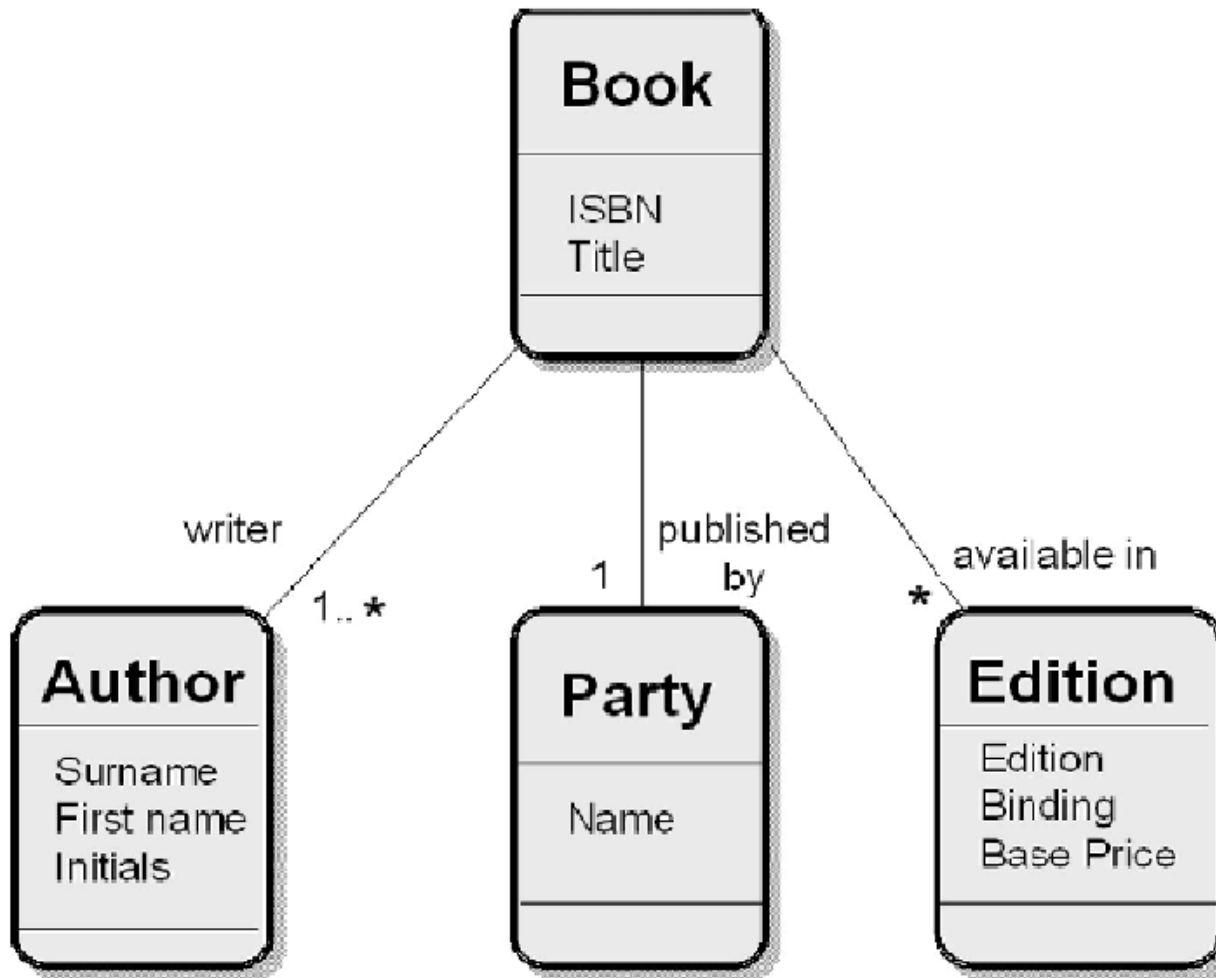
# Example: Document Component Model



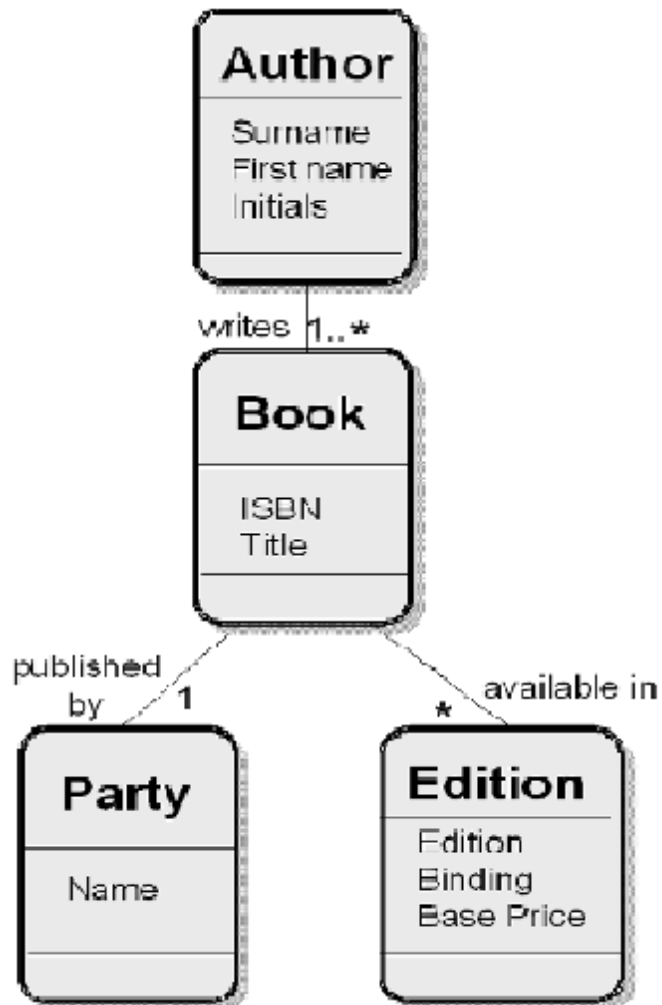
# Different Document Assembly Models from Same Component Model



# Assembly Model for “Library Catalog”

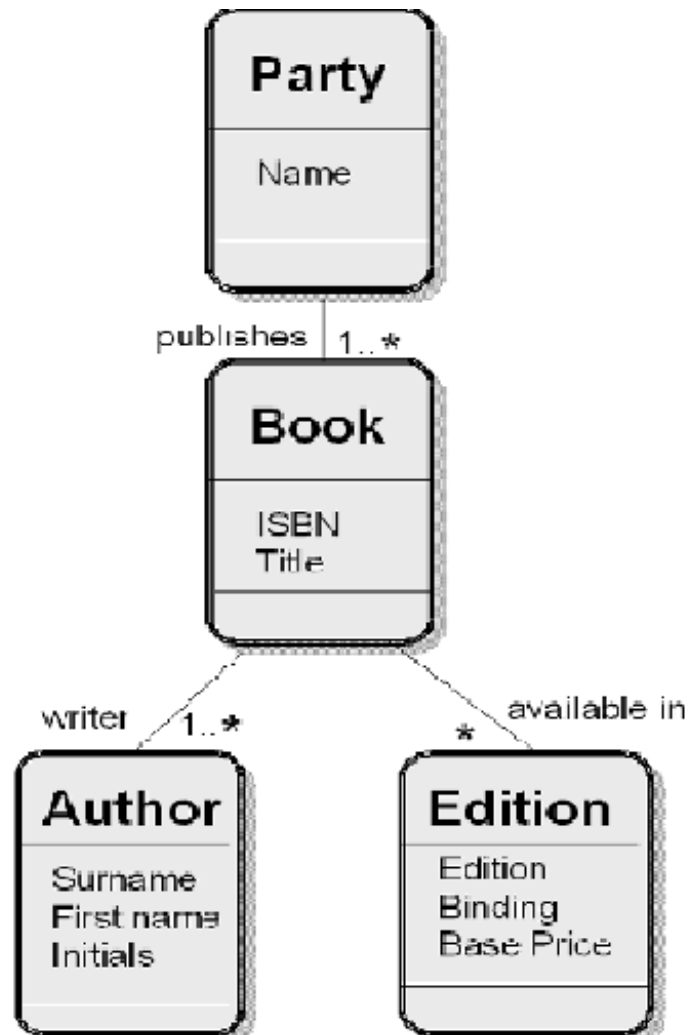


# Assembly Model for “Author Catalog”

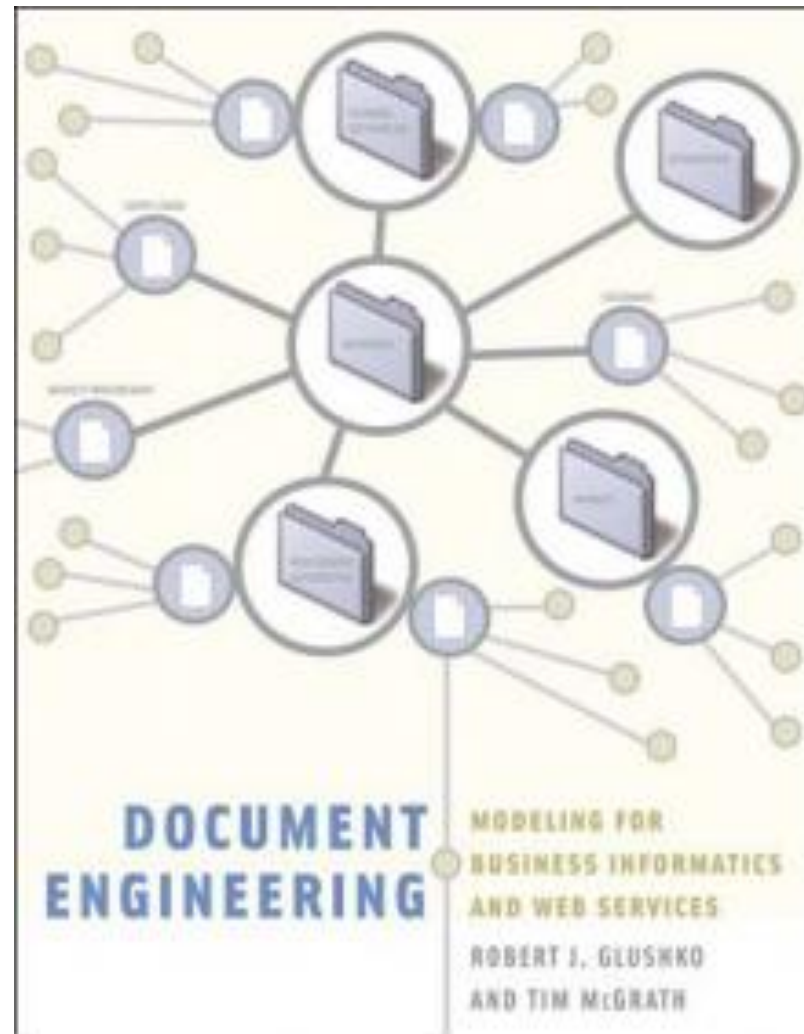




# Assembly Model for “Publisher Catalog”



# To Learn More about “Document Analysis” Read this Book





UNIVERSITY OF CALIFORNIA, BERKELEY  
SCHOOL OF INFORMATION

# **INFO 202**

## **“Information Organization & Retrieval”**

### **Fall 2013**

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17 September 2013  
Lecture 6.2 – Names and Identifiers



## What is a Name?

- A NAME is a label for some thing or some category that is used to distinguish one from another
- Many surnames are literally resource descriptions
- But most resource names do not convey properties of the resource
- If a name is used to refer to some thing and is unique in some context it is an IDENTIFIER



## Issues with Names and Naming – 1

- A specific resource or type or resource can often have multiple names; these are SYNONYMS or ALIASES
- Different things can sometimes have the same names -- these are HOMOGRAPHHS or POLYSEMES
- What's a worse problem - synonymy or homography?



## Both are “Shipping Containers”





## Issues with Names and Naming – 2

- False cognates
- A name can have undesirable associations
- A name can have assume impermanent attributes or associations ([baby names over time](#))
- Alphabetic ordering bias
- Autogenerated names can't cross the "semantic gap"



## The Vocabulary Problem

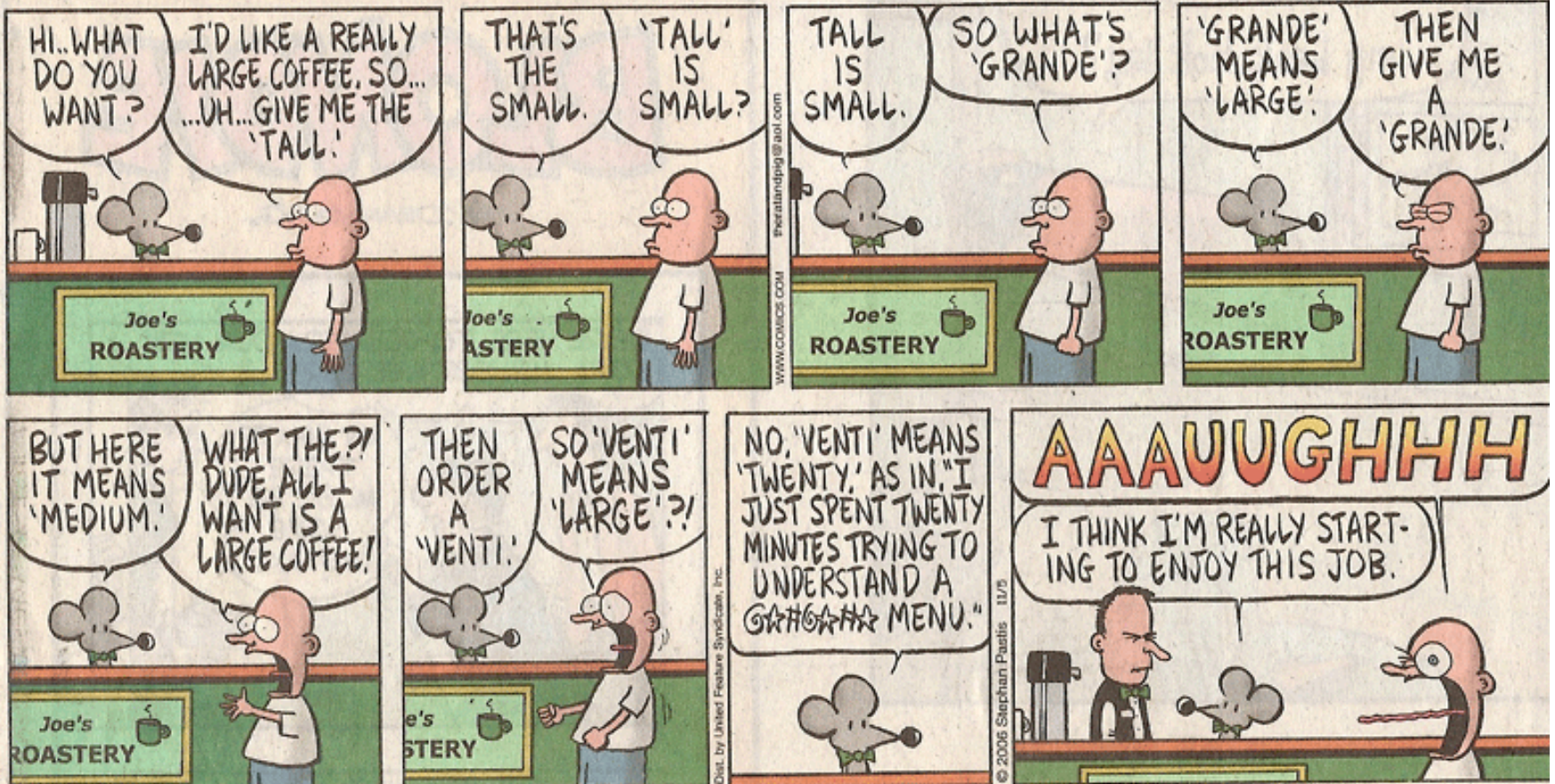
- People use a large variety of words for the same thing or concept
- Most people - especially system designers - are surprised by this because they think their own word choices are “intuitive” or “natural”
- The extreme variability of word selection is an inescapable fact that has its roots in the nature of language and categorization





# Everyday Example of the Vocabulary Problem

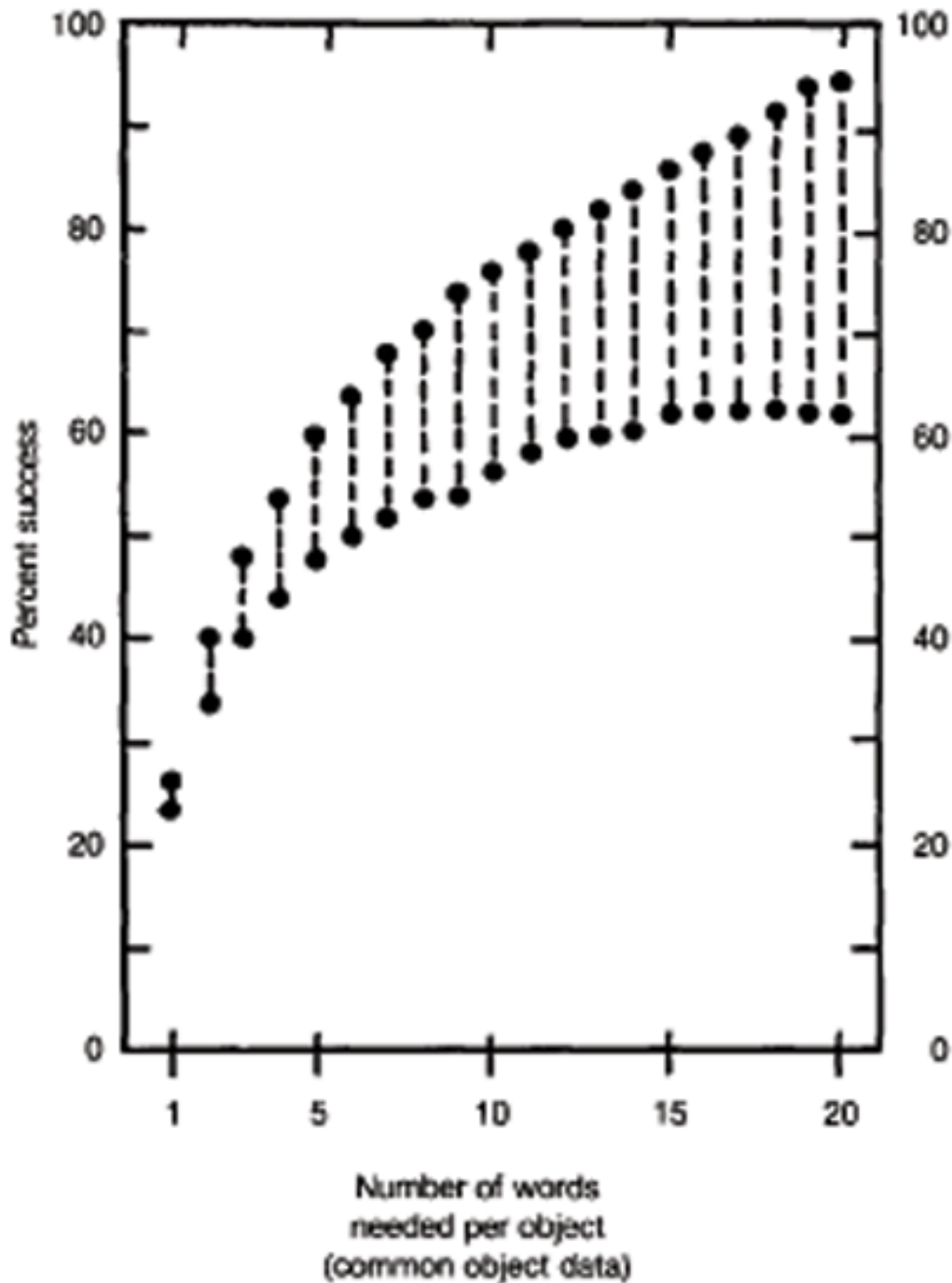
**PEARLS BEFORE SWINE** *Stephan Pastis*





## Measuring the Vocabulary Problem

- Furnas et al. (1987) – classic paper in "statistical semantics" - 6 different experiments at assigning words to text editing functions, common objects, and categorization of household goods and recipes
- Armchair " Method - Probability of two people coming up with the same term: 7, 8, 11, 12, 14, 18%
- "Naming by Voting" -- Probability of someone using most popular word: 15, 21, 22, 28, 34, 36%
- "Select What I Intend" -- Probability that two people using the same term intend the same referent: 13, 15, 41, 52, 62, 73%



Does “Aliasing”  
Solve the  
Vocabulary  
Problem?



## Identifiers - 1

- An identifier is a special type of name assigned in a controlled way and governed by rules that define possible values and naming conventions; "some person or organization asserts the relationship between the string and the thing" (Coyle, 2006, p. 428)
- But the same resource can have more than one identifier
- How many different identifiers can a person have?
- What if the answer is "none"?



## Identifiers - 2

- Identifiers are **UNIQUE** if they refer to one and only resource within some defined context or scope
- Identifiers are **PERSISTENT** if they resolve to the same referent indefinitely, or as long as needed; but "persistence is a function of organizations, not technology
- Identifiers are **UNSTRUCTURED** or **DUMB** (as opposed to **STRUCTURED** or **INTELLIGENT**) if they have no inherent meaning based on their values
- Identifier schemes are designed to be **STRUCTURED** or **INTELLIGENT** but over time they often become less so



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# **INFO 202**

## **“Information Organization & Retrieval”**

### **Fall 2013**

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17 September 2013  
Lecture 6.3 – Smart Resources



## “The Computer for the 21<sup>st</sup> Century”

- “The most profound technologies are those that disappear”
- “Computers in light switches, thermostats, stereos and ovens help to activate the world”
- “Doors open only to the right badge wearer, rooms greet people by name, telephone calls can be automatically forwarded to wherever the recipient may be, receptionists actually know where people are...”





## “The Computer for the 21<sup>st</sup> Century”

- When almost every object either contains a computer or can have a tab attached to it, obtaining information will be trivial: "Who made that dress? Are there any more in the store? What was the name of the designer of that suit I liked last week?"
- The computing environment knows the suit you looked at for a long time last week because it knows both of your locations, and, it can retroactively find the designer's name even if it did not interest you at the time."

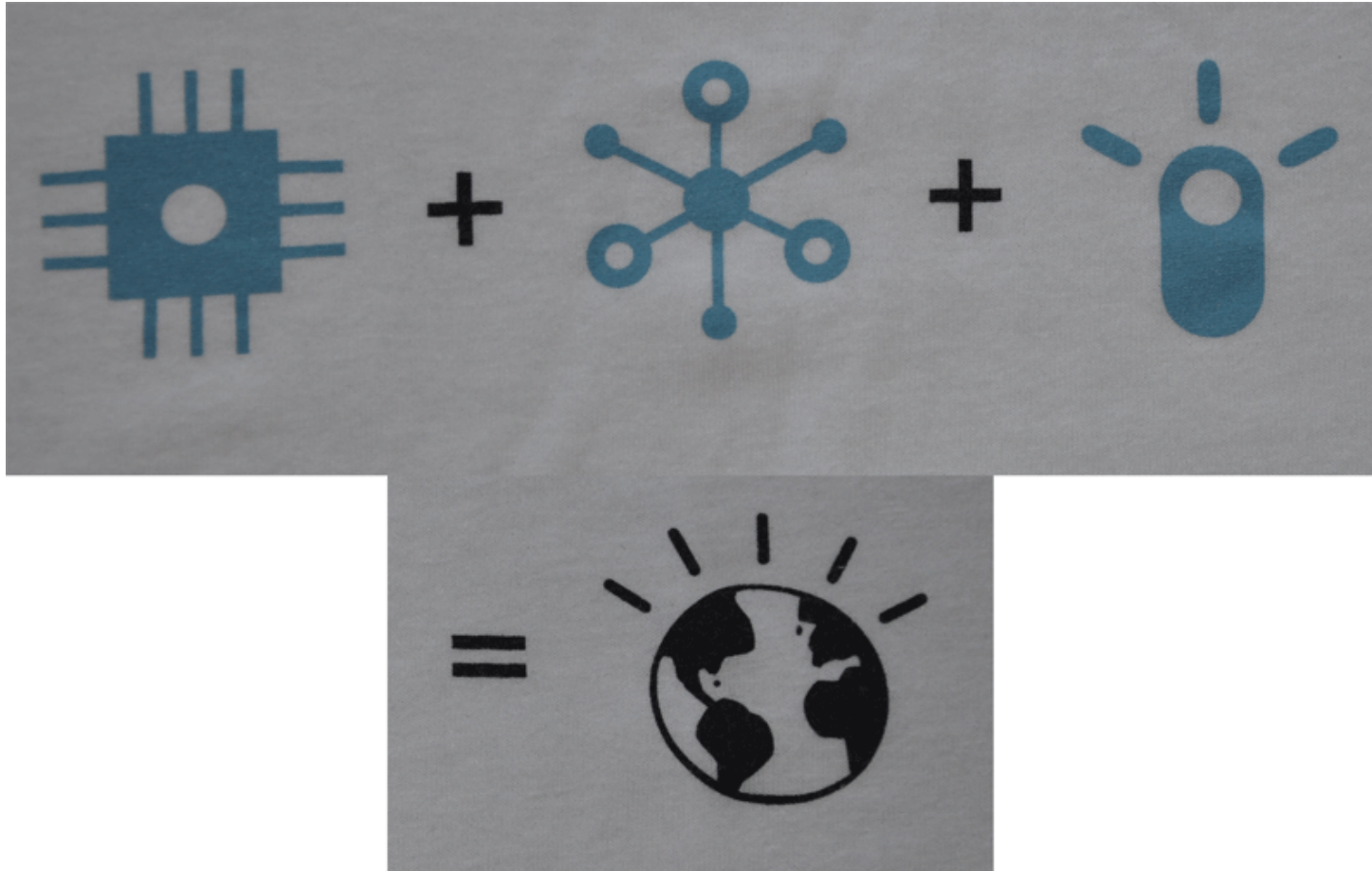
Mark Weiser, "[The Computer for the 21st Century](#)"



## Active / Operant / Smart Resources

- “Smart” is a commonly used description of resources that can exploit sensing, computing, and communication capabilities
- Virtually any product that uses electricity - toys, coffeemakers, cars, medical diagnostic machines - possesses inherent data processing capabilities. Each has a wealth of information about its current status, usage history, and performance
- A “smart” resource with an IP address is said to be part of the “Internet of Things”

# IBM Smarter Planet Initiative



<http://www.ibm.com/smarterplanet>



## Classes of Smart Resource Applications

- Remote monitoring (of environments or products or people) via [sensors that transmit data about their environment](#)
- Vendor-managed inventory ("remote monitoring" of retail shelf space)
- Monitoring + capability upgrading
- Remote monitoring + Interactive control

# What Can a Sensor Sense?

Properties	Measurand
Physical properties	Pressure, temperature, humidity, flow
Motion properties	Position, velocity, angular velocity, acceleration
Contact properties	Strain, force, torque, slip, vibration
Presence	Tactile/contact, proximity, distance/range, motion
Biochemical	Biochemical agents
Identification	Personal features, RFID or personal ID



## Some Design Issues for Smart Sensing

- How is the information obtained from the environment?
- Are the sensors in known locations, or is locating and arranging them a task in its own right?
- How "smart" is the information communicated by the sensor?
- What initiates the sending of context information to the recipient?



## Dealing with the Data Torrent

- If low-level sensor information is being captured there can easily be too much of it, but making resources smarter so they can do local processing makes them vastly more expensive
- How can sensors decide what are "significant" events in the torrent of data?
- How does the information recipient process the sensor information?



## Ad hoc Sensor Networks

- Dozens, hundreds, or even thousands of tiny, battery-powered computers, often called motes, can be scattered throughout the environment to collect sensor data
- The Motes form an ad hoc network that relays the sensor data, to a specified destination for processing.
- See <http://www.xbow.com> for some obvious applications





## Context Awareness

- Where are you?
- What are you doing, looking at, looking for?
- Who are you with?
- What's it like there?



## Location and Activity Tracking

- Objects are identified and "timestamped" in known locations - e.g., package / pallet tracking, Fastrak transponders to pay bridge tolls
- Objects identify their location
- Supply chain and Demand chain (information about demand for, use of products that moves in the opposite direction from the supply chain) - what potential customers want, when and where they become customers by buying something, how they use the products
- [Tagg - the Pet Tracker](#) & [LoJack](#)

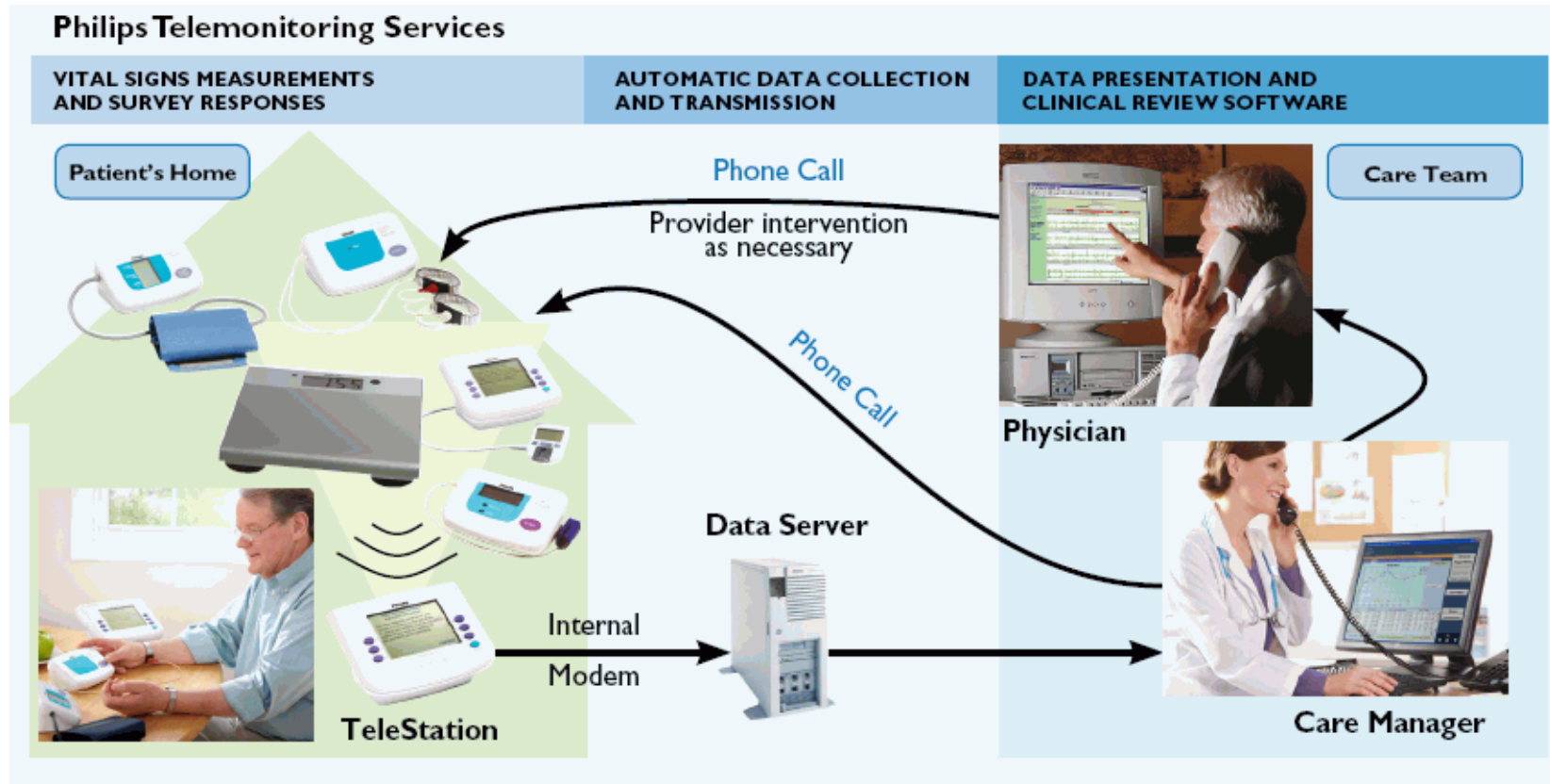


# Remote Patient Monitoring

- [Classic Commercial for "Lifecall"](#)
- Enabling "aging in place" with "assistive technology" can vastly improve the quality of life for old folks
- Three kinds of services: assurance, support (compensation for impairment), and assessment (determining physical or cognitive status)



# Remote Patient Monitoring



See [fitbit](#) and [whistle](#) and [NY Times 12 September 2013](#)



## Smart Transportation Systems

- Goal is to build a transportation system that will be more efficient, less polluting, and safer for better-informed drivers
- "Personal navigation devices" (PNDs) have until recently been dedicated devices, often built into vehicles, but we're starting to see them as smart phone applications

# BMW's Vision of Smart Cars



<http://www.digitaltrends.com/cars/bmw-teams-with-continental-for-fully-autonomous-cars-by-2025/>



## Privacy as a Limiting Factor in Smart Resources

- A limiting factor on context-aware smart services might well be the willingness of people to allow service providers to use information about their current or previous contexts
- Nevertheless, privacy or spam concerns or other worries about annoyances from commercial firms seem minor compared to potential abuses by governments.



## Readings for Next Lecture

- TDO 4 up until 4.4; 4.5 Key Points
- Coyle, Karen. Library Data in a Modern Context.
  - At [kcoyle.net](http://kcoyle.net), follow the link that says "Excerpt from *Understanding the Semantic Web*"