

MACIASZEK, L.A. (2005):  
*Requirements Analysis and System Design*, 2<sup>nd</sup> ed.  
Addison Wesley, Harlow England, 504p.  
ISBN 0 321 20464 6

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Chapter 7  
*User Interface Design*

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# *Topics*

- *From UI prototype to implementation*
- *Guidelines for UI design*
- *UI containers and components*
- *Web UI design*
- *Window navigation*

# *About user interfaces*

- **Server solutions** make the software
- **Client solutions** sell the software
- **Programmable client** – a thick client with a program residing and executing on it and with access to the client's machine storage resources
- **Browser client** – a thin client (web client) representing a web-based UI and using server to obtain its data and programs
- **UI design** is a multidisciplinary activity

# From UI prototype ...

**Organisation Details** [X]

Company: Bedrock Stone Quarry Pty. Limited

Phone: (02) 9953 0144

Fax: (02) 9953 2452

Email: stoney@bedrockquarry.com.au

Address: 15 Riverbed Avenue  
Bedrock, NSW 2077

Business: [v]

Type: Advertiser [v]

Created: [ ] [ ]

OK

Cancel

*... via design ...*

**Maintain Organisations** [X]

ABC Radio [v] [New]

General | Postal Address | Courier Address | Contacts

ABC Radio

? \_\_\_\_\_

Agency     TV provider     Press provider  
 Advertiser     Radio provider

\_\_\_\_\_

Phone : [02] 9800-944    Fax : \_\_\_\_\_

Email : [secr@abcrad.com.au]


Created : [10-Aug-1998] [LAM]


[OK]    [Cancel]    [Apply]

*... to implementation*


**Update Organisation - Tim's Lolly Shop**

Organisation | Contacts | Postal Address | Courier Address

 Name:

 Phone:  Fax:

Email:

 Status:

Preference:

Notes:

Classification

Ad  Agency  
 TV  Radio  Press

History

Create:    
Modify:    
End:

# *Guidelines for UI design*

- *User in control*
- *Consistency*
- *Personalization and customization*
- *Forgiveness*
- *Feedback*
- *Aesthetics and usability*

# *User in control; Consistency*

## ■ *User in control*

- *user's perception of control*
- *no mothering*
- *feedback (an hourglass, wait indicator, or similar)*

## ■ *Consistency*

- *conformance to the UI vendor's standards*
- *conformance to the naming, coding and other UI-related standards developed internally by the organization*

## *Personalization and customization; forgiveness*

- *Personalization and customization = adaptability*
  - *UI **personalization** – customization for personal use*
    - *includes the user's locale information*
  - *UI **customization** – administrative task of tailoring the software to different groups of users*
- *Forgiveness*
  - *support for an explorable interface*
  - *multi-level undo operation*

# *Feedback; Aesthetics and usability*

## ■ *Feedback*

- *spin-off of the first guideline – the user in control*
- *visual and/or audio cues to inform the user of what's going on when the control is temporarily with the program*

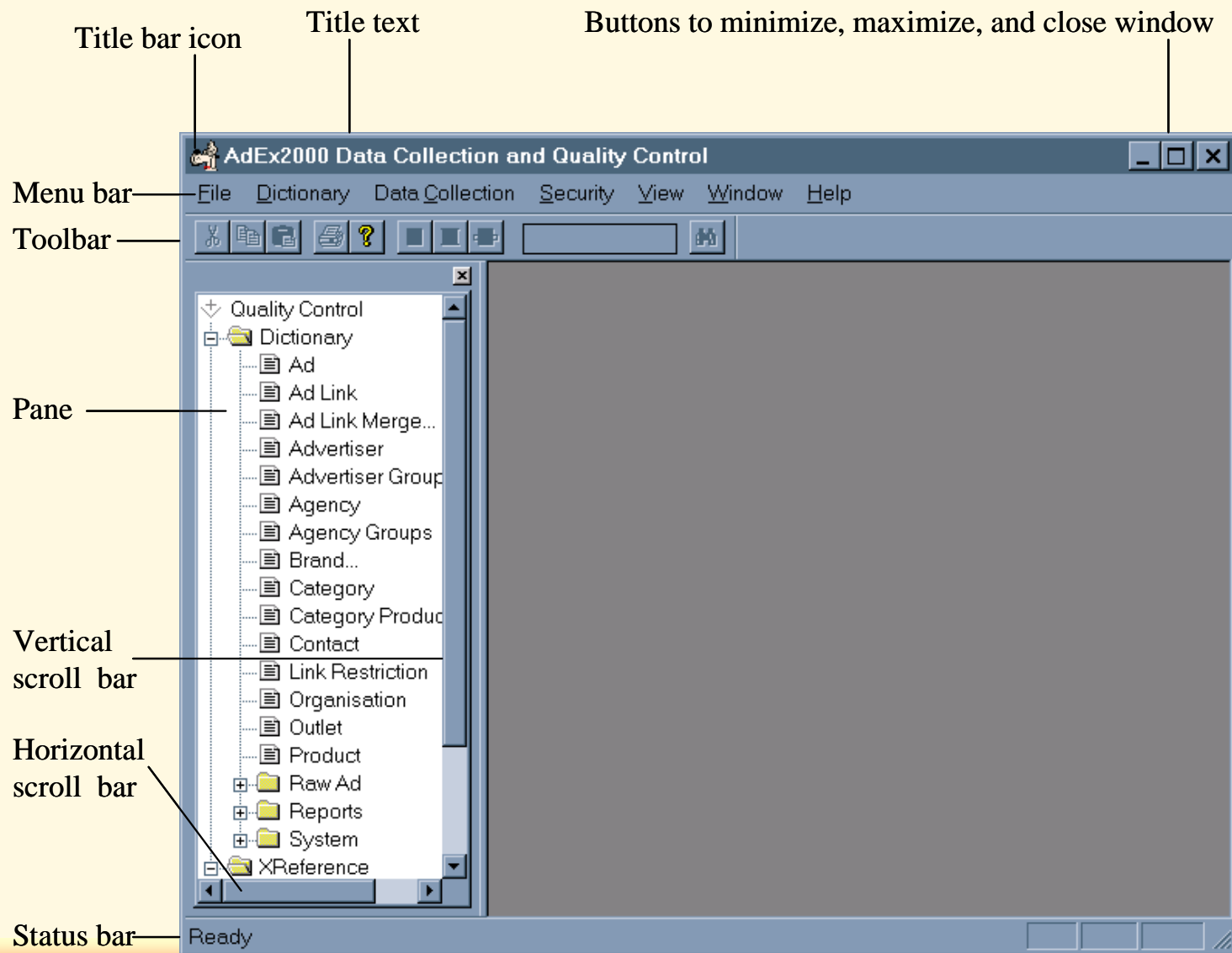
## ■ *Aesthetics and usability → user satisfaction*

- *Aesthetics are about the system's visual appeal*
- *Usability is about the ease, simplicity, efficiency, reliability, and productivity in using the interface*

# *UI containers and components*

- *Two main aspects of UI design:*
  - *design of windows*
  - *design of windows' input and editing controls*
- *Primary and secondary windows*
- *Windows are **UI containers***
- *Together, containers, menus, and controls constitute **UI components***
  - *Swing library in Java world*

# Primary window



# Example 7.2 (AE) – primary window

AIM2000 Data Collection and Quality Control - [Products]

File RawData Dictionary Links XReference Record View Window Help

Office

Quality Control

- Dictionary
  - Advertiser
  - Agency
  - Category
  - Product
  - Organisation
  - Contacts
- XReference - main
  - Media
  - Networks
- XReference - other
  - Action
  - Activity Status
  - Ad Type
  - Collection Status
  - Communication Type
  - Contact Status
  - Discrepancy Status
  - Job Title
  - Mag Colour
  - Mag Position
  - Media Type
  - Organisation Status
  - Outdoor Size
  - Press Colour Loading
  - Press Position Loading
  - Raw Log Status
  - Type Of Contact

Product ID	Description	Brand ID	Category	Employee	Notes
3	Traveland Travel Agents	1	Finance	DTP	Press: Keyed: HW/W... Hanlon V
7	Four N Twenty Pies	1	Finance	JAS	
15	Dominos Pizza - Delivery	1	Finance	JAS	AIS Media for now (press)
16	Supradyn Multi Vitamins	1	Finance	JAS	
18	Campbells Cash N Carry W/House	1	Finance	KLN	
20	Jeans West Strs	1	Finance	JAS	
21	Mars Bar	1	Finance	JAS	
22	Crown & Andrews Whack Attack	1	Finance	JAS	
23	Crown & Andrews Jumping Monkey	1	Finance	JAS	
25	Bailey McBride Furn Strs	1	Finance	KLN	
28	Siemens Phone Systems	1	Finance	KLN	
29	Stacks Sports Warehouse	1	Finance	JAS	
30	Trivett Classic Car Sales	1	Finance	JAS	
31	Commonwealth Bank S'Line Acc	1	Finance	JAS	
32	Goulburn Valley Tinned Fruit	1	Finance	JAS	
35	AAMI Car Ins	1	Finance	JAS	
36	Brescia Furniture Strs	1	Finance	KLN	
37	Lighting Warehouse The	1	Finance	JAS	
40	Pepsi Cola Soft Drink	1	Finance	JAS	
41	Red Rooster		Transaction Accounts	JAS	
52	NSW Milk Pure Fresh		Transaction Accounts	JAS	
53	Diet Pepsi Soft Drink		Transaction Accounts	JAS	
56	NSW Lotteries Corporate		Transaction Accounts	DMT	
60	HFA EPI Smile Tth White/Clnr		Transaction Accounts	JAS	
67	Uncle Tobys Microwave Popcorn		Transaction Accounts	JAS	
69	Yates Packet Seeds		Transaction Accounts	KLN	
71	Kelloggs Special K		Transaction Accounts	JAS	
72	Devondale Extra Soft Butter		Transaction Accounts	JAS	
76	White Wings Cake Mixes		Transaction Accounts	JAS	
79	Slate People Tiles Strs		Transaction Accounts	JAS	
81	Diet Coke Soft Drink		Transaction Accounts	JAS	
84	Advance Bank Investment Acc		Transaction Accounts	JAS	
97	Goodyear Tyres Corporate		Transaction Accounts	JAS	
105	United Airlines	4	Transaction Accounts	JAS	
112	Canon Fax Machines	4	Transaction Accounts	JAS	
116	Nissan Motor Co/Corp	4	Transaction Accounts	JAS	Nissan Leadership campaign pro
119	7Up Soft Drink	4	Transaction Accounts	JAS	
121	Joyce Mayne Discount Strs	4	Transaction Accounts	JAS	
122	Meat & L/Stock Aust Beef	4	Transaction Accounts	SZV	
128	Toyota Corolla	4	Transaction Accounts	JAS	
129	Southern Comfort Bourbon	4	Transaction Accounts	JAS	
130	Aust Wonderland	4	Transaction Accounts	SZV	
131	KFC - Corp	4	Transaction Accounts	GAL	

Ready

Microsoft Word Exploring - Uri AIM2000 Data Collec...

NUM 6:13 PM

# Primary window – row browser

Ad Link...	Product	Advertiser	Agency	Centre
44300	Capri Body Fashion Lingerie St	Capri Body Fashions	Direct Advertiser	ATMC
44301	Capri Body Fashion Lingerie St	Capri Body Fashions	Direct Advertiser	ATMC
44302	Capri Body Fashion Lingerie St	Capri Body Fashions	Direct Advertiser	ATMC
44303	Capri Body Fashion Lingerie St	Capri Body Fashions	Direct Advertiser	ATMC
703135	Classic Sounds Hi Fi Str	Classic Sounds Hi Fi	Direct Advertiser	ATMC
791837	Classic Sounds Hi Fi Str	Classic Sounds Hi Fi	Direct Advertiser	ATMC
767987	Classic Sounds Hi Fi Str	Classic Sounds Hi Fi	Direct Advertiser	ATMC
936551	Classic Sounds Hi Fi Str	Classic Sounds Hi Fi	Direct Advertiser	ATMC
1008655	Classic Sounds Hi Fi Str	Classic Sounds Hi Fi	Direct Advertiser	ATMC
612797	Centrepoint Toyota Dealers	Centrepoint Toyota Dealers	Direct Advertiser	ATMC
612814	Centrepoint Toyota Dealers	Centrepoint Toyota Dealers	Direct Advertiser	ATMC
1076412	NWS9 Promotions/Competiti...	NWS9 (SA)	Young & Rubicam Adelaide (...)	ATMD
1461650	NWS9 Promotions/Competiti...	NWS9 (SA)	Media Edge\Yng & Rubicam ...	ATMD
960401	Gateway Tasmania Tourism	Gateway Tasmania Ltd	Andrews Thomas&Mallinson (...)	ATMD
955070	Gateway Tasmania Tourism	Gateway Tasmania Ltd	Andrews Thomas&Mallinson (...)	ATMD
1177271	Meander HorseDrawn Coach...	Meander Coaches	Direct Advertiser	ATME
964005	Gateway Tasmania Tourism	Gateway Tasmania Ltd	Andrews Thomas&Mallinson (...)	ATME
1403901	Atomfest Student Film Festival	Aust Teachers Of Media	Direct Advertiser	ATME
617464	Examiner Newspaper	Examiner Newspaper Launce...	Direct Advertiser	ATME
628623	Examiner Newspaper	Examiner Newspaper Launce...	ZZ TV Agency (TV Use Only)	ATME
617484	Examiner Newspaper	Examiner Newspaper Launce...	Direct Advertiser	ATME

# Primary window – multi-pane row browser

The screenshot shows the 'AdEx2000 Data Collection and Quality Control' application window. The title bar reads 'AdEx2000 Data Collection and Quality Control - [Products by Advertiser by Agency]'. The menu bar includes 'File', 'Dictionary', 'Data Collection', 'Record', 'Security', 'View', 'Window', and 'Help'. The toolbar contains icons for file operations and a search field. The main area is divided into three panes, each with a table view.

**Agencies**

Description	Notes
Virgin Advertising (VIC)	Contact: Chris Frayman 0412 386 806. 4/11/98. Gill.
Wade-Ferrell Larkins (NSW)	
Walker Wimble Media (NSW)	accreditation confirmed june 96 Doug
Webster Marketing Svcs (NSW)	(02) 6228 1800. Gill. 15/12/98.
Whybin TBWA & Partners (NS...)	Previously known as Box Emery & Partners. media buying for this agency is thru BO.

**Advertisers**

Description	Notes
Briquettes Australia	fuel merchants and manufacurors of heating products (Heat-a-brix) Ph:03 9398 8231
Dimmeys & Forges Of Footscray	*TV use Raws for Russell Curtis, direct and Virgin Advertising. *Virgin Advertising buy
Hardings Hardware Stores	
Hire A Hubby	service - hubby looking *Press use Virgin Adv WA *Tv and radio use raws for Virgin

**Products**

Description	Category	Notes
Briquettes Heat A Brix	BBQ's & Equipment	artificial heating product for wood fire burns 3 times

Ready

# Primary window – tree browser

The screenshot shows the 'AdEx2000 Data Collection and Quality Control - [Agency Groups]' application window. The window has a menu bar with 'File', 'Dictionary', 'Data Collection', 'Record', 'Security', 'View', 'Window', and 'Help'. Below the menu bar is a toolbar with various icons. The main area is divided into two panes. The left pane, titled 'Agency Groups', shows a tree view of agency groups. The right pane, titled 'Agencies for - AIS Media (VIC)', shows a list of agencies with columns for 'ID' and 'Description'.

**Agency Groups**

- Agency Groups
  - Carat Consortium
    - Carat Australia Media Group
      - Carat Australia Sub-Group(NSW)
  - Equmedia Consortium
    - AIS Group
      - AIS Media (NSW) Sub-Group
      - AIS Media (QLD) Sub-Group
      - AIS Media (SA) Sub-Group
      - AIS Media (VIC) Sub-Group
      - AIS Media (WA) Sub-Group
      - Total Media (VIC) Sub-Group
    - Bowtell Clarke Yole Group (WA)
    - Charterhouse Adv Sub-Group
    - DMB&B Group
    - Euro RSCG Partnership Group
    - MediaCompete Group
      - MediaCompete (NSW) Sub-Group
      - MediaCompete (VIC) Sub-Group

**Agencies for - AIS Media (VIC)**

ID	Description
974	Advertising Works (VIC)
557	AIS Media (VIC)
612	C&N Advertising Pty Ltd (VIC)
677	Francis Agency The (VIC)
816	Leeds Media & Comm Svcs (...)
724	Magnum Opus Advertising (VIC)
628	Nicholson Guthrie Advtg (VIC)
588	Sanford Vick & Assoc (VIC)
499	SSB Advertising (VIC)
568	Us Advertising (VIC)
665	Wilson Everard Advtg (VIC)

Ready

# Primary window – web page

**In a Nutshell: Practical Software Engineering - Addison-Wesley @ 2004 - Microsoft Internet Explorer**

File Edit View Favorites Tools Help

Back Forward Stop Home Search Favorites Media Print Mail News RSS Feeds

Address [http://www.comp.mq.edu.au/books/maciaszek-liong-bills/basic\\_info/index.htm](http://www.comp.mq.edu.au/books/maciaszek-liong-bills/basic_info/index.htm) Go Links

## Practical Software Engineering

Maciaszek L.A. and Liong B.L. Addison-Wesley

MACQUARIE  
Department of Computing

- Main**
- Basic Info
- Book in a Nutshell
- Brief TOC w/Page
- Detailed TOC w/Page
- Outline & Organization
- Distinguishing Features
- Intended Readership
- Supp Materials
- The Book's story

- Sample Chapters**
- Readers Area
- Instructors Area
- Temp Area

### Maciaszek, Liong (2004): Practical Software Engineering. A Case Study Approach, Addison-Wesley

## About the Book

The distinctive character of this book stems from two endeavors. Firstly, this book is about the way software engineering is done in practice. Secondly, it is about software engineering for enterprise applications. The book is pivoted on one main case-study, a substantial number of supporting examples, exercises and mini-cases. The four parts of this book capture its essence. The parts are:

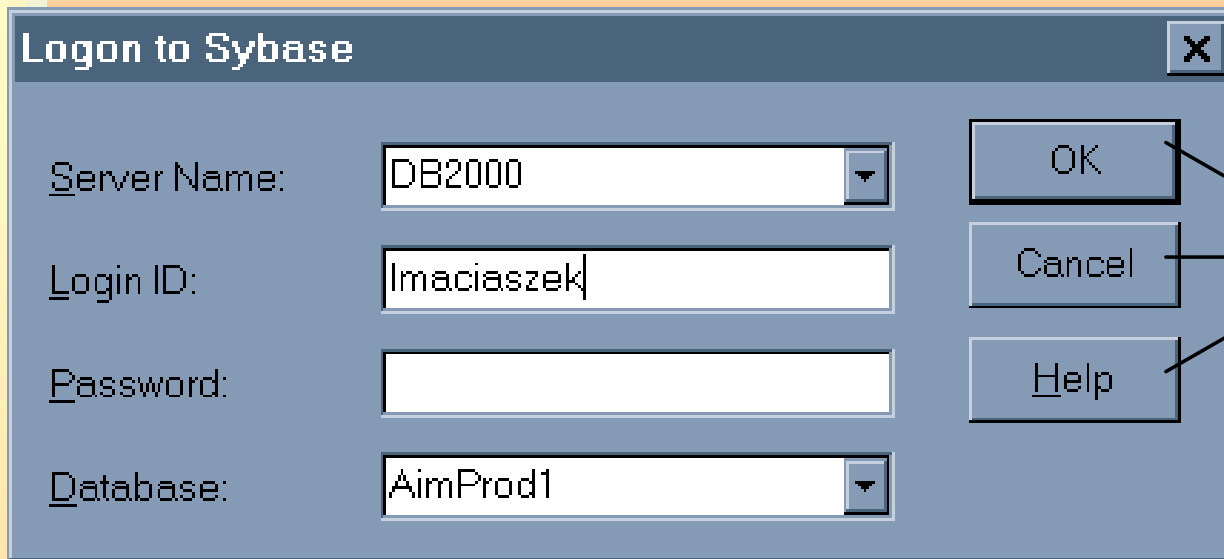
- Part A - *Software Projects*
- Part B - *From Requirements via Architectural Design to Software Release*
- Part C - *Software Refactoring and User Interface Development*
- Part D - *Data Engineering and Business Components*

Look in this textbook for:

- Complete coverage of software engineering principles for the development of large systems.
- Thorough treatment of software development lifecycles, modeling languages, engineering tools, project planning and process management.
- Emphasis on object oriented modeling and programming.
- Practical application of iterative and incremental development with explanation of three iterations of

Error on page. Internet

# Secondary window



Command buttons

- Typically **modal** with respect to the primary window – user must respond and close the secondary window before interacting with any other window of the application
- **Modeless** secondary windows are possible but not recommended
- **Does not have any 'bars'** – a menu bar, toolbar, scroll bars, or status bar
- User events are achieved with **command buttons (action buttons)**

# Secondary window – dialog box

**Insert TV Ad Instance**

Outlet: ATN7  
Program Instance: NBC Today - 11 September, 2000 at 01:21:49  
Episode:  
Shown At: 01:35:51 11 September, 2000  
Duration: 30  
Type of Ad: Normal  
Market Level: Submarket - (N)

**Ad Instance Attributes**

Attributes  
 0 - Olympic Flag ( Press)

**Ad**  
Key Number: pop0007 Advertiser:   Scoped  
Product:   Scoped  
Agency:   Scoped

**Ad Links**

Product	Advertiser	Agency
Streets Paddle Pops	Unifoods P/L	Initiative Media (NSW)
Streets Paddle Pops	Unifoods P/L	J Walter Thompson (A
Streets Paddle Pops	Unifoods P/L	Universal McCanns (N
Streets Paddle Pops	Unifoods P/L	Universal McCanns (N
Streets Paddle Pops	Unifoods P/L	Universal McCanns (N


Found Key Number: pop0007

Save and Next Save and Close Query and Next Query and Close Clear Cancel

# Secondary window – tab folder

**Insert Contact** [X]


Details | Postal Address | Courier Address

 ID: \_\_\_\_\_

Family Name:


First Name:  Salutation:

---

 Organisation:  ▼


Department:  Status:  ▼

Job Title:  Start:  End:

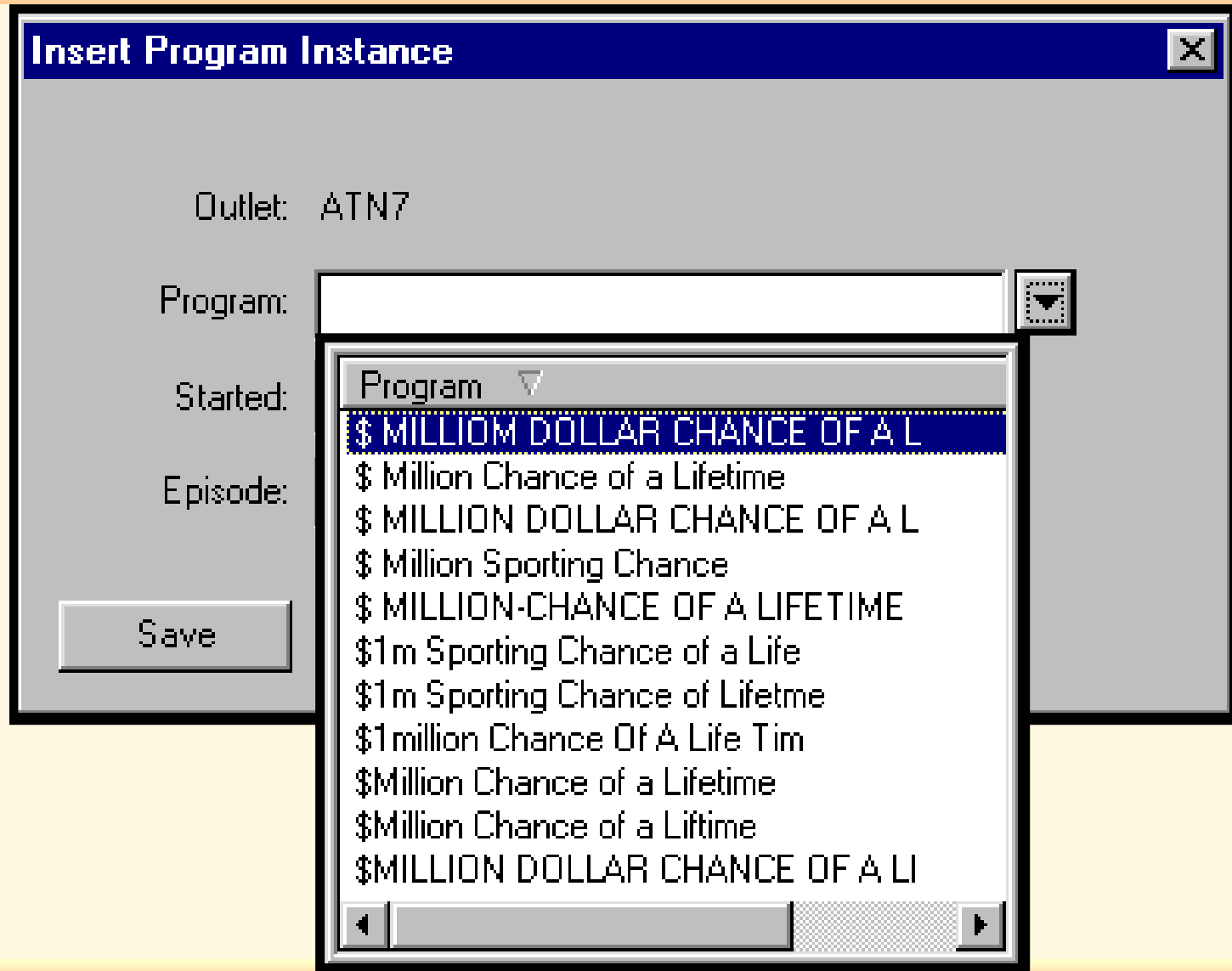
 Phone:  Mobile:  Fax:

Email:

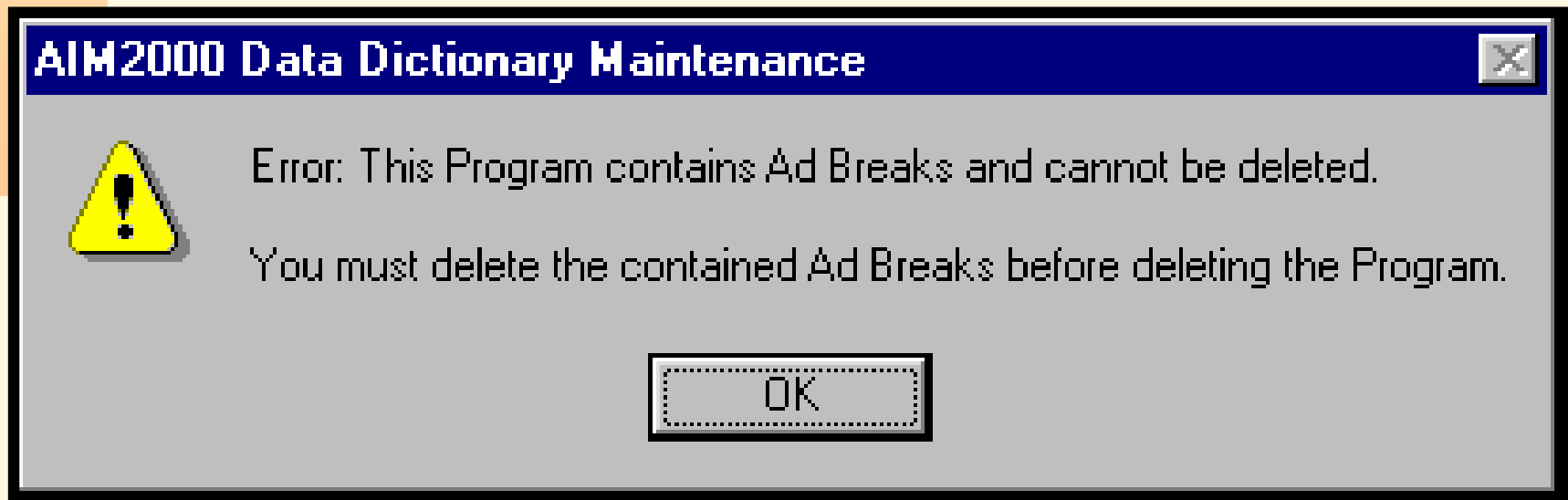
---

 Notes:

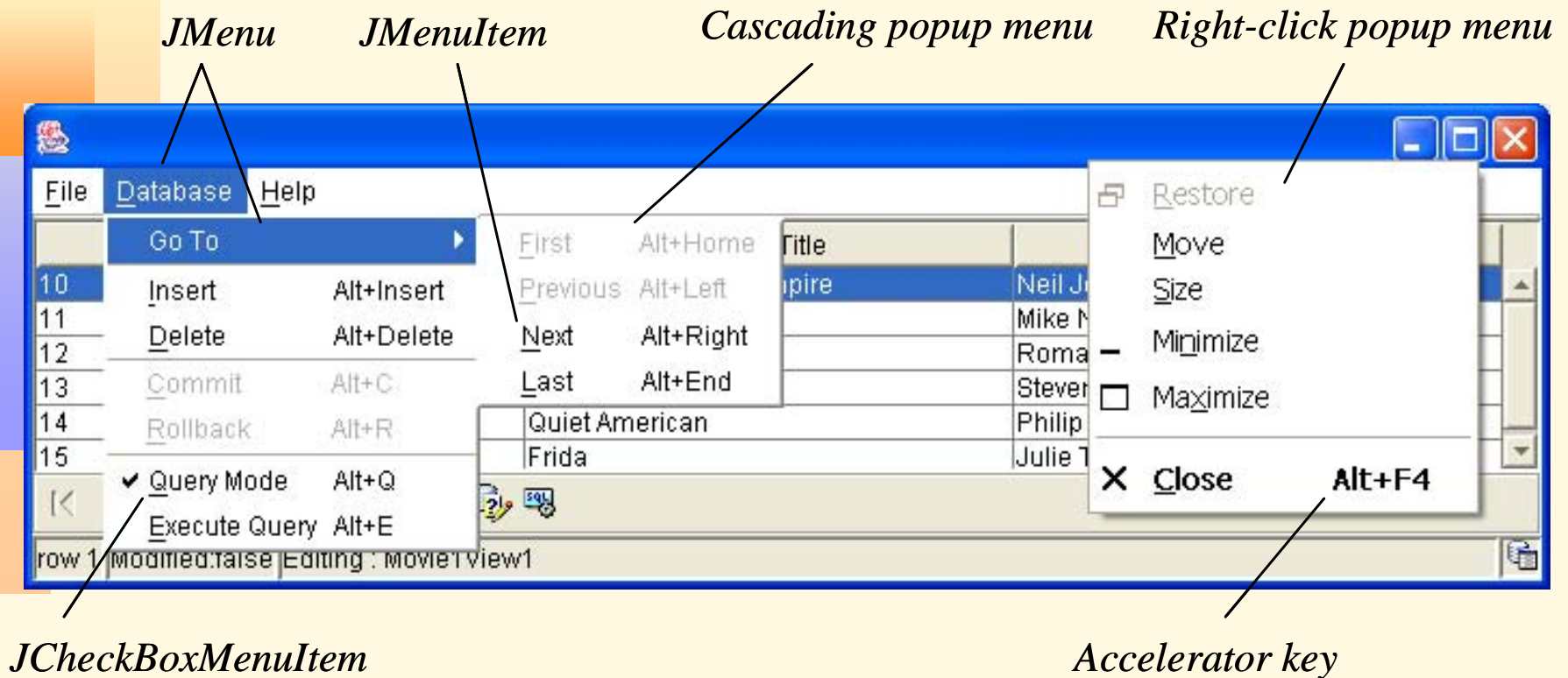
# Secondary window – drop-down list



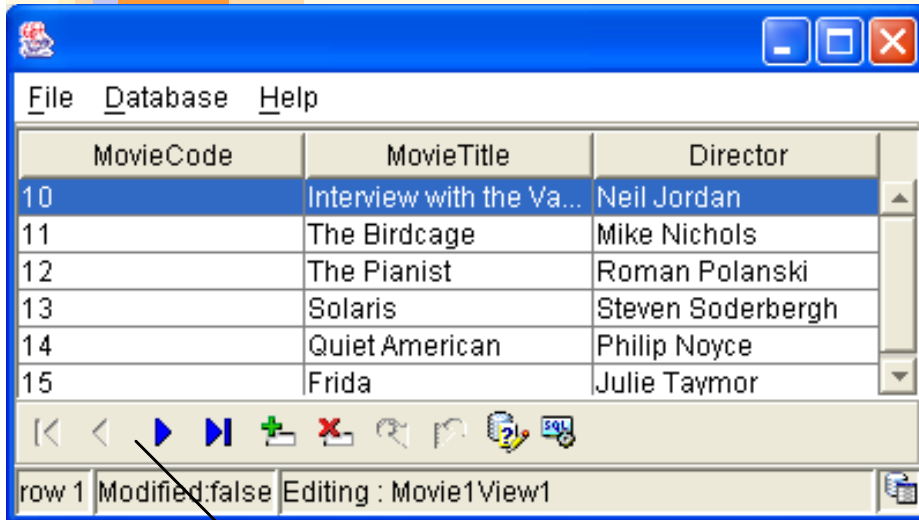
# *Secondary window – message box*



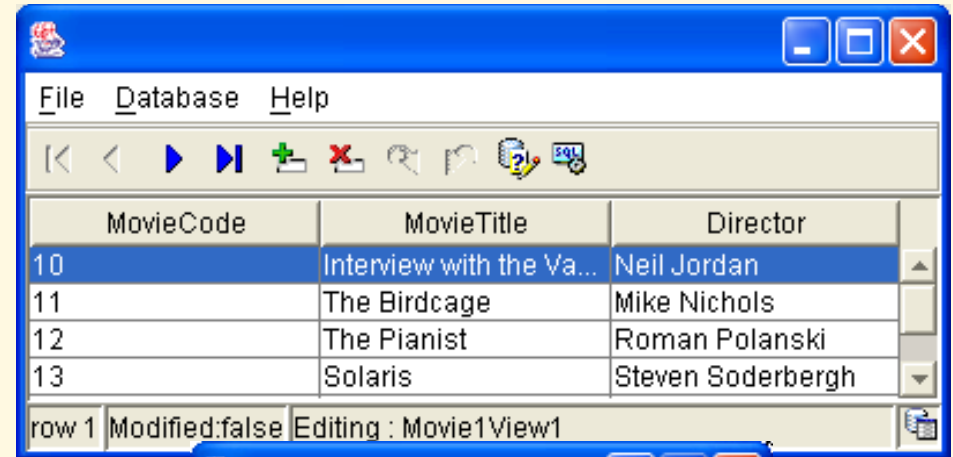
# Menus



# Toolbars

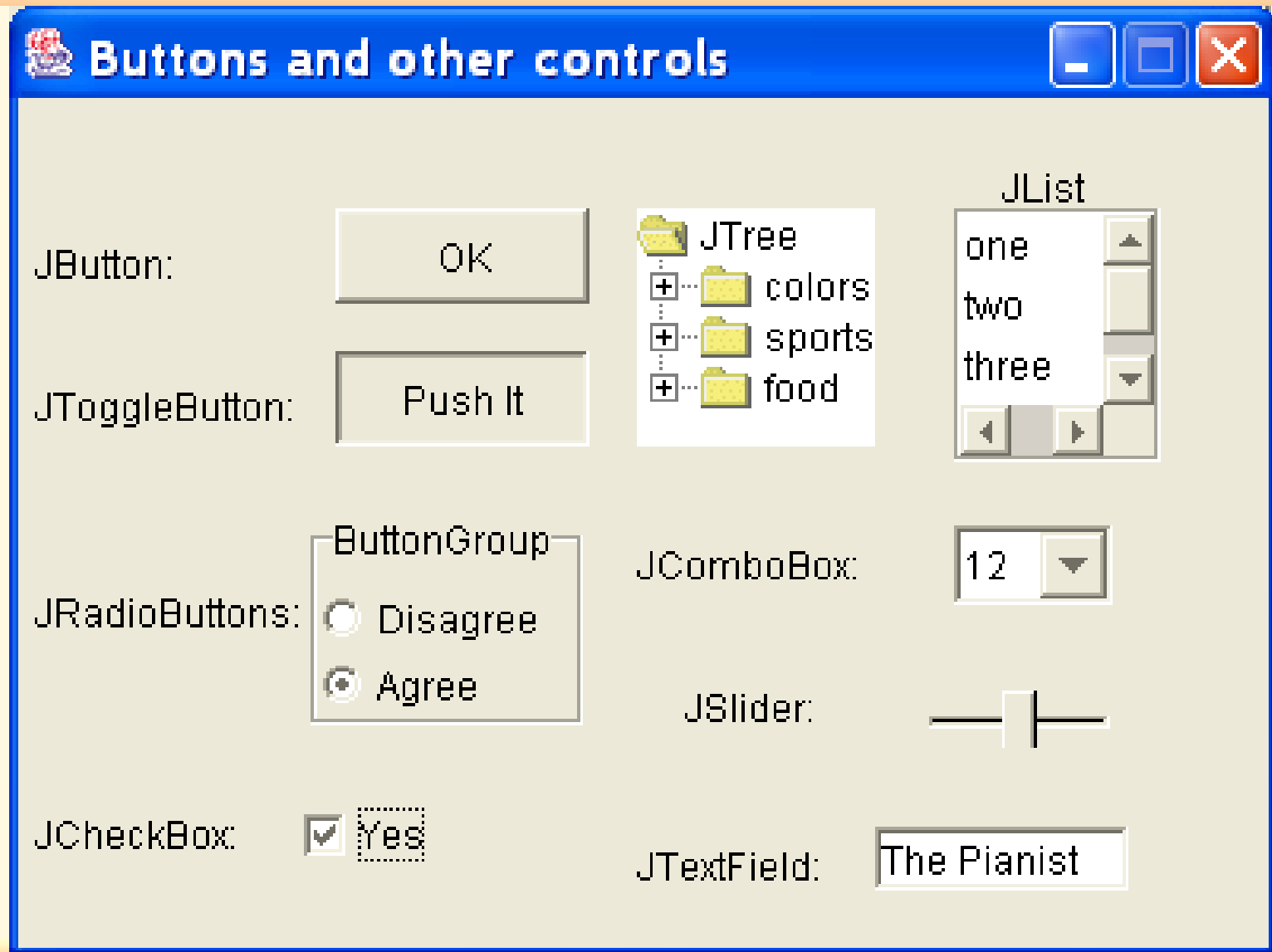


*Toolbar*



*Floatable toolbar*

# Buttons and other controls



# Web application

- **Web application** is a Web system that allows its users to execute business logic with a web browser
  - **client browser** renders web pages on a computer screen
  - **web server** delivers the web pages to the browser
  - can include an **application server** to manage the application logic and to monitor the application state
    - a simple technique to monitor state is to store a **cookie** in the browser
- **Scripts and applets** are used to make the client page dynamic
  - **script** is a program interpreted by the browser
  - **applet** is a compiled component that executes in the browser's context but it has only limited access to other resources of the client computer (for security reasons)
- **Server pages** – scripts executed by the server on a web page

# *Web application – enabling technologies*

- **Data access libraries** to allow scripts in server pages to access the database
  - ODBC (Open Database Connectivity)
  - JDBC (Java Database Connectivity)
  - RDO (Remote Data Objects)
  - ActiveX Data Objects (ADO)
- **Enabling technology for the web server – scripted HTML (HyperText Markup Language) pages**
  - ASP (Active Server Pages)
  - JSP (Java Server Pages)
- **Enabling technology for web pages**
  - client scripts (JavaScript or VBScript)
  - XML (eXtensible Markup Language) documents
  - Java applets
  - JavaBean
  - ActiveX controls

# *Deployment architecture tiers*

- *Client with browser*
  - *to display static or dynamic pages*
  - *scripted pages and applets can be downloaded and run within the browser*
- *Web server*
  - *handles page requests from the browser*
  - *dynamically generates pages and code for execution and display on the client*
- *Application server*
  - *manages the business logic*
  - *indispensable when distributed objects are involved in the implementation*
- *Database server*
  - *provides for a scalable storage of data and multi-user access to it*
  - *business components encapsulate persistent data stored in a database and communicate with the database server*

# *Window navigation*

- **UI design** – through prototyping or UI layout tools – does not inform how the windows can be actually navigated by the user
- A **window navigation model** consist of diagrams visualizing screen containers and components and showing how the user can traverse from one window to another
- **User eXperience (UX) storyboards** – a UML profile for window navigation

# User experience (UX) storyboards

- **Add actor characteristics to the use case.**
  - *This includes definition of actor's (user's) computer familiarity, domain knowledge, frequency of accessing the system, etc.*
- **Add usability characteristics to the use case.**
  - *The usability characteristics include helpful hints (e.g. how to make the UI easier to use or easier to implement) and any rigorous requirements that must be conformed to (e.g. system response time, acceptable error rates, learning times).*
- **Identify UX elements.**
  - *This refers to the identification of the UI containers and components.*
  - *A specially stereotyped class model is used to represent UX elements.*
- **Model the use case flows with the UX elements.**
  - *This is a UX-driven behavioral collaboration modeling.*
  - *UML sequence and collaboration diagrams are used to depict the interaction between the user and the UI presentation screens or between the presentation screens themselves.*
- **Model screen navigation links for the use case.**
  - *This is a UX-driven structural collaboration modeling.*
  - *Stereotyped UML class diagrams are used to depict associations along which the navigation between UX elements takes place.*

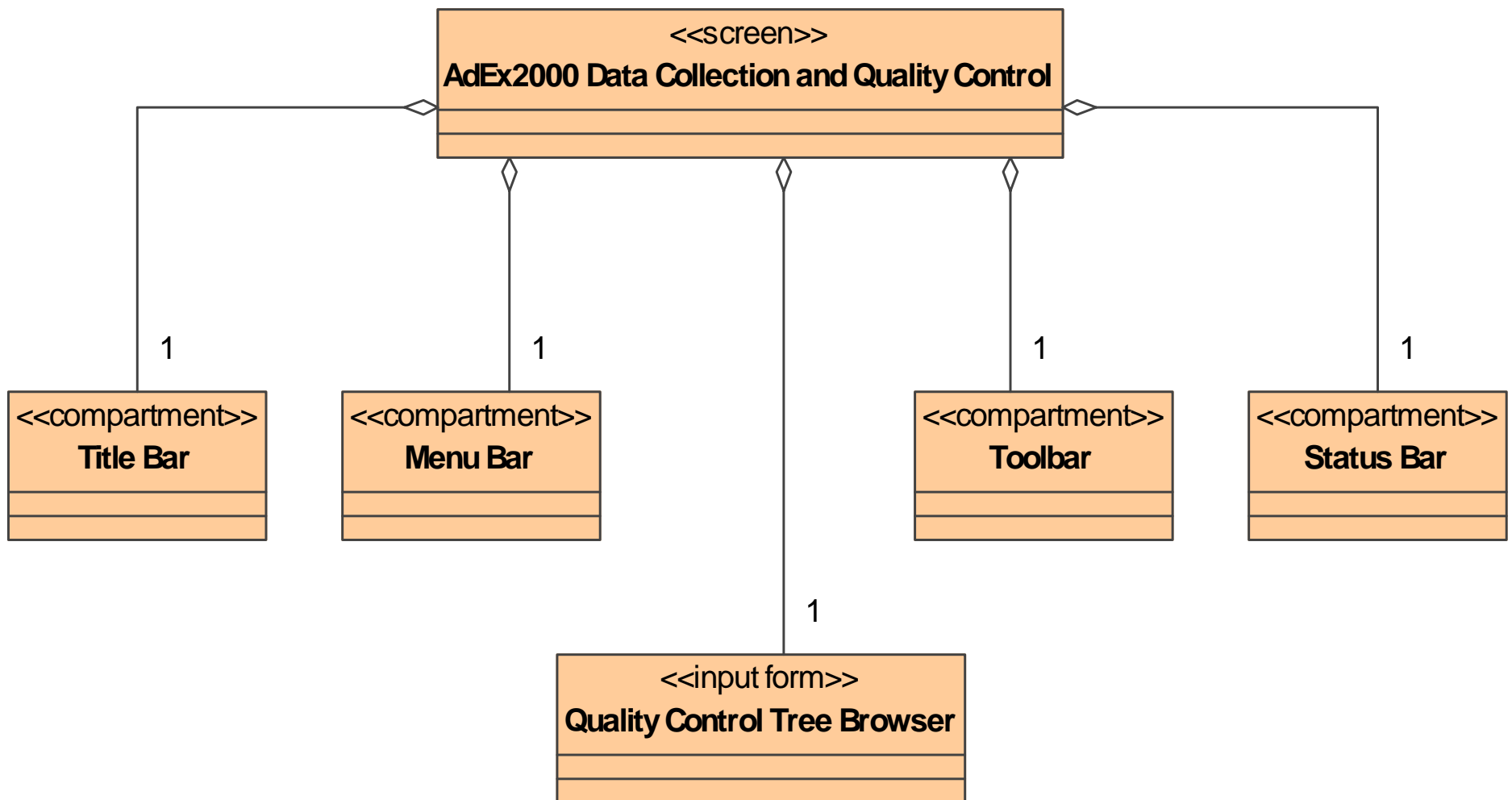
# Modeling UX elements – class stereotypes

- **The UML classes can be stereotyped as:**
  - `<<screen>>`
    - defines a window or a web page rendered on the screen
  - `<<input form>>`
    - represents a window's container or a web page form through which the user can interact with the system by entering data or by activating some actions
  - `<<compartment>>`
    - represents any region of a screen that can be reused by multiple screens (e.g. a toolbar)

# Modeling UX elements – field tags

- **Three most interesting *tags* specify if a **field** is:**
  - *editable*
    - indicates if the field can be modified by the user or not
  - *visible*
    - indicates if the field is displayed on the screen or hidden from the user's view (but still accessible to the program)
  - *selectable*
    - indicates if the field can be selected (highlighted or otherwise shown as active)
- **For example**
  - `{editable = true, visibility = visible}`
  - `{editable = false, visibility = hidden}`

## Example 7.7 (AE) – UX elements for primary window



# *Behavioral UX collaboration*

- *Two categories of **actions** in UX classes:*
  - ***User actions** are any UI events coming from the user*
  - ***Environmental actions** are any UI events coming from the system*
    - *Navigation to a new screen is one of the most noticeable environmental action*
    - *The UX profile recommends to distinguish environmental actions with a dollar sign prefixing the action's name*
- *UX flows of events capture the **behavioral aspect** of a UX collaboration*
- ***UML interaction diagrams** (sequence and/or collaboration diagrams) are used to represent UX flows of events*

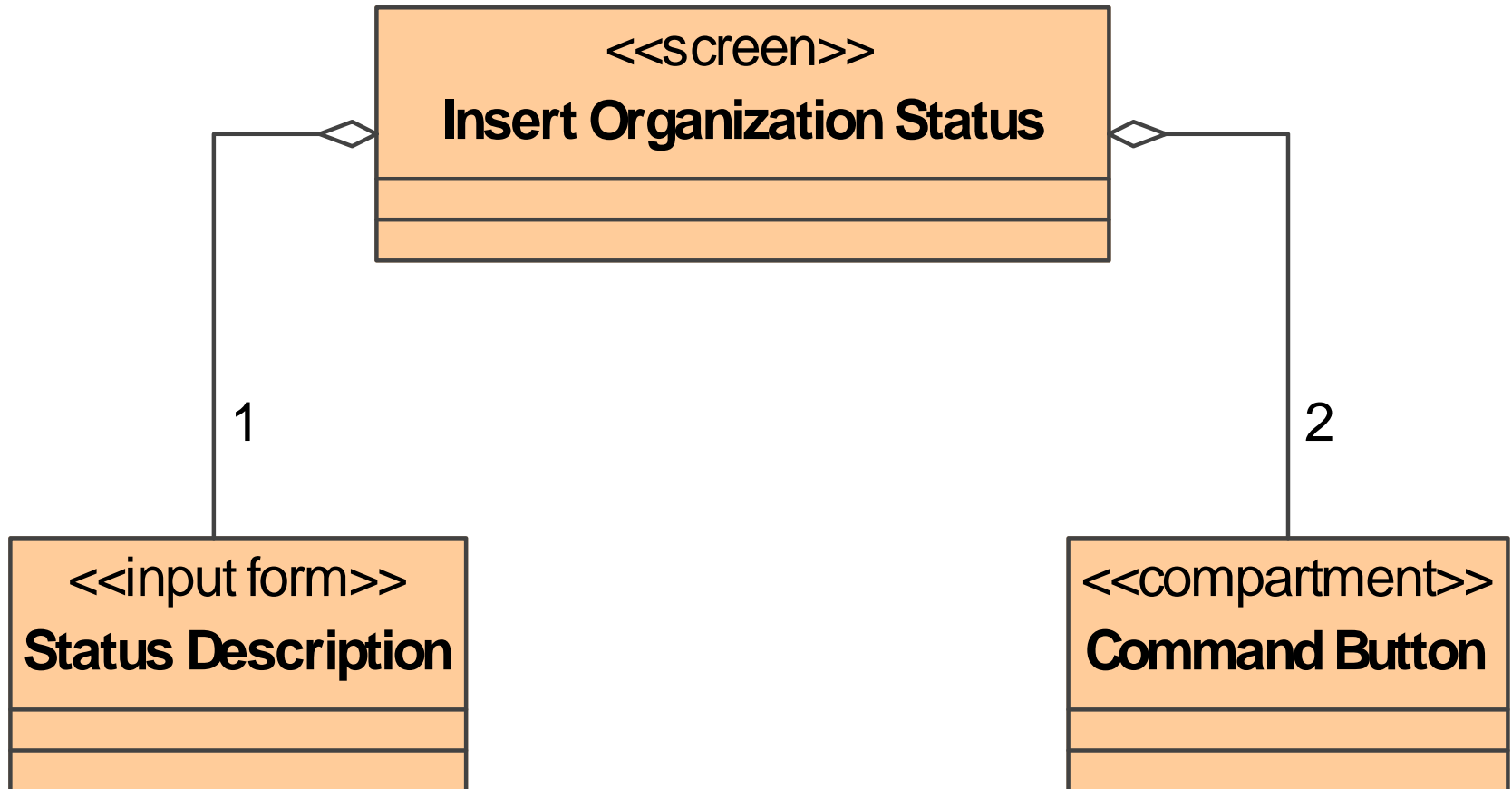
# Example 7.4 (CM)

Organisation Status	
Code ▾	Org Status ○
1	Prospective customer in long term
2	Prospective customer soon
3	Current customer
4	Past customer
5	Current customer with contract soon t...
6	Uncertain if a good prospect

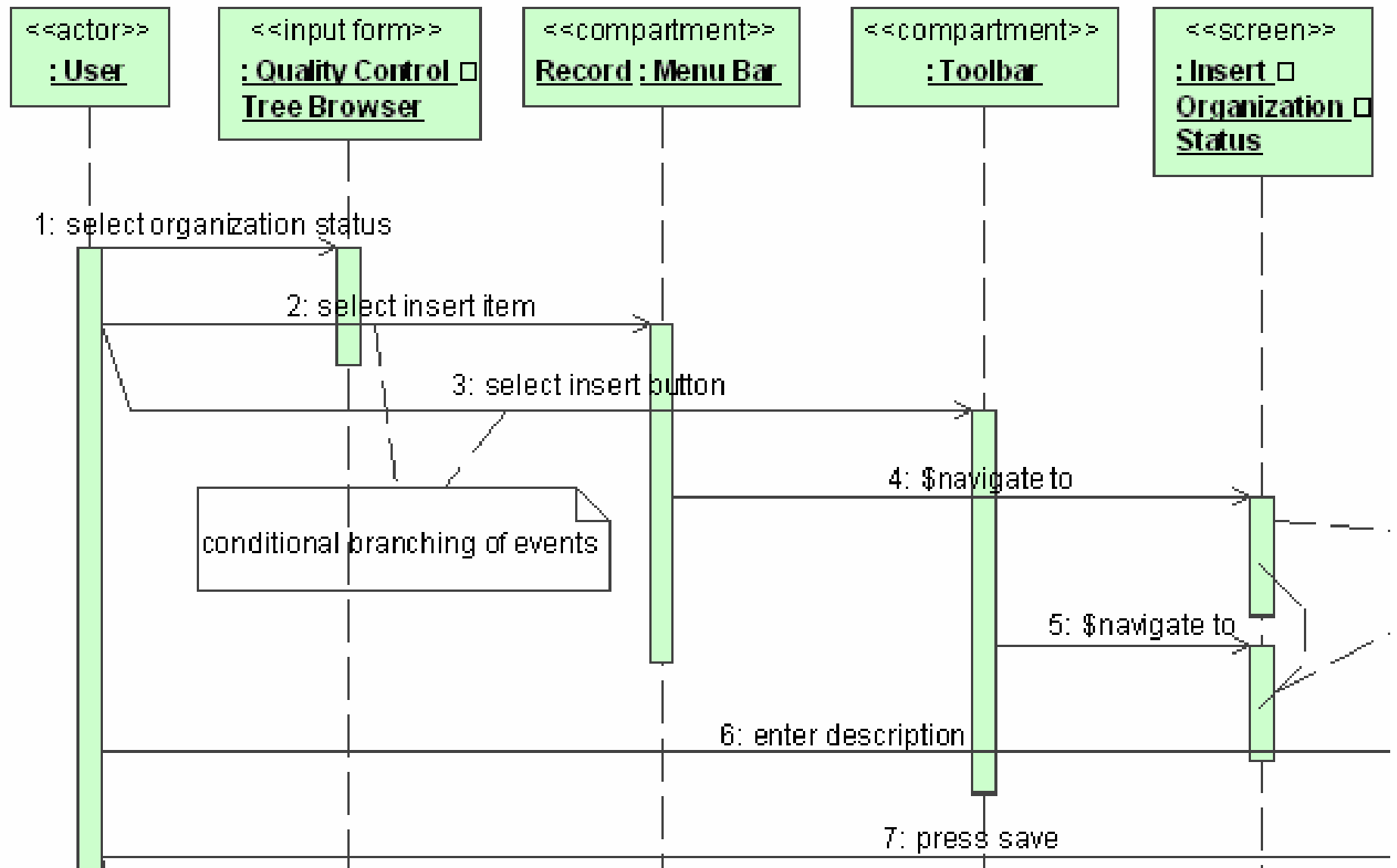
**Insert Record - Organisation Status** [X]

Description

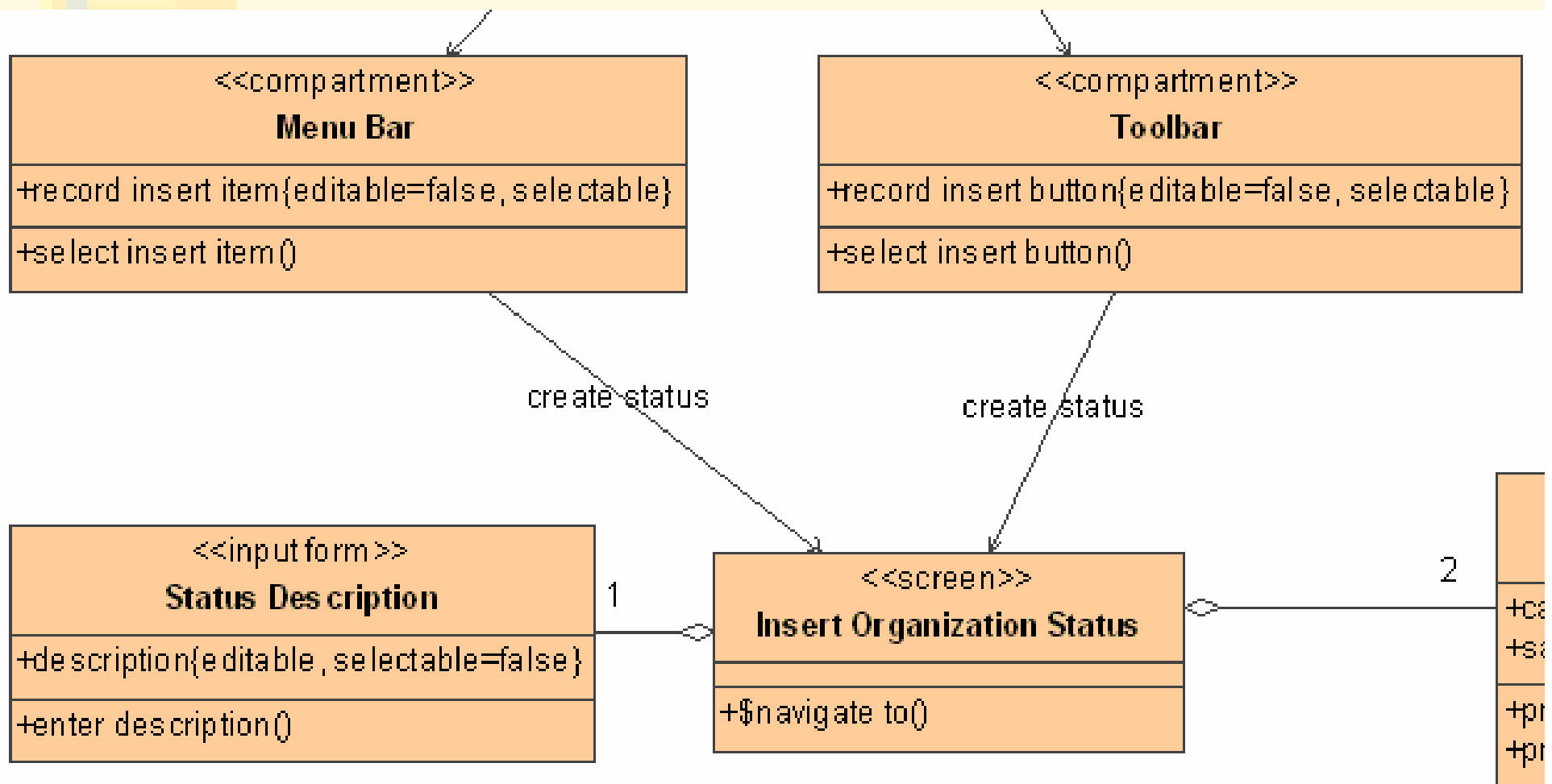
# Example 7.4 (CM) – UX elements



# Example 7.4 (CM) – behavioral collaboration



# Example 7.4 (CM) – structural collaboration



# Summary

- *The UI design is a **multidisciplinary activity** requiring the combined expertise of different professions*
- *The design must adhere to the **guidelines** published by the manufacturer of a windows interface*
- *The **containers** define various windows and web pages used in the application*
- *Containers are considered to be one category of UI **components** – menus, toolbars, and controls are other kinds of components*
- *Modern **web applications** place their own demands on UI design*
- ***Window navigation** captures possible navigation paths between application windows and other UI elements*