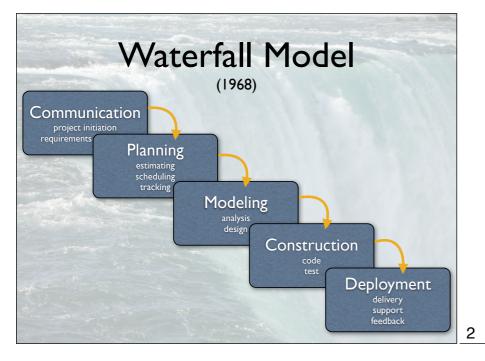
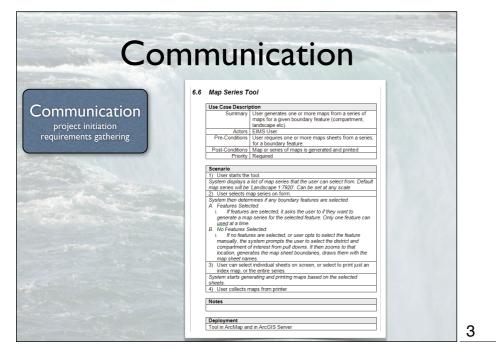


Based on the Book by Pressman: "Software Engineering – a Practitioner's Approach", as well as Wikipedia



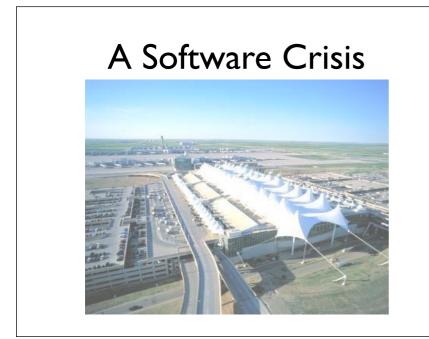


| Communicatio | n | |
|---|------------------------------|--|
| 6.6 Map Series Tool | | |
| Use Case Description | | |
| Summary User generates one or more ma maps for a given boundary featu landscape etc) | rom a series of compartment, | |
| Actors EIMS User | | |
| Pre-Conditions User requires one or more maps for a boundary feature. | | |
| Post-Conditions Map or series of maps is genera Priority Required | and printed | |
| Evenario User starts the tool stem displays a list of map series that the user co p series will be Landscape 17920 Cam be set Users evit be Landscape 17920 Cam be set Users evit be series on form. | iy scale. | |
| How do we get there? How a do we get there? How a do we get there? | v want to | |
| No Features Selected: i. If no features are selected, or user opts to s mamually, the system prompts the user to select | the feature | |
| comparison of interest from pull downs. It then comparison of interest from pull downs. It then location, generates the map sheet boundance, o map sheet names. | oms to that | |
| User can select individual sheets on screen, or s index map, or the entire series. | | |
| System starts generating and printing maps based of sheets. | he selected | |
| 4) User collects maps from printer | | |
| Notes | | |
| Deployment | | |
| Tool in ArcMap and in ArcGIS Server | 4 | |
| | т | |

"Requirement"Standard Glossary of Software Engineering Terminology (ANSI/IEEE Standard 610.12-1990) I. A condition or capability needed by a user

- to solve a problem or achieve an objective.
- A condition or capability that must be met or possessed by a system or system component to satisfy a contract, standard, specification, or other formally imposed documents.
- 3. A documented representation of a condition or capability as in (1) or (2).

5



Denver International Airport (DIA) Construction started in 1989 • 53 sq miles • Planned: 1.7 bio USD costs, opening 1993

| Glass' Law | This and other laws are found in Endres/Rombach: |
|--|---|
| Requirement deficiencies are the prime source of project failures. | Handbook ofSoftware andSystemsEngineering.Evidence: Denverairport case study7 |
| "Requirements Analysis" Standard Glossary of Software Engineering Terminology (ANSI/IEEE Standard 610.12-1990) | |

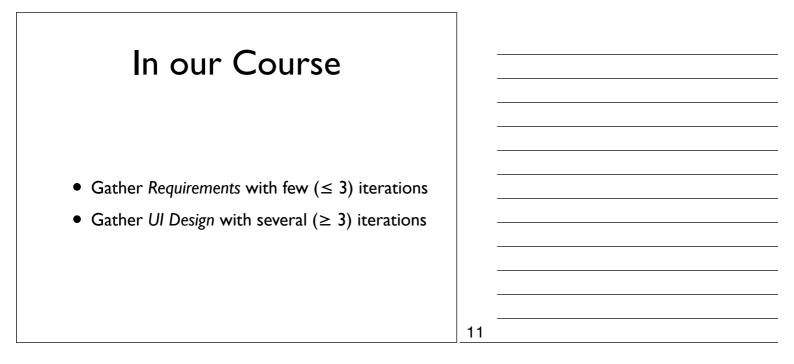
- The process of studying user needs to arrive at a definition of system, hardware, or software requirements.
- The process of studying and refining system, hardware, or software requirements.

8

9

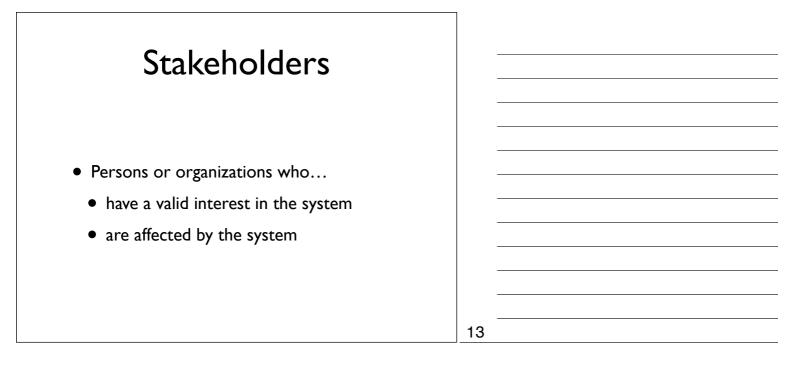
Analysis vs Design • Analysis = what the software should do • Software functionality • Software properties • Design = how it should do it

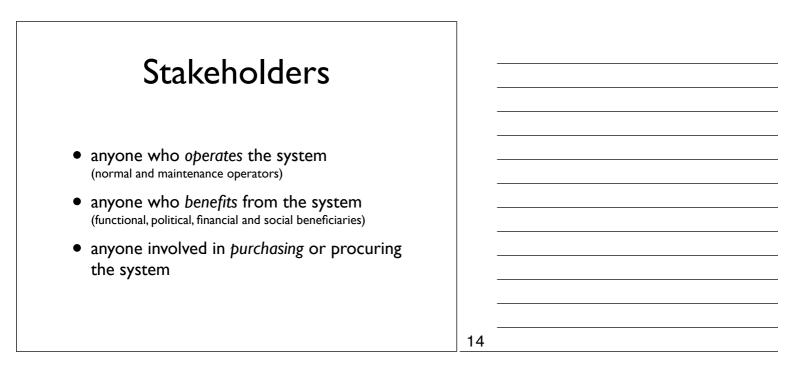
| Up-front RE | |
|---|----|
| "We must know [exactly] what to build before we can build it" classical engineering viewpoint leads to waterfall process but is this realistic for today's systems? | 10 |



Topics in Requirements Analysis

- Identify Stakeholders
- Elicit Requirements
- Identify Requirements
- Prototypes





| Stakeholders |
|--|
| organizations which regulate aspects of the system (financial, safety, and other regulators) |
| organizations responsible for systems which interface with the system under design |
| people or organizations opposed to the system (negative stakeholders) |



Elicit Requirements

- Interviews are the best way to elicit requirements
- Explore requirements systematically
- Sounds simple but is the hardest part!

16

Why is Elicitation hard?

- Problems of scope What is the boundary of the system? • What details are actually required?
- Problems of understanding
 Users do not know what they want don't know what is
 needed have a poor understanding of their computing
 environment don't have a full understanding of their domain
 omit "obvious" stuff are ambiguous
- Problems of volatility Requirements change over time

17

Identify Requirements Types of requirementsFunctional requirements • Nonfunctional requirements • Constraints Contract-style requirements Use cases (user stories)

| | <section-header></section-header> | | Suppose we want to set up a system that tracks who has had how much coffee |
|----|-----------------------------------|----|--|
| 19 | | 19 | |

Functional Requirements

• An action the product must take to be useful

The product shall allow to track individual payments of coffee servings

Nonfunctional

Requirements

• A property or quality the product must have

Constraints

 Global requirements – on the project or the product

> The product shall be available before March 1st.

| 22 | |
|----|--|

Contract Style

Requirement

The system will support client inquiries from four access points: in person, paper-based mail, voice communication, and electronic communication (Internet, dial-up, and LAN/WAN).

The telephone system must be able to support an 800 number system.

The telephone system must be able to handle 97,000 calls per year and must allow for a growth rate of 15 percent annually. Of these calls it is estimated that 19 percent will be responded to in an automated manner and 81 percent will be routed to call center staff for response. Fifty percent of the calls can be processed without reference to the electronic copy of the paper file, and approximately 50 percent will require access to the system files. Four access points are how; we should focus instead on who needs access from where.

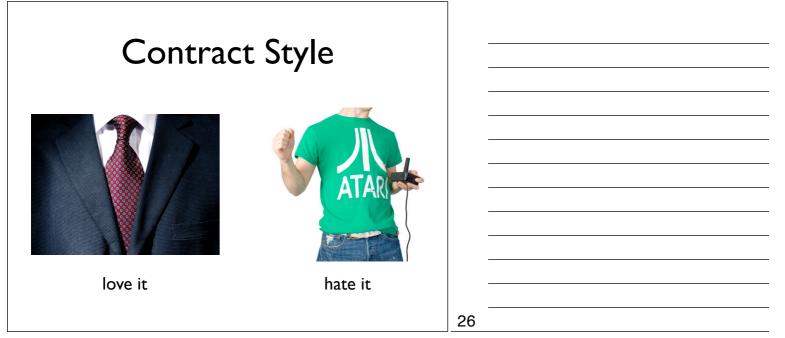
Comment

An 800 number? Can't use 888 or 877? Again, what's missing is who needs what kind of access from where. Valuable statistics; this one is actually pretty good. From "Use cases: requirements in context" By Daryl Kulak, Eamonn Guiney

23

Classify product features as • Must-have features "The product must conform to accessibility guidelines" • May-have features "The product may eventually be voice-controlled" • Must-not-have features "The product supports only one language" Be explicit about must-not-have features!

| | Strengths |
|--|--|
| Contract Style | Provides a checklist of |
| Contract Style | requirements. |
| | Provide a contract between |
| | the project sponsor(s) and |
| Provide a contract between sponsors and | developers. |
| developers | For a large system can |
| Can run to hundreds of pages | provide a high level |
| Abstract all requirements, with little context | description. |
| | Weaknesses |
| | Such lists can run to hundreds |
| | of pages. It is virtually |
| | 25 impossible to read such |
| | |
| | _ |



| Use Case | | |
|---|----|--|
| An actor is something that can act – a person, a system, or an organization | | |
| A scenario is a specific sequence of actions and interactions between actors (where at least one actor is a system) | | |
| A use case is a collection of related scenarios – successful and failing ones | | |
| Useful for clients as well as for developers | 27 | |

Actors and Goals

- What are the *boundaries* of the system? Is it the software, hardware and software, also the user, or a whole organization?
- Who are the *primary actors* i.e., the stakeholders?
- What are the *goals* of these actors?
- Describe how the system fulfills these goals (including all exceptions)

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| 29 | | |
| 29 | | |

Initial Scenario

Use case: display camera views Actor: homeowner

If I'm at a remote location, I can use any PC with appropriate browser software to log on to the SafeHome Web site. I enter my user ID and two levels of passwords and, once I'm validated, I have access to all the functionality. To access a specific camera view, I select "surveillance" and then "select a camera". Alternatively, I can look at thumbnail snapshots from all cameras by selecting "all cameras". Once I choose a camera, I select "view"...

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| Refined Scenario | | |
|--|----|--|
| Use case: display camera views Actor: homeowner | | |
| 1. The homeowner logs on to the Web Site | | |
| 2. The homeowner enters his/her user ID | | |
| 3. The homeowner enters two passwords | | |
| 4. The system displays all major function buttons | | |
| 5. The homeowner selects "surveillance" button | | |
| 6. The homeowner selects "Pick a camera" | | |
| | 31 | |

Alternative Interactions

- Can the actor take some other action at this point?
- Is it possible that the actor encounters some error condition? If so, which one?
- Is it possible that some other behavior is encountered? If so, which one?

Exploring alternatives is the key to successful requirements analysis!

| | Use-Case Template for Surve Use-case: Access camera surveillance—display camera views | 9. The homeowne 10. The system disp | r selects the "view" button. Iays a viewing window that is | |
|---|---|---|---|--|
| Primary actor: Goal in context: Preconditions: Trigger: | (ACS-DCV). Homeowner. To view output of camera placed throughout the house from any remote location via the Internet. System must be fully configured; appropriate user ID and passwords must be obtained. The homeowner decides to take a look inside the house while away. | vindow at one Exceptions 1. ID or password see use-case: " 2. Surveillance fur system displays | e camera ID. lays video output within the viewing frame per second. s are incorrect or not recognizec— validate ID and passwords." not configured for this system— appropriate error message; see user- e surveillance function." | |
| Web site. 2. The homeow eight charac 4. The system of 5. The homeow function but | | Homeowner se cameras"—see for all cameras A floor plan is configured—di see use-case: " An alarm cond | lects "view thumbnail snapshots for all use-case: "view thumbnail snapshots" " not available or has not been splay appropriate error message and configure floor plan." ition is encountered—see use-case on encountered." Moderate priority, to be | |
| 7. The system of | rner selects "pick a camera." lisplays the floor plan of the house. rner selects a camera icon from the | When available: Frequency of use: | implemented after basic functions. Third increment. Infrequent. | |

| SAFEHO | OME | | |
|------------------|--|----|--|
| | Use-Case Template for Surve | | |
| | Use-case: Access camera surveillance—display camera views (ACS-DCV). | | |
| Primary actor: | Homeowner. | | |
| Goal in context: | To view output of camera placed throughout the house from any | | |
| | remote location via the Internet. | | |
| Preconditions: | System must be fully configured; appropriate user ID and passwords must be obtained. | | |
| Trigger: | The homeowner decides to take a look inside the house while away. | 34 | |

Scenario:

- The homeowner logs onto the SafeHome Products Web site.
- 2. The homeowner enters his or her user ID.
- The homeowner enters two passwords (each at least eight characters in length).
- 4. The system displays all major function buttons.
- 5. The homeowner selects "surveillance" from the major function buttons.
- 6. The homeowner selects "pick a camera."
- 7. The system displays the floor plan of the house.
- 8. The homeowner selects a camera icon from the floor plan.
- 9. The homeowner selects the "view" button.
- The system displays a viewing window that is identified by the camera ID.
- The system displays video output within the viewing window at one frame per second.

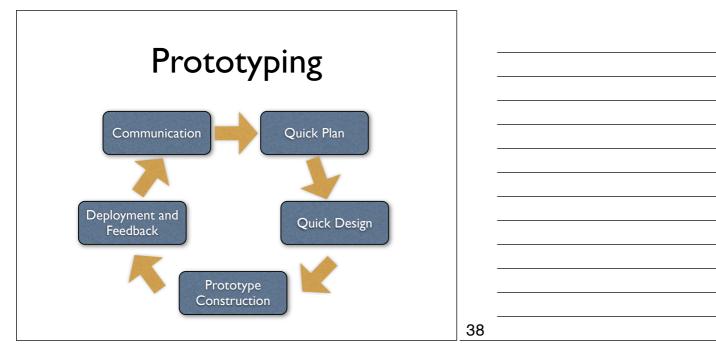
35

Exceptions:

- ID or passwords are incorrect or not recognized see use-case: "validate ID and passwords."
- Surveillance function not configured for this system system displays appropriate error message; see usecase: "configure surveillance function."
- Homeowner selects "view thumbnail snapshots for all cameras"—see use-case: "view thumbnail snapshots for all cameras."
- A floor plan is not available or has not been configured—display appropriate error message and see use-case: "configure floor plan."
- 5. An alarm condition is encountered—see use-cose: "alarm condition encountered."

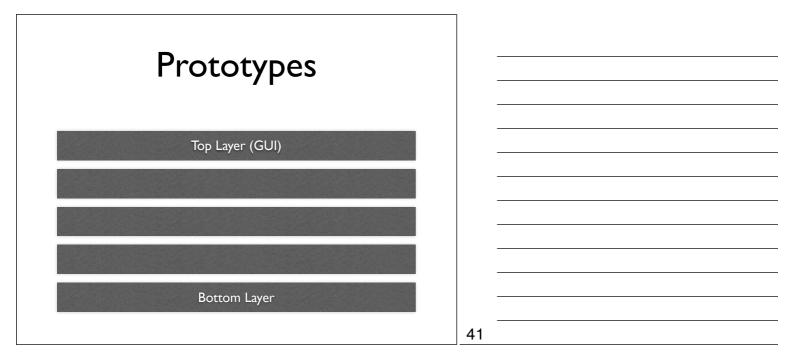


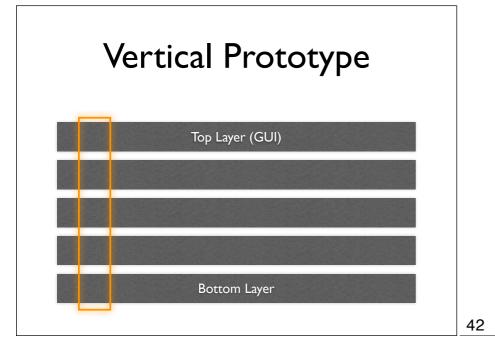
Suppose we want to set up a system that tracks who has had how much coffee

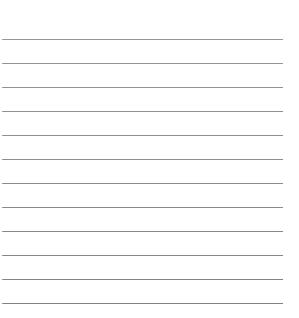


| Prototypes | | |
|-----------------|----|--|
| Top Layer (GUI) | | |
| | | |
| | | |
| | | |
| Bottom Layer | | |
| | 39 | |

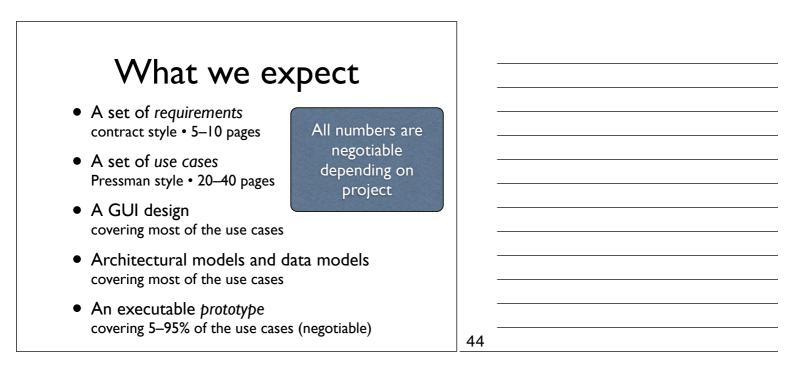
| Horizontal Prototype | |
|--|----|
| Page Setup Margins Paper Size Paper Surcelowert Pager Size: Refer (2:5 x 11 in) H Width (25 H) Height (21 H) Orient Han Oceant Oper Olandroope Default Oh Cancel | 40 |







Prototypes A horizontal prototype tests a particular layer (typically the GUI) of the system A vertical prototype tests a particular functionality across all layers Resist pressure to turn a prototype into a final result!



| "Requir Standard Glossary of Softw (ANSWEEE Stand | are Engineering Terminology | Contract S | Style |
|--|---|---|---|
| | bility needed by a user or achieve an objective. | Requirement The system will support client inquiries from four access points: in person, paper-based real, voice communica- tion, and deterrine communication (Internet, dial-up, and LANWAN). | Comment Four access points are how; we should focus instead on who needs access from where. |
| or possessed by a s | | and LANYWAN, The sleppone system must be able to support an 800 number system. | access from where, An 800 number? Can't use 888 or 87?? Again, what's missing is who needs what kind of access from where, |
| component to satisf specification, or oth documents. | fy a contract, standard, er formally imposed | The telephone system must be able to handle 97,000 calls per year and must allow for a growth rate of 15 percent annual). Of those all it is columited that its percent will be responded to in an automated remote rate A1 percent will be transformed and the second second second second second will be responded to all ones ratif or segressor. File per- | Valuable statistics; this one is actually pretty good. |
| A documented repr condition or capabil | | cent of the calls can be processed without reference to the electronic copy of the paper file, and approximately 50 percent will require access to the system files. | |
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| SATHOME Use case Trendede for Survey Weeking Admin (CA) | illance | - | ototype |
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