INTRODUCTION TO REQUIREMENT ENGINEERING IN SENG2021

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AGENDA

- Why requirement Engineering
- Project Scoping(Problem Statement)
- Features and how to present them
- User Stories

DISCLAIMER

- Part of the material presented here are taken from the SENG1031 lectures presented by Sci Prof. Boualem Benatallah.
- No “Actual” software code was hurt during the creation of these slides.

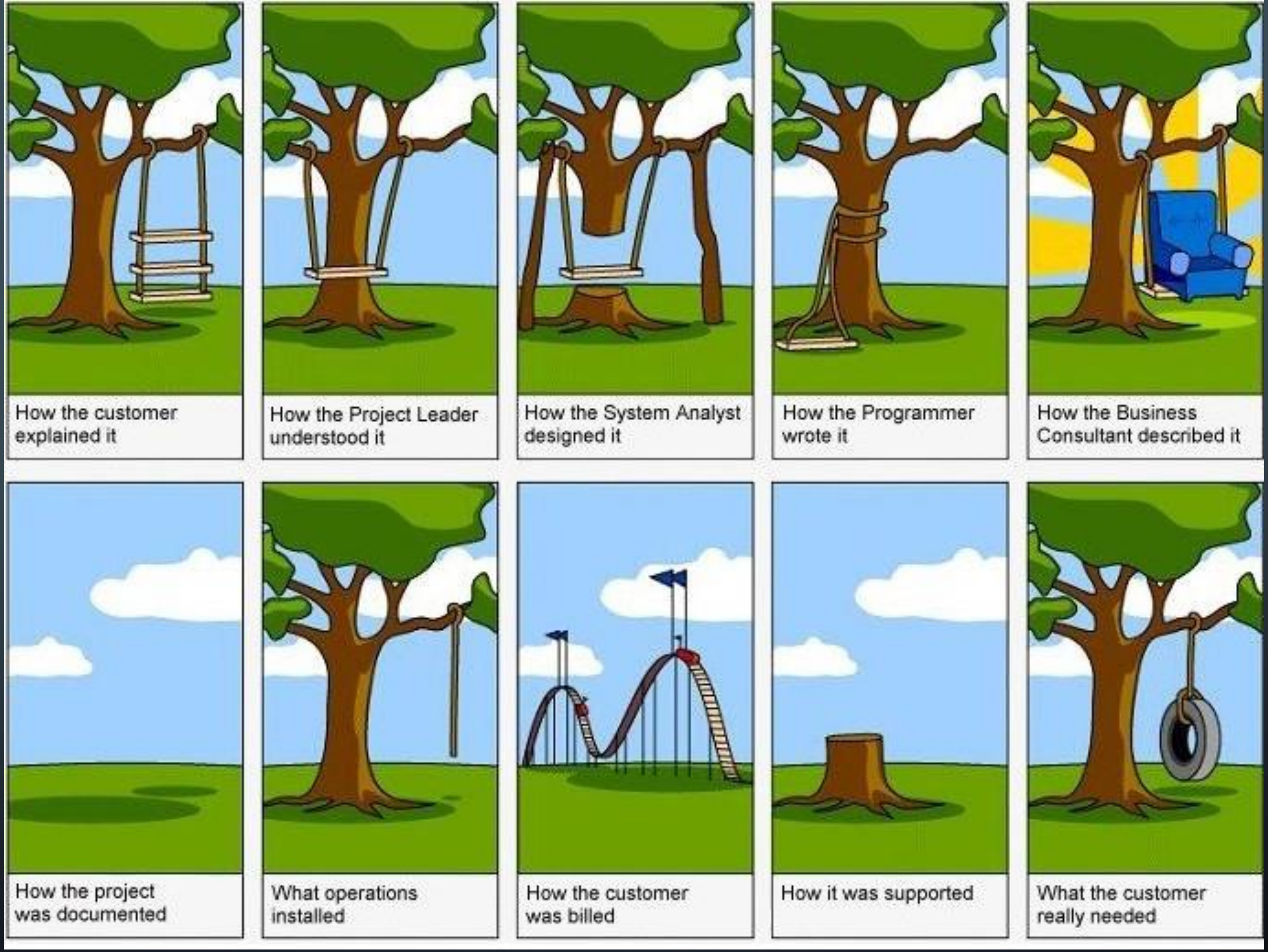

How the customer explained it
How the Project Leader understood it
How the System Analyst designed it
How the Programmer wrote it
How the Business Consultant described it
How the project was documented
What operations installed
How the customer was billed
How it was supported
What the customer really needed

Image Curtesy of https://medium.com/omarelgabrys-blog/requirements-engineering-introduction-part-1-6d49001526d3

SOME REFRESHERS (REF1 & REF2)

- **User Requirement**: criteria/constraints to satisfy (natural language, other artefacts / use cases), problem statements / customer needs
- **System Requirement**: detailed descriptions (functions, constraints), services and operational constraints, interface/contract between customer/development team (e.g., class diagrams, state diagrams, functions, pre/post conditions, business rules)
- **Functional Requirement**: the main functions provided by the software (e.g., send messages, receive messages, add courses)
- **Non Functional Requirement**: the constrains on the functions provided by the software (e.g., security, performance, reliability)

PROBLEM STATEMENT (PART1)

- Few sentences (e.g., one or 2) to describe specific user/customer needs
- Identify a problem from customer perspective
- Understand the current state of the world
- **Problem statements** are not bug reports (the problems may never been raised before, problems were not in the requirements of existing projects), focus on identifying new requirements (not bug fixes, which errors of implementation not missing requirements)

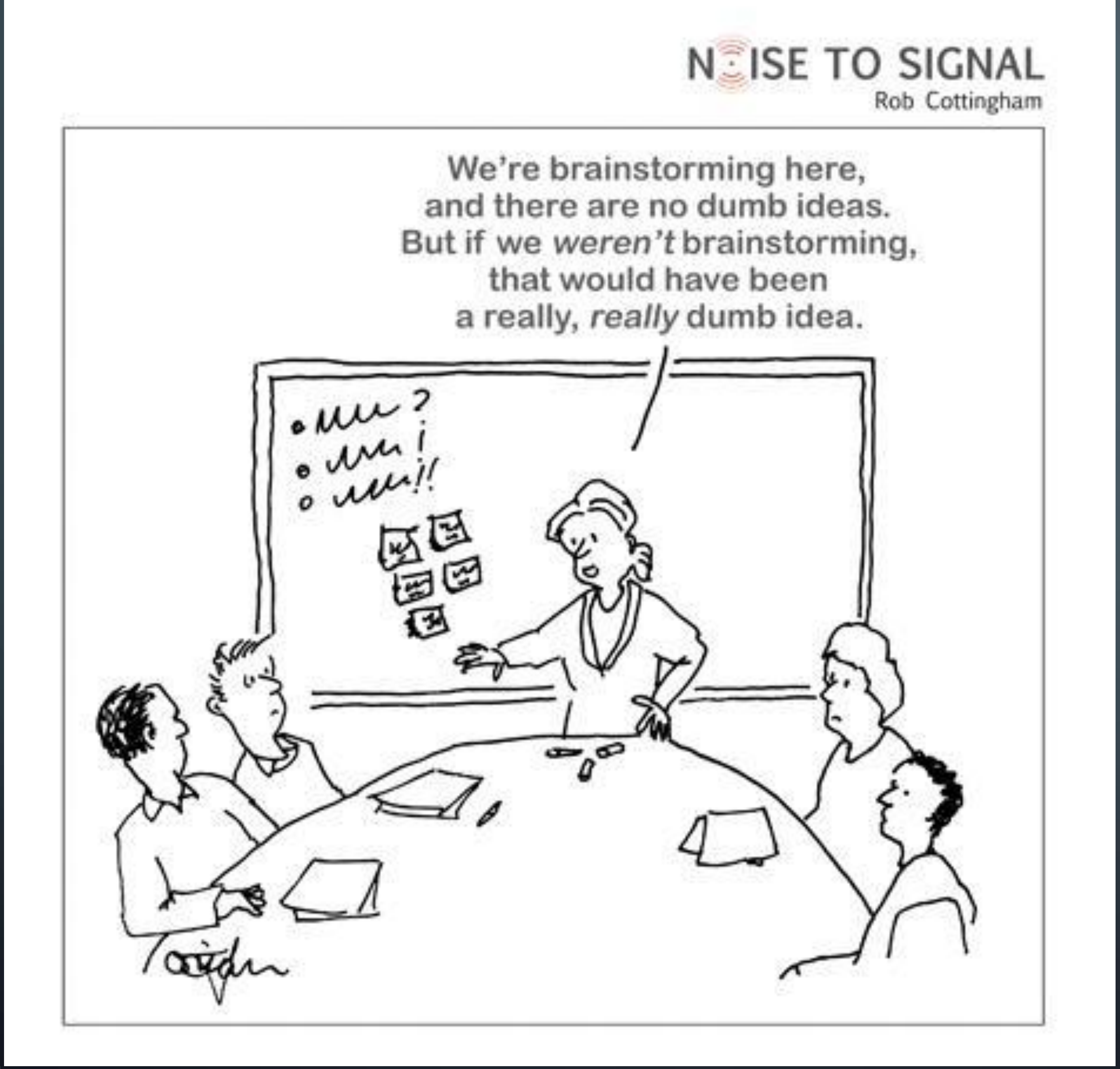
PROBLEM STATEMENT (PART2)

- **Problem statements** can be enriched with references, supporting materials (e.g., market research reports, videos, government policy statements), but should be made clear and separate from supporting artefacts
- **Problem statements** are input to what is called feature statements or scenarios. Features / scenarios describe the state of the world when the project is done (e.g., the project will support category, interests based search in addition to keyword search, the project will support search across 4 most popular MOOC platforms).

EXAMPLE OF A GOOD PROBLEM STATEMENT

- *There is no feedback system for a particular course.*
- *There is no reputation / popularity system for users or course instructors.*
- *There is no general forum for the students to interact with each other, only a forum for each individual course.*
- *There is no Intuitive notification system.*
- *Major social hubs are not integrated into the platform*

Brainstorming


NOISE TO SIGNAL
Rob Cottingham
We're brainstorming here, and there are no dumb ideas. But if we *weren't* brainstorming, that would have been a really, *really* dumb idea.

Curtesy of https://shonaliburke.com/friday-funny-brainstorming/

FEATURES (REF3)

- Describe a way to solve a problem mentioned in the problem statement
- Behaviour oriented : focus on what the software will do when delivered
- Customer / Engineering collaboration : requirements created jointly between customer and engineering team, using, controlled natural language
- Simple to understand, testable, have business value
- Used as input in software management tools, e.g., to review, to generate input/output test cases, to monitor project progress
- Problem statement VS feature: current state of the world VS the state of the world when the project is delivered.

FEATURE EXAMPLE

General project information : MOOC system (called myMOOC) provides access to courses by groups of people involved in those courses.

Feature: As a teacher, I can access myMOOC to search and manage courses

COMPLEX FEATURES

- Complex feature: As a student, I can search courses, enrol in a course or drop it (complex feature)
- Concrete/small features

1: As a student, I can search courses by tags

2: As a student, I can enrol in a course

3: As a student, I can drop a course

FEATURES NOTATION

- Based on **Connextra** notation, a feature is described as follows : **role**, **goal**, **task**

Feature **name**

As a **[the role of the user]**

So that **[I can achieve some goal]**

I want to **[do some task]**

FEATURE EXAMPLE USING NOTATION

Feature **Search Tutor by reputation**

As a **Student**

So that I can **find a qualified Tutor**

I want to **search Tutors by their reputation scores**

GOOD FEATURES

- SMART principles are one way to write good features
- **SMART** stands for:

– **S**pecific

– **M**easurable

– **A**chievable

– **R**elevant

– **T**ime-Boxed

EXAMPLES OF GOOD VS BAD FEATURES (PART1)

- Specific

– Example of a vague story:

Student can search for a tutor

– Example of a specific story:

Student can search for a lecturer by their reputation score

EXAMPLES OF GOOD VS BAD FEATURES (PART2)

- Measurable

– Example of a non-measurable story:

Searching tutors should be fast.

– Example of a measurable story:

When searching for a tutor, the results should appear within 5 seconds.

EXAMPLES OF GOOD VS BAD FEATURES (PART3)

- Time-Boxed (time budget, may be complex, prioritize, reschedule, re-negotiate dead-lines, re-negotiate features, scale down)
- Achievable

– Realistic in terms of time assigned (can be implemented in one iteration. If not may need to decompose into smaller features)

EXAMPLES OF GOOD VS BAD FEATURES (PART4)

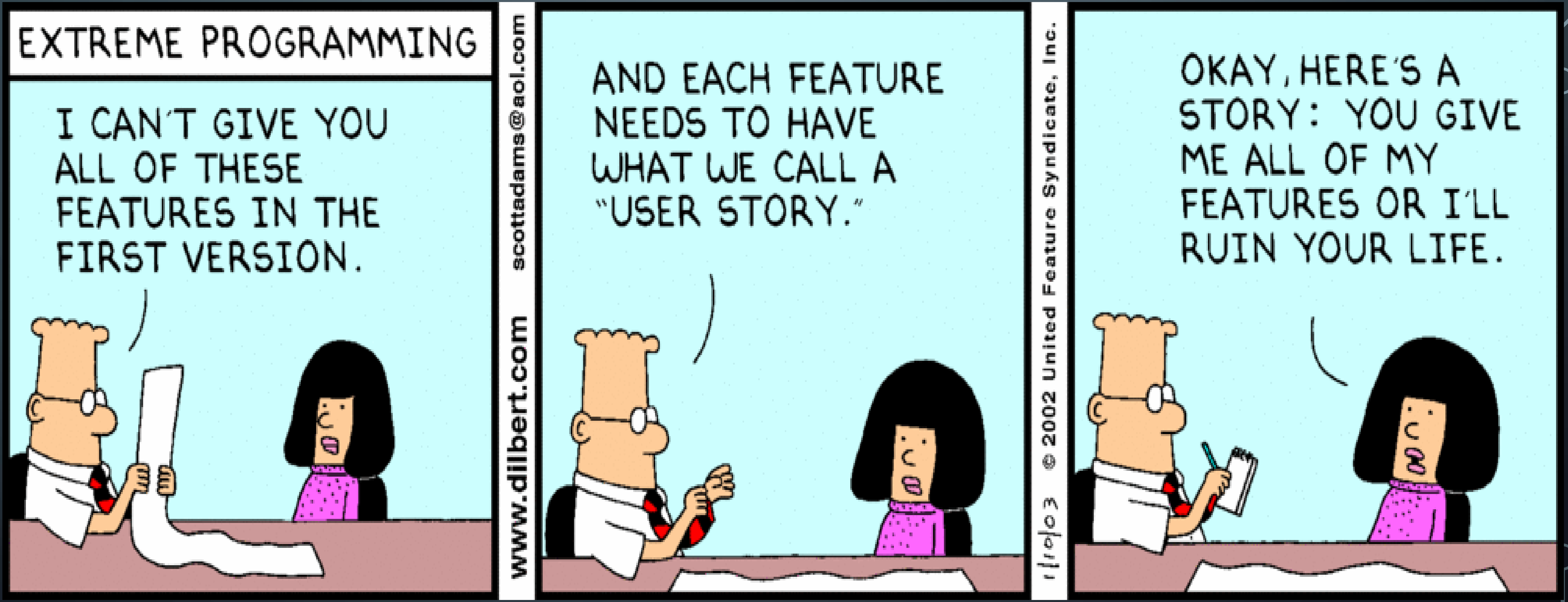
- Relevant:
  - resolving one of the problems in the problem statement
  - Adding business value
- Example:
  - Why searching for reputable tutors? To maximize quality of courses.

USER STORIES (REF1 &REF2)

- User story: feature + scenarios
- Stories: concept in HCI, paper cards, easy to understand and manipulate, used for brain storming, prioritizing
- Stories: few sentences written in non technical terms, yet ready to be used as input for various project tasks, focus on stakeholder perspective
- Will refine features in future phases of the project (e.g., use case diagrams, input/output interfaces, UI prototypes)

STORIES (CONTIN'D)

- Captures a feature rationale (not detailed requirements) n Business value (customer oriented, a feature that customer needs)
- Small (few person / month to deliver the feature)
- Independent functional requirements (no overlaps between stories)
- Testable by customer
- Effective project management (more accurate estimate of progress, iterative development cycle, manage priorities)


EXTREME PROGRAMMING
I CAN'T GIVE YOU ALL OF THESE FEATURES IN THE FIRST VERSION.
AND EACH FEATURE NEEDS TO HAVE WHAT WE CALL A "USER STORY."
OKAY, HERE'S A STORY: YOU GIVE ME ALL OF MY FEATURES OR I'LL RUIN YOUR LIFE.
www.dilbert.com scottadams@aol.com
1/10/03 © 2002 United Feature Syndicate, Inc.

SCENARIO

- A scenario

– Explain how a single feature is used.

– consists of a set of (3 to 8) steps.

- Each step of a scenario starts with a keyword, i.e.,

– GIVEN (pre-condition/state)

– WHEN (Action/Event)

– THEN (Transition / consequence of action)

– AND (conjunction)

SCENARIO EXAMPLE

- Feature: student can search tutors by reputation score.
- Scenario: Search Tutors by reputation (cloud be used to generate UI interactions/mock-ups, state machine)

GIVEN I am on myMOOC home page

WHEN I click on “search for a Tutor”

THEN I should be on “search for a Tutor” page

WHEN I fill in “reputation” higher than” “0.9”

AND I press “Search” button

THEN I should see all tutors whose reputation score higher than 0.9

WRITING GOOD USER STORIES

- Write for broad audience: e.g., people who are not in your team. Will they understand?
- Complementary to other techniques, e.g., SMART user stories
- Reuse/analogy: e.g., search and analysis of similar services/products, reuse of feature descriptions (at least style) from previous projects.
- Avoid obscure language: e.g. technical jargon (unless internal project and agreed upon by team), mixing requirements with background/detailed design documentation

PROTOTYPING

- Visual elements (UI mostly)
- Web, mobile, desktop, APIs
- Focus on interactions with actors
- Low fidelity (sketching), high fidelity (mock-ups, wireframes)

WHAT IS PROTOTYPE ?

- Whiteboard sketching
- Paper / pencil sketching, post-its
- Mockups (domain specific and general tools, e.g., photoshop, balsamiq, InVision, Visio, ppt)
- HTML / CSS (could be time consuming as it requires building details of UI elements, both content, state, look, style).
- Software dev. productivity is improving (reuse /templates/ themes / examples / code generation) but UI dev is still tedious task)

WHY PROTOTYPING ?

- Feedbacks from customers
- Save time, cost (cheaper to build a prototype than the real system)
- It is easier and easier to build the real UI (e.g., HTML/CSS), but still cheaper to start with prototypes
- More applicable to features where actors use UI elements to interact with the system
- But in the new era of back end as a service, prototyping will also be used to some extend for APIs, apps as the actors.

FIDELITY IN PROTOTYPING

- Low fidelity:

– Called Lo-Fi UI (sketches, concept from HCI community)

– Engage non technical users

– Kinder-garden tools (papers, crayons sketches)

- High fidelity?

- Detailed UI elements (wireframes, mockups)

- Look and feel of real system

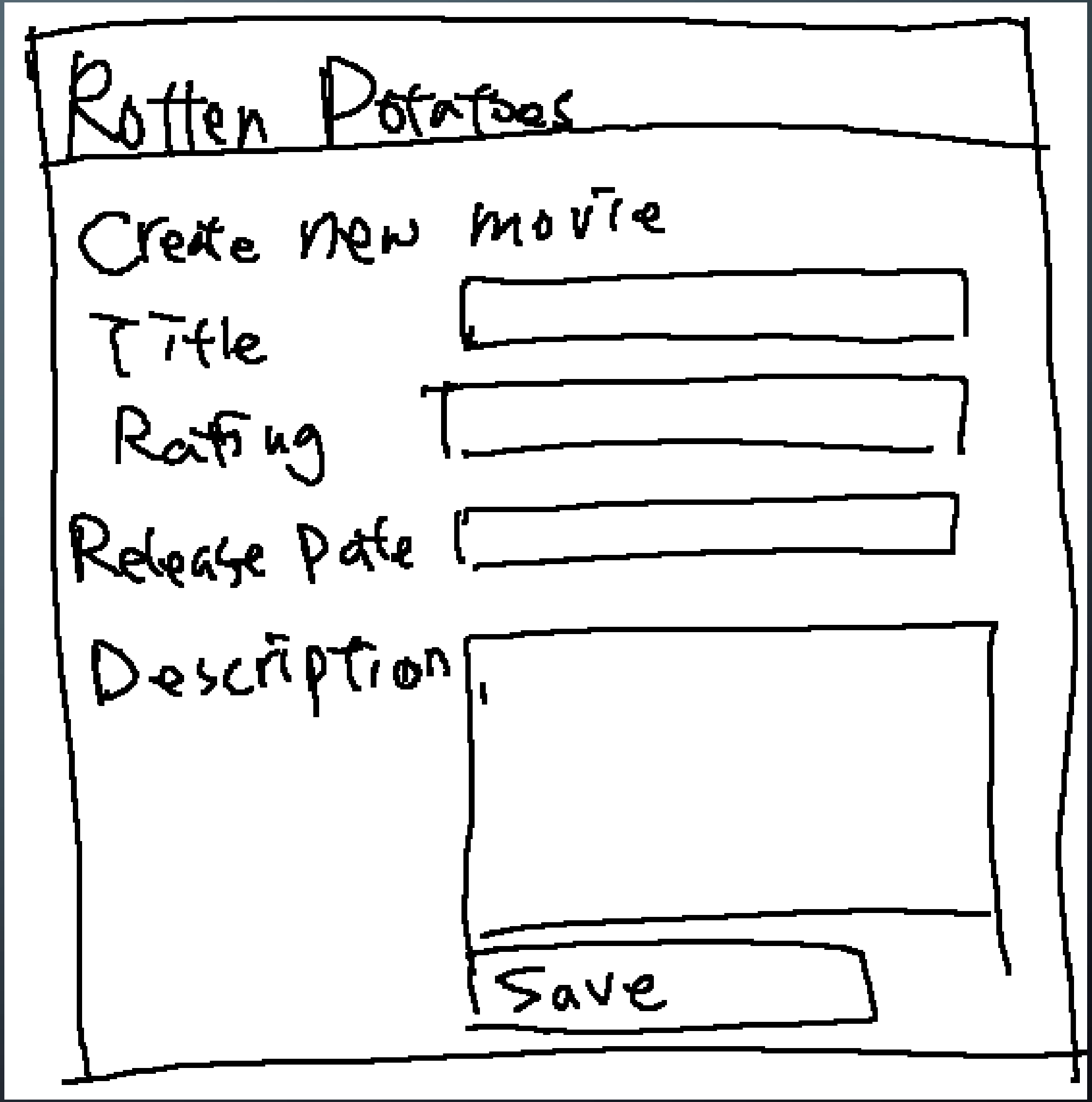
LO-FI UI: STORYBOARDS

- **Sketches**: sketch of feature UI
- **Features (steps in a use case) – UI sketches**: explicit relationship, can be 1 to 1, 1 to many, many to 1
- UI involve **interactions with actors**, transitions from UI components to other to understand a complex UI involving several UI components
- **Storyboards**: a concept borrowed from filmakers
- **Storyboards in film making**: sequence of scenes (called a script), focus on interactions (not scene details)

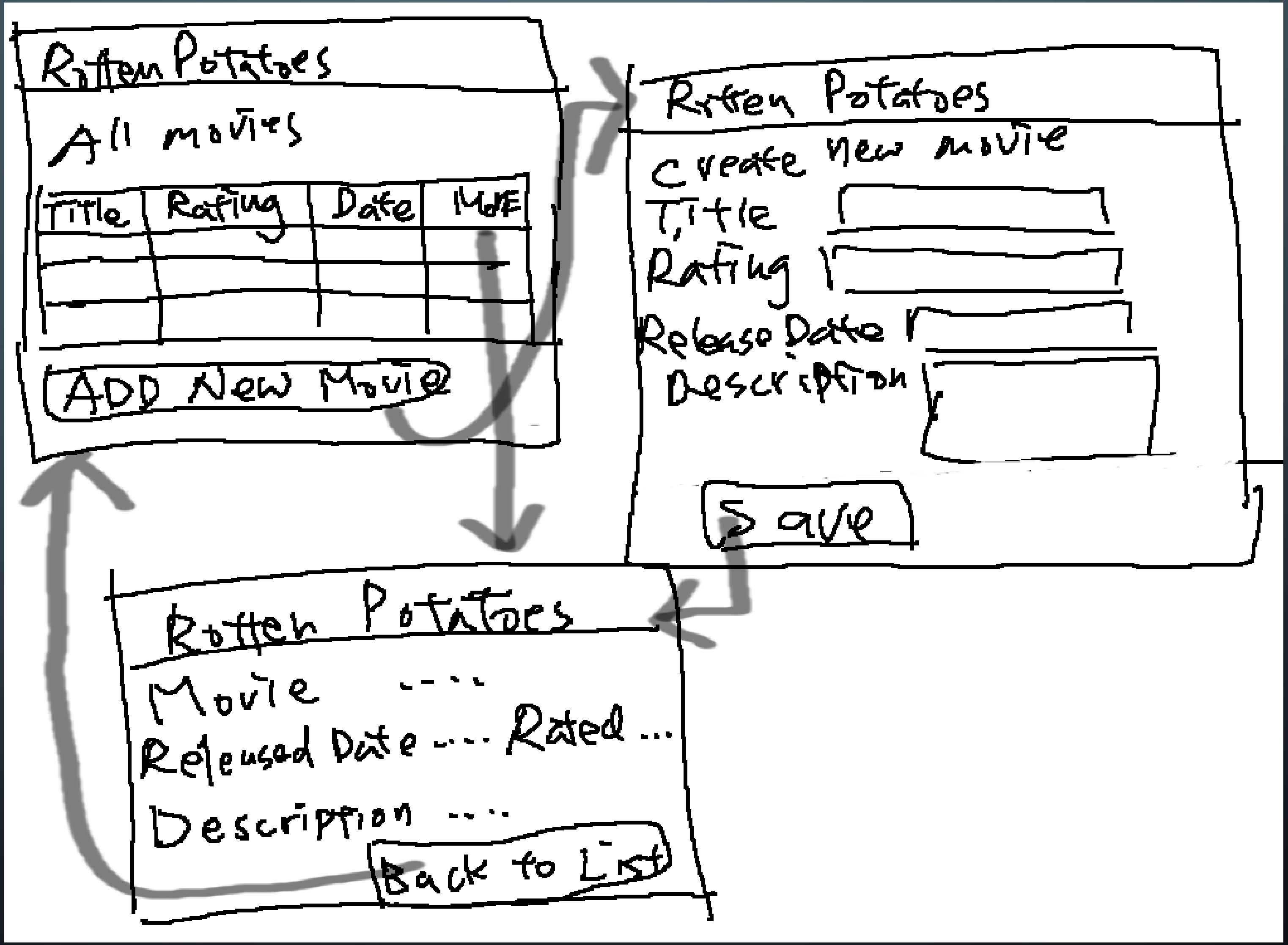
UI STORYBOARDS

- Film storyboards: sequence of events/scenes
- UI storyboards: trees/graphs of UI screens (use cases involve sequences, decision points, alternative flows)
- Various notations can used to represent UI storyboards (e.g., UML activity diagrams, BPMN process models, and even UML state machines)
- Elements of storyboards: nodes (UI component sketches including: pages, parts of pages, input / output forms, popup menus), transitions (interaction between UI sketches)

LO-FI - UI COMPONENT SKETCH (SOURCE: REF. 2, ONE INTERACTION, ONE STEP)

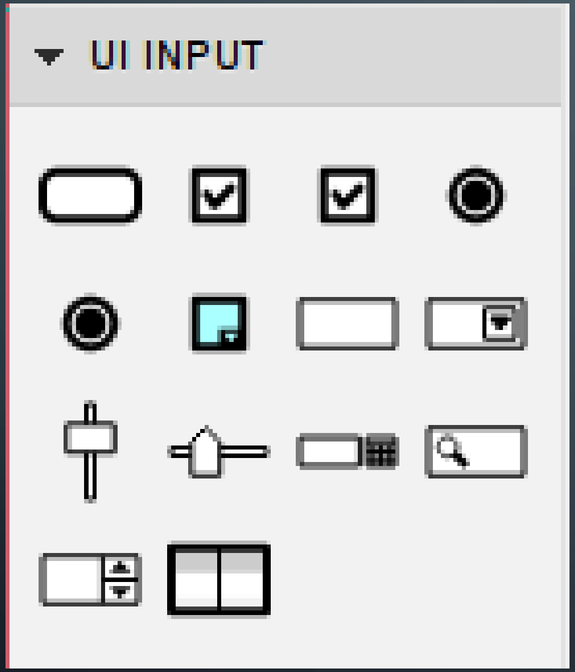


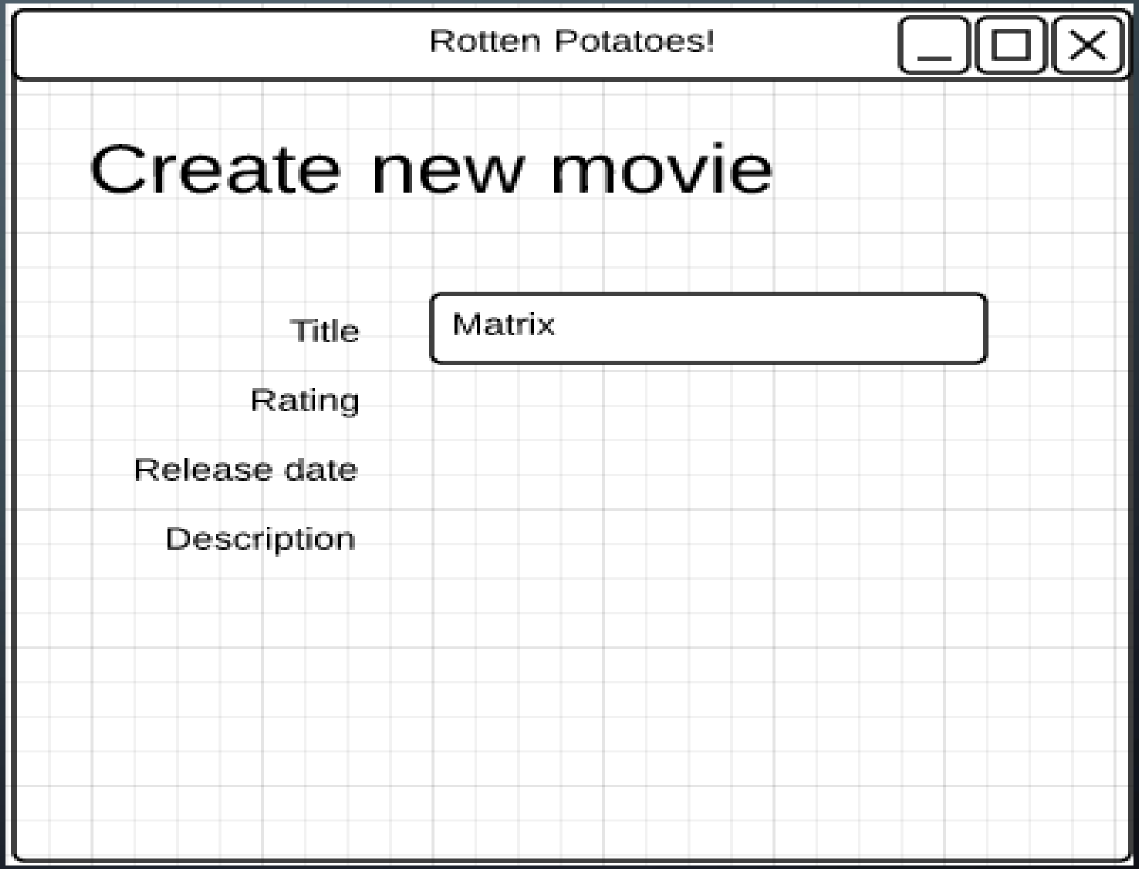
LO-FI - UI STORYBOARD (SOURCE: REF. 2, BIG PICTURE, USE CASE)



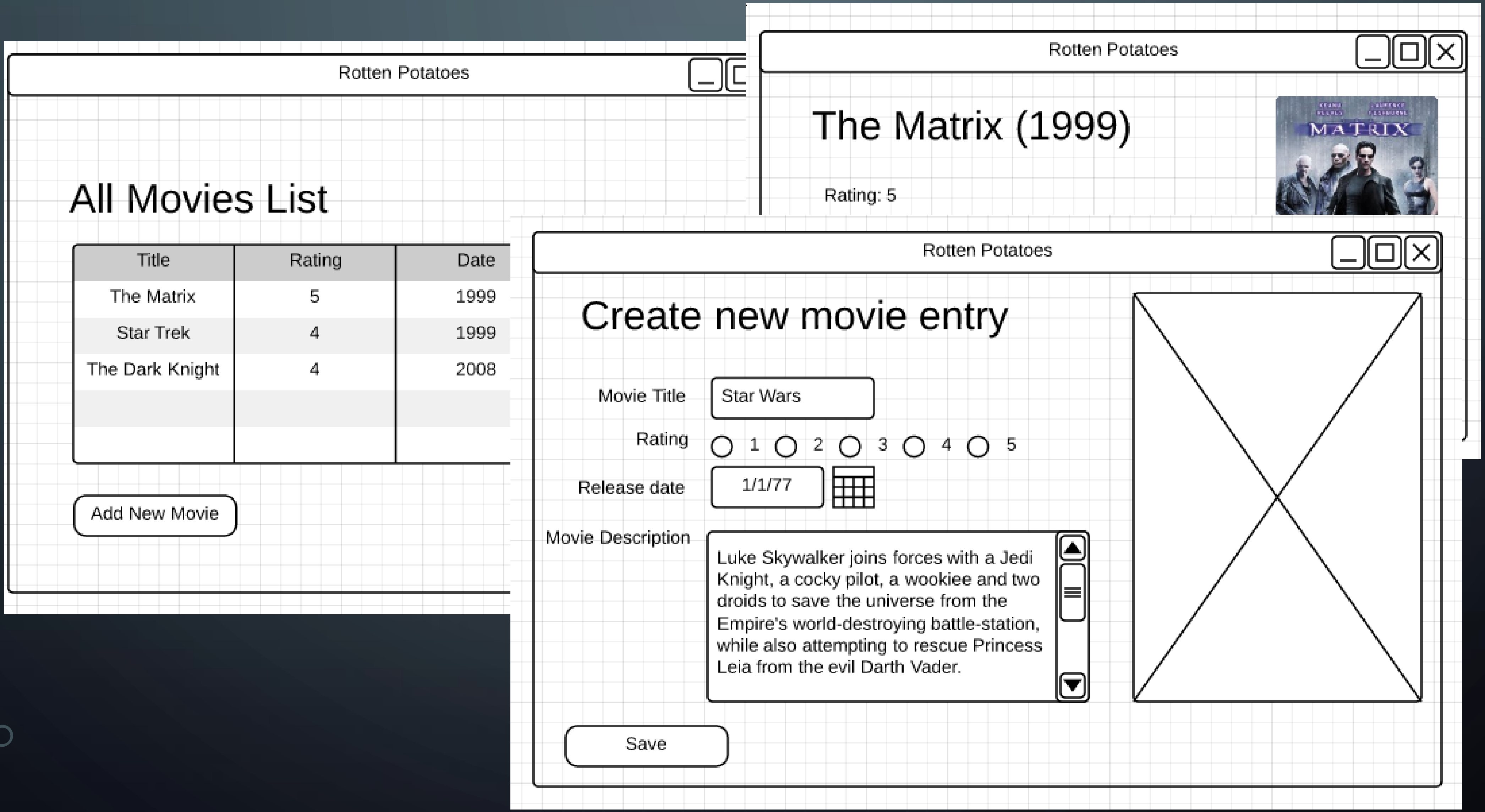
HIGH FIDELITY PROTOTYPES

- Wireframes / mockups (various tools, as an example Lucidchart)





MULTI-PAGES UI COMPONENT



Rotten Potatoes

All Movies List

Title	Rating	Date
The Matrix	5	1999
Star Trek	4	1999
The Dark Knight	4	2008

Add New Movie

Rotten Potatoes

The Matrix (1999)

Rating: 5

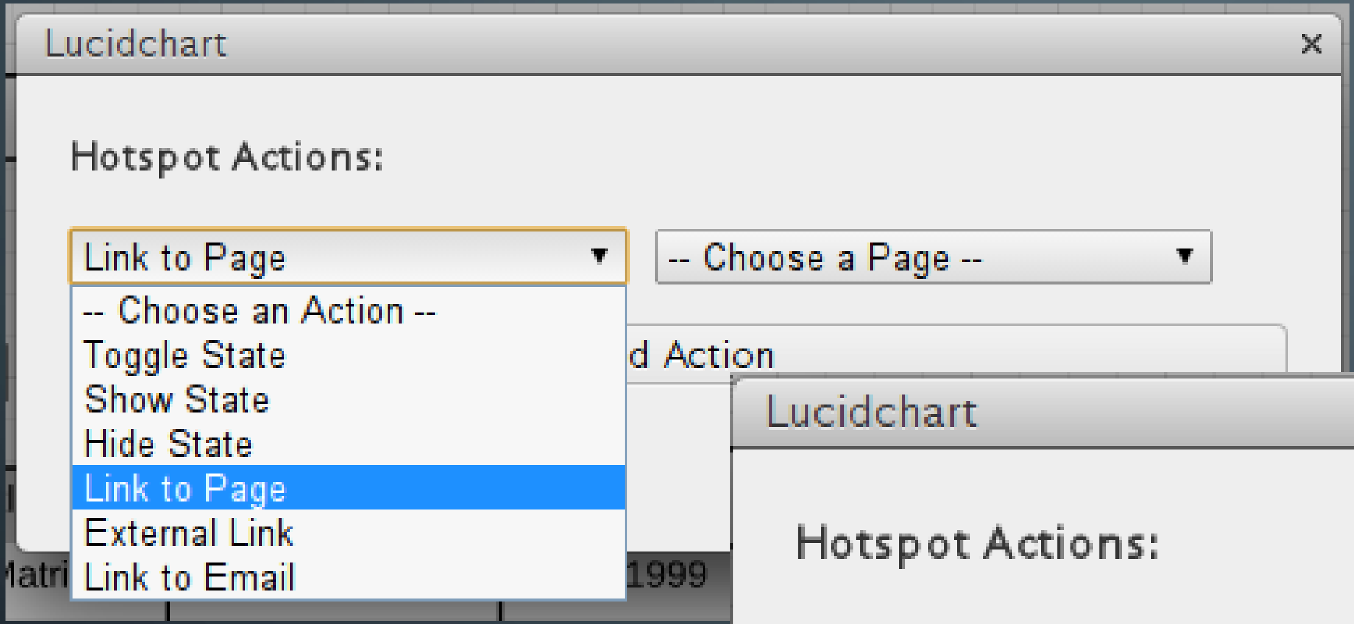
Rotten Potatoes

Create new movie entry

Movie Title	Star Wars
Rating	○ 1 ○ 2 ○ 3 ○ 4 ○ 5
Release date	1/1/77
Movie Description	Luke Skywalker joins forces with a Jedi Knight, a cocky pilot, a wookiee and two droids to save the universe from the Empire's world-destroying battle-station, while also attempting to rescue Princess Leia from the evil Darth Vader.

Save

HOTSPOT: TRANSITION, SOURCE: “PAGE”, TARGET: ``PAGE”



Lucidchart

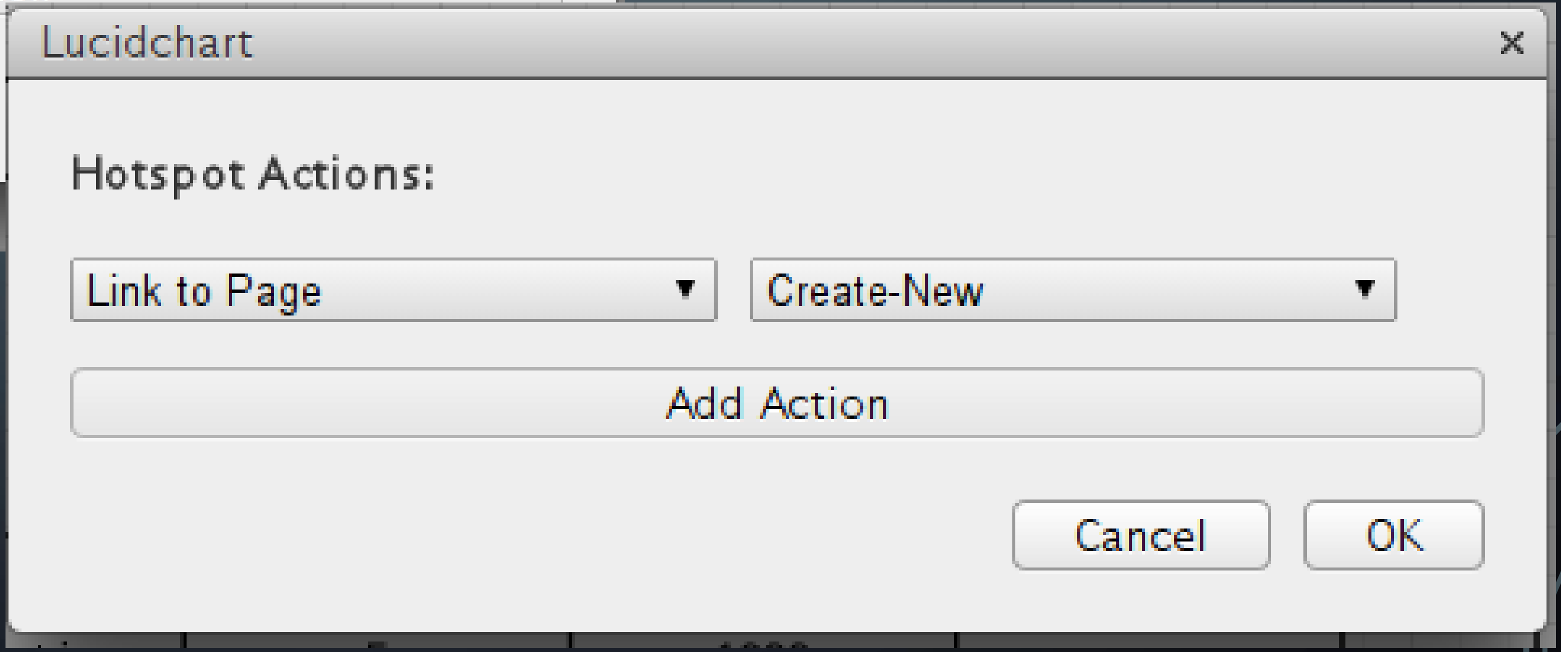
Hotspot Actions:

Link to Page ▾ | -- Choose a Page -- ▾

-- Choose an Action --
Toggle State
Show State
Hide State
Link to Page
External Link
Link to Email

d Action

1999



Lucidchart

Hotspot Actions:

Link to Page ▾ | Create-New ▾

Add Action

Cancel | OK

GOOD PROTOTYPES - GUIDELINES

- Select customer representative (through workshops, research, customer site visits, etc)
- Start from features and use cases
- Start from basic flows, then complex flow (alternative flows)
- Use reviews to improve (project leader, business analyst, developers, customer perspectives – business, customer, engineering)
- Identify issues, resolve issues, iterate
- Spend short time on lo fi sketches, mockups for final UIs (input to code – HTML/CSS)

REFERENCES

- (Ref. 1) Scott Berkun. The art of project management. O'Reilly 2005
- (Ref. 2) Leszek A. Maciaszek: Requirements analysis and system design (2. ed.), Addison-Wesley, 2005
- (Ref. 3) Software Engineering. Ian Sommerville, Addison-Wesley, 9. ed., 2010,
- (Ref. 4) inGenius: A Crash Course on Creativity, by Tina Seelig

FIRST DELIVERABLE

- Describe few problem statements you are going to solve in your project
- Identify the features that you are going to implement to solve the problems
- Describe user stories
- Low Fidelity prototype
- High Fidelity Prototype (UI elements and how they will be interacting)

FIRST DELIVERABLE (CONT'D)

- Group effort.
- Meeting with mentor to refine ideas and get feedback.
- A detailed specification will be released soon.

Q&A