Software Specification and Design - Week 2

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Today

- Review
- Quiz
- Inception phase
- Use cases
- Supporting requirements
- Some more design patterns

Our case studies

- POS System
- Monopoly game
- Both will be done in iterations
    - Requirements
    - Object oriented analysis
    - Design
    - Implementation

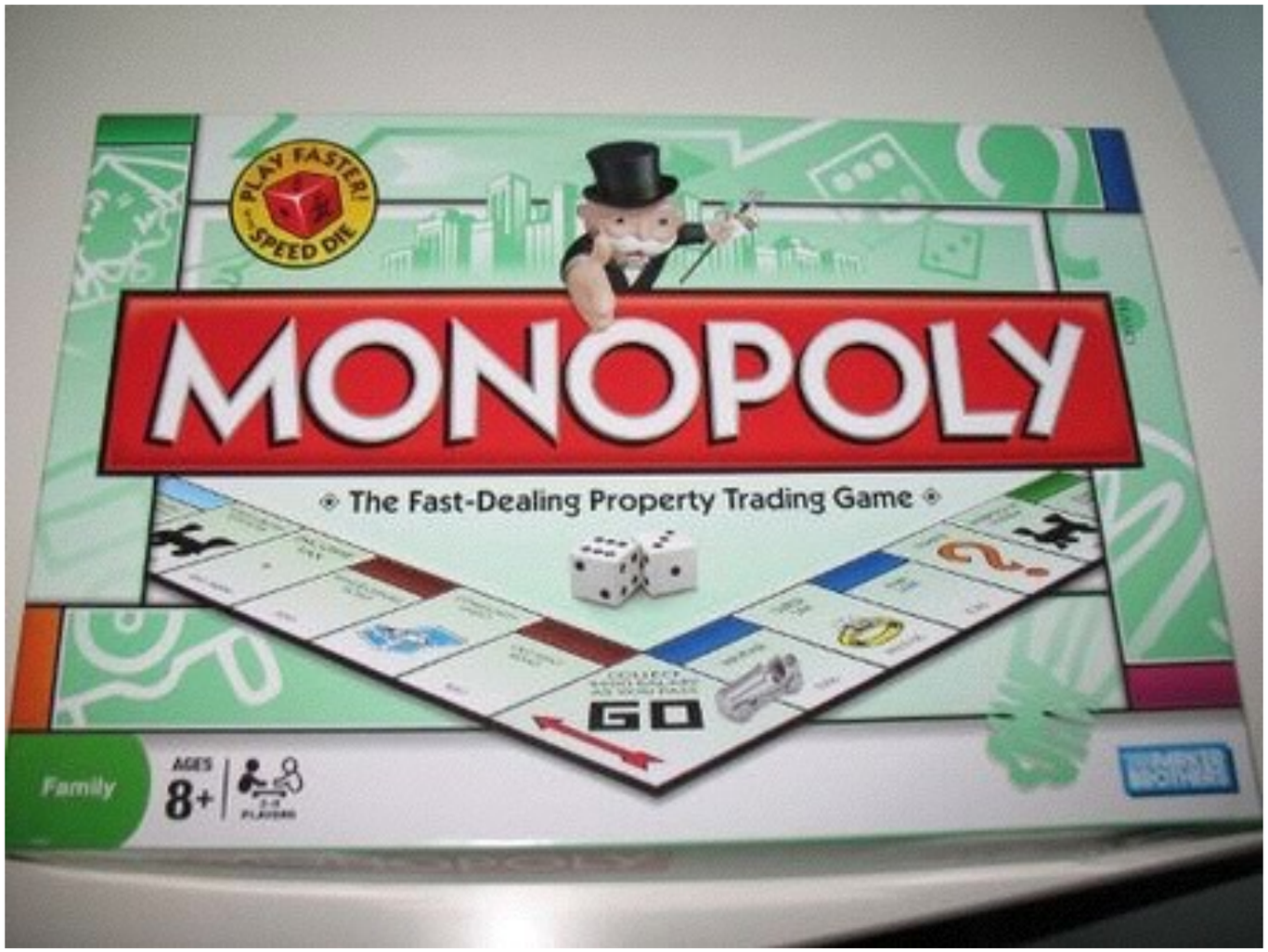
POS System

Source: wikipedia.com

POS System

- Record sales
- Handle payments
- Usually includes barcode scanner

Monopoly Game



Source: wikipedia.com

Our case studies

We will make both of them very flexible!

- Platform independent
- Could be on Web, Desktop, Mobile, Anything that use Java

Inception

What is Inception again?

- The initial short step to establish a common vision and basic scope for the project.
  - Business cases
  - Usecases ~ 10%
  - Critical non functional requirements
  - Prepare for development

Something to ask in Inception

- What is the vision and business case for this project.
- Buy/build?
- Cost range?
- Proceed/stop?

Question

- Should we define all requirements in Inception phase?
- What is the main problem solved in Inception phase?

Analogy

- You are an oil company
- There is information suggesting that a new field might contain oil to start exploratory drilling
- What is the inception step?

Evolutionary Requirements

- Requirements are the capabilities and conditions to which the system, and more broadly, the project, must conform.
- Do not attempt define all requirements at once
- Find, communicate, remember (write them down!)

Categories of Requirements

FURPS+

Developed at Hewlett-Packard
Now widely used in software industry

Categories of Requirements FURPS

- **Functional** - features, capabilities, security
- **Usability** - human factors, help, documentation
- **Reliability** - recoverability, predictability
- **Performance** - response times, throughput, accuracy, availability, resource usage
- **Supportability** - adaptability, maintainability, internationalisation, configurability

FURPS - Functional

- Examples

FURPS - Usability

- Examples

FURPS - Reliability

- Examples

FURPS - Performance

- Examples

FURPS - Supportability

- Examples

Categories of Requirements FURP+

- Functional, Usability, Reliability, Performance, Supportability

- **Implementation** - resource limitation, language, tools, hardware

- **Interface** - interfacing with external factors

- **Operational** - System management

- **Packaging**

- **Legal**

Artifacts in Inception

- Vision and Business case
- Use-case model
- Supplementary Specification
- Glossary
- Risk List & Risk Management Plan
- Prototypes
- Iteration plan

How UP artifacts organised

How do you do prototyping?

On paper

How do you do prototyping? (2)

Keynote or Powerpoint

Prototyping - Case study

- OLX
- They go out, using paper prototyping to talk to real users
- The final UI drastically changed, the dropout rate went down

Prototyping - Case study

Use Cases

Use Cases

- Quick review, from Dicegame
- Use case [**Play a dice game]**
  - A player requests to roll two dice. System presents results. If the sum of faces is 7, player wins, otherwise, player loses.

What are use cases

- Text stories
- Discover and record requirements
- 3 types, brief, casual, fully dressed

Brief use case example

- POS - Process Sale :
  - A customer arrives at a checkout with items to purchase.
  - The cashier uses the POS system to record each purchased item.
  - The system presents a running total and line-item details.
  - The customer enters payment information
  - The system validates and records.
  - The system updates inventory.
  - The customer receives a recipe from the system and then leaves with the item.

Use case - Actors and Scenarios

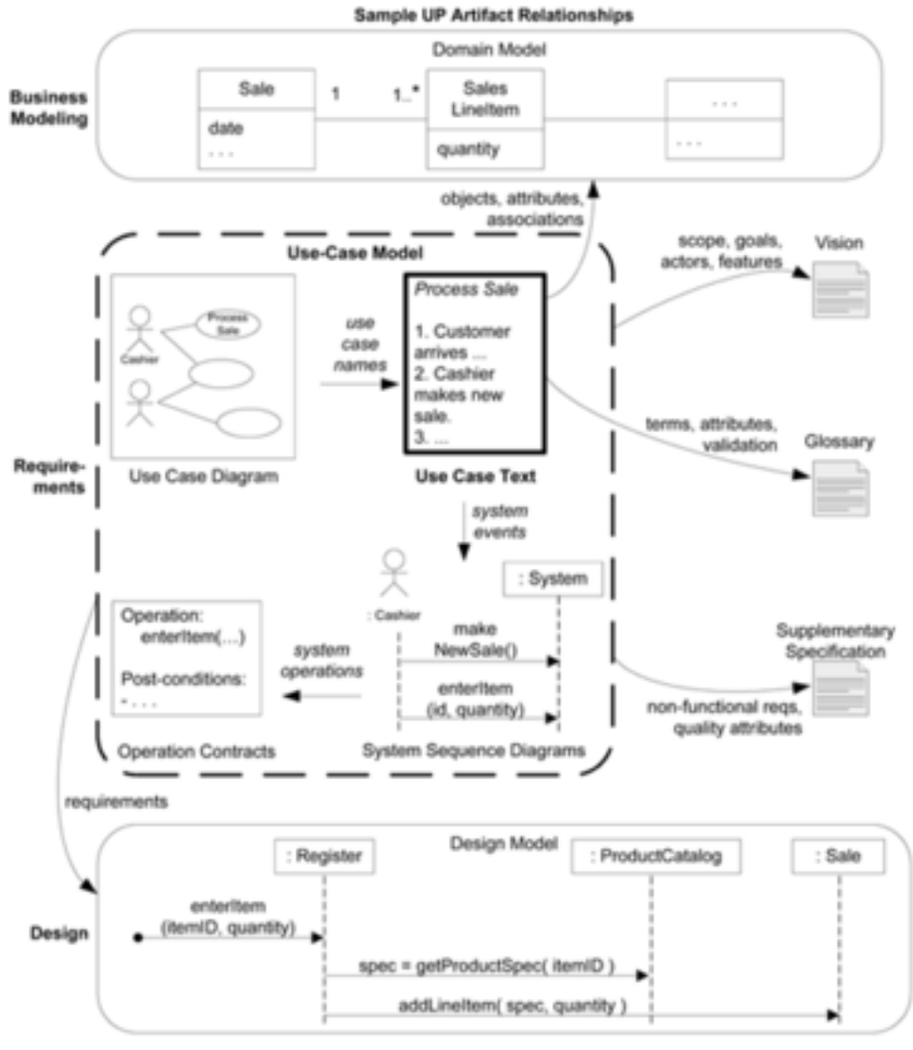
- Actors
    - A sale person
    - A customer
    - Computer system
    - An organization
- Scenario
    - The scenario of successfully purchasing items with cash
    - The scenario of failing to purchase because of a credit payment denial

Why use cases?

- Simple for normal people (non-tech)
- Have clear goal
- Can scale up and down in term of complexity
- Can be used as a central mechanism in requirements management

Use cases and FURPS+

Where do typical use cases fit in FURPS+?


Sample UP Artifact Relationships
Business Modeling
Domain Model
Sale
date
...
1
1..*
Sales LineItem
quantity
...
...
objects, attributes, associations
Use-Case Model
Process Sale
Cashier
use case names
Process Sale
1. Customer arrives ...
2. Cashier makes new sale.
3. ...
scope, goals, actors, features
Vision
Require-ments
Use Case Diagram
Use Case Text
terms, attributes, validation
Glossary
system events
: System
: Cashier
Operation:
enterItem(...)
Post-conditions:
- ...
system operations
make NewSale()
enterItem (id, quantity)
Supplementary Specification
non-functional reqs, quality attributes
Operation Contracts
System Sequence Diagrams
requirements
Design
Design Model
: Register
: ProductCatalog
: Sale
enterItem (itemID, quantity)
spec = getProductSpec(itemID)
addLineItem(spec, quantity)

Actors in use cases

- Actors are anything with behavior

1. Primary actors
    - Their goal are fulfilled in the use case
2. Supporting actors
    - The ones who provide service in the use case
3. Offstage actors
    - Related but do not appear in the use case

Use case styles

- Brief - main success scenario
- Casual - various scenarios
- Fully dressed - written in detail with supporting sections

Use case - Casual example

Handle returns

Main Success Scenario [Success]:

- A customer arrives at a checkout with items to return
- The cashier uses the POS system to record each returned item

Use case - Casual example (3)

Alternate Scenario [Rejected credit card]:

- A customer arrives at a checkout with items to return
- If the customer paid by credit, and the reimbursement transaction to their credit is rejected, inform customer the customer and pay with cash

Use case - Casual example (3)

Alternate Scenario [Item id not found]:

- A customer arrives at a checkout with items to return
- If the item identifier is not found in the system, notify the cashier and suggest manual entry of the id

Use case - Fully dressed example

Use case UC1 : Process Sale

Scope: SKE POS

Level: use goal

Primary Actor: Cashier

Stakeholders and interests:

- Cashier: Wants accurate, fast entry, no payment errors

- Salesperson: Want sales commissions updated

- Customer: Want to purchase with minimal effort, want displayed item and price on screen, want the purchase to support return

- Company: Accurate record, customers to be satisfied,…..

- Manager: Wants to be able to quickly perform override operations

- Government: Wants to collect tax from evert sale

- Payment Authorisation Service: Wants to receive digital authorization requests in the correct format and protocol. Wants accurate account information

Use case - Fully dressed example

Preconditions: Cashier is identified and authenticated

Postconditions: Sale is saved. Tax is correctly calculated. Account and inventory updated. Commission recorded. Receipt is generated. Payment authorization approvals are record

Main Success Scenario:

1. Customer arrives at POS with items
2. Cashier starts a new sale
3. Cashier enters item id
4. System records sale line item and present item description, price, total

- - - Cashier repeat steps 3-4 until done

5. System presents total with taxes calculated
6. Cashier tells customer the total, and asks for payment
7. Customer pays and system handles payment
8. System logs completed sale and sends sale and payment information to the external Accounting and inventory system
9. System presents receipt
10. Customer leaves with items

Use case - Fully dressed example

Alternative flows:

…….

……. Too many. Let’s write them together to get the picture ……

…….

Use case - Fully dressed example

Special Requirements:

- Touch screen UI on a large flat panel monitor
- Text must be visible from 1 meter
- Language internalization on the display
- Pluggable business rules to be insertable at steps 3 to 7

Use case - Fully dressed example

Technology and Data variation list:

*a. Manager override entered by swiping an override card through a card reader, or entering an authorisation code via the keyboard.

3a. Item identifier entered by a bar code laser scanner

7a. Credit account information entered by card reader or keyboard

Use case - Fully dressed example

Frequency of occurrence: Could be nearly continuous

Open issues:

- What are the tax law variations?
- What customisation is needed for different business?
- Must a cashier take their cash drawer when they log out?
- Can the customer directly use the card reader?

Use case

Are our use case perfect?

Use case - The best format

- There’s no best format

- It’s good enough if it’s good enough

Use case - Essential UI-Free Style

- When you talk to your POS users (like cashiers), they might think in term of UI
- We need to focus on the actor intent instead (Especially in the early phase)

Use case - Essential UI-Free Style

Not quite good in an early phase

…..

1. Admin enters ID and password into a dialog box
2. System authenticates the Admin
3. System show the “welcome” window

…..

Use case - Essential UI-Free Style

Better at the early phase

.....

1. Admin identifies self

2. System authenticates identity

.....

Use cases - tips

- Write terse use cases, delete all noise words

- Black box use cases

Steps to find use cases

1. Choose the system boundary
2. Identify the primary actors
3. Identify the goals for each primary actor.

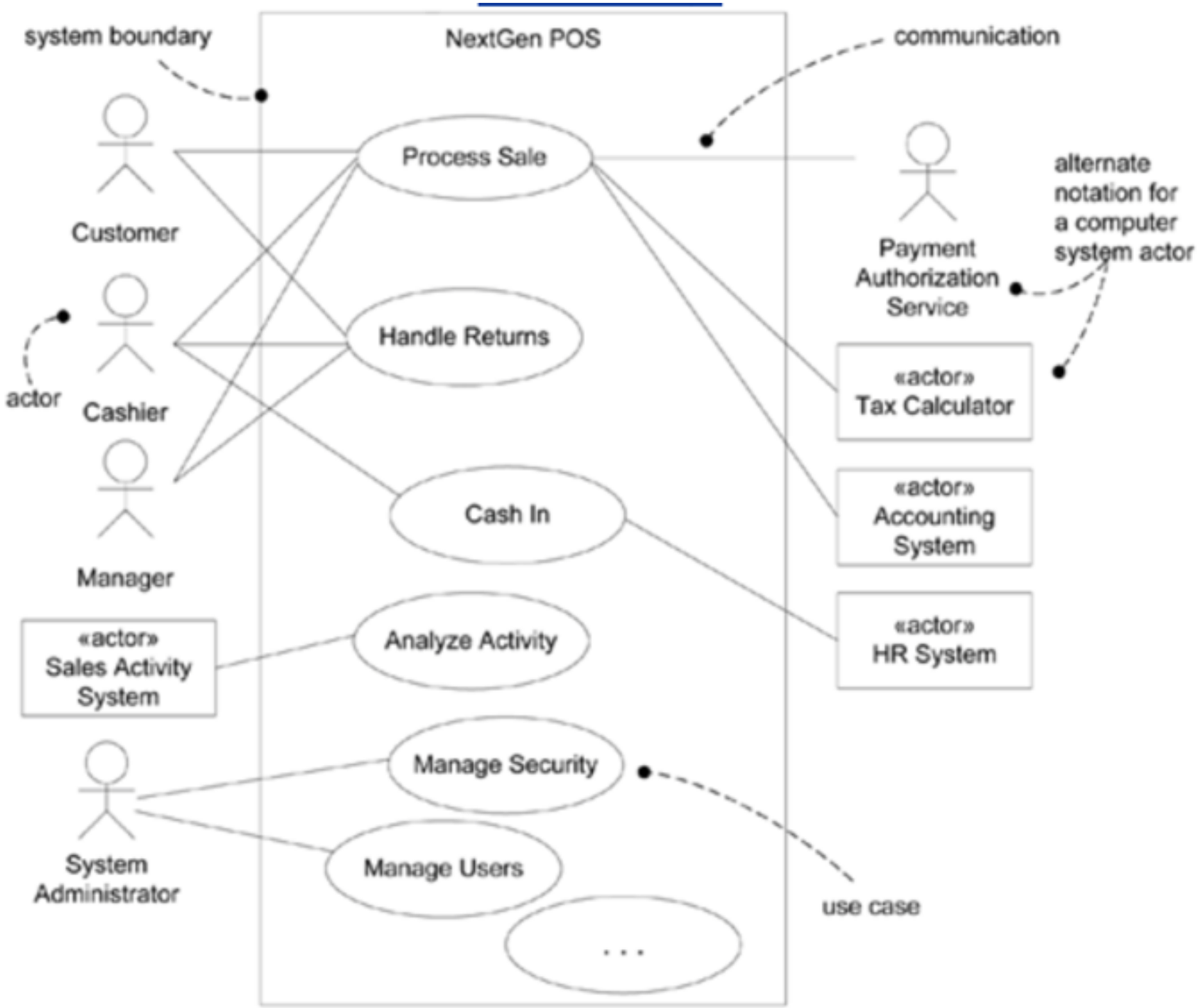
Primary Actor - Cashier vs Customer

- Why is the cashier the primary actor in the use case Process Sale we did together?

- The system is being designed to serve and interact with a cashier.

Primary Actor - Cashier vs Customer

Use Case Diagrams



Other Requirements

Vision

- Revision history
- Introduction
- Business Opportunity
- Problem Statement
- Product position

Other Requirements

Supplementary Specification

- Revision history
- Introduction
- FURPS+
- Constraints
- Purchased & 3rd party components
- Hardware & software specification

Other Requirements

Glossary

- Example:
  - Item : A product or service for sale
  - Payment authorization : validation by external blah blah
  - UPC : code that identifies product. 12 digit. digit 12th is the check digit

Inception done