Use case methodology
(IEC 62559)
From lagging to leading standardization

In the past standardization took place only after successful market introduction of a new product by market leader and adoption of the product idea by other vendors.

If standardization shall take place before product implementation, standardization has to analyze the market demands for new technical solutions too!

**ATTENTION**

Business case analysis to be included!

**IEC 62559 (Use case methodology) can help you to structure this analysis**

Standards Development Organization (SDO) drive activity

Industry driven activity
Customer (in) need

Integrated YouTube Object removed to the rejection of certain firewalls

Video: http://www.youtube.com/v/p_xTnH_pQ5o
Business model analysis

New business idea:
“Cash delivery service provider”

<table>
<thead>
<tr>
<th>Role</th>
<th>Customer</th>
<th>Bank XYZ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Problem</td>
<td>No cash for shopping</td>
<td>No bank branch close to the actual customer location</td>
</tr>
<tr>
<td>Condition</td>
<td>Has money on his account at bank XYZ;</td>
<td></td>
</tr>
<tr>
<td>Motivation</td>
<td>Wants to withdraw money from his bank account</td>
<td>Wants to sell services i.e. delivers cash to customers from banks as a service</td>
</tr>
</tbody>
</table>
Develop business use case

Role: Customer  Cash delivery service provider  Bank XYZ

Motivation: Needs cash  Wants to sell services  Want customer retention
i.e. wants to withdraw money from his bank account  i.e. delivers cash to customers from banks as a service  i.e. wants to offer its customers services, like money withdrawal, independently from own bank locations

- Identifies himself as customer of bank XYZ
- Ask for needed amount of money
- Selects certain amount of money
- Hand out cash
- Verifies soundness of customer
- Authenticates customer
- Requests permit for cash hand out
- Grant hand out
- Send transaction record and settlement data
- Balance transaction

Next step: Concretize implementation of cash delivery service
Use case: Using a bank machine (ATM) to make a withdrawal

Video: http://www.youtube.com/v/5PGEWejcmNU
System use case

**Role:**
- **Customer**
  - Needs cash
    - i.e. wants to withdraw money from his bank account

**Cash delivery service provider**
- Wants to sell services
  - i.e. offers ATM functions also to customers from other banks as a service

**Bank XYZ**
- Want customer retention
  - i.e. wants to offer its customers services, like money withdrawal, independently from own bank locations

**Precondition:**
- Has money on his account at bank XYZ
- ATM is operation and contains enough money
- Has service agreement with ATM owner

**Business process supporting actor:**
- **Customer**
  - Identifies himself as customer of bank XYZ
  - Offers available service options
  - Selects withdrawal of a certain amount of money
  -Dispense cash

ATM
- Verifies soundness of customer
- Authenticates customer
- Requests permit for cash dispense
- Grant dispense
- Send transaction record and settlement data
- Balance transaction

**Bank computer**
- Has updated customer's account balance

**Postcondition:**
- Has received cash
- ATM ready for next user
- Has updated customer's account balance
Translating activity steps in a use case

Step 1: Use case – Short version

Use case: Using a bank machine (ATM) to make a withdrawal

Only the following fields of IEC 62559-2 are mandatory covering the minimum short version of a use case:

- name of use case,
- author,
- date,
- narrative,
- actors.

Use motivation, pre- and post condition depended on the viewpoint of the use case; e.g. from the customer ’s view

Use roles for business use case and business supporting actor for system use case
Translating activity steps in a use case

Step 1: Use case – Short version

1.1 Name of use case

<table>
<thead>
<tr>
<th>Use case identification</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID</td>
</tr>
<tr>
<td>----</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

1.2 Version management

<table>
<thead>
<tr>
<th>Version management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Version No.</td>
</tr>
<tr>
<td>--------------</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

1.4 Narrative of use case

**Narrative of use case**

**Short description**

A customer of a bank needs cash.

**Complete description**

A customer having an account at a bank with a positive balance wants to do a withdrawal at a bank machine (ATM) to get money to be able to pay for something by cash.

3.1 Actors

<table>
<thead>
<tr>
<th>Actor name</th>
<th>Actor type</th>
<th>Actor description</th>
<th>Further information specific to this use case</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer</td>
<td></td>
<td>Customer of a bank</td>
<td></td>
</tr>
<tr>
<td>ATM owner</td>
<td></td>
<td>Responsible for operation of the ATM, typically also a bank</td>
<td></td>
</tr>
<tr>
<td>Bank</td>
<td></td>
<td>Bank where the customer has its account</td>
<td></td>
</tr>
</tbody>
</table>

Note: The text and tables are from a sample document, not the original context.
## Translating activity steps in a use case

### Step 2: Use case – Scenario Steps

#### 4.2 Steps – Scenarios

<table>
<thead>
<tr>
<th>Scenario name:</th>
<th>No. 1 – Withdrawal</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step No.</strong></td>
<td><strong>Event</strong></td>
</tr>
<tr>
<td>1</td>
<td>Start dialog with ATM</td>
</tr>
<tr>
<td>2</td>
<td>Customer ID read</td>
</tr>
<tr>
<td>3</td>
<td>Step 2 ready</td>
</tr>
<tr>
<td>4</td>
<td>Positive authentication</td>
</tr>
<tr>
<td>5</td>
<td>Menu displayed</td>
</tr>
</tbody>
</table>
## Translating activity steps in a use case

### Step 2: Use case – Scenario Steps (cont’d)

### 4.2 Steps – Scenarios

<table>
<thead>
<tr>
<th>Step No.</th>
<th>Event</th>
<th>Name of process/activity</th>
<th>Description of process/activity</th>
<th>Service</th>
<th>Information producer (actor)</th>
<th>Information receiver (actor)</th>
<th>Information exchanged (IDs)</th>
<th>Requirement, R-IDs</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Selection done</td>
<td>Permission request</td>
<td>The ATM request permission from the bank for cash dispense</td>
<td>GET</td>
<td>ATM</td>
<td>Bank</td>
<td>Request</td>
<td>AAA-3, IS-1</td>
</tr>
<tr>
<td>7</td>
<td>Request received</td>
<td>Grant permission</td>
<td>The Bank gives the permission for cash dispense</td>
<td>REPORT</td>
<td>Bank</td>
<td>ATM</td>
<td>Approval</td>
<td>AAA-3, IS,1</td>
</tr>
<tr>
<td>8</td>
<td>Dispense granted</td>
<td>Dispense cash</td>
<td>The ATM dispense the requested amount of money to the customer</td>
<td>N.A</td>
<td>ATM</td>
<td>Customer</td>
<td>N.A.</td>
<td>USE-1</td>
</tr>
<tr>
<td>9</td>
<td>Dispense done</td>
<td>Balancing</td>
<td>The ATM sends the transaction record to the bank</td>
<td>CREATE</td>
<td>ATM</td>
<td>Bank</td>
<td>Record</td>
<td>AAA-1, AAA-3, IS-1</td>
</tr>
</tbody>
</table>
Translating activity steps in a use case

Step 2: Use case – Scenario Steps (cont’d)

Service definition about the nature of the information flow

CREATE means that an information object is to be created at the Producer.
GET (this is the default value if none is populated) means that the Receiver requests information from the Producer (default).
CHANGE means that information is to be updated. Producer updates the Receiver’s information.
DELETE means that information is to be deleted. Producer deletes information from the Receiver.
CANCEL, CLOSE imply actions related to processes, such as the closure of a work order or the cancellation of a control request.
EXECUTE is used when a complex transaction is being conveyed using a service, which potentially contains more than one verb.
REPORT is used to represent transferral of unsolicited information or asynchronous information flows. Producer provides information to the Receiver.
TIMER is used to represent a waiting period. When using the TIMER service, the Information Producer and Information Receiver fields shall refer to the same actor.
REPEAT is used to indicate that a series of steps is repeated until a condition or trigger event. The condition is specified as the text in the “Event” column for this row or step. Following the word REPEAT, shall appear, in parenthesis, the first and last step numbers of the series to be repeated in the following form REPEAT(X-Y) where X is the first step and Y is the last step.
Translating activity steps in a use case

Step 3: Use case – Exchanged Information

5 Information exchanged

<table>
<thead>
<tr>
<th>Information exchanged, ID</th>
<th>Name of information</th>
<th>Description of information exchanged</th>
<th>Requirement, R-IDs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Id</td>
<td>Identification</td>
<td>Unique bank account identification</td>
<td>AAA-3, IS-1</td>
</tr>
<tr>
<td>Auth</td>
<td>Authenthification</td>
<td>Confirmation of soundness of ATM user</td>
<td>AAA-1, IS-1</td>
</tr>
<tr>
<td>Menu</td>
<td>Service Menu</td>
<td>Display menu for selection of available options, e.g. withdrawal</td>
<td>USE-1</td>
</tr>
<tr>
<td>Withdrawal</td>
<td>Withdrawal data</td>
<td>Information how many many money to be withdrew from which account</td>
<td>USE-1</td>
</tr>
<tr>
<td>Request</td>
<td>Mones dispense request</td>
<td>Request for permission to dispense requested amount of money to the customer</td>
<td>AAA-3, IS-1</td>
</tr>
<tr>
<td>Approval</td>
<td>Money dispense approval</td>
<td>Permission to dispense the requested amount of money to the customer</td>
<td>AAA-3, IS-1</td>
</tr>
<tr>
<td>Record</td>
<td>Transaction record</td>
<td>Transaction record and balancing data</td>
<td>AAA-2, AAA-3</td>
</tr>
</tbody>
</table>
## Translating a sequence in a use case

### Step 4: Use case – Requirements

### 6 Requirements (optional)

<table>
<thead>
<tr>
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</tr>
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<tbody>
<tr>
<td><strong>Categories ID</strong></td>
</tr>
<tr>
<td>AAA</td>
</tr>
<tr>
<td>IS</td>
</tr>
<tr>
<td>USE</td>
</tr>
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<table>
<thead>
<tr>
<th>Requirement ID</th>
<th>Requirement name</th>
<th>Requirement description</th>
</tr>
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<tbody>
<tr>
<td>AAA-1</td>
<td>Two factor Authentication</td>
<td>The ATM access only withdrawal requests if the user enters a valid bank card and the correct corresponding personal identification number (PIN).</td>
</tr>
<tr>
<td>AAA-2</td>
<td>Money dispense accounting</td>
<td>All cash dispense action must be accounted correctly the allow the right balancing afterwards.</td>
</tr>
<tr>
<td>AAA-3</td>
<td>Unique identification</td>
<td>There must be a unique identification scheme for banks and bank customers</td>
</tr>
<tr>
<td>IS-1</td>
<td>Secure communication</td>
<td>All communication between the ATM and the customer's bank need to be secured against disclosure, modification or destruction.</td>
</tr>
<tr>
<td>USE-1</td>
<td>User guidance</td>
<td>The ATM user should be guided through the withdrawal procedure in a way that the next user action is easy to understandable.</td>
</tr>
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...
Detailing system use case

In the real world, detailing a use case needs a modeling framework to manage the complexity.

**Reason of the analysis complexity**: an increase of data exchange steps because of an increase of:

- description of detailed data
- actors (ex: ATM decomposition into internal sub systems)
- activity steps for error or alternative processes (wrong login/pwd, transaction errors,..)
Detailing System use case

- Description of detailed data exchange

Refined descriptions

Customer

- Identifies himself as customer of bank XYZ
- Offers available service options
- Selects withdrawal of a certain amount of money
- Dispense cash

ATM

- Verifies soundness of customer
- Authenticates customer
- Requests permit for cash dispense
- Grant dispense
- Send transaction record and settlement data
- Balance transaction

Bank computer

Customer

- Welcomes
- Enters card
- Ask for PIN
- Enter PIN

ATM system

- Show menu
- Select “Withdrawal”
- Ask amount
- Select wanted sum
- Ask account
- Select account for withdrawal
- Take card
- Take money
- Take receipt
Detailing System use case

• Actor decomposition into sub internal actors
Detailing System use case

- Actor decomposition into sub internal actors

With their related data exchange
Detailing System use case

• Adding activity steps for error or alternative processes

What happens when refused customer authentication, refused withdrawal, not enough money on bank account...Etc?
Detailing System use case

A modelling framework is needed to manage the complexity, structure the analysis, guide experts and automate the generation of standardized textual template (IEC 62559-2)

4.2 Steps – Scenarios

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SyC Smart Energy/WG6:
- is an earlier adopter of the use case methodology to define smart grid requirements (IEC 62913-X)
- provides a UML modelling framework to satisfy those needs
Detailing system use case (UML example)

- Structuring the description by splitting into sub set of activities
Detailing system use case (UML example)

- Adding workflow behavior

Activity: SystemUseCase1 - scenarios flowchart

- Authenticate the customer
- Authorise a selected withdrawal
- Dispense cash and retrieve card/receipt
- Authentication error?
  - [No]: Customer Aborts the withdrawal
  - [Yes]: Customer Abortion
- Withdrawal authorisation is refused?
  - [No]: Retrieve credit Card
  - [Yes]: Process bank transaction
- Customer Aborts the withdrawal
  - [No]: Retrieve credit Card
  - [Yes]: Process bank transaction

Zoom inside to define activity steps for information exchange
Detailing system use case (UML example)

- Defining activity steps for information exchange related to this part of the use case

Activity: Scenario1 - activities flowchart

ATM System
<<Business>>
Customer
«System»
Card Reader
(from Roles)
«System»
CPU
(from Roles)

ActivitySet
ActivityInitial
«Activity» Take Card
Send
Card Retrieved: Card

ActivitySet
ActivityInitial
«Activity» Release card
Card Released: Card

ActivitySet
ActivityInitial
«Activity» Report for card removal
RemovalReport: Card
Send

ActivitySet
ActivityFinal
«Activity» Process card removal information

Customer Aborts the withdrawal
«Scenario»
Authenticate the customer
«Scenario»
Authorise a selected withdrawal
«Scenario»
Dispense cash and retrieve card / receipt

Customer Aborts
«Scenario»
Retreive credit Card
«Scenario»
Process bank transaction

[Yes]
[Yes]
[No]
[No]
4.2 Steps – Scenarios

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Modsarus® : From Use Case Modelling down to data flow modelling

Use Case Modelling IEC62559

Data Flow Modelling
Example: CIM Profile such as IEC62325
Modsarus® : From Use Case Modelling down to data flow modelling

Logical: Information Exchanged

«BusinessObject»
MoneyDispenseAuthorisationRequest

«ContextualModel»
CIM Profile Package

<<realize>>

MODESARUS®

MODSARUS® = EDF Addin of the UML Tool Enterprise Architect
Thank You