IN2013: Object-Oriented Analysis and Design

Tutorial 1: Introduction and Context

Model Answer

Exercise 1: Case study (BAPERS)

In the coming weeks we will be building different models for a case study (see the Appendix) – the information system, BAPERS, used by a photographic lab. I strongly encourage you to read the description before the next tutorial, so you can already start to familiarize yourself with it. This will save reading time on the next tutorial and allow you to practice more on modelling.

Work either individually or in groups of 2-3 and answer the following questions related to the scenario:

- Define the systems boundary of BAPERS (e.g. by stating the bespoke and third party software components that together will make up BAPERS).
    - o We can speculate how much of BAPPERS will be based on 3rd party components. It seems clear that the system needs a database to store the data related to customers, jobs, payments, etc, Many RDBMS software exist – commercial (Oracle, MS SQL, etc.) , open sources (PostgreSQL, MySQL) and even services which allow data to be stored on computer cloud, e.g. Google's Firebase. There are **subtle but important differences** between the different options a DB storage is deployed, which affect the decision whether the DB server is outside the system's boundaries or not:
        - ▪ Option 1: A DB server is deployed to serve **only BAPERS**. In this case the DB server will normally be seen as part of BAPERS, which merely will include complex off-the-shelf software.
        - ▪ Option 2: A DB service is used, which is managed by 3rd party (e.g. Google's Firebase or a Relational Database server deployed say on Amazon Web Service). In this case the Database service will be seen as an external system, which BAPERS relies upon.
- What are the external systems, if any, which BAPERS is expected to interact with?
    - o One external system is mentioned in the case study – the payment processor. This could be an online service such as PayPal, Sage, etc. or a connection to a payment processor operated by a bank. In case of option 2 of DB deployment, we will have an additional external system – the Data storage.
- Who are the users of BAPERS?
    - o A number of users are listed in the case study:
        - ▪ Receptionist,
        - ▪ Technician
        - ▪ Office/Shift Manager
        - ▪ Interestingly, the administration of access to BAPPERS is delegated to the Office Manager. It could have been done differently, e.g. by having a dedicated system administrator, whose only interaction with BAPERS would be to create and remove user accounts. It is important to reflect on the differences between these two arrangements: i) how access is administered according to the case study, and ii) how it could have been done. The difference between these two scenarios affects significantly how we specify systems' requirements and subsequently – system design and implementation.
        - ▪ *IMPORTANT*: The customers are *NOT* users of BAPERS.

- What are the main services offered by BAPERS to the users (list the main functions that different users will be able to use)?
  - o These are specified explicitly in the text.

- Using the Volere Template provided in class, capture 2-3 functional requirements and 2 non-functional requirements of BAPERS software.

  - o **Functional Requirements**
    - ▪ System shall allow new customer accounts to be created. This is an essential requirement which should be given high priority.

Requirement ID: 1	Requirement Type: FR	Event/Use Case #2 (CreateCustomer)
Description: The system shall allow new customer accounts to be created.		
Rationale: BAPERS is a software system which maintains customer accounts and offers benefits to the customers, hence the requirement.		
Source: BAPERS initial statement of requirements by BIPL.		
Fit Criteria: A test to create a new customer account with valid data should be passed successfully (the provided data must be recorded on BAPERS). A test to create a duplicate of an existing customer account should result in a Warning message and no duplicate account shall be created. A test to create a new customer account with incomplete or invalid customer data (e.g. invalid email address, etc.) should result in a Warning message and no new customer account being created.		
Customer Satisfaction: 5 (Meeting this requirement is a must**).**	**Customer Dissatisfaction: 5** (Failure to satisfy the requirement is unacceptable**).**	
Priority: Essential ty	**Conflicts:** None	
Supporting Material: BAPERS initial statement of Requirements by BIPL. t e m s		Volere Source: Atlantic Systems Guild
History: June 25, 2009, Passed Quality Gateway review s		

The system shall allow new jobs to be created. Again, this is an essential requirement which should be given high priority.

Requirement ID: 2	Requirement Type: FR	Event/Use Case #3 (CreateJob)
Description: System shall allow new jobs to be created.		
Rationale: BAPERS is a software system which maintains records of the jobs that customers bring to the lab. The processing of the jobs via the lab is based on an accurate record of the jobs (as a collection of predefined tasks).		

Source: BAPERS initial statement of requirements by BIPL.

Fit Criteria: A test to create a new job with valid data (a set of tasks from the list of standard tasks) should be passed successfully (the provided job data must be recorded on BAPERS).

A test to create a new job with incomplete (e.g. no tasks) or invalid data (e.g. non-existing task type) should result in a Warning message and no job record being created.

Customer Satisfaction: 5 (Meeting this requirement is a must**).**	**Customer Dissatisfaction: 5** Failure to satisfy the requirement is unacceptable**).**
Priority: Essential	**Conflicts:** None

Supporting Material: BAPERS initial statement of Requirements by BIPL.	**Volere** Source: Atlantic Systems Guild
History: June 25, 2009, Passed Quality Gateway review	

The system shall allow payments to be recorded, another essential requirement.

Requirement ID: 3	**Requirement Type: FR**	**Event/Use Case #4 (RecordPayment)**

Description: System shall allow payment records to be created.

Rationale: BAPERS is a software system, which maintains records of the jobs and payment made for them. A number or reports are then generated with various statistics on the work completed the revenue generated.

Source: BAPERS initial statement of requirements by BIPL.

Fit Criteria: A test to record a cash payment for an existing job should be passed successfully (the provided payment data must be recorded correctly on BAPERS). After a sufficient payment the respective job will be flagged as "paid for".

A test with incomplete payment amount for a job should be rejected and the job status retained as "not paid for".

Test to record card payments should be passed successfully, too: i) a full card payment will change the job status to "paid for", ii) declined card payment should raise a warning to the user and retain the status of the corresponding job to "not paid for".

Customer Satisfaction: 5 (Meeting this requirement is a must**).**	**Customer Dissatisfaction: 5** Failure to satisfy the requirement is unacceptable**).**
Priority: Essential	**Conflicts:** None

Supporting Material: BAPERS initial statement of Requirements by BIPL.	**Volere**

History: June 25, 2009, Passed Quality Gateway review	Source: Atlantic Systems Guild

Make sure that you reflect on the provided "fit criteria". Broadly, the tests should i) test that the system DOES correctly what it is supposed to do, and ii) in case of incorrect data from the user, the system should raise warning and ignore the incomplete/incorrect requests made by the user. Both aspects of the fitness criteria are important.

- o **Non-functional requirements**
    - ▪ The system shall be secure. As a fitness criterion one can list following the relevant standards, e.g. ISO27001/5.

Requirement ID: 4	**Requirement Type: NFR (security)**	**Event/Use Case N/A**
Description: The system shall be secure		
Rationale: BAPERS is a software system which stores sensitive data.		
Source: BAPERS initial statement of requirements by BIPL and relevant regulations on storing sensitive data.		
Fit Criteria: The development and use of the system is compliant with ISO 27001/ISO27005		
Customer Satisfaction: 4 (Highly important requirement**).**	**Customer Dissatisfaction: 3** Important requirement**).**	
Priority: Highly important	**Conflicts:** None	
Supporting Material: Relevant Regulation in the UK.	Volere	
History: June 25, 2009, Passed Quality Gateway review	Source: Atlantic Systems Guild	

- ▪ The system shall be highly available (99%). Fitness criterion can refer to recovery from failure no longer than say 10 min.

Requirement ID: 5	**Requirement Type: NFR (availability)**	**Event/Use Case N/A**
Description: The system shall be highly available.		
Rationale: BAPERS is a software system which affect daily operation. Downtime will lead to losses.		
Source: Private conversation with the Managing Director of BIPL followed by a clause on the contract with the software developer.		

Fit Criteria: 99% measured over a month of typical operation of 2 shifts per day.	
Customer Satisfaction: 3 (Expected to be met**).**	**Customer Dissatisfaction: 4 (**Serious implications if not met**).**
Priority: Highly important	**Conflicts:** None
Supporting Material: Private conversation with the Managing Director of BIPL followed by a clause on the contract with the software developer.	**Volere** Source: Atlantic Systems Guild
History: June 25, 2009, Passed Quality Gateway review	

Exercise 2: Visual Paradigm installation

In this module we will use Visual Paradigm[1]. This exercise you will make a start with the tool:

- Install Visual Paradigm on your personal laptop.
  - o Follow the installation guide provided on Moodle. A detailed step-by-step guide is also provided by vendors on their website.
- Explore the tool's functionality by skimming through the help files and/or looking at the various online tutorials offered by the vendors.
  - o No answer provided.

I do not expect you to complete both exercises during the Tutorial. Use the time at the tutorial in the best possible way and complete both exercises at home.

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[1] The software will be handy in the module "Team Project" in Term 2 of Y2 and also may be useful in your work on the Final Year project in Y3.

Appendix

Bloomsbury's Automated Process Execution Recording System (BAPERS)

The case study describes the requirements for automating the processes at the photographic laboratory 'The Lab' operated by Bloomsbury's Image Processing Laboratory (**BIPL**). **BIPL** handles the work of professional photographers and carries out *jobs* on behalf of customers, but the customers do not use the system. The access to the system is limited to the laboratory staff only.

Each job is given a *unique identifier* and assigned *urgency* (a job may be urgent or normal which affects the turnaround time) when the job is placed. Urgent jobs must be completed within 6 hours while the normal jobs – within 24 hours. A job may consist of any number of the *standard tasks* offered by BIPL.

Currently there are around 30 standard tasks. Each task has an identifier (e.g., a number), is carried out at a particular location within the laboratory, has a quoted price, and an (estimated) duration. Some of the tasks are shown in Table 1 below. The case study ***does not require*** that the list of tasks be maintained (i.e. BAPERS does NOT offer functionality for adding new tasks, removing or updating existing tasks).

Table 1

Task ID	Task Description	Location	Price (£)	Duration (min)
1.	Use of large copy camera	Copy Room	19.00	120
2.	Black and white film processing	Development Area	49.50	60
3.	Bag up	Packing Department	6.00	30
4.	Colour film processing	Development Area	80.00	90
5.	Colour Transparency processing	Development Area	110.30	180
6.	Use of small copy camera	Copy Room	8.30	75
7.	Mount Transparencies	Finishing Room	55.50	45
…	Etc.	Etc.	Etc	Etc

At any given time, hundreds of jobs will be in progress or pending within the laboratory. Every accepted job must be chargeable to a valid *customer account*, either an existing account, or a newly created account (e.g. a photographer may walk in, leave a film to be developed and pay cash on collecting the finished job).

BIPL want to enable the employee on the reception desk to enter the job on a computer terminal. The material will be labelled with the job number and taken down to the laboratory.

The laboratory staff will interrogate **BAPERS** to ascertain the tasks required. As the job is transferred from one location to another in the laboratory, the staff responsible for each task will record its completion on a computer terminal in their location before passing it on. A terminal will be required in each of the following locations: Copy Room, Dark Room, Development Area, Printing Room, Finishing Room, and Packing Department.

Many jobs will be going through the laboratory at any given time, and confusion between them must be avoided. At all costs, loss or mistreatment of the customer's material must not occur. Queues of work may build up at the processing stations, but flexible scheduling is required to

allow priority to be given to *urgent* jobs over the *regular/normal* jobs. The system should provide functionality for inspecting the list of active/pending jobs as well as already completed ones, including the inspection of the progress of individual tasks (active/pending tasks vs. completed ones).

BAPERS must therefore provide the following main facilities:

BAP-ACCT *Accept job at reception*: Identify existing (or create new) customer account (name, phone). Assign job number. Record the deadline for completion of the job. This functionality will be mainly used by the receptionists but will also be made accessible by either Office manager or Shift manager in case receptionist(s) are absent.

BAP-PROC *Process a job through laboratory*: Respond to enquiries from any computer terminal about status of any jobs in progress, or of all jobs (including the completed ones). Update status of any given job by recording completion of current task and commencement of next (possibly with transfer of material to a new location). This functionality is available to Technicians, Shift and Office Manager.

In addition, alert Shift and/or Office manager (by, for example, displaying a visual cue with appropriate text) if the expected time to complete outstanding tasks for any job is likely to exceed the set time period, i.e. if the deadline for the job is not likely to be met; the alerts should be performed only for these two user roles.

BAP-PAYM *Payment processing*. The customers are supposed to pay once the jobs they had placed have been completed. Customers can pay by cash or credit/debit card only. The system is connected to an external payment processor to move funds between the customers' credit/debit cards and the BIPL bank account. In case of a card payment BAPERS is expected to connect to the external payment processor and on successful completion of the card payment the payment is recorded with the following details: card payment, type of card, and the last 4 digits of the card used. Cash payments are recorded, too. Several jobs can be paid at once. Only payment in full is accepted (i.e. no partial payments are allowed). This functionality is available to Receptionist, Shift and Office Manager.

BAP-ADMN *Administering the system*. This includes creating a user account for BAPERS and setting up access privileges. The following user roles are essential to be implemented: Office manager, Shift manager, Receptionist and Technician. This functionality will be available to Office Manager only.

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