ICT284 Systems Analysis and Design

Assignment 2

Worth: 25% of your final grade.

Due: Please refer to the date o LMS.

Submit to: LMS, via the Assignments tool. Submit as a single Word document including all parts of the assignment. Ensure you complete the declaration that is part of the submission process. You do not need to include a separate cover sheet but you should include your name and student number as part of your document filename. Your name and student number should also be included in the assignment document.

Late assignments that do not have an extension will be penalised at the rate of 5% per day.

The assignment requires you to carry out some systems analysis and early systems design activities for the case study described here. Read the case study on the next page and answer questions 1-10 following.

Summary of what to submit:

Question	Task	Marks
1	Stakeholders	5
2a	Functional requirements	5
2b	Non-functional requirements	5
3a	List of use cases from user goal technique	10
3b	List of use cases from event decomposition technique	10
4	Domain model class diagram	20
5	CRUD matrix	10
6	Fully-developed use case description	10
7	Activity diagram	10
8	System Sequence Diagram (SSD)	10
9	State Machine Diagram (SMD)	10
10	User acceptance test plan	20
GENERAL	Presentation including layout, formatting, table of contents, and proofreading	10
	TOTAL MARKS	135

The case study: Light-As-Air Ballooning System (LAABS)

Light-As-Air Ballooning (LAA) is an organisation which operates hot air ballooning on the Malaysian peninsula across from Singapore (the Singapore air-space is too busy and tightly controlled to allow free-flying ballooning there). The company has a mixed fleet of balloons and baskets and a team of pilots to cater for both small and large groups.

The five (5) smaller baskets have the capacity to carry up to 10 passengers each; six (6) larger balloons and baskets can carry up to 20 passengers each. This is a relatively new venture for this part of Asia, and the owner of this company, TEO Hong, is keen to see LAA grow and expand.

Flights take place just before sunrise, and can be booked by individuals or groups, or can be chartered (such as for wedding ceremonies and other special occasions). The larger baskets are ideal for corporate and social group bookings.

As the business expands, Light-As-Air needs a new information system; as the current one was based on Mr TEO doing all the bookings himself. The new **Light-As-Air Ballooning System (LAABS)** must manage the booking system for the balloons, and maintain all information about clients and flight sessions. It must also manage the information about balloon and basket maintenance, and keep track of pilot and other staff certification.

Customers book online or at the LAA Singapore city office. As the flight sessions are heavily subscribed, customers are sent reminder texts about their flight the week before and the day before. Cancellation without incurring a charge is only possible up to 4 weeks before the flight (after that the full price is payable). The LAABS is not required to handle any payment information as this is done by a third party system. Customers are informed the night before the booking date if the flight is cancelled due to weather.

The flights are only booked out in lots of ten (10) (small balloons) or twenty (20) (large balloons), and each flight session must be accompanied by a senior pilot and a staff member who act as co-pilot. These staff members must have first aid training, a Commercial Balloon Pilots Licence, and have passed a medical within the last 3 months. The LAABS must ensure that the staff have current first aid certificates and pilot certificates, as well as regular medical check-ups. This will require alerts to the relevant staff members at the appropriate times.

Customers must also meet various conditions: the office will need to know the weights of the passengers in each party and if anyone has had recent injury or surgery, or is pregnant. This is confirmed when they book, along with name, address, and contact phone number, and the date of the flight required. Details of all customers in a party are required, and all customers must sign a statutory declaration that the information they provide is true. Insurance and OHS requirements mandate permanent storage of these declarations.

Each flight *session* is booked out for two (2) hours, of which between 45 and 60 minutes is actual flying time, with 30 minutes preparation (check-in, safety briefing and boarding and balloon inflating) and 30 minutes disembarkation time (this includes bus transport back to the launch site). Customers are expected to make their own way to/from the launch site.

Customers may book two (2) different types of experience:

- Flight– this includes flight, loan of warm jacket for the duration of the flight, Certificate of Participation and transport back to the launch site only

- Deluxe experience – as well as 'Flight' inclusions, this adds a post-flight breakfast, champagne and photo opportunities with the (inflated) balloon and pilot.

Safety and comfort of customers and staff is obviously paramount for LAA. Before each flight an inspection is made of the basket and balloon (including physical damage, integrity of equipment, balloon control systems, cleanliness, etc). There is also a thorough technical check of the equipment after each flight session. These checks are noted by the system.

There is a full mechanical check of all equipment by a service engineer at the beginning and end of every working day, and in addition each balloon inflating and control system must be fully serviced by the manufacturer at least every three months or every 50 hours of use, whichever is sooner. The mechanism is removed from the balloon structure and sent to the manufacturer for examination and possible repair/replacement. This takes 4 days, so to keep the business operating TEO Hong tries to stagger the downtime so there are always at least two balloons of each size in service.

The hours of balloon use are logged by the LAABS, by adding the number of session minutes to the usage log at the end of each session. When a balloon reaches 50 hours of use it is flagged as 'in maintenance'. On reassembly the number of usage hours is reset. LAABS also records the dates, times, and details about each service.

While the control equipment is being serviced at the manufacturers, the basket and guy-ropes are refurbished and jackets inspected for wear and cleaned.

Several reports will be required of the new system. The LAABS must be able to provide an ad-hoc status report on each balloon and basket (different baskets can be attached to various balloons as long as maximum capacity is adhered to), showing whether it is in use or being serviced, its current hours of use and date of next scheduled service. It also needs to provide all the information about mechanical checks and services in a report that TEO Hong sends to the manufacturers annually as part of the maintenance agreement. Finally, TEO Hong would like a report showing the customer usage so that he can see what are the most popular times of year and types of flights and plan for expansion.

TO DO:

Note the following points:

- You may need to make assumptions where information is incomplete: state any assumptions clearly. You can also ask questions on the forum.
- Your **diagrams** should be drawn using Visio (or suitable alternative that creates UML diagrams). Use the appropriate template for each diagram type. Make sure your diagrams are clear and readable.
- Your diagrams must follow correct UML notation and naming conventions, and each diagram should include a title and legend.
- Your models, diagrams and discussions should be consistent with one another throughout your analysis and design.
- Ensure your work is clearly and professionally presented, proofread for spelling and grammar, with a title page and table of contents. Start each main question on a new page.

Q1.	List the main **stakeholders** for the new **Light-As-Air Ballooning System (LAABS)**. For each stakeholder, write a brief description of their interest in the system and what aspects of it are of particular relevance to them.

 You do not need to categorise the stakeholders. Don't include the systems development team.

Q2.	(a)	List and briefly describe the main **functional requirements** for the LAABS. There should be around 5-10.

 (b)	List and briefly describe the main **nonfunctional requirements** for the LAABS.

Q3.	(a)	Use the **User Goal technique** to develop a list of **use cases** for the LAABS. Present your list in a table that includes the participating actors, use case name and a brief use case description.

 (b)	Use the **Event Decomposition technique** to identify any **additional use cases** for the LAABS. These will probably be temporal and state event types. Present your list in a table that includes the event, type of event, trigger, use case name, and brief use case description. You do not need to repeat the use cases you identified in (a) here.

 (Note that some use cases are already identified in Q6, 7, 10 below. Include these in your lists.)

Q4.	Create a **domain model class diagram** for the LAABS, including all classes, attributes, associations, and multiplicity. Show association classes and generalisation hierarchies where appropriate.

Q5.	Create a **CRUD matrix** to check the consistency between your domain model class diagram and your *complete* list of use cases. Set this out in the form of a table with classes as the columns and use cases as the rows. If you find discrepancies between

the models while you are doing this, you should go back and correct your earlier models as required so that your final set of models is consistent.

Q6. Create a **fully-developed use case description** for the use case *Book a Flight.* Follow the template provided at the end of this handout.

Q7. Draw an **activity diagram** to represent the flow of activities for the use case *Inspect Balloon* shown at the end of this handout.

Q8. Draw a **system sequence diagram** for the use case *Inspect Balloon* shown at the end of this handout that corresponds to your activity diagram in Q7.

Q9. Draw a **state machine diagram** to show the possible states and transitions for a **Balloon** object. Label each state with the state name. Label each transition with the appropriate transition name, guard condition (if appropriate) and action expression (if appropriate).

Q10. Develop a **user acceptance test plan** for a **customer** of the LAAB system. Base it on the relevant use cases you have identified. You can follow the example in the textbook (below). Present your test plan in a table including the fields: use case name, test conditions, expected outcomes. You do not need to include test data.

	A	B	C	D	E	F
1	Spec ID	Cross refer to use case	Short description	Test conditions	Expected outcomes	Comments
2	10		101 Maintain customer Info	Add customer, update customer, delete not allowed	New customer with all fields, updated customer with selected fields	
3	11		201 Maintain sale info	Create sale, update sale, finalize sale, pay for sale	New sale in DB, update selected fields, payment creates transaction	
4	12		202 Ship items	Display items, update status	Sale update, sale items updated, shipment created	

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Template for Question 6

Use Case Name:		
Scenario:		
Triggering Event:		
Brief Description:		
Actors:		
Stakeholders:		
Preconditions:		
Postconditions:		
Flow of Activities:	Actor	System
Exception Conditions:		

Use case description *Inspect Balloon*

Use Case Name:	Inspect Balloon
Scenario:	
Triggering Event:	A party of customers is ready to undertake a flight they have booked.
Brief Description:	Before a party of customers can commence their session, the accompanying staff member carries out an inspection of the balloon, checking for physical damage, integrity of equipment, balloon control systems, cleanliness, etc. If any of the checks fails, the system records the nature of the failure and issues an alert that the session cannot proceed until it has been rectified. If the checks are all OK, the system records this fact and issues the go-ahead for the session.
Actors:	Staff member
Stakeholders:	Staff member, manager
Preconditions:	The balloon has been booked for a session, and this has been recorded in the system.
Postconditions:	The session booking record has been updated to reflect the details of the balloon.

Flow of Activities:	Actor	System
	1. Staff member completes inspection checks	
	2. Staff member enters session record number for the booked session	2.1 System displays the information about the session (time, date, customers in party, etc) 2.2 System prompts for confirmation that the inspection checks have happened.
	3. Staff member enters details about physical damage, cleanliness. For the cleanliness there must be a statement to indicate that the problem is no longer an issue.	3.1 System records inspection details in session booking record. 3.2 If physical damage checks are failed, system advises session must not go ahead and balloon must be withdrawn until the problem is rectified. 3.3 If cleanliness test is failed and there isn't a statement of cleaning, system advises session must not go ahead until the balloon area is cleaned.
	4. Staff member confirms inspection report complete.	4.1 If all checks are OK, system confirms that session can go ahead 4.2 If any checks are failed, balloon flagged as out of use.
Exception Conditions:		