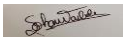
OLLSCOIL NA GAILLIMHE
UNIVERSITY OF GALWAY

Systems Development and Project Management Assignment Submission Form
Module: MS804

Student Details

Group Number**:**	6
Group Leader	1. Akshata Anil Ghumatkar –24240627 
Group Members	2. Marywinnie Mugah –24259364 3. Amit Kumar –24236930  4.Prarhamesh Rajeshirke –24237854  5. Soham Tambde – 24259687  6. Dhanashree Bhandari – 24237943 
Peer Evaluation Group	Group-22, Group-20
Email**:**	1. A.Ghumatkar1@universityofgalway.ie 2. M.Mugah1@universityofgalway.ie 3. a.kumar13@universityofgalway.ie 5. S.tambde1@universityofgalway.ie 6. d.bhandari1@universityofgalway.ie
Lecturer (s**):**	Coyle Sharon sharon.coyle@universityofgalway.ie
Course:	MBY, ISM, CYB

i

I hereby declare that the work submitted is entirely our own, and that ideas received from peer evaluation groups or extracts taken from other sources (e.g., online materials, using ChatGPT, etc.) are properly acknowledged and referenced. Furthermore, I acknowledge that the penalty for plagiarism may include reduction in marks, cancellation, or suspension of the assignment.

Signed by: 

Date: 08/11/2024

Table of Contents

Teton Whitewater Kayak case study

[A] Overview

This report provides different models for the Teton Whitewater Kayak (TWK) system and its main processes, specifically equipment rentals, returns, sales, and inventory management processes. Using various diagrams such as Functional Decomposition Diagrams (FDD), Data Flow Diagrams (DFD), and UML diagrams we provide a visual representation of how customers and employees interact with the system for activities like renting, purchasing, and managing equipment inventory. In addition, we outlined the assumptions we made to enhance understanding of each process.

[B] Functional Decomposition Diagram (FDD) (Valacich, George and Hoffer, 2015), (Coyle, Sharon., 2024), (Al-Fedaghi, S., 2016).

The FDD below goes in depth of each process in the TWK system.

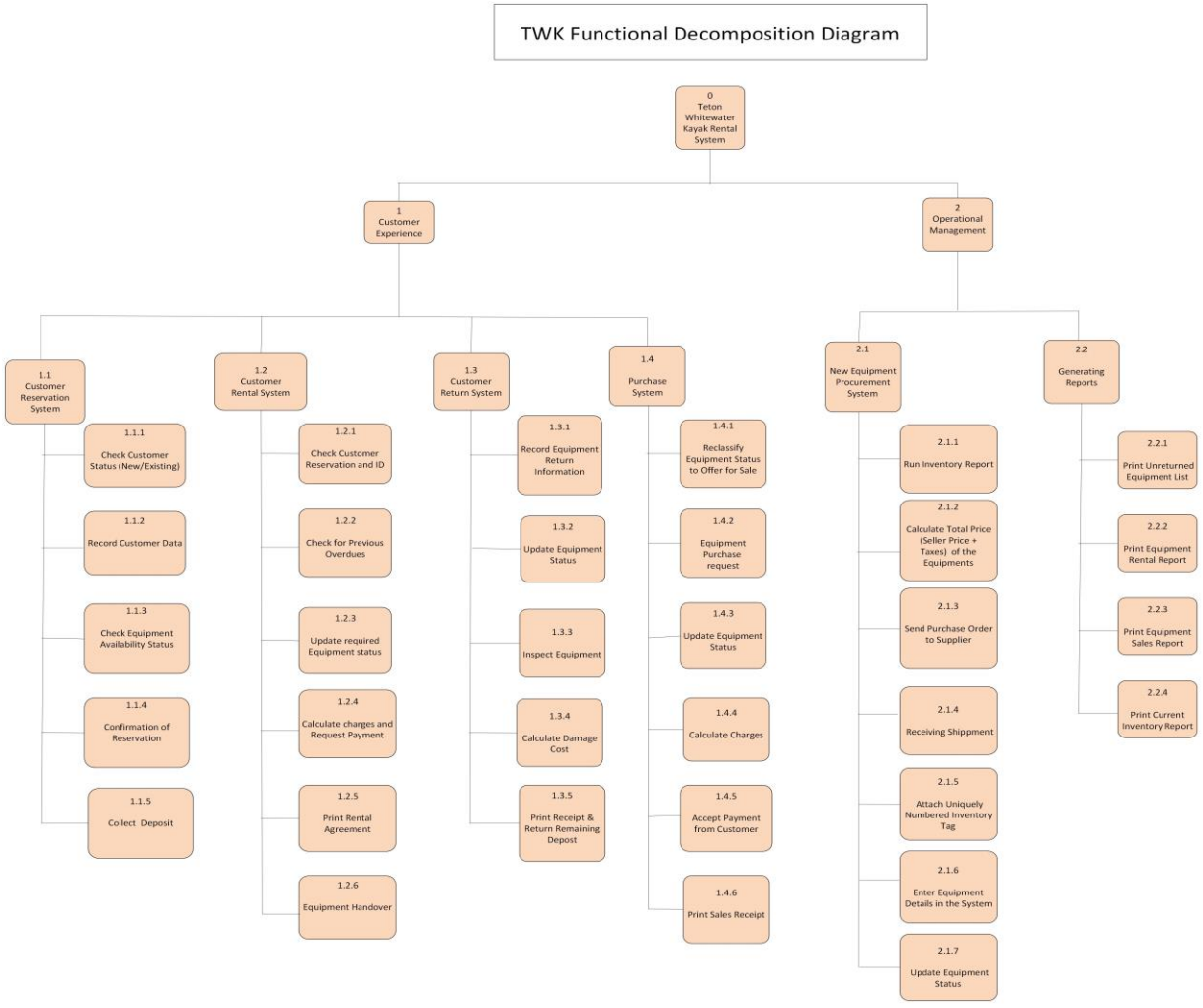


Fig 1. Functional Decomposition Diagram of TWK System.

The FDD (Fig 1) is divided into two major sections:

1. Customer Experience (Front Office)
   This covers all the customer-facing services and will mainly work in assisting customers to get equipment's needed by them.
2. Operational Management (Back Office)
   This handles all the management tasks that are needed for the smooth functioning of the business. It would also deal with procurement of new equipment's and making sure all of the expenses and outstanding dues are accounted for.

Section 1 – Customer Experience

1.1 Customer Reservation System

The Customer will first call in, go online or come at the front desk of TWK to reserve equipment that they wish to rent.

1.1.1 Check Customer Status (New/Existing): The status of customer is first checked in our system. The status would be either existing or new.

1.1.2 Record Customer Data: In the case of a new customer, the system records the customer's information.

1.1.3 Check Equipment Availability Status: The Equipment that is requested by the customer is checked in systems database to confirm availability.

1.1.4 Confirmation of Reservation: Once availability is confirmed, the system proceeds to reserve the equipment.

1.1.5 Collect Deposit: A deposit is collected from the customer to secure the reservation.

1.2 Customer Rental System

The Customer comes into the store on the day of equipment collection date as mentioned in their reservation receipt.

1.2.1 Check Customer Reservation and ID: Verification of customer's reservation and identification is done before proceeding.

1.2.2 Check for Previous Overdue: A Check is done on the customers profile for any outstanding overdue payments in case of an existing customer.

1.2.3 Update required Equipment Status: Updates the equipment's status in the system as per the reservation.

1.2.4 Calculate Charges and Request Payment: Calculates rental charges and requests the customer to make payment along with writing a rental record.

1.2.5 Print Rental Agreement: Once the payment is done, system generates and prints the rental agreement for the customer.

1.2.6 Equipment Handover: Since deposit was already collected at the time of reservation, handover of the rented equipment is done to the customer.

1.3 Customer Return System

The Customer when returning the equipment, is present in person and following tasks are performed.

1.3.1 Record Equipment Return Information: System records information related to the equipment return, such as return time and condition.

1.3.2 Update Equipment Status: Updates the status of the returned equipment in the system from “rented” to “in-stock”.

1.3.3 Inspect Equipment: An employee conducts an inspection of the returned equipment for any damage.

1.3.4 Calculate Damage Cost: If damage is found, calculates any applicable costs for damages and is recovered from the deposit paid by the customer.

1.3.5 Print Receipt & Return Remaining Deposit: Issues a receipt to the customer and returns any remaining deposit after deducting fees or damages.

1.4 Purchase System

Customers are periodically allowed to buy used equipment’s that are classified as “For Sale” in the TWK store. The purchaser’s information is solely needed to generate a transaction receipt and is never stored in the system.

1.4.1 Reclassify Equipment Status as Offer for Sale: Systems changes the equipment status to "for sale" if it’s no longer fit for rental or if it crosses certain number of renting cycles.

1.4.2 Equipment Purchase Request: The customer requests to purchase the equipment.

1.4.3 Update Equipment Status: Updates the system with the new status once the equipment is sold. A new version of the same equipment might be bought by the store later.

1.4.4 Calculate Charges: Calculates the final price of the equipment for sale.

1.4.5 Accept Payment from Customer: Accepts payment from the customer for the equipment purchase.

1.4.6 Print Sales Receipt: Prints the receipt for the equipment sale.

Section 2 – Operational Management

2.1 New Equipment Procurement System

The Employee would periodically run an inventory report to get an idea of the equipment’s available in the store and if it falls under certain limit as predicted by the system, a new equipment purchases process takes place.

2.1.1 Run Inventory Report: Generates an inventory report to assess current equipment stock.

2.1.2 Calculate Total Price (Rental & Sales) of the Equipment: Calculates the total cost of new equipment being ordered.

2.1.3 Send Purchase Order to Supplier: Sends a purchase order for new equipment to the supplier based on the best quote sent by several suppliers.

2.1.4 Receiving Shipment: Confirms receipt of the ordered equipment from the supplier.

2.1.5 Attach Uniquely Numbered Inventory Tag: Assigns a unique inventory tag to each piece of equipment.

2.1.6 Enter Equipment Details in the System: Logs the details of each new piece of equipment in the system along with its retail cost.

2.1.7 Update Equipment Status: The Equipment gets registered in the database and the status is updated as available for rental.

2.2 Generating Reports

A part of operation management is getting monthly reports of data present in the central database belonging to the equipment's, rentals, sales and current stock.

2.2.1 Print Unreturned Equipment List: Generates a report of equipment that has not been returned by the customers who have rented it. The date of expected return is printed in this report along with equipment data.

2.2.2 Print Equipment Rental Report: Prints a report summarizing rental activities and rental volume.

2.2.3 Print Equipment Sales Report: Generates a report detailing equipment sales.

2.2.4 Print Current Inventory Report: Creates a report showing current equipment inventory. It helps in taking stock of current equipment's and can be used during the purchasing process.

Assumptions

- We have divided the system into back office (operational management) to look for after the equipment handling and the report generation tasks.
- The other half is the front office (customer experience) that contains all customer services.
- Central database is assumed to be the backbone of the operations of TWK the database contains records of the customer profile, equipment's, records of damages along with outstanding balances and deposits present with the company. This helps in providing real-time access to data to all the departments.
- Customer reservation done whether online, by phone or in person has similar reservation process and for the diagram we have assumed that the flow is uniform for all of them.
- If the equipment is requested for same day and is available, it is handed over and the equipment status is updated accordingly.

- The system periodically checks for equipment availability in the system and triggers a notification to the employees when the inventory numbers go below a certain threshold. Reports generated detailing the equipment's availability equipment damage status also help employees in taking this decision.
- All the receipts pertaining to the renting of equipment, reservations and sale of equipment's are standardised with the field being similar in all the receipts that the system generates. This helps in effective record keeping and minimal confusion to the customers as well as the TWK employees regarding transactions.
- Based on usage, wear and tear condition of equipment's they are reclassified from rental to sale, and this is done with minimal intervention by employees and possibly automated by system with the help of data gathered from equipment rental database.

[C] Context level Diagram (Coyle, Sharon., 2024)

The context level diagram below summarizes the entire TWK rental system and shows how data flows within the system boundary including the interaction with the external entities.

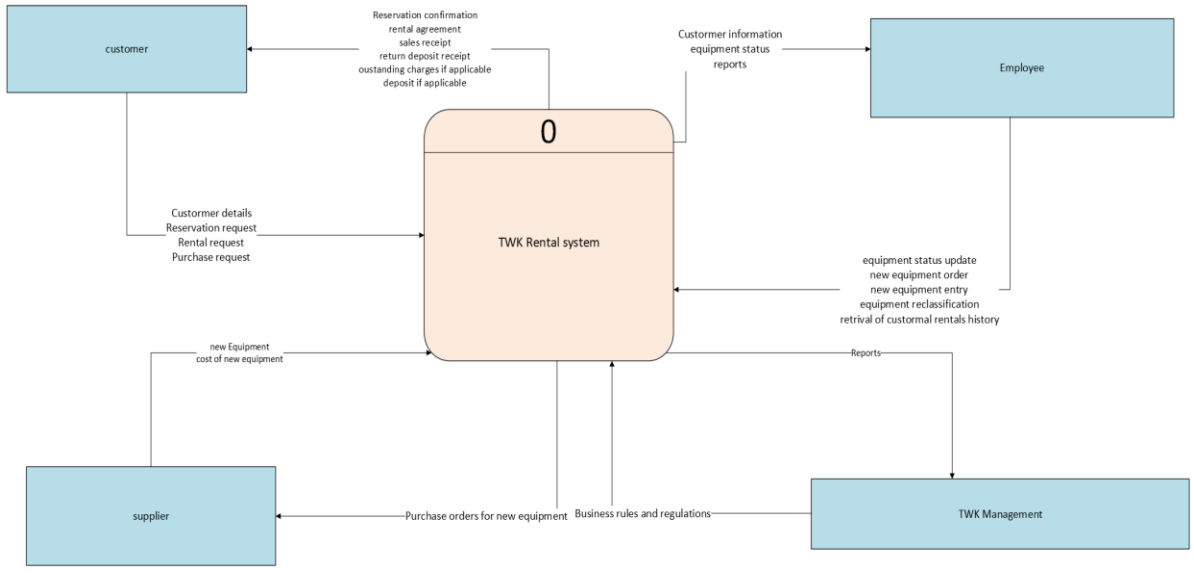


Fig 2. Context Level Diagram of TWK System.

The external entities are:

Customer: The customer interacts with the system when placing an equipment reservation request, renting the equipment, and placing a purchasing used equipment. In return the customer receives an equipment reservation confirmation, rental agreement, deposit receipt once the payment is made and any outstanding charges if applicable

Employee: The employee interacts with the system when retrieving customer details once a reservation or purchase request is made. The employee also checks the equipment status and generates reports from the system. The information from the employee to the system includes information related to inventory

management i.e., equipment status update, equipment reclassification, placing new equipment order and registering new equipment.

Supplier: The supplier receives purchase orders for new equipment from the system and provides the cost details of the new equipment and supplies the new equipment.

TWK Management: The management team receives various reports from the system and provides the rules and regulations that govern the operations of the business

Assumptions

1. There is a user interface used by the customer to place equipment reservations, rental request, and purchase request
2. TWK management team is solely responsible for formulating the business rules and regulations
3. The reports generated are used by the management to give an overview of the business performance
4. The reports are only generated by the employees.

[D] System Level DFD Diagram (Coyle, Sharon., 2024), (Draw.io Blog., 2024), YouTube (2023)

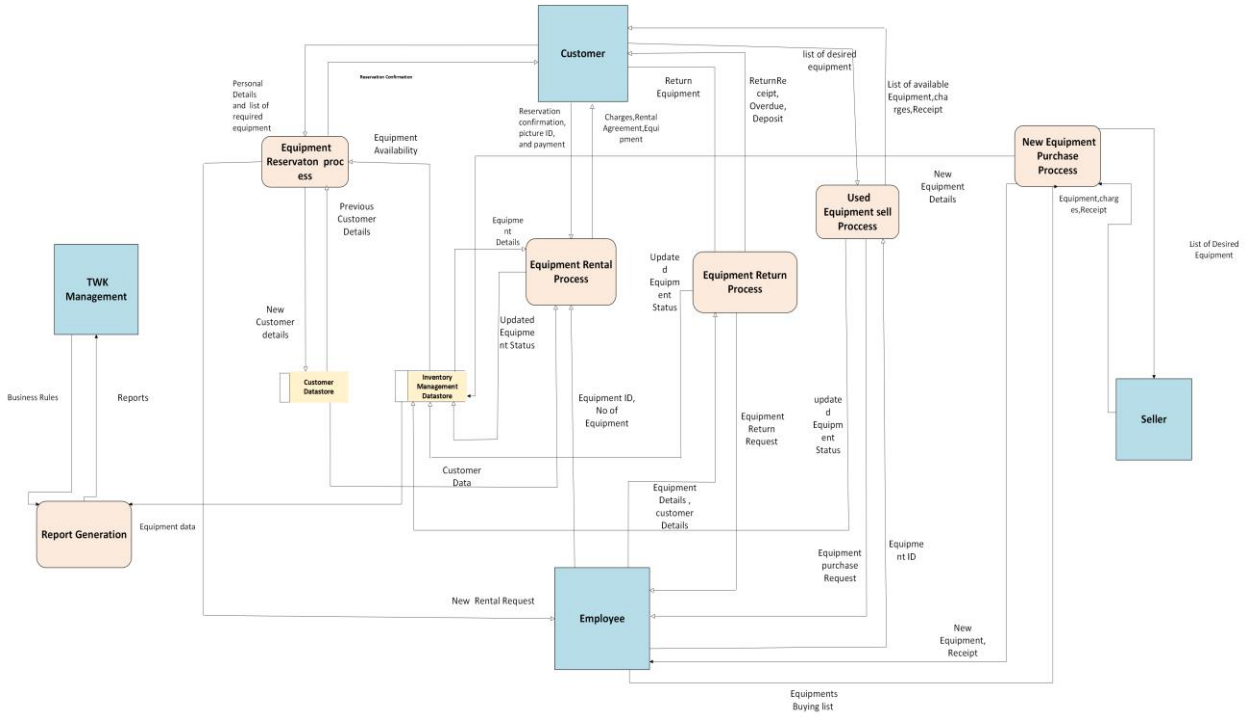


Fig 3. System Level Data Flow Diagram of TWK System.

Report: System Level 1 DFD

1. Overview: The System Level 1 DFD for TWK captures the main processes involved in managing the rental, return, reservation, and purchase of water sports equipment. The diagram highlights interactions between TWK's customers, employees, inventory, and management systems, providing a comprehensive view of TWK's operations in equipment rental and sales.

2. Data Stores and External Entities

- **Customer Datastore**: Stores customer personal and reservation information.
- **Inventory Management Database**: Maintains records of all equipment, including status, rental history, and stock levels.
- **Customer**: Requests for renting or purchasing equipment.
- **Employee**: Assist with processing of rentals, purchase and selling of equipment by accepting requests and managing inventry.
- **TWK Management**: Represents TWK's administrative team, which reviews reports and enforces business rules.
- **Seller**: An external entity that supplies TWK with new equipment.

3. Processes in the DFD

1. **Equipment Reservation Process**:
    a. Customers initiate equipment reservations by providing personal details, desired equipment, and reservation dates.
    b. Employees verify equipment availability and confirm the reservation if the equipment is in stock.
    c. The process involves the Customer Datastore to retrieve or add new customer information as needed.
2. **Equipment Rental Process**:
    a. Customers who reserved equipment come in to finalize the rental process.
    b. Employees retrieve equipment details and customer data (from the Customer Datastore) and update the Inventory Management Database to mark equipment as rented.
    c. Charges are calculated based on rental terms, and a rental agreement is provided to the customer.
3. **Equipment Return Process**:
    a. When customers return equipment, employees update the equipment status to "in stock" in the Inventory Management Database.
    b. Equipment is inspected, if damaged, appropriate charges are applied, and if late, a late fee is deducted from the deposit.
    c. Deposits are refunded based on the equipment's return condition.
4. **Used Equipment Sell Process**:
    a. Periodically, TWK retires older or worn-out equipment, which is then offered for sale.
    b. Customers select used equipment for purchase, and employees finalize the sale by updating the equipment status to "sold" in the Inventory Management Database and decrementing the stock.

c. No customer information is recorded for these sales, aligning with TWK's policy for used equipment sales.

5. **New Equipment Purchase Process**:
    a. TWK acquires new equipment as necessary, based on rental demand and inventory levels.
    b. Orders are placed with suppliers, and upon receiving new items, the Inventory Management Database is updated to reflect new stock and available rental items.
6. **Report Generation**:
    a. Reports periodically generated to assist with inventory management and financial reporting and submitted to management.
    b. These reports include inventory status, equipment usage and rental.

"You can find a clear explanation of functional decomposition on YouTube (2023), where they use real-life examples to show how systems can be divided into smaller parts."

Assumptions:

1) Customer History Availability: The system can instantly access and retrieve customer rental history upon request, enabling employees to quickly determine if a customer has rented equipment previously and check for any overdue or damaged returns.
2) Inventory Accuracy: The availability status in the Inventory Database is assumed to be up-to-date, accurately reflecting all equipment that is currently rented, reserved, or available for rental
3) Standardized Confirmation Receipt: The system is designed to generate a standardized Reservation Confirmation Receipt that includes all relevant details (such as rental dates, deposit amount, and pickup information) for clarity and consistency.
4) Centralized Database Access: It is assumed that employees have real-time access to a centralized database that contains customer information, rental history, inventory details, and reservation records.

[E] DFD diagram below System Level (Coyle, Sharon., 2024), (Draw.io Blog., 2024)

The below diagram illustrates how the data is flowing in detail for many processes of purchase system, and external entities which are customer, employee.

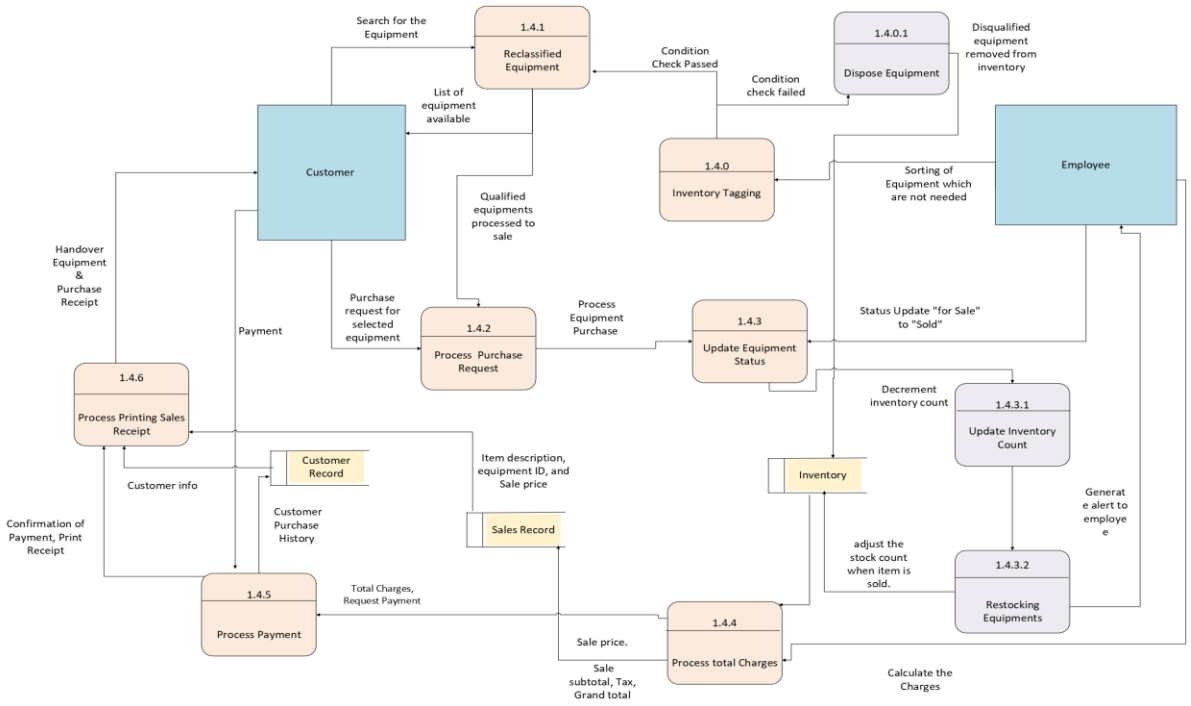


Fig 4. Data Flow Diagram for used equipment Purchase System.

The Processes and their breakdown are as follows:

1.4.0 Inventory Tagging

Only items that have been tagged and checked for quality can be sold. The employee takes care of the tagging and quality checks during the reclassification process. If the equipment does not qualify then it is disposed of and removed from the inventory.

1.4.1 Reclassification of equipment's for sale

From time to time the equipment is sorted by the TWK employee for sale after evaluating its condition or the number of renting cycle it has completed considering that they are not fit for renting. Customer searches for the equipment which he wants to buy in the system.

1.4.2 Equipment Purchase Request

When the customer searches for the equipment in the system and he finds the one which he wants to buy is for sale he sends the request to purchase the equipment.

1.4.3 Update Equipment Status

When the employee sees the purchase request, he/she updates the status for equipment from sale to sold and the inventory is decreased by the number of purchases.

1.4.3.1 The inventory is updated with every equipment sold and the count is decreased to update the status of equipment.
1.4.3.2 When there is a demand for a particular used equipment then the system sends an alert to the employee for restocking, when the stock drops below a set level.

1.4.4 Calculate Total Charges

The employee calculates the total charges by adding taxes and subtracting sale price with the help of item description and equipment ID from the sales record.

1.4.5 Accept Payment from Customer

The payment is requested from the customer, the customer data is required only to generate receipt, once the details are confirmed, the payment is done by the customer.

1.4.6 Print Sales Receipt

Once the employee receives the confirmation of payment, he prints the receipt of purchase and handover the equipment with receipt to the customer.

External Entities are:

Customer: Searches for the stuff he wants and chooses from the listed sales inventory, request for purchase, once the request is accepted, he checks for the total cost and makes payment. In return he gets the receipt after completion of the payment with the equipment.

Employee: Sorting of equipment's manually for sale is done by the employee which are not fit for further renting. Employee is responsible for the update of inventory. Additionally, employees interact with the system and calculate total charges for the equipment, adding taxes and deducting the sales discount.

Data Stores Used are:

Inventory: The detail of the equipment is stored in it, where employees can update the count of used equipment available for sale.

Sales Record: It has the details of each transaction payment which are needed for printing the receipt such as item description, equipment ID, sale price, taxes and total charges.

Customer Record: Here customer details such as name phone number are stored temporarily for the sole purpose of generating the receipts only.

Assumptions:

1. The system keeps an eye on how well each item is rented previously and after some cycles of renting it notifies the employee. Where employees sort the equipment's manually, it only gets moved to "For Sale" status after it's been looked at closely. Customers don't really get to see this part; it all happens behind the scenes by the system.

2. Customer searches for the equipment he wants and select the item of his liking, validating the equipment availability.

3. Total charges are calculated by the employee on the system, the charges are shown to the customer for confirmation of payment.

4.No customer information is stored for long periods; it is only needed for printing receipts.

5.When the confirmation of payment is received the printing of the receipt is done and the equipment is given to the customer along with the receipt.

[F] Unified Modeling Language (UML) Diagram (Coyle, Sharon., 2024), (Draw.io Blog., 2024)

The below UML diagram illustrates Equipment reservation system , which includes customer reservation process, equipment renting process and return process. According to FDD, all 3 process consider as renting equipment system so based on that Unified Modeling Language

Diagram is design.

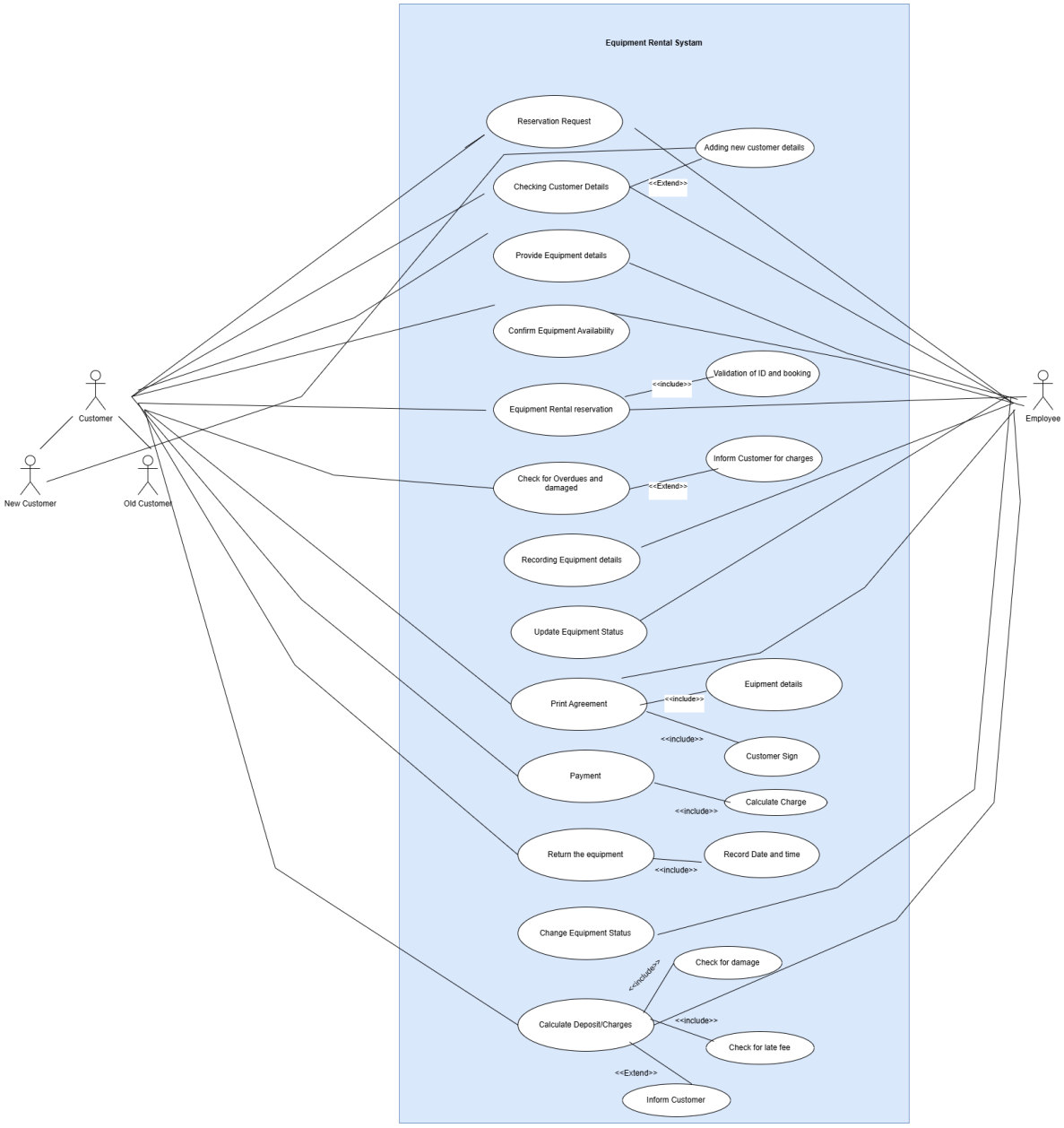


Fig 5. Unified Modeling Language (UML) Diagram of Equipment Renting System

UC Name : Reservation Request ID : UC-1 Priority : High
Actor: Customer, Employee
Description: The use case starts when customer wants equipment from Teton Whitewater. Customer request for renting the equipment with specific date and time. Employees provide

equipment details if available. In renting equipment, an employee takes customer identity and then checks for overdue and any damaged records for that customer. Employees record all information in the system of renting equipment and calculate the charges. In the return equipment process, checking for damaged and date/time, accordingly, calculate charges and inform customer.
Trigger: Customer request for reservation of equipment and get equipment from employee according to overall details should be stored in system. In the return process, equipment is returned.
Preconditions: 1.The customer's identity is authenticated. 2.Details of customers should be up to date. 3.New customers basic information is recorded 4.Equipment details should be up to date. 5.Employees need to check requested equipment as available or not 6.System maintains the record for each customers overdue and rental history.
Normal Course: 1.Customer request for equipment reservation. 2.Employee checks customer details. 3.New customers basic information is recorded 4.If equipment is available, then proceed with reservation. 5.Employee access customer profile. System displays past rental records and any outstanding dues. 6.Customer request for equipment details 7.Employee search details of equipment in the database and provide all the necessary information to the customer. 8.Employee start the reservation for equipment. 9.System display status that reservation is confirmed. 10.Employee checks the customer's rental history. System displays any outstanding overdue or damages 11.Employee saved all equipment details in the system with specification and condition. 12.System stored reservation information under the customer profile. 13.Employee update the status of equipment (rented, sold, in stock) 14.System reflects the updated status. 15.Employee generates the rental agreement including name and equipment details 16.System prints agreement with equipment details and terms 17.Employee provide the cost of equipment. 18.Customer will do payment. 19.In return process, employee inspect equipment and change the status 20.Customer get confirmation from employee about charges.
Postconditions: 1. The reservation is recorded in the system.

2. Customer reservation is confirmed and get equipment.
3. In return process, the customer returns equipment and pay the charges.

Exceptions:

E1: Equipment unavailable.
System displays "Equipment Unavailable" and suggests alternatives.

E2: Customer information not found.
Employee prompts customer to provide details.

E3: Equipment reserved by another customer.
System notifies employee of unavailability and suggests alternatives.

E4: System error in recording details.
Employee retries entry or logs details manually for later update.

E5: System does not update status.
Employee notes issue and contacts technical support.

E6: Payment failure.
System prompts customer to retry or use another payment method.

E7: Calculation error in system.
Employee manually calculates charges or escalates to support.

[G]Sequence Level Diagram (Coyle, Sharon., 2024), (Draw.io Blog., 2024)

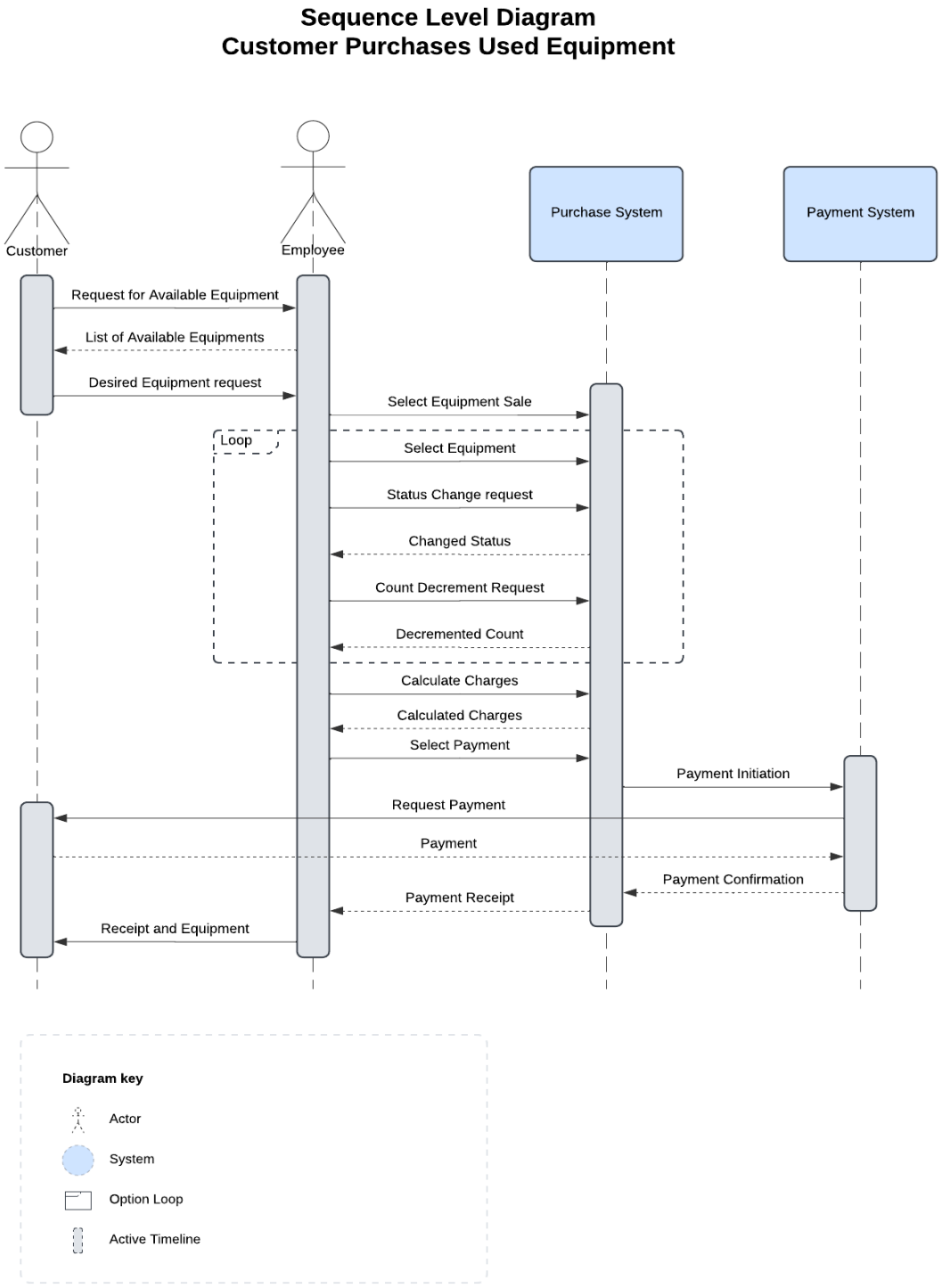


Fig 6. Sequence Diagram for used equipment Purchase.

1. Overview: This sequence diagram outlines the process by which a customer purchases used equipment from the organization. The main participants in this process are the Customer, Employee, **Purchase system** and the **Payment System**. The sequence illustrates the flow of interactions from equipment selection to payment and handing over the equipment.

2. Actors:

- Customer: The individual interested in purchasing used equipment.
- Employee: The staff member facilitating the sale.
- **Purchase** System: The platform used to manage inventory, calculate charges, and print receipts.
- **Payment System**: The platform used for payments and authorization of payments.

3. Assumptions:

- No Customer Data Storage: No customer information is recorded in the system as per the business process rules.
- Standard Pricing Policy: The sale price for each equipment type is standardized at 60% of the retail price, as per the business rules.
- Inventory Management: The system internally handles updates to equipment status and inventory counts.
- **Error Handling**: The system assumes that the equipment entered will be in stock as a list of available items is provided at the beginning.
- **Payment Failures**: The sequence assumes successful payment on the first attempt, without failures.

4. Process Flow:

- Step 1: Request for Available Equipment
    - The customer initiates the process by requesting a list of equipment available for sale.
    - The employee provides the list of available items to the customer.
- Step 2: Equipment Selection
    - The customer indicates the equipment they are interested in purchasing.
    - The employee inputs this selection into the system, initiating the sale process.
- Step 3: Status Change and Inventory Management
    - The system receives a Status Change Request to update the item’s availability from "for sale" to "sold." The system confirms the Status Change.
    - The employee decreases the inventory count for the selected equipment.
    - These steps are repeated for each equipment, to address this situation, a loop has been put.

- Step 4: Charge Calculation
    - Upon confirming the item is available, the employee calculates the charges for the selected equipment.
    - A standard calculation method applies, where the sale price is typically 60% of the retail price, per the business rules.
- Step 5**: Payment Handling**
    - Once the charges are calculated, the Employee initiates the payment process by selecting the "Payment" option.
    - The Payment System receives the payment request, and payment is requested from the customer.
    - The payment System then processes the transaction and confirms the payment.
- **Step 6: Receipt Printing**
    - After the successful payment, the Sales receipt is generated for all selected items and sent to the employee.
    - The system automatically produces a receipt with:
        - Header: Date and time of the transaction.
        - Detail Section: Item description, equipment ID, and sale price.
        - Footer: Total sale amount, tax, and grand total.
- **Step 7: Receipt and Equipment Handover**
    - The employee provides the customer with the receipt and the purchased equipment.

[H] Conclusion

We have gained a better grasp of how the Teton Whitewater Kayak Rental System works by modeling it. When we created the functional Decomposition Diagram, we pointed out the main processes and the smaller ones involved in handling rentals, returns, and equipment inventory. The context-level Data Flow Diagram showed us the big-picture interactions between outside entities and the system. Meanwhile, the system-level and lower-level DFDs explored how data moves and connects through various system processes.

Our UML diagrams, the Use Case and Sequence level Diagram, highlighted key operational workflows and interactions. These diagrams also identified critical paths and user interactions, aiding in optimizing system efficiency. During the modeling process, we made assumptions that simplified real-world complexities for clarity and maintainability. In conclusion, this assignment provided valuable insights on how system processes can be modelled in a real-world environment.

[I] Feedback from Peers

Peer Review and Suggestions from **Group 22** on Wednesday, November 6th, at 1:05 PM

Group 6

Peer Review and Suggestions

Your report provides a detailed view of Teton Whitewater Kayak's (TWK) operations, covering key customer and employee interactions through a range of diagrams. The organization and clarity in the Functional Decomposition Diagram (FDD) and Data Flow Diagrams (DFD) are strong points, and the step-by-step explanations make each process easy to follow.

Here are a few specific suggestions based on our approach that might help enhance your draft:

Consider Adding an Overall Assumptions Section: While your report includes assumptions in various sections, consolidating them into a single Assumptions section could create a unified overview for readers at the start. This approach helped us avoid repeating assumptions across diagrams, creating a clear foundation before diving into each diagram.

Expand on Key Process Areas in the FDD: Your FDD is well-organized, with processes split into "Customer Experience" and "Operational Management." Adding brief descriptions or key steps within each main area, similar to what we did, could make the process flow even more apparent to readers.

Detail the Reporting and Notification System: In our report, we outlined specific types of reports (e.g., monthly rental summaries, inventory restocking) and notifications (like overdue reminders). Adding similar specifics would emphasize the system's functionality in tracking, alerting, and supporting real-time decision-making at TWK.

Clarify Employee Roles in the DFD: While grouping all tasks under a single employee role is practical, showing how tasks might be split across roles (like inventory manager vs. customer service rep) can add realism. We found this differentiation useful to clarify responsibilities and show how TWK staff manage their daily tasks.

Enhance Inventory Management Details in the Lower-Level DFD: Your breakdown of the purchase system is clear, but adding more steps for inventory tagging, restocking, or condition checks could better represent how TWK keeps its stock organized and up-to-date.

Peer Review and Suggestions from **Group 20** on Tuesday, November 5th, at 7:29 PM

Peer Review on Group 6

Diagram A:

1. The diagram isn't readable. I would suggest you to input the image into the final report in some other way so its much more clear.

2. I would suggest you add the link in order for the reader to access the diagram in case its difficult to view the diagram clearly through pdf document.

Diagram B:

1. We believe there is lot of information in the context level diagram than supposed to be. Processes with fewer significance in terms of context level diagram could be removed.

2. Too Many Specific Data Flow Labels as there are a lot of labels mentioned in a single line process. This could be reduced.

3. The label "Business rules and regulation" may not be needed in this diagram, as it a very broad aspect and may not be used in a context level diagram.

Diagram C:

1. Some data flows seem unclear or overly complex. For example, tracing where data flows are initiated and where they end due to crossing lines is challenging.

2. Some process names such as "Charges Records Datastore" can be confusing. It would be better to name it something else.

3. There are multiple datastores present in this diagram. Datastores such as "Rental Record Datastore," "Inventory Datastore" could be combined maybe to share similar information more efficiently.

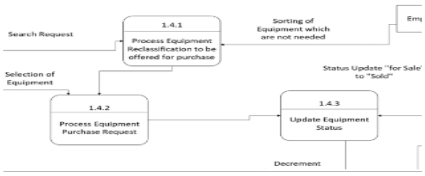
4. Differentiate employee tasks (e.g., handling customer interactions) from supplier tasks (e.g., equipment provisioning) which could really help illustrate both of these entity's role more effectively. In the current stage it looks a bit confusing.

5. Some labels, like "Print Monthly Rental Reservation Reports" and "Print Monthly Sales Report," seems redundant or could be consolidated under broader labels like "Generate Reports."

6. Since this is a really complex diagram, you can try providing the reader with context such as legends, instead of descriptive information about each processes.

Diagram D

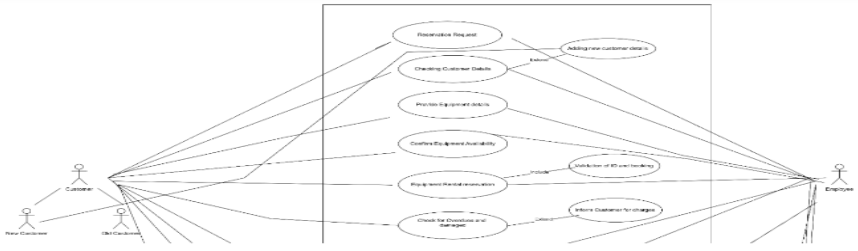
1.



To make a diagram easier to read, you can shorten and simplify the process labels, which are quite large.

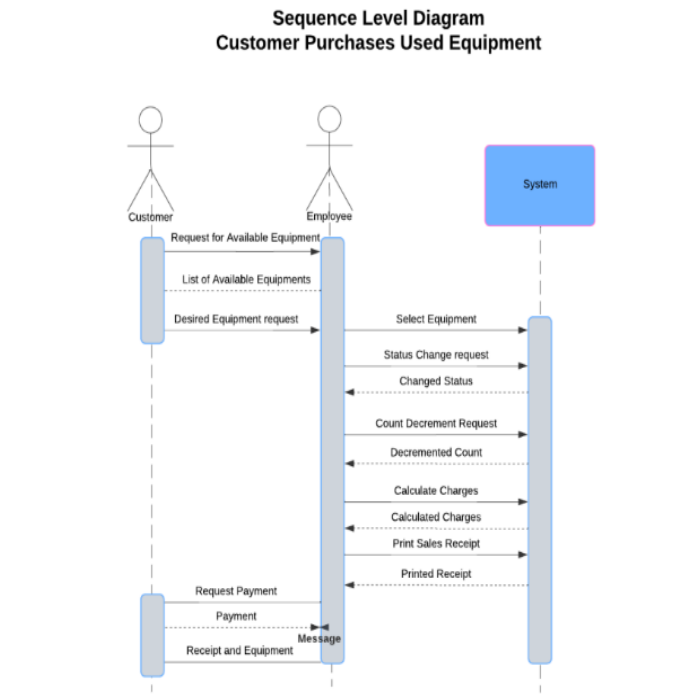
2. Customer history can be added before renting the equipment. What if the customer has returned damaged equipment previously or has pending payment.

Diagram E



1. Some Use Case Relationships are not well defined and labelled. Eg. In diagram, 'Checking Customer details' or 'Provide Equipment Details' are linked to both actors (Customer and Employee). Could use more descriptive associations to clarify how the use cases interact with each other.
2. Avoid overlapping or crossing lines as much as possible, as they make the diagram difficult to follow for better and cleaner appearance. Ensuring that each line correctly represents the flow of interactions between an actor and a use case will provide better accuracy.
3. Double-check that associations are properly linked to the relevant actors and use cases, ensuring clear start and end points for all connections.

Diagram F:



Positive Feedback.

1. The diagram correctly identifies and uses different actors, like Customer, Employee, and System, and aligns each with specific tasks. The segregation improves clarity and adheres to conventions commonly seen in interactions between these systems.

2.The diagram includes elaborate interactions, such as the "Status Change Request ", which proves that consideration of care is given to the process of inventory management and its updates in the system.

3.The final message "Receipt and Equipment" is well placed, pointing toward the end of the processing of transactions.

4. The diagram correctly depicts the system responses to employee actions. For instance, the "Printed Receipt" for "Print Sales Receipt" shows task automation.

Areas of Improvement:

1. Line Types: In the given diagram, there is an inconsistency between the use of solid and dashed lines. Best practice denotes that requests or actions sent by the actors will use solid lines while responses or data returned uses dashed lines. In the diagram, both types are mingled, which may be confusing.

2. Lacking Labels for Each Step: While the interactions are named, they lack the step labels correlating to the narrative process flow, such as Step 1: Equipment Request. This would make the diagram much easier to cross-reference against the documentation.

3. Ambiguity in the payment step: The process of making a payment can be ambiguous. It needs to be better designed in such a way that the employee is witnessed getting the payment from the customer and not that the payment is just "requested."

4. Explain the content of the receipt: Indicate the content on the receipt in terms of date, description, total amount in word/s or commented on its comprehensiveness.

5. Exception Handling for Items Out of Stock: Currently, there is no handling of edge cases, such as when the customer chose an item that is no longer in stock. Inclusion of an optional path to handle items that are unavailable would further make the diagram more robust.

6. Physical handover of receipt and equipment: Sometimes, it is useful to graphically indicate the completion of the process by providing a final interaction that includes the employee physically handing the receipt and equipment over to the customer.

[J] Changes and Enhancements Based on Peer Feedback

Peers have suggested we include more about inventory management, like tagging and checking item conditions. This is relevant for buying. For purchases, it would show how the handling of items, checking their quality, and preparing them for sale is done, which fits well with our first assumption. We **have implemented it** to the lower level DFD.

The peer group 20 suggested adding customer history but we **assumed** that for used equipment purchase we will **not record customer info**rmation as TWK is selling the used equipment's only. Additionally, when someone is buying equipment, it's usually **not important** to look into any past rental problems, like damaged returns. These things are mostly related to rentals, not for used equipment purchases. So, if a customer is buying something outright, past rental issues probably won't affect the sale of used equipment.

In our UML sequence diagram, Initially, for the scenario, if a customer submits a request for multiple pieces of equipment. Based on the feedback we received, we added a loop construct that iterates for each equipment request. As per the feedback payment process was ambiguous in our initial design, to address this issue new Payment system is introduced in the diagram to clearly represent the payment process.

The feedback also helped to improve other parts of report as well, for example, in our System level Diagram, initially it was a bit complicated because we added lot of Datastores namely charges and Records Datastore which were making the Diagram complex. Based on the feedback we received, we minimized the Datastores wherever possible to make it more understandable and also changed the flow a bit according to the updated Diagram.

[H] Thoughts on Learning in Groups

AKSHATA GHUMATKAR

Teaming up with my group members really helped us create a friendly atmosphere where we could share ideas, clarify our thoughts, and fine-tune our approach. By chatting together, we could take on challenging tasks, for instance, when we created the Function Decomposition Diagram (FDD), we all made our own drafts, showing our **different viewpoints**. By discussing and finding common ground, we managed to combine our ideas into one model that reflected everyone's contributions. This supportive setting made me feel more confident and improved my ability to think critically as I encountered various viewpoints from the group.

Leadership was important in how our group operated. Different people stepped up to lead discussions, making everything flow more easily and helping us take responsibility for the project. Also, the feedback we received from other groups was truly valuable. It highlighted aspects that we had overlooked and confirmed that we were heading in the right direction. Overall, learning from each other made me understand the material better, boosted my confidence in modeling, and helped me improve my skills in teamwork and leadership.

MARY WINNIE MUGAH

Working with my group members has been an enriching experience. With each meeting I got a deeper understanding of how to model the different diagrams. Each member brought their own strengths which contributed to producing the final assignment. It was also quite interesting producing the final diagram as each one of us had a unique perspective on the flow, for instance when working on the FDD we all had different models but through collaboration we were able to produce a final diagram that reflected our work as a team. Our approach as a group where we would agree in advance on the diagram we were working on, and each member was expected to represent their work, really helped in gaining individual modelling skills for the different diagrams.

The peer reviews from the other groups were also beneficial as it helped us identify some areas of improvement that we could have missed in our draft which helped us to refine our final output to a better version. The positive feedback received was also a sign that we did the assignment in the right way. In conclusion, peer assisted learning has influenced my collaboration and critical thinking skills. I have understood the modelling part of the module better compared to when we went through the topics in class.

AMIT KUMAR

Working on this assignment with my peers was an enriching experience. Coming from diverse backgrounds, each of us has different strengths. We helped each other in various aspects, whether it was brainstorming ideas, tackling technical challenges, or refining our diagrams. One of the challenges we faced early on was that each of us had a different approach to the assignment. For example, we debated how detailed our Functional Decomposition Diagram (FDD) should be, whether to treat management as an external entity, what data stores to include in our system-level diagram, and the appropriate use cases for our UML use case diagram. We had our disagreements, that encouraged us to do more research, helping us understand the concepts more thoroughly and leading to conclusions.

The feedback we received from other groups also played a crucial role in shaping our work. It was constructive and helped us identify where we were off track or had missed any point. For example, in our initial draft, the FDD image lacked clarity. Similarly, we had too many processes in our system-level diagram, which made it complicated. With feedback, we redesigned it to make it more streamlined. Our UML sequence diagram was missing the condition where a customer could purchase multiple equipment, so we included a loop into our final version.

Through this process, I learned the immense value of collaboration and how much we can learn from each other. Working together, we pushed each other to be better, challenged each other's ideas, and enhanced our understanding of the Concepts. The experience has not only improved our report but also deepened our knowledge.

PRATHAMESH RAJESHIRKE

Contributing to this project as a team has been nothing but awe-inspiring and revealing. Specifically, it was essential that all members of a team knew their role and delivered to their best capacity, quickly achieving the shared goal .One such Instance is we decided that each team member would create a FDD diagram and then we could compare everyone's Diagram and then come up with a final Diagram considering everyone's point of view embedded inside it . My peers helped me in understanding where I went wrong with different Diagrams which made me understand each Diagram thoroughly.

The feedback we received from other groups also played a crucial role in shaping our work. It was very informative and helpful, which helped us identify where we were off track or had anything missing with respect to the project. For example, in our initial draft, the FDD image lacked clarity. Similarly, we had too many processes in our system-level diagram along with Datastores which were not needed, so they suggested not to make more datastore and reduce the datastores if possible. With feedback, we redesigned it to make it more streamlined. Our UML sequence diagram also had some small changes, which we got from the peer group. These changes helped us to know where we were going wrong and helped us make our Diagram's precise.

The more we worked as a group the more we grew and learnt. We motivated each other to achieve more by engaging in constructive dialogue, examined views objectively and sharpened our knowledge base. Finally, it helped us become more knowledgeable in the studying of these Diagrams. These are the processes that enhance the benefits of collaboration and expose the wisdom gained from the interrogation of alien thought contents.

SOHAM TAMBDE

I learnt a lot of things working as a group for this assignment as well as the peer review process. It helped me understand how a group of individuals can take a humongous task and break it down to tiny bits and work on them individually while bringing the learning that they had to the table and sharing it with others. This point especially helped me with the knowledge gaps that I did not even realize I had. Once such instance is the use of UML and the table explaining the different processes. I struggled with the concept of "include" and "extend" in this diagram and a groupmate of mine helped me understand it better as she had developed a strong suite in it.

The next lesson was time management. Initially we weren't strict on timelines and took it casually but quickly realized we wouldn't be able to complete the assignment with this approach. We started with charting a proper timeline with meetings and days dedicated to personally working on the assignment as well as working on it as a group. This helped me learn the importance of defining proper timelines and sticking to it.

Working in a group, I was constantly bombarded with views that were drastically different from mine. We had an approach of constructively criticizing the work that was done by all of us. This was hard to hear but that helped me look at my own solution from a different perspective and find issues that I was not able to pinpoint initially. The group review feedback from other groups also helped in regards. There were some good points that were given to us, and we made sure to analyze those and work on them accordingly.

There were a few difficult times while working in a group where I would not agree with a style of working of my peer or maybe the feedback that they gave and that made me understand how at times empathizing with our peers could help me solve the differences. I feel this is a major learning since at a workplace I would encounter these situations a lot of times and I should know how to tackle those effectively and work with those difficult colleagues.

I feel like I learnt a lot of important lessons and I would use these learning to work on my individual assignments not only for SDPM but also for all other subjects.

DHANASHREE BHANDARI

Working with team on this project is such an enriching experience for me. I was able to explore many viewpoints from team and able to utilize our abilities to produce excellent diagrams. For instance, we individually created each diagram and compare with others diagram and got to know various structures of it. By discussing several drafts and finding points of agreement to produce a cohesive version, I improved my understanding and boosted my confidence in my abilities to approach difficult tasks with a collaborative viewpoint. System level diagram is bit complicated so from teammates I understand it better rather than struggling. Hence, teamwork is best to help and understand various concept and got to know about more point of views of individual.

Peer review feedback is one of the helpful improvements in our work and we were definitely on the right path. From the feedback, we were able to know the issues and what we can do to make it better than the previous one. This feedback directly led to changes like inserting conditions in the UML sequence diagram, simplifying the system-level design, and streamlining data stores. I learned how peer review process is vital and helps us to improve our work and make it clearer and more concise.

Considering all points, group work helps me to learn time management, leadership, and cooperation skills, which is very helpful in the corporate world. Staying on course required making and adhering to timelines, and I improved my time management skills.

Sources:

- Valacich, Joseph, et al. *Essentials of Systems Analysis and Design, Global Edition*, Pearson Education, Limited, 2015. *ProQuest Ebook Central*, https://ebookcentral.proquest.com/lib/nuig/detail.action?docID=5174420.
- Coyle, Sharon., 2024. *System Development Life Cycle.* Lecture slides. University of Galway.
- Al-Fedaghi, S., 2016. Design functional decomposition based on flow. In 2016 IEEE International Conference on Systems, Man, and Cybernetics (SMC), pp. 002693-002698. IEEE.
- Akshata Anil Ghumatkar, 2024. Group 6_Initial draft of the TWK Group Assignment., National University of Galway.
- YouTube, 2023. Functional Decomposition.
- Available at: https://www.youtube.com/watch?v=i5JNUlfzRMg
- Lucidchart, n.d. Data Flow Diagram.

  Available at: https://www.lucidchart.com/pages/data-flow-diagram

- Draw.io, n.d. UML Diagram Tools. Draw.io Blog.

  Available at: https://www.drawio.com/blog/uml-diagram-tools

- Lucidchart, n.d. UML Sequence Diagram.

  Available at: https://www.lucidchart.com/pages/uml-sequence-diagram

  Available at: https://www.youtube.com/watch?v=pCK6prSq8aw

i