Hong Kong Institute of Vocational Education
Department of Information Technology
HD in Software Engineering
ITP4915M System Development Project
(2022/2023)

Case Study

1. Introduction

The purpose of this Case Study is to provide students with material regarding a business-oriented project in ITP4915M System Development Project of the full-time Higher Diploma courses in Software Engineering.

2. Student role

You are the one of the software developers of a medium-size software consulting firm in Hong Kong. The firm aims to provide tailor-made software development services to the clients. A software development project of a Company called Yummy Restaurant Group Limited is assigned to your team.

3. Supervisor role

Students are divided into groups. Each group of students has a supervisor who monitors the ongoing project work.

The role of the supervisors in classes is two-fold. Firstly, the supervisors monitor the progress of students against the student groups' plans by means of weekly progress meetings. Secondly, they are to help students by offering advice and suggestions. There is no model answer to the project; students will not be told what to do but to find out themselves what and how to do. They will, however, be guided so that they remain within the given terms of reference to enable them to follow reasonable or practical methods of solution.
Supervisors will, in addition to their supervisory role, also give technical advice. During class contact hours, supervisors will, to some extent, "wear two hats". Supervisors will be expected to give opinions or suggestions to students. It is up to the students to decide which opinions, if any are most useful to them. When offering suggestions, supervisors must bear in mind that only the staff member playing the respective case study role can give approval to the proposed solution, which is specifically the responsibility of that role.

4. Assessment

There is a business-oriented project in the ITP4915M System Development Project. The assessment of the project is continuous, with weighting of 7:3 in favor of the individual contribution (i.e. 70% for individual marks and 30% for group marks).

Each student will be assessed in the following four components, plus presentation of their work in progress and supervisor-student meetings.

The four components for individual assessment in the business-oriented project are:

- a feasibility study report and a system development proposal (after investigation and requirements elicitation) – Requirements Specification;
- an analysis report, an architectural and database design and an implementation plan (after initial design) – Initial Design Specification;
- a software product and
- a technical documentation (after development).

Normally, there are 3 - 4 students in a project group. Each student member of a group acts as the coordinator for one of the four components and its associated submission of work. However, each group member will be individually assessed in every component. The group marks for a project is derived from the final product which is comprised of a software product, a full set of technical documentation and oral presentations. The assessment factors and mark allocations are detailed in Teaching Plan. The breakdown of the individual and group marks will be distributed to students in due course.

5. Project Work Structure

The business-oriented project work is a group exercise which lasts for around 20 weeks. However, for assessment purposes and formal progress monitoring, of both group and individual, it is divided into four major stages that are:

Stage One: Feasibility study and a System Development Proposal;
Stage Two: System analysis and System design;
Stage Three: First Prototype
Stage Four: Second Prototype and Technical Documentation.

The deliverable(s) of each stage are as below:

Stage	***Deliverable(s)***
One	Requirements Specification
Two	Design Specification
Three	A software prototype
Four	A software product and a technical documentation

6. Case Study Scenario

6.1 Profile of the Yummy Restaurant Group Limited

The Yummy Restaurant Group Limited is a catering company. It has grown into one of the largest catering company in Hong Kong. The Group provides diversified services including Chinese Restaurants, Western Restaurants, Japanese Restaurants, Conveyor-belt Sushi Restaurants, Fast Food Restaurants and etc. It has over 10 brands and around 100 restaurants in 2021.

In year 2022, the Head of Information Technology Department suggested to deploy an integrated system to reduce overhead and risk of data inconsistency. In this project, an IT team is required to develop a centralized Procurement system; therefore, all Restaurants will send their request to the centralized system by the Restaurant Manager.

6.2. Overview of Procurement Procedure

After System Integration, the procurement procedure will be centralized, therefore all Restaurants, including Chinese Restaurants, Western Restaurants, Japanese Restaurants, Conveyor-belt Sushi Restaurants, Fast Food Restaurants and etc, will send their request to the centralized system by the Restaurant Manager.

Ordering process

Requests sent to the system will be queued up and a Request Mapping procedure will be processed three times a day either manually by Purchase Manager (or known as Buyer in some ERP Systems) or automatically by System (according to rules set by Purchase Manager).

The request is processed with the following rules:

1. Request may be mapped to a Despatch Instruction only if warehouse has stock. If stock is available in warehouse, he/she may ask warehouse to deliver items to Restaurant instead of generating a Purchases Order.
2. Otherwise (if there is no stock), the request will be mapped to an appropriate and valid **Blanket Purchase Agreement (BPA)** depending on the Purchase Manager's choice, generating a Blanket Purchase Release to be sent to Supplier.
3. If there is no appropriate and valid BPA, Purchase Manager will check whether the coming Planned Purchase Order suits Restaurant's request. If not, the manager will create a **Standard Purchase Order**.
4. Another possibility for creating a purchase could be a **Planned Purchase Agreement** with Supplier pre-designed by Purchase Manager. In this case, items from Supplier are usually delivered to the warehouse, but for some special case or urgent needs, the shipping address can still be changed to Restaurant in the Schedule Release.
5. All Purchase Order (Blanket Purchase, Planned Purchase and Standard Purchase) will be sent to Supplier for purchase and Accounting Department for further process.

Item checking process during and upon delivery

After the mapping is made, the Restaurant Manager can check the status of the request and obtain references, such as Delivery Note Number (from warehouse) or Purchase Order numbers (usually printed in Supplier's Delivery Note). For Planned Purchase Order, Warehouse Clerk in warehouse can also check the status of the Purchase Order issued to supplier. Upon delivery of the items, Restaurant Manager can match the delivery note with the request easily. He/she can then sign on the delivery note, keep a copy of it and record the received quantity in the System.

Accounting process

Signed Delivery Note (from Supplier) will be sent to Accounting Department daily. Accounting Clerk will check the Delivery Note and Invoice received from Supplier. If they are matched, Accounting Manager will complete the payment and update the status of the Purchase order.

7. Appendix

The definitions of the business terms and details of the attributes are listed below.

7.1. Purchase Agreement

In our system, there are two kinds of Purchase Agreements: Blanket Purchase Agreement and Contract Purchase Agreement. A Blanket Purchase Agreement is an agreement made by a Seller (Supplier) to a Purchaser (Purchase Manager or Buyer), reporting that on a specific date, terms, for a particular sum of money or other value received, and a specific item of personal, or parcel of real, property that Supplier sold to the Purchase Manager which he had lawful possession.

A Contract Purchase Agreement is an agreement with Suppliers to agree on specific terms and condition without indicating the detail of goods that you will be purchasing, such as quantity, price...etc. Purchase Manager can later issue Standard Purchase Orders referencing your contracts.

Details of these Purchase Agreements will be explained below.

7.1.1. Blanket Purchase Agreement

Blanket Purchase Agreement (BPA) is made when Purchase Manager know the detail of the goods that you plan to buy from a specific supplier in a period, but do not know the detail of the delivery schedule yet. BPA is used to specify negotiated prices for items before actually purchasing them. Sometimes it specifies also Price Break information.

The items in BPA usually have discount compared to the one in Standard Order and Purchase Agreement is a legal document that should be fulfilled. Therefore, most Purchase Manager usually map request to BPA before Standard Purchase or use stock in warehouse.

The Header of a BPA includes the Purchase Order Revision, Created Date, Effective Dates, Supplier Information (such as name, address, contact person…etc), Buyer's Information (such as name, billing address…etc), Amount Agreed, Currency, Terms and Condition…etc.

The Lines of a BPA includes the details of goods such as Supplier's Item ID, Item Description (Buyer's Item ID maybe included here), Promised Quantity (for Contract, Quotation may leave this blank), Unit of Measurement (UOM), Minimum Order Quantity (MoQ), Price, Amount, Category, Reference…etc.

The Price Breaks includes the quantity, price break, discount, effective date.

A Blanket Release against a BPA can be issued to place the actual order as long as the release is within the blanket agreement affective dates. Blanket Release can be created manually or automatically by system according to rules preset by Purchase Manager.

A Blanket Release contains all the information stated in the BPA, in addition, it provides also Release Number, Blanket Release Created Date, Shipment Information (note: Supplier delivers items to Restaurants directly), Expected Delivery Date, Account, Actual Amount, Actual Quantity of Items.

In some cases, if the BPA cannot be completed (fulfilled) in the specified period, Purchase Manager may negotiate with supplier to extend the period or reduce the amount or quantity.

7.1.2. Contract Purchase Agreement

A Contract Purchase Agreement is an agreement with Suppliers to agree on specific terms and conditions without indicating the detail of goods that is to be purchase. Purchase Manager can later issue Standard Purchase Order referencing the contracts. Therefore, a Contract Purchase Agreement only includes Contract Number, Created Date, Effective Dates, Supplier Information (such as name, address, contact person…etc), Buyer's Information (such as name, billing address…etc), Terms and Condition, Item information (without purchase detail such as quantity, price…etc). Note that Contract Purchase Agreements are directly referenced on Standard Purchase Order Lines.

7.2. Planned Purchase Order

Items in Planned Purchase Order are usually consumables such as chopsticks in Japanese Restaurants, Table Paper in Fast Food Restaurants and…etc. Besides, items are usually General Items and some F&B (Food and Beverage) items, which can be kept for a longer period. To save storage space in Restaurants, items are usually delivered to warehouse.

A Planned Purchase Order is a long-term agreement committing to buy items from Supplier. Purchase Manager must specify tentative delivery schedules and all details for goods that he wants to buy including charge account, quantities and cost. Shipments Information is optional in Planned Purchase Order. In our systems, we set the shipment address to warehouse by default in Planned Purchase Order, but for some special case or urgent needs, the shipping address can still be changed to Restaurant in the Schedule Release.

The Header of a Planned Purchase Order includes the Purchase Order Revision, Created Date, Effective Dates, Supplier Information (such as name, address, contact person…etc), Buyer's Information (such as name, billing address, account…etc), Tentative Schedules (such as weekly, monthly), Amount, Currency, Terms and Condition…etc.

The Lines of a Planned Purchase Order includes the details of goods such as Supplier's Item ID, Item Description (Buyer's Item ID maybe included here), Quantity, Unit of Measurement (UOM), Price, Amount, Category, Reference…etc.

Shipment Information such as Delivery Address is set to the warehouse by default, but can be modified in Schedule Release.

A Schedule Release against a Planned Purchase Order can be issued to place the actual order according to the tentative schedule. The actual delivery schedule can be a few days different from the tentative schedules, but usually not more than three days. A Schedule Release contains all the information stated in the Planned Purchase Order, in addition, it provides also Release Number, Schedule Release Created Date, Expected Delivery Date.

7.3. Standard Purchase Order

Purchase Manager generally creates a Standard Purchase Order for one-time purchase of various items, such as decorations in Restaurants. If the items are delivered to Restaurant, Restaurant Manager can also check the items that he/she is going receive. It contains details of the goods that is required by Purchase Manager such as quantities, amount, account, delivery schedules and shipment information.

The Header of a Standard Purchase Order includes the Purchase Order Number, Created Date, Effective Dates, Supplier Information (such as name, address, contact person…etc), Buyer's Information (such as name, billing address, account…etc), Shipment Information (note: Supplier delivers items to Restaurants directly), Expected Delivery Date, Terms and Condition.

The Lines of a Standard Purchase Order includes the details of goods such as Supplier's Item ID, Item Description (Buyer's Item ID maybe included here), Quantity, Unit of Measurement (UOM), Price, Amount, Category, Quotation No., Contract No. (if it is generated from Contract Purchase Agreement), Reference…etc.

7.4. General Requisitions

General Items are items that are not F&B (Food and Beverage), such as Chopsticks, Table Paper, Plates, Bowl…etc. Item ID is unique for different items, for example the Item ID of 12" Plain Plate and 12" Plate with Logo is different. Category Manager manages the category hierarchy by creating and modifying categories. The category hierarchy organizes products offered by different Restaurants, for example Plain Plate may share across different Restaurant, but Plate with Logo can only be used in a Restaurant with that brand. The Category Manager also manages products, expected inventory records, supplier information, inventory, return reasons…etc.

In a Restaurant, only the Restaurant Manager can login to the system to send request to the system (in future, after other components are developed, other staff can also login to the system to do different tasks, but for procurement that we are now considering, only Restaurant Manager can login to the system).

- Since there are many items associated with Restaurant, the system must provide a user-friendly interface to work with. The Chief Operation Manager suggests the following:
- A search function must be provided to search an item by different attributes, such as Category, Item Name, Item ID…etc.
- The system can show Recent Requested Items when entering a request. The period can be customized by the Category Manager for different Restaurants.
- Restaurant Manager may input the Item ID manually and the system should check if the Item is valid to the Restaurant to prevent incorrect request.

A request should at least include Restaurant Information, Staff Information, Request Creation Date and Item Information such as Item ID, Quantity, Expected Delivery Date and remark.

When a request is sent, it will be put in a queue for Request Mapping (See Section 5.8). The Restaurant Manager can view recent request and request history anytime. He/she is also allowed to edit the request before the mapping process take place or the request cannot be handled (failed request). The status of the request will be shown to Restaurant Manager clearly, such as waiting for process, delivering, completed…etc. Besides, after Request Mapping is done, P.O. Numbers or Delivery Note Numbers will be assigned to the request line with other shipment information. *P.O. Numbers* are assigned when the request is handled by Purchase Orders, such as Blanket Purchase Order, Standard Purchase Order and sometime Planned Purchase Order. *Delivery Note Numbers* are assigned when the request can be handled by warehouse. Therefore, when items are

received from Supplier or Warehouse, the Restaurant Manager can check the request with the corresponding delivery note easily (Delivery Note from Supplier is expected to have P.O. Numbers printed on it). Depends on Supplier's system, one Delivery may serve more than one request and one request may also divided into a few deliveries. After verification, he/she will mark down the number of items received in the system and corresponding stock count will be updated. He/she can also check and update the stock count anytime.

Chief Operation Manager suggests that all transactions are better to be logged in order to trace the workflow easier. Besides, he also suggests having notification service to remind Restaurant Manager for some events, such as expected delivery date has passed but no item received yet.

7.5. Food and Beverage Requisitions

Food and Beverage (F&B) Requisitions is similar to General Requisitions, however the Item ID entered by Restaurant Manager is virtual. The **virtual Item ID** will be mapped to a real ID in the system according to Category Manager's setting, then the real ID will be used for Request Mapping. Note that, on the P.O. or delivery note send to restaurant, it still shows the virtual Item ID, so the Restaurant Manager can check the inwards item easier.

The purpose of using virtual Item ID are two-folded. Since the F&B items and its supplier may change often from time to time, by using virtual Item ID, it is not necessary to inform all Restaurants to make the change frequently. For example, if the Category Manager wants to change the brand and supplier of potato for all Fast Food Restaurants, he does not need to inform all the Restaurant to change to Item number for potato, but just modify the virtual Item ID mapping. This also makes the work of Restaurant Manager easier. Secondly, Restaurant Manager may shift to different Restaurant brand within the group, but the code of the same item remains unchanged, for example, rice used in Western Restaurants is different from Sushi Restaurant or Japanese Restaurant, but the Item number are the same across these Restaurants, so he/she can pick up the duty easier.

7.6. Purchase Orders Generation (Request Mapping)

When a request is sent from Restaurant, it will be put in a process queue for Request Mapping, this process executed by Purchase Clerk three times a day (09:00, 13:30 & 17:00) and can be done automatically or manually depends on system setting. The purpose is to generate Purchase Order to supplier (items are delivered to Restaurant directly) or schedule a delivery to deliver requested item from warehouse.

In general, the aim of Request Mapping is to fulfill BPA first. When a request is matched with the BPA, a Blanket Release will be generated. When there are more than one BPA related to the same Item, Purchase Manager will choose the one that is incomplete and is going to expire soon. If the expiry date of BPA are the same or near (for example, in one month), Purchase Manager will choose the one that has lower price. In some cases, a request may associate with more than one Blanket Release. For example, a BPA has a line of Item A, which can be completed with 20 more orders and another BPA has a line of the same Item, which can be completed with 80 more order. The Purchase Manager may serve a request with 100 Item A by the two BPAs above in order to complete the BPAs faster.

If there is no BPA matched, Purchase Manager will check with the warehouse. If warehouse has stock, a Despatch Instruction will be issued to warehouse for them to generate a Delivery Note and deliver requested item to Restaurant. In general, priority of BPA is higher than deliver items from warehouse, however for some F&B items that has expiry date, Purchase Manager / Category Manager may override the mapping and serve request by warehouse first.

If a request cannot be served by both BPA and warehouse, it is considered as a failed request. Purchase Manager has to handle this manually; there are several possible solutions:

- To check if a Planned Purchase Order can serve the request later and may ask Restaurant Manager if it is possible to postpone the expected delivery date. If so, the request can be served by warehouse after the item delivered to warehouse from supplier.
- To issue a Standard Purchase Order from Contract Purchase Agreement. For this case, the price is usually higher than the one in BPA. Purchase Manager will review the orders to see if it is possible to create a new BPA in future.
- In some urgent cases of F&B request, it maybe served by manually create a Blanket Release to supplier to deliver different brand of similar items by ignoring the virtual Item ID mapping temporary.
- Wait for the next batch if the Restaurant Manager is agreed.

Since there are some manual processes that required longer time for decision making for failed request, it may not be able to complete in current batch.

When the Blanket Releases, Purchase Orders and Despatch Instructions are prepared, they will be issued to supplier or warehouse. Then Restaurants Manager in Restaurant can check the status of the request and obtained references, such as Delivery Note Number (from warehouse) or Purchase Order numbers (which supposed to be printed in Supplier's Delivery Note). Warehouse clerk in the warehouse can see the Despatch Instruction and start to prepare items to be delivered to Restaurants.

7.7. Warehouse

Warehouse Clerk can see the Planned Purchases Order after it is sent to the supplier. He/she can see the item information in the order, but no pricing information will be shown. Depends on Supplier's system, one Delivery may handle more than one Purchase Order and one Purchase Order may also divided into a few deliveries. When items are received, he/she can match the delivery note with the Purchase Order, sign on the delivery note, keep a copy of it and mark the received quantity in the system. Signed Delivery Note (from Supplier) will be sent to Accounting Department daily. Accounting Clerk will check the Delivery Note and Invoice received from Supplier, if they are matched, Accounting Manager will complete the payment and update the status of the Purchase order.

When Despatch Instruction is sent to warehouse, Warehouse Clerk will prepare the items, update stock count and generate a Delivery Note when items are ready (Restaurant Manager can check the Delivery Note number if the delivery serves his/her request). He/she can also check and update stock count anytime. Chief Operation Manager suggests that all transactions better be logged in order to trace the workflow more easily. Besides, he also suggests having notification service to remind Purchase Manager and Category Manager for some events, such as when the stock level is too low.

7.8. Technical requirement

The company uses standalone PCs and electronic spreadsheets to manage the delivery services in the centers. Since the PCs are not inter-connected, data between different centers cannot be readily shared. For the new proposed system, a new server should be purchased for the installation of the database server and application server. The company has enough Visual Studio licenses, and some of our staff are trained to use C#. Therefore, the new system should be developed in the programming language C#. To increase the system security, all staff should have their own account to manage and log their records and tasks.

8 Term of Reference

Each group of students are asked to investigate the current situation and to make recommendations to the management as to how information technology could best be used by the Company.

Students are given permission to meet the Operations Manager (Your supervisor) who is in the Headquarters. The scope of the investigation includes all routines only related to delivery services.

The terms of reference specify an open-ended system capable of extension in appropriate areas in future. Any proposals for an immediate extension of the area of the investigation should seek approval from the Operations Manager.

The students should aim to:

1) Understand the present situation (i.e. obtain the most up-to-date information related to procedures, data, management controls, etc.);
2) Identify areas where major problems exist and mistakes always make;
3) Determine the need for immediate and future improvements in the area's delivery services;
4) Identify the requirements of any proposed system;
5) Produce a computer-based software solution with technical documentation and user guide.

8.1Deliverables

8.1.1. Requirements Specification Report

The report should clearly identify the problem of the current system. The user requirements and project schedule for the proposed system are also expected. In addition, an initial design for functional and structural model is required

8.1.2. Design Specification Reports

After considering the comments and suggestions from the user, the user requirements should be confirmed. The Design Specification Report is required to submit to the Management in April.

8.1.3. Software (the management system)

The software should be conformed to the user requirements. The software package includes the executables, source code, database scripts and related applications. In addition, an installation guide should be provided.

8.1.4. Testing Plan

Test case should cover all aspects of the proposed system and should be executed before the release of the software.

8.1.5 Technical Documentation and User Guide

Technical documentation includes the architectural, structural and behavioral design of the system. This information is essential for maintenance in the future. The user guide provides clear steps and procedures to a specific task for administrator and/or end user.