Hong Kong Institute of Vocational Education
Department of Information Technology
HD in Software Engineering
ITP4915M System Development Project
(2023/2024)

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 Smart & Luxury Motor Company (Spares) 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 Smart & Luxury Motor Company (Spares) Limited

Smart & Luxury Motor Spares (SLMS) Limited Company is a subsidiary of a public limited liability company, Smart & Luxury Motor Company (SLMC). The business of SLMC is to assemble and to distribute motor cars, and to run trading entirely in PRC market. Senior management and the area sales staff, however, remain common to the two companies. SLMS is operating to provide spares to its mother company SLMC and to sell its spares to 50,000 main dealers in different provinces and cities of PRC. There are 300 main sales areas, each with an area manager who controls a selling force making regular calls to dealers

In order to improve the existing operation and increase the market share, the Head of IT Department suggested to develop a new Order Processing and Stock Recording System to improve existing operation.

6.2. Overview of the Order Processing and Stock Recording Procedure

In SLMS, it is the responsibility of the Sales Office manager to support the selling force by processing dealer's orders and issuing instructions for the dispatch of spares. Spares are grouped into four categories: A-Sheet Metal, B-Major Assemblies, C-Light Components and D-Accessories. Each category of spares may contain from 1000 to 25000 different types of lines. Spares are located in the stores numerically within their physical category. Each bin location contains one complete line and is identified by a part number which consists of the category letter plus a 5-digit number. When a new part is introduced, a part number is allocated by the spare parts controller according to its physical category.

Incoming Orders

There are different channels for incoming orders from dealers. These sales order channels include by post, by phone, by telex and fax, and by verbal instructions from dealers. There is no standard order request form for dealers or for production request from SLMC. The Sales Office needs to follow up all incoming orders even for orders with missing details.

Order Processing

Each incoming order is allocated a SLMS serial number. The contents of the orders are input to computer by the Order Processing Clerk. The computer generates a Despatch Instruction Cover (DIC) for each order received and a Despatch Instruction Detail Sheet (DID) is generated for each item on that order.

During this processes an outstanding orders file is referenced to establish whether or not a dealer has any previous orders still unsatisfied. These will be recorded in the DIDs in the space indicated, if they are for a spare part currently ordered; otherwise a separate DID will be raised for each item. These files are also inspected weekly for the clearance of outstanding orders not picked up during the normal order routine

The DID's are sorted into part number order for each dealer and together with their DICs form a DI set which is sent to the spare parts store. Original orders are then filed, in the sales office, by SLMS serial number within dealer.

Order Assembly Procedure

The DI sets are received in the spare parts store and the storemen pick the items from the bins. Where there is insufficient stock in any bin to meet the order then this is indicated on the DID by apportioning the ordered quantity between 'actual quantity despatched' and 'to follow'. The latter clearly generates an outstanding order.

Currently, storemen manually check the stock level. When the stock level of particular spare part reaches the re-order level (ROL), they will send the re-order card to Purchasing Department to purchase the stock. When the stock level of particular spare part reaches the minimum stock level (Danger Level), they will send the danger card to Purchasing Department to purchase the stock. When the order clears the bin then the out-of-stock card is sent to the Purchasing Department, together with the re-order card. All three types of cards are, under normal stock conditions, retained at the bin.

When an order has been assembled, it is passed with its DI set to the Spares Despatch Department.

An automatic re-ordering system has been installed in the warehouse. The Stock Record Clerk has to input the amount of goods inward items and goods outward items every time. He has to input the discrepancy and amount of scrap items as well.

Spares Despatch Procedure

When the Spares Despatch Department receives a dispatch instruction set, an invoice set (4-part set) is issued with invoice number and with partly completed. Copy 1 of the invoice is passed to the invoicing section. Copy 2 is the advice note and is posted to the dealer. Copy 3 and Copy 4 are delivery notes which they are carried by the deliveryman accompany the order to the dealer. Copy 3 is signed by the dealer and returned by the deliveryman to the Spares Despatch Department. Then copy 3 is filed in invoice number order for further reconciliation by Invoicing Section. Copy 4 is retained by the dealer for record.

Following the part-completion of the invoice set, the DI set is sent to the stock records clerk.

Stock Recording Procedure

The stock records clerk receives the DI sets from the Spares Despatch Department. For each DID, he enters the 'actual quantity dispatched' figure on the stock record card for that part. A specimen stock record card is attached. He then input the values to the computer. The computer calculates the new book stock balance. The stock records clerk copies the balance onto the record card. He also ticks the 'entered stock' box on the DID. Then, the DIDs are returned to the Sales Office.

Good Received Notes (GRN) arrived from the Goods Inward Department and each line entry is input to the computer and posted to the stock record as well. The new book stock is calculated by the computer and recorded in both computer and stock record. The item on the GRN is then ticked. The GRNs are subsequently sent to the Purchasing Department for invoice clearing.

As the continuous inventory check proceeds, the actual stock figures are entered on the record card in the ‘inventory check, actual figure’ column. Discrepancies are reported to the accountant where any exceeding 1 per cent or $100, whichever is the greatest, are investigated. The write-off for last year was $9,000,000.

7. Appendix

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

The details of each Departments and the company background are listed below.

7.1. Order and Stock Policy

Consultants, engaged three years ago to examine company procedures and prepare a report, found that conflicting demands arose from an attempt to satisfy spares and production requirements from a common stock. Apart from their proposal regarding the upgrading of computer system, they recommend the creation of a separate stock for the spares demand, and the packaging, where possible, of items as 'Smart & Luxury Spares'. This system has worked well and any attempt to recombine production and spares stocks would be vigorously resisted by management.

The consultants also installed an automatic re-ordering system based on stock records and average consumption rates, but this quickly fell into disrepute as a result, it is assumed, of a clerical error, and delays in stock recording. The present 'physical' control system was devised as an expedient and is regarded as the best possible in the circumstances.

Current company policy dictates that:

- delivery of items actually in stock is to be within two working days of the receipt of order, except for 'overnight' runs;
- despatch of items not in stock on receipt of order is to be 'automatic' (the dealer does not re-order) and must take place within five working days of the replenishment of stocks, oldest orders first;
- price must not appear on documents used in the spare parts store;
- invoices must be despatched within one working day of the despatch of material;
- an evaluated list (at standard purchase price) is required for all stock balances at the end of each accounting period.

This policy is based on what is thought to be practical rather than, necessarily, on what is desirable.

7.2 The Sales Division

The sales manager controls three functions:

- stimulating sales of cars and Smart & Luxury spares in the PRC. Since most items are bought-in, it is possible for dealers to buy spares direct from suppliers, but normally at a higher price than Smart & Luxury spares;
- maintaining an efficient sales order office to meet dealers' orders for cars and spares;
- holding sufficient stocks of Smart & Luxury spares to meet dealer demand within the timescale established by the executive committee but without inflating inventory levels, which are already considered by management to be too high.

7.2.1 The Sales Functions

Cars and spares are sold through 50,000 main dealers in the PRC in different provinces and cities. Dealers distribute spares to a number of branches, or agents of their own choice. There are three hundred main sales areas, each with an area manager who controls a selling force making regular calls on dealers. The Smart & Luxury franchise is generally well thought of by the dealers. Salesmen are responsible for encouraging dealers to make use of the Smart & Luxury spares service.

7.2.2 The Spares Sales Order Office

It is the responsibility of the sales order office manager to support the selling force by processing dealers' orders and issuing instructions for the despatch of spares. Dealers are instructed not to re-order items which are indicated as out of stock (although they may order further quantities of such items). The sales order office manager must therefore ensure that outstanding orders are dealt with promptly and automatically.

7.3 The Stock Control System

Smart & Luxury spares are grouped into four categories:

A	Sheet Metal	(1,000 lines)
B	Major Asssemblies	(10,000 lines)
C	Light Components	(25,000 lines)
D	Accessories	(14,000 lines)

Spares are located in the stores numerically within their physical category. Each bin location contains one complete line and is identified by a part number which consists of the category letter plus a 5-digit number. When a new part is introduced, a part number is allocated by the spare parts controller according to its physical category.

With the aim of satisfying the desired level of dealer service, re-order levels and quantities, and danger levels have been established. These are not altered except when the need to do so is highlighted by stockouts, by store men commenting on slow-moving lines, or to take account of seasonal fluctuations (forecasts usually based on intuition and experience).

7.4 Growth of Competition

Over the past year SLMC Spares has been subject to competition from several organizations selling spares and accessories which can be used on SLMC cars. These organizations are making inroads into SLMC Spares sales and profits by providing an off-the-shelf service over a limited range of products. This limited range incorporates SLMC's fast moving and highly profitable lines. The problem from SLMC's point of view, is essentially that they are unable (without considerable effort) to tell a dealer who enquires over the telephone whether or not stock of a particular item is available. Even if it is available and the Sales Office could so inform the dealer, there is no mechanism for reserving the stock for that dealer. This inability to answer dealer's queries and reserve stock is beginning to cause loss of sales and profit and the situation is likely to deteriorate further unless steps are taken to rectify it.

7.5 Computer System

In these years, different offices and departments use their only budget to develop computer systems to support their own operations. All these systems developed in different offices and departments are independent systems. Depending on the budget and operation volume, some departments are using mini-computer systems while some use micro-computer based systems. These systems are not integrated with each other. At most, data are transferred by email or ftp between one department and the other. The IT department is only responsible for the use of IT in the head office and some major offices and sites.

The consultant recommended upgrading the system by putting all the operations in a coordinated and systematic way so as to better utilize the information that can be obtained from the computer system in all sites.

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.

8.1 Deliverables

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.

Figure 1 Despatch Instruction Cover

DESPATCH INSTRUCTIONS		
	DATE	ORDER SERIAL
	INVOICE NAME AND ADDRESS	DELIVERY ADDRESS
		DEALER ORDER NO.

Figure 2 Despatch Instruction Detail

<table>
<tr><td colspan="2">DESPATCH
INSTRUCTION</td><td>DATE</td><td>From: Sales Office
To: Spare Parts Stores</td></tr>
<tr><td colspan="2"></td><td>Order Serial</td><td rowspan="3"></td></tr>
<tr><td colspan="2"></td><td>Dealer Code</td></tr>
<tr><td colspan="2"></td><td>Part No.</td></tr>
<tr><td>Order Qty.</td><td>Previous Outstan-ding</td><td>Total to Despatach</td><td>Entd. Stk.</td></tr>
<tr><td colspan="2"></td><td>Actual Quantity Despatched (if different from ordered)</td><td rowspan="2">Entd. Stk.</td></tr>
<tr><td colspan="2">Order Serial</td><td>To follow</td></tr>
<tr><td colspan="2"></td><td>No. of Bundles</td><td rowspan="3"></td></tr>
<tr><td colspan="2"></td><td>Weight</td></tr>
<tr><td colspan="2"></td><td>Carrier</td></tr>
</table>

Figure 3 Re-order Card

RE-ORDER CARD							
Part Description					Part No.		
Suppliers Name & Address							
						Qty. to Order	
Date	Order No.	Date	Order No.	Date	Order No.	Date	Order No.

Figure 4 Danger Card

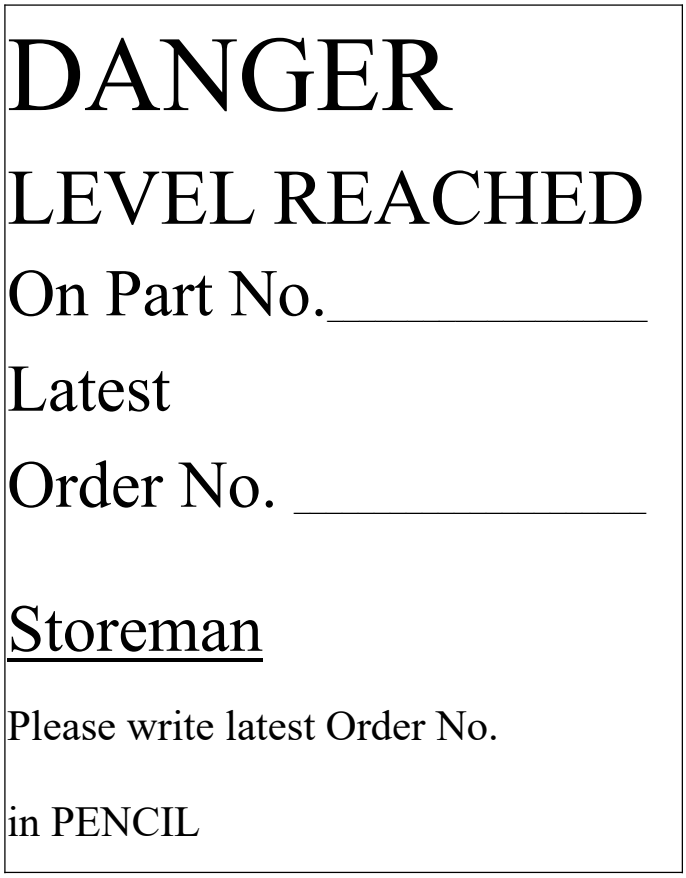

Figure 5 Stock Card

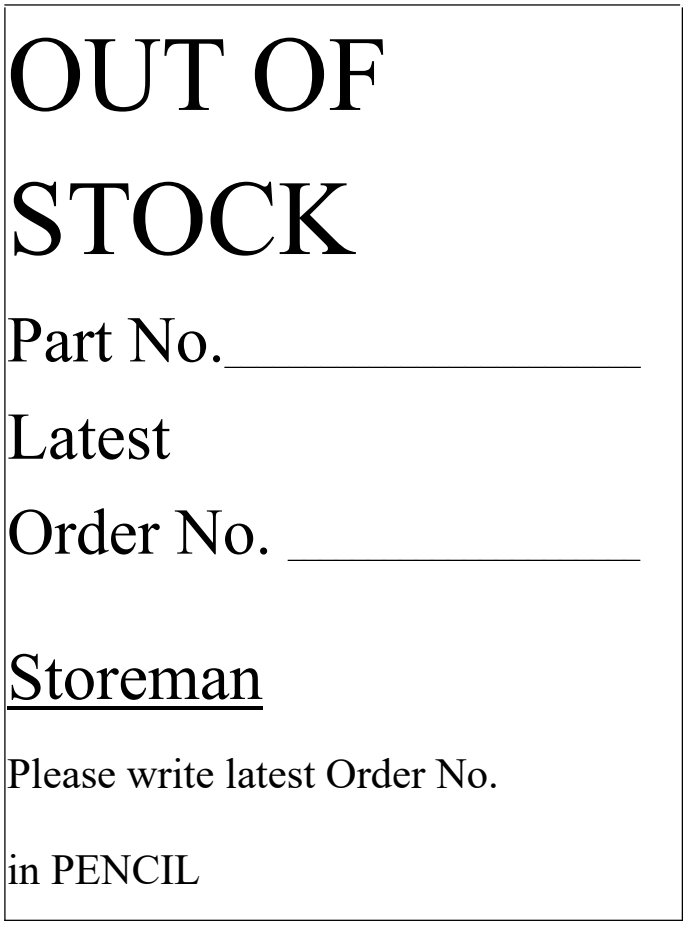

Figure 6 Invoice Set (6 copies)

DELIVERY NOTE

Part 6

SMART & LUXURY MOTOR Co. Ltd.

SMLC District, Tienhou, Guangzhou.

Tel: 133 808 12345 Grams: SmartLuxuryMC

Please receive the following goods:

INVOICE ADDRESS	DELIVERY ADDRESS (IF DIFFERENT) PER

DATE	YOUR ORDER NO.	OUR ORDER NO.	DEALER CODE

No. of bundles	Part No.	Prev. Qty. under delivered	Quantity to follow	Quantity delivered		
						Total weight
						Despatch Foreman

Received in good order

Date…….Signature…….

Figure 7 Spares Stock Record Card

SPARES STOCK RECORD CARD					Part No.	
DATE						BALANCE

Figure 8 Goods Received note (GRN)

GOODS RECEIVED NOTE		Serial Stamp	
SUPPLIER			
		Our Order No.	Part/All
Part No.	Quantity	Part No.	Quantity

End of Case