

Hong Kong Institute of Vocational Education
Department of Information Technology
HD in Software Engineering
ITP4915M System Development Project
(2024/2025)

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 Smile & Sunshine Toy Co, Ltd. 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:

<i>Stage</i>	<i>Deliverable(s)</i>
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 Smile & Sunshine Toy Co, Ltd.

Smile & Sunshine Toy Co, Ltd. is a global leader in the Original Design Manufacturing (ODM) toy industry. Established in 2008 and headquartered in Hong Kong, it offers creative designs and top-notch manufactured solutions to famous toy brands across the world. Through great design skills, excellent quality control Smile & Sunshine Toy has become a major force in the industry attracting confidence and working with several international clienteles.

Apart from its Hong Kong headquarters Smile & Sunshine Toy runs manufacturing facilities across regions like mainland China, Vietnam and Thailand. The geographic proximity of these facilities enhances production efficiency facilitates cost reduction, thereby enabling timely shipments to customers worldwide.

To adapt to the changing marketplace as well as achieve long-term growth objectives, Smile & Sunshine Toy is now shifting strategically from ODM to Original Brand Manufacturing (OBM). This will move the company's role beyond mere manufacturing creating a brand owner that directly engages consumers in order to enhance market competitiveness and brand value.

In order to facilitate these changes, Smile & Sunshine Toy intends to streamline its computer systems.

6.2. Overview of the Operation Procedure

Smile & Sunshine Toy's production is divided into two types: products designed by the company and products requested by customers. The company handles everything from design and production to packaging and delivery, with different departments collaborating at each stage. Each product follows a series of processes, completed in an assembly line manner.

Product Designed by the company

Research and Development (R&D) department conducting ideation sessions and market research to identify trends. The design team then develops concepts and creates initial sketches, evaluating feasibility. Once detailed specifications are drafted, the Engineer assists in building prototypes using 3D modeling, which undergo functionality and safety testing. Feedback is gathered from focus groups, coordinated by the Sales and Marketing Department. Based on this feedback, designs are refined and finalized. The management is involved in the approval process, ensuring compliance with industry standards. Once approved, the Production department prepares detailed production plans and coordinates with manufacturing for tooling and materials. Finally, the Sales and Marketing Departments develop strategies for product launch and distribution, ensuring a seamless transition from design to market.

Product Requested by customers

During the production, the sales department plays a crucial role. They maintain close communication with customers to confirm all order details, including product specifications, quantities, and special requirements. The sales department provides quotations, including prices, delivery times, and shipping options, and negotiates as necessary to meet customer needs. Customer product requests are divided into two types: requesting an existing product or a tailor-made product.

After the customer confirms the order, the sales department carefully verifies all details to ensure accuracy. Once confirmed, customer may need to pay deposit. Finance check the payment and notify sales pass the order information to the production department to help arrange the production schedule. Throughout the process, the sales department is responsible for providing customers with order status updates to keep both parties aligned. They also address any customer inquiries to ensure satisfaction with the entire order process. These responsibilities ensure that orders proceed smoothly and efficiently, meeting customer expectations.

For tailor-made products, the R&D and other departments help develop the product specifications, following a process like product design. A product manager is assigned by R&D director to follow up tailor-made order, and the final approval is carried out by the customer. Regardless of whether the product is adopted, a consultant fee is charged.

Since project coordinator need to help on arrange meeting between customer and manager, coordinator may need to check the schedule with manager. Once the design is approved, a prototype is developed to ensure it meets all specifications and quality standards. The customer reviews the prototype and may request adjustments. Manager may need to change the status of tailor-made order after each stage. Once the customer confirms the prototype, the sales department takes over to finalize the order details.

Production Procedure

The production manager reviews the product specifications, timelines, and material requirements. Production officer base on the product specification to schedule the manufacturing process accordingly to ensure it aligns with the project deadlines. They allocate necessary resources, such as machinery and labor, to each stage of the process to maximize efficiency. Additionally, a raw material requirement form is sent to the inventory to ensure that all necessary materials are procured and available on time.

Raw materials are sent from the warehouse with transfer form to various production line for different stages, such as mold making, component production, decoration, product assembly, produce packaging materials, and final product packaging. Once all products are completed, product manager inform logistics are arranged to deliver the goods to customers.

Each worker work for one product line process and form a worker team. Quality control worker help to check the quality of material from the previous step. The leader of each

worker team need to report the number of finish component and number of damage material at the end of the day. Before transfer the component to next product line process, production officer may need to attach the transfer form.

Products are then carefully packed according to specific guidelines, ensuring protection and presentation. Labels containing product details and barcodes are applied accurately. A final quality check is conducted to verify the integrity of the packaging. Once completed, the packaged products are placed in designated storage areas with transfer form.

The product planner manages reports from both workers and officers to better develop and monitor the entire production process.

Distribution procedure

Organizing transportation logistics, selecting suitable carriers, and scheduling delivery times to meet customer demands. Logistic officer prepared delivery notes and products are then picked from warehouse and loaded onto transport vehicles with care to maintain their condition. Officer keeps monitor and update the state of each shipment for proactive management of any delays or issues. Upon arrival at customer locations, products are unloaded and verified against delivery note to ensure accuracy. Notify customer service staff and accountant after the shipment settled.

After-service procedure

Account department prepare an invoice and send to customer with final payment. Customer service take over for after service. When receive customer inquiries or complaints through various channels such as phone or email. A customer service representative first acknowledges the issue and gathers detailed information to understand the problem fully. The case is then logged into a customer relationship record for tracking and resolution. If the issue involves technical aspects, it's escalated to the technical support team for in-depth analysis and troubleshooting. Solutions are proposed, and the customer is guided through the resolution process, whether it involves product replacement, repair, or guidance. Feedback is collected to assess customer satisfaction and identify areas for service improvement. Finally, all interactions are documented for future reference, and any recurring issues are analyzed to enhance product quality and service offerings.

Material Procurement and Management

The inventory control specialist checks the stock book after receiving the requirement form. When materials are sufficient, a simple reply is sent to the production department by email. If stock is low, they notify the procurement specialist to order more and provide an estimated delivery time to avoid any production delays.

The supply chain management department sends the purchase order to the raw material supplier. When the supplier replies with the estimated delivery date, procurement staff notify the inventory staff. The procurement specialist coordinates with suppliers to ensure timely delivery of raw materials, maintaining a balance between inventory levels and

production needs.

The inventory officer is responsible for recording the movement of finished products and raw materials in and out of the warehouse. Upon entry, items and quantities are verified. Raw materials from suppliers arrive with a delivery note, officer send the copy to accountant and notify procurement staff. Finished products from the production line are accompanied by an internal transfer form when sent to the warehouse.

When the warehouse reports defective materials, procurement staff negotiate with the supplier to resolve the issue. For returned items from customers, the customer service department follows up and records the details. If it's an existing product, an exchange is processed; for tailor-made products, the financial department is contacted for a refund.

7. Appendix

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

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

7.1 R&D Department

Research and Development Department involves cross-functional teams working together, such as design, engineering, and marketing, to integrate diverse expertise and perspectives. All products are consolidated into a comprehensive product specification document. This document includes detailed information on design, materials, dimensions, functionality, and compliance with industry standards. It serves as a central reference point for all departments involved in the production process, ensuring consistency and quality across the board.

7.1.1 New product design

Conducting market research to identify trends and consumer needs. Using this data, they brainstorm and design innovative product concepts. Engineers then create prototypes, which undergo extensive testing for functionality, safety, and quality. The department collaborates with other teams, like marketing and production, to ensure the product aligns with market demands and manufacturing capabilities. Throughout the process, they document specifications and ensure compliance with industry standards, driving the company's innovation and competitive edge.

7.1.2 Tailor-made product

Gathering detailed customer requirements and translating them into specific design and technical specifications. The team collaborates closely with clients to ensure the design aligns with their needs and expectations. Engineers then create prototypes, allowing for testing and refinement to meet quality and functionality standards. Throughout the process, R&D ensures the product complies with industry regulations and maintains open communication with the customer, adjusting as needed. This tailored approach ensures a high level of customization and customer satisfaction.

7.1.3 Product Specification

A base product specification includes a product overview with its name, unique identifiers and minimum order quantity (MOQ). It outlines design details such as dimensions, materials, and color schemes. The production process provides step-by-step manufacturing instructions, equipment requirements, timeframes, and estimated labor needs, specifying the number and skills of workers required as an extra remark. Packaging information details dimensions, materials, and labeling requirements.

A detailed specification may also include some prototype and component image. Performance criteria cover technical specifications, durability, and environmental conditions. Quality standards highlight industry benchmarks, tolerances, and safety features. Testing procedures describe types of tests, conditions, and acceptance criteria.

Regulatory compliance lists necessary certifications and regulations. User instructions provide assembly, operation, and maintenance guidelines. Lastly, warranty and support information covers warranty periods, repair policies, and customer service contacts. This comprehensive document ensures clarity and consistency throughout the product lifecycle.

7.1.3.1 Product materials

A product may include a variety of materials chosen for their durability, aesthetics, and functionality. Common plastics like polyethylene, polypropylene, and ABS are often used for their versatility and cost-effectiveness. Metals such as stainless steel, aluminum, and copper provide strength and resistance to corrosion. Textiles, including cotton, polyester, and nylon, offer flexibility and comfort. Composites like fiberglass and carbon fiber are selected for their lightweight and high-strength properties. Wood options such as oak, pine, and plywood add a natural and sturdy element. Glass, including tempered and laminated varieties, is used for its clarity and safety features. These materials are integral to meeting the product's design and performance criteria.

7.1.3.2 Manufacturing instructions

To manufacture a toy, the process begins with material preparation, where raw materials like plastic pellets and paint are gathered and inspected for quality and safety compliance. Next, injection molding machines are used to create plastic parts, which are then trimmed to remove excess material and checked for defects. During assembly, components are joined using screws, adhesives, or snap-fits, ensuring that all moving parts function smoothly and securely. Decoration involves applying paint and decals with automated systems, allowing adequate drying time to prevent smudging. Quality control is crucial, as each toy is inspected for defects and verified for functionality, undergoing safety tests to meet industry standards. Finally, toys are placed in packaging that includes instructions and safety warnings, sealed, and labeled for distribution. This comprehensive process ensures that the toy is produced efficiently and safely.

7.2 Sales & Marketing Department

The sales and marketing department plays a pivotal role in driving a company's growth and market presence. They begin by collecting and organizing data from various sources, such as sales transactions, customer feedback, and market trends. Using this data, the marketing team develops strategic campaigns across various channels, including digital, print, and social media, to promote brand awareness and generate leads. The sales team works closely with marketing to convert these leads into customers, using personalized approaches and relationship-building techniques. They also gather feedback from customers to refine strategies and improve product offerings. Additionally, the department analyzes sales data and market performance to adjust tactics, ensuring alignment with business goals. Through collaboration and innovation, they enhance the company's competitive edge and drive revenue growth.

7.2.1 Quotation

Quotation should include a unique quotation number and the date of issuance. It must detail

customer information, such as name and address, and provide product details, including names, product numbers, and prices. The document should specify delivery timeframes and available shipping options, along with associated costs. Payment terms, such as due dates and accepted payment methods, are essential. It should also highlight any discounts or special offers and include remarks or notes regarding terms and conditions, warranties, and validity period. This ensures clarity and thorough understanding for the customer.

7.2.2 Production Order

A production order includes a unique order number for tracking and the issue date. It details product information, such as descriptions, product codes, and specifications, along with the quantity to be produced. Additional remarks or special instructions are included to ensure the production process is organized and efficient.

For customer order, also need to record the refer quotation.

To finalize the product order, production department may help to update the order specifies the materials required, listing all necessary components and allocate worker. It outlines the estimated production schedule with start and end dates and provides detailed work instructions.

All documents related to the same product order should be kept together with the product order and placed in the same folder.

7.3 Production Department

The production department is integral to transforming designs into finished products. They start by reviewing detailed product specifications to plan the manufacturing process efficiently. This involves scheduling production runs, allocating resources, and coordinating with supply chain to ensure the timely arrival of materials. The team oversees the assembly line, ensuring that each step meets quality standards and adheres to safety regulations. Throughout the production process, they monitor equipment and workflows, making adjustments as needed to optimize efficiency. Quality control checks are implemented at various stages to ensure conformity to specifications. The department also collaborates with supply chain to manage inventory levels and prepare products for shipment. By maintaining clear communication and precise execution, the production department ensures that products are manufactured on time and to the highest quality standards.

7.3.1 Material Requirement Form

A material requirement form includes a unique form number for tracking and the date of issuance. It specifies the requesting department and provides detailed product information, including descriptions and specifications. The form lists the required materials and their quantities, along with the priority level to indicate urgency. It also specifies the delivery date needed for the materials. Approval signatures from relevant managers ensure authorization, and additional remarks or special instructions may be included.

7.4 Supply Chain Management Department

The supply chain management department is crucial in ensuring seamless operations from raw material procurement to product delivery. They start by coordinating with suppliers to secure high-quality materials at competitive prices, maintaining strong relationships to ensure reliability. Inventory management is a key focus to monitor stock levels, minimizing costs while preventing shortages. The department oversees logistics, planning efficient transportation routes and schedules to ensure timely delivery to production facilities and customers. They implement a mini tracking system to monitor shipments in real-time, promptly addressing any disruptions. Additionally, they collaborate with other departments to forecast demand accurately, aligning supply chain activities with business goals. Through continuous analysis and process improvement, the supply chain management department enhances efficiency, reduces costs, and supports the company's ability to meet market demands effectively.

7.4.1 Internal transfer form

An internal transfer form includes a unique transfer form number for tracking and the date of initiation. It specifies the source and destination department or product line for the materials or products being moved. The form details relevant production order number, item descriptions and specifications, whether they are raw materials, components, or finished products, along with the quantity being transferred. It includes the reason for the transfer to provide context. Approval signatures from relevant manager ensure proper authorization, and any additional remarks or special instructions help facilitate a clear and organized transfer process.

7.5 Customer Service Department

The customer service department serves as the frontline for customer interactions, ensuring satisfaction and loyalty. Addressing inquiries and resolving issues through various channels, such as phone, email, and chat. Representatives are trained to provide prompt and empathetic assistance, whether handling product information requests or troubleshooting problems. The department maintains a detailed log of customer interactions in a master excel file, enabling follow-ups and personalized service. Feedback collected from customers is analyzed to identify trends and areas for improvement, which is then communicated to relevant departments for action. Additionally, customer service collaborates with sales and marketing to ensure consistent messaging and support for promotional initiatives. They also play a key role in managing returns and exchanges, ensuring a smooth process that reinforces customer trust. Through proactive communication and a commitment to excellence, the customer service department enhances the overall customer experience and supports the company's reputation.

7.6 Finance Department

The finance department plays a critical role in managing the company's financial health and ensuring sustainable growth. They are overseeing budgeting and forecasting to align financial resources with strategic goals. This involves analyzing financial data to provide

insights on revenue trends, cost management, and profitability. The team manages accounts payable and receivable, ensuring timely payments and collections to maintain cash flow. They also handle financial reporting, preparing accurate statements and reports for stakeholders, which comply with regulatory standards. Risk management is another key focus, where they assess potential financial risks and develop strategies to mitigate them. The department collaborates with other teams to evaluate investment opportunities and guide decision-making processes. Through meticulous planning and analysis, the finance department supports the organization's stability and long-term success.

7.7 IT Department

The IT department is essential in maintaining and enhancing the company's technological infrastructure. Managing and supporting network systems, ensuring secure and efficient connectivity across all departments. This involves regular maintenance and updates to prevent downtime and protect against cyber threats. The team also oversees software and hardware installations, providing troubleshooting and technical support to employees. The CTO suggests integrating the processes of different departments into a single management system to track all data and production information. The company has a C# license and recommends using a MySQL database to build a central system. Once completed, this will make maintenance easier for the IT department. Additionally, the IT department collaborates with other departments to identify technology needs and develop customized solutions that enhance productivity. They stay abreast of emerging technologies, recommending upgrades and innovations to keep the company competitive. Through proactive management and strategic planning, the IT department ensures that technology effectively supports the company's operations and growth.

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.