

# **BACS2163 Software Engineering**

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# Tutorial 1: Introduction to Software Engineering

- With the aid of examples, differentiate **generic software product** from **bespoke software product**.

|                                                                                                                                 | <b>generic software product</b>                                                                                                                                          | <b>bespoke software product</b>                                                                                                                                                                              |
|---------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"><li>Area</li><li>Description</li><li>Cost</li><li>Requirement spec.</li><li>Example</li></ul> | <ul style="list-style-type: none"><li>Develop for public</li><li>Cheaper- share among buyer</li><li>Controlled by s/w org</li><li>MS office,</li><li>Window OS</li></ul> | <ul style="list-style-type: none"><li>Develop for a specific user</li><li>Expensive- pay by one customer</li><li>Controlled by user/ cust</li><li>Public bank system, TARC UMT</li><li>Library sys</li></ul> |

- Do you think that **system engineering** same as **software engineering**? Explain.

No.

System engineering: concerned with all aspects of software production from the early stages of system specification through to maintaining the system after it has gone into use. It is composed of a variety of system elements that encompasses **包括** software engineering. The elements are: Soliwar, Hardware, People, Database, Documentation and Procedures

Software engineering, with all aspects of software development from the early stages of system specification, design, implementation, testing and through to maintaining the system after it has gone into use.

- Easy2Study is interested to develop an education system according to the **Software Engineering's layered technology** which consists of 4 important layers.

Assist Easy2Study to analyse each layer based on the system by proposing appropriate technology. [Hint: technology for each layer can be a tool, methodology, quality attributes, and software process model.]

## 1. Quality Focus

- Any engineering approach must rest on an organisational commitment to quality.
- Total quality management and similar philosophies foster a continuous process improvement culture, and this culture ultimately leads to development of increasingly more mature approaches to software engineering.
- Example: software quality attributes: reliability, maintainability, etc.

## 2. Process

- Process defines a framework for a set of key process areas (KPAs) that must be established for effective delivery of software engineering technology.
- E.g. Waterfall, RAD spiral model, etc.

## 3. Methods

- Methods are organised ways of producing software. They include suggestions for the process to be followed, the notations to be used, rules governing the system descriptions, which are produced and design guidelines.
- E.g. OOAD methodology.

## 4. Tools

- Tools provide automated and semi-automated support for the process and the methods.
- Eg. IBM RSA, CASE TOOL, Microsoft Project®

4. Sri Touch Academy is a newly established company in Kuala Lumpur which offers make-up, hairstyling, and art courses. The courses are conducted in both full time and part time modes. As a software engineer, you are responsible to build an online website for the company to allow customer to register as member, pay the fees, check classes' schedule, post questions, share success story, subscribe to weekly newsletter, chat with company personnel, and connect to other social networks such as Facebook Page, Twitter, and Instagram. You have three months to accomplish the project together with your junior software engineer. Sri Touch Academy requested you to deliver the initial version within two months and the subsequent within one month.

Recommend and explain 3 software quality attributes that must be included in the online website.

|           |                                                                                                                                                  |
|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| secure    | Sri Touch Academy online website payments detail and memberships information must be secure and not to be accessed by an unauthorised party.     |
| flexible  | Sri Touch Academy online website shall operate in any platforms                                                                                  |
| efficient | Sri Touch Academy online website shall allow user to process payment in 5 sec                                                                    |
| reliable  | Sri Touch Academy online website downtime lesser than 0.05%                                                                                      |
| usable    | Sri Touch Academy online website user experience low leaning time, the website has consistent "back button" in every page, provide user guidance |

5. Discuss 3 challenges/problems on software developments that are likely to be faced by software engineer in current software industry.

- Heterogeneity challenge
- Delivery challenge
- Developing systems that are trusted by their users Developing systems that are resistant to attack
- Developing systems that can be adapted and configured by end-users
- Finding ways of testing, validating and maintaining end-user developed systems

6. Mandy is a fresh graduate from the School of Computer Sciences. Recently she is hired by a software house to develop bespoke software for clients. Describe 3 important code of ethics that Mandy need to follow as a software engineer in the software house.

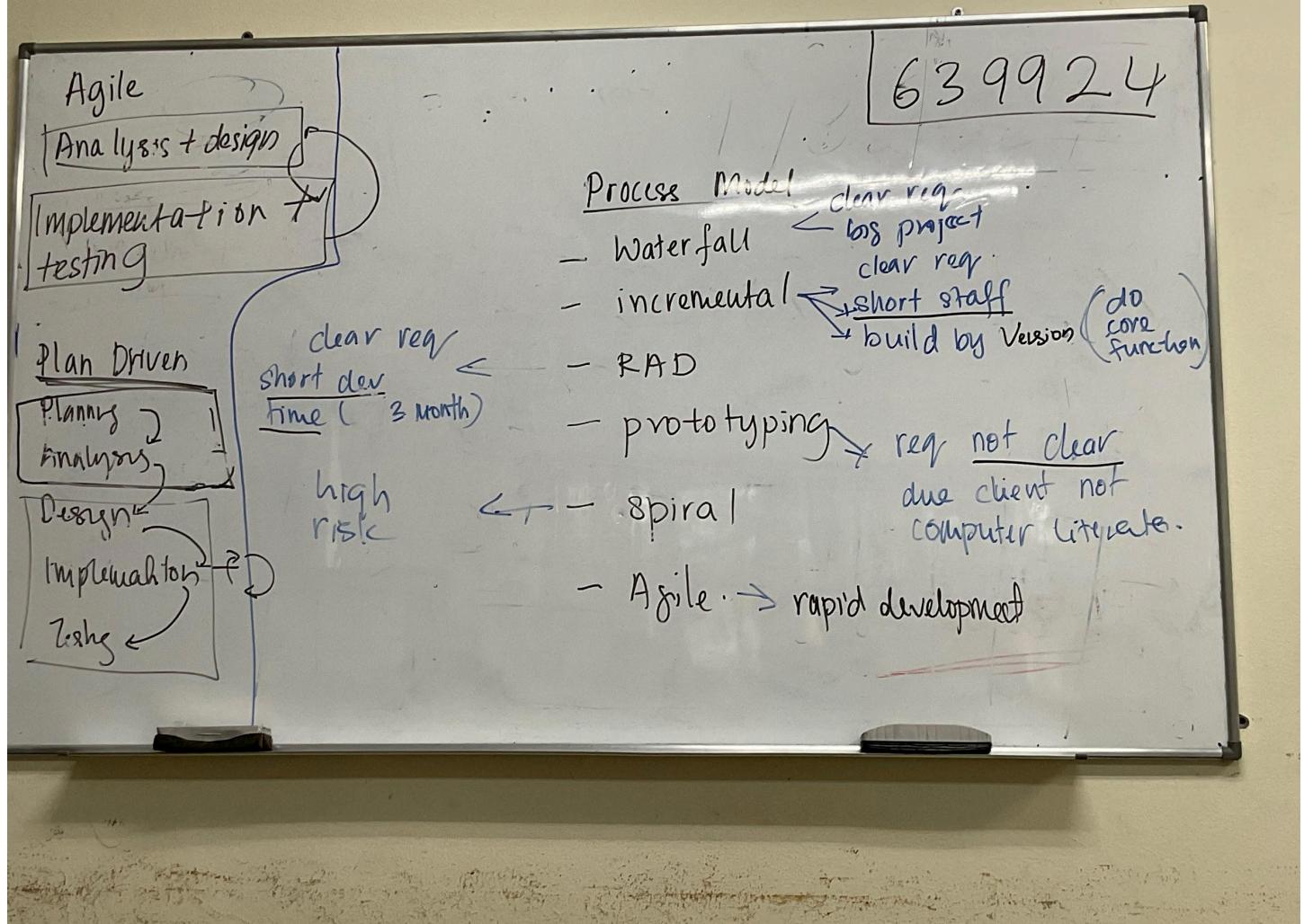
- PUBLIC - Software engineers shall act consistently with the public interest.
- CLIENT AND EMPLOYER - Software engineers shall act in a manner that is in the best interests of their client and employer consistent with the public interest.
- PRODUCT - Software engineers shall ensure that their products and related modifications meet the highest professional standards possible.
- JUDGMENT - Software engineers shall maintain integrity and independence in their professional judgement.

7. EPS Company is currently researching into Track Your Truck (TYT) application that offers an efficient and effective vehicle tracking system. TYT allows users to check real time location of their vehicles through Global Positioning System (GPS). Users can also view their vehicles' fuel usage, mileage, performance analysis reports through TYT. In the event of vehicle theft, a notification message will be sent to police station automatically and to the owner at the same time. In order to recover the lost vehicle, the real time location can be tracked by the owner. (Source: <http://www.trackyourtruck.com/>)

Software engineering is a layered technology consisting of Quality, Process, Methods, and Tools. Suggest 3 **software qualities** that must be included in the Track Your Truck system. Justify your answer.

- Reliable:
  - The TYT system should have downtime that less than 0.05%, ensuring it displays correct information every time a user checks on their vehicle.
- Functional:
  - The TYT system must offer precise features that meet the user's needs, as outlined in the question, and operate exactly as intended.
- Efficient:
  - The TYT system should promptly update and deliver vehicle information, ensuring fast response times while remaining a lightweight application.

## Tutorial 2: Software Process Model



1. Incremental model and Prototyping model are two commonly used process models in software projects.

a. Discuss a scenario that is suitable or useful to adopt the prototyping model.

Adopt the Prototyping Model when user requirements are unclear or the technology is new and untested, such as developing a VR training simulator for a complex task like aircraft maintenance.

- User does not have any computer background - difficulty in requirement elicitation
- User unclear about the requirement. Prototyping quickly can be development and provide to user to elicit requirement
- User are not really know what actually they want

b. Explain the process involved in incremental software process model.

**Requirements:** Define what the module must do and its role within the full system.

**Design:** Lay out the module's structure, how it interacts, and its data flow, matching the overall system's layout.

**Implementation:** Write the code based on the design, build the module to stand alone with its features.

**Testing:** Examine the module intensively to confirm it works properly, meets all specs, and has no defects.

- analysis and requirement (need very clear), repeat in version(1,2,3...): design, implementation, testing
- deliver the **core product** function(s)/feature(s) at the first increment/version
- deliver the supplementary product function(s) feature(s) in next increment(s) version(s).

c. Why the incremental process model is considered by many IT professionals to be the best approach to software development in the current software industry?

Adaptability: It lets us add or change features without causing major disruptions to the project.

Customer Feedback: Users can share their input continuously, which helps us make sure the software meets their needs.

Quality Assurance: We make sure each part works well before moving on, so the whole project stays at a high quality level.

- Useful when staff unavailable
- Can plan to manage the technical risk
- User can use the core function first - user satisfy

2. You as an IT manager of Cozzway Direct Selling Sdn. Bhd. are required to develop an online system which will provide services for its distributors and customers. Among other services, the system should allow users to view product and promotion details, register as a distributor, make orders and payments, track order status, check on distributor's points accumulated and perform redemption based on points entitlement.

The distributors and customers of this company basically come from all parts of Malaysia with different education backgrounds, level of computer knowledge as well as preference of language. Currently, the IT department consists of three staff under your supervision, i.e. one systems analyst and two programmers. This could be a challenging project as it concerns a new area that your team has not ventured into before. The requirements gathered were clear and could be modularized easily. The top management requires that the new online system be completed within three months.

Recommend, with explanation, an appropriate software process model to complete the project. Justify your recommendation. You may state any relevant assumptions to support your answer.

#### Incremental Software Process Model

The incremental model emphasises customer collaboration, which is crucial to tailoring the system to the diverse needs of Cozzway's distributors and customers.

Given the small team size, this model supports empowered decision making, allowing each team member to effectively contribute to the incremental development of the project.

The incremental nature of the model facilitates regular feedback cycles, ensuring that each module is aligned with user expectations and can be refined within the tight three-month timeframe.

As the project moves into unfamiliar territory for the team, the step-by-step approach of the incremental model helps to manage uncertainty and mitigate risk step by step.

#### RAD

- requirements gathered were clear
- could be modularized easily.
- new online system need to be completed within three months.
- Assumption
  - Top management increase the number of staff

## Incremental

- requirements gathered were clear
- could be modularized easily
- less staff - IT department consists of three staff under your supervision, i.e. one systems analyst and two programmers.
- Assumption
  - Top management increase the duration of project

3. Highlight the distinct feature(s) and suggest a scenario where Spiral model is suitable to be adopted.

- The Spiral model emphasises risk assessment and mitigation at every stage of development.
- It involves a series of iterative cycles, with each cycle building on the results of the previous one.
- It brings together different stakeholders, including developers, users, and managers, to address project aspects from various perspectives.
- The model is flexible and can be adapted to various project sizes and complexities.

The Spiral model is best for developing large, critical systems like **air traffic control** where safety is vital.

- It carefully manages risks due to the system's complex and safety-critical nature.
- It ensures the system meets strict regulations through continuous risk assessment and iterations.
- It adapts to new technology and changing needs over time through its iterative cycles.
- It involves various stakeholders, like safety experts and users, fitting the model's comprehensive approach.

## Spiral model - risk analysis and management

- This model is particularly useful dealing with high risks projects - whereby failure of system can cause lost of life/ huge amount of money
- Requirements are unclear and complex
- Large project

4. JC grocery is a mid-sized family business that has operated since 30 years ago. The main operations in the grocery store, i.e., stock in and stock out, are still performed manually. To ease the daily operations, the owner of JC grocery wants to computerise the stock in and stock out operations in the stores. In addition, he also wants to enable online-ordering services to the clients. Nevertheless, the owner does not have any background or knowledge in computerised and online systems.

If you are the project manager of a software solution company, analyse the description above and suggest the most suitable process model to be used in case study above. Justify your suggestion. You may state any assumptions in supporting your justifications.

The Prototyping Model is ideal for JC Grocery's project for these reasons:

Prototypes enable the team to design a system that specifically meets the owner's needs, incorporating direct feedback into the development.

It offers a hands-on approach for the owner to grasp the system's functionality without prior technical knowledge.

With the owner's active participation, potential issues are identified and addressed early, reducing risks.

Rapid Progress Demonstration: Even without a specified timeline, the Prototyping Model enables swift creation of a working model, allowing the owner to see and contribute to the system's evolution.

## prototyping

1. owner does not have any background or knowledge in computerized and online systems. - difficult for him to express what actually he wants
2. we may face difficulty in requirement elicit because user is unclear about the requirement.
3. Develop prototype to elicit requirement

## 5. Discuss 3 main differences between Plan-Driven Development and Agile Software Development.

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Requirements Management:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Plan-Driven: Assumes fixed, upfront requirements with a formal process for changes.<br>Agile: Embraces changing requirements and incorporates them flexibly.                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Adaptability to Change:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Plan-Driven: Less adaptable, with each phase depending on the completion of the previous one.<br>Agile: Highly adaptable, with short iterations allowing for quick responses to new information.                                                                                                                                                                                                                                                                                                                                                                                                         |
| Project Control and Collaboration:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Plan-Driven: Focuses on strict control, detailed planning, and documentation.<br>Agile: Prioritises flexibility, collaboration, and continuous assessment and adaptation.                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Agile Approach                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Plan-Driven Approach                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <ul style="list-style-type: none"><li>• Consider design and implementation to be the central activities and thus incorporate requirements elicitation design and implementation + testing</li><li>• Iteration occurs across activities. Therefore, the requirements and the design are developed together, rather than separately.</li><li>• Might produce some design documentation. E.g. instead of producing a new version of a system, the team produces system documentation.</li><li>• Requirement could rapid changing</li></ul> | <ul style="list-style-type: none"><li>• Identifies separate stages in the software process with outputs associated with each stage.</li><li>• Iteration occurs within activities with formal documents used to communicate between stages of the process. E.g. requirements will evolve then a requirements specification will be produced as input to the design and implementation process.</li><li>• Support incremental development and delivery. It is feasible to allocate requirements and plan the design and development phase as a series of increments.</li><li>• Clear requirement</li></ul> |

6. Delicious restaurant is a new restaurant in town. The restaurant is having a soft-launch in less than a month's time. To further increase the popularity of the restaurant, Delicious restaurant has decided to have a website which introduces the menu and soft-launch promotion to the customers. After that, Delicious restaurant also wants to have an online system to enable table-booking services to the customers. In the future, Delicious restaurant also wishes to extend their online system to provide wireless ordering and delivering services.

If you are the project manager of a software solution company, analyse the description above and suggest the most suitable process model to be used in the above case study. Justify your answer. You may state any assumptions in supporting your justifications.

### Incremental model

This allows the key features of the site to be prioritised and rolled out in a timeframe of less than a month for the soft launch.

It aligns with the restaurant's growth plans and allows for the gradual addition of new services.

After launch, customer feedback can be incorporated into the website and future modules for continuous improvement.

The model ensures that each new part of the system is tested and stable, reducing overall project risk.

#### Incremental

- Requirement is clear and easy to modularized
- The first iteration the core function delivery within 3 weeks - website which introduces the menu and soft-launch promotion to the customers
- The second iteration - online system to enable table-booking services to the customers
- The third iteration - extend their online system to provide wireless ordering and delivering services.

### 7. With the aid of examples, discuss any 5 principles of Agile Software Development.

#### Customer satisfaction through early and continuous delivery:

- Example: An agile team might prioritise early delivery of a minimum viable product (MVP) to users so they can start using it and provide feedback for further development.

#### People and interactions over processes and tools:

- Example: Agile teams often prefer face-to-face communication over formal meetings and documentation. For example, a quick huddle around a whiteboard can replace a lengthy status report.

#### Working software over extensive documentation:

- Example: Rather than producing extensive documentation upfront, agile teams focus on producing functional software that meets customer needs, with just enough documentation to maintain and support it.

#### Responding to change:

- Example: If market research indicates a shift in customer preferences, an agile team can quickly adjust its product development direction to reflect these changes, rather than sticking to a rigid plan.

#### Build projects around motivated individuals:

- Example: Agile teams trust their members to organise themselves and take on tasks that best suit their skills. For example, developers can choose to work on the features they are most passionate about, leading to higher engagement and better results.

- Customer satisfaction by rapid delivery of useful software
- Welcome changing requirements, even late in development
- Working software is delivered frequently (weeks rather than months)
- Working software is the principal measure of progress
- Sustainable development, able to maintain a constant pace
- Close, daily cooperation between business people and developers
- Face-to-face conversation is the best form of communication (co-location)
- Projects are built around motivated individuals, who should be trusted Continuous attention to technical excellence and good design
- Simplicity- The art of maximizing the amount of work not done - is essential
- Self-organizing teams
- Regular adaptation to changing circumstances

# Tutorial 3: Project Management

1. a) With relevant examples, discuss the 4 important roles and responsibilities of a software project manager.

Planning: The project manager is responsible for creating a comprehensive plan that outlines project objectives, timelines, milestones, and resource allocation. Example: Defining the project scope for a new software feature release, including timelines for design, development, and deployment.

Scheduling: They develop and manage the project schedule, ensuring all tasks are completed on time. Example: Creating a Gantt chart to track the progress of software development phases, including coding, testing, and release.

Supervision: The project manager supervises the team, providing guidance and resolving issues that may arise during the project. Example: Mentoring developers on best practices for code reviews to maintain software quality.

Monitoring Progress: They monitor the project's progress to ensure it stays on track and within budget. Example: Regularly reviewing burn-down charts to assess whether the team is meeting sprint goals.

Planning

Scheduling

Supervise

Monitor progress

1. b) List and explain the 6 management activities need to handle by a software project manager.

Proposal Writing: Preparing a proposal that describes the project's objectives, approach, cost, and schedule. Example: Writing a proposal for a client to outline how the project will be executed and estimated costs.

Project Planning and Scheduling: Identifying activities, milestones, and deliverables, and creating a project plan and schedule. Example: Developing a detailed project plan with timelines and resource assignments.

Project Costing: Estimating the resources required and conducting cost-benefit analysis. Example: Calculating the budget for software licenses, hardware, and personnel.

Project Monitoring and Reviews: Tracking progress against the project plan and conducting regular reviews. Example: Holding weekly team meetings to review progress and address any deviations.

Personnel Selection and Evaluation: Selecting the right candidates for the project team and evaluating their performance. Example: Assessing candidates based on their technical skills and project requirements.

Report Writing and Presentation: Preparing and presenting reports on the project's status and outcomes. Example: Creating status reports for stakeholders and presenting them in review meetings.

Proposal writing

Project planning and scheduling

Project costing

Project monitoring and reviews

Personnel selection and evaluation

Report writing and presentation

2. ZenHardware Sdn Bhd is a local company established for more than ten years. Recently the company is planning to automate their customer service processes through an online system.

They have identified a list of functions the online system must include. Basically there are two main modules which are customer module and administrator module. Customer can request/update/cancel a hardware service ticket, track their hardware service records, update their profile and invoke a live chat with sales representative. Your company is contacted by ZenHardware Sdn Bhd to handle the project with a budget of RM10,000 within three months duration. This project has been approved by your company's top management. You are given full authority to select your own team members from other departments.

As a project manager, briefly write a proposal to your management regarding this project. Your proposal should include the objective(s) of the *project*, *cost*, and *schedule*.

### **Project Proposal for ZenHardware Sdn Bhd's Online System**

Objective: Develop an online system with customer and administrator modules to streamline ZenHardware's customer service.

Cost: RM10,000, allocated for development, integration, and testing.

Schedule: Completion within three months, with these milestones:

Month 1: Requirements, design, and start of development.

Month 2: Module development, integration, and testing.

Month 3: Final testing, UAT, and go-live.

Justification: This project fits our expertise, offers client relationship growth, and enhances our service automation portfolio. With the given budget and timeline, we are poised for a successful delivery. I will assemble a skilled team to ensure on-target completion.

Objective: To develop customer module and administrator module for ZenHardware Sdn Bhd

Costing : RM10 000.00

Schedule : 3 Months

3. Managing a project group is one of the challenging and critical management tasks in software development projects. Discuss 4 factors that you would look into to improve the motivation and productivity level of a project group.

Key Factors for Team Motivation and Productivity:

Clear Goals: Set achievable objectives to align team efforts.

Recognition: Reward accomplishments to boost morale.

Growth Opportunities: Encourage skill development and career progression.

Positive Culture: Cultivate a supportive and respectful work environment.

Group composition - is there the right balance skills, experiences & personalities in the team?

Group cohesiveness - does the group think of itself as a team rather than as a collection of individual who are working together?

Group communication - do the members communicate effectively?

Group organization - is the team org in such a way that everyone is satisfied and feels valued with their role in the group?

4. Anderson is starting up a new company to provide Internet of Things (IoT) services in automating data collection from building construction and send notification to the users based on the data

collected. For example, if the noise level has exceeded the safety measurement, IoT detector will alert all the workers to take some corrective actions. Another example is the electrical equipments used in the wet construction must not exceed 110V. Anderson has hired three senior software engineers in developing the IoT applications. The applications will be developed phase by phase in order to provide end-to-end solutions. Anderson plans to get the first version of IoT service for building construction hazard control application ready in the market within two months.

In project management, a project manager would need to consider the factors that could motivate employees throughout the project. Suggest and explain 2 motivating factors in this case based on Maslow Motivation Model.

Maslow's Motivation Model Application:

Physiological Needs: Provide fair compensation and a conducive work setting.

Safety Needs: Ensure job security and a stable, predictable work environment.

(explain with detail examples (environment))

Physiological - provide proper office set up environment with wifi connect

Safety - offer permanent employment for contract staff, they feel secure in the job

5. Construct a *Gantt Chart* for developing an online system based on the following table.

Assume that the project starts in January.

| Task ID | Task Description                                | Predecessor | Duration (month) | Overlap (month) |
|---------|-------------------------------------------------|-------------|------------------|-----------------|
| A       | Form project teams and gather user requirements | None        | ¼                | None            |
| B       | Plan project                                    | A           | ½                | None            |
| C       | Business modeling                               | B           | 1                | ¼               |
| D       | Data modeling                                   | C           | 1                | ¼               |
| E       | Process modeling                                | C           | 1                | ¼               |
| F       | Application generation                          | E           | 1 ½              | ½               |
| G       | Testing & Turnover                              | F           | ½                | ¼               |

| Task ID | Duration       | January |  |  | February |  |  | March |  |  | April |  |  |
|---------|----------------|---------|--|--|----------|--|--|-------|--|--|-------|--|--|
| A       | $\frac{1}{4}$  |         |  |  |          |  |  |       |  |  |       |  |  |
| B       | $\frac{1}{2}$  |         |  |  |          |  |  |       |  |  |       |  |  |
| C       | 1              |         |  |  |          |  |  |       |  |  |       |  |  |
| D       | 1              |         |  |  |          |  |  |       |  |  |       |  |  |
| E       | 1              |         |  |  |          |  |  |       |  |  |       |  |  |
| F       | $1\frac{1}{2}$ |         |  |  |          |  |  |       |  |  |       |  |  |
| G       | $\frac{1}{2}$  |         |  |  |          |  |  |       |  |  |       |  |  |

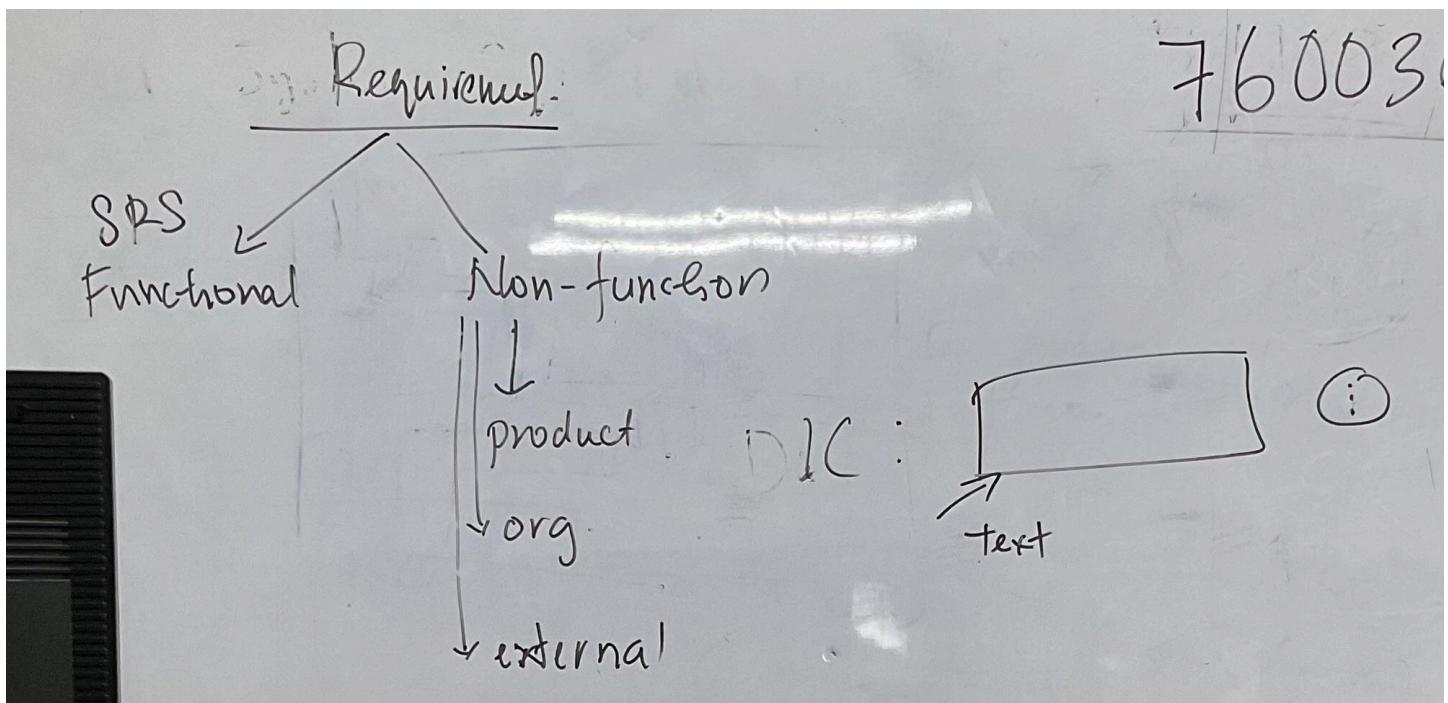
6. WildLife Wonderland is a veterinary, pet food and pet care shop. It is a small scaled family business founded in 1990s. Recently the shop owner, Anderson, plans to sell its products online. He has contacted your company, a software house, to handle this project.

Prepare a Gantt Chart to develop the online pet shop system based on the following table. Assume that the project starts in February.

| Task ID | Task Description      | Predecessor | Duration (month) | Overlap (month) |
|---------|-----------------------|-------------|------------------|-----------------|
| A       | Requirement gathering | None        | $\frac{1}{4}$    | None            |
| B       | Prototype 1           | A           | $\frac{1}{4}$    | None            |
| C       | Customer feedback     | A           | $\frac{1}{4}$    | None            |
| D       | Prototype 2           | C           | $\frac{1}{4}$    | None            |
| E       | Customer feedback     | C           | $\frac{1}{4}$    | None            |
| F       | Prototype 3           | E           | $\frac{1}{4}$    | None            |
| G       | Customer feedback     | E           | $\frac{1}{4}$    | None            |
| H       | Coding                | G           | 1                | None            |
| I       | Testing               | H           | $\frac{1}{2}$    | $\frac{1}{2}$   |
| J       | Deployment            | I           | $\frac{1}{4}$    | None            |

|         |               | February |    |    |    | March |    |    |    | April |    |    |    |
|---------|---------------|----------|----|----|----|-------|----|----|----|-------|----|----|----|
| Task ID | Duration      | W1       | W2 | W3 | W4 | W1    | W2 | W3 | W4 | W1    | W2 | W3 | W4 |
| A       | $\frac{1}{4}$ |          |    |    |    |       |    |    |    |       |    |    |    |
| B       | $\frac{1}{4}$ |          |    |    |    |       |    |    |    |       |    |    |    |
| C       | $\frac{1}{4}$ |          |    |    |    |       |    |    |    |       |    |    |    |
| D       | $\frac{1}{4}$ |          |    |    |    |       |    |    |    |       |    |    |    |
| E       | $\frac{1}{4}$ |          |    |    |    |       |    |    |    |       |    |    |    |
| F       | $\frac{1}{4}$ |          |    |    |    |       |    |    |    |       |    |    |    |
| G       | $\frac{1}{4}$ |          |    |    |    |       |    |    |    |       |    |    |    |
| H       | 1             |          |    |    |    |       |    |    |    |       |    |    |    |
| I       | $\frac{1}{2}$ |          |    |    |    |       |    |    |    |       |    |    |    |
| J       | $\frac{1}{4}$ |          |    |    |    |       |    |    |    |       |    |    |    |

# Tutorial 4: System Requirements



1. Penxoniks Sdn. Bhd. has recently launched its new products. In view of the sales that have been very encouraging since then, Mr. Alex Tham, the Sales Director of Penxoniks, has decided to computerize the sales and inventory system.

The software organization that you work with has successfully bid for the above mentioned project. You, as one of the project managers in your software organization, have been appointed to lead this project. During the initial requirement study exercise, your team noticed that the staff members of the Sales Department of Penxoniks are all very supportive of this upcoming project. They are able to explain their requirements very clearly in the recent interview sessions. Furthermore, most of them have highlighted to you that they hope the new system should have a very low learning time.

The top management of Penxoniks wants the new system, which will include an online order and payment feature, to be available before Christmas. They believe that this online feature will boost their sales during the Christmas and New Year festive season. Hence, the project team will only have about three months to work on this project. Top management has also emphasized that the new system's downtime should not be more than 0.05%. Furthermore, the new system should be developed using the Object-Oriented Analysis and Design Development Methodology and must be implemented based on the Oracle database.

- a. Compose the user and system requirements for the *Online Order and Payment* function mentioned in the scenario.

## User Requirements:

Users must be able to browse products online and view detailed information.

Users should be able to place orders for products and proceed to payment securely.

Users need the ability to track the status of their orders online.

Users expect a simple and intuitive interface for ease of use.

## System Requirements:

The system must provide a user-friendly interface for browsing and ordering products.

It should support secure online payment processing and integration with payment gateways.

The system must have a backend to manage and update order statuses in real-time.

The system should ensure data privacy and security for user information and transactions.

#### User requirement

The sales and inventory system includes online ordering and payment features to be developed in three months using the Object-Oriented Analysis and Design Development Methodology and to be implemented based on the Oracle database. The new system's downtime should not be more than 0.05% and has very low learning time

System requirement spec (one line only explain one function - eg: separate place order & cancel order)

1. The system shall allow customer to place order online.
2. The system shall allow customer to cancel order online.
3. The system shall allow customer to modify order online.
4. The system shall allow customer to make a payment order online.
5. The system shall send order confirmation notification to customer email
6. The system shall allow customer to track order online.
7. The system shall allow customer to view order history.
8. The system shall allow staff to generate online sales report
9. The system shall allow staff to check the stock inventory online

- b. Non-Functional requirements can be categorized into three main categories, namely product, organisational and external.

Identify 4 non-functional requirements requested by the management and staff of Penxoniks in the above scenario. For each identified non-functional requirement, indicate whether it is a product, organisational or external requirement.

#### 1. Low Learning Time (Product Requirement):

The system should be intuitive and easy to use, minimizing the time required for staff to learn how to operate it.

#### 2. High Availability (Product Requirement):

The system must have minimal downtime, with a requirement of no more than 0.05% to ensure continuous service.

#### 3. Object-Oriented Development (Organisational Requirement):

The system must be developed using Object-Oriented Analysis and Design Development Methodology, as per the company's development standards.

#### 4. Oracle Database Implementation (Organisational Requirement):

The system should be implemented using the Oracle database, aligning with the company's technology infrastructure and preferences.

low learning time- usability criteria

Non-Functional Requirement

Product

#### 1.0 Reliability

- 1.1 The new system's downtime should not be more than 0.05%.

#### 2.0 Usability

- 2.1 The new system has very low learning time, maintain consistency in every page, provide user

guidance, use familiar icon (cannot easy to use, can say how low learning time)

### 3.0 Security

3.1 The system shall secure user's information like credit debit card from unauthorised access.

### 4.0 Performance

4.1 The system shall process payment in 5 sec (...send notification in 3 sec)

### Organization

1. The new system should be developed using the Object-Oriented Analysis and Design

Development Methodology

2. The new system implemented based on the Oracle database.

3. The system to be developed in 3 months

### External

1. The taxation shall conform to Malaysian Sales and Services Tax

(...legacy, privacy act in external)

2. System requirements specification (SRS) is the main output document of Requirements Specification stage and it is usually presented in a structured form of natural language supplemented by system models and tables.

a. Analyse the possible problems of writing this document in natural language.

Ambiguity: Natural language can be vague, leading to multiple interpretations of the same requirement.

Lack of Precision: It's difficult to express requirements with exactness, increasing the risk of misunderstanding.

Inflexibility: Once written, changing natural language requirements can be cumbersome.

Difficulty in Verification: It's hard to validate whether the system meets the requirements as they are not clearly defined.

b. Suggest and explain 2 alternatives to using natural languages.

Structured Natural Language: This involves using a more formalized version of natural language with clear, unambiguous terms. It can be supported by tables, decision trees, and other structured elements to reduce ambiguity.

Graphical Notations: Tools like UML (Unified Modeling Language) diagrams, flowcharts, and use-case diagrams can visually represent requirements. These can be more intuitive and easier to understand at a glance, reducing the reliance on text.

Formal Specifications: Using mathematical or logical formalisms to specify requirements can provide a high level of precision and unambiguity. Techniques like Z-notation or Alloy can be used for this purpose.

structured natural language eg. structured English  
design description language  
requirement specification languages  
graphical notations  
mathematical specifications  
(Our lvl: z notation)

3. This is one of the user requirements provided in the requirement documentation:

*This e-shopping system shall allow online users to search, select and purchase their desired product online.*

Prepare the 3 functional requirements and 3 non-functional requirements from the above user requirement.

### **Functional Requirements from User Requirement**

Search Functionality: The system must provide a search feature that allows users to find products based on keywords or categories.

Selection Capability: Users should be able to select products from search results and add them to a shopping cart.

Purchase Process: The system must support a secure checkout process where users can finalize their purchase and make payments online.

### **Non-Functional Requirements from User Requirement**

Performance: The search and checkout processes must be fast and responsive to ensure a good user experience.

Security: The system must ensure secure handling of user data and payment transactions to protect against fraud and data breaches.

Usability: The interface must be user-friendly, allowing users to easily navigate and complete their purchases without confusion.

#### Functional requirement

The e-shopping system should allow online users to search their desired product by the product name.

The e-shopping system should allow online users to select the product from the product list.

The e-shopping system should allow online users to purchase their desired product from their cart.

#### Non-functional requirement

##### 1.0 Usability

1.1 The e-shopping system has very low learning time via providing the user guidance and understandable icons.

##### 2.0 Performance

2.1 The e-shopping system should respond to users' action within 2 seconds.

##### 3.0 Reliability

2.1 The chances of down-time error of e-shopping system should not exceed 0.05% per year.

4. EPS Company is currently researching into Track Your Truck (TYT) application that offers an efficient and effective vehicle tracking system. TYT allows users to check real time location of their vehicles through Global Positioning System (GPS). Users can also view their vehicles' fuel usage, mileage, performance analysis reports through TYT. In the event of vehicle theft, a notification message will be sent to police station automatically and to the owner at the same time. In order to recover the lost vehicle the real time location can be tracked by the owner. (Source :<http://www.trackyourtruck.com/>)

- a. Give 4 functional requirements for the Track Your Truck system.

Real-Time Location Tracking: The system must provide real-time GPS tracking for vehicles.

Fuel Usage Monitoring: Users should be able to view their vehicles' fuel consumption data.

Mileage Reporting: The system should generate reports on vehicle mileage.

Theft Notification: In case of theft, the system must automatically send notifications to the police and the vehicle owner.

#### Functional requirement

The system shall allow users to check the real time location of their vehicles through Global Positioning System (GPS).

The system shall allow users to view their vehicles' usage.

The system shall allow users to view their vehicles' performance analysis reports.

The system shall send a notification message to police station and owner automatically if the owner's vehicle is being stolen.

- b. Explain 2 problems if you are to construct user requirements using natural language.

Ambiguity: Natural language can be unclear, leading to different interpretations of the same requirement, which can result in miscommunication and incorrect system behavior.

Lack of Precision: It's challenging to specify requirements with exact details using natural language, making it difficult to validate whether the system meets the requirements as they are not precisely defined.

Lack of clarity: difficult to use language in a precise and unambiguous way without making the document wordy and difficult to read.

Requirement confusion: functional, non-functional requirements, system goals, design info may not be clearly distinguished.

Requirements amalgamation: several requirement expressed as a single requirement.

5. Sri Touch Academy is a newly established company in Kuala Lumpur which offers make-up, hairstyling, and art courses. The courses are conducted in both full time and part time modes. As a software engineer, you are responsible to build an online website for the company to allow customer to register as member, pay the fees, check classes' schedule, post questions, share success story, subscribe to weekly newsletter, chat with company personnel, and connect to other social networks such as Facebook Page, Twitter, and Instagram. You have three months to accomplish the project together with your junior software engineer. Sri Touch Academy requested you to deliver the initial version within two months and the subsequent within one month.

Produce 2 functional requirements and 2 non-functional requirements for the online website based on the case study.

## **Functional Requirements for Sri Touch Academy's Online Website**

Member Registration: The website must allow customers to create and manage their member profiles.

Class Schedule Viewing: Users should be able to view the schedule for makeup, hairstyling, and art courses.

## **Non-Functional Requirements for Sri Touch Academy's Online Website**

Performance: The website should load and respond quickly to ensure a smooth user experience.

Security: The system must securely handle user data and payment transactions to protect against unauthorised access and fraud.

### Functional requirement

The system shall allow customer to register as member.

The system shall allow customer to pay the fees.

### Non-functional requirement

#### 1.0 Portability

1.1 The system should be able to operate in different browser such as Google Chrome, Microsoft Edge and Opera.

#### 2.0 Performance

2.1 The system should provide the response to the users within 5 seconds.

# Tutorial 5: Requirements Engineering Process

1. Discuss the 5 main activities involved in Requirements Engineering Process.

Feasibility Study - an estimation and study is made to see whether the system is feasible to be implemented in terms of economically, operationally and technically.

Requirement elicitation and analysis - a process to work with stakeholders to derive their functional and non-functional requirements from the new system

Requirement Specification - a process to produce SRS

Requirement Validation - a process to show that the requirements actually define the system that client wants.

Requirement management - an ongoing process to manage requirements

2. Nobiana specializes in swimwear and clothing for women. Started in 1995 as a small scale mail order company, Nobiana has now grown into a multi-million pound and award winning organization.

Working with an independent outsourcing consultancy Zen, Nobiana decided to implement a new point-of-sales and inventory management system. The new project was driven by the need to simplify the way in which stock information and point-of-sales applications were delivered to retail stores and to enable this to be easily scalable in order to accelerate roll-out to existing or new stores, reduce ongoing administration and support costs while providing real time and accurate view of stock across the business, minimizing stock levels and streamlining ordering across the branches.

- Suggest and briefly explain 2 techniques for discovering requirements for the above project.
- Assume that Zen is planning to adopt a viewpoint-oriented analysis method for the requirements analysis process. Describe viewpoint-oriented analysis in requirements analysis process.
- Suggest 5 principal viewpoints which should be considered in the process of discovering requirements for the above project. Construct a viewpoint hierarchy to present your viewpoints.
- Discuss 2 advantages and 1 disadvantages of using viewpoint-oriented analysis method in requirement gathering and analysis.
- Suggest 3 aspects to be checked when validating the SRS for the above mentioned project.

- Interview/ Observation
- (Identify stakeholder requirements)

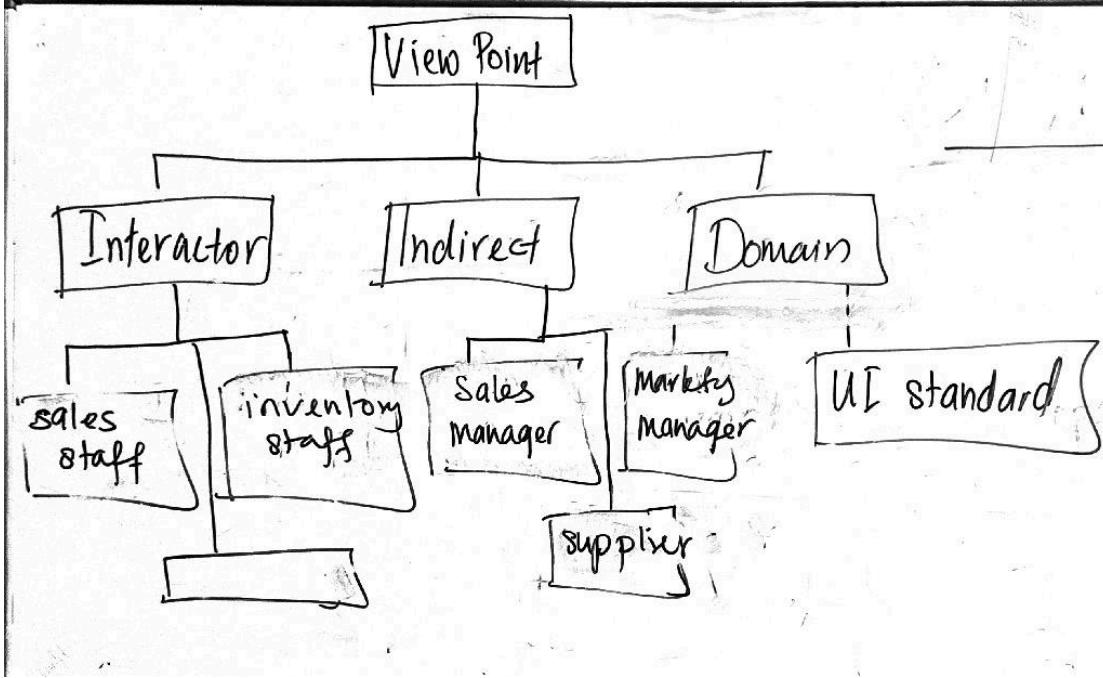
Viewpoint-oriented analysis:-

which are external to the system and the services delivered to these viewpoints. Data and control requirements for these services are also defined.

Viewpoints can be used to classify stakeholders and other sources of requirements. Helps to ensure get broad stakeholders coverage when discovering requirements.

3 generic types of viewpoints are:

- Interactor - people or other systems that interact directly with the system
  - Indirect - stakeholders who do not use the system themselves but who influence the requirements
  - Domain - domain characteristics and constraints that influence the requirements
- c.



d.

Advantages

Get broad coverage of stakeholder

Help to identify the valid and invalid VP

Disadvantages

Take time costly

e.

Validity - functions user wanted is correct and confirmed needed

Consistency - no conflicting functions

Completeness - include ALL functions needed

Realism check - could be implemented (with existing technology, budget, schedule)

3. Discuss any 3 possible problems in Requirements Elicitation and Analysis process.

4. Company KW is planning to develop an online document management system that is used by internal staff to store, share, and work on some confidential documents. You, and IT project manager, are responsible to manage this project with senior software engineers. Company KW requests you to deliver an initial version within 2 months and the subsequent increment within 2 months with active internal staff involvement.

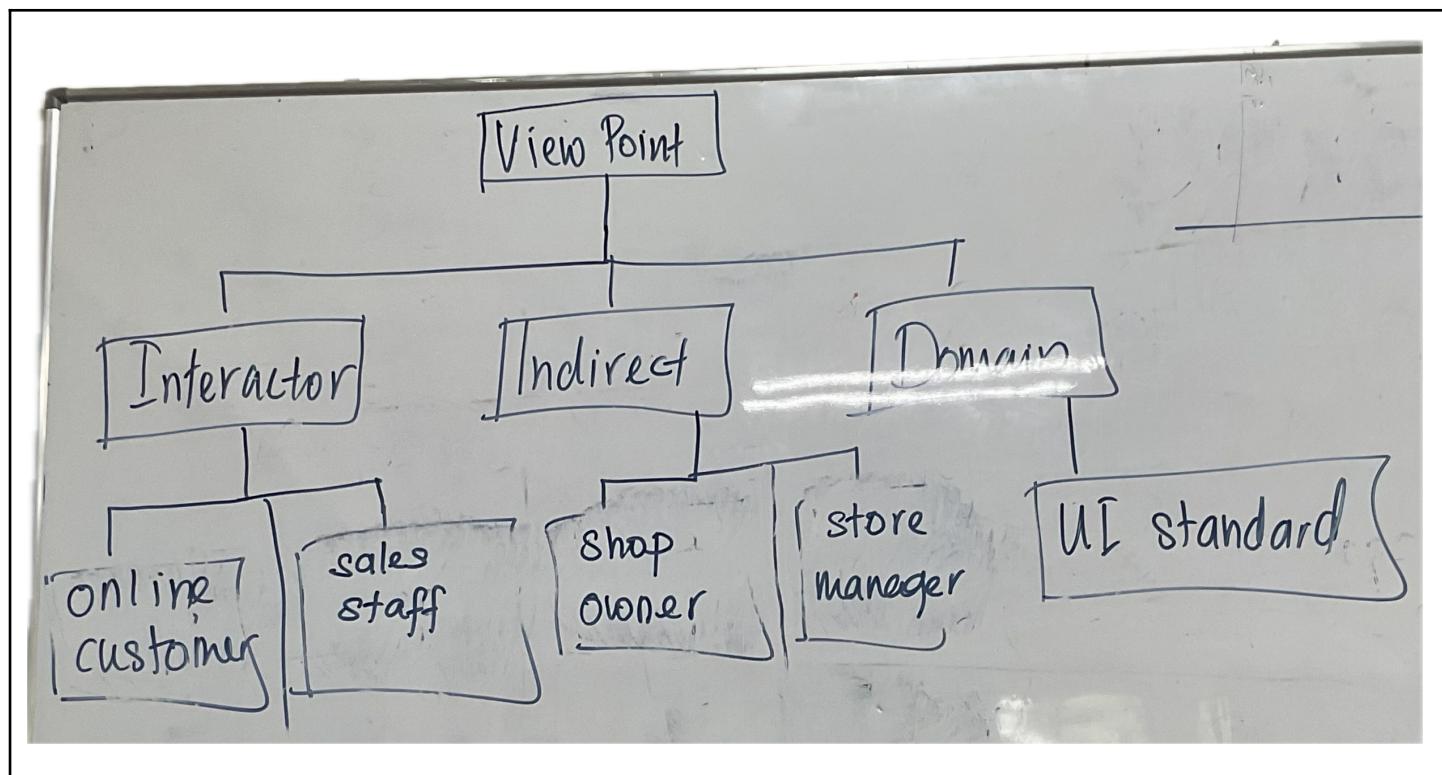
Identify 3 viewpoints for the online document management system. Construct a viewpoint-oriented hierarchy for the system.

5. Easy2Study.com is a global marketplace for teaching and learning online where students are mastering their skills. The system allows the students to search, view available courses, purchase, make payment, and join the courses. An access to start the course will be given once the payment is confirmed. Easy2Study.com is planning to extend their online system on mobile platforms to attract more customers as mobile users are increasing extremely.

As a software engineer for this project, you are required to prepare the system requirements document for Easy2Study.com mobile application. Recommend and explain 2 aspects that must be validated during Easy2Study.com SRS document validation process.

6. Ladre is a small scaled family business found in 2000s which selling computers' hardware and software. Recently the shop owner plans to improve the business by selling the products online. He has contacted your company as a suitable software house to handle this project.

Based on the case study, construct a viewpoint-oriented hierarchy for the online computer store system with 5 possible viewpoints. You must categorize your viewpoints under 3 categories (Interactor, Indirect, and Domain) with at least one viewpoint under each category.



## Tutorial 6:

1. Ladre is a small scaled family business found in 2000s which selling computers' hardware and software. Recently the shop owner plans to improve the business by selling the products online. He has contacted your company as a suitable software house to handle this project.

Discuss the 3 main activities that your team would perform for the architectural design of the above project.

- System Organization/Structuring

The Ladre online computer store system is structured into (Repository model !

Client-server model / Layered model) by number of principal sub-systems and communications between sub-systems in share data, how they are distributed and interface with each other.

- Modular Decomposition

The decomposition of Ladre online computer store sub-systems into modules by using (Object-Oriented Decomposition / Function-Oriented Decomposition)

- Control Modeling

Ladre online computer store sub-systems must be controlled so that their services are delivered to the right place at the right time by-using (Centralized control /

Event-based control)

2. You, as a project manager have been assigned to lead project team e-learning system for a college. The main functions of the e-learning system include programme registration and payment, on-line assessment, assignment submission, uploading and downloading course materials. The main campus of the college is located at Penang and the other branch campuses are located in Melaka, Kelantan and Sarawak.

Recommend and draw an appropriate *system organization* model for the above project. Explain the model and justify your recommendation.

Client server with repository model

Repository - to share large data like programme details, course details, students details, staff details among sub systems.

Client - server - the processing of heavy transaction from online user of the system distributed across sub system to avoid overloaded situation, etc during registering, expected huge transaction from students(online user) at the same period of time. In order to avoid overloaded situation, client server model is used.

3. Differentiate the following pairs of *control model*:

- a. Call-return model and manager model
- b. Interrupt-driven model and broadcast model

- a

Call-return model

- A top down sub-routine model

- Applicable for sequential systems
- manager model
- A system component is designated as system manager
  - Processes (sub-systems) can execute concurrently
  - Applicable for concurrent systems
- Interrupt-driven model and broadcast model
- Interrupt-driven model
- Used in real-time systems where interrupts are detected by an interrupt handler and passed to some other component for processing
- broadcast model
- An event is broadcast to all sub-systems. Any sub-system which can handle the event may respond to it.
  - Effective in integrating sub-systems distributed across different computers on a network
- b.

4. Giving reasons for your answer, suggest an appropriate system organization model for the following systems:
- a. An automated ticket issuing system used by customers at a cinema.
  - b. A Sales and Inventory System used by Sales Staff and Inventory Staff in an organization

Repository model - share data like movie information among the sub system

b. Client server with repository

Client server - to avoid overloaded transaction situation during peak sales

Repository - to share inventory details among the sub system

5. A Sales Invoicing System will firstly take the customer order transactions and itemize unit price from database, follow by totaling up all the items ordered prices to calculate the invoice amount. The system will then deduct the invoice amount with a discounted rate (if any) and this will produce the final invoice amount. Then the system will update the customer account and finally print the invoice for each customer.

Giving reasons for your answer suggest a suitable control model for the above system. You may state any assumptions to support your answer.

Call return model - suitable for sequential systems where by customer order transactions and itemize unit price from database then totaling up all the items ordered prices to calculate the invoice amount then deduct the invoice amount with a discounted rate finally produce invoice amount.

6. XinJin Press is a newspaper company which started its first printed newspaper in 1960s. Recently, you are invited to attend a discussion meeting with XinJin Company's IT department. The main agenda of the meeting is to decide on the maintenance of some of their legacy systems. One of their legacy systems is a text file storage server which stores large amount of the newspaper draft contents (original story from the interview, news draft, supporting images or news, and et cetera). The file storage system has no documentation and no proper module design. The draft contents might be useful in the future to trace the original story.

Assuming that XinJin IT department decided to re-engineer the legacy system. Propose 1 system organization/structuring design model. Explain and justify your answer.

Repository model - share data -> large amount of the newspaper draft contents (original story from the interview, news draft, supporting images or news, and et cetera).

7. Easy2Study.com is a global marketplace for teaching and learning online where students are mastering their skills. The system allows the students to search, view available courses, purchase, make payment, and join the courses. An access to start the course will be given once the payment is confirmed. Easy2Study.com is planning to extend their online system on mobile platforms to attract more customers as mobile users are increasing extremely.

Suggest and explain 1 suitable system organization model and 1 control modelling model for the Easy2Study.com mobile application. Discuss your answers.

Control model - manager model - one sub system act as manager responsible for control start and stop other sub systems which handling search, view available course, purchase, join course and make a payment

## Tutorial 7:

1. SmartOffice.com is a newly established company which designs and implements Internet of Things (IoT) in offices such as automation of lighting during night and in the washroom, office air-con automated temperature detection and adjustment, video monitoring system, and et cetera. The company is approaching you to develop an Online Customer Service System which eases their customers to contact their sales representative whenever they have problems with the technology. The website should be available 24x7. There will be a group of sales representatives answering the customers' questions through online chat or email.
  - a. Assume that the project testing team is going to adopt the following testing techniques for testing the above Online Customer Service System. Explain each testing technique.
    - i. Black-box testing
    - ii. White-box testing
    - iii. Stress testing
    - iv. Back-to-back testing
    - v. Regression testing
  - b. What is the relationship between unit testing, module testing and sub-system testing? Explain your answer by using appropriate example(s).
  - c. Construct 2 test cases for the Online Customer Service System based on the following format.

| Program Name:<br>Test Date: - |           |           |                  |                |         |
|-------------------------------|-----------|-----------|------------------|----------------|---------|
| No.                           | Test Case | Test Data | Expected Results | Actual Results | Remarks |
|                               |           |           |                  | -              | -       |
|                               |           |           |                  | -              | -       |

- d. Explain any 3 testing principles that would help to improve software testing process.

2. CBrat is developing Chatbox, which is a platform for all sizes of businesses to build, automate and operate personalized messaging application. This Chatbox supports SMS, Facebook, Messenger, live web chat with a single cross-channel customer history. Instant Apps is able to exchange structured data (forms, files, photos, and etc.) in-line with the conversation. Chatbox is also able to sync conversational history and structure data from Instant Apps to the data source. The Instant Apps can escalate between bot and live agent with full conversational history, measure and analyze the effectiveness of messaging through all facets of the customer experience, including tracking across all supported channels and Instant Apps. (Source:<http://chatbox.com/>)

Propose and explain 2 testing techniques in ensuring Chatbox's performance

3. Standard Printing Company is established in 1981. The main business is designing and printing advertisement. The graphic designer is using a legacy system to design advertisement for customers. The design is stored as both PDF and DOC in the legacy system. The documentation of the legacy system are incomplete and the system is programmed in an obsoleting programming language. Recently, the company is considering to purchase Atlassian JIRA in assisting their advertisement project management. The owner of the company, Mr. S, is consulting you regarding the cost of the tool.

Assuming that Mr. S has decided to integrate Atlassan JIRA with the legacy system. Compare 2 testing techniques/strategies to test the system integration.

4. Differentiate between Software Testing Stages, Software Testing Techniques, and Software Testing Strategy. Support your answer by providing 1 example for each component.

## Tutorial 8:

- UniversalAuto.com is an online website which allows the users to book and rent car for vacation. The company's service areas include the whole country of Malaysia. The website allows users to view available car models, rental fee, make booking, and make payment. A booking number will be generated once the payment is confirmed. Recently UniversalAuto.com is planning to extend their website on mobile platform as mobile users are increasing dramatically

Propose 4 user interface designs principles to UniversalAuto.com mobile application.

- What are the 2 elements that must be put into attention in presenting information while designing a mobile game for children age 5-7 years old? Explain your answer with appropriate example.

- Furious Movies Cinema is approaching your company to implement an online cinema ticketing system. Suggest and explain 4 good user interface design principles to the system to ensure screen usability.

- Around The Globe (ATG) Sdn Bhd is a travelling agency that is owned by family Berth since 1960s. The company is using a high quality legacy system to manage the staff and customers' information. However, the maintenance cost is increasing recently as a system requires Pascal experts. Seeing that this system has low business value to the company, Berth Junior (CEO of ATG) consults your company regarding the legacy system's management strategy.

Berth Junior is complaining about the legacy system's usability (user interface design). Explain to Berth Junior 3 golden rules for a good user interface design that your company normally applies.

- SmartOffice.com is a newly established company which designs and implements Internet of Things (IoT) in offices such as automation of lighting during night and in the washroom, office air-con automated temperature detection and adjustment, video monitoring system, and et cetera. The company is approaching you to develop an Online Customer Service System which eases their customers to contact their sales representative whenever they have problems with the technology. The website should be available 24x7. There will be a group of sales representatives answering the customers' questions through online chat or email.

Suggest and explain 4 user interface designs principles that must be included in the Online Customer Service system.

## Tutorial 9:

1. A local television programs production company (Longevity Pte. Ltd.) is planning to develop an online real time system which allows users to watch television programs online (OnlineWatch.com). The website allows users to login and watch three local television channels' programs archived for one month. You have successfully bid the project for your software organization and will kick start the project in a month time.
  - a) Explain to Longevity Pte. Ltd. on the real time system design process for OnlineWatch.com.
  - b) Provide 1 set of stimuli-response in the first step of the design process
2. You are joining a software house that specialized in developing games. A colleague has just resigned and left the company due to personal reasons. You are assigned to take over the resigned colleague's on-going project which is to develop an online shooting game. The online gamers can choose to join any group to compete with another group of online gamers. The online game also allows gamers to invite their friends through social media.

Compose and explain 2 sets of stimuli and associating response for this real time system.

3. iRobot is an automated vacuum cleaner that can automatically clean the floor at a pre-set time. This real time vacuum cleaner uses a high-efficiency cleaning pattern algorithm and a full suite of sensors to map and adapt to real world clutter and furniture for thorough coverage of a home. (Adapted from: <http://www.irobot.com/For-the-Home/Vacuum-Cleaning/Roomba.aspx>).

Compose and explain 2 sets of stimuli and associating response for the iRobot system.

4. SmartOffice.com is a newly established company which designs and implements Internet of Things (IoT) in offices such as automation of lighting during night and in the washroom, office air-con automated temperature detection and adjustment, video monitoring system, and et cetera.

Compose 2 sets of stimuli and associating response for the automation of a lighting system.

5. EPS Company is currently researching into Track Your Truck (TYT) application that offers an efficient and effective vehicle tracking system. TYT allows users to check real time location of their vehicles through Global Positioning System (GPS). Users can also view their vehicles' fuel usage, mileage, performance analysis reports through TYT. In the event of vehicle theft, a notification message will be sent to police station automatically and to the owner at the same time. In order to recover the lost vehicle the real time location can be tracked by the owner. (Source :<http://www.trackyourtruck.com/>)

Identify 1 periodic stimulus and 2 aperiodic stimulus with associating responses and timing constraints.

6. Donao is an online theatre that provide high-definition mode movie. User can watch movie online or download the movie.

Identify 2 periodic stimulus and 2 aperiodic stimulus with associating responses and timing constraints.

7. You, as an appointed software engineer are in-charge for designing an online management system for Study Point Tutor center. Currently the tuition center has been using manual way to manage the center and now has decided to automate all their registration, classes scheduling, attendance, and payment processes.

Design 3 sets of aperiodic stimuli-response for Study Point Tutor online management system as mentioned above.

# Tutorial 10:

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1. Discuss the 5 *activities* involved in software reengineering process. For each activity, suggest a scenario where it is applicable.
  
2. Explain 2 advantages and 2 disadvantages of software reengineering.
  
3. Compare and contrast between Perfective Maintenance and Adaptive Maintenance. Which maintenance is invoked in improving a mobile application with new security feature? Explain your answer.
  
4. RS Pastry is a Malaysian bakery shop which has successfully extended their business to five countries which are Singapore, Indonesia, China, Myanmar, and Thailand. Their inventory system was developed since their establishment in the year of 1983. Recently you and your partner are contacted by RS Pastry to maintain their inventory system. After a preliminary study of their inventory system, you found that there is little documentation done and the system is programmed by using obsoleting programming language. There is no proper module design and therefore the system has very high coupling and low cohesiveness. You couldn't even find any testing and validation documentation. RS Pastry is requesting for a quotation for the inventory system's maintenance cost. You are in the midst of preparing the quotation.
  - a. Discuss the 4 factors that could affect RS Pastry Inventory System's maintenance cost.
  
  - b. Draw a diagram to explain legacy system assessment and management. Explain and justify which strategy you should apply to RS Pastry legacy system.
  
5. Around The Globe (ATG) Sdn Bhd is a travelling agency that is owned by family Berth since 1960s. The company is using a high quality legacy system to manage the staff and customers' information. However, the maintenance cost is increasing recently as a system requires Pascal experts. Seeing that this system has low business value to the company, Berth Junior (CEO of ATG) consults your company regarding the legacy system's management strategy.

Advice Berth Junior regarding 4 factors affecting the ATG legacy system maintenance cost. What should Berth Junior do with the legacy system? Justify your answer.

four factors:

1. **Expertise Availability**: It's getting harder to find developers familiar with Pascal, leading to higher costs for maintenance.
  
2. **Documentation**: Poor or outdated documentation can make it difficult to maintain the system efficiently.
  
3. **Dependency on Specific Staff**: If the system relies on knowledge that only retired staff

possessed, it can be costly to keep it running.

4. **Integration Issues**: The legacy system may not integrate well with newer technologies, increasing maintenance complexity and cost.

Given these factors, Berth Junior has a few options:

1. **Refactor the System**: Update the system to use modern technologies and practices.
2. **Hybrid Integration**: Keep the stable parts of the legacy system while gradually adding new, modern components.
3. **Phased Replacement**: Replace the system in stages, starting with the parts that are most problematic.
4. **Complete Replacement**: If the system's value to the business is low and the costs are high, it might be best to invest in a new system that meets current needs.

6. Standard Printing Company is established in 1981. The main business is designing and printing advertisement. The graphic designer is using a legacy system to design advertisement for customers. The design is stored as both PDF and DOC in the legacy system. The documentation of the legacy system is incomplete and the system is programmed in an obsoleting programming language. Recently, the company is considering purchasing Atlassian JIRA in assisting their advertisement project management. The owner of the company, Mr. S, is consulting you regarding the cost of the tool.

What should Mr. S do to the legacy system if he is going to integrate Atlassan JIRA with the existing legacy system? Justify and discuss your answer in detail (steps to carry out the solution). [Hint: Legacy system management including Re-engineering, Maintain, Scrap, and Unchanged.]

7. Ladre Group's online Human Resource Management System (HRMS) possessing the following characteristics:

- high dependency between module
- developed by high level programming language
- tested for 3 months before deployed
- all versions are stored in a configuration management system
- developed in 1995

Analyse each of the stated online HRMS's characteristic and comment on the system's maintenance cost.

## Tutorial 11:

1. Fit Your Body (FYB) is a gymnastic center located in the center of Kuala Lumpur. Foreseeing the increasing membership in the coming three years, the company is planning to automate all the classes timetabling, registration, and payment processes. The company has decided to adopt Aspect Oriented Software Engineering (AOSE).

Identify and construct a diagram to show 4 core concerns and 1 cross cutting concerns for this Gymnastic Center Management System (GCM).

2. With the aid of example(s), differentiate *tangling* from *scattering* problem in the implementation of cross-cutting concerns.
3. CBrat is developing Chatbox, which is a platform for all sizes of businesses to build, automate and operate personalized messaging application. This Chatbox supports SMS, Facebook, Messenger, live web chat with a single cross-channel customer history. Instant Apps is able to exchange structured data (forms, files, photos, and etc.) in-line with the conversation. Chatbox is also able to sync conversational history and structure data from Instant Apps to the data source. The Instant Apps can escalate between bot and live agent with full conversational history, measure and analyze the effectiveness of messaging through all facets of the customer experience, including tracking across all supported channels and Instant Apps. ( Source :<http://chatbox.com/>)

Identify 5 functional concerns and 3 cross-cutting concerns. Construct a diagram to reveal the relationship between the functional concerns and cross cutting concerns.

4. Donao is an online theatre that provides high-definition movie. User can watch movie online or download the movie.

What is a *Concern* in Aspect Oriented Software Engineering? Identify 5 main concerns and 3 cross-cutting concerns. Present your answer with a diagram to reveal the relationship between the main concerns and cross-cutting concerns.

5. You, as an appointed software engineer are in-charge for designing an online management system for Study Point Tutor center. Currently the tuition center has been using manual way to manage the center and now has decided to automate all their registration, classes scheduling, attendance, and payment processes.

Identify 4 main concerns and 2 cross-cutting concerns. Present your answer with a diagram to reveal the relationship between the main concerns and cross-cutting concerns for Study Point Tutor online management system.

## Tutorial 12:

1. You, as an appointed software engineer are in-charge for designing an online management system for Study Point Tutor center. Currently the tuition center has been using manual way to manage the center and now has decided to automate all their registration, classes scheduling, attendance, and payment processes.

Assuming that you are adopting Component Based Software Engineering. Identify and explain 4 activities that must be carried out in developing the proposed Study Point Tutor online management system.

2. Highlight the difference among *black-box wrapping*, *white-box wrapping* and *grey-box wrapping* technique in Component Adaptation of CBSE.
3. Discuss 2 advantages and 2 obstacles of CBSE approach on software development.
4. Running Boy For You (RuBy4U) is a company that allows users to call in to select food and beverages from a list of twenty-five local restaurants and six fast food restaurants. RuBy4U will deliver the order with minimum charges from RM1 to RM5 depending on the delivery distance. Recently the owner of RuBy4U is planning to market its business online within a month. As a newly recruited software engineer in RuBy4U, you are to handle the system development all by yourself.

Suggest 4 functional categories of computer-aided software engineering (CASE) tools to help you to automate the software engineering process in accelerating the RuBy4U online system development. Explain the tools by giving 1 example for each category.

5. A local television programs production company (Longevity Pte. Ltd.) is planning to develop an online real time system which allows users to watch television programs online (OnlineWatch.com). The website allows users to login and watch three local television channels' programs archived for one month. You have successfully bid the project for your software organization and will kick start the project in a month time
  - a. Assume that this project is adopting Computer-Aided Software Engineering (CASE). List and explain 4 appropriate CASE tools that can assist you in this project. You must select the tools from different functional classification of CASE tools.
  - b. Longevity Pte. Ltd. would like to reuse some screens (user interface) from their proprietary system. Briefly explain the 4 activities involved in Component-based Software Engineering (CBSE) to the customer.