Q1. (a) Explain project management and its importance. (10 marks)

[Explain Project Management]
Project management is a carefully planned and organised effort to accomplish a specific (and usually) one-time effort, for example, construct a building or implement a new computer system. It includes developing a project plan, which involves defining project goals and objectives, specifying tasks or how goals will be achieved, what resources are needed, and associating budgets and timelines for completion. It also includes implementing the project plan, along with careful control to stay on the "critical path", and that is, to ensure the plan is being managed according to plan.

[Importance of Project Management – Organisational & Individual Standpoints]
- From an organizational standpoint, project management is critical to sustainable economic growth which can only be achieved by constant innovation, developing new products and services, and improving productivity and quality of work.
- From an individual standpoint, all professions are involved in project management to some extent; career progression is influenced by individuals' ability to lead and manage projects. Project management fundamentals and skills are universal, transferable across professions, improving employability.

Companies would remain stagnant amongst its competitors and will not be sustainable. (i.e no changes or improvements) if it does not invest in projects. Its products and services, operations, and employees' skills will lose their competitiveness, and be overtaken by competitors over time. Fewer customers will purchase the company's products and services. The company will lose market shares earn less profits or experience losses, leading to its eventual closure.
- Exceptions: Monopoly companies need not sell unique products; they can just sell the same products as they have already dominated the market; but most companies in the market are not monopoly.

Q1. (b) Discuss ways to classify projects for portfolio management. Identify and elaborate some considerations when deciding the right mix of projects for a company. (15 marks)

There are two ways of portfolio management
1. Purpose of the Project
   (i) Compliance (Must do projects) – Projects that are required to be done in order to operate company
   (ii) Strategic Projects – Projects that support the strategy of the company
   (iii) Operational Projects – Projects that help to improve the efficiency of the company

2. 2 Dimensions – A project portfolio that classifies project in terms of degree of difficulty (i.e. technical feasibility) and commercial value (i.e. profitability) can be used.
   (i) Bread-and-butter – Projects involve revolutionary improvements to current products & services.
       (e.g.) Firmware update for mobile phones through increase processing speed of phone but only minor satisfactory gain from customers, thus there is no high returns
   (ii) Pearls – Represent revolutionary commercial advances using proven technology

(e.g.) Launching new iPhone every year that is built based on existing technology of company and previous version of their phones (high TF), though performance of phone is enhanced, thus high CV

(iii) Oysters – Involve technological breakthroughs with tremendous commercial value
(e.g.) Through unacquired technology and successful research, product is made that creates high commercial value such as autonomous ships

(iv) White Elephants – Showed promise at one time but no longer viable now.
(e.g.) Projects to make thumb drive is superseded by cloud/internet storage capabilities
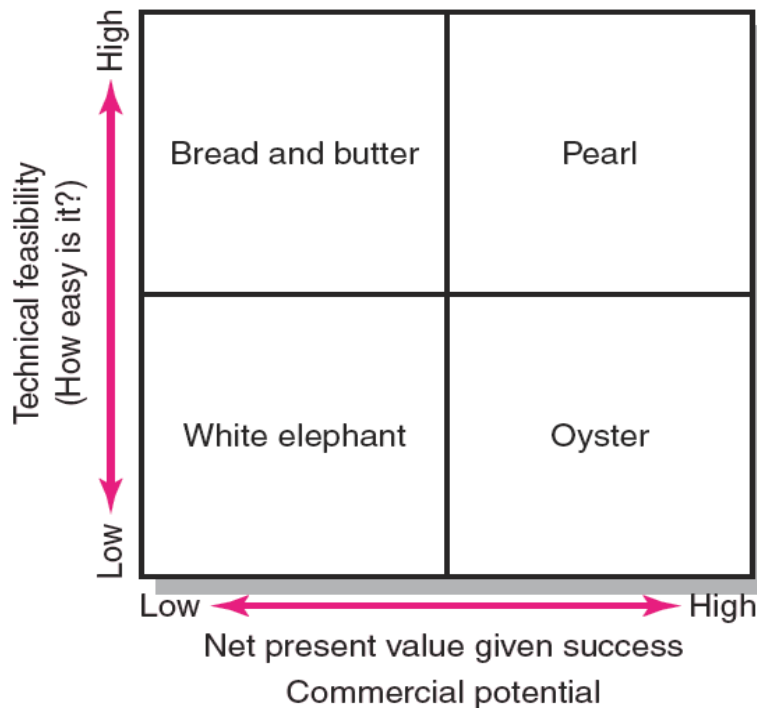
In deciding the right mix of projects for a company, **external and internal environments** should be considered.

External Environment
Economic Framework
- Poor economic outlook will favour allocations of more resources to lower risk projects, such as Pearls and Bread & Butter) and less on higher risk projects such as Oyster.
- This is because companies have limited cash reserves and would desire safer investments.
- On the other hand, if the economy is doing well, more resources can be allocated to higher risk projects such as Oysters.

Political Framework
- Political instability will favour lower risk projects such as Bread & Butter and Pearls over higher risk projects.

Legal Framework
- Regulations and conventions can also influence the type of projects undertaken by companies.

- For example, comprehensive amendments to regulations on STCW, SOLAS conventions and ISM code to accommodate and regulate autonomous ships favours Oyster projects (i.e., research on autonomous ships).

Internal Environment (Within the company)

<u>*Depends on the culture (risk tolerance) of a company*</u>
The risk appetite of a company can greatly influence the type of projects they pursue
- If culture of company is more risk-adverse, more resources can be allocated to lower risk projects such as Bread & Butter and Pearl.
- If culture of company is risk-taking/adventurous, resources can be allocated to higher risk projects such as Oysters.

<u>*Type of industry also influences portfolio management*</u>
- High-tech company — Focus on Pearl and Oyster due to the need to outperform competitors through radical innovation
- Consumer/Necessity (Rice/Salt/Sugar) Company — Focus on Bread & Butter and Pearl as more emphasis would be placed on packaging and manufacturing procedures /processes to produce goods as cheap as possible

Q2. (a) Under what conditions would it be advisable to use a strong matrix structure instead of a dedicated team in organising a project? Discuss and give your reasons. (6 marks)

Most importantly, **culture** is essential when deciding which structure is best for any organisation.
- For an effective strong matrix structure, the culture of the organisation must be able to support dual authority. A strong culture with strong communication and coordination to avoid conflicts between functional and project departments should be present, alongside good resource planning so that there will be no rivalry of resources since they share the same pool of resource. Departments should be able to effectively communicate well across functional departments and project teams.
- Dedicated project teams would be recommended when projects are deemed to be extremely crucial for the company to uptake, and where the culture of the organisation does not support collaboration or innovation. Dedicated project teams structure do not need a strong culture in an organisation since the project teams can act as a separate entity

Additionally, available manpower and resources should also be considered when choosing between the two types of structures.
- When the organisation has a lack of manpower, dedicated teams might be a more appropriate structure to consider.
- On the other hand, if there are resource or budget constraints, such that there are insufficient funds to hire external expertise to form dedicated teams (especially when the demand for expertise is high, becoming too expensive to hire) or when there are insufficient resources to go around such that it might be better to share from a pool of resources, strong matrix structure would be more suitable to be used as organisations are able to tap onto the same pool of resources and manpower, whilst achieving dual gains from project and day-to-day operations.

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Moreover, the external environments (Political, economic, etc.) should also be considered. If the economic outlook is good, dedicated teams might seem more worthwhile due to the high rewards that can be gained, whereas, if the economic outlook is bad, matrix structure might be more ideal as it enables organisations to fall back on functional operations as the iron bowl to keep them afloat.

Q2. (b) "One of the key factors influencing the choice of the project organising structure is the culture of the organisation." Elaborate with examples how true is this statement. (10 marks)

Firstly, it is important to address the **importance of culture**. *Culture dictate structure.* A strong culture is fundamental in supporting any structure. *Culture influences values, attitudes, and behaviours of the employees, more so than structure,* which consequently impact the effectiveness of different project management structures. Though there is a formal layout for any project management structure, if organisation culture is poor, the structure can be ineffective, resulting in poor performance that can hinder project completion.

If an organisational culture does not encourage teamwork, collaboration, and cross functional integration, with employees who do not support one another, and work individually with no regard for others, the culture becomes poisoned and the structure chosen must be aligned to suit the needs of the culture, such as in the case of International Business Machines Corporation, an American multinational technology corporation that almost went bankrupt due to poor culture, was transformed with the help of new CEO making use of a separate project team to work externally on improving culture of the company.

Having a strong culture in a work environment can help compensate for weaknesses in the structure. Culture was used to fill gaps in structure in the example of King Abdullah University of Science and Technology.
Another important point to note is that **culture takes time to change.** Therefore, it would be more effective to assign a structure to the company to suit its culture, rather than putting in effort to change culture, which can take years to take effect.

An example that illustrates the importance of culture in any structure is notable in shoe company, **Zappos**, which is famous for its work culture as for its quality of shoes.
- Organisation's aim is to provide world-class service to customers.
- The selection process of hiring a candidate is designed in a way where an individual who resonates most with the company culture and ethos is given a preference over others.
- *Tony Hsieh, CEO of Zappos even offered $2000 to quit the job for those who feel that the that the organisation is not the right for them in the first week of training.*

This shows the company's commitment to building and nurturing the right culture to suit its organisational structure. As the saying goes, "it takes one bad apple to spoil the whole barrel" – likewise, it takes one employee of poor culture to ruin the organisation's culture as a whole. Strong emphasis on culture has also been placed in many other top listed companies such as Apple, Adobe, Google and Amazon.

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Q2. (c) What are the common problems encountered in multi-project resource scheduling? What can you do to better manage or resolve such problems? (9 marks)

Common problems encountered in multi-project resource scheduling are:

1. **Overall project slippage**
   - All the projects share the same pool of resources, hence the delay on one project creates delays for other projects
2. **Inefficient resource application**
   - The peaks and valleys of resource demands create scheduling problems and delays for projects.
   - While all projects share the same pool of resources, different projects require different resources at different time, hence there will be resulting oversupply and shortage at different intervals.
3. **Resource bottlenecks**
   - Shortages of critical resources required for multiple projects cause delays and schedule extensions
   - This occurs when multiple projects require the same resources at the same time, hence leading to a shortage of resources available for project utilisation, delaying projects

To better manage or resolve such problems, the following can be performed:

1. Create project office or departments to oversee the scheduling of resources across projects
   - A centralised project office/departments that coordinates all resources across the projects
   - Require all resources to be centralised under the project office's command — Common pool of resources
2. Centralise project management: Treat all projects as part of a mega-project
   - Plan as a portfolio based on common pool using multiple project scheduling software instead of single project.
3. Outsource projects to reduce the number of projects handled internally
   - Extra activities requiring more resources than others can be outsourced so that resources will not be so constrained.
   - Not only does the project get done on time, but the company avoids hiring additional manpower unnecessarily just to meet a short-term need, stabilising manpower turnover rate.
4. Use a project priority queuing system: First come, first serve basis for resources
   - Resource allocation sequence will not be interrupted
   - Resources will stay and see through the completion of the project it was at, before moving to the next project in line
   - Ensures that there is no oversight or biases of one project over another such that a project requiring resources is unable to get any
5. Resource scheduling comes before project planning
   - Only finalise project planning after resources have been allocated according to the priority of the projects.

6. Learn how to use multiple project scheduling software

Q3. (a) Calculate the ES, EF, LS and LF times and the total slack (TS) for each activity in Figure Q3 and identify the critical path for the project. Can the project be completed in 30 weeks?

Assume that activity A actually finished at week 5, activity B actually finished at week 6, and activity C actually finished at week 12. Recalculate the expected project completion time. Which activities would you focus on in order to get the project back on schedule? (9 marks)
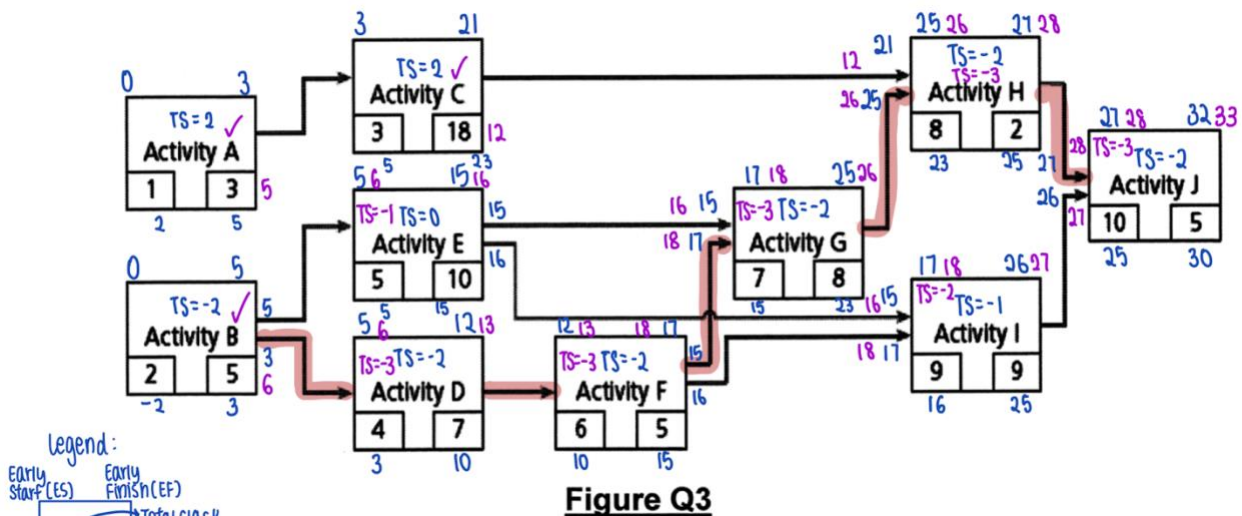

Figure Q3

(i) Given 30 weeks to complete the project, the project will not be completed in time. Total project duration is 32 weeks.

Critical path is identified to be: B→D→F→G→H→J

(ii) After recalculation, the expected project completion is now 33 weeks.

Activities to focus on would be: D, F, G, H and J which have the least total slack, TS = -3.

Q3. (b)The Macro and Micro methods are two basic approaches to project estimation.
(i)   What are the differences between these two approaches? Under what conditions would you prefer one over the other? (5 marks)

Macro (Top-down) estimates are:
1. Typically used in the *project conceptual phase*, where not much information is available.
2. Top-down methods *do not consider individual activity issues and problems* but look at the overall picture instead.
3. Good for *rough estimates* and can *help select and prioritize projects*.
4. Used when time is tight.
5. Made by experienced top management.

Micro (Bottom-up) estimates are:

1. Usually *tied directly to the WBS and a work package*.
2. *Made by several people familiar with the task*, which helps to gain buy-in on the validity of the estimate, increasing the accuracy of the estimate.
3. Good for *precise and accurate estimates*
4. Bottom-up estimates should be preferred if:
   ▪ Time to estimate is available,
   ▪ Estimating cost is reasonable, and
   ▪ Accuracy is important

(ii)   Select the preferred estimation methods for the following projects:
   o **Developer tendering a government land sale**
   o **Owner calling for tender to reinstate a retaining wall damaged by landslide**
   o **Owner calling for tender to renovate his house**
   (3 marks)

[Answer]
   o Developer tendering a government land sale – Macro estimation
   o Owner calling for tender to reinstate a retaining wall damaged by landslide – Macro estimation
   o Owner calling for tender to renovate his house – Micro estimation

Q3. (c)Why should a project baseline be adhered to as far as possible? Under what conditions would changes to a baseline be allowed? And under what conditions would that be disallowed? (8 marks)

The usefulness and integrity of the baseline, as a mechanism for monitoring progress and tracing back to the problem, can be eroded by constant changing of the baseline. It can be disruptive to work if there are changes to the baseline, especially big changes. Additionally, it erodes the clarity of goal and objective, affects the morale of the project team, as well as the scheduling, budget, and resource allocation.

Therefore, a project baseline should be adhered to as far as possible and changes in baselines should be limited.

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However, project managers are often forced to make changes to the baseline due to customers and external factors and if no changes are made, projects can end up irrelevant and dead upon arrival.

Scenarios in which a project manager makes changes to a baseline:
1. Customer makes a request for scope changes with extra charges applied – The additional charges applied to the changes in scope can be good for business. Project managers are incumbent to customers, hence are able to set the price and gain more profits.
2. Due to external forces – Evolutionary advancements in technology, environment, politics, economic changes, etc.
   For example:
   - COVID-19 pandemic, construction work was forced to stop, hence baseline would inevitably be changed to cater for lost time and incomplete work
   - New technological advancements such as 5G would force projects involving older technology to change because otherwise, they become futile as compared to competitors who keep up with new technologies
3. Sometimes the complete elimination of a cost account can result in a baseline change.

Scenarios in which a project manager should not allow for changes to a baseline:

1. Gold Plating – Changes to "improve performance" should not change a baseline
   - Planning errors and failures made by project manager, requiring more budget or time to increase performance of project
2. Scope creep – Cannot allow customers to constantly make small changes as this would incur more costs that are not being paid for

Q4. (a) Assuming that you are a project leader tasked to complete a multi-million dollar project, when would you think are the situations where you would hold formal team-building sessions for the project team? (8 marks)

Formal team-building sessions should be held whenever it is believed that such activities will ***enhance the performance of the project team***. This would especially be true at the ***beginning of a project*** when the session would **help develop a team identity among a group of strangers**.

Likewise, team-building activities could be used to ***assimilate new project members*** once the project is underway. Devoting time and attention to team-building would also be appropriate when the project team is experiencing problems working together or needs to elevate its performance to meet new project demands. The sessions would be ***useful in identifying and changing dysfunctional behaviour*** as well as re-energizing the team to higher levels of performance.

The following are some of the scenarios to incorporate formal team-building sessions:

- Whenever it is necessary to enhance team performance
- At the beginning of the project to develop a team identity among strangers
- To assimilate new members when project is underway

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- When project team experiences problem working together
- To re-energize the team towards higher performance
- To improve collaboration to prevent small problems from escalating into big problems within the team
- Whenever deemed appropriate by project manager

One mistake project manager make is that they resort to formal team-building activities after they realize the team is in trouble. It might be wiser to utilize team-building sessions earlier to encourage collaboration and to prevent small problems from escalating into major problems within the team.

Q4. (b) Explain the following statement concerning project risk management:
(i)   Difference between avoiding and accepting a risk.
(ii)   Difference between mitigating a risk and contingency planning.
(iii)   Difference between budget reserves and management reserves.
        (9 marks)

(i) **Avoiding risk** is **changing the project plan to eliminate the risk or condition**, such as by choosing an Australian supplier as opposed to an Indonesian supplier to virtually eliminate the chance that a political unrest taking place in Indonesia would disrupt the supply of critical materials.
   Accepting risk is retaining a risk by **making a conscious decision to accept the risk of an event occurring**, whereby the **project owner will assume the risk** because the chance of such an event occurring is **slim** or something that is *small*, such that the project owner is able to stomach the risk, where impacts are manageable and minimal. Accepting risks depends on the risk tolerance of the company, and whether they can afford to handle the impacts of the risks should it come.
   Accepting risks involve a ***contingency plan that has been set aside to tackle the risk should it materialise***, whereas avoiding risks eliminates the risk completely and therefore do not require a contingency plan.

(ii) A **Contingency Plan** is an **alternative plan** that will be used if a possible foreseen risk event becomes a reality, representing a plan of actions to be taken that will **reduce or mitigate the negative impact (consequences) of a risk event**. It acts as the silver bullet to counter the *residual risk* should it arise, despite mitigating measures to reduce it.
   Mitigating a Risk is a **risk response** to **reduce the likelihood** that the event will occur and/or **reduce the impact** that the adverse event would have on the project.
   Examples of reducing the probability of risks occurring include investing in safety training and choosing high-quality materials and equipment for better durability.
   Examples of reducing the impact, could be using concrete instead of timber for building, such that in the event of a fire, the whole building stand a lower chance of collapsing.

   Both Risk Mitigation and Contingency Planning work hand-in-hand, where either will address the risk **holistically**.

   The **key distinction between a risk response and a contingency plan** is that a response is part of the actual implementation plan and action is taken before the risk

can materialize, while a contingency plan is not part of the initial implementation plan and only goes into effect after the risk is recognized.

(iii) **Budget reserves** are funds managed by a project manager with his expertise and experience on project management, allocated to addressing ***known foreseeable risks*** arising out of ***specified work packages*** from the Work Breakdown Structure (WBS). **Management reserves** are funds managed by top management, with their overview and expertise on macro-environments, allocated to addressing ***unknown risks*** arising out of major unforeseen situations (i.e., Political or Environmental Changes, Disease outbreak, Currency crisis, etc.) that potentially hinder the completion of a project.

Both are independent of each other, that are included in the contingency funds, where **contingency funds = budget reserve + management reserve.** If risks occur from the project, budget reserves will be used to tackle these risks; whereas if the risks do not occur and its chance of occurring has passed, the fund will return to the management fund, where it will continue to grow, to safeguard against risks arising from the macro and microenvironment. *This will remove the temptation to misuse the reserves for other issues and/or problems.*

Q4. (c) Why is it important to conduct a project audit? What major information would you provide in a project audit? (8 marks)

Reasons why Project Audit is important:

1. Improve organisation's future project deliveries by evaluating what has been done correctly or wrongly — Highlight good practices that should be continued, and mistakes that require corrective actions
2. Highlight the blind spots that might have been overlooked by project team (Project teams can become too focused on the project and work, that they might have missed   out on other important factors)
3. Acts as a proxy to support organisational culture that vigorously promotes continuous improvement and organisational learning through the assessment of organisational culture
4. Improves organisation's way of doing things (Standard Operating Procedure (SOP) and work processes)
5. Empowers organisations to re-think, re-plan and re-strategize, through reassessment of project's role in the organisation, with respect to external factors that might impact its importance

The major information that can be found in a project audit are the following:

1. Classification of project
(1)   Project Type
(2)   Size
(3)   Staffing
(4)   Technology level
(5)   Strategic or support

2. Analysis of information gathered
(1)   Project mission & objectives

      (2)   Procedures and systems used

      (3)   Organisation resources used

3. Recommendations
- Highlight good practices that should be continued, and mistakes that require corrective actions

4. Lessons learnt
- Reminders, recap, and reflection of the project

5. Appendix
- Backup data that are relevant, important, and critical to stakeholders reading

6. Summary booklet
- Key takeaways from the audit

Hey there! ☺
Here are some pointers I'd like to share that I hope might be able to help you in your MT4002 finals preparation!

- If you started your revision late and stumbled across this solutions paper, my advice would be to start looking through the recent PYPs and prepare your answers accordingly. PYP questions tend to be repetitive in nature so, starting your revision with PYPs can greatly help narrow down your focus and finetune your expectations on what is to be tested for finals. If you have the time, tutorials are also extremely useful.

- Every PYP has a question similar to Q3(a) and it will always come out in Q3(a) or at least, to this date. Technique of solving is also the same, with the only difference coming from the phrasing of the question and the completion timings given for the second part. Therefore, I strongly recommend going through these questions from PYPs as it's easily ~10marks in the bag.

- All lectures are tested so don't just revise certain chapters!

Wish you all the best in finals! ☺