THE UNIVERSITY of ADELAIDE

INTRODUCTION TO PROJECT MANAGEMENT

Dr. Tracey Dodd, Angeli Damodaran, Sascha Tarasenko

Table of Contents

Table of Figures

1. What is project management?

Project management involves changing something. This can occur within an organisation (e.g., a new ICT software package) or your own life (e.g., purchasing a new house). The process in which you engage in to plan and implement the change is essentially project management. To this end, projects have some things in common. First, they must have a specific goal in mind. What is changing? This goal must have **quality** parameters. For example, if you were buying a new home you would define the area that you wished to live in, as well as specifications of the house, such as the number of bedrooms. All projects also require dedicated **resources**. In the example of purchasing a home, these resources can be monetary (e.g., the amount of money you wish to spend). In other examples, such as a project to clean out your spare room, resources can be non-monetary (e.g., your time to clean, plus cleaning products you may have in the home, such as your vacuum cleaner). At times the resources available can influence your quality parameters. For example, you may wish to live in a luxury property in the Bahamas but your budget dictates a modest home in Adelaide. In this example, your resources are constrained and influence the quality parameters of your project. Other times, where resources are unlimited, quality parameters are not constrained and you can plan the project around your ideal aspirations. The last consideration that all projects share is that they have an end date. That is, they are **time** bound. All projects should have a clear beginning (planning phase), middle (the doing phase), and an end (the evaluation and hand over phase). If you are an avid house dreamer and enjoy looking at real estate but do not have a deadline in which you plan to buy a home, then this is an everyday process that you engage in rather than a project. The day that you pick a house to purchase and put plans in place to make it happen is the day that this process transitions to a project.

In this eBook, we expand your understanding of project management by drawing on the Project Management Body of Knowledge (PMBOK) guide published by the Project Management Institute (2017). The PMBOK guide is one of the most widely used sources by Project Managers and can complement other methods of project management, such as Prince2.

For those who love a definition, PMBOK provides the following for a project: It is *'a temporary endeavour undertaken to create a unique product, service, or result'* (Project Management Institute 2017, pp. 4).

As introduced above, PMBOK organises the theories, tools, and techniques, which are considered good practise in project management into 10 distinct knowledge areas. These knowledge areas describe what a project manager should do to optimise their chance of successfully completing a project within the constraints of quality, resourcing, and time (or schedule as used in the PMBOK guide). These knowledge areas are:

1. Project Integration Management
2. Project Scope Management
3. Project Time Management
4. Project Cost Management
5. Project Quality Management
6. Project Resource Management

7. Project Communication Management
8. Project Risk Management
9. Project Procurement Management
10. Project Stakeholder Management

PMBOK does not have a formal method for describing the project life cycle (that is the beginning, middle, and end). Instead, it provides 5 process groups - initiating, planning, executing, monitoring and controlling and closing (Project Management Institute 2017).

These process groups describe the actions that a project manager and project team should do at different stages of the project lifecycle. The process groups and knowledge areas work together to provide a holistic picture of what processes occur at which stage of the project and what supporting knowledge is required. Process groups will be discussed further in Topic 4.

2. What are the three constraints of project management?

Now that you have a basic understanding of what project management is, let's discuss the three critical elements that constrain every project: **cost**, **schedule** and **quality**.

The client will be most concerned about the three elements of a project, cost, schedule and quality. The cost (or the budget) of the project is set by the client, this is most commonly based on how much money the organisation can afford to spend on the project. For example, a small company may have a strict cost of $10,000 to invest in a project, hence, once the project costs $10,001 the project may be put on hold or terminated as they no longer can afford to continue the project. In some cases, the cost may not be as important to the organisation and they may be willing to pay whatever is required to get the project done. For example, a large company such as Apple may be working on the next iPhone upgrade, to remain competitive they are willing to pay whatever it costs to release their new phone before Samsung releases their next upgrade. Similarly, the set schedule will be based on the client's needs. For example, if you are hired by the state government to build park and the contract states that it must be completed by the 10th of January, this is a hard deadline that you must meet. On the other hand, if you are conducting a research project to create a new innovative product this is focused on developing that new design/product. Thus, the client may not care if this project takes 6 months or 4 years, as long as they finish the project with a new innovation. The quality that is expected of a project is set out by the client. If you are implementing a project to develop a new camera model, meeting the required specifications and functionality of the camera is critical, otherwise, why even create a new camera?

Will the project be completed within the set budget? Will the project be completed on time? Will the project meet the needs required to be successful? Idealistically, in a perfect world, the perfect project and with the perfect project manager all three of these factors would be met. Unfortunately, this is often not the case. A project manager has the role of trying to meet all three factors. However, to meet one of the factors (e.g. schedule) a project manager will often compromise on another factor (e.g. cost). This is commonly known as the triple constraint theory, which is shown in Figure 1. The theory states that if you change one of these three factors then it will impact one of the other factors as well. For example, if a client wants to bring forward the project deadline, to achieve this, you will have to either spend more money (increase the budget) or reduce the quality of the project deliverables. If a client wants to reduce the cost (budget) of a project, the schedule is likely to become extended and the quality of the project may decrease. Furthermore, where there are adjustments to the project scope, the cost (budget) and schedule of the project will also inevitably change.

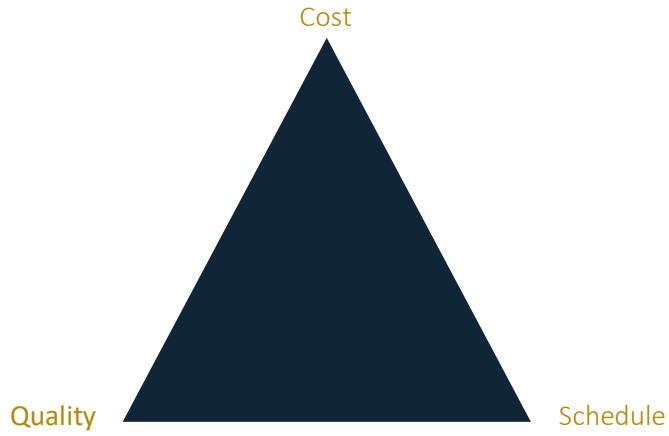

Figure 1: Three constraints of a project (Triple constraint theory)

The success of a project can be determined by evaluating the project's ability to be delivered according to the triple constraint, on time, within the budget, and to the specified quality. A project that balances these three elements is usually determined to be a successful project. However, some projects that do not meet all three constraints may also be deemed to be a success. For example, projects that are strictly time-bound such as the construction of an Olympic stadium, may place more emphasis on meeting the schedule and quality constraints than that of the cost (budget) constraints. For a project that prioritises schedule and quality, the client and project managers will have to be very flexible with cost (budget) to satisfy the other two constraints. In this case, going over the budget may be necessary to satisfy quality and schedule constraints, and by doing so ensures the delivery of a successful project.

Cost (budget), schedule and quality should be at the core of every decision made throughout a project.

3. What do project managers do?

So now you have a basic concept of what a project is and the key activities (or group processes) that a project manager should engage in, let's take a step back and critically examine what the role of a project manager is.

Essentially, *project managers are responsible for coordinating project tasks and managing stakeholders to support the delivery of project goals*.

Today the demand for qualified project managers far exceeds the current supply and by 2027, employers will need nearly 88 million project managers (Project Management Institute, 2017). The need for successful projects has increased in the 21st century since globalisation has increased market saturation and organisational competitiveness has increased since the introduction of modern technology, which has made it harder to find success in global markets (The State of Project Management: Annual Survey 2017). The implementation of standardised project management knowledge increases project effectiveness, which can save an organisation money.

A project manager has a range of roles and responsibilities when managing a project. A project manager can take the role of **both a manager and a leader**. As Peter Drucker (2006) discusses, a manager does things right, whereas a leader does the right thing. A leader is a visionary, they see how things can be improved and motivate others to work towards their goal. Important skills that a leader should have include; empathy, humility, active listening and creativity. On the other hand, a manager follows what must be done and their power derives from their position of authority. Their tasks include goal setting, strategic/operational planning, organising and directing the activities of others.

Project success often relies on project managers holding both effective **soft and hard skills**. Hard skills are typically technical skills that are learned and often involve the creation of a deliverable such as a work breakdown structure, project budget or project schedule. This can include the knowledge associated with using project management tools like project management softwares or an excel spreadsheet. Project managers usually gain hard skills by receiving qualifications in a certificate, bachelor's degree, master's degree or diploma. In comparison, soft skills are interpersonal skills that some project managers may naturally possess, however, they can be developed over time through experience and training. Soft skills are associated with one's emotional intelligence and include traits like communication, problem-solving, decision-making, negotiation skills and political and cultural awareness. Soft skills are beneficial to working and communicating with others, hence, it is a critical skill that can make a project manager stand out during the hiring process. Soft skills also help project managers to manage the most important resource of the project, the project team. These skills allow project managers to identify the strengths, weaknesses, needs and motivations of project team members, which can improve a project team's likelihood of achieving project objectives. A successful project manager continuously develops their soft skills, whether that be by encouraging feedback from clients, engaging in self-reflection or using a mentor or a coach as a guide. Prioritising the development of these necessary skills positions project managers to increase their chance of successfully completing the project.

A project manager can be hired either externally, meaning they consult to an organisation or hired internally, so they exist in the organisational structure of an organisation. More than two thirds of organisations interviewed by the Project Management Institute (2017) suggested they utilise externally hired project managers. An externally hired project manager often lacks the insight into the existing business processes, organisational culture and project team dynamics. However, an externally hired project manager can provide new and unbiased perspectives, which can be utilised to offer different ideas and solutions to improve the organisation. Alternatively, an internal project manager can be limited by the organisational structure that exists as it may restrict their authority over their project team.

A project manager's roles and responsibilities differ depending on the organisational structure that exists in the workplace. An organisational structure consists of three main elements: it designates the formal reporting relationships that determines communication channels, coordinates and groups individuals in departments, and identifies the number of levels in the hierarchy. Functional organisational structures allocate limited authority to a project manager. This structure results in project team members having competing responsibilities, one being their organisational role and the other being their project team role. A matrix and project organisational structure generally allocate a high level of authority to a project manager. Having a high level of authority within an organisation as a project manager is beneficial to your ability to successfully run the project. When being hired, it is important to be aware of the organisational culture, your authority and your role and responsibilities in the organisation. This will help you realise limitations, strengths and how you, as a project manager, can maximise them to get the best results for the project.

4. What is a project team's role throughout the process groups?

While you have already been introduced to the process groups (initiating, planning, executing, monitoring and controlling, and closing) in Topic 1, it is time to discuss them in more detail and how they are implemented realistically.

As previously established in Topic 1, the 5 process groups contain the processes that should occur in every stage of the project.

Initiating occurs before the project has officially commenced. Commonly the initiating phase is directed by the project sponsor and project manager. This stage involves developing and brainstorming the idea for a project, identifying what the project involves, who the stakeholders are and gaining approval from project sponsors. During this process various members of the organisation or external specialists may be consulted. The initiating process group helps the organisation visualise what is to be accomplished to complete the project. Another aim is to align the organisational objectives with the project.

Planning tells the project team where you want to go and what steps need to be taken to get there. During the planning phase, ideally you will create a plan for each of the 10 PMBOK knowledge areas, which will create a project management plan (discussed further in Topic 6). Critical steps include defining what is inside and outside of the scope of the project, identifying how project tasks are to be completed, organising the project team and delegating responsibility. Another important step is estimating the schedule and cost of the project, which is used as a baseline during the execution and monitoring and controlling phases of the project. Planning is a crucial step that can maximise project success and ensures there is a baseline to avoid project divergence. Planning ensures that the project team is on the same page and has the resources and knowledge to move forward and holds them accountable to the aim of the project.

Executing is where the project team has the most involvement in the project, as all hands are on deck. Tasks are completed by the project team members who were assigned to them during the planning phase. During this phase, most of the budget is spent and time is taken to complete the project tasks. As a result, there will be strong stakeholder involvement during this phase. The role of the project manager is to direct and manage the project work and implement the project management processes.

Monitoring and controlling oversight is primarily the role of the project manager. However, all team members are also responsible to identify any deviations from the project plans and escalate it. Project progress is reviewed against project plans to identify how the project is travelling against the goals and baselines of the project particularly regarding cost, schedule and quality. The tools and techniques required for monitoring and controlling are to be used as needed throughout the entire project life cycle. Risk events inevitably arise during the project, therefore monitoring risks is one crucial process where pre-established risk responses are implemented and the risk responses are analysed to evaluate their effectiveness.

Closing is the responsibility of the whole project team. Team members need to ensure all of the tasks of the project are complete and the project manager needs to have the project formally finalised and signed off once completed. A document is created by the project manager to collate all of the lessons learnt throughout the project, which can be used to inform future projects.

An easy way to remember the 5 process groups is by using the acronym, *I Pick Every Management Course (IPEMC)*.

5. Who are project stakeholders and how to engage with them?

Now it is time for you to learn about the power of a stakeholder. *A stakeholder is any individual or organisation that can impact or be impacted by a project negatively or positively*. Stakeholders are similar to the people in your life. For example, your friends, family or your employer are all stakeholders in your life as they are impacted by the actions you take and can also impact your life. There are two classifications of stakeholders; internal stakeholders and external stakeholders. Internal stakeholders are those that have a direct relationship with the project or organisation. On the other hand, external stakeholders are those outside of the organisation or project but still have influence over the outcomes.

The following is a list of potential internal and external stakeholders:

Internal	External
Management in an organisation	Client
Employees	Suppliers
Project team members	Government
Shareholders	Investors
Owners	Creditor

Identifying stakeholders is one of the most important first steps for any project. Stakeholder analysis is one tool that a project manager will use during the planning phase of a project once stakeholders have been identified. This tool groups stakeholders according to their interest, power and influence in regards to the project. Once the potential stakeholders are mapped across the grid (Figure 2), you can identify which stakeholders you need to work closely with. Stakeholders with low power and low influence over the project are the easiest to manage as they only need to be monitored. Next are the stakeholders who have low power but high interest, these are the stakeholders that you should keep informed. As a project manager, if you have a stakeholder that has low interest but high power, it is optimal to keep these stakeholders satisfied by meeting their needs and requirements as they can impact the outcome of your project. Lastly, there are the stakeholders who have high power and a high interest in the project. These are the stakeholders who can be the most dangerous or helpful on a project, and thus, it is critical to develop a close working relationship.

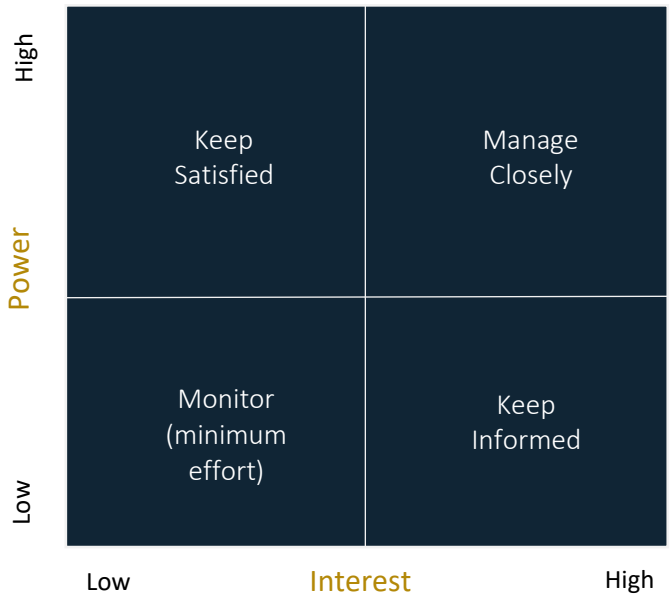

Figure 2: Stakeholder Analysis

In order to understand a stakeholder's interest in a project, a project manager may ask the stakeholder a series of questions that facilitate the understanding of their power and influence on the project. It is important to recognise how a stakeholders' interest, power and influence may change throughout a project life cycle. This tool (Figure 2) is also useful because it reveals where resources should be allocated to manage stakeholders.

Once the most influential stakeholders in a project are identified, stakeholder engagement plans must be developed to establish the strategy to manage these stakeholders' needs. The plan will outline how often a stakeholder should be informed, what type of communication channel should be used, tools and techniques to manage conflict should it occur, and steps to monitor and control the stakeholder. For example, a stakeholder who is identified as holding high influence, interest, and/or power will require frequent meetings to be updated on the project's progress. The use of resources for these meetings will have to be considered when planning the project budget and schedule. The stakeholder engagement plan is actioned during the execution stage of the project life cycle. Within this stage, the project team should continuously engage with monitoring and controlling tools and techniques to review stakeholder engagement plans. There should also be consideration of whether the needs of the stakeholders have changed and the adoption of conflict management techniques if issues arise. Stakeholders who are not properly identified and consulted have the potential to disrupt project progress. While managing stakeholders may utilise a lot of resources and time, it is an important process that will help the project team to meet the project schedule, budget and quality constraints.

Communication is critical to stakeholder engagement. Communication is how you share knowledge, provide project updates, resolve conflicts and develop relationships. For a project, a communication plan is used to determine who is to be communicated to when and by what communication method. There are various types of communication methods such as written, verbal, formal/informal, body language/gestures, and media. There are also different mediums used to communicate, such as face-to-face meetings, virtual meetings, emails, texts, YouTube videos, phone calls, and/or other forms of social media. When choosing a method and medium of communication you must consider which stakeholder you are communicating with, whether they are internal or external to the organisation and how quickly you wish to transfer the message. Vercic and Spoljaric (2020) found that communications made internally are more valuable when the medium chosen is convenient to employees, however, the preferences change as technology advances. For example, it may be appropriate to adopt a formal communication approach like an email when engaging with an important stakeholder compared to an informal face to face conversation that occurs between project team members. Another thing to consider, is the severity of the conversation, if it is a conversation where decisions have to be made, it should be a more formal meeting so these decisions are recorded in meeting minutes. Whereas, if a decision is made in an informal conversation in passing, these can often lead to confusion or conflict, if one individual forgets what is agreed upon.

A stakeholder's role and interest changes throughout the project life cycle. Thus, carefully planning for and managing stakeholders' increases the likelihood of a project being successful (Butt, Naaranoja & Savolainen 2016). Effective communication techniques can improve stakeholder engagement throughout the project. A key attribute of stakeholder engagement is transparent communication between the project team, stakeholders and clients. Assigning one individual in the project team to be responsible for managing the relationships of key stakeholders is proven to lead to better outcomes (Sinclair 2011). Within each plan it is important to establish the level of communication that stakeholders need, since one who is highly involved will require more frequent updates on the project (Zulch 2014). Once established, meetings with relevant stakeholders need to be scheduled. To maximise stakeholder engagement follow up every meeting with an email that summarises what was stated and by who. Depending on the complexity of the project and the seniority of the project manager, the meetings do not have to be long, 20 minutes in length is usually sufficient. Formal communication methods such as virtual meetings may be required through the execution phase to inform stakeholders of any changes in project scope that are related to them. Another technique used to engage stakeholders is to celebrate key project milestones. Celebrations can take many forms, for example, a team lunch or publically sharing achievements on the organisation's social media platforms.

6. How to plan a project and what documents need to be created?

You now have a basic understanding of foundational concepts. However, it is time to learn the importance of planning and the role that it plays in project management.

The planning stage of any project is critical as it sets the baseline of the project and determines how successful the project will be. Thus, you need to record all planning through documents so that everyone can understand the plans. As stated in Topic 4, during the planning phase, the project scope is outlined, as well as project objectives and steps taken to meet these requirements for a successful project. The main output of the project planning is the project management plan (PMP).

The **project management plan (PMP)** is a descriptive document containing the intended plan for the whole project. The document is an accumulation of all the plans generated from each knowledge area. The format of a PMP is flexible to meet the needs of your project, however, a detailed project management plan can include:

- Preamble
- Assumptions
- Scope statement/management plan
- Work Breakdown Structure
- Project management approach, which can include a management plan for:
    - Schedule
    - Cost
    - Quality
    - Resources
    - Communications
    - Risk
    - Procurement
    - Stakeholder engagement
- Project exit/termination conditions

The **project scope** is a critical component of the PMP as it defines the project, without this the project may go off track or not deliver what the customer requires. The project scope describes the parameters of the project, including criteria to determine project success. It is important to clearly state what is inside and outside of the project scope. The scope is not just a description of the project; it is the source of truth that sets out contracts. Contracts and scope requirements change throughout the life cycle of a project. However, the project scope document can be used to reason or justify why the project is not required to take on certain changes or additions. For this reason, it is vital to be clear throughout the planning phase what the scope includes, as well as what it doesn't include. Scope management processes are used during the planning phase of a project and outlines the project constraints, limitations and goals. The project scope management processes are:

- Plan scope management: A scope management plan is incorporated within the project management plan and describes how the scope will be defined, developed, monitored,

controlled and validated. Adopting scope management processes to a project is important because they help a project team maximise efficiency and the chance of achieving project success.

- Collect requirements: The process determines, documents and manages stakeholder needs and requirements to meet project objectives. Collecting information from stakeholders who are impacted by and can impact the project is important because it helps other project management planning processes for cost, schedule, quality and procurement. This ensures that stakeholders are all on the same page regarding the project.
- Define scope: The outcome of this process is to establish a project scope statement that describes the project scope, major deliverables, assumptions and constraints. From the outcome of this process, the Work Breakdown Structure (WBS) can be produced.
- Create WBS
- Validate scope: The acceptance of deliverables is completed through control quality processes. One tool for this is an inspection, where a project manager walks through a project to ensure that the deliverables meet requirements.

Within a PMP the management plans states what tasks are to be done, who is involved, how success will be measured and information to be communicated. The document includes baselines for the schedule, cost and quality, which are used monitor project progress and overall project success. The document is not meant to be a set and forget document - it is a live document that must be updated regularly throughout the project life cycle. Project documentation is important because people forget the details of what they say when they communicate. This is because memory is subjective, therefore, two people can come away from the same conversation with two different meanings. Documentation adds a sense of accountability to the project stakeholders because they will be careful and specific when putting their words in writing. This helps the project manager hold the stakeholders responsible and accountable, which assists internal and external communication.

7. What tools and techniques can support a project team?

Now that we have gone over the basic concepts of project management, we can look at the supporting tools and techniques that can help a project team to deliver the project. Tools and techniques are vital as they can help plan, organise and make decisions within a project.

Some organisations have multiple projects that they wish to start, however, due to limited funding and resources they are only able to complete one. In these cases, the first step is to select the correct project for the organisation. A decision-making tool such as a **decision matrix** (Figure 3) can help make this decision. A decision matrix compares the different projects against the specific criteria. Primarily, a project should always align with an organisation's strategy, vision, mission and values. If not, the project will not enhance the work of the organisation. Each organisation may have different criteria to determine what project will be the most beneficial. For example, an organisation must consider both the internal and external influences:

1. Internal influences: Organisational cultural, strategy, and structure
2. External influences: Legal, technology, critical incidents, and environment including geographical location.

A project manager may pose questions to determine the value of a project in comparison to other projects:

- Does the project add commercial value to the organisation?
- What level of risk does the project carry?
- Are there changes required to the organisations operations? (e.g. does the project require training of staff?)
- How much value will this project add to the organisation?
- What is the economic value added or net present value?

A decision matrix (Figure 3) lists the criteria selected by the organisation on the left-hand side. On the right-hand side the multiple projects are compared. The best way to use a decision matrix is to create a weighting scale for the criteria. This is useful for prioritising certain criteria. The project selected will be based on the project that receives the highest score.

	Project 1	Project 2	Project 3
Cost benefit analysis			
Aligns to organisational strategy			
Profitability			
Impact			
Has required resources			
Total			

Figure 3: Decision Matrix

A **Work Breakdown Structure (WBS)** is a visual tool that breaks down all of the tasks that have to be completed for a project, into smaller, more manageable tasks that are called 'work packages' (Figure 4). Work packages are highly detailed and are useful when developing risk, schedule and cost management plans. Therefore, a highly detailed and accurate WBS is important as it helps create other documents. A WBS should reflect project objectives and can be used to identify progress throughout the project. It also contains all of the tasks that must be completed to finalise the project. For a project team, the work packages are more approachable and manageable to complete and they can be assigned to individual team members to assist in reducing conflict associated with unclear roles and responsibilities.

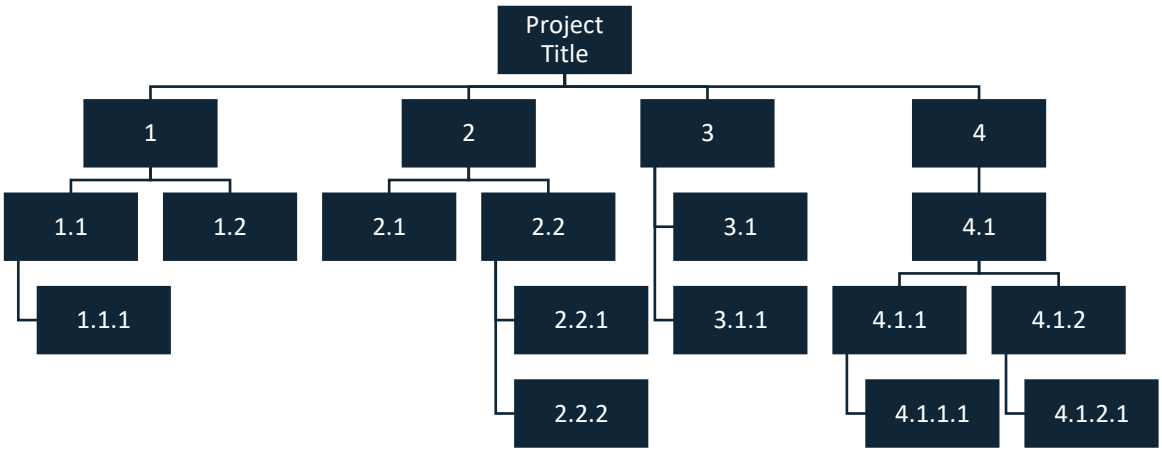

Figure 4: Work Breakdown Structure (WBS)

A **Responsibility Assignment Matrix (RAM)** can be used by a project manager to show how project resources are assigned to each work package outlined in the WBS. One example of a RAM is a RACI chart (Figure 5). RACI stands for Responsible, Accountable, Consult, and Inform. This chart removes confusion about responsibilities among the project team. For example, if an issue arises, the RACI dictates who you must go to regarding the issue and what level of support is required. An example of a RACI is shown below, with a legend describing the definition for each label.

Legend
R= Responsible, who is responsible for the completion of the deliverable.
A= Accountable, who is held accountable for the completion of the deliverable.
C= Consulted, who can be consulted and offer advice during the completion of the deliverable.
I= Informed, who must be informed upon the completion of the deliverable.

Project Deliverable	Project Manager	Architect	Builder	Painter	Site Supervisor
Create plan for house extension	C	R	C	C	A
Assess associated risk	R + I	C	C	C	A
Complete demolishment	A	I	R	I	C
Paint walls	I	C	C	R	A

Figure 5: RACI Matrix

Another useful tool is a **Gantt Chart**, which is used when developing a schedule for a project in the planning phase. A Gantt chart is one of the most popular and useful ways of showing activities (tasks or events) displayed against time (Figure 6). On the left of the chart is a list of the activities and along the top is a suitable time scale (e.g. days, weeks, months). Each activity is represented by a bar; the position and length of the bar reflects the start date, duration and end date of the activity.

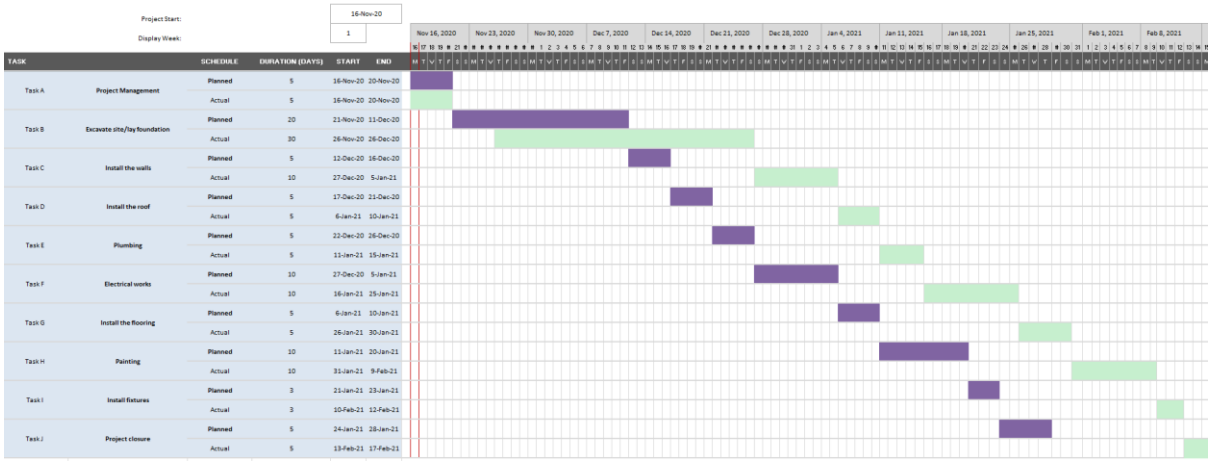

Figure 6: Gantt Chart

Tools and techniques can help a project manager to plan and organise a project. This can result in a chart or table being created where relevant project information is easily accessible for all team members.

8. How to manage project risks?

Unfortunately, risks are present in every project. So it is critical that you learn to recognise potential risks and how to manage them.

A risk is any event that, if it occurs, has the potential to positively or negatively impact project objectives. Risks are present in our everyday lives. We often don't realise it but everyone is a risk manager of their own lives. A task as simple as crossing the street, everyone risk assesses this situation. You stop before crossing, look both ways to assess if there are vehicles that could pose a threat to you if you were to cross and then you make the final decision of what to do. If there are no cars you would decide that the best option is to cross the road. If there are a few cars you may decide to wait until the cars pass. However, if there is heavy traffic, you may avoid the situation completely and go cross at the traffic lights.

Risk management aims to reduce the likelihood of a risk event occurring and to reduce the impact of said risk event on the project objectives. Not all risks are negative, risks that have a potentially positive impact on the project are known as opportunities.

All projects are inherently risky due to the unknown and unpredictable nature of change. There are a wide range of risks that can impact a project or even our day to day lives. These risks can be predicted or unknown. 'Known-known' risks are those that we can predict. For example, this can be scheduling delays, budget blowouts, unmet expectations by the supplier or ongoing team conflict. On the other hand, there are 'unknown-unknowns', which are risks that are unimaginable to a project. For example, in 2019, no-one would have considered a possible pandemic as a risk that could impact the completion of a project or their day to day lives.

The first step of the risk management process is to identify project risks and opportunities. Many techniques can be used to identify risks. This can include, interviewing subject matter experts, using lessons learned documents from similar past projects or even conducting a brainstorming session with the project team. To accurately conduct risk management you must think outside of the box, when identifying risks you have to think about the impossible. After the risks have been identified, they are analysed using different tools, such as a root cause analysis, risk register, PESTLE analysis and probability and impact matrix. These tools enable you to analyse the likelihood and impact of each risk (Figure 7) to determine which one's should be a core focus of the project team. Usually, if a risk were to be deemed as high, you would not continue on with the project unless you were able to successfully mitigate the risk. However, for the risks that are identified by the risk matrix as low and medium, your next step would be to develop a risk management plan.

Impact →

← Likelihood

	1	2	3
1	Low	Low	Medium
2	Low	Medium	High
3	Medium	High	High

Figure 7: Risk Matrix

The second step is to evaluate the identified risks and assign necessary resources to manage them. This is where risk management strategies are implemented. For both risks and opportunities, there are five risk management strategies that can be implemented based on the severity of the probability and impact of the risk (Figure 8). If it is a simple risk or opportunity then the project would accept that the risk may occur as it is not severe enough to take any pre-emptive actions. For example, if you were to get into your car in the morning and the petrol tank is half full there is a small chance that you will run out of petrol, however, you are not driving far enough to empty the tank and are willing to accept the risk or deal with it when it gets closer to empty. To mitigate a risk is to reduce the likelihood of the risk occurring or the negative consequences that result. For example, if you check the weather and it says there is a 50% chance that it will rain today, you can mitigate the impacts of the rain by taking an umbrella, so if it does rain you will not get as wet. Transferring a risk is when you are able to give the responsibility of that risk to another party. A possible risk is that you may get into a car accident, while you can try and be a cautious driver another driver may cause the accident. However, in most cases you would have bought car insurance, this is a method of transferring the risk to another party. To avoid a risk, shows that it is not worth the consequences of following through. Imagine you are hosting a dinner party and you are trying to decide what to cook, you can cook your trusty lasagne or try cooking a new dish that is supposedly very hard but delicious. You would probably decide to cook your trusty lasagne, and avoid the risk of poisoning someone or ending up with an inedible dish for your guests. Your last option is to escalate a risk, this is for risks or opportunities that are not within the scope of your project but may impact someone else in the organisation. For example, discussions between staff reveal that employees are dissatisfied with terms of their contracts across the organisation, this would be escalated to HR as it is out of the project scope.

Risks	Opportunities
Escalate	Escalate
Avoid / Eliminate	Exploit
Transfer	Share
Mitigate, Reduce	Optimise, Enhance
Accept / Retain	Accept, Retain

Figure 8: Risk Management Strategies

Project risk management, like all project management knowledge areas, is an iterative process, which is continuous throughout the project lifecycle. Project managers need to undertake the risk management process at all stages of the project to address new arising risks.

9. What is a resources management plan?

You've already learnt about the importance of stakeholders in a project, however, it is now time to consider another important group of people, your project team.

Project resource management is the processes of planning, organising and allocating resources while maximising efficiency and effectiveness to deliver the project. A resource is any good that is required to complete a goal or activity. Resources that may be used in a project include human resources like employees, industry experts or physical resources such as a building, raw materials, vehicles and machines as well as financial resources like cash, credit and owners' equity. The project manager's role is to manage these resources, with the aim to do more with less, while ensuring the project is completed successfully. This topic will focus on human resources, as physical resources will be covered in Topic 10.

Once a project team has been identified and allocated to their roles, a *project manager is responsible for team development processes, conflict resolution and motivational techniques*. Emotional intelligence is a critical skill for a project manager to have when planning and engaging with human resources. Understanding and valuing the project team's emotions and the ability to apply this understanding when responding to and managing the project team is vital.

Team development is a process. Every team goes through these stages of development during a project. As a project manager, understanding the process of team development can inform how you manage the team. Bruce Tuckman's (1965) theory states that there are five stages of team development:

1. Forming: The project has just started and there are high levels of uncertainty amongst the project team as they first get to know each other.
2. Storming: A period of conflict for the project team, may be a result of conflicting personalities or different expectations of the project. It is the project manager's role to lead the team to overcome the conflict.
3. Norming: Conflict has been resolved and the team has come to agreement about roles, responsibilities and leadership. Team performance increases as there is cohesion.
4. Performing: The team are at their strongest, working together and problem-solving efficiently.
5. Adjourning: Final tasks are being completed, the project has finished and team members are being reassigned or moving onto different projects.

There are many useful techniques used to develop a successful team. One technique is to understand the personality type of every project team member which can be achieved by using a personality test. One example is the Myers-Briggs personality test, which gathers information about how individuals prefer to use their perception and judgement and what communication approach they prefer. A project manager can then use this information to match a team member's personality with project tasks to ensure they feel motivated by their work and also identify a preferred communication approach. However, personality tests are limited in nature as they omit the context of how employees manage their personal preference and conduct at work. Thus, personality tests

can be discriminatory (Youngman 2017) and should not be relied on as a soul source of information. Other tools, such as training, performance coaching and other systems of employee support should also be explored and included.

Conflict is vital to control when it first arises to avoid further complications. One approach of conflict management is to utilise project management tools in the planning phase that prevent conflict. For example, a common source of conflict in a project is undefined roles and responsibilities. Thus, as a project manager you would ensure from the start roles and responsibilities are clearly defined. Conflict that is left without appropriate resolution wastes resources and time, which can impact the overall project. For example, if you are doing a university group project, no one person has more authority than another, if you have two people fighting over that position of authority, this will cause conflict amongst the larger team. Therefore, a RACI matrix as described in Topic 7 (Figure 5) can be used to define the roles and responsibilities of each member of the project team. The RACI matrix is a tool that can improve the quality of the project since the project team can identify what tasks they must complete for the project to be completed, and it reduces the likelihood of conflict arising from unclear roles and responsibilities.

The following are various conflict resolution techniques that project managers can adopt:

- Withdraw/avoid: Transferring the issue to be solved by others or engage in better preparation before fixing.
- Smooth/accommodate: Highlighting to the conflicting parties where they agree on the issue, showing them the importance of being harmonious for the overall benefit of the project.
- Compromise/reconcile: Providing a sense that the needs of both parties are being met to temporarily or partially resolve conflict.
- Force/direct: Uses someone in a position of power (e.g. project manager), to advocate for one parties' viewpoint over the others, usually used in an emergency.
- Collaborate/problem solve: Uses the opinions of both parties to draw a consensus where they are mutually satisfied with the resolution. This technique will increase the commitment of both parties to the project.

Motivating the project team is central to a project manager's role. Motivation is commonly at the highest at the start of the project and gradually decreases over time. Team motivation may be lacking at various stages of the project life cycle and as a project manager you must find a way to motivate them. One technique that can be established is setting tight but realistic deadlines for tasks. Long timelines for project tasks de-motivate people and they become counter-productive as they encourage people to put work off. Another technique to indicate that you are understanding the motivations of those you communicate with is to actively listen during conversations by interrupting by saying '"As I understand it, then, you are saying....'. This tactic demonstrates that you are clearly understanding what the other person is saying. Clear goals are also a motivating factor to a project team.

The Google Oxygen case study was funded by google to establish whether managers are important in a workplace and it found that good managers make a significant difference (Garvin 2013). The qualities a good manager possesses includes the ability to empower the team, does not micromanage, expresses interest and concern for team members' success and personal wellbeing, is

productive and results-orientated and helps with career development. The study suggested that to maximise motivation, the project manager should aim to facilitate a team culture where individuals are comfortable to express their personalities. Each individual is motivated by different factors, which means that different approaches should be adopted for each individual.

A resource management plan is the output of the resource planning phase, which makes up a component of the project management plan. During the rest of the project life cycle, the resource management plan will contain all necessary information to best manage the resources of the team, including plans for monitoring and controlling resources. Overall, the resource management plan highlights the most effective and efficient allocation of resources.

10. What is procurement in a project and how is it managed?

Now that you have learnt a lot about planning, you need to learn about the process of obtaining the resources required to execute the project.

Procurement is the process obtaining goods or services. Simply, procurement is a contract between a buyer and a seller. According to Chen, Chiang and Guo (2013) increased global competitiveness and shorter product life cycles have increased the use of a variety of suppliers since it can be cost-effective, lead to improved quality and likelihood of completing project deliverables. Hence, procurement management is a critical component of project management, as many major deliverables are outsourced

Procurement management involves two components, **capital resource** and **human resource management**. Capital resources are man-made elements that are used to produce goods or services (e.g. machinery, tools, buildings). Human resources refer to the management of people, this can be staff, consultants or other people that are involved in the project.

Procurement is often interlinked with the law and legal processes which are tied to severe consequences. Planning procurement is an important process that protects the project manager and the organisation because contracts are legal documents that can hold up in court. A contract will outline the terms and conditions of what deliverables the seller has agreed to perform, the responsibility of key individuals, and agreed pricing. This relationship is delicate in that it is mutually binding, what is stated in the contract must be honoured.

A procurement management plan, created during the planning phase, details the approach that is to be taken to manage procurement. Initially, the project manager identifies what resources are required and determines whether it can be made in house or outsourced. Once identifying the products, the specifications of the product and when it is required must be outlined. A project manager should consider:

- The complexity of the procurement (larger/more complex procurement requires detailed planning)
- Whether the buyers and sellers are capable of meeting the specifications and requirements of the needed good
- If procuring from overseas, how the geographic location or time zones may impact the process
- Any council, state, national or international laws that may impede procurement

The project manager will develop criteria that establishes expected outcomes of the supplier, which can be used to monitor and control supplier performance. Developing appropriate criteria is important as the performance of suppliers can impact project success (Safa, et.al 2014). Criteria will differ dependent on the organisational environment, where the project occurs, the type of industry and the different organisational objectives (Safa, et.al 2014).

The pre-solicitation phase involves investigating what is going to be purchased through informal conversations with suppliers. This process may change the scope of the purchase, as the information gathered may expose something that impacts the budget, schedule or quality. The solicitation process is when formal documentation, such as an expression of interest or quote is created and sent to the market. Following is the evaluation process where all of the different quotes are evaluated and one of the quotes is selected. Selecting an appropriately qualified supplier is important to gain the trust of stakeholders since it increases the likelihood of achieving project objectives. Once the project sponsor has approved the quote and selected the service/product, the successful contractor is told they have been selected. Then the process of creating a contract between the supplier and the project team, in which terms and conditions of the contract are established.

Control procurements details the process of managing and controlling procurement relationships and contracts, monitoring performance and making changes as required. Monitoring and controlling procurement are critical since it ensures all goods and services are up to standard. During this process challenges may arise that have the potential to impact the scope of the project which requires risk responses, which are accounted for in the risk management process.

Overall, managing procurement is a continuous process that requires constant monitoring and controlling tools and techniques to ensure that procurement relationships are managed and contractors are doing what is set out in the procurement management plan.

Reference List

Butt, A, Naaranoja, M & Savolainen, J 2016, 'Project change stakeholder communication' *International Journal of Project Management,* vol.34**,** pp. 1579-1595.

Chen, J, Chiang D & Guo R 2013, 'Partner selection model for design chain collaboration, *International Journal of Production Research*, vol. 51, no.4, pp. 1131-1145.

Drucker, P 2006, *The Practice of Management*, Harper Collins, US.

Garvin, D 2013, 'How Google Sold Its Engineers on Management' *Harvard Business Review,* 1st February 2021.

Project Management Institute 2017, *A guide to the project management body of knowledge (PMBOK Guide)*, 6th edn, Project Management Institute, Pennsylvania.
Rajkumar, S 2010, 'Art of communication in project management' *Research Conference: Defining the Future of Project Management*, Project Management Institute, Washington, DC.

Safa, M, Shahi, A, Haas, C & Hipel, K 2014, 'Supplier selection process in an integrated construction materials management model' *Automation in Construction,* vol.48**,** pp.64-73.

Sinclair, M 2011, 'Developing a Model for Effective Stakeholder Engagement Management' *Asia Pacific Public Relations Journal*, vol. 12, no. 2.

The State of Project Management: Annual Survey 2017, Wsellington, viewed 17 March 2020, <https://wellingtone.co.uk/wp-content/uploads/2017/03/The-State-of-Project-Management-Survey-2017-1.pdf>.

Tuckman, B 1965, 'Developmental Sequence in Small Groups', *Psychological Bulletin*, vol. 63, no. 6, pp. 384-399.

Vercic, A & Spoljaric, A 2020, 'Managing internal communication: How the choice of channels affects internal communication satisfaction', *Public Relations Review*, vol. 46, no. 3, 101926.

Youngman, J 2017, 'The use and abuse of pre-employment personality tests', *Business Horizons*, vol. 60, no. 3, pp. 261-269.

Zulch, B 2014, 'Communication: The foundation of project management' *Procedia Technology,* vol.16**,** pp. 1000-1009.