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Effectiveness and contribution of project close out phase in capital projects.

A minor dissertation submitted in partial fulfilment of the degree of

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in

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Abstract

The aim of this research was to evaluate the effectiveness and contribution of project close out. This an important phase in a project life cycle. The study assessed and identified the areas of improvement that can positively influence the project management performance and competitiveness of the organisation. The research was a case study based on a Petrochemical company in South Africa.

The research firstly sought to find out whether the organisation under research implements projects according to a recognised project management standard. Additionally the motivation was to assess whether the implementation is in line with industry best practices for project close out. It was important to also find out if the information compiled at project close out contribute to the project management performance. Lastly, the project management maturity model was applied to the findings to establish the project management competitiveness of the organisation.

The research methodology used was hypotheses testing through observation. The supporting information was gathered from archived project close out information. The study samples were projects completed in the last three years.

Results of the study indicate that there is a standard in place that is aligned with the Project management body of knowledge. However, there is inconsistency in the implementation of Project close out across the organisation. The information collected from lessons learnt is not structured in a manner that the information can be properly utilised for knowledge management. Because of the uniqueness and temporary nature of the projects, organisation tend to treat knowledge produced unique to the project. The unique and temporary nature makes knowledge management and knowledge transfer between projects challenging.

Finally, when applying the Project Management maturity model to the recorded information on project close out process, it can be noted that the organisation is at level two of five on the maturity scale which indicates there is a lot of improvement required. The findings are in line with the hypotheses. It is therefore recommended that the organisation refines a process for lessons learnt and develops a SMART (specific,

measurable, achievable, relevant and time-bound) action plan in order to ensure continuous improvement and support knowledge management. This needs to be supported by improvement of the close out process in order to ensure effectiveness of project close out and support organisational learning and improvement.



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Finally, thanks to the Almighty for the gift of life.

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Prof P Mativenga, for not giving up on me.

I declare that the information contained in this dissertation is my own and complies with University regulations on plagiarism.



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List of Acronyms

BU – Business Unit

BS – British Standard

EIA – Environmental Impact Assessment

EOJ - End of Job

PM – Project management

PMO – Project management Office

(PM)² – Project management process maturity

PMBok – Project management book of knowledge

SMART – Specific, Measurable, Achievable, Relevant and Time-bound



1. Introduction

1.1. Background to the research study

Steyn et al. (2006) defined a project as “any planned, temporary endeavour undertaken to create a unique product, service or other complete and definite outcome within a limited time scale and with limited resources – in a limited project budget.” The main objective of project management is that the venture be completed within the set time and cost according to the specified quality standards. Project management ensures that client’s needs are clearly defined and translated in manageable deliverables, and delivered when the client requires the deliverables. The scale of projects ranges from large construction of new power plants to small installation of a processing plant.

Project management offices may be managing project differently in different organisations but there are guiding bodies of knowledge that need to be followed. For the organisation to have continued successful projects it must ensure improved project management. Therefore, the project management process need to also be improved continuously. The preliminary investigation and observation suggested that there is lack of proper project close out within the organisation that is the focus of this study.

Project managers manage a number of projects at a time and there is the urge for project members to move onto the next project towards the completion of current project. If project teams put a lot of effort into the other phases of the project and less effort on the project close out this may result in ineffective project management and may influence or affect the success of future projects. That is, project close out must be given same the same attention as the rest of the project phases in the project lifecycle. Every phase of the project has a role and result to achieve. Ineffective project close out may result in missing opportunities for learning from completed projects.

Mapane (2011) in his study reviewed a parastatal organisation project management processes. The project management process was in line with the Project Management body of knowledge but there were some areas of strength and weakness in application of the process that were identified. It was found that the application of lessons learnt which part of the closing process was not implemented.

The aim of this research was to evaluate the effectiveness and contribution of project close as a phase in the project life cycle. The research study was to assess and identify the areas of improvement that can positively influence the project management performance and competitiveness of the organisation. The research was a case study based on a Petrochemical company in South Africa.

The significance of the research project is to generate recommendations to enable the company to improve its project management. To also indicate the importance of project close out in project management.

The objective of the research was to evaluate the effectiveness and contribution of project close out by reviewing project close out activities and document and recommend an improved way of closing out projects that will contribute to an improved project management. Furthermore it was important to also give an indication of the Project Management close out maturity level of the organisation to encourage better awareness of progress and unrealised potential.

1.2. Research scope/Limitation

This study was focused on one specific Petrochemical organisation. The findings of this study could also be relevant to other project management organisations that are follow similar project management model or projects. The context and challenges faced by other organisations could be different from this organisation therefore due care should be applied when applying the recommendations of this study.

There was very limited literature and past studies on the subject of project close out which made it difficult to find diverse views of the subject. This is a limitation to the findings of this study.

Data collection was limited to archives and informal interviews due to operational challenges in the organisation.

1.3. Research Hypotheses

In answering the following research questions effectively, I will establish the effectiveness and contribution of project close.

Hypothesis 1: Does the organisation implement project close out in line with the Project management body of knowledge?

Hypothesis 2: Does the information compiled at project close out contribute to the project management performance?

Hypothesis 3: What is the Project management maturity level of the close out phase for the organisation?

Hypothesis 4: How can proper project close out be realised?

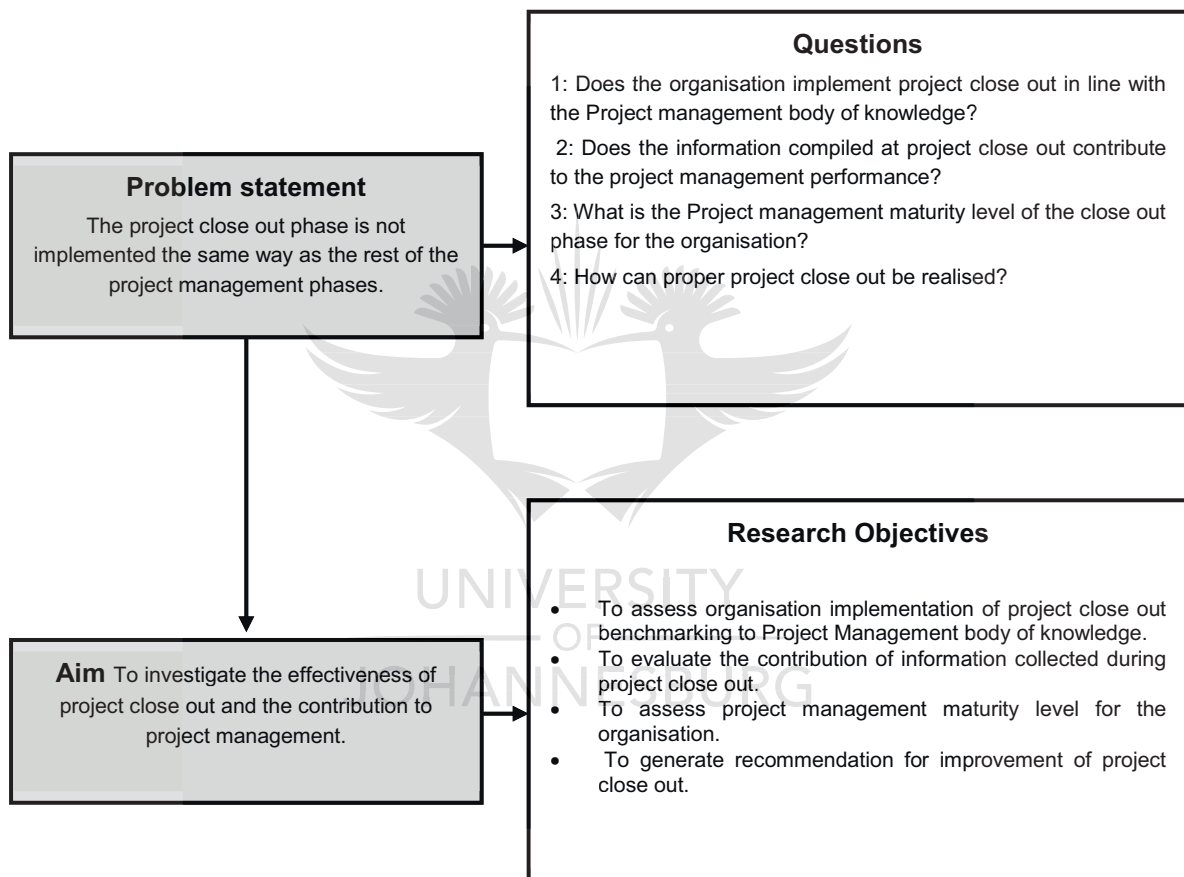


Figure 1-1: Research Problem and objectives

1.4. Research Methodology

Research methodology gives an outline of the method used to conduct the study. It outlines the exact areas of the organisation that the study will be undertaken and the methods that will be used to gather the data and information required.

Research approach followed for the study is a qualitative hypotheses testing by observation method, supplemented by informal interviews with Project team members. Informal interviews can also be referred to as narrative inquiry which are

used understand the knowledge of individuals. Structured interviews and survey could not be issued due to some organisation operational challenges.

The data was collected only within the organisation under study. The main focus was projects that were completed in the last 3 years, which is 2015 -2018. Data was gathered from project document management system from archived projects.

1.5. Overview of the research

The research is divided into the following section:

A. Chapter 1: Introduction

In this section the reader is given the background of the study. The problem statement, objectives and the aim are outlined in this section. Followed by a plan of how the study will be undertaken and the format of this report.

B. Chapter 2: Literature review

This chapter is a review of the literature on the subject of project close out. The chapter will give the reader a background project management methodologies with specific focus on the close out phase and the progress that has been made in researching the project close out within the project management industry.

C. Chapter 3: Conceptual Model

Methodology of the study will be discussed in this section. The reader will be given the method and plan that the research followed in order to test the hypotheses.

D. Chapter 4: Research Design & Methodology

The findings of the study will be outlined in this section. Results will be analysed in order to indicate clear findings of the study.

E. Chapter 5: Results

This chapter will analyse the findings of the study in relation to the research questions.

F. Chapter 6: Conclusions and recommendations

Conclusion and recommendations will be made on the contribution and the effectiveness of project close out to the organisation. Areas of improvement that could result in the improved project management performance will be recommended.

1.6. Project close out in the organisation and research supposition

All the project management phases are managed internally, that is within the Group Project management team. All the project life cycle phases (Idea Generation, Front-

End loading, implementation and Continuous Improvement) except implementation are normally handled by the Project manager and using external resources such, engineering and project management consultants. Implementation is almost always outsourced.

The management of projects within the organisation is guided by the commonly known project management guidelines, the Project Management Body of knowledge (PMBok 2017). There is a customised project management process that is used on most projects. The process is managed and revised in-house by the project management office.

In most project management offices within the organisation and other businesses, project management close out phase is not treated like the rest of the life-cycle phases. More especially when Project Managers deal with multiple projects. A lot of emphasis or attention is on the first phases of the project life cycle, that is, initiation, planning, controlling, implementation and closure. The close out phase is not managed effectively. As soon as the implementation/execution is done, the Project Managers move to the next without closing out/ finalising some administrative and operations issues.

Some operational issues such as environmental management and operating costs are mentioned and sometimes detailed during the initiation and planning phase of the project but are not handed over to operational phase correctly due to the lack of proper projects close out. Some of the lesson learnt on the project could also be captured to enhance the processes and applied on the forth-coming projects. Capturing of lessons and knowledge gained from projects is critical to the project management success and performance as well knowledge management.

1.7. Conclusion

This chapter has introduced the research subject, the intent and the contribution of the research to Project Management. Subsequent chapters will give more details of the research framework as outlined in the introduction. The next chapter is the review on literature on project close out.

2. Literature Review

2.1. Introduction

This chapter provides a theoretical background of concepts of project management and more specifically, project close out phase. It reviews the work that has been done on the subject to date. The main objective is to have clear understanding of project management and its phases as well as relate it to the literature to the research problem. Understanding project management process and phases, specifically project close out, will assist in identifying the gap, if any, in the project close out within project management teams.

2.2. Project Management

Projects are done on clients request or identification of a need by stakeholders. Projects require a project manager, comprise of sequential activities that lead to the accomplishing of the need, have a start and finish time; the activity thereof are divided into phases, require a systematic process to manage them and requires resources internal and external to the business and different skills.

PMBok (2017) defines a project as a temporary endeavour undertaken to create a unique product, service or result. "Project management is the application of knowledge, skills, tools, and techniques to project activities in order to meet or exceed stakeholder needs and expectations from a project. Project management is accomplished through the appropriate application and integration of the project management processes identified for the project" (PMBok 2017).

BS 6079 defines project as a unique set of coordinated activities, with definite starting and finishing points, undertaken by an individual or organisation to meet specific objectives within defined schedule, cost and performance parameters. Project management is defined as "planning, monitoring and control of all aspects of a project and the motivation of all those involved in it to achieve the project objectives on time and to the specified cost, quality and performance."

As indicated in the definitions, project management is about applying tools and techniques to put a new venture into place. There are several methodologies that are applied in the different organisations or companies to manage projects which mostly are aligned with these two standards PMBok (2017) or BS 6079. In spite of having all the different definitions the ultimate goal is meet the client's requirement within the defined cost, time and performance parameters. Therefore, project can be characterised by bringing about something new that will meet needs or expectations within set defined schedule, cost, and quality in a safe manner.

There are number of Project Management tools, techniques and process that are now being used to execute projects. The most commonly used technique for project management is outlined in the Project Management book of knowledge (PMBok (2017)). Project management integrates different functions in a business to create a new operations, process, products or services. The life cycle of projects are divided differently by different authors and standards. PMBoK (2017) divides project into life cycle phases and there are processes for managing the project through the phases.

BS 6079 in the figure below divides the project life cycle into five phases namely: Conception, feasibility, implementation, operation and termination. Nicholas and Steyn divide the project life cycle in four phases namely: conception, definition, execution and operation phase. Termination phase is included in the operations and feasibility in the conception phase as stages of phase development. The different phases indicate a phased approach of implementing the activities in order to complete the task.

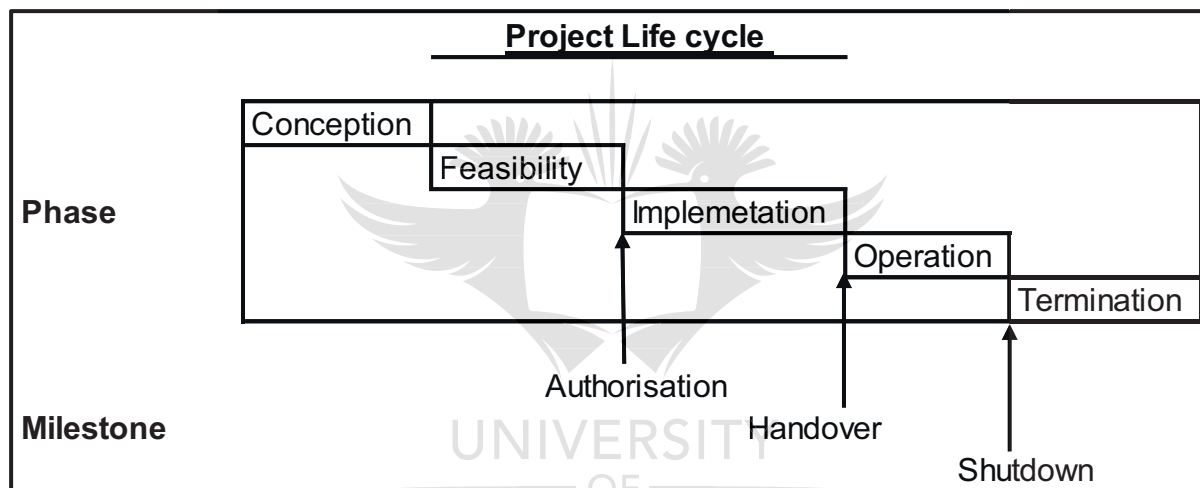


Figure 2-1: Project Lifecycle (BS 6079)

According to PMBoK (2017) "Project management processes are concerned with describing and organizing the work of the project" It does not prescribe a fixed project lifecycle, the phases may be sequential, iterative or overlapping. It utilises process groups to work through the different phases of the project. The process groups are applied in every phase of the project. The project management processes can be grouped into five groups. That is, the initiation, planning, controlling, executing and closing process. There are 10 Knowledge areas that are applied within the different phases of the project that categorise project management processes

Labuschagne et al (2005), state that due to the complexity and diversity of the projects, industries or even companies within the same industry sector cannot reach the same agreement about the life cycle phases of the project. The theoretical systems life cycle has been the proposed life cycle to be applied to projects. The system life cycle phases are conceptual, planning, testing, implementation and closure. Although there are different ways the phases/ groups are divided, the close out phase is not always

included. In other literature it is incorporated in Post Implementation review or audit, which is done some months after the completion.

Lewis (2002:4) further defines a project management as “facilitating the planning, scheduling and controlling of all activities that must be done to achieve project objectives”. The point that is stressed in the definition is the management part. That is, the facilitating of the planning, scheduling and controlling. This indicates that the skills and experience of a project manager are vital in the management of the projects. The process of managing the project is also important to ensure the proper execution.

2.3. Project close out

Project close out is referred to as Close Project phase in PMBoK (2017), it is defined as the process of finalizing all activities for the project, phase or contract. It is the process of completing work, archiving project information and releasing of project team resources to future activities. The key activities for project close out as defined in the PMBoK (2017) are:

- Project documents to be marked final version
- Finalised lessons learnt register
- Transition of final product, service or result to another team that will operate or support
- Final report on project performance Organizational process asset update.

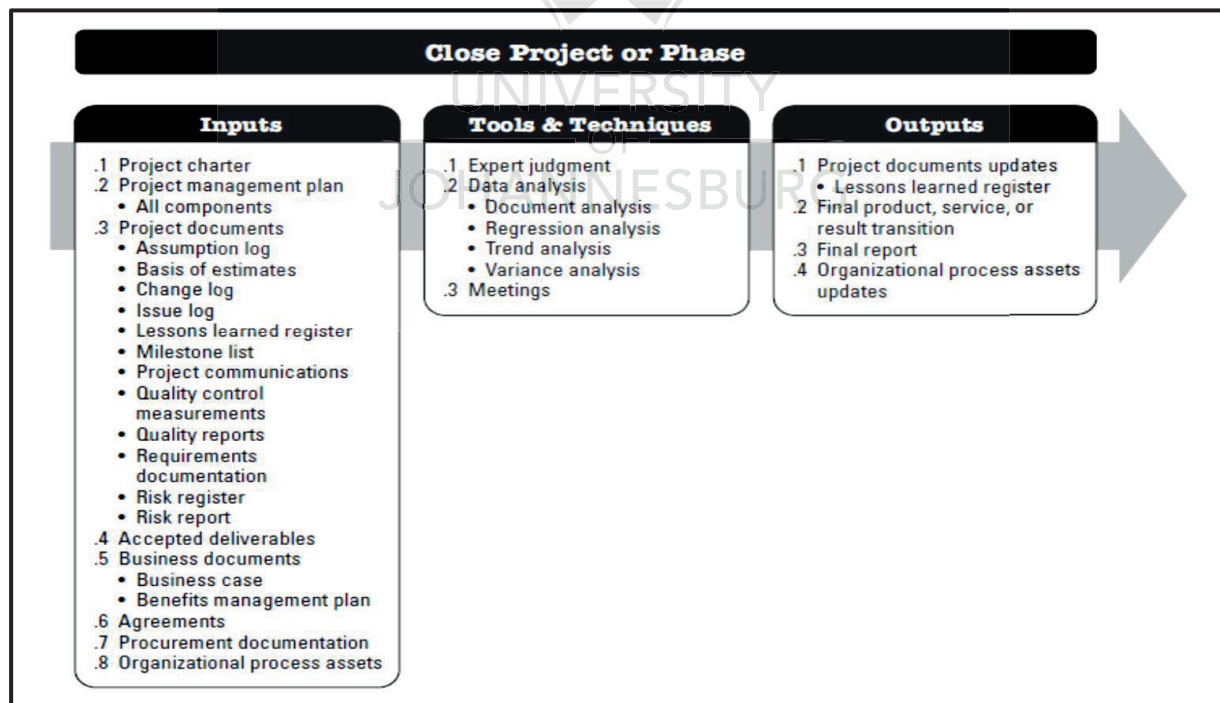


Figure 2-2: Close project or phase. Input, tool & techniques, output.

Lewis (2002:15) summarises the phases of managing a project as shown in Figure 2.3. The phases are divided into six main phases: Problem definition, development of

solution option, planning, and execution, controlling and monitoring progress then closing of the project. The main objective of doing project close out is to find out what can be avoided or improved in the next project. He further states that the organisation will benefit from these lessons learnt.

As indicated in the Figure 2.3, the main activities of project close out are focused on knowledge capturing, identifying the learnings from the project and on project management process improvements. That is, Project close out is key to organisational learning and continuous improvement of the project management processes. Thus organisations that do not have effective project close out are missing an opportunity of learning from completed projects.

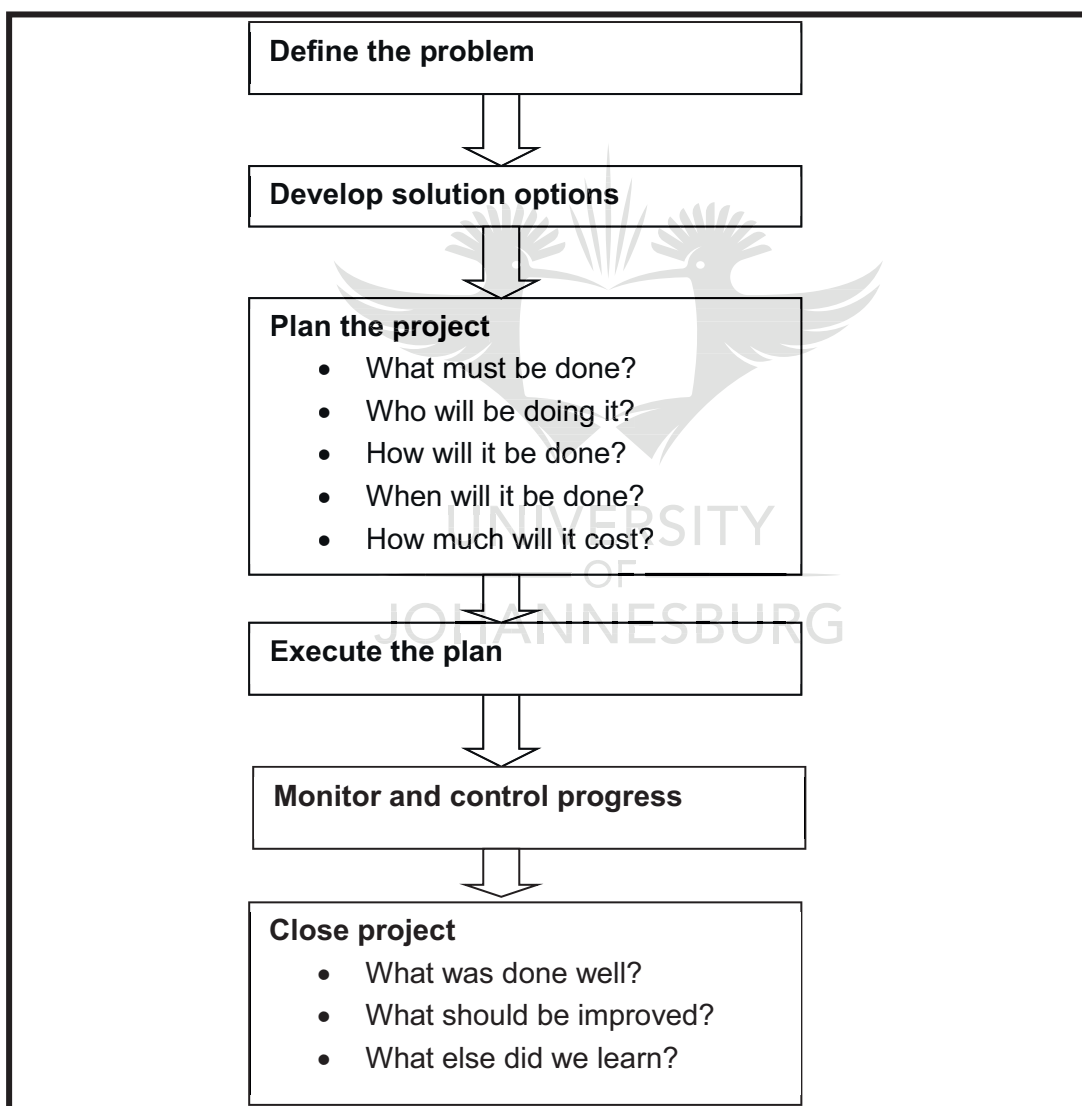


Figure 2-3: The steps in managing a project (Adapted from: Lewis (2002))

Kerzner (2001) describes project closure as follows:

- Verifying that all has been completed

- Contractual closure of the contract
- Financial closure of the charge numbers
- Administrative closure of the paperwork.

This description is much broader than the PMBoK (2017) guide definition. But both of them indicate the contractual, financial and administrative closure. Kerzner (2001) misses the core benefit of capturing what went well and what can be improved as articulated by Lewis (2002).

Nicholas and Steyn (2017) defined project close out as a point where the project deliverable is handed over to the customer. They are in agreement with the objective of this study that towards the end of the project managers put less effort into the closing activities of the project. The focus of the team moves onto the upcoming projects. The Project teams' responsibilities for close out are much more detailed and give direction as to some of the steps to be taken during project close out. Responsibilities are as follows:

1. Planning, scheduling and monitoring close out activities.
2. Final close out activities.
 - Close out of all work orders and contracts.
 - Notification of project completion.
 - Close project office and all facilities occupied by project organisation.
 - Close project books.
 - Ensure delivery of project files and records to the responsible managers.
3. Customer acceptance, obligation and payment activities.

The above activities do not include lessons learnt capturing as well as project success and failures review since project close out is not regarded as the last phase of the project. It is recommended that after close out a formal project review must take place. The review is to be conducted into two parts namely: Post-completion project review and Post Installation system review.

Post completion project review "is a summary review and assessment of the project conducted by the contractor immediately after project close out – early enough so project team members are still around, available to participate and remember what happened." Post completion review is a continuous improvement process that utilises project lessons learnt for improvement of future projects. Whereas post completion project review focuses on the project and can be done several months later the project deliverable has been handed over to assess its performance under operational conditions. In both instances time and budget need to be allocated for the project teams to do the reviews.

The IRTM guidelines 2006 define Project close out as the last phase of the project life cycle and it begins when the client accepts the deliverables of the project and the

project authority concludes that the project has met its goal. They identify the project key elements as:

- Turn over the project deliverables to operations
- Demobilise project team
- Closing out financial account
- Complete, collecting and archiving project records
- Documenting the successes of the project
- Documenting lessons learned
- Planning for post implementation review.

The IRTM guidelines are more comprehensive and capture the need to document successes and learn lessons.

The activities involved in this phase are administration closure and contractual closure. Contractual closure is the completion and settlement of the contract and including resolution of any open items. And, administration closure is the generating, gathering and disseminating information to formalise phase of project completion. This view misses the importance of the project close out as a review phase that allows improvement in the management of future projects.

It has been observed, however, that a lot of attention in the literature is placed on the first phases until at the end of execution or start up depending on the project life cycle that is being used. That is after the final product has been delivered to the customer. The implementation of close out phases is sometimes not done or not given the full attention as the rest of the project phases. This trend is noted the most in environments where project managers are involved in multiple projects one after the other. Soon after the delivery of the final product then the project team is dissolved and the project manager moves on to the next project.

Van der Merwe (2001) states that management effort in project management is spent in the implementation phase where management of change to the original plan is the key activity. He continues to say that project close out is not normally seen as part of the project, neither is commercial operation.

Martin et al (2000) share the sentiments of Van der Merwe. They say that project close out is a critical part of project management process and assist in learning how to do better on the next project. "Close out is an often overlooked but important project phase that should include evaluation, lessons learned, sponsor review activities".

After the final product delivery the customer, the sponsor and project team need to evaluate the project. The customer needs to evaluate the project, whether expectation have been met, at the agreed time within budget and at what quality. The project team

needs to also look at the execution of the project, the communication, team morale and the overall performance of the team throughout the project.

When the evaluation of the project is completed then the project team can put together the lesson learnt. The lesson learned should be used to put together recommendations for improvement in future projects and should form part of the close out report. The close out report should be communicated to project sponsors or clients and all stakeholders to avoid repeating same mistakes in future (Martin, 2000).

Wiegand (1990:15) states that some utilities are engaging in the close out and post review of the projects which includes most of the project team members in order to improve on the future performance of the project. The project teams included in the review are the user, project management team, engineering, construction and contractors. He further suggests that there should be analyses of the variances between planned and actual cost and schedule.

According to Wiegand (1990:15), the timelines of the project closeout used by many utilities must be improved. It takes a while for the cost accountants to capture projects costs and that could result in erroneous cost being captured. He reckons that the reason for failure to closeout projects promptly could be the complexity of the closeout procedures, poorly defined responsibility for project closeout and delays in completing open items on project punch lists. This is as a result that there are multiple projects that require management attention that requires the spread of resources and project control tools over the number of projects.

It is evident from the different literature that has been reviewed that there is a need for clearer definition of the project close out responsibilities. Project close out activities need to also be expanded more to allow proper evaluation of project management and project success. Finally, Project close out is key for continuous improvement process. The project is not complete until the close out has been conducted. Therefore, time and cost should be planned for project close out.

2.4. Project Management Success

Both Project management success and Project success are evolving subjects. Conventionally, project success as measured by most concentrates on the four measures scope, cost, time and quality as shown on the project management triangle in Figure 2.4. Williams (2016) states that both research and practice are moving towards multi-dimensional definitions involving objective and subjective criteria. Rolstadas et al (2014) argues that the recipe for PM success has to be found, and there will probably be no single best solution.

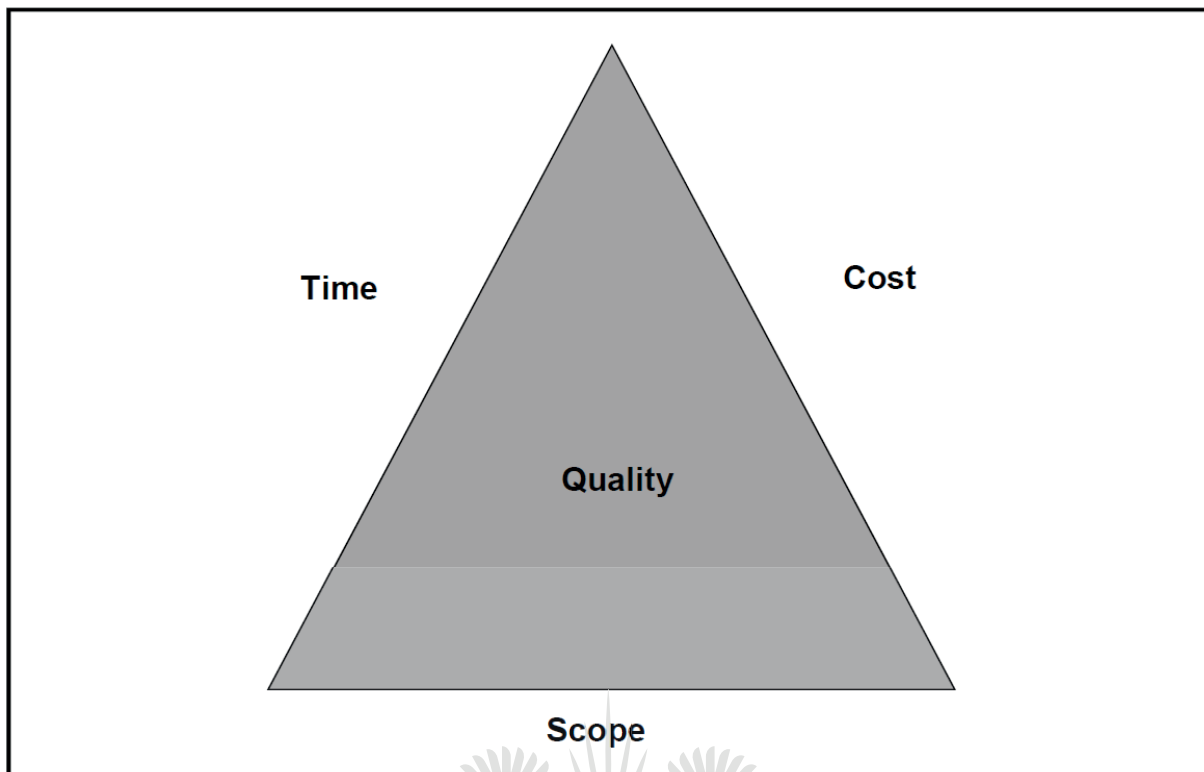


Figure 2-4: Project success "triangle"

A number of authors have studied and identified a number of factors that are important to project success. "The identification of the success factors and the causes of failure is very useful in that it provides project owners, contractors and other stakeholders with the lessons learnt from past projects. Project success factors are also useful for analysing why projects are a success or failure but cannot be used for measuring the degree of success" (de Wit, 1988)

De Wit (1988) distinguished project success as measured against the overall objectives of the project and project management success measured against a widespread and traditional measures of performance against cost, time and quality. He further distinguished success criteria and success factors.

Cooke-Davies (2002) used the above definitions to further develop success factors. He identified "the existence of an effective benefits delivery and management process that involves the mutual co-operation of project management and line management" as a critical success factor on an individual project". He further identified "An effective means of learning from experience on projects that combines explicit knowledge with tacit knowledge in a way that encourages people to learn and embed that learning into continuous improvement of project management processes and practices" as a factor that lead to consistently successful projects. That concurs with Kerzner (2000), continuous improvement represents the fifth and highest stage of project management maturity in the organisation.

Although project close out per se is not directly linked to the project management success, effective process for embedding lessons learnt from past projects and effective knowledge management will ensure consistent project management success. This will be achieved by proper close out of the project.

2.5. Project Management Maturity

Although higher Project maturity level doesn't necessarily guarantee project success, it can be a good indication of the organisation's capability and competency regarding project management. Nicolas and Steyn (2017) states that for the organisation to further develop its capability people must practice the principles of project management. Maturity assessment needs to be supported by senior management and there must be willingness throughout the organisation to support the efforts. Maturity models assesses how well the organisation is doing in relation to leading competitors.

Kwak and Ibbs (2002) developed a project management process maturity (PM)² model by integrating previous maturity models that measure the PM levels of different companies and industries. The model assists in evaluating and positioning the organisation's current project management maturity level as well as, to incrementally improve on its overall PM effectiveness. The model maturity levels increase from functionally driven activities to organisation driven activities. That is, at the lowest maturity level, Level 1 the activities are driven functionally and Level 5 are driven at organisational level. Therefore improved maturity is a whole organisation effort.

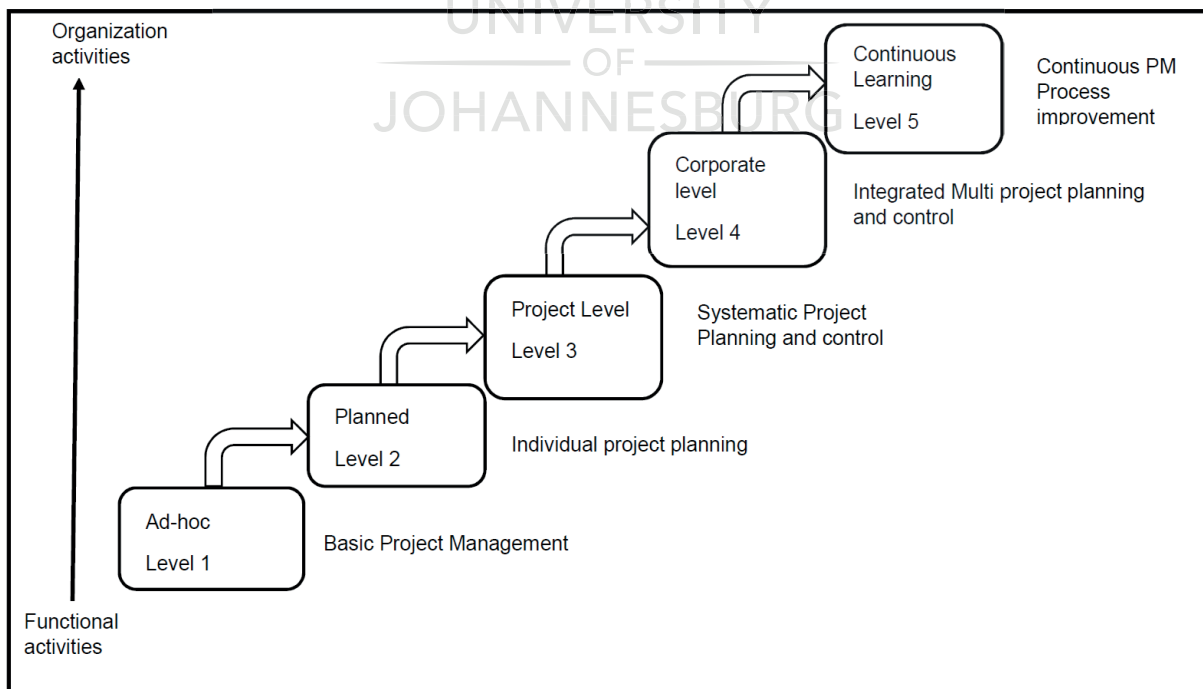


Figure 2-5: Project Management process maturity model (PM)² Model

The project maturity model utilises project management processes and knowledge areas as in the PMBoK (2017). According to Kwak and Ibbs (2002), project closing process ensures formalising acceptance of the project and bring it to an orderly end. The process includes contract closeout, lesson learned documentation as well as administrative closure. The (PM)² model overview on the closing process of the project is shown in Table 2.1 Kwak and Ibbs (2002).

Table 2:1: Summary of (PM)² Model in relation to project closing process.

Project management maturity level	Organisation project closing
Level 1 - Basic Project management process	<ul style="list-style-type: none"> • No formal closing process that close all deliverables and contracts. • Project file records are not consolidated, classified, or stored.
Level 2 – Individual project planning	<ul style="list-style-type: none"> • An informal closing process is defined. • Key technical learning and quality of overall PM process is informally reviewed.
Level 3 – Systematic project planning and control	<ul style="list-style-type: none"> • All closing activities are completed and the project files are stored and managed. • Project team members actively participate to suggest and document best PM practices.
Level 4 – Integrated multi-project planning and control	<ul style="list-style-type: none"> • Contract close out, administrative closure, and documentation of the files are integrated.
Level 5 – Continuous project management process improvement	<ul style="list-style-type: none"> • Closing process is optimised and sustained for continuous PM process improvement.

Table 2.1, above indicates how the project closing process is conducted in relation with the organisation’s project management process maturity. The table will definitely assist an organisation to position itself and improve on its project management process. For an organisation to be on reasonable level of the maturity model it needs to have a formal closing process and closing all deliverable and contracts in time and in an integrated manner. The closing process should also be optimised and sustained to ensure PM process continuous improvement. Level 4 suggests that project teams

should periodically have an integrated process for reviewing and acceptance of lessons learnt at an organisational level.

There is a need for organisations to start utilising systems like text mining, machine learning and artificial intelligence to identify key success factors to identify lessons to be learnt across a large number of projects over a number of years in order to optimise on lessons learnt process.

2.6. Project Knowledge management

“For organisation to gain competitive advantage, this knowledge needs to be transferred effectively between projects. Knowledge transfer is thus an important and decisive competitive factor” Tshuma (2018). The amount of knowledge that is produced through projects is high. Because of the uniqueness and temporary nature of the projects, organisation tend to treat knowledge produced unique to the project. The unique and temporary nature makes knowledge management and knowledge transfer between projects challenging. Organisations require a formal and structured process for capturing and disseminating knowledge. Some organizations will use text mining, machine learning and artificial intelligence to identify key success factors to identify lessons to be learnt across a large number of projects over a number of years. The figure below summarises Knowledge management process.

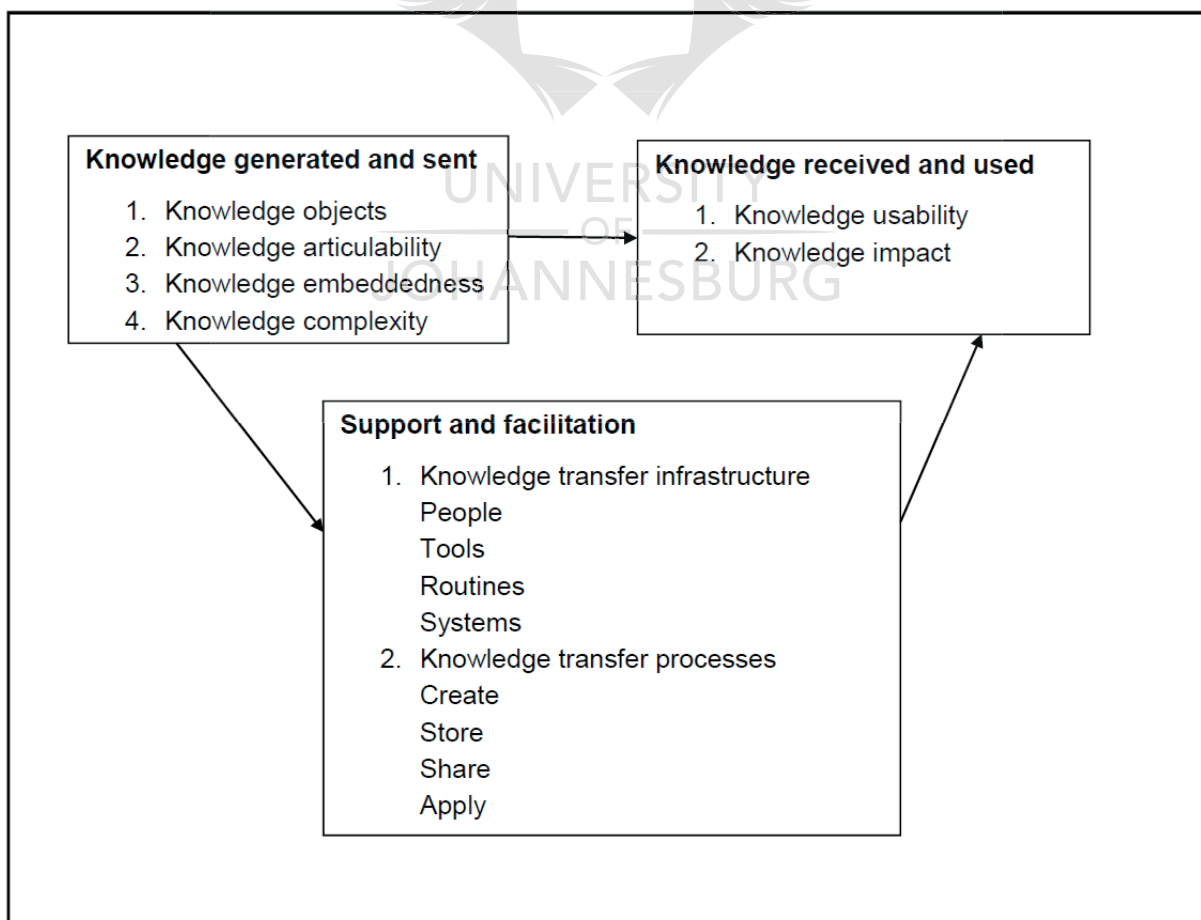


Figure 2-6: Knowledge management (Tshuma 2018)

“Knowledge management is concerned with management of both tacit and explicit knowledge for two purposes: reusing existing knowledge and creating new knowledge” PMBoK (2017). Knowledge creation and reuse of existing knowledge can be achieved by two activities namely knowledge sharing and knowledge integration PMBoK (2017).

“Manage project knowledge is the process of using existing knowledge and creating new knowledge to achieve the project’s objective and contribute to organisational learning. The key benefit of this process are that prior organisational knowledge is leveraged to improve project outcomes, and knowledge created by the project is available to support organisational operations and future projects and phases” PMBoK (2017).

Knowledge management process should be embedded in the project management processes. The key activity that facilitates knowledge management is lessons learnt process. Best practices, failures and successes during project execution need to be identified and captured for use in future projects and to ensure consistent project management success. Documenting of learning from projects and incorporating the learnings into project management processes and methodologies will improve the project management success.

2.7. Conclusion

Project close out is definitely an important process in project management. It is a means for bringing a project to end by consolidating all the administrative and contractual information and developing best practice by learning from completed projects. It contributes to the overall project management performance. The theory discussed in this chapter has helped to identify the gaps in theory and the different close out practices from different authors. It was found that different authors do agree that organisations do not appear to pay attention to project close out. There is also lack of clearly defined roles and responsibilities for project close out. Some organisation combine post implementation review activities with close out activities.

Although project close out is not directly linked to project success, Cooke- Davis’s study indicated that learning from past projects can assist organisation in consistent project management success. Project knowledge management is key to the success of a learning organisation as well as improved competitiveness. It is not a single function activity but needs to be embedded in the different project management processes. Capturing of knowledge at the end of the project is crucial to knowledge management. Project close out can definitely be a key step in ensuring that knowledge is captured at the end of a project. Finally, tools like Project management maturity model can be useful in improving the competitiveness of the organisation’s project management.

Chapter 2: Literature Survey

Project close out is not an instantaneous activity. It needs to be planned for and managed throughout the execution of the project. Most of the project management literature focuses on the initial stages of the project till the implementation phase. The same effort must be applied to the whole lifecycle of the project. It is a key step not only in the specific project but also in the organisation's project management methods and processes. It is also key to the project knowledge management



3. Critical review of projects management in case study

This chapter entails the conceptual methodology that will be used to assess the project close out theory against the practices within the petrochemical organisation being studied. The assessment will be done by exploring project management within the organisation with explicit focus on project close out. The method will be used to identify the gaps and correlations in the implementation of project closeout against theory. The literature study has provided a background for conducting the research. It has also identified clear prospects of proper project closeout.

3.1. Petrochemical organisation

The petrochemical organisation being studied is based in South Africa. It is a leading chemicals and energy company with more than 50 years of experience. The main focus of the company is production of liquid fuels, chemicals and low carbon electricity. The organisation is structured into a number of business units: Strategic Business Units (SBU), Regional Operating Hubs (RoH), Operating Business Units (OBU) and Group Services. Within the group services division of the organisation there is a group responsible for the entire organisation's project management. That is, there is an in-house project management services company that render a service to the rest of the organisation: SBU, RoH, and OBU. For the purpose of this study the different business units will be referred to as BUs. Majority of the projects and the most project capital that is managed by the Group project management team is within the RoH. That is, the only and major clients for the team are BUs. Although the different teams are part of one organisation, they are managed as separate entities and in some instances located in different sections.

3.2. Nature of projects

Although the projects differ vastly, they mostly follow project management processes that are aligned with the Project Management body of knowledge (PMBok (2017)). The nature of the project can vary from like-for-like replacement of major equipment, to installation of a small plant or even construction of a completely new operating plant. So there is a combination of both greenfield (a completely new installation that is not following a prior work) and brownfields (a modification or upgrade of current facility) projects, with the latter being the majority. Although some may argue that some of the projects are normal operations activities, they may be categorised by the characteristics of a project as defined in PMBoK (2017): "temporary endeavour undertaken to create a unique product, service or result." The projects are definitely temporary as they have a definite beginning, when the problem has been identified, and definite end when the deliverable has been handed over to the client or a decision has been made to terminate the project. They create a unique outcome or result.

Projects undertaken in the Petrochemical organisation do create one of the following as an end result. PMBoK (2017):

- A unique product that can be either a component or another item or an end item in itself .e.g. Motor replacement.
- A unique service or a capability to perform a service .e.g. shutdown services
- A unique improvement in the existing product or service line .e.g Implementation of SAP system to automate most of financial reporting.
- A unique result such as an outcome or document. E.g. company restructuring.

Group Project management team executes some of the project activities and outsources more of the specialised tasks to engineering and project consulting companies. Depending on the complexity and required project deliverable, project maybe involve single or multiple BUs. The project management teams are structured into a matrix organisation that is supported by the Project management office. Most of the resources are dedicated to one or more projects at the same time. At times, some project team resources, including project managers, are involved in more than one project that are in different phases of execution. Although, there is a structured process in place for allocating project resources, availability of resources especially project managers remains a constraint.

3.3. Project management in the Petrochemical organisation

Project management processes are through a formalised model that is understood and utilised throughout the entire organisation. The purpose of the model is to “facilitate alignment between business and operational requirements and project and technical activities, to ensure activities are executed at the right time” Project Management framework (2006).

The formalised project management model was developed for the execution of different magnitude and complexity projects within Group project management and all other organisation BUs. The model uses the stage process associated with the seven project life cycle phases as indicated on Figure 3.1. The model is a stage-gate model. At the end of each phase there is a gate review to ensure that the phase deliverables have been met as well as to ensure that the facility has been developed to enough detail to minimise the risks before proceeding to the next phase. As well as to endure the project is progressing according to plan.

Focus	Business definition			Business establishment		Operate Business	
Idea Generation	Front end loading			Implementation		Continuous Improvement	
Idea Packaging	1 Pre-Feasibility	2 Feasibility	3 Basic Development	4 Execution	5 Start - up	6 Evaluation	7 Operation
Strategic Alignment	Business Planning	Facility planning	Project Planning	Provide assets	Safe start-up	Evaluation	Optimise

Figure 3-1: Project Management phases (Source: Case study organisation)

The model is has seven phases of project management. Each phase has set objectives and deliverables that need to be achieved before proceeding to the next phase. Each phase activities are divided between project, business, technical and sponsor track. Each track has deliverables that are related and specific to it and contribute to ultimate phase deliverables. The summary of each phase objective is as follows:

The PMBoK (2017) 10 knowledge areas are built into the model. The model doesn't follow the implementation of the five stages: initiation, planning, controlling, executing and closing process as outlined in PMBoK (2017), especially the closing process. There no formal closing of the phase that feeds into the next phase which entails processes performed to formally complete or close the project, phase, or contract PMBoK (2017).

Idea Generation – Possible business opportunity or business need is identified. Required information for assessing preliminary business and technical information is gathered.

Prefeasibility – this phase focuses on the quantification of potential benefits for ideas generated at strategic level. It involves gathering of information sufficient to define the problem or opportunity. Technical and Project work is very minimal. Most activities are business/operations based.

Feasibility - the problem's technical, business and project execution solution alternatives are identified, assessed and the best alternative is selected. The cost and benefits are calculated and the viability of the project is determined from an economic and technology point of view. Major technology risks are identified and assessed.

Basic development - the selected business, technical and project execution alternatives are sufficiently developed in preparation of the project implementation plan and cost estimate in order to support final project authorisation by approval committee.

Execution – this phase entails the detailed design, procurement and installation of the facility according to the Project execution plan, agreed quality, within the authorised

budget and time. When the facility erection is complete, the facility is then prepared for commissioning and handover to business/operations.

Start-up – this phase will commence when the facility has been commissioned and it is ready for operation. The phase is completed when sustained production to specification has been achieved.

Evaluation – the performance of the implemented business concern is evaluated to ensure business objectives are met. Post project audit and project closure are completed and lessons learnt and best practices are captured and shared. Technical track supports operations to achieve optimal operation.

Operation – on-going optimisation of the implemented facility. Newly identified opportunities are included assessed in phase 1.

Project close out activities commence in the Start-up phase of the project continuing to Evaluation phase. Project close out as an activity is completed in Evaluation phase with the Project close out report as a one of the deliverables of Evaluation phase.

Start-up phase close out activities:

- Identify Resources for and responsibilities for project review and close-out.
- Coordinate and schedule resources for performance test and project review
- Ensure that the performance procedures are developed and accepted by the Operations personnel.
- Ensure that End of Job (EOJ) documents are received from contractors and accepted by Operations and Maintenance.
- Update the Know Risk software Knowledge base with lessons learnt. Ensure that all project related risks are closed out, or that remaining risks are passed on to the relevant business owners

Evaluation phase close out activities:

- **Contractual and financial closure** - To ensure that contracts are closed on-time and projects are financially closed on-time for capitalisation of project expenditure. The activities are:
 - Ensure that all contractual expenditures with change orders are within budget.
 - Confirm that there are no outstanding claims, change orders or outstanding payments on invoices from contractors and sub-contractors.
 - Complete necessary documentation for contract closure.
 - Ensure that the project bank account is close when applicable.
- **Project close-out as per plan** - To ensure that the project is properly closed at the right time.

- Perform the project close-out as per plan.
- Ensure that Business partners are satisfied with the project outcomes for project closure.
- Ensure that all project hand-over documentation is in place.
- Demobilise the project team and contractors.
-
- **Lessons learnt** – To capture project lessons learnt.
 - Capture Examples, Lessons Learnt and Best Practices.
 - Forward good examples, lessons learnt and best practices for update of Project Management Framework and improvement of methodologies.
 - Develop action plans for the application of the lessons learnt and best practice. This should have measure of success, milestones and named action owners.
 - The process should be continuous throughout the project life cycle and the post mortem at the end of the project.

Project close out report entails, lessons learnt, financial and contractual closeout and project close out as per plan. Project closeout has been incorporated in the model as it is supposed to guide the final closing of the project. The deliverable for project management track in the evaluation phase is a project closeout report. Post audit report is also a deliverable of evaluation phase.

3.4. Proposed framework for Project close out

Table 3.1 indicates both the comparison of project close out activities as recommended by other authors as well as the proposed framework for the assessment for the study. The proposed framework includes a combination of activities from literature and expands on them including the new observations from this study.

Table 3:1: Project close out activities comparison

Project close out activities				
Project Management Framework	Martin (2000)	PMBok (2017)	Kerzner (2001)	Proposed Assessment for this study
Contractual and financial closure	Planning, scheduling and monitoring close out activities.	Project documents update	Verifying that all has been completed	Contractual closure
Project close-out as per plan	Close out of all work orders and contracts.	Final document transition	Contractual closure of the contract	Financial closure
Lessons learnt	Ensure delivery of project files and records the responsible managers.	Final report	Administrative closure of the paperwork	Historical review of lessons learnt
	Customer acceptance, obligation and payment activities.	Organisational process updates	Financial closure of the charge numbers	Timing of Lessons learnt capturing.
	Notification of project completion.			Notification of completion
	Close project office and all facilities occupied by project organisation.			
	Close project books.			

Project close out deliverables on the organisation’s project management framework concur with those stipulated by Kerzner (2001) and Martin et. al (2000). The deliverables of the project closeout phase are supposed to assist with the project management team to capture learning points for the future, as well as to ensure that the contractual and financial requirements are met and that the costs are captured correctly. This does not only benefit the project managers and their teams on planning for the next project but also benefits the business as a whole as there can be some costs incurred by not closing contracts on time and by not improving on the project management skills of project managers.

3.5. Knowledge management process

There is currently no single formal knowledge management process. Every function within the organisation has its own informal process of knowledge sharing. As discussed in literature, Knowledge management is a key process for organisation to identify successes and failures in order to avoid repeating mistakes. It is also critical in the updating and improving of processes. It is key to the continuous improvement process of the project management processes and ultimately for the entire organisation.

Lessons learnt process is a key input into the knowledge management process for the company. Also, capturing and sharing of the lessons learnt can assist in improved performance of future projects. There is a formal lessons learnt process that is built into the model. The major focus of lessons learnt is in the last phases of the project, Start up and evaluation phase. The lessons learnt process is summarized below: the following steps:

1. Capture

Learning from executing work is captured in the form of additions, modifications or deletions to existing work methods and practices.

2. Classify

Learning is classified according to the specific system of best practices and the element within the system where it could impact.

3. Review

The classification of the learning document determines to which Best practice custodian it is routed for comments.

4. Rework

The custodians may route the document back to the originator for further clarification or rework.

5. Formulate

The Best practice custodians crystallize and sanction out of the learning document specific modifications to the existing set of best practices.

3.6. Project and Project management performance

One of the project manager's key role during the project implementation is to constantly report on project performance against plan. The performance report is mainly shared with project key stakeholders. The key focus of the reporting is cost, time, safety, quality and risk. Ideally, this should focus on most, if not all of the PMBoK 10 Knowledge areas. At the end of the project, performance of projects with cost less than R500M are reviewed at a portfolio level on cost and schedule. Whereas project with

total cost above R500M, performance is assessed and reported. The report is similar to post-completion review. The following items are assessed:

1. Performance against plan of execution (months)
2. Capital cost performance, s-curve of cash flow
3. Owners cost performance
4. Technical performance requirements of the plant against the design specifications or guaranteed performance requirements
5. Feedback on technical risks highlighted during capital application process
6. Operability:
 - Commissioning and start-up problems experienced:
 - Details and cost of start-up modifications:
 - Stability / availability
7. Safety performance during construction and start-up:
8. Results of Performance trial compared to Guarantee
9. Financial parameters
10. Organisational structure evaluation
11. Realisation of business assumptions, including group assumptions and project specific assumptions
12. Lessons learnt

3.7. Project Close out challenges

It has been observed that project close out is not given the same attention as the rest of the project management phases. As soon as activities approach handover during start-up phase, project starts losing momentum. The reason could be individuals are already thinking about the next venture. The consequences of not closing out projects range from maintenance department being scheduled to maintain an asset that has been removed from operation/service or asset not being included on the maintenance schedule to contractors final invoices not paid for months after completion of project. Some of the activities that are to be completed during close out are updating drawings, updating costs and closing project account, conducting project review meeting to capture lessons learnt, completing documents on the project file and registering the file in the archives.

The following are some of the consequences of lack of closeout:

- A number of project cost account remain open for long periods with budget allocated to them. Financially, the amount will remain allocated/committed to the project until financial closure documents have been signed off.
- Knowledge captured during the project could remain in the project documentation and not shared with the rest of the organisation, potentially leading to mistakes being repeated and success not carried through to future project. There is a need for tacit to be captured.

- Some assets will end up not being covered by insurance as they have never been registered as complete because the administrative closure was not yet completed.
- Contractual close out is a formal notification to the supplier/service provider that the project is complete. This is critical in ensuring that all amount committed to the supplier/service provider are reviewed, paid or reversed, where required, in order to be able to close the contract and allow financial closure.
- Project files and documents need to be closed and archived correctly soon after the project has been completed. This will allow for ease of reference access to information. The current focus in the organisation archiving and capturing of technical information such as drawings and design packages. It is critical for the all project information to be captured and archived correctly.
- Involvement of key operations/business personnel in the closing of the project is key in ensuring that the knowledge doesn't only remain with project management team and will ensure the correct knowledge and general project information has been transferred from project to operations.
- Project Managers and project teams are involved in multiple project simultaneously. This might lead to divided attention on the critical deliverables of project especially when the projects are in different phases.

3.8. Conclusion

The chapter illustrated the conceptual method that is used as a basis for the research study. This chapter introduces the gap that can be notified from the theory as described in the PM processes to what is actually being done in practice in the organisation. As was discussed in Chapter 2 (Literature survey); there is a structured process as per the PMBoK (2017) for managing projects. The process takes cognisance of some of the important factors that will lead to successful project management. The process incorporates most of the required action and activities that are necessary to bring a new endeavour into being and to ensure that the need as identified at the beginning as been met. The conceptual method identified above relies on the fact that there are process and guidelines in place for the project management process.

4. Research Design and Methodology

4.1. Introduction

This chapter entails the research methodology that was pursued in the design of the research for the case study. The process of designing the research study followed the review of literature followed by the formulation of the conceptual framework. As previously discussed, this study has assessed project information to find out whether project close out is effectively implemented on projects in the organisation under study. If so, how effective is the process. And, if not, what are the gaps and how can the process be improved to ensure effective project close out. This chapter addresses the research design and method, research instruments that was used to answer the research questions and finally justify why the methods have been proposed.

The research process that was followed:

- Reviewed the theory on project management process and project close out best practices.
- Reviewed the current project management process as applied in the organisation under study, with explicit focus on the project close out.
- Compared what theory prescribes and what is actually being practiced.
- Investigated the organisational challenges and link to project close out
- Proposed improvements for the close out process.

4.2. Research Methodology

The research methodology entails the method that was used to gather the data of information required for the research to be completed. According to Blumberg et al (2008: 195), “research design provides answers for the following questions:

- What kind of answers are the study looking for and which methods will be used to find them?
- What kinds of sampling will be used?
- What techniques will be used to gather data?
- How will the time and cost constraints be dealt with?”

The first three questions will be answered in the sections to follow. There was definitely a time constraint for completing the study as it was done part time and the researcher is employed full time. Another time challenge was experienced when having to meet with subject matter experts of functionalist specialists to gather information for the study. The cost of conducting the study was minimal as most resource were available to the researcher in their line of work. The rest of resources were available from the organisation. It is not envisaged that costs will be incurred for implementing the solution. The will be time requirement from Project management office to update and implement the proposed improvements. The anticipated risk associated with the

solution is resistance from the organisation, especially project management teams, in adopting the proposed improvements.

The researcher could access the information for the different sites from a central location. Information was readily available but access restricted.

4.3. Research design

Research design includes translating the research questions into research variables, Choosing appropriate sampling and data-collection methods, choosing appropriate analysis methods, deciding on a time frame and budget, and writing the research proposal (Page and Meyer, 2006).

There are three forms that a theory based empirical research can take to collect the research data, that is, Case study, survey or experiment. Experiment requires for the setting to be controlled and the survey requires a large number of units of analysis. Due to the size of population for the study case study will rather be used to get high validity of results.

“Case study is a research strategy which focuses on understanding the dynamics present within single setting” Eisenhardt (2001). The organisation under study is a single setting for the research and the study will examine the dynamics of managing projects, particularly, the closing process of the project. Since the results/findings of this study are not meant to generalise project closeout in the whole project management field or any other petrochemical business; case study is the most suitable method of conducting this research.

In case study research several methods of collecting data can be used. The methods available to this research method are:

- Documents
- Archival records
- Observations
- Physical objects

This study used multiple sources of evidence. That is, archival records and informal discussions to verify the data. The use of multiple sources is meant to enhance the validity of the results and assist in answering the following research questions:

4.4. Research Instruments

The findings of the literature review were substantiated by archival records and informal discussions with the relevant persons. The random personal interviews were conducted with project team members within the Group Project Management team. Archival records that were most helpful are the records of the project files that have been registered in the document storage as well as minutes of project review meetings.

Chapter 4: Research design and methodology

For the study to be valid the 15 projects completed in the past 3 years (2015 – 2018) will be reviewed. The information was gathered from archived project on the record management system. The unit of analysis for this study is Petrochemical organisation that manages project from within the organisation through a dedicated project management team.

Only individuals that are involved in projects within the group project management team were contacted. Within this group, there are departments that are directly and indirectly affected by the results of project closeout. For instance, commercial department will not be able to close the contracts until the project manager has done proper closure. At times, there will be numerous open contracts whereas the execution thereof have completed. The data to be collected is non-numeric and case-oriented where the researcher is closely involved.

4.5. Conclusion

This chapter gives details of the research strategy and method that was followed to collect data. There is a basic theoretical background of the design that the research will follow. There is a clear indication of the reasons for choosing the particular research method, that is, the case study method. Then the design and the instruments that was used for data collection and analysis are discussed. The use of the discussed methods will assist with the analyses of the data and therefore the research question's answers will be uncovered.

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5. Results on Case Study

5.1. Introduction

The purpose of this chapter is to present and analyse the findings of the research study. The data gathering process and the focus of the data in order to answer the research questions is outlined. The data collected will be analysed in order to draw conclusions and make recommendations for the research study.

5.2. Data gathering Process

The primary method that was used for data collection for this research was that of non-interactive data collection procedure and the secondary process was informal interviews with project management personnel. The information gathered from the study was mainly to verify the information and process being studied. The primary data was collected from project documents and archives and confirmed through informal discussions with the relevant responsible persons. Data was collected from commercial, financial and documents management. The data was discussed with the project individuals in order to check the correctness and reliability of the data. Different functional procedures were also reviewed to ensure alignment of the information.

It was challenging to access project information and make sense of the information as it is access controlled. The organisation was also going through operational changes which restricted the researcher's data gathering methods. Personal structured interviews were strictly not allowed. Thus, the discussion with project document managers confirmed the status of the project and the availability of information. Secondly, it was challenging to find relevant Project Managers to assist with the analysis of archives as some people have since left the organisation and others did not want to be held accountable.

Nine individuals from the following groups were contacted:

- Portfolio management - The team is responsible for opening and closing of the project account.
- Cost control – The team is responsible for the cost flow of the projects. They integrate well with Project Management, Commercial, Finance and Estimating department as well as suppliers and service providers.
- Project Management – responsible for the project personnel and deliverables.
- Document Management - responsible for project document filing system.
- Project Learning and development – responsible for project competency and learning development as well as lessons learnt process development.
- Project Management Office – responsible for the project management governance and assurance and processes.

A sample of 20 projects was taken. The main focus of the study was on projects closed between 2015 and 2018 but of the twenty projects some were completed prior to 2015 and they were only assessed on lessons learnt only. The organisation went through some operational changes in 2015 that led to a number of changes in the functional roles and day-to-day operations.

5.3. Data Analysis

5.3.1. Secondary data

Informal discussions with personnel involved with project assisted in clarifying the formal processes in the different functions for project close out. During the discussion the following questions were asked:

1. Do you think that project close out is executed properly?

All nine respondents respond NO to this question.

2. Is there a formal process with clear roles for function specific close out activities?

All nine respondents responded YES to above question.

5.3.2. Primary data

The following information was considered during primary data gathering:

1. Was the project capitalised? (Recorded as an asset).
2. Was the main contractor notified of contract closure?
3. Was a lessons learnt session held?
 - Were contractors involved?
 - Analyses of the lessons learnt information.
 - Involvement of the main contractor/service provider?
 - Trends/recurring themes on the lessons learnt.
4. Project management maturity level for each of the projects assessed.

5.3.2.1. Administrative closure

The primary data was gathered from the Project Document Management system that was managed by Document Controllers for the Project Manager. Document controllers report to project manager and to the document management function line management. The structure of the electronic project document file index is included in the Appendix A. The Appendix only indicate the project management documents as well as close out related documents. The rest of the information was removed.

Projects generally follow the prescribed project filing index. It was a bit of a challenge finding certain documents as the location is inconsistent across the projects. Also, the version of the document reviewed could not be confirmed. The individual documents were also not the same. Especially, the lessons learnt documents. Some did not have attendance register nor the date of the session.

According to the filing index the following Project close out deliverables are supposed to be filed:

- Environmental Impact Assessment (EIA): Minutes of close out meeting
- Commissioning close out report
- Financial close out and capitalisation.
- Contract close out.

The following were observed:

- None of the project that were evaluated for the study had a close out report in the project filing system, as well as the Environmental Impact Assessment (EIA): Minutes of close out meeting and Commissioning close out report.
- Project close out report and minutes of project close out meeting were not included in the filing structure.
- Risk close out was indicated as one of the Project Management Framework's key close out deliverables in the start-up phase, there was no mention of it in the filing system and there was also no document found that related to it.
- There was also no indication of the final status of the project in the document filing system.

5.3.2.2. Financial closure

One critical document for financial closure is capitalisation certificate. The certificate is completed with consolidated financial expenditure by project and it is shared with the owner BU to finalise project financials. Capitalisation certificate can only be completed at the end of the project and signed off when all the committed cash has been expended or reversed by change order. It also gives an indication of budget versus expended cost. Therefore, contractual closure must take place before financial closure. In fact, financial closure must be the last step of project closure to ensure that all activities are accounted for financially.

For the study, the researcher observed whether all the project were capitalised by assessing the availability of capitalisation certificate. Below is a graph that indicates the number of projects that have a signed off capitalisation certificate.

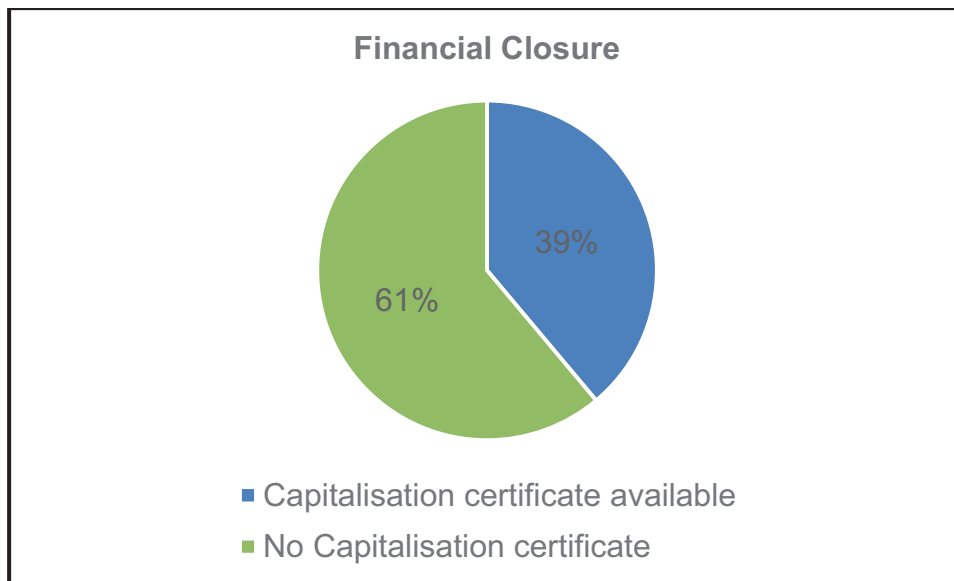


Figure 5-1: Financial close out

From the graph above it can be noted that only 39% of the assessed project had Capitalisation certificate filed in the project filing system. This could mean that there is a delay in financial closure of the project which could affect cash flow and insurance process.

5.3.2.3. Contractual closure

When gathering information from Procurement management for the contract closure it was found that rarely formal communication is sent to the works supplier at the end of the project. The only document that could address or insinuate closure of the project that was the signing of ready for commissioning certificate. It is a document that Service provider and project manager sign to confirm that implementation of project scope is complete, the product or deliverable has been completed and it is ready for testing. Otherwise, the contract end date stipulated in the contract determines the end of contract unless the project manager requests an extension.

The figure below indicates the results of contractual closure. Only 17% of the projects assessed have contract closure notification memo in the project filing system. Since financial closure requires contractual closure to be in place before it can be achieved, it would be expected that the same results would be achieved for contractual closure as with financial closure.

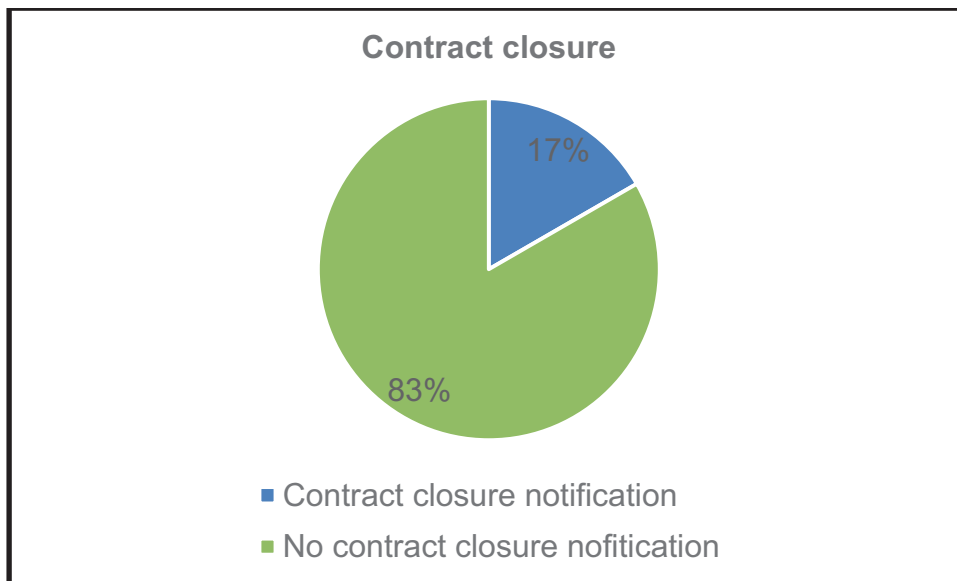


Figure 5-2: Contractual close out

5.3.2.4. Lessons learnt

48% of the 21 projects, additional project was added to the sample, that were examined have lessons learnt documents in place. Most of the lessons learnt sessions were held at the end of the project. No closing of phase lessons learnt session was held. Lessons learnt capturing documents are not consistent. Some projects lessons learnt do not have basic document information like attendance register no date. Only 14% of the project indicate that service providers were involved in the lessons learnt process. There is currently no lessons repository for capturing history and lessons learnt. It was not possible to assess if the lessons were implemented. The lessons were not categorised, only the first step of the lessons learnt process was completed; capturing. This makes it difficult to capture the information for Knowledge management as well. This is not a strong basis for project management, organisational learning or business performance.

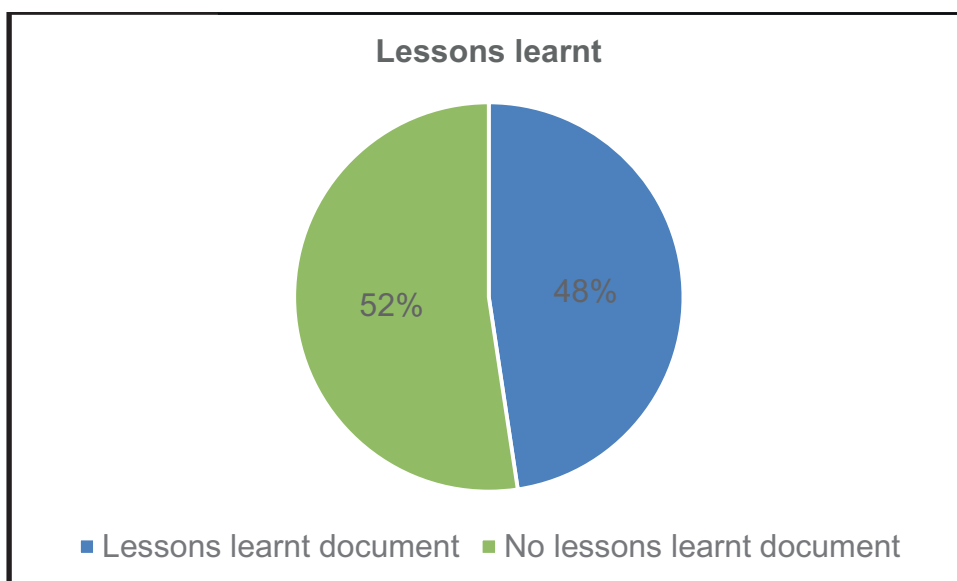


Figure 5-3: Lessons learnt

Most of the lessons learnt captured are focused on the construction or implementation phase of the project. Table 3 shows examples of the lessons learnt at extracted from a sample of projects. Not all findings had lessons learnt. There is also need to define who acts on the lesion and by what date.

Table 5:1: Sample of Lessons Learn

Project	Major lessons Finding	Recommended Actions
A	<ol style="list-style-type: none"> 1. The two contractors did not work as a collective team due to previously strained relationship. 2. Contractor had no experience on 2% nitrogen gas welding on duplex steel. This was missed during Contract Award. 	<ol style="list-style-type: none"> 1. Where possible, Sectional completions date was not part of this contract. For critical delivery dates in a contract, sectional completion dates with high delay damages to be part of the contract. 2. Employ to provide a qualified quality controller for the welding.
B	<ol style="list-style-type: none"> 1. Extensive cost overruns due to scope changes as a result of insufficient BEP scope definition. Cost for converting pdf drawings to CADD forms a major part of EOJ costs and only becomes known at a very late stage in the project. 2. Actual work sequences deviate from programme sequence due to different systems being shut down at different times. (e.g. Work planned may not start as per programme because the plant shutdown sequence and plant availability differs) 3. Procurement ran way late and the constructor waited until he had the very last bolt per ISO before starting the manufacturing process. Procurement of the wrong material occurred in certain cases 	<ol style="list-style-type: none"> 1. Proper scope definition and extensive FEED will prevent contract changes. Determine scope of drawing conversion prior to detail design. We must ensure that as- builts are transmitted back to Plomic timeously. 2. Identify the relevant plant unit representatives early in the project and keep them involved throughout the planning process in order to align project and maintenance work. 3. The procurement effort and control of materials by the EC is way below par and will be addressed via high level discussions
C	Contractor's systems not in place, SHE file, Org structure- confirmation of key personnel etc.	<i>..No relevant action recorded</i>
D	<ol style="list-style-type: none"> 1. Planned to do tie-ins outside shut down period 2. Lack of experience for the type of switchgear. 3. Lots of work done during the shutdown which could have been done outside shut down. 4. Panel not lining up with the existing switchgear 	<ol style="list-style-type: none"> 1. Plan for tie-ins to be done during shutdown. 2. Employer's personnel to be involved in the entire installation 3. Plan in detail for scope of work to take place during shutdown. 4. include additional mechanical checks with FAT
E	The project complexity was initially not well understood by management as a result insufficient resources allocated to the project.	<i>.. No relevant action recorded</i>
F	<ol style="list-style-type: none"> 1. Inaccurate milestones from GO management. Schedule Alignment with GO. 2. Construction team lean in the early stages of the project. 3. Failure in management of QC & construction punch items. PMI activities were done before punch items were worked off. Coordination of punch items and lists failed. 4. Tracking sheet updates inaccurate/late 	<ol style="list-style-type: none"> 1. Schedule integration should be integrated with the GO schedule. 2. Allow adequate resources during tender stage. 3. Minimum punch items at RFI/RFL stage. 4. Timeous updating by individuals. Fixed updating window e.g. daily at 13:00

The captured lessons indicate performance issues from service providers which can be classified as time delays. Although some projects had more lessons identified, only a few were assessed for the purpose of this study.

Only 11% of the projects have completed a combination of three areas of project close out; lessons learnt, contractual and financial close out.

5.3.2.5. Project Management maturity

Assessed projects were plotted according to the Project management maturity scale. The graph below indicates the level of each project. The organisation maturity level can be classified as Level 3. Although the process is defined, formalised with clear activities, there is an implementation concern.

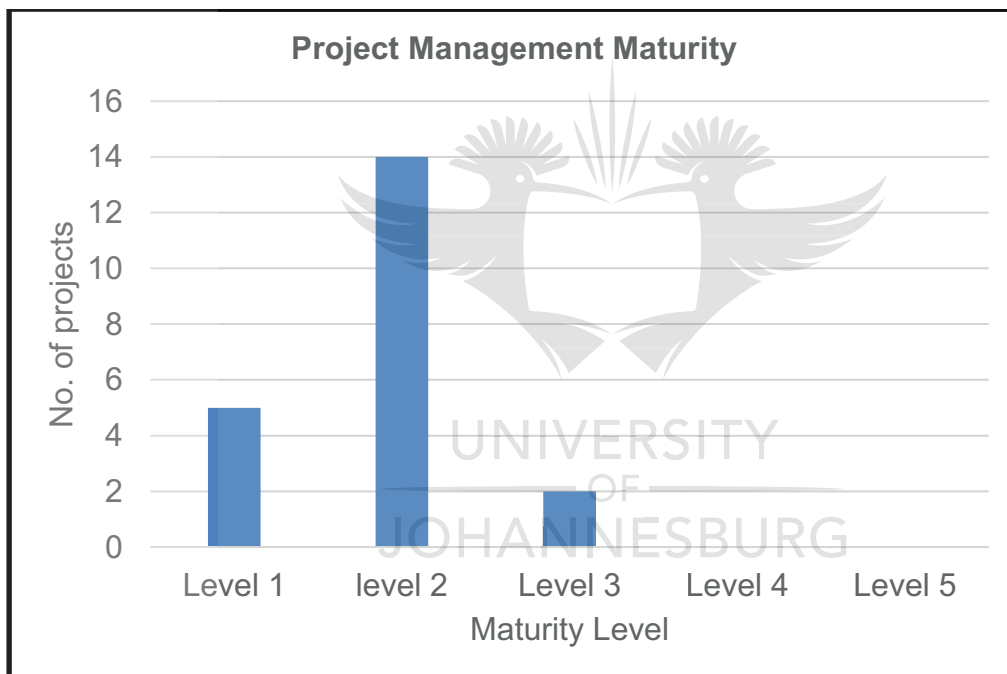


Figure 5-4: Project Management Maturity

5.4. Discussions

It can be observed that there is a great amount of projects that are closed but did not follow the proper project close out. Projects that are completed but can be considered financially active since there is no documentation to indicate that they have been capitalised. The delay in the financial closing out of the projects can cause a delay in the capitalisation of the project. That is, the time that the asset could be depreciated and gaining tax allowance is delayed.

For the projects that do not have contractual completion certificate, it could mean that the contractor has completed all the scope of work for the contract but is still legally

Chapter 5: Results

bound to the employer since the project has not been closed out. The impact of this is great on the contractor financially. It means that the contractor still has to insure the works and the bank guarantee still needs to be in place though the works have been handed over to the employer.

Lesson learnt are of utmost importance in the project environment for project management performance improvement and knowledge management. From the data above it can be noted that Knowledge management activities are not included in the project close out.

Administrative closure facilitates the proper documenting and archiving project information for future reference. Due to the lack of project close out report and the status of the project filing system it is a challenge to refer to the project information.

Finally, there are authorisations that are applied for when the project is initiated such as EIA and Wayleaves. Some of these authorisations govern the facilities to be installed or construction thought their life cycle. During project close out the conditions of the authorisations need to be passed over to the operations and they must be documented and signed off properly in order to ensure compliance.



5.5. Correlation of Research results to Research questions

Table 5.2 shows the correlation of insights gained through the research results with the research questions that were posed in order to achieve research objective. All the research questions were successfully addressed with some further insight gained that is currently not in literature.

Table 5.2: Correlation of results and questions

Research question	Comprehension from results	Comment
1. Does the organisation implement project close out in line with the Project management body of knowledge?	<p>The following are key activities for project close out in the organisation under study: Contractual and financial closure. Project close-out as per plan Lessons learnt.</p> <p>The above is in line with the close out activities as outlined by other authors. Although some authors prescribe more activities than those mentioned above.</p> <p>The organisation has defined and formalised processes that direct the project close out process. According to the results information gained there are some implementation challenges that need to be addressed in order to achieve proper implementation. Only 11% of the assessed project completed 3 areas of project close out.</p>	Achieved
2. Does the information compiled at project close out contribute to the project management performance?	<p>Financial close out is critical to the cash flow management and other financial processes like insurance and tax process.</p> <p>Contractual close out has an impact on financial close out as a result if it is not properly it will affect financial close out.</p> <p>Lessons learnt assessed indicated valuable information on the performance of contractors that could be used for performance assessment. Also, the information can also be used to improve the project management process of the organisations. Lessons learnt feed into the knowledge management process that could also improve the project management process.</p> <p>Usability of historical information and ease of reference are critical for future reference. Therefore project close out will affect accessing of knowledge.</p>	Achieved
3. What is the Project management maturity level of the close out phase for the organisation?	The organisation maturity level can be classified as Level 3. Although the process is defined, formalised with clear activities, there is an implementation concern.	Achieved
4. How can proper project close out be realised?	This is addressed in the recommendation and the proposed model in chapter 3	Achieved

6. Conclusions and recommendations

The following is a list of summarised conclusions drawn from the results based on the assessment of the organisation under research:

- Project close out is not well defined and integrated into other project management processes.
- Project close out is the responsibility of the project team and the organisation although the project manager is still accountable for the project. From the results, it can be noted that there are challenges in implementing project close out properly.
- Although the organisation has defined process for project close out process that is in line with best practices and PMBoK (2017), project close out is not implemented according to the prescribed process. The findings indicate major concern on Administrative and contractual close out.
- Project close out information is critical to the Knowledge Management and project management process improvement. Project close out information will add value on the post implementation functional improvements and assessments.
- Project management maturity for the close out process is Level 3 at system level. For maturity to improve the project teams must align project close out activities and implement close out process on all projects.
- Value can be gained by properly implementing project close out lessons learnt. As it can be noted on the lessons learnt information assessed a trend was observed on the contractor performance and this information can be used on future projects. It can be concluded that the current process implementation is focused on end of project closing activities and on the implementation phase lessons learnt only.

It is therefore recommended that:

- The number of projects per project manager be reviewed and handover of all project documentation must be handed over to operations before project manager can move onto the next project.
- In order to ensure proper close out of the project, the project file and all project close out should be finalised and approved before the asset is put into operation. This will ensure that there no outstanding issues at the end of the project.
- Project close out must be extended to either align with the PMBoK (2017) Knowledge areas or the key tracks or disciplines within the project. The same categories must be used for capturing of the lessons learnt.
- Close out activities must be applied at the end of each phase with lessons learnt and knowledge management processes are applied to ensure the information is captured while still new. The phase information will then form part of the final project close out information. This is not in line with literature but it is to improved

knowledge management. Learning happens all the time and it should be captured while still new. Project managers should also not be allowed to proceed to the next phase without phase close out report and lessons learnt. They both should form part of mandatory deliverables for the phase.

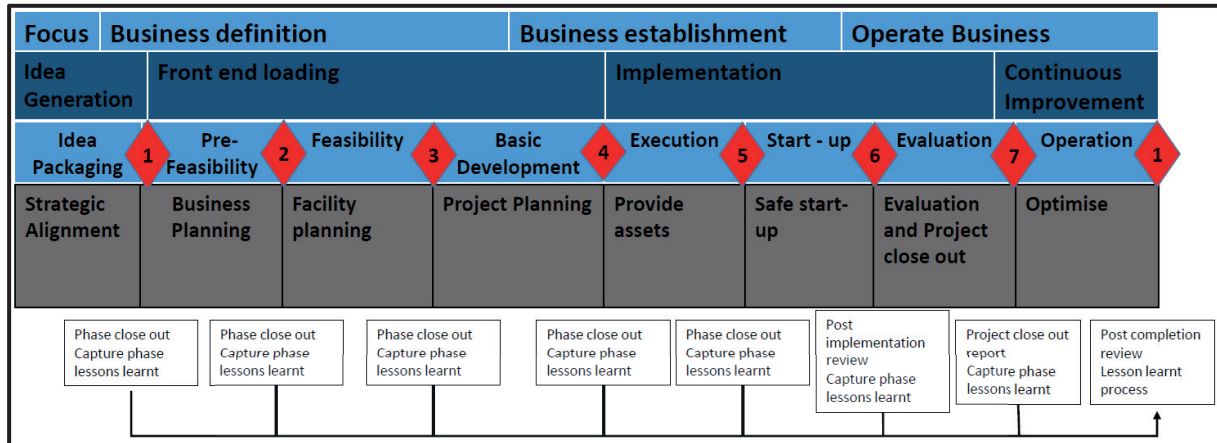


Figure 6-1: Revised Project Management framework with recommendations

- The following activities can be used as a minimum for project close out:
 - Contractual closure
 - Financial closure
 - Project closure plan (including each phase close out information)
 - SMART (specific and measurable, achievable, relevant and time-bound) actions plans arising from lessons learnt that should ideally be managed by the PMO.
 - Involvement of entire project team for close out
 - Notification of completion to Operations
 - Knowledge management information such a project team knowledge assessment. E.g. Project Manager Knowledge assessment in order to allocate them correctly to the next project.
- Lessons learnt process needs to be detailed, structured and captured in usable form in order to allow ease of use and application.
- Project filing system needs to include project close out report as a deliverable and the one document that will have a summary of the project information. A clear version control system on the final documents needs to be implemented. Also, all minutes of meetings including Lessons learnt sessions should have attendance register and dates.
- It is recommended that the company should assess and mitigate the impact on the business of these projects that are not properly closed out as well as the reasons behind improper close out.

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Appendix A

Below is the Project filing index indicating the key documents included in the filing system. The index only indicate the project management documents as well as close out related documents. The rest of the information was removed.

PROJECT FILING INDEX	
	01. Business Requirements
	01.10. Commissioning Management
	01.10.09. Commissioning Close-Out
	02. Project Management
	02.01 Project Execution Plan (including all Project plans)
	02.02 Objective Matrix
	02.03 Assumptions (Project, Business, Engineering)
	02.04 Policies/Procedure
	02.05 Defect Certificate
	02.06 Work Request Form
	03. Process Engineering
	04. Mechanical
	05. Piping
	06. Electrical
	07. Instrumentation/Controls
	08. Civil
	09. SH&E Management
	10. Engineering Co-ordination
	11. Construction Management
	12. Scope Management
	13. Time Management (Schedule)
	14. Cost Management
	14.08 Close-out & capitalization

 15. Quality Management
 16. Human Resources
 17. Risk Management
 18. Communications
<ul style="list-style-type: none"> 18.04 Minutes of meetings<ul style="list-style-type: none"> 18.04.01 Project progress meetings 18.04.02 Framing alignment meetings 18.04.03 Steering committee meetings 18.04.04 Project track meetings 18.04.05 Engineering track meetings 18.04.06 Construction meetings 18.04.07 Pre-Award meeting 18.04.08 Bid clarification 18.04.09 SHE&R meetings<ul style="list-style-type: none"> 18.04.09.03.06 EIA Close out meetings 18.04.10 Design review meetings 18.04.11 Gate readiness review 18.04.12 Cost meetings 18.04.13 Shutdown meetings 18.04.14 Commissioning meetings 18.04.15 Handover meetings 18.05 Reports<ul style="list-style-type: none"> 18.05.01 Project progress reports 18.05.02 Contractor progress reports 18.05.03 Monthly reports 18.05.04 Bi-Weekly reports 18.05.05 Project matrix report 18.05.06 Cost reports 18.05.07 Steering committee reports 18.05.08 Commissioning progress reporting 18.05.09 Construction reports
 19. Procurement Management
<ul style="list-style-type: none"> 19.01.02 Execution contracts<ul style="list-style-type: none"> 19.01.02.13 Contract close-out
 20. Handover
 21. Lessons Learnt

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