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Customising a Project Management Framework at a Trinidad-based Paper Manufacturer: A Case Study

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Abstract: *There has been a huge excess of low-cost paper on the market and a global price erosion of manufactured product. Paper Products Limited (PPL) – a Trinidad-based tissue paper manufacturer, was ruthlessly exposed to this changing environment. This paper reviews a strategic realignment exercise which was done to determine the root causes of project failures, and to tailor-make a project management (PM) framework to govern process improvement projects at PPL. In order to quantify historical project performance and determine the reasons for historical project failure at PPL, a four (4) phase study was initiated. Phase-1 involved the analysis of projects undertaken from 2012 to 2015 on the cost, schedule and scope variances. Phase-2 determined the root cause of project failures, Phase-3 comprised the development of a PM framework, incorporating the common processes advocated in literature and the final phase involved testing the efficacy of the framework using selected projects at PPL. Trial implementation of the customised PM framework achieved a reduction in budget, schedule and scope variation by 20%, 18% and 1%, respectively. These performance improvements were attributable to enhancements in the framework's approach to developing the risk management plan, the work breakdown structure and the stakeholder management. As validated by an executive review of the PM framework, the adoption of the framework could enhance PM practices and sustain PM performance improvements at PPL. This case study demonstrates an initiative in fostering PM practices and performance in business. The results and implications of the analyses discussed are of potential value to the field of studies. Evaluations are suggested to examine critical processes and individual steps, and future studies could validate the key elements identified for the customised PM framework.*

Keywords: *Project management, framework, project success, paper products*

1. Introduction

"Operations keep the lights on, strategy provides a light at the end of the tunnel, but project management is the train engine that moves the organisation forward" (Gumz, 2012). Adopting effective project management (PM) practices is a key to unlocking performance improvement and to providing the foundation for continuous improvement. This has gained popularity in recent times as organisations strive to succeed in the highly competitive and dynamic market which globalisation and e-commerce has created.

China's meteoric rise as the world's largest paper producer has had a ripple effect on the industry. The influx of low cost paper in the second decade of the 21st century has forced global manufacturers to operate optimally in order to defend their market shares (Ragbir, 2015). In 2012, Paper Products Limited (PPL) – a Trinidad-based tissue paper manufacturer, attempted to insulate itself from the searing competition by focusing on optimisation and cost reduction. As such, in 2012, the Process Improvement Team (PIT) was formed to design and manage optimisation projects in order to reduce production costs at PPL (Ragbir, 2015). However, these projects often incurred significant budget, schedule and scope variances. Despite initial promising results, the PIT began to experience project delays, cost overruns and unfavourable business results as the complexity and quantity of projects assigned to them increased. Underpinning these problems was the absence of a framework or strategy for governing PM practices at PPL.

This paper reviews the core features and components of three (3) common PM frameworks in relation to the determination of project success. The benefits and challenges of instituting PM practices are also explored and finally, the ability of the implementation of a customised PM framework to counteract historical failures and reduce the scope, schedule and budget variances of projects undertaken by the PIT at PPL is examined.

2. Project Success and the Project Management Framework

Customarily, project success has been defined as compliance with project plans (i.e. budget, schedule and scope compliance) as this usually signals proper use of design, timeliness of delivery and optimum value creation. Conversely, Baker et al. (1997) proposed that project success should instead be measured by the level of satisfaction from the end user, as compliance to plan will not matter if the outcome or end-product is substandard. Building on these ideas, Baccarini (1999) identified six (6) critical criteria for project success: time, cost, quality, strategic goal attainment, end user satisfaction and overall stakeholder acceptance.

Moreover, studies completed by the Economist Intellegence Unit (EIU 2009, 2010) suggest that proper PM practises were critical to the ability to remain successful and/or competitive during difficult economic times, providing evidence of the importance of PM principles to organisational success. Executives and experts were confident in organisations to deliver better results if they utilised a structured methodology for PM. This methodology (hereafter referred to as the PM framework) is defined by McConnell (2010) as a sub-section of tasks, processes, tools and templates which are used in amalgamation by the management team to provide foresight to the major structural elements of the project, in order to initiate, plan, execute, control, monitor, and terminate the project activities throughout the project life-cycle. Experts have proposed varying approaches to developing PM framework that facilitate sustainable project success. As such, the methodologies advocated by Naybour (2010, 2014), Project Management Institute (PMI 2013) and PRINCE2 (Adler, 2008) were studied. Table 1 depicts a comparison of the three approaches.

3. Challenges of Instituting PM Practices

Recently, high performing organisations have invested more resources into developing their PM maturity in order to ensure greater efficiencies, improved customer satisfaction, improved quality, lower costs, increased stakeholder satisfaction and greater competitive advantage (Ragbir, 2015). However, these organisations vary significantly with respect to their organisational structures, objectives, strategic drivers, constraints and business models. Therefore, a blanket solution for PM cannot be applied across the industry. Instead, the PM framework should be tailored to reflect the size, duration and complexity of projects undertaken and be adaptable to the level of organisational PM maturity, the nature of the industry and the organisational culture of the industry. Whitaker (2014) defines this tailoring as "the process of referencing framework documents, standards and other relevant sources and utilising those elements that provide processes, tools and techniques that are suitable for that particular organisation."

In addition, according to PMI (2013), a customised approach can lead to improved project performance through the utilisation of existing organisational process assets (e.g. lessons learnt from past failures and organisational policies and procedures). This cause-and-effect relationship was further validated by Whitaker (2014) via surveys issued to PM practitioners to determine the frequency of tailoring in the industry; the level of success and the level of PM maturity. Implementing a customised PM framework however presents some unique challenges. In order for the framework to be adopted, there must be top-level support and buy-in. Furthermore, to ensure this buy-in, the project team must ensure alignment between the framework and the organisation's strategy (PMI, 2014). Additionally, the project team must ensure that the implementation is aligned with the organisational culture and that the project team is comprised of competent individulas with the right behaviours for the type of project. This ensures acceptance from various levels of the organisation.

Table 1. Comparison amongst Three PM Approaches

Core Features and Components	Naybour (2014)	PMI (2013)	Adler (2008)
1. Establishing ownership of framework	√	√	√
2. Clarification of roles and responsibilities to establish chains of command and ensure accountability	√	√	√
3. Identification of inputs and constraints to the PM methodology	--	√	--
4. Identification of available resources	--	√	--
5. Definition of levels of governance for different projects	√	--	--
6. Establishment of effective communication	√	√	√
7. Design of project lifecycle with stages and gates	√	--	√
8. Development of key documents and associated templates	√	√	--
9. Establishment of effective reporting process	√	√	--
10. Product delivery	√	√	√
11. Monitoring and review	√	√	--
12. Project close-off	--	--	√

Moreover, the project team must carefully balance stakeholder's expectations to ensure that they are realistic while still providing significant value to generate management support. Finally, the team must be able to successfully manage risks in order to drive the implementation to completion and help effect a performance improvement.

4. Exploring PM Practices at PPL

4.1 Diagnosis of PM Performance and Challenges

PPL has recently been encountering challenges associated with declining project performance and the resultant negative effects on the total cost of goods sold of semi-finished products. The management team realised a need to ensure that its operations could be sustained and that its products would remain competitive in the market. While PPL lacked a documented or structured approach to PM practices, there existed an informal procedure for managing projects based on their relative complexity. A complex project was defined as one which required process engineering design and/or a lifecycle of more than three (3) months, whereas simple projects were regarded as small in scale and routine in nature. Table 2 depicts the approaches in managing complex versus simple projects at PPL.

An analysis of the existing PM approach was undertaken and deficient or sub-standard practices were identified. From the analysis, it was found that at inception, there was no guideline or standard in place for preparing a problem description, aim, scope of works and the initial (approximate) project cost. Additionally, project roles and responsibilities were not developed nor was the project team established at this stage. Most worrying was that a high level risk assessment was not completed, nor was approval from the project sponsor sought at inception.

Many obvious deficiencies existed at the planning phase. Firstly, there was limited stakeholder involvement during this phase. Secondly, the approach to budget and schedule preparation was rudimentary, being based commonly on historical experiences and therefore lacking consideration for task effort, resource requirements or management reserves. Thirdly, the planning phase completely omitted a quality management plan, a stakeholder management plan and a communication management plan, thereby permitting non-conformances to go unnoticed and adding additional complexity in the form of resistance to project acceptance and support.

For the execution phase, it was found that no procedure existed to evaluate, manage and communicate changes to the project plan. The absence of this process could amplify the effect of project delays and budget variances, and also reduce the likelihood of stakeholder and project sponsor satisfaction upon handover. Similarly, it was found that the close-out phase did not include the preparation of a 'lessons learned' document nor was a post-completion audit done. Therefore, the system facilitated the occurrence of repeat errors. Moreover, the analysis identified roadblocks to project success outside of the existing PM strategy. Notably, the organisational structure itself – hierarchical in nature – served to limit staff involvement (outside of their department) and also weakened the Project Manager's authority. Evidence also showed that there had been a lack of upper management support in providing the right resources and infrastructure to support the PM function.

4.2 Execution of a PM Study: Procedures

A PM study was initiated to quantify historical project performance and to determine the reasons for historical project failure at PPL (Ragbir, 2015). This involved four (4) main phases as elaborated below.

Table 2. PPL's approaches in managing complex projects versus simple projects

Phase	Processes	Deliverable	Complex Projects	Simple Projects
Initiation	Prospect proposal to address operational issue/performance gap		√	√
	Management approval to develop prospect		√	--
	Needs Analysis for project	Project Requirement List	√	√
Planning	Engineering Analysis and Planning	Technical Design Document	√	--
		Engineering Drawings	√	--
	Project Planning (WBS, Project Schedule, Responsibility Chart, Risk Management and Budget)	Project Definition Report	√	√
	Management approval to pursue project	Signed project approval document	√	√
	Selection of project team		√	√
	Review of project plans		√	√
Execution	Kick-off meeting		√	√
	Initialisation and implementation of work based on the project schedule and report progress at weekly meetings	Completion of works	√	√
	Implementation Review	Project Report	√	√
	Handover to final user/department		√	√
Close Out	Technical and Commercial Closure	Signed project closure document	√	√

Phase one involved the analysis of projects undertaken from November 2012 to January 2015, with the purpose of determining the following:

a) Cost variance – Budget for the project versus actual cost of the project.
b) Schedule variance – planned days for the project (to completion) versus actual amount of days taken for the project to be completed.
c) Scope variance – Number of work packages planned to complete the project versus actual number of work packages completed for the project.
d) Average variance – the average of the cost, schedule and scope variances.

Additionally, within this phase, a survey was used to gather information on stakeholder's opinion of the existing PM process. This was designed to determine the effectiveness of the existing strategy, the level of involvement, the level of confidence in and among the teams and the perceived level of support by upper management.

The Second Phase focused on determining the root cause of project failure for projects having an average variance of -5% or worse. To simplify the process and ensure maximum participation from project members, the A3 thinking process was used to determine the root causes of problems. This is a systematic problem solving tool utilising a structured problem description (such as where, when, what, who and how), an Ishikawa diagram for potential causes, a five-why analysis to determine the root cause(s) of project failure and the formulation of appropriate corrective actions (Toolshero, 2017). These corrective actions along with those derived from the analysis of the stakeholder survey were incorporated into the development of a customised PM framework.

The Third Phase comprised the actual development of the PM framework. The framework's structure was designed by adopting common processes advocated by PMI (2013), Naybour (2014) and PRINCE2 (Adler 2008). The content was developed by using corrective actions from the A3 problem solving analyses and the stakeholder survey to specifically address the deficient areas of current PM practices at PPL.

At Phase Four, the efficacy of the framework was tested. This was done by comparing current project performance to the performance of projects governed by the customised framework on a trial basis. Additionally, the responses of an executive survey were used to determine the comprehensiveness of the framework for its intended use and its ability for organisation-wide utilisation.

4.3. Results of the PM Study

Table 3 depicts a summary of the performance analysis on historical projects with respect to budget, schedule and scope variance. It was found that 57% of the projects had an average variance of -5% or worse and were thus considered failed projects. More importantly, these failed projects accounted for 71% of total project expenditure by the PIT, thereby suggesting that project failures tended to occur in the higher budgeted projects. Furthermore, these failed projects (by virtue of their actual durations)

Table 3. Historical Project Performance

		Budget	Schedule	Scope	Average Variance
Project Type	**Code**	**Variation**	**Variation**	**Variation**	
Chemical Trial	CT-1	0%	-28%	12%	-5%
	CT-2	8%	0%	0%	3%
	CT-3	-26%	-33%	4%	-18%
	CT-4	12%	17%	0%	10%
	CT-5	-9%	-15%	0%	-8%
HSE	HS-1	8%	0%	-4%	1%
	HS-2	62%	50%	0%	37%
	HS-3	0%	-175%	0%	-58%
	HS-4	11%	1%	0%	4%
	HS-5	2%	22%	0%	8%
Optimisation	OP-1	-23%	-17%	0%	-13%
	OP-2	0%	-23%	14%	-3%
	OP-3	-72%	-34%	-26%	-44%
	OP-4	-23%	19%	0%	-1%
	OP-5	9%	0%	0%	3%
	OP-6	-38%	-59%	-6%	-34%
	OP-7	20%	76%	8%	35%
Contaminant Removal	CR-1	16%	0%	0%	5%
	CR-2	-23%	-25%	-3%	-17%
	CR-3	-40%	-72%	48%	-21%
Relocation	RE-1	0%	0%	0%	0%
Totals		-18%	-18%	-3%	

accounted for 63% of the PIT's project time and 53% of the tasks completed by the team. This indicated that the planning and execution strategies for projects needed to be reviewed as more time was being spent on failed projects.

The A3 thinking process was applied to these 'failed projects' to determine root causes of failure and to develop potential corrective actions. Table 4 summarises the results of this analysis. It was found that 76% of the corrective actions devised addressed core PM practices. From these, risk management was found to be particularly deficient with it being identified as a cause of failure in forty four percent (44%) of the failed projects analysed. Similarly, the strategy for communications management and contract management presented significant areas of opportunity with both being identified as a root cause of failure in 33% of the projects analysed.

Table 4. Results of A3 Thinking/Problem Solving Process for Failed Projects

Project	Identified Root Cause	Corrective Action Plans
CT-1	Poor communication between project team and core operations team	Establish proper communications management plan
	Failure to form contingency plan for operational problems	Establish proper risk management plan
	Inadequate technical support	Ensure proper technical support is provided
	Lack of PM checks on electrical system prior to project implementation	Review PM schedules with maintenance to help identify possible risks
CT-3	Insufficient planning - contract agreement insufficient	Establish proper contract management plan
	Frequency of communication between project team and vendor was insufficient	Establish proper communications management plan
	Process Description provided was not comprehensive (did not cover full range of possibilities)	Establish proper procedure for compiling comprehensive project definition reports
	Failure to identify lost time (due to polymer failure) as a project risk	Establish proper risk management plan
	Sampling frequency (to establish baseline) was inadequate	Implement continuous sampling for all process stream analyses
CT-5	Failure to procure required technical expertise	Establish proper resource planning protocol
	Contract agreement does not include compensation from vendor for equipment delays	Establish proper contract management plan
	Lack of testing for incoming raw materials - quality assurance plan	Implement stringent raw material analysis
HS-3	Contract agreement does not include penalising vendor for delays	Establish proper contract management plan
	Insufficient resources (expertise)	Establish comprehensive resource planning methods
	Absence of resource allocation agreement	Create inter-departmental staff usage application form
	Poor description of environment in project definition	Establish guidelines for the preparation of project definition report
OP-1	Poor communication between E&I team and project team	Revise SOP and Toolbox procedures
	Poor communication between E&I team and project team	Establish proper project execution plan
	Critical spare parts list was incomplete	Revise critical spare parts list
OP-3	Failure to evaluate English proficiency of foreign staff prior to site visit	Establish proper communications management plan
	Failure to evaluate English proficiency of foreign staff prior to site visit	Issue English competency evaluation prior to bringing foreign technicians
	Absence of resource allocation agreement	Create inter-departmental staff usage application form
	Failure to complete a time study to determine employee's idle time	Establish proper resource planning methodology
	Failure to involve stakeholders in planning phase of projects	Establish proper stakeholder identification and management plans
	Failure to correlate potential translations errors as delays (risk identification)	Establish proper risk management plan
	Poor Budgeting procedure	Establish proper cost management plan
	Inaccurate classification of risk	Establish proper risk management plan
OP-6	Failure to identify risk	Establish proper risk management plan
	Absence of a data verification step in trial plan	Establish a 'plan-do-check' system
	Lack of training	Re-evaluate technical training programmes
	Poor PM planning for lab equipment	Develop laboratory equipment PM schedule
CR-2	Poor procurement strategy	Establish proper procurement strategy for projects
	Absence of a change management plan	Establish proper change management plan
	Absence of a materials management plan	Establish proper materials management plan
	Failure to use up to date geo-technical information	Ensure that up-to-date data is used for analysis
	Frequency of stakeholder meetings was insufficient	Establish proper stakeholder management plan
	Failure to identify risk	Establish proper risk management plan
CR-3	Poor procurement strategy	Establish proper procurement strategy for projects
	Lack of available expertise	Ensure project team is equipped with required expertise
	Lack of available expertise	Ensure that employees capabilities are adequate before beginning project
	No change management plan	Establish proper change management plan
	Poor Resource planning	Establish proper resource planning procedures

Table 5. Stakeholder Survey Responses

	Survey Question	Responses				
		Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
Planning	From Project Definition, I have a comprehensive understanding of the projects aims and objectives	5%	27%	14%	50%	5%
	The quantity of work assigned to me is sufficient (not too much or too little)	0%	32%	23%	45%	0%
	The time allocated to me to complete each task is sufficiently planned (i.e. the duration is neither too long nor too short)	0%	59%	14%	27%	0%
	The risk identification process is thorough. A full anlaysis of threats are done to determine all plausible risks for the duration of the project	18%	45%	14%	23%	0%
	I feel fully involved in project planning	9%	32%	36%	23%	0%
Execution	Throughout the duration of the project, the assigned manpower (from external departments) is allowed and supported in the fulfillment of their project duties	0%	45%	14%	41%	0%
	Throughout the duration of the project, resources allocated for project use are readily issued by the controlling manager/department	9%	45%	18%	27%	0%
	In execution, variations from the plan are well documented and communicated to the project team and necessary stakeholders	14%	50%	18%	14%	5%
	These changes are properly and effectively managed with little to no adverse effects resulting unexpectedly	14%	55%	23%	9%	0%
Close Out	Upon completion, the end user is satisfied with the performance and deliverables of the project	0%	23%	27%	45%	5%
	Upon completion it is clear to all stakeholders that the project's aims and objectives were achieved	0%	32%	27%	36%	5%
Overall	Communications throughout the project lifecycle (among all relevant parties) is effective and occurs at the required frequency	23%	50%	5%	23%	0%
	I feel confident in the abilities of each team member to complete the task(s) assigned to them	14%	14%	23%	45%	5%
	There is a strong belief within the team that we can successfully complete the project being undertaken	0%	9%	36%	45%	9%
	Management provides the necessary support throughout the project's lifecycle	9%	41%	27%	14%	9%
	Project documentation is adequate and effective	5%	68%	9%	18%	0%
	There are an adequate number of effective control systems in place to prevent project failure	18%	55%	14%	14%	0%

Additionally, inadequacies were identified in the project definition, stakeholder management and change management strategies with each of these being found as a root cause of failure in 22% of the projects analysed. As evidenced in the results of the stakeholder survey, this was a key to the analyses of the failed projects at PPL. This survey provided insights into how effective the PM strategy was perceived to be, its adequacy, the team morale and the perception of the team's ability to deliver good results.

Table 5 shows the responses of the Stakeholder Survey. The results suggested that the majority of respondents possessed a clear understanding of the deliverables expected from each project and were satisfied with the quantity of work assigned to them. However, most felt constrained with the time allocated to complete these tasks. Further evidence of the inadequacy of the risk management system was provided by the fact that 63% of respondents perceived the risk identification process to be incomprehensive leading to the inference that there would also be an absence of a risk mitigation strategy. Overall, respondents felt that their involvement in the planning phase was below expectations – providing the researcher with a major area of improvement to be considered for the framework.

The analysis of the execution phase unearthed a core issue impeding progress whereby respondents believed that resources (e.g. manpower) were not readily available by supporting departments, thereby limiting the team's ability to perform job tasks optimally. Further evidence of the need to work on a communication management plan was provided by the fact that 64% of respondents shared that changes/variations were not documented and communicated in an efficient manner. In addition to the issues identified in the project phases, the survey highlighted the inadequacy of the overall project communications strategy. Moreover, while respondents felt confident in the ability of their team members, half of the respondents believed that management had failed to provide the necessary support throughout the project lifecycle. Most notably, the survey highlighted stakeholders' concern that there were not sufficient controls in place within the existing PM strategy to support consistent performance.

5. Focusing Improvement of the PM Framework

Incorporated with the major findings of the PM Study, the components and process attributes were derived for the development of customised PM framework. Table 6 depicts a list of components and attributes of the project initiation, planning, execution, and close-out phases.

One pertinent area in need of refinement was found to be risk management at PPL. The historical shortcomings were addressed in the framework by developing a process involving the entire project team for risk identification. Part of this process involves the review by an expert and/or the project manager to ensure that no risks are omitted. Following this, the risks are then classified according to both their impact and likelihood of occurrence. Impact and likelihood are ranked on a scale of one to five and the product of these two values is used to prioritise the risks. These risks are then managed by using three approaches – (1) avoiding the risk by eliminating it or protecting the project from its impact, (2) mitigating the risk by reducing the impact or probability of the risk occurring or (3) transferring the risk consequence to another party. Depending on the approach taken, appropriate plans are devised and reviewed with the project champion and project sponsor. Moreover, the risk register is kept as a live document and reviewed periodically to ensure that risks are consistently managed in an efficient manner.

Significant gaps in the stakeholder management plan were also found and as such, a more structured and inclusive approach was designed. This involves using the project team to list all possible stakeholders for the project and placing them into the appropriate quadrants of a power interest grid as shown in Figure 1.

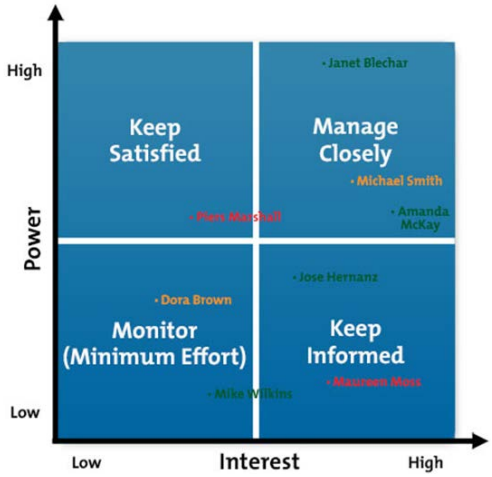

Figure 1. Power-Interest Matrix
Source: Abstracted from Thompson (2014)

Table 6. Components of the Customised PM Framework

Phase	Component and Guidelines
Initiation	Guideline for Developing Background to Project
	Guideline for Developing Purpose Statement, Scope and Objectives
	Guideline for Defining Project Roles and Responsibilities
	Guideline for Setting up the Project Team
	Guideline for Developing a High Level Work Breakdown Structure (WBS)
	Guideline for Developing a High Level Risk Assessment
	Guideline for Developing Cost Estimates
	Guideline for Developing a High Level Project Charter
	Guideline for Review and Approval
Planning	Conducting a Planning Kick-Off Meeting
	Creating a Detailed Work Breakdown Structure (WBS)
	Guideline for Developing a Milestone Plan
	Guideline for Developing a Responsibility Matrix
	Guideline for Conducting Stakeholder Analysis
	Guideline for Stakeholder Management
	Guideline for Developing a Communications Management Plan
	Guideline for Developing a Risk Management Plan
	Guidelines for Developing a Cost Management Plan
	Guidelines for Developing a Quality Management Plan
	Project Procurement Management
	Guideline for Closing the Planning Phase
Execution	Tracking Process
	Change Management
	Maintaining Quality
	Conducting Executive Review
	Schedule Updating and Reporting Process
	Guidelines on Completing Phase Sign Off and Review
Close-Out	Guidelines to Project Close Out

This model suggests that the greatest efforts must be made to satisfy high power - interested persons, while significant work should be assigned to high power - less interested people to keep them satisfied, but not too much that they become disinterested. Low power - interested people however are to be kept adequately informed and communicated with in order to minimise disruptions and issues and low power - less interested people are to be monitored, but not overwhelmed with excessive communication. Henceforth, the plan requires analysing the stakeholders to obtain key information on the most appropriate means of communication and engagement. This information thus becomes a key input to the communications management plan.

To ensure that projects undertaken by the PIT could progress in a timely manner and that the expectations of the end user could be met, a new strategy and improved communications management plan had to be devised. For each project, the project team would be required to define the overall objectives of project communication plan (i.e. what, when and why there is a need to communicate to each stakeholder or stakeholder group). The frequency and duration of communication (via e-mail, phone call, and meetings) could then be defined along with emergency procedures. Finally, the communications strategy is reviewed with the project team, followed by key stakeholders to ensure alignment and to resolve concerns prior to implementation.

It is imperative that the proposed framework includes a guideline on how changes should be managed in order to ensure improved and sustainable project performance, as the analysis found that no such procedure existed for the PIT. For changes which affect the project's scope or schedule, the following management plan was designed.

The change request must first be evaluated and assessed. Only if the change provides a significant benefit or avoids a major risk, should it then be accepted. The change request must be documented and approval must be obtained from the project sponsor and team. Once this approval is granted, any necessary corrective actions arising from the change should be executed and if possible the project should be crashed to keep it on schedule and within cost. From this point onwards, the project plans must be updated to reflect the change and any consequence of the change must be communicated to key stakeholders.

Notable additions to the proposed PM framework ensure that the strategy facilitates proper project execution. It encompasses various guidelines for 1) defining project roles and responsibilities, 2) conducting a planning kick-off meeting, 3) developing a quality management plan and project procurement management plan, 4) progress reporting during execution, and 5) closing out a project. The proposed framework therefore provides the team with a standard for developing each component in each phase of a project in order to maximise the chances of success. Moreover, the strategy is more structured and aligned with current best practices. Project documentation, controls and accountability were improved and an inclusion was made for lessons learned in order to ensure continuous improvement within the organisation.

6. Evaluation of the PM Framework

6.1 Trial Implementation of the Framework

The framework was applied to the management of two (2) short-term projects (including project code OP-8 and CT-6). The performance of both projects was compared to that of the historical projects to determine if there were any benefits from its use. The findings of this trial revealed the following:

1) The average variance for OP-8 was -1% while the average variance for historical optimisation projects (OP-1 to OP-7) was -8%;
2) The average variance for CT-6 was 4% while the average variance for historical chemical trials (CT-1 to CT-5) was -4%;
3) The total average budget variance for framework governed projects was 2% compared to -18% for historical projects;
4) The total average schedule variance for framework governed projects was 0% compared to -18% for historical projects;
5) The total average scope variance for framework governed projects was -2% compared to -3% for historical projects.

From the trial implementation, the use of the framework led to a 20% improvement in budget variance, 18% improvement in schedule variance and a 1% improvement in scope variance. Such significant improvements were undoubtedly not attributed to luck but were largely attributed to key framework components by project experts and executives at PPL.

The improvements in budget variance were attributed to the application of the cost management plan and the guidelines for developing the work breakdown structure (WBS). Suitably developing this WBS increased accountability and improved engagement as the project team became the owner of the work packages. In addition, the final task list provided the input to the cost management plan as each work package was then assigned a delivered cost based on the sum of their component costs. This structured breakdown of costs ensured that budgets were more accurate and reduced variations.

The framework's improved risk management approach facilitated a more thorough evaluation of threats

and associated mitigation strategies. This was particularly evident in the case of CT-6, where the contingency plan for the risk of delivery delays by the supplier was triggered once the communication of a delay on the port was sent from the supplier to PPL. The execution of this contingency plan ensured that start-up was not delayed.

Proper stakeholder management and communications management played a vital role in reducing delays. This was particularly evident in OP-8 where the warehouse team (which was involved in project planning) was able to communicate a potential threat arising out of the timeliness of raw material requests and as such, the team was able to factor this into their materials management thereby avoiding any delays. Additionally, the new communication procedure used for OP-8 allowed the maintenance team to alert the project team of specific maintenance work that was required prior to start up. These jobs could then be executed in advance, thus allowing the project timeline to be unaffected.

During project execution, the framework also proved to be a game changer as the proposed procedures for reporting, handling requests for changes and maintaining quality also aided in keeping control of the project and so achieving project performance targets. Most notably, the procedure for change management ensured that the change to the production target for OP-8, was only accepted after approval by the sponsor and team and from this point the project plan was revisited to ensure that schedule resources and budget usage were optimised. OP-8's project plan was updated and the change was communicated to the project team and key stakeholders, thereby minimising the impact on the project's deliverable.

Moreover, the team was particularly pleased by the benefits of the quality review system which enabled the early detection of a breach in the permit to work system for CT-6. This early warning allowed the necessary adjustments to be made by the contractor and the project was so allowed to progress without any delays. Overall, the PM framework served to provide a structured, comprehensive and functionally applicable methodology for the management of process improvement projects at PPL. It allowed for thorough planning, successful execution and effective close out thereby adding greater control and accountability in order to effect improved project performance.

6.2 Executive Review of the Implementation

The development of PM framework, the results of the trial implementation, a description of the methods employed during data collection and analysis and an executive review were shared with the executive team at PPL in order to facilitate a discussion on the validity of the methods employed for data analysis, the applicability/adequacy of the framework to PPL and the potential of the framework to improve project performance and foster PM within the organisation. Table 7 shows a summary of responses from the Executive Survey. It was found that the management team considered the applicability of the PM framework and supported the adoption as a strategy to improve project executions and performance and as a key tool in achieving PPL's organisational goals. The executive committee also expressed the satisfaction with the methodical approach to quantifying project performance and unearthing the

Table 7. Responses from Executive Review

Survey Questions	Responses				
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. The analysis of historical projects was accurate and unbiased	0%	0%	0%	100%	0%
2. The methods used to determine the root causes of project failure were applicable to PPL's operation and was conducted using industry standard best practices	0%	0%	0%	75%	25%
3. The proposed PM framework has addressed the majority of failures of the historical project management system	0%	0%	25%	75%	0%
4. The guideline for implementation and development of each section of the framework is comprehensive	0%	25%	25%	50%	0%
5. The proposed PM framework is applicable to PPL	0%	0%	0%	50%	50%
6. The improvements in budget, scope and schedule compliance which were obtained from the trial application of the framework warrant a prolonged trial application to process improvement projects at PPL	0%	0%	0%	75%	25%
7. I would support the application of this proposed framework to process improvement projects undertaken by the Production department at GBPP	0%	0%	0%	75%	25%
8. In my professional opinion, the PM framework will help to foster proper project management practices within the Production department with respect to their improvement projects	0%	0%	0%	75%	25%
9. The PM framework can be used as a model for developing proper PM strategies throughout the organisation	0%	0%	0%	50%	50%
10.The PM framework can aid in improving project performance, thereby helping PPL to achieve its long-term organisational goals	0%	0%	50%	50%	0%

reasons for poor project performance, thereby further validating the methodology used for the study.

7. Conclusion

The study had four (4) objectives – 1) to quantify project failure by the PIT at PPL from November 2012 to January 2015, 2) to determine the root causes of these failures, 3) to custom design a PM framework to counteract these failures, and 4) to test the efficacy of the framework. From the analysis of project documents it was found that 43% of process improvement projects ended in failure. These failed projects represented 71% of the PIT's project expenditure, 63% of their time and 53% of the work completed by the team.

The A3 thinking process and the results of the stakeholder surveys found that 76% of project failures could be linked to sub-standard PM practices. Of these, risk management, communications management and change management required the greatest focus. As such, a comprehensive PM framework was suitably designed to improve project performance by structuring the framework according to best in class recommendations specifically focused on strengthening the deficient areas identified from the root cause analyses.

The trial application of the framework to two projects at PPL was coupled with an executive review of the framework. The study found that the initial application to short-term projects led to a reduction in budget, schedule and scope variation by 20%, 18% and 1% respectively. Additionally, the executive review validated the research methods, provided support for a prolonged trial and supported the institutionalisation of the framework as a departmental standard. Evaluations are suggested to examine critical processes and individual steps, and future studies could validate the key elements identified for the proposed PM framework.

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