A MECHANISM FOR THE EARLY DETECTION AND MANAGEMENT OF PHYSICAL ASSET MANAGEMENT STRATEGY EXECUTION FAILURE

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ABSTRACT

The purpose of this paper is to present a mechanism that can assist physical asset management (PAM) practitioners and academics with the early detection and management of PAM strategy execution failure. In the pursuit of this objective, case studies were applied to develop the theory related to this topic the methodologies involved in the development of theory through case studies was were applied. The paper commences with a brief literature review of the contemporary literature on general business strategy, strategy execution, and, more specifically, PAM strategy execution failure (PAMSEF).

The physical asset management strategy execution enforcement mechanism (PAMSEEM) is presented next. Validation of each one of the components of the PAMSEEM takes place within the context of an organisation that is highly dependent on physical assets (PA) dependent organization. The conclusion reached is that the PAMSEEM, can indeed assist organisations with the early detection and management of PAMSEF.

OPSOMMING

In die artikel word ‘n meganisme voorgestel wat deur fisiese batebestuur praktisyns sowel as akademici gebruik kan word tydens die vroeë identifikasie en bestuur van fisiese batebestuur strategie uitvoering faling (FBBSUF). In die strewe om hierdie doelwit te bereik word die navorsingsmetodologie wat gebruik word in die skep van teorie deur middel van gevalle studies, toegepas. Die artikel begin met ‘n oorsigtelike bespreking van intydse besigheidstrategie en strategie-uitvoerings literatuur en meer spesifiek fisiese batebestuur strategie faling.

Die fisiese batebestuur strategie uitvoering afdwingingsmeganisme (FBBSUAM) word hierna voorgestel. Validasie van alle aspekte van die FBBSUAM vind plaas binne ‘n organisasie met baie groot investering in fisiese bates. Die gevolgtrekking aan die einde van die studie is dat die FBBSUAM wel organisasies kan help met die vroeë identifikasie en bestuur van FBBSUF.

1 INTRODUCTION AND BACKGROUND

Organisations around the world are becoming more capital- and asset-intensive[1]; and it has been found in various studies that spending on Physical Assets (PAs) and asset maintenance has been increasing steadily over the past few decades ([1]; [2] and [3]). In the context of the very uncertain macro-economic landscape, the largest challenges facing these organisations are the need to

[1] In this study, the focus will fall on the challenges and opportunities involved in the management of physical assets (PAs). Except when specifically indicated, all references to assets will imply reference to PAs.

maintain and increase operational effectiveness, revenue, and customer satisfaction. Organisations need to achieve these objectives while simultaneously reducing capital, operating, and support costs [4]. The contemporary business environment has thus raised the strategic importance of the effective management of PAs.

Asset Management has been defined by the International Standards Organisation (ISO) [5] as:
"*...the coordinated activity of an organisation to realize value from assets - where realization of value involves the balancing of costs, risks, opportunities and performance benefits...*"

The complexities involved in the formulation of an agile strategy have been well-chronicled. However, implementing strategy throughout the organisation seems to be even more difficult. Unlike strategy formulation, strategy execution (SE) is often seen as something of a craft rather than a science, and its research history has previously been described as fragmented and eclectic. The impact of strategy non-execution can vary from a mere 'slap on the management team wrist' to major loss of life, environmental damage, financial loss, and reputation damage that might take years to rebuild (if at all possible).

1.1 Research objectives

The aim of this article is to reject the following null hypothesis:

H_0 *It is not possible to develop a physical asset management strategy execution enforcement mechanism that would assist academics and practitioners with the early detection and management of PAMSEF.*

1.2 Research design strategy and methodology

The methodologies used to develop 'formal theory' seemed most appropriate to achieve the aim of this paper. During the development of the chosen methodology for this research, the work done by Eisenhardt [6] was found to be extremely useful. According to Eisenhardt [6], building theory from case studies is a research strategy that involves using one or more cases to create theoretical constructs, propositions, and/or midrange theory from case-based, empirical evidence. According to Eisenhardt and Graebner [7], theory-building through case studies is an increasingly popular and relevant research strategy that forms the basis of a disproportionately large number of influential studies.

2 LITERATURE REVIEW

Turbulence has become the hallmark of the contemporary business environment. In these uncertain times, organisations are under constant pressure continually to enhance their capability to create value while ensuring cost-effectiveness. The focus in the contemporary organisation is no longer on the definition of a grand plan, but rather on the continuous generation and execution of innovative ideas that surprise the competition and delight the customers.

2.1 The evolution of strategy paradigms

Strategy paradigms evolved from a strong focus on corporate planning in the 1960s, in a time when the economy was characterised by mergers and the creation of large corporations. As organisational efficiency increased, businesses increasingly embarked on diversification campaigns, which in turn led to the rise of so-called strategy consultants and the development of a number of portfolio-planning models during the 1970s. A number of factors in the early 1980s led decision-makers to explore the structural reasons that some industries and organisations were more profitable than others. The dominant strategy contributions in this period came from a sub-field of economics known as industrial organisation. During the late 1980s and early 1990s, the focus shifted inward. During this period the dominant discourse revolved around what Barney [8] described as the "resource based view of the firm".

The technology boom of the late 1990s, which was characterised by the growth of the internet, mobile telephony, and digitisation, led to the introduction of new thinking on strategy. Changes in the technology landscape introduced a rate of change unseen in any the previous periods. Theorists and practitioners alike started to question and de-construct existing approaches and paradigms regarding not only strategy formulation, but also organisational design archetypes. The existing

paradigms and models were no longer adequate to support decision-makers in what Ghezzi [9] calls "the age of discontinuity".

Changes in the conception, role, and deployment of employees also had a significant impact on the role and conception of strategy. Prahalad and Hamel [10] are of the opinion that the strategic apex no longer exists as a centre of information, or as a central linking pin between the organisation and its external stakeholders.

Theorists are of the opinion that the contemporary[2] paradigm rejects the positivist notion that senior managers can predict the future or that they can even dictate strategy. At best, these contributors see top management and the formal institutions of strategic thinking as the creators of the context within which strategic decision are taken.

The complexities involved in the formulation of contemporary organisational strategy are well-chronicled. In the context of the recent global economic meltdown, the failure of so-called 'too big to fail' corporations and inconsistencies between intended and realised strategies have been more closely scrutinised. Many organisations currently find themselves in a strategy crisis, not because they chose the wrong strategy, but because they have struggled to execute or implement the strategy.

2.2 The strategy execution (SE) challenge

Executing strategy throughout the organisation often seems to be even more difficult than strategy formulation. In addition to SE failures reported in the mainstream media, the fact that organisations struggle to execute their strategies is also evidenced by the results of a number of empirical studies that paint a rather bleak picture on the state of SE [11-16].

The intuitive assumption is that there is a strong correlation between corporate performance and SE. Good corporate performance thus indicates successful SE, while poor corporate performance is an indication of unsuccessful SE.

Miller [17] finds this correlation somewhat contentious and potentially problematic because corporate performance is the result of a range of complex and interrelated elements. Dean and Sharfman [18] concur, and state that a firm's performance is a function of a diverse array of factors. For this reason, Miller [17] is of the opinion that corporate performance is not necessarily an indication of successful SE. Miller as well as Sharfman hus argue that in the presence or absence of good corporate performance, it is critically important to understand the functioning of and relationship between the complex elements of a strategy. Without such an understanding it would be impossible to ensure sustainable and repeatable SE.

Strategy non-execution occurs when the intended strategy does not meet its established goals, does not yield the predicted results, or does not operate as initially intended — or if the execution of the strategy took so long that it became irrelevant. In some instances, strategies are implemented as intended, on time, and within budget (achievement). The strategy may also meet all predefined objectives (completion), but is so unpopular that it cannot be claimed to be an unmitigated success (acceptability). According to Miller [17], the first two criteria can be viewed as somewhat more impersonal with information derived from objective information. Because of the intuitive but problematic assumption that good corporate performance indicates successful SE, while poor corporate performance is an indication of unsuccessful SE, poor performance is often the catalyst for strategy review and reformulation. Unless a clear distinction is made between organisational performance and the extent to which strategies are effectively executed, the cycle of endless formulation-implementation-performance will ultimately result in attempts to implement the wrong strategy. When this happens, it is difficult to determine whether poor performance is due to good implementation of a bad strategy, or the result of poor implementation of a good strategy.

According to Miller *et al*. [19], the interaction between organisation and strategy has long been treated as something of a black box. Thus the implication is that it is often very difficult, or even impossible, for executives to identify and explain why organisations perform either well or badly.

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[2] The contemporary strategy management period for the purpose of this study began in 1990.

Despite the challenges and risks posed by the non-execution of strategy, there has been very little deep and cohesive research on SE up until the start of the contemporary strategy management period. For example, Sull *et al*. [16] contend that books and papers on strategy formulation outnumber those on execution by an order of magnitude.

However, theorists who have been active in recent years agree that a myriad of factors can affect the process by which strategic plans are turned into organisational action. They suggest that, instead of concentrating on the macro-perspectives that focus on the content of strategic initiatives, the debate should shift towards more micro-perspectives that emphasise how strategy is put into practice. The activity-based view of strategy proposed by Miller *et al*. [19] argues that, since managers manage strategic actions, academics and practitioners need to go inside organisations to understand what they are doing.

It is important to note that the relatively large body of knowledge on the topic of strategy control should not be confused with SE. Strategy and management control systems and processes provide important feedback (mostly after the fact) about the effectiveness of the strategy, and most organisations understand the importance of identifying and measuring key performance areas (KPAs) and key performance indicators (KPIs). However, the existence of a strategy control system is no guarantee that strategies will be executed, and it does not sufficiently explain why strategies were not executed. In this study, a clear distinction is made between strategy or management control and SE.

Considering the SE success criteria (see Miller [17] and other perspectives from the SE literature, such as Li *et al*. [20], Noble [21], Hrebiniak [22], and Laffan [23]), it is important to consider both the process and outcome of the SE process when a definition is formulated. For the purpose of this paper, SE has the following definition:

SE refers to the continuous process during which an organisation critically evaluates and adjusts:

- *The applicability of its organisational design and management systems (including control mechanisms); and*
- *The readiness of its interpersonal processes (such as strategic consensus, behaviours, organisational climate, and communication),*

in order to ensure the acceptable completion, achievement, and stakeholder acceptance of strategic objectives.

2.3 SE within the changing PAM landscape

The recognition among organisational stakeholders that the management of PAs is important and requires an integrated and strategic focus is indeed a very important development. The mere fact that organisations have a strategic intent does not automatically lead to the achievement of strategic objectives. PAM practitioners are faced with exactly the same SE challenges as their counterparts in the rest of the business.

In the quest to find an acceptable definition for SE (see Section 2.2), fundamental questions about the correlation between organisational performance and SE were raised. In one of very few peer-reviewed article dedicated to the topic of PAMSE, the authors Baum and Vlok [30] defined PAMSE as follows:

"It is the process of translating the PAMS aspirations into workable actions, and of managing strategic initiatives through the allocation of resources and the coordination of responsibilities and accountabilities, while continuously reviewing, adapting, and communicating this process."

That definition by Baum and Vlok [30] is indeed useful, but in the light of the insights gained during the literature review that formed part of this study, the definition was extended. For the purpose of this study, PAMSE is defined as follows:
PAMSE refers to the continuous process during which an organisation critically evaluates and adjusts:

- *The applicability of its PAMS relative to the organisational strategy;*
- *The applicability of the PAM organisational design and management systems (including control*

mechanisms); and

- *The readiness of its interpersonal processes (such as strategic consensus, behaviours, organisational climate, and communication),*

in order to ensure that PAs contribute to the creation of sustainable competitive advantage.

The objective of this study is to develop a mechanism that will assist academics and practitioners with the early screening, detection, and prevention of PAMSEF. In the quest to develop such a mechanism, it was important to gain an understanding of the factors that contribute to strategy execution failure (SEF). In the absence of a peer-reviewed framework that categorises the factors impacting on a successful PAMSE, the framework developed by Yang *et al*. [31] was used to structure the discussion on PAMSE's complexities and challenges. In their evaluation of 60 recent publications on the topic of SE, Yang *et al*. [31] identify the nine most often recurring factors influencing SE. The identification of all these factors is important.

In order to simplify and structure the screening and detection process, it was decided to use the first three components of the PAMSE definition as a framework to categorise the nine casual factors. The fourth component, "contribution to the creation of sustainable competitive advantage", is treated as a lagging indicator. Furthermore, in the light of the evaluation of recent examples of PAMSEF, it was decided to include a tenth factor referring to "the non-adherence of generally accepted PAM practices and procedures". These ten factors, which are illustrated in Figure 1, are referred to by the author as "the deadly dectet of PAMSEF".

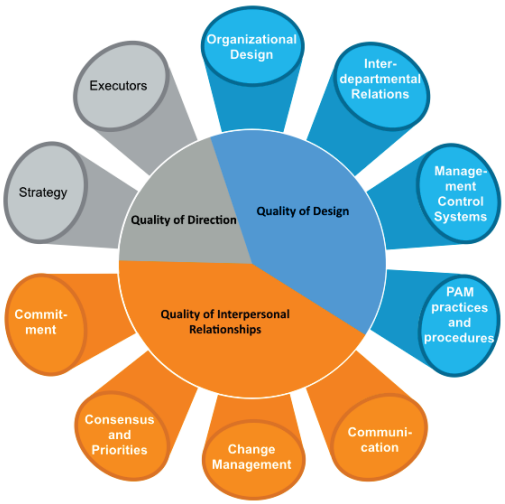

Figure 1: The deadly dectet of SEF

The application and use of the model, in addition to a number of other steps, might require iteration and modification of these factors; derivates or combinations of these factors can be included in a context-specific application.

3 THE 'PAMSEEM'

In this section, a mechanism to assist practitioners with the early detection and prevention of PAMSEF will be presented. The mechanism is referred to as the 'physical asset management strategy execution enforcement mechanism' (PAMSEEM)[3], illustrated in Figure 2. It is essentially a double-loop feedback system consisting of four iterative phases, four major decisions, and a number of implementation processes or steps.

[3] It is important to note at this point that 'enforcement' in the context of this mechanism refers to the discipline of continuous detection, prevention, and management of the underlying causes of PAMSEF.

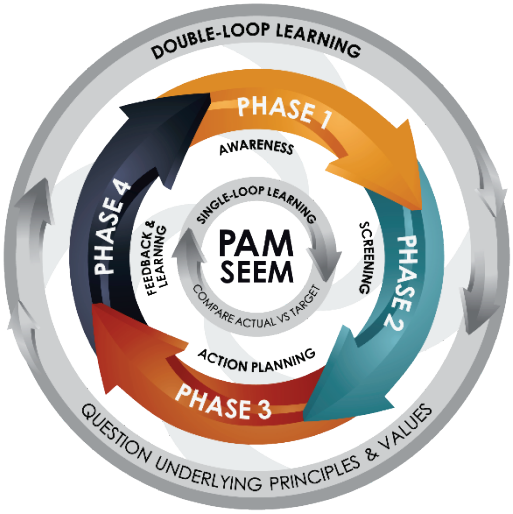

Figure 2: The PAMSEEM

3.1 The PAMSEEM's characteristics and operationalisation

The practical value and contribution of the PAMSEEM will be diminished if the mechanism is merely postulated as a theoretical framework to be used within the confines of a laboratory. The PAMSEEM is also a practical mechanism that should ultimately become part of the PAM organisation's standard operations procedures and DNA.

The phases, decisions, and processes involved in the use of the mechanism are introduced briefly in Table 1.

In order to illustrate the value of the PAMSEEM, the mechanism and its various artefacts were operationalised and validated within the context of a highly PA-dependent organisation. A detailed discussion of the validation process is beyond the scope of this article.

Unlike empirical research, where it would be possible to quantify the extent to which validation objectives are met, the nature of the validation objectives of this study required a more qualitative approach when the achievement of validation objectives were evaluated. In the light of this reality, it was expected that the effective operationalisation of the PAMSEEM within the chosen validation context would:

1. Contribute to organisational awareness of factors that lead to PAMSEF;
2. Lead to the detection of the 'deadly dectet' factors (DDFs) that cause PAMSEF;
3. Lead to the development of action plans aimed at addressing these factors; and
4. Lead to the creation of a PAM organisation that understands and applies the principle of single-loop and double-loop learning.

In the next section the validation context is described in more detail.

3.2 2 The validation context

The PAMSEEM was validated in the context of the largest platinum producer in the world. The Anglo American Corporation (AAC) is a global and diversified mining business. Amongst other holdings, the AAC has a 77.3 per cent stake in Anglo American Platinum (AAP). The AAC has established relationships with a number of academic and research institutions, including the University of Stellenbosch.

Table 1: Abridged introduction to the PAMSEEM

Phase	Major Decision	Process
Phase 1: Awareness	The most important decision during the Awareness phase is the decision about the need to optimise.	Step 1 – Constitute steering committee; Step 2 – Evaluate PAMS; Step 3 – Create Statement of Direction; Step 4 – Introduce generic PAMSEEM; Step 6 – Develop PAMSE calendar; and Step 7 – Continuous stakeholder communication.
Phase 2: Screening	The most important decision during the Screening phase is the acceptance of the results of the screening process.	Step 1 – Contextualise the generic screening model; Step 2 – Gather data; Step 3 – Complete the model and calculate scores; Step 4 – Interpret the results; and Step 5 – Present the results.
Phase 3: Action Planning	The most important decision during the Action Planning phase relates to the prioritisation of Action Plans. A number of methods to assist decision-makers during the prioritisation process are introduced.	Step 1 – Develop Action Plans; and Step 2 – Implement Action Plans.
Phase 4: Learning and Feedback	The most important decision the PAM organisation can take is to embrace the principles of continuous learning.	Step 1 – Data acquisition; Step 2 – Data analysis; and Step 3 – Trade-off recommendations.

In line with the established relationship between the AAC and the University of Stellenbosch, the purpose of the study was explained to senior decision-makers within the AAC, who immediately acknowledged the PAMSE challenges experienced by the AAC's operations, and confirmed the AAC's commitment to assist with the development and validation of the PAMSEEM. These decision-makers also recommended that the PAMSEEM should be validated in the context of one of the AAP's operations.

In accordance with the research agreement entered into between the University of Stellenbosch and the AAP's operation, the identities of the business unit and the critical stakeholders will not be revealed; reference will only be made to the 'ABC concentrator'. In addition, some of the less-important facts and characteristics of this concentrator were deliberately changed in an attempt to protect the identity of both the organisations and the stakeholders that formed part of this study.

4 AWARENESS AND ACCEPTANCE

Executives in organisations often deny that PAMSEF is possible. Even in those environments where progressive managers contemplate the possibility of PAMSEF, very few mechanisms have existed until now that could assist them in the early identification of the presence of those factors that ultimately lead to PAMSEF[4].

Within the PAM organisation, the catalysts for change can range between 'a near miss', the failure of a critical piece of equipment, or — as in the case of the Deep Water Horizon oil disaster — a total catastrophe.

The awareness and acceptance of the possibility that PAMSEF is a reality is the first step in the development of a sustainable programme to ensure the early detection and prevention of failure.

4.1 Operationalisation of the acceptance and awareness phase

The ABC concentrator has been under pressure to improve its PAM performance levels for a number of years. The decision to initiate a risk identification and optimisation process had thus already been taken by senior executives within the organisation before the intervention was embarked upon. The 'catalyst for change' in this instance was sub-optimal PA performance and pressure from the central AAP structures.

The awareness and acceptance phase was operationalised in the context of the ABC concentrator by following the steps described in Table 1. A detailed discussion of each of these steps is beyond the scope of this article.

4.2 Impact and effectiveness of the process and artefacts

Awareness in itself plays a critical role in prevention. This has been confirmed in many studies, including the study by Mosca *et al.* [33].

The evaluation of the impact and effectiveness of the operationalisation of the Awareness and Acceptance phase was complicated by the fact that it was not possible to establish an experimental control environment prior to the operationalisation. In addition, a yardstick for the measurement of organisational awareness of PAMSEF's causal factors did not exist prior to this study. As a result, it was impossible to quantify the impact that the operationalisation of the PAMSEEM had on increased PAMSEF causal factor awareness levels.

During conversations with 15 the 20 steering committee members and from e-mail correspondence that was entered into after the completion of the study, it was confirmed that awareness levels of the potential impact PAMSEF could have on the sustainability of the concentrator increased significantly as a result of both the PAM assessment and the PAMSEEM operationalisation.

The first expected outcome of the validation process (see Section 3.2) was that the operationalisation of the PAMSEEM would contribute to organisational awareness of factors that lead to PAMSEF. In the light of the above discussion, it can be concluded that this outcome was achieved.

SCREENING AND DETECTION
The importance of screening and early defect detection is recognised in a number of fields (for example, see Peng *et al.* [39], Ngan *et al.* [40], and Patel *et al.* [41]). However, a detailed evaluation of these contributions is beyond the scope of this study. Suffice it to note that the importance of screening and early detection of the presence of factors causing defects cannot be over-emphasised.

[4] It is important to make a clear distinction between equipment failure and SEF. A large number of preventative maintenance practices and procedures have been developed over the years and are utilised effectively in most organisations. The focus here falls on SEF.

Screening for PAMSEF has three prerequisites:

1. A thorough understanding of the factors that cause PAMSEF. In this study, ten factors were identified, referred to as the DDFs of PAMSE;
2. An instrument that can be used to screen for these factors; and
3. A reporting mechanism that PAM practitioners can use to interpret screening results. In line with the recommendations made in Table 1 and the framework presented in Figure 5, the operationalisation of the Awareness and Acceptance phase in the context of the ABC concentrator is discussed in the next section. That section concludes with a discussion of the impact and effectiveness of the PAMSEEM.

4.3 Operationalisation of the screening and detection phase

During Phase 2 of the implementation of the PAMSEEM, the focus fell on screening the organisation for the detection of PAMSEF causal factors (i.e., the DDFs identified in Section 2.4). The process required the collection of both qualitative and quantitative data from a wide range of sources. The instrument (the scorecard) used during the screening process is presented in Figure 3. During the completion of the scorecard, a five-point Likert scale was used, and the principles of multi-variate analysis were applied during the calculation of results. A detailed discussion of this process is beyond the scope of this article.

Deadly Dectet Factor	FW	TPC	IPS	MAS	PS	TFS	TFS %
Quality of Direction							
Strategy Formulation	20%	3.00	2	2	2	1.2	40%
Executors of Strategy	10%	1.50	4	3	2	0.9	60%
Quality of Design							
Organizational Design	15%	2.25	3	2	2	1.05	46%
Interdepartmental Relations	5%	0.75	4	3	2	0.45	60%
Management Control Systems	5%	0.75	3	2	2	0.35	46%
PAM Systems, Processes and Practices	20%	3.00	3	3	2	1.6	53%
Quality of Interpersonal Processes							
Communication	15%	2.25	3	2	2	1.05	46%
Change Management	2,5%	0.37	4	4	4	0.2	80%
Consensus and Priorities	2,5%	0.37	4	4	4	0.2	80%
Commitment	5%	0.75	3	3	3	0.45	60%
Totals	**100%**	**15**				**7.45**	**49.6%**

Figure 3: The PAMSEEM scorecard

After completion of the scorecard and the calculation of scores, the steering committee — in conjunction with the research team — used the guidelines provided in Table 2 to interpret the results and compile the PAMSEEM creening report, presented in Table 3.

Table 2: PAMSEF report: Interpretation guideline

Score range	Interpretation guideline
0% – 50%	Immediate action is required, irrespective of the relative importance of the DDF.
51% – 60%	Immediate action is required if the DDF carries a weight of more than 15%. If the DDF carries a weight of less than 15%, the DDF should still be closely monitored and, if at all practical, should be evaluated at least every three months.
60% – 75%	No immediate action is required unless this is the lowest-scoring DDF and the organisation has resources available. The DDF should, however, be closely monitored and evaluated at least every six to twelve months.
75% – 85%	No immediate action is required. Should be evaluated on an annual basis.
85% plus	No immediate action is required, as it is an indication of a very healthy state of affairs. Should be used as a benchmark, and the conditions contributing to the score should be evaluated to ensure repeatability.

Table 3: PAMSEF Report

Deadly dectet factor	Interpretation
Quality of direction	
Strategy formulation	It is strongly recommended that, as a matter of urgency, the organisation invest time and resources to ensure the development of an ABC concentrator-specific physical asset management strategy.
Executors of strategy	Senior managers are often caught between strategic and operational responsibilities because lower-level managers are not properly trained or do not have sufficient experience. This is a serious problem; but considering the resource limitations within the organisation and the fact that there are factors that are considered to be more important, the organisation should not attempt to address this problem in the next six to twelve months. The DDF should, however, be closely monitored, and if the score does not improve as a result of action plans being implemented in other areas, a dedicated action plan to address the capacity of middle- and first-line management should be contemplated.

Quality of design	
Organisational design	Organisational design is an important DDF. The score is very low and immediate action is required. Long-term sustainability is not possible within the context of a non-functional organisational structure. It is thus recommended that the underlying factors evaluated during the assessment of the organisational design should be evaluated in detail, and that a detailed improvement plan (that may include organisational re-design) should be formulated.
Interdepartmental relations	Despite the relatively low weight that 'interdepartmental relations' carries in this context, the score is still relatively low. This score should be read in conjunction with the low score for organisational design. However, the steering committee did note the effort of the executive management team to address the existing relationship dynamics. If the score does not improve as a result of action plans implemented to address organisational design aspects, a dedicated action plan to address interdepartmental relations should be considered.
Management control systems	The score for this DDF is very low. However, the development of action plans to improve management control will be futile if an appropriate PAMS is not formulated. The development of a PAM scorecard and the implementation of a Plan–Do–Act feedback cycle should be considered as part of the development of the PAMs. The optimised use of the SAP system should also become an objective in the short- to medium-term. This factor needs to be evaluated again in the next twelve months.
PAM systems, processes, and practices	The organisation should take note of the immature state of PAM systems, processes, and practices. In addition to the fact that many PAM processes and systems have not been defined, those systems and processes that have been defined are not joined up and are not aligned to the strategy. A detailed action plan to address this state of affairs needs to be developed as a matter of urgency. It is also recommended that this factor be monitored closely and evaluated on a three-monthly basis until the score increases.
Quality of interpersonal processes	
Communication	Organisational communication is central to most processes, including training, knowledge management, and learning. The communication score is low, and it is strongly recommended that the communication dynamics within the organisation be evaluated in more detail. Based on the finding of the in-depth analysis, an action plan should be developed to address communication inefficiencies.

Change management	Evidence could be found of some change management tactics and practices currently being employed within the organisation. Despite the fact that 'change management' carries a relatively low weight, the non-acceptance and non-performance of these tactics has a significant impact on the performance of a number of other DDFs. For this reason, it is recommended that the organisation investigate the effectiveness of change management tactics in far more detail. Specific cognisance should be taken of the cultural values of all stakeholders, in order to ensure the use of appropriate change management tactics.
Consensus and priorities	The PAMSEEM implementation process is consultative in nature, and requires stakeholders to engage in continuous dialogue. For this reason, there seem to be very high levels of consensus on priorities. However, the formulation of the PAMS will also involve setting priorities. Against the backdrop of the relatively unhealthy Interdepartmental relationships that currently exist at the operational level, it is strongly recommended that this factor be monitored and evaluated on a three-monthly basis.
Commitment	It was noted that staff at the operational level seem to be generally disengaged. In the light of the fact that levels of engagement and commitment are a lagging indicator, and with full cognisance that a number of action plans will be developed that might have an impact on staff engagement and commitment levels, immediate action on this DDF is not recommended. However, it is strongly recommended that commitment levels be monitored and evaluated on a three-monthly basis.
Total	The PAMSEF score is border-line critical. Although at this juncture the PAM organisation might still achieve some results, there are a range of critical factors that need to be addressed to prevent complete PAMSEF and possible disaster in the short- and medium-term.

4.4 Impact and effectiveness of the process and artefacts

The operationalisation of Phase 2, which was briefly described in Section 5.2, had the following impact:

- The PAMSEEM screening report highlighted the most critical PAMSEF risk areas;
- It gave the steering committee the opportunity to provide informed and structured feedback to all stakeholders. The quality and scientific nature of the feedback raised the status and credibility of both the report and the steering committee;
- The screening and detection process contributed further to raised PAMSEF awareness levels. This is confirmed by the fact that PAMS and its execution was included on the agenda of all executive and operational meetings; and
- In line with the principles of the learning organisation, the steering committee not only used the feedback sessions to provide feedback on the findings of the screening report, but also took the opportunity to invite recommendations from the stakeholders on ways to address these risks. These inputs were all incorporated during the development of action plans.

In the light of the above discussion, it can be concluded that the operationalisation of Phase 2 contributed to the early detection of PAMSEF In the absence of effective screening, the development of action plans would also have been a completely unfocused exercise. With the insight gained during the screening and detection phase, the steering committee, in conjunction with the research team, was able to develop and prioritise the action plans discussed in Section 6.

5 ACTION PLANNING

"*It does not do to leave a live dragon out of your calculations, if you live near him.*"

Tolkien [42]

Phase 3 of the PAMSEEM is the action planning phase. Based on the interpretation and recommendations made in the PAMSEF DDF report, the organisation had to develop and prioritise a number of action plans.

5.1 Operationalisation and use of artefacts

During the development of action plans to address the DDFs of PAMSEF, the following aspects were considered:

- The organisation's readiness to change. Change readiness assessments identify possible barriers, enablers, and risks, which in turn help to identify where to focus change implementation activities and resources.
- Stakeholder demographics and diversity. Stakeholder diversity often complicates action plan implementation, and practitioners should be aware of and consider this reality during the conception plans;
- The importance of simplicity during the development of action plans. Highly complex plans have a far lower probability of being successfully implemented (especially within the context of a diverse group of stakeholders);
- Action plans have a far higher probability of succeeding if the relationship between managers and non-managers is sound. Unhealthy relationships are characterised by mistrust and suspicion, and complicate the implementation of action plans;
- Understanding and acceptance of the action plan's intention and purpose are critical prerequisites for effective organisational change to take place. Most traditional organisational communication efforts only create awareness, and PAM practitioners should investigate and use context-appropriate and creative communication methods to ensure understanding and acceptance of action plan intentions.

A detailed discussion of the operationalisation and validation of each of the prescribed steps within the ABC concentrator context is beyond the scope of this article.

5.2 Impact and effectiveness of the process and artefacts

It is impossible to express any validated opinion on the impact and effectiveness of action plans that were not fully implemented at the time of writing this article. However, the action planning process was deployed in such a way that stakeholder consensus and commitment had already been confirmed during the formulation and prioritisation of action plans. The implementation of the plans became the responsibility of the total cross-functional PAMSEEM implementation team, and the achievement of objectives was also incentivised on a cross-functional and cross-departmental basis.

The action planning process in itself addressed a number of the fundamental factors contributing to PAMSEF, such as the lack of consensus and commitment, and interdepartmental conflict.

The operationalisation of Phase 3 of the PAMSEEM seemed to have contributed not only to the early detection of PAMSEF, but also to its management.

6 LEARNING AND FEEDBACK

Extensive research has been done in recent decades to assess the long-term health impact of effective behavioural therapy as opposed to clinical therapy in cardio-vascular disease (CVD)

patients. The findings of a study done by Sjöström *et al.* [46] provide a useful framework to illustrate how patients at risk of CVD can be influenced through learning and training of skills to enable the behavioural and lifestyle changes required for the control of weight and blood pressure.

6.1 Operationalisation and use of artefacts

Just like patients being treated for CVD, stakeholders in the PAM organisation need to:

- Understand the causes and implications of PAMSEF;
- Be committed continually to learn more about DDFs; and
- Understand that the implementation of complex action plans is not the only way to treat or prevent PAMSEF. Knowledge of the condition, and a commitment to question fundamental assumptions about not only the impact of the chosen action plans, but also the PAMS *per se*, will have a significant impact on successful PAMSE.

The final (ongoing and iterative) phase of the PAMSEEM is learning and feedback. Although this phase is presented as the fourth step in a series of activities, it should not be construed as such. Feedback and learning is a continuous process. In the context of the contemporary organisation, the PAMSEEM implementation team should be constantly vigilant, and identify signs that might indicate or require not only a change of plans, but a fundamental rethink of the underlying objectives and principles. The PAMSEEM thus embraces the principles of double-loop learning and dialogue. The process requires stakeholders to engage continually in dialogue, not only about whether or not results are being achieved, but about understanding the fundamental principles and values that led to the formulation of the PAMS in the first instance. Only once the organisation has acquired the discipline of double-loop learning and the skill to engage in constant dialogue will effective strategy feedback and learning, and ultimately SE, be possible.

The aim of the operationalisation of Phase 4 is thus not just the mere completion of a number of action steps. The fundamental aim is to ensure the continuous development of the culture of learning and feedback that was initiated during the operationalisation of Phases 1 to 3, and to ensure that that culture becomes ingrained in the PAM organisational lifestyle.

7 CONCLUSION AND RECOMMENDATIONS FOR FURTHER RESEARCH

The aim of this research was to address the following research problem:

There is no mechanism to assist PAM practitioners and academics with the early detection and management of PAMSEF.

Based on the above discussion, it is concluded that it was indeed possible to develop a physical asset management strategy execution enforcement mechanism that would assist academics and practitioners with the early detection and management of physical asset management strategy execution failure, and that H_0 (presented in Section 1.1) should be rejected.

In the pursuit of the research objective, a number of summaries, flowcharts, frameworks, artefacts, and models were developed. A summary of these outputs, and evidence of their impact, were presented in this article. In the course of the research process, a number of additional problems were highlighted. Despite the temptation to attempt to address all the problems, the research scope of this study was limited, as it would have been both impractical and academically irresponsible to attempt to address all of these problems in one research study. The apparently spurious relationship between SE and organisational performance was not evaluated in detail in this study. It is recommended, therefore, that this relationship be evaluated in far more detail.

In this study, a number of factors (DDFs) contributing to PAMSEF were identified and described. It was not possible, however, to explore or define the dynamics and the existence of possible correlations between various DDFs. It is thus recommended that these dynamics be evaluated in more detail; this could possibly happen through the completion of a longitudinal study.

No claims are made that the operationalisation of the PAMSEEM will assist with the early identification and management of SEF in disciplines outside the domain of PAM. It is recommended,

however, that the principles established in this study be contextualised and that the applicability and usefulness of the mechanism be evaluated in other business domains as well.

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