

RISKS ASSOCIATED WITH PHYSICAL ASSET MANAGEMENT: A LITERATURE REVIEW

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ABSTRACT

Accelerated physical asset operations in organisations are necessitated in order to sustain within the competitive business environment. These asset operations involve a number of risks. The management of risks associated with physical assets as well as their operations is an essential element of Physical Asset Management (PAM). Although there is a growing interest in PAM around world, a lack of consideration of risks associated with PAM is evident. However, it is believed that a proper understanding of these risks is essential for effective Physical Asset Risk Management (PARM). Accordingly, the aim of this paper was to review the existing literature to investigate the risks associated with PAM. A comprehensive literature survey referring data sources, and a subsequent desk study were carried out in order to achieve the above aim. The study identified thirty-five risks, which could be categorised under six (06) groups as 'physical failure risks', 'operational risks', 'risks associated with natural environmental events', 'risks associated with the factors outside the organisations' control', 'stakeholders related risks' and the 'risks associated with different lifecycle phases of assets'. Giving a prior concern for the identified risks and reviewing the exposure level of each risk towards PAM will support the organisations to evaluate the risk levels and make decisions on risks mitigation. This will provide the organisations with a smooth operation of physical assets and numerous benefits associated with it.

Keywords: *Physical Assets; Physical Asset Management (PAM); Physical Asset Risk Management (PARM); Risks Associated with PAM.*

1. INTRODUCTION

The emerging discipline of risk-based approach to manage physical assets has received an increased popularity during the last decade. By acknowledging and paying attention to risks associated with Physical Asset Management (PAM), they can be effectively mitigated (Gichun, 2015). Therefore, understanding the associated risks is important to ensure effective PAM in an organisation. Though there are some studies on risk management of physical assets, the researches which have specifically addressed the risks associated with PAM are hardly found. Thus, the risk factors associated with PAM are unknown (Jeeva & Baswaid, 2014). Therefore, this study aims to review the existing literature and investigate the risks associated with PAM in order to increase the present level of awareness on risks which can be associated with PAM. The paper structure begins with an introduction to the study followed by a description of the method adopted in this research. The findings of the study are discussed in the next section. Finally, the paper presents the discussions and conclusions derived from research findings with the way forward.

2. RESEARCH METHOD

A comprehensive literature review on a broader perspective was conducted to identify the risks associated with PAM referring to published literature on journal articles, conference proceedings, and reports from government and non-government associations, articles from websites, etc. Due to the limitation of empirical studies on literature relating to risks associated with PAM, the literature on physical assets, PAM and Physical Asset Risk

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Management (PAM) were comprehensively reviewed. Accordingly, thirty-five (35) risk factors were identified from twelve (12) literature sources. After a desk study, the identified risk factors were classified as per the classification of ISO 55000 standard for asset management, into six (06) main categories (Refer Table 1). Hence, both through the literature review and desk study, the research question of the current study; i.e. what are the risk factors associated with PAM?, was answered.

3. RISKS ASSOCIATED WITH PHYSICAL ASSET MANAGEMENT: AN OVERVIEW

According to the ISO (International Standard Organisation) 55,000, an asset is an item, an entity or something that has the actual or potential value for an organisation (ISO 55000, 2014). There are many types of assets relevant to all process industries such as physical, human, information, financial and intangible assets (Robert, 2017). Physical assets have a useful life greater than a year and are expected to earn income sufficient to cover the operating expenses and amortized acquisition cost associated with it (Theron, 2016). According to Mardiasmo *et al.* (2008), efficient allocation and management of physical assets are crucial in order to maximise the performance and fulfil strategic goals. Therefore, PAM is a fundamental element in an organisation's operations.

PAM has come to the forefront recently, in order to help assets and activities to exploit the full potential of the organisations and effectively reach their business goals (Malestic *et al.*, 2016). It includes a set of disciplines, approaches, techniques, applications, and tools to optimise the value of physical assets (Ratnayake & Markeset, 2012). To gain a greater value, the PAM process should extend from design, procurement, and installation through operation, maintenance and retirement over the complete asset lifecycle (Blanchard & Fabrycky, 1998). Further, PAM is a complex part of any organisation and must be treated as such, in order to strike the right balance between performance, cost and risk in pursuing the organisational goals (Emmanouilidis & Komonen, 2013). Hence, PAM is regarded as an essential technical as well as a business process.

According to Bharadwaj *et al.* (2012), a risk is a combination of the probability of uncertain event and its consequence. Good PAM approach helps to improve asset performance and to handle risks effectively (Dean, 2014). The general purpose of risk management is to understand the cause, effect, and likelihood of negative events and to optimally manipulate associated risks to an acceptable level (Transpower New Zealand Limited, 2013). Accordingly, PAM functions are to understand the causes, effects and the likelihood of adverse events which may occur while an asset is managed (British Standards Institution, 2008). Running a business that does not have an adequate PAM system will lead to take unnecessary damages and risks to the organisation, investment, and even to people's lives, without even knowing the risks (Pearson, 2016). According to Proctor and Varma (2012), in the PAM, risk of failure is not only considering the catastrophic failure of physical assets, but also considers the failure to achieve desired condition levels, failure to preserve asset value and failure to ensure desired levels of service. Multiple risks are involved at every step of asset lifecycle. In order to make sure that each asset performs within defined capability limits, risks have to be identified and proper measures have to be placed even before the risks appear (Mittal, 2014).

4. DIFFERENT TYPES OF RISKS ASSOCIATED WITH PHYSICAL ASSET MANAGEMENT

According to the classification of ISO 55000 standard for asset management - overview, principles, and terminology, risks related to PAM can be categorised into six (06) main categories as 'physical failure risks', 'operational risks', 'risks associated with natural environmental events', 'risks associated with the factors outside the organisations' control', 'stakeholders related risks' and 'risks associated with different lifecycle phases of assets'. Due to the international recognition of ISO classification, it was selected to categorise the risks identified through this study. Hence, the identified risks with the respective authors under six (06) types have been shown in Table 1, and they have been discussed in detail under following sub sections.

4.1. PHYSICAL FAILURE RISKS

According to Deloitte Enterprise Risk Service (2015), gradual deterioration and mechanical breakdowns are top risks associated with physical assets. As mentioned by Network of Associations of Local Authorities of South East Europe (NALAS, 2014), every asset failure or a possibility of failure is a result of asset's poor condition and brings minor or major consequences to the provision of the required level of service. Further, the system components or the whole system can fail due to incorrect installation, incorrect site assembly,

incorrect mounting practices, inadequate environmental protection and deficient foundations and supports. Some of the system failures are along with commissioning and operating errors, and these errors that do not appear during equipment infant-life will eventually cause failures during its operating life (Sondalini, 2016).

Table 1: Different Types of Risks Associated with Physical Assets Management

Risks	Reference Source											
	1	2	3	4	5	6	7	8	9	10	11	12
Physical Failure Risks												
Gradual deterioration/ aging of asset			✓			✓	✓		✓	✓	✓	
Mechanical breakdowns of assets/ equipment and sub-components failures									✓		✓	
Operational Failure Risks												
Improper operation of assets (above/below)		✓						✓	✓			
Lack of operational safety			✓	✓					✓			
Improper/inadequate risk planning						✓		✓				
Unclear roles and responsibility/improper structure								✓				
Unavailability of inadequate models and systems to guide asset management (policy & strategy), etc.						✓		✓				
Ineffective information on assets/asset management		✓				✓		✓	✓		✓	✓
Poor management of asset criticality		✓										
Poor spare parts management		✓						✓			✓	
Reactive asset management and maintenance										✓		
Lack of investment in new technologies								✓			✓	✓
Poor contract management								✓			✓	
Service failures (due to changing demand for asset management)			✓					✓				
Risks Associated with Natural Environmental Events												
Natural phenomena and disasters				✓					✓			
Environmental related incidents/damages		✓	✓						✓			
Risks Associated with the Factors Outside the Organisations' control												
Risk of theft/ burglary				✓					✓		✓	
Terrorism/ Sabotage/ Malicious				✓					✓		✓	
Technical obsolescence		✓	✓									
Economical obsolescence			✓			✓					✓	
Environmental obsolescence			✓									
Stakeholders Related Risks												
Lack of participation/attention of some key stakeholders								✓			✓	✓
Lack of commitment from top management								✓				
Incompetency of senior managers to implement developed asset management											✓	
Engineering/ technical skills challenges								✓				
Lack of experiences of technical employees											✓	✓
Negative attitudes and morals of employees											✓	
Poor service delivery by service contractors											✓	
Lack of legal and regulatory compliance									✓			
Rigid organisational culture								✓				
Risks Associated with Different Lifecycle Phases of Assets												
Design and production/ construction errors/defects									✓			
Acquisition risk		✓										
Construction damage									✓			
Lack of proper maintenance (under/over)								✓	✓		✓	
Disposal risks		✓										
1- Rittenberg, <i>et al.</i> (2008)					5- El-Akruti & Dwight (2013)						9- Deloitte Enterprise Risk Service (2015)	
2- Griffin (2010)					6- Jeeva & Baswaid (2014)						10- Canning (2015)	
3- Dalesio (2012)					7- Cillia (2014)						11- Miya & Grobbelaar (2015)	
4- Brennan & Mattice (2013)					8- Gichun (2015)						12- Actenum Corporation (2017)	

4.2. OPERATIONAL RISKS

As stated by Dalesio (2012), industries have become increasingly intolerant of industrial incidents due to improper operation of assets. Many organisations suffer from a lack of understanding of the inherent design capabilities of their assets and how best to operate within their ranges to optimize the asset lifecycle. For some assets, either operating below or above the design range adversely affects the asset life (Gichun, 2015). Deloitte Enterprise Risk Service (2015) reported that as per the recent incidents, the lack of operational safety is a crucial risk and due to this, the industries have pushed operational safety as a significant risk. According to Institute of Certified Public Accounts of Kenya (2015), inadequate asset planning results in failure to prioritize and determine the feasibility of the organisation's assets towards the achievement of organisation's objectives. As Cillia (2014) pointed out, there is no adequate models or guidelines to direct the PAM. Aligning PAM objectives with organisational strategic objectives is also hardly found and linking them with maintenance, risk management, health and safety and other relevant practices is rarely done (Rajini & Thatshayini, 2017). As a result, most of the organisations follow a set of policies or general and static processes which may not be consistent with the specific needs of the organisation (El-Akruti & Dwight, 2013). Uncertainty regarding the structure which indicates who should be responsible and accountable for making assets decisions, result in delays in taking decisions and this is a huge risk in cases like catastrophic failures.

As mentioned by Miya and Grobbelaar (2015), ineffective or lack of information and support systems to base decisions on is a shortcoming of current PAM processes. Further, it is very difficult to measure the past performance of assets due to ineffective information (Cillia, 2014). Incorrect recording of assets is hidden by complex ownership structures designed to keep assets off the books (Rittenberg *et al.*, 2008). Hence, wrong decisions on asset replacements and improvements are taken due to incorrect estimation of assets' useful life in financial calculations (Komonen, 2009). In addition, the lack of simple practical tools for risk assessments without which it is unsure that what kind of data should be collected to support risk assessments is evident (Miya & Grobbelaar, 2015). As Griffin (2010) stated, there is a narrow concentration given to asset criticality analysis to determine the most significant assets and associated approaches for the development of maintenance tasks. Also, spares criticality analysis is not much practised to determine the inventory category and associated approach for a specific spare or material of emerging concern.

As per Canning (2015), reactive PAM is likely to result in unreliable plant and increased human and financial risks. Reactive maintenance is the process of reacting to failed, ineffective or damaged equipment and repairing or replacing in order for the intended function to be achieved. The main disadvantage of reactive maintenance is the unpredictability of when issues may occur. This lack of knowledge may well result in either labour or materials being unavailable immediately, and therefore delay the time taken for a repair, so that increase the equipment downtime (Gordonw, 2013), being a risk for PAM. Apart from that, most of the organisations are rigid for absorption of innovation due to counterproductive cultural issues. Workers may familiarise to old technologies. Therefore, they resist moving into new innovative technologies. Further, most of the organisation are not willing to spend much on technological investments (Cillia, 2014) which is a risk for effective PAM.

Further, the budgets, resources allocated and information about asset condition and performance are usually obtained in the same format. These activities are done by various departments in the organisation but may not be integrated and optimised for the strategic objectives of the organisation (El-Akruti & Dwight, 2013). As per Emmanouilidis and Komonen (2013), the status of implementation of PAM best practices in the industry is not sufficiently recorded or documented (Emmanouilidis & Komonen, 2013). The poor relationship is the main issue with the organisation and the external contracting people. Due to the poor relationship, expected service level cannot be obtained. Poor contract management with external service providers can negatively impact a business in a variety of ways. Running with sub-standard service levels and chronically poor services, can impact the business potential for profit maximisation as well (McQuerrey, 2012). Accordingly, asset condition reflects the physical state of the asset, which may or may not affect its performance. The performance of the asset is the ability to provide the required level of service to customers. Not knowing the current service level condition and performance of an asset may lead to premature failures. The unforeseen service failure of an asset can have major consequences that constitute a business risk or potential loss to the organisation (Institute of Public Work Engineering Australia, 2009).

4.3. RISKS ASSOCIATED WITH NATURAL ENVIRONMENTAL EVENTS

Natural environmental events can cause failures of physical assets and it only takes a minute for natural disasters such as flood, hurricane and others to happen that will damage the physical assets and stop the business process (Brennan & Mattice, 2013). Moreover, physical assets such as buildings, structures, and engineering systems operate in a dynamic environment where they are exposed to short, medium and long-term variability in ambient environmental conditions (Rayner, 2010) and these weather and climate changes pose a particular risk for assets and operators in all sectors. These risks have the potential to seriously affect the availability and reliability of assets. However, no one pays attention to PARM unless the natural disaster happens to them and affects their business or shuts the operations down (Smith, 2011). Not surprisingly, the saddest part is that most of the industries seemed doomed to repeat their mistakes because they think that natural disasters are a one-time event and remain unprepared.

4.4. RISKS ASSOCIATED WITH THE FACTORS OUTSIDE THE ORGANISATIONS' CONTROL

According to Guard (2017), one of the unfortunate aspects of PAM is confronting the fact that theft happens. Gould (2004) stated that the public, private, and governmental organisations face an increased need to understand and manage the risks to their organisational physical assets with the increased threat of terrorism.

Apart from them, different obsolescence can be experienced when managing physical assets, which act as barriers for PAM. Theron (2016) described obsolescence as a major risk and require writing off of the value of the obsolete item against earnings to comply with the accounting principle of showing inventory at lower of cost or market value. Further, obsolescence is the significant decline in the competitiveness, usefulness, or value of physical assets. Obsolescence occurs generally due to the availability of alternatives that perform better or are cheaper or both, or due to changes in user preferences, requirements, or styles (Hout, 2016). Technical obsolescence is the state of a fixed asset, service or process when it becomes unwanted or should no longer be used (Wendling, 2012) and when technical requirements are not satisfied (Proctor & Varma, 2012). Economical obsolescence means where the cost to maintain and operate an asset is likely to exceed the economic return expected (Proctor & Varma, 2012). Moreover, economic obsolescence of asset is a form of depreciation where the loss in value or usefulness of an asset (Sytsma & Baumann, 2014). Further, there are unexpected costs associated with physical asset operation. Such as the opportunity costs, unexpected maintenance costs associated with older assets, opportunity cost of lost tax shelter due to expired depreciation, expected loss costs associated with declining reliability of an old asset, costs of time, energy and materials needed above and beyond owning the newest and latest like an asset. When the economic costs reduce the return on investment, the asset is said to be economically obsolete (Wendling, 2012). Environmental obsolescence is the loss of value from causes outside the property itself. This can also be called as external obsolescence. Environmental obsolescence can be identified as environmental hazards, noise, excessive dust, and radon or methane gas issues (Hulsey, 2008). It occurs when negative impacts are given by the assets to the environment. Normally, assets operations needs to be environmental friendly. If the asset operations does not comply with the required environmental friendly conditions and exceeds the standard exposure levels, then the asset is environmentally obsolete (Proctor & Varma, 2012). Insurance companies take obsolescence into account to reduce the amount of claim to be paid on damaged or destroyed assets.

4.5. STAKEHOLDERS RELATED RISKS

According to Cillia (2014), stakeholders related risks include the disconnections at different levels of the organisation, lack of participation from some key stakeholders and unclear commitment from top management due to little corporate guidelines on reporting and management of physical assets. Moreover, it is difficult to handle physical assets without involving a specified person who has experience and competence in managing assets as there are lot of stages and activities related to PAM. As per the Hastings (2010) and Cesca and Novaes, (2012), mostly, PAM responsibilities and activities are not confined to a specific department. Hence, in some organisations, the decisions related to PAM are taken by the professionals such as general managers who have no sufficient knowledge about PAM, and this will negatively affect the performance of those organisations (Rajini & Thatshayini, 2017). However, as stated by Miya and Grobbelaar (2015), senior managers' incompetence to implement developed PAM strategies is a risk for effective PAM. Therefore, the management should ensure that those who were given responsibilities for PAM are competent and have adequate skills especially, the required engineering and technical skills (Cillia, 2014) and training to perform their duties and

deliver the required outcomes, in line with the asset management policy, strategy and objectives. Organisations in developing countries do not consider PAM as an important discipline and do not provide the asset management professionals with adequate training on it (Rajini & Thatshayini, 2017). As per Miya and Grobbelaar (2015), in most of fields, employees who operate and maintain the plants are not keen to know the details about PAM. This is because employees feel that the top management does not involve them and take their opinions about daily operations and maintenance, and this negative morale is a risk for effective PAM.

Most of the organisations do not have a clear idea of the separation of the role of asset manager from the service provider. This has caused friction between the departments, de-motivation of employees and increased complexity and requirement for double work and inefficiencies. Also, the extra amount of time and manpower has negatively influenced the financial efficiency and the organisational effectiveness (Gaarenstroom, 2014). According to Justin (2018), asset owners face risk factors from financial and health, to safety and environmental due to poor service delivery by service contractors. To mitigate these risks, service providers, need to know exactly their responsibility, condition of assets and how assets should be maintained in order to maintain the asset value. Further, physical assets are aging due to lack of information and external service providers take advantage of this situation by delivering poor services as well (Miya & Grobbelaar, 2015).

According to the survey results of Deloitte Enterprise Risk Service (2015), 43% of companies have accepted regulatory compliance as a crucial risk. Hence, it reveals that the legal and regulatory compliance as a main criterion in evaluating asset risks in the industry. Most of the organisation struggle with establishing an effective PAM within their organisations. The simple reason behind this is that PAM needs a change management to work. Rigid organisational culture always resists to improve and adapt with standardised PAM system (Joubert, 2017). Some recent studies indicate that PAM is not always given the priority and attention that is merited. Countless operational experts will retire over the next decade and the retiring maintenance or engineering experts may have known about the advanced PAM knowledge. Since asset owned organisations tend to outsource more than before, there is a danger to lose 'Asset Knowledge' (Komonen, 2009).

4.6. RISKS ASSOCIATED WITH DIFFERENT LIFECYCLE PHASES OF ASSETS

As Griffin (2010) pointed out, there is a lack of consideration on asset acquisition to determine issues that should be included in the specification of the assets, such as training, integration of systems, energy considerations, critical spares, etc. Any mistake in the working processes within design and construction stages ultimately leads to errors that affect the durability, performance, reliability, maintainability, availability, and safety of the systems (Ab Ghani *et al.*, 2017). Moreover, Keqa (2016) mentioned that the acquisition planning includes activities involved in purchasing an asset with the aim of ensuring cost-effective acquisition. This covers activities such as designing and procuring of an asset. Appropriate application of these activities will guarantee that the asset is fit for use. If there is any risk associated with acquisition process, there will be an issue to meet service delivery and other organisational objectives.

The risk to the firm's business processes and key facilities due to the unavailability or improper maintenance of physical assets have been reported by a number of researchers (Miya & Grobbelaar, 2015; Hoffman, 2002). Maintenance is often viewed as a business expense open to cutting like any other in order to maximize profits. With these pressures, maintenance departments are constantly struggling with how to balance the cost with the performance requirements such as reliability and uptime (Gichun, 2015). The key issue regarding over maintenance typically involves two issues that will make the PAM system ineffective. Firstly, there is generally a significant cost associated with the execution of non-value-added maintenance. Secondly, the typical organisation that can be accused of over-maintaining its assets will most likely be performing intrusive maintenance tasks more frequently. The issue of under-maintenance and how it prevents effective PAM is even more clear-cut (Gichun, 2015).

Apart from them, the disposal of assets is an area where the risk of corruption is high (Crime and Corruption Commission, 2017). In most of the organisations, there is the unavailability of disposal risk assessment to identify assets that should be disposed of and any issues that should be considered during the disposal process (Griffin, 2010). If the disposal process is not supported by competent and professional advice and the use of accurate and relevant information, this may result in an inadequate return on the disposal of buildings and poor coordination of cash flow with capital investment requirements (Queensland Department of Housing and Public Works, 2017). Further, failure to replace old assets have led to high energy consumption, high

maintenance costs and increased risk of accidents and calamities. On the other hand, organisations have experienced negative impacts due to unnecessary replacement of physical assets (Madusanka *et al.*, 2016).

5. DISCUSSION

Following the above discussion, it was identified that PAM could fail in many ways. There are definitely six types of risks which critically contribute to an organisation's failure to manage physical assets efficiently. Most of the risk categories are interconnected. As per the above highlights, operational risks factors contribute to risks associated with physical failure and different life cycle phases of assets. On the other hand, operational risks could be occurred due to factors outside the organisation's control such as economic obsolescence. Furthermore, the risks associated with natural environmental events and factors outside the organisation's control such as environmental obsolescence are interconnected. In addition, the stakeholders' related risks and operational risks are interconnected by means of risks associated with commitment of managerial level, delegation of authority, training and experience and legal and regulatory compliance towards physical assets.

As seen from Table 1, almost all the sources indicated that operational failure risk factors as risks associated with PAM, whereas, 50% of the sources indicated physical failure risks and risks associated with the factors outside the organisations' control. Other risks; risks associated with different lifecycle phases of assets, natural environmental events and stakeholders' related risks were identified by 25% of the sources as the risks associated with PAM. Accordingly, operational failure risks have been highest discussed by different authors as PAM related risks. Considering the risk factors identified under the operational risks category, ineffective information on PAM has the priority, whereas, aging of assets is the highly addressed under physical failure risks. The risk of theft, burglary, terrorism, sabotage and malicious have received more concentration as the risk factors outside the organisations' control. On the other hand, lack of proper maintenance has been identified as the major risk under risks associated with the different lifecycle phases of assets. Environmental related incidents/damages and lack of commitment of key stakeholders are also highlighted by the authors as significant under the risks of natural environmental events stakeholders' related risks respectively.

Further, most of the above categorised risk factors will directly impact on the continuation of core operations. Amongst, the highly influential factors are found under the operational risks category. For example, inadequate asset planning could be caused to poor achievement of organisation's objectives due to prioritize and determine the feasibility of the organisation's assets, whereas, the unexpected service failure of an asset constitutes a business risk or potential loss to the organisation. Considering the physical failure risks, the replacement of physical assets due to aging or deteriorating are extremely expensive and the organisations face financial difficulties. Therefore, physical assets oriented organisations need to have clear concentration on risks associated with PAM to take the necessary steps to identify and mitigate the adverse impacts.

6. CONCLUSIONS AND WAY FORWARD

The study focused to investigate the risk associated with PAM and it was limited to carry out a literature review and a desk study to drive the findings. Overall, thirty-five (35) risks were identified through previous studies and categorised as 'physical failure risks', 'operational risks', 'risks associated with natural environmental events', 'risks associated with the factors outside the organisations' control', 'stakeholders related risks' and 'risks associated with different lifecycle phases of assets'. Prior identification of risks related to PAM helps to understand the cause, effect, and likelihood of adverse events occurring in future. By realising the risks exposure level, the organisations can optimally manage such risks to an acceptable level and it will strongly impact to have a proactive PAM. The identification of risk of PAM should be done when planning, obtaining and receiving the physical assets and during operational, maintenance and disposal stages of the physical assets

The findings revealed that more attention has been given to address the operational risks. Ineffective information on PAM has the prior concern under operational risks. On the other hand, aging of assets is the highly addressed under physical failure risks categorisation while, natural disasters and environmental conditions are not that much addressed by researchers. However, few authors have highlighted that natural environmental events also can be the risks to manage physical assets. Furthermore, the risk of theft, burglary, terrorism, sabotage and malicious have received more concentration as the high risks under the risks associated with the factors outside the organisations' control. Lack of participation from some key stakeholders has been

highly addressed under stakeholders' related risks. Finally, lack of proper maintenance is the major risk which has been highly addressed by authors under 'risks associated with the different lifecycle phases of assets.

Accordingly, it is clear that though there are number of risks which restricts effective PAM, a very limited attention has been received for in depth studies on management of those risks. Hence, the article motivates an agenda for future research that advocates a critical review of risks related PAM which could be identified through this study, and evaluation of the critical exposure levels of those risks in Sri Lankan organisations.

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