

# **A Strategic Procurement Concept for Physical Asset Management Framework**

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## **Abstract**

Physical asset management has been described from a variety of different perspectives including management, engineering, operations and finance. Regardless of the increased attention paid to physical Asset Management by practitioners, academic literature still has gaps in identifying the challenges and obstacles for Asset Management. Few studies have been conducted in the area of physical Asset Management and little attention has been received on the Oil & Gas sector. This conceptual paper proposes the development of a physical Asset Management framework from two perspectives: Supply Risk (SR), and Strategic Procurement (SP). It focuses on how both perspectives can create value for Asset Management. This proposal will also examine how SR and SP can overcome the challenges and obstacles in Asset Management. It combines Reliability Theory (RT) and Business Continuity Theory (BCT) to build a theoretical foundation to formulate a physical Asset Management framework.

## **Keywords**

Asset management, strategic procurement, operations management.

## **1. Introduction and Background**

Physical Asset Management (AM) is becoming an important critical aspect of operations management, especially in the Oil & Gas and Resources sectors. The biggest challenge facing the organisations in these sectors is the capacity and capability to implement the effectiveness of maintenance, repairs and operations (MRO), while concurrently reducing operating and capital cost. The efficiency and effectiveness of managing the physical assets helps to increase and achieve business profitability. Historical lessons learnt from instances of catastrophic failures in Asset Management have raised the awareness and the importance of PAM. With the recent increase in plant and equipment failure, it has become much more critical in the Oil & Gas (O&G) industry due to possible environmental pollution. Physical asset management is planning for the long term maintenance and operations of the physical assets like sub-sea floor pipelines, above ground pipelines, drilling rigs, oil production platforms and associated plant and equipment. Oil & Gas companies are taking a much more concerted approach towards the long term maintenance of their physical assets. Industry reports are highlighting that much of the physical assets in the Oil & Gas industry are decades old and have not had maintenance done, let alone physical inspection. AM includes checking the reliability of these physical assets.

Research suggests that this is because of the lack of maintenance and risk planning. The global response to these disasters has been the peak of a continuous progression of changes in this area since the early 1970's. These changes have encompassed attitudes within industries, heightened levels of understanding as well as the efficiency and implementation on the functions of Asset Management (Mather 2003).

The integrity of physical assets in the O&G industry also needs to ensure business continuity. When there is an interruption of the flow in oil and gas pipelines, it has a direct impact on revenue earning capacity as well as the environment (Rahim 2010). These interruptions may take weeks or months to repair. Therefore, business continuity

is critical in keeping the business operating in all instances to maintain competitiveness (Priscilla et al. 2012). Hence, Business Continuity Theory is suggested into the conceptual research model.

The Oil & Gas industry has assets more than 100 years old reaching thousands of miles underground and undersea along with facilities that are outdated. Interestingly, some companies with such huge physical assets did not know the actual life span of these assets when they were initially installed. Eventually, companies are ending up with replacements which cost billions of dollars due to uncertainty and lack of proper maintenance (Wireman 2004). This goes to the core of equipment and plant reliability and its failure.

This conceptual paper puts forward a AM framework from the Strategic Procurement perspective using Business Continuity and Supply Risk concepts, see Figure 1.

The basis for this research is establishing the concepts of Strategic Procurement with physical Asset Management. Using these established concepts this research will investigate how it can be applied to the Oil & Gas and Resources sectors. Since some assets are known to have a life span of over a hundred years and costs to build are very expensive (example oil rigs and oil platforms), supply risk concepts will be used to establish the current and future risk of sourcing parts and components. At the same instance Reliability Theory will establish the reliability and integrity of sourced parts as well as existing plant in terms of their life span and establish mean time between failures and when inspection and replacement work needs to be carried out. All this leads to establishing continued uninterrupted operations.

This research proposes the development of a Asset Management framework from two theoretical perspectives: Reliability Theory, and Business Continuity Theory. Two aspects of AM are that any business operations must continue without interruptions or with minimum short term interruptions; and that there is a reliable supply of spare parts to enable quick recovery of plant and equipment that requires attention.

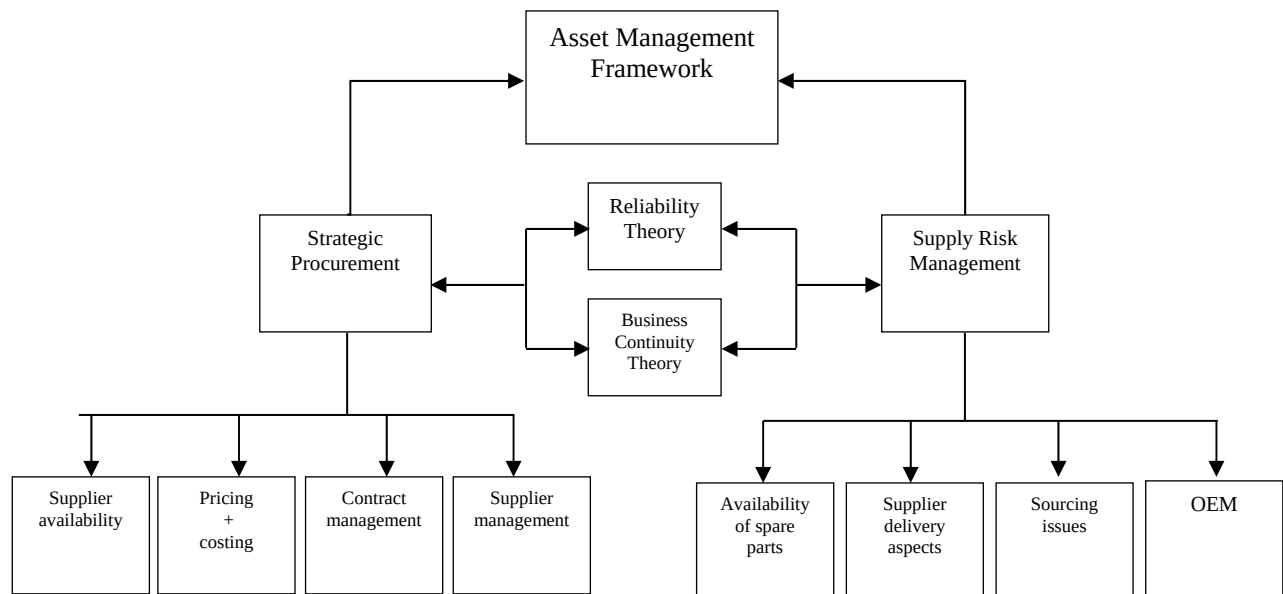


Figure 1: Proposed conceptual model

## 2. Literature Review

### 2.1 Reliability Theory:

In Reliability Theory (RT), aging is defined through the increased risk of failure (Klein 2011). More precisely, if something ages it is more likely to fall apart, or die, or breakdown tomorrow than today. If the risk of failure does not increase as time passes, then there is no aging. There is much literature of RT in human aging process. The concept of RT will be adopted into this research to examine and develop the reliability of Assets and Procurement since the theory's concepts is on failure of systems (Klein 2011). Reliability Theory of aging provides an optimistic preparation on the opportunities for healthy life-extension. According to Reliability Theory, human lifespan is not fixed, and it could be further increased through better body maintenance, repair, and replacement of the failed body

parts in future. This concept can be similarly adopted and applied to physical assets.

RT is a way of modelling and forecasting the failure modes and mean time between failures of equipment with many redundant parts subject to wear and tear. Reliability Theory has been used in the electronics industry, engineering and explains why supply chains have failed. It allows researchers to predict how a system with a specified architecture and level of reliability of the constituent parts will fail over time (Gavrilo 2001). Reliability Theory will help to support forming an AM framework in terms of assessing supplier reliability, equipment validity and business continuity.

## **2.2 Business Continuity Theory:**

Business Continuity Theory (BCT) is a management approach that classifies potential issues that threaten firms and delivers a framework for structural resilience and the capability for an effective response. Business Continuity Theory is the subject of continuing growth and research. Speight (2011) states that Business Continuity Theory “*is about achieving a balance between preparing for situations in which contingency plans will have to be used, while at the same time doing everything conceivable to stop them ever having to be used*”.

BCT helps to identify the critical operational functions of an organization and the potential impacts of threat prior to its occurrence. It specifies effective ways of responding and quick recovery measures so that a business can continue to operate at acceptable levels and avoid disruptions for a specified period of time. BC Theory is also linked to Risk Management strategy that focuses on maintaining the continuity of critical operations to ensure the companies services continue, and thereby the organization’s survival. Developing a BC strategy helps an organization identify what preparations must be made before a disaster strikes to secure its assets. Hence, SR together with BCT and RM will identify the supply risks and SP will ensure the availability and timely delivery of required equipment and sub-assemblies. RM will also enable formulation of contingency plans for Business Continuity (British Standards Institution’s Code of Practice 2009).

## **2.3 Asset Management**

The absence of a conceptual framework in AM is revealed in an empirical research by (CIEAM 2011). This highlights that due to a lack of studies to reduce the Risk Management, achievement of AM framework is still ambiguous. Priscilla et al. (2012) argues that AM needs to be studied from different perspectives to increase the theoretical frameworks and aspects and increase the richness in this area. It also mentions that previous studies on AM aspects have focused on overall industries, which create difficulties for some enterprises to apply the same risk management strategies. Priscilla et al. (2012) investigates AM from an environmental aspect and concludes that it can only be improved if it is applied independently.

Because of the lack of sufficient theoretical studies and the absence of extensive literature on the AM area in deriving the challenges and obstacles of AM; this research proposes to concentrate on these aspects. Therefore this study will be conducted from a Strategic Procurement perspective through Supply Risk Management to overcome AM challenges.

## **2.4 Supply Risk:**

The life span of most physical assets outlasts the life span of many Original Equipment Manufacturers. Hence, continuity of spare parts, components and sub-assemblies increases in risk as time goes on. This research intends to investigate Supply Risk (SR) of critical plant and equipment. As a result, it creates serious consequences on business continuity in the long term and on-going procurement strategy. Ng (2008) states that AM and SR are correlated to each other and SR needs to be considered to achieve successful AM framework. Whereas Davis (2008), argues that the lack of consideration in SR has a serious consequences on assets over a long-run. As it is well known that SR method is implemented to recognize potential problems prior to occurrence, so that risk-handling events may be proactively planned and invoked, as needed, across the life span of the project in an effective and efficient manner (Perera and Holsomback 2005). However, traditional Supply Risk still has limitations in Asset Management studies theoretically and practically. Hence, further consideration in SR needs to be taken into account in order to support AM studies (Ng 2008).

The International Association for Oil & Gas (2008) argue that understanding of risks is a significant step in Asset Management but still not enough is stressed in today’s studies. Traditionally, SR is the likelihood of loss or a bad consequence, but in a bigger sense, is a neutral measure of the degree to which uncertainty exists about the consequence of an action Cohen and Kunreuther (2007). While Robinson (2011) and Ernst & Young (2012) state that SR is a managerial process involving the executive functions of planning, organizing, leading, and controlling

activities in a firm relative to specified risks with a view to reducing their cost to the firm in order to maximize the firm's assets value, it is necessary to investigate the impact on decision making..

### **2.5 Strategic Procurement:**

Strategic Procurement is the main enabler of an Asset Management Framework. Without SP, new or substitute parts and components may not be sourced easily or cheaply (Love, Skitmore and Earl 1998). Hence, this proposal suggests to evaluate the challenges and role of Strategic Procurement in AM framework. Bloch (2011), Crespo (2004) and Friedl (2012) state that enterprises need to develop and pay attention to Strategic Procurement due to its important key role in regards to supplier relationship, spare parts availability and maintenance. Madu (2000) states that organisations that develop SP in their business can achieve improvements of its assets and reduce their uncertainties. This is supported by Jeeva (2009); and Liu 92010) who argue that SP has an essential importance for organisations as it can deal with uncertainty, such as lack of equipment availability and suppliers' flexibility. While other researchers state that Strategic Procurement can have several impacts on businesses such as supplier's relationships, purchase equipment's, etc. Liyanage (2003) views SP as significant to competitiveness in many firms and that it can have a major positive effect on enterprises.

Cox (2001) assessment of Procurement from a supplier perspective states that Strategic Procurement plays a major role with suppliers when it comes to equipment availability. Therefore, understanding the supplier's behaviour and ability can improve organisational performance. This leads to the challenges and issues within the Oil & Gas sector.

### **2.6 Asset Management:**

Chandima-Ratnayake (2012) defines AM as the set of disciplines, approaches, techniques, applications and tools to maximize the entire life business control of risk, performance and related cost. Whereas Fureaux (2008) describes it as to reduce lifecycle costs, assess, understand and control risk, increase reliability, improve knowledge management and enhance communications with internal and external stakeholders and make effective practice of infrastructure's lifecycle with good decision making. Fureaux (2008) further explains AM as an emerging effort to combine finance, planning, engineering, personnel, and information management to support agencies in controlling assets cost-effectively.

AM has been illustrated as the strategic management of physical assets during their useful life. While physical assets have a life: they are planned and created, used, managed and maintained, and when no longer required, prepared for disposal. Asset Management is a combined approach that efficiently integrates operations, suppliers, information, environmental and skills to increase a long-term performance of the business. It is found that long term relationship with suppliers, transparency of information during the process, prioritises the risk and integrating the plan are the most important aspects of AM framework. This is supported by Brown and Spare (2004), and Chandima-Ratanyake (2012). They examined AM from different perspectives and concluded that Risk Management along with Strategic Procurement from different perspectives is the key success to AM. As well as, Friedl (2012) who illustrates in a study that supplier's relationship, sharing information and identifying the risks and defining it is essential to overcome AM challenges.

### **2.7 Supply Risk Management:**

From these definitions, SRM has been described as the procedure of measuring, identifying, monitoring and controlling both businesses and portfolio risks in terms of reducing unanticipated losses and uncompensated risks and maximize the reward/risk ratio (Liyanage 2006).

## **3. Business Continuity Management:**

Business Continuity Management (BCM) is a philosophy and a coherent body or set of tested principles and practices to ensure the continuation of a business and protecting critical functions during times of crises. Business Continuity Management Theory can be defined as *"A holistic management process that identifies potential threats to an organisation and the impacts to business operations that those threats, if realised, might cause, and which provides a framework for building organisational resilience with the capability for an effective response that safeguards the interests of its key stakeholders, reputation, brand and value-creating activities"* (British Standards Institution's Code of Practice 2009). BCM theory covers business resumption planning, disaster recovery planning and crises management. BCM helps scholars and researchers to forecast threats either from internal system failure or external risks.

## **4. Significance:**

The practical significance in developing an AM Framework that can be used by Oil & Gas producing companies is better ecological management process. A more efficient and effective AM will lead to cost savings and better risk management.

Theoretical significance is that it will move the body of knowledge forward. Narrow the gap published material. Provide the impetus for future research in this area of AM. Contribute to the adoption of Reliability Theory concepts into the Strategic Procurement arena.

## References

- Bloch, H. P., Spare parts availability and the need for non-OEM options, *Hydrocarbon processing*, vol. 90, no. 12, pp. 9-10, 2011.
- Bloomfield, P., Ritter, L, and Fortin, J., A triple bottom line approach to asset management and sustainability, *Water Asset Management International*, vol. 8, no. 1, pp. 12-17, 2012.
- British Standards Institution's Code of Practice, Business Continuity Management, 2009.
- Brown, R. E., and Spare, J. H., Asset management, risk, and distribution system planning, Paper read at Power Systems Conference and Exposition, 2004, IEEE PES, pp. 10-13 Oct., 2004.
- Chandima-Ratnayake, R. M., Asset integrity management for sustainable industrial operations: measuring the performance, *International journal of sustainable engineering*, vol. 5, no. 2, pp. 145-158, 2012.
- CIEAM. 2011., Asset Management in a Constrained Future, <http://www.cieam.com/site>.
- Cohen, M.A, and Kunreuther, H., Operations Risk Management: Overview of Paul Kleindorfer's Contributions, *Production and Operations Management*, vol. 16, no. 5, pp. 525, 2007.
- Cox, A., Understanding Buyer and Supplier Power: A Framework for Procurement and Supply Competence, *The Journal of Supply Chain Management*, vol. 37, no. 2, pp. 8-15, 2001. <http://sfx.library.curtin.edu.au/sfx>.
- Davis, M., Risk-Sensitive Benchmarked Asset Management, *Quantitative Finance*, vol. 8, no. 4, pp. 415-426, 2008. [http://sfx.library.curtin.edu.au/sfx\\_local?ctx](http://sfx.library.curtin.edu.au/sfx_local?ctx).
- Ernst & Young, Risk Management for Asset Management, 2012.
- Friedl, G., Supplier development or supplier switching? *International Journal of Production Research*, vol. 50, no. 1, pp. 3066-3079, 2012.
- Furneaux, C. W., Engineering asset procurement: Operationalising complex adaptive system theory, 2008.
- Gavrilov, L.A., The reliability theory of aging and longevity, *Journal of theoretical biology*, vol. 213, no. 4, pp. 527-45, 2001.
- International Association of Oil and Gas Producers., Asset Integrity - the key to managing major incident risks, 2008.
- Jeeva, A., Theory and Practice of Procurement Flexibility: A Model for Suppliers and Manufacturers, *The journal of contemporary issues in business and government*, vol. 15, no. 1, pp. 59-78, 2009.
- Klein, I., Theory of Reliability Generalised to Multiple Outliers: Presentation, Discussion and Comparison with the Conventional Theory of Reliability, *Boletim de Ciências Geodésicas*, vol. 17, no. 4, pp. 519-548, 2011.
- Liu, Y., Control Mechanisms across a Buyer-Supplier Relationship Quality Matrix, *Journal of Business Research*, vol. 63, no. 1, pp. 3-12, 2010. [http://sfx.library.curtin.edu.au/sfx\\_local?ctx](http://sfx.library.curtin.edu.au/sfx_local?ctx).
- Liyanage, J., P., Operations and maintenance performance in oil and gas production assets: theoretical architecture and capital value theory in perspective, *Engineering Science and Technology*, 2003.
- Liyanage, J.P., Strategies for sustainability risk management through active bap (business-asset-process) performance integration, *The 1st World Congress on Engineering*, 2006.
- Love, P.E.D., Skitmore, M., and Earl, G., Selecting a Suitable Procurement Method for a Building Project, *Construction Management and Economics*, vol.16, no. 2, pp. 221-233, 1998. [http://sfx.library.curtin.edu.au/sfx\\_local?ctx](http://sfx.library.curtin.edu.au/sfx_local?ctx).
- Madu, C., Competing through Maintenance Strategies, *The International Journal of Quality & Reliability Management*, vol. 17, no. 9, pp. 937-949, 2000.
- Marquez, A.C. and Blanchar, C., The procurement of strategic parts: Analysis of a portfolio of contracts with suppliers using a system dynamics simulation model, *International journal of production economics*, vol. 88 no. 1, pp. 29-49, 2004.
- Mather, D., The Strategic Importance of Asset Management, *Maintenance Journal*, 2004.
- Ng, J., Risk based asset management - a success story. Paper read at Railway Engineering - Challenges for Railway Transportation in Information Age, 2008. ICRE 2008. International Conference on, 25-28 March, 2008.
- Perera, J. Holsomback, J., An Integrated Risk Management Tool and Process *Aerospace Conference, 2005 IEEE*, doi: 10.1109/aero.2005.1559306, 2005.

Rahim, Y., The 5C model: A new approach to asset integrity management, *The International journal of pressure vessels and piping*, vol. 87, no 2-3, pp. 88-93, 2010.

Robinson, L., The revolving relationship between risk assessment and risk management. *Risk analysis*, vol. 31 no. 9, pp. 1334-44, 2011.

Speight, P., Business Continuity, *Journal of applied security research*, vol. 6, no 4, pp. 529-554, 2011.

Wireman, T., *Benchmarking best practices in maintenance management*, Industrial Press Inc., 2004.

## Biography

**Ananda S Jeeva** is a senior lecturer and researcher in procurement, supply and logistics management at Curtin University, Perth, Australia. Ananda has 25 years industry experience in business process improvements, operations management, work flow, customer relations management, project management and telecommunications network planning. He has also implemented ISO9000 quality assurance projects. He holds a Bachelor of Commerce (Marketing & Management) and a Master of Business Administration. He is also an Electronics Engineer. He completed his PhD in Procurement Flexibility with a Supply Chain Management perspective at Curtin University. Ananda has published in international journals and presented in international conferences. His professional networking includes fellowship with The Chartered Institute of Purchasing and Supply, The Chartered Institute of Logistics and Transport, Australian Institute of Management; and membership with The Institution of Electrical Engineers (UK), and the Supply Chain and Logistics Association of Australia. His research interests include Strategic Procurement, Supplier Intelligence, Supply Management and its related areas.

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