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The application of GFMAM's influential asset management subject matters in the South African steel industry

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The Global Forum for Maintenance and Asset Management (GFMAM) was established by industry professionals and organizations to view asset management as a strategic activity for achieving organizational goals. In the 21st century, there are two main types of technology-based businesses: rapid technology improvement and slow improvement industries like steel, mining, and metallurgy. Efficient decision-making linked to asset and maintenance management is crucial for long-term operations. Without a structured approach to asset management, organizations in slow-improvement industries risk inefficiencies, higher operational costs, and reduced competitiveness. The steel market is expected to decline over the next five years, with traditional methodologies negatively impacting the industry. Despite this, the steel sector remains significant to South Africa's GDP and employs thousands. The study aims to determine the rankings, critical success factors, and limitations of GFMAM's most influential subject matters in the South African (RSA) steel industry. A quantitative method was used, with 22 RSA steel organizations invited to participate in an online survey. The survey ranked the most influential subject matters as: (i) strategic planning, (ii) asset management policy, (iii) asset management leadership, (iv) asset management strategy and objectives, and (v) asset management planning. The study also identified critical success factors and limitations for each subject matter. It is recommended that RSA steel companies use these findings to gain a competitive edge in the market.

Keywords: Asset management policy, asset management leadership, steel industry.

1. Introduction

1.1. *Asset management*

Asset Management (AM) highlights the management of asset condition or asset maintenance (Reid, S.R.M. & Xerri, M.J., 2013). Moreover, AM has extended from the focus of asset monitoring and maintenance activities to topics of organisational strategies and objectives (El-Akruti, K.O., 2012).

Organisational strategies and objectives concetrate on cost reduction, production target, regulatory requirements and return on assets (El-Akruti, K.O., 2012). In the last couple of years, an increasing number of industry professionals, experts, practitioners, societies, societies and research organisations that view AM as a strategic activity to achieve organisational objectives meet annually to develop new knowledge and frameworks that include multi-disciplinary interpretation of AM (El-Akruti, K. & Dwight, R., 2013). There are numerous non-profit with the focus on the development of AM standards, models and principles. This research study will focus on the GFMAM.

Two types of technology-based businesses have developed over the years. The first type is based on rapid improvements of technology such as semi-conductors and chip designing. The second type is based on slow improvements which include heavy engineering industries such as steel, mining, and metallurgy (Burgelman, Maidique, & Wheelwright, 2001). The difference in technology-led businesses, each require a different managerial approach. The focus of this report will be based on technology improvements that are slow and such technology-led business

require a long-term understanding of technology management activities and tools (Cetindamar, Phaal, & Rrobert, 2016).

The steel sector consists of steel processing plants to produce the required steel products. Schulze Spuntrup, et al. (2019), mentions that industrial plants have a timescale between 30 to 50 years. During this duration, efficiency and sustainablity resonate from long-term decision making that is interlinked with asset and maintenance management to ensure optimal oprations.

1.2. *Steel industry*

Steel is the most widely used metal and recycled material in the world. It is required as an input material across several industries such as the construction, automotive, transportation, machinery, packaging, and energy (Marketline , 2022).

Two decades ago, in RSA, the steel sector used to be increasingly profitable and used to be a seller's market. However, over the years due to increasing competition, increasing input prices, increasing substitutes, increasing stringent environmental policies (Tata Steel White Papers, 2012) and in most recent times the COVID-19 pandemic are the challenges that have contributed to the market reducing by 37.1% (Marketline , 2022). Thus, the sector has ultimately changed to a buyer's market (Tata Steel White Papers, 2012). In 2021, the industry gained momentum due to economic recovery and a massive shortage of steel. This was caused by numerous steel organisations closing off during the pandemic period, as RSA declared it as a national disaster (NICD, 2020). According to Marketline (2020), it is forecasted that within the next 5 years the steel market will further decline, but at a slower rate than the last 5 years.

According to the Trade & International Policy Strategy (2020), the RSA steel sector employs about 190,000 people and contributes 14% to the country's GDP.

1.4. *Problem statement*

According to Visser and Botha (2015), the GFMAM have a positive effect on the strategic, tactical, and operational level of an industrial organisation. Preliminary review indicates there has been little to none research done on the effects of the GFMAM most influential subject matter in the context of RSA steel industry. Based on the status of the Steel sector, continued application of traditional methodologies will continue to have a negative impact on the actual industry and livelihood of people employed by this industry. This study will focus on the GFMAM's subject matters to reveal the ranking, critical success factors and limitations of the most influential subject matters in the context of the RSA steel industry.

1.5. *Research objectives*

This research study is to determine the following research objective; "The objective of this research study is to determine the rankings of the GFMAM most influential subject matters in the steel industry. The research will further determine the merits (success factors) and limitations of using the GFMAM's most influential subject matters, as identified by Visser and Botha (2015), in the steel industry in RSA."

Given the objectives, the research questions are as follows;

- RQ1: What are the rankings of the GFMAM most influential subject matters in the steel industry?
- RQ2: What are the critical success factors of using the GFMAM most influential subject matters in the steel industry?
- RQ3: What are the limitations of using the GFMAM most influential subject matters in the steel industry?

2. Proposed Model or Conceptual Method

Sunjka & Mona (2016) stated that strategic planning within the steel industry, requires the AM leadership to put in place principles and boundaries that define that AM policy, strong guidance and direction to deliver the AM strategy and objectives and detail the activities, resources, responsibilities, timescales, and associated risks for the AM plan.

GFMAM (2014) revealed that asset management planning is defined as the process of developing detailed asset management plans that specify the activities, resources, responsibilities, timescales, and associated risks for the attainment of the asset management objectives. Once the AM plans are approved, they will require monitoring, reviewing and consistent feedback. Lastly, the AM plans are incorporated with other

departmental plans such as human resources, finance, health, and safety plans.

For asset management leadership, effective decision making is required by improving the process inclusive of the entire organisation. This promotes shared knowledge and skills across the barriers created by each department. Lastly, obtaining sufficient data quantity and quality in order to make effective decision making. Asset management policy requires the adoption and integration into the organisational strategic plan. Moreover, the integration should be inclusive of other organisational policies such as finance, operations training etc. Senior management is needed to continuously review it, maybe annually, and effectively communicated using a top-down approach.

AM strategy and objectives is defined as the strategic plan, used by the leadership of the assets of an organisation, to make effective decisions using sufficient data quantity and quality to achieve specific, measurable, achievable, realistic and time-constrained objectives to achieve the organisational strategic plan (GFMAM, 2014).

3. Research Method

A descriptive research design strategy is adopted for the research design strategy to answer the research questions. the study investigates the whom in the RSA steel industry and how the critical success factors are implemented and what the limits and merits are for the adoption of GFMAM's most influential subject matters in order to determine the required strategy to be executed. A quantitative approach is used where the various RSA steel organisations providing data and different views will be analysed.

Population selection involves the population that is to address the problems that affected a specific population. In this research, the unit being investigated are RSA steel companies which will be represented by the engineering managers, asset managers, maintenance managers, engineers, artisans, electricians', boilermakers etc. Sampling frame selection is a collection of RSA organisations that produce steel that are operated and maintained by numerous employees. A probabilistic design is where all the relevant personal are known such as engineering managers, asset managers, maintenance managers, engineers, artisans, electricians', boilermakers etc. Sampling size selection of 41 participants. the survey questions will be distributed to the organisations involved and the replies will be monitored.

For this research a data acquisition method was chosen, a single data collection is required which is an online survey. The online survey is a self-administered. This instrument of collecting data is chosen as it can reach a large population from different geographical areas without much time and costs in collecting data.

The dependent variables that could directly impact the RSA steel industry positively and negatively was the following subject matters, as viewed by GFMAM's;

- Asset management strategy and objectives
- Strategic planning
- Asset management planning
- Asset management policy
- Asset management leadership

Once the questionnaire items are developed, a measurement or a scaling process will be required with the sole purpose of translating their characteristics and properties into an arrangement that can be statistically analysed. Once the questionnaire is completed, the scaling process used will translate the characteristics into statistics that can be analysed. Most likely, Microsoft excel will be used to statically analyse the data. Microsoft excel offers a range of graphs and charts in its toolbars and a faster access to frequency, descriptive and statistic functions in its drop-down menus.

4. Results

For this research, the online survey was made up of two parts. The first part used a ranking methodology, to rank the most influential subject matters, as viewed by the GFMAM. Out of a total of 41 respondents, 2 respondents selected the option of not participating in the online survey questionnaire. The second part required used a frequency methodology, to represent the critical success factors and limitations of each of the most influential subject matters. Out of a total of 41 respondents, 2 respondents selected the option of not participating in the online survey. Lastly, this research study did not contain any data that can be considered as outlier data.

The online survey was used to determine the rankings of the most influential subject matters, as viewed by the GFMAM applied to the steel

industry. The highest rank influential subject matter is strategic planning. The second highest ranked subject matter is asset management policy. The third ranked subject matter is asset management leadership. The fourth ranked subject matter is asset management strategy and objectives. Lastly, the fifth ranked subject matter is asset management planning.

RQ2 is used to answer the research objective, by determining the frequencies of the critical success factors of the GFMAM's most influential subject matters in the steel industry. The research study revealed the following CSF's and went further by presenting them in the order of their prioritization according to the steel sector by taking into consideration the percentage results of the slightly agree and strongly agree. For strategy planning, the below was agreed as the critical success factors;

(i) Strong AM leadership.
(ii) AM policy of the set principles and objectives that are aligned with the organisational strategic plan.
(iii) AM strategy and objectives to manage and achieve the set measurable objectives to achieve the organisational strategic plan.
(iv) AM plan that details the activities, resources, responsibilities, timescales, and associated risks to achieve the organisational strategic plan.

For AM policy, the below was agreed as the critical success factors and two of the CSF's were prioritized the same as first;

(i) Adopted and integrated into the organisational strategic plan.
(ii) Incorporated with other organisational policies such as finance, operations, maintenance, standard operating procedures and talent/training management.
(iii) Supported by senior management, effectively communicated using a top-down approach, and regularly reviewed.

For AM leadership, the below was agreed as the critical success factors;

(i) Data capturing of the correct data, with sufficient data quantity and data quality for effective decision making.
(ii) Organisational changes that promote better decision making, shared knowledge and skills, breaking the barriers of mentality silos for the purpose of maximising the value of the assets.
(iii) Effective decision making by improving the process inclusive of the entire organisation, through better use of Financial and non-financial metrics to maximise the value of all assets being managed in the organisation.

For AM strategy and objectives, the below was agreed as the critical success factors;

(i) AM strategy consists of realistic and achievable AM objectives with Specific, Measurable, Achievable, Realistic and Time-constrained (S.M.A.R.T) traits.
(ii) Develop asset data to support and manage risk analysis.
(iii) Decision-making criteria that expand on lifecycle cost and risk analysis.

For AM planning, it was agreed that the critical success factors are;

(i) Details of the activities, resources, costs required to be carried out to obtain the AM strategy and objectives and the AM Policy.
(ii) How the AM plans will be approved, monitored, reviewed, and updated.
(iii) Incorporation of the AM plans with other organisational strategic plans such as human resources, finance, health, and safety plans.

RQ3 is used to answer the research objective, by determining the frequencies of the limitations of the GFMAM's most influential subject matters in the steel industry The research study revealed the following limitations and went further by presenting them in the order of their prioritization according to the steel sector by their ranking order and list them in order of their prioritization by taking into consideration the

percentage results of the slightly agree and strongly agree. For strategy planning, the below was agreed as the limitations;

(i) Lack of the correct data, data quantity and data quality.
(ii) Lack of organisational culture due to reluctance for changes which were agreed upon during the implementation phase but fail in gaining traction within the organisation.
(iii) Lack of effective decision making due to focusing mainly on financial metrics and/or failure in considering the various departments of the organisation.
(iv) Lack of management involvement and commitment in managing and monitoring using the top-down approach in delivering the AM policy, AM strategy and objectives and AM planning.

For AM policy, the below was agreed as the limitations;

(i) Lack of senior management involvement and commitment in ensuring that the strategy and objectives of an organisation permeates into middle management and staff, with set objectives and allocated resources.
(ii) An organisational culture that lacks motivation for change where agreed upon changes are implemented, but do not succeed in gaining traction within the organisation.
(iii) A silo mentality where the AM policy only guides and directs on a short-term in each process within an organisation. This will create tension across the various processes within an organisation.

For AM leadership, the below was agreed as the limitations;

(i) Lack of organisational culture due to de-motivation for changes which were agreed upon during the implementation phase but fail in gaining traction within the organisation.
(ii) Lack of the correct data, data quantity and data quality.
(iii) Lack of management involvement and commitment by strongly managing and monitoring that the AM policy, AM strategy and objectives and AM planning are delivered using the top-down approach.
(iv) Lack of effective decision making due to failure in considering the various departments of the organisation and/or focusing solely on financial metrics.

For AM strategy and objectives, the below was agreed as the limitations;

(i) Lack of the correct data, data quantity and data quality.
(ii) Lack of senior management involvement and commitment by confirming that the strategy and objectives of an organisation permeates into middle management and staff, with set objectives and allocated resources.
(iii) Lack of effective decision making throughout the various departments of the organisation by concentrating solely on financial metrics can hinder maximising value for all involved in managing assets.

For AM planning, the below was agreed as the limitations;

(i) Lack of senior management involvement and commitment by confirming that the strategy and objectives of an organisation permeates into middle management and staff, with set objectives and allocated resources.
(ii) Lack of effective decision making which creates a silo mentality where the AM planning focuses only on a short-term basis and individual process within an organisation. Tension will occur across

the various processes within an organisation.

In conclusion, this research study determined the following research objectives;

- The rankings of the GFMAM most influential subject matters in the steel industry.
- The merits (success factors) and limits of using the GFMAM's most influential subject matters, as identified by Visser and Botha (2015), in the steel industry in RSA.

The limitations of using GFMAM's most influential subject matters, as identified by Visser and Botha (2015), in the steel industry in RSA.

5. Discussion

This section presents the discussion of results covering the rankings, critical success factors, and limitation of the most influential subject matters, the results are presented to map the ranking of the most influential subject matters as achieved in this study. Moreover, the research study accessed the critical success factors and limitations of each of the most influential subject matters by using a likert-scale to determine the frequencies and the results were further investigated which critical factors and limitations should be prioritized by considering the sum of the "slightly agree" and "strongly agree" numbers.

5.1. *Strategic Planning*

The achieved results illustrate that strategic planning as the highest most influential subject matter as represented by the rank, shown in table 1. The steel sector recognised and agree with the formulation of strategic planning; (i) Robust AM leadership (Parlikad, 2013) to develop the (ii) AM policy (GFMAM, 2014) which consists of principles and boundaries that are aligned with the organisational strategic plan, (iii) AM strategy and objectives (GFMAM, 2014) that are achieved with sufficient (iv) AM planning (Sunjka & Mona, 2016) that align with the organisational strategic plan.

The steel sector recognised and agree with the limitations; (i) Lack of the correct data, data quantity and data quality (Parlikad, 2013), (ii) lack of organisational culture changes which were agreed upon during the implementation phase but fail in gaining traction within the rest of the organisation (Parlikad, 2013), (iii) lack of effective decision making due to focusing mainly on financial metrics and/or failure in considering the various departments of the organisation (Parlikad, 2013) and (iv) lack of management involvement and commitment in managing and monitoring using the top-down approach in delivering the AM policy, AM strategy and objectives and AM planning (Sunjka & Mona, 2016).

5.2. *Asset management policy*

The obtained results revealed that asset management policy as the second most influential subject matter as represented by the rank, shown in Table 1. The steel sector recognised and agree with the recipe for asset management policy, and two of the critical success factors were tie; where the asset management policy should be (i) Adopted, integrated and aligned with the organisational strategic plan (Rose, Isaac, Shah, & Blake, 2016) and (i) the support by senior management, effective communication using a top-down approach, and regular reviews (GFMAM, 2014) to ensure that the set principles and boundaries give guidance and direction by (ii) Incorporating with other inter-departmental policies such as finance, operations, maintenance, safety, health, environmental, quality and talent/training management (Sunjka & Mona, 2016) of the organisation to be able to approach asset management.

The steel sector recognised and agree with the limitations; (i) Lack of senior management involvement and commitment in ensuring that the strategy and objectives of an organisation permeates into middle management and staff, with set objectives and allocated resources (Sunjka & Mona, 2016). (ii) An organisational culture that lacks motivation for change where agreed upon changes are implemented, but do not succeed in gaining traction within the organisation (Parlikad, 2013). (iii) A silo mentality where the AM policy only guides and directs on a short-term in each process within an organisation. This will create tension across the various processes within an organisation (Parlikad, 2013).

5.3. *Asset management leadership*

The obtained results revealed that asset management leadership as the third most

influential subject matter as represented by the rank, shown in table 4.1

The steel sector recognised and agree that the formula for success for asset management leadership to promote the an entire AM lifecycle; (i) Data capturing of the correct data, with sufficient data quantity and data quality for effective decision making (Parlikad, 2013), (ii) Organisational changes that promote better decision making, shared knowledge and skills, breaking the barriers of mentality silos for the purpose of maximising the value of the assets (Parlikad, 2013) and (iii) Effective decision making by improving the process inclusive of the entire organisation, through better use of Financial and non-financial metrics to maximise the value of all assets being managed in the organisation (Parlikad, 2013).

The steel sector recognised and agree with the limitations; (i) lack of organisational culture due to de-motivation for changes which were agreed upon during the implementation phase but fail in gaining traction within the organisation (Parlikad, 2013), (ii) lack of the correct data, data quantity and data quality (Parlikad, 2013), (iii) lack of management involvement and commitment by strongly managing and monitoring that the AM policy, AM strategy and objectives and AM planning are delivered using the top-down approach (Sunjka & Mona, 2016) and (iv) lack of effective decision making due to failure in considering the various departments of the organisation and/or focusing solely on financial metrics (Parlikad, 2013).

5.4. *Asset management strategy and objectives*

The achieved results illustrate that asset management strategy and objectives as the fourth most influential subject matter.

The steel sector recognised and agree with the following methodology for implementation of asset management strategy and objectives; (i) AM strategy consists of realistic and achievable AM objectives with Specific, Measurable, Achievable, Realistic and Time-constrained (S.M.A.R.T) traits (Sunjka & Mona, 2016) guided by the sufficient (ii) development of asset data to support and manage the risk analysis (GFMAM, 2014) and (iii) the decision-making criteria that expand on lifecycle cost and risk analysis (GFMAM, 2014).

The steel sector recognised and agree with the limitations; (i) lack of the correct data, data quantity and data quality (Parlikad, 2013), (ii) Lack of senior management involvement and commitment by confirming that the strategy and objectives of an organisation permeates into middle management and staff, with set objectives and allocated resources (Sunjka & Mona, 2016) and (iii) Lack of effective decision making throughout the various departments of the organisation by concentrating solely on financial metrics can hinder maximising value for all involved in managing assets (Parlikad, 2013).

5.5. *Asset management planning*

The achieved results illustrate that asset management planning as the fifth most influential subject matter as represented by the rank, shown in table 4.1. The ranking results are in alignment with the research study, as stated in chapter 2.

The steel sector recognised and agreed with the following methodology for implementation of asset management planning; (i) details of the activities, resources, costs required to be carried out to obtain the AM strategy and objectives and the AM Policy (Sunjka & Mona, 2016), (ii) how the AM plans will be approved, monitored, reviewed and updated (GFMAM, 2014) and (iii) the incorporation of the AM plans with other organisational strategic plans such as human resources, finance, health, and safety plans (GFMAM, 2014).

The steel sector recognised and agree with the limitations; (i) lack of senior management involvement and commitment by confirming that the strategy and objectives of an organisation permeates into middle management and staff, with set objectives and allocated resources (Sunjka & Mona, 2016) and (ii) the lack of effective decision making which creates a silo mentality where the AM planning focuses only on a short-term basis and individual process within an organisation. Tension will occur across the various processes within an organisation (Parlikad, 2013).

6. Conclusion

The findings of this research underscore the critical role of the Global Forum for Maintenance and Asset Management's (GFMAM) subject matters in shaping asset management practices within the South African steel industry. Strategic

planning emerged as the most influential factor, emphasising robust leadership and alignment with organisational objectives. Similarly, the prominence of asset management policy and leadership reflects the necessity of cohesive frameworks and effective decision-making processes. These insights are vital for addressing industry challenges, particularly in an environment characterised by economic pressures and the need for sustainability.

Moreover, the identification of critical success factors and limitations provides actionable guidance for practitioners and policymakers. For instance, fostering a culture of collaboration and ensuring data quality were consistently highlighted as pivotal elements for effective asset management. The limitations, such as resistance to organisational change and inadequate senior management engagement, present significant barriers but also opportunities for targeted interventions to enhance implementation effectiveness. These findings serve as a valuable foundation for refining asset management strategies to meet evolving industry demands.

By leveraging the GFMAM's subject matters, South African steel organisations can navigate the complex interplay between operational efficiency and strategic goals.

6.1. *Limitations of this Research*

This study acknowledges the importance of the ISO 55000 series in asset management. However, the focus was specifically on the GFMAM framework, as it is widely used for assessing asset management maturity and best practices rather than to assess compliance with international standards.

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