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The Impact of Inventory Movements on Financial Performance at Arab Potash Company

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Abstract

The inventory of Spare parts is considered an important portion of the financial statement of capital-intensive companies, and they are classified according to their movements to fast moving, slow moving and unmoved (obsolete) Spare parts. The purpose of this research is to study the impact of inventory movements on the financial performance at Arab Potash Company. The study adopts the descriptive research approach. It will be conducted on the past nine years' financial statements of Arab Potash Company to determine the impact relation on financial performance measures of profitability and liquidity indicators at Arab Potash Company. The findings are found significant on both profitability and liquidity measures, while the researcher provided some recommendation for the decision makers to mitigate the impact value on the firm.

Key Words : Inventory, Movements, Financial, Performance, Potash.

1. INTRODUCTION

Maximization of its worth is the core financial goal of an organization. Most financial literature includes data on various variables that influence valuation. Net working capital and aspects that produce it, such as the level of cash tied in receivable accounts, inventories and operating cash flows, are among those variables. The calculation of the impact of adjustments in the decisions of an organization in the field of inventory management is a balance between reducing risk by providing greater inventory and limiting inventory costs. This is the crucial topic of corporate financial management (Grzegorz, 2008, p. 82).

There are a variety of explanations for keeping inventories. Organizations can retain a certain amount of stock levels, with the assumption that they will be required in the future (Ghosh & Kumar, 1991, as cited in Masudin et al, 2018, p. 34). Capital-intensive enterprises are also challenged due to high system availability criteria. Therefore, the most important resource to this purpose is the spare parts. Unavailability of spare parts in one of the

Theoretical Background

main problems which can lead to long unplanned shutdowns or slowdown of the system with direct results on the firm's profit. On the other hand, retaining large stocks of spare parts locks up money, which often leads to considerable costs and consumes a major portion of investment in capital. This makes spare parts handling a vital subject worth studying carefully (Roda et al., 2014, p.528-529).

According to Roda et al. (2014, p. 530), and Baluch et al. (2013, p. 69) mining is an industry where maintenance costs can be calculated at between 40 and 50% for a fraction of the overall operational expenditure annually, and this can generally lead to high commitment to maintenance optimization. This justifies the sector as a strong representative of advanced procedures, even concerning the management of spare parts. Depending upon previous mentioned reasons Arab Potash Company (APC) will be chosen as the target for this empirical research analysis which aims to identify the current discrepancies between actual industrial practice and literature; the recommended direction is therefore considered to be the

and spoilage. However, maintaining a low level of inventory can lead, in turn, to other problems in meeting supply demands.

Furthermore, Masudin et al. (2018, p. 33) stated that efficient materials handling can lead to a decrease in costs, resulting in considerable savings and thus increased operational efficiency. Also Maximizes revenue by stopping surplus inventory from being kept, which would ultimately end up being written off. The handling of slow moving or obsolete inventory is the biggest issue for the manufacturing, storage and industrial sectors. In order to increase customer service and to minimize production, inventory and holding costs, an efficient inventory Monitoring system should be created and introduced (Kocer & Tamer, 2011, p. 6), and (Balaji & Kumar, 2013, p. 243).

1.1 Problem of Research

Companies are concerned in improving their financial performance and profitability through minimizing the investment value in fast-moving spare parts, reducing the holding costs of excess slow-moving spares and eliminating unmoved (obsolete) stock of spare parts. The improvement of spare parts management would increase Arab Potash Company profitability and financial results in the present time and future. Accordingly, the study intends to define the relationships among spare parts inventory values based on their movement's classifications and financial performance indicators at Arab Potash Company.

1.2 Research Questions

The main research question of this study:

What are the impacts of inventory movements of spare parts on financial performance measured by the profitability and liquidity indicators of Arab Potash Company?

While the study attempts to answer the following sub-questions:

1. What is the impact of inventory movements of spare parts on the financial performance measured by initial goal for the capital-intensive sector as a function of the related cost of spare parts in relation to the overall maintenance costs. Also, Forbes Middle East Magazine had recognized APC with the rank of 96 in the list of top companies in the Middle East 2019; honors some of the largest and most profitable companies in the country.

In many respects, spare parts inventories differ from those of other manufacturers. To begin with, the functions are distinct. In order to smooth out output flow irregularities, work-in-process (WIP) inventories are used. Quality standards, system performance speeds, labor problems, schedule issues, power and demand discrepancies, and other well-known manufacturing characteristics are all examples. Spare parts inventories, on the other hand, are designed to help maintenance workers maintain machines in good working condition. Spare parts aren't finished or intermediate products that can be sold to customers. Second, the regulations for spare parts inventories differ from those for WIP and finished goods inventories. WIP and final product inventory levels may be increased or reduced by changing production rates and plans, increasing performance, reducing lead times, and so on. (Kennedy et al., 2002, p. 201).

For a corporation, inventory monitoring is critical because the mismanagement of inventory affects the profitability of a company. Too much inventory is consuming space, creates financial burdens and increases the risk of destruction, loss and waste (Lwiki et al., 2013, p. 76). In this context, Grzegorz (2008, p. 82), Masudin et al. (2018, p. 34), Teixeira et al. (2018, p. 2) and Koumanakos (2008, p. 356) mentioned that the goal of simple financial inventory monitoring is to maintain the inventory at a level that is minimally appropriate in relation to its costs. Inventory holding involves using money to fund inventory and links with inventory storage, insurance, transportation, obsolescence, cost of waste

parts (fast-moving spare parts (FMS), slow-moving spare parts (SMS) and unmoved (obsolete) spare parts (OBS)) on financial performance measured by the return on assets (ROA) of Arab Potash Company.

H_{01-2}: There is no statistically significant impact of the movements of spare parts (fast-moving spare parts (FMS), slow-moving spare parts (SMS) and unmoved (obsolete) spare parts (OBS)) on financial performance measured by the return on equity (ROE) of Arab Potash Company.

H_{01-3}: There is no statistically significant impact of the movements of spare parts (fast-moving spare parts (FMS), slow-moving spare parts (SMS) and unmoved (obsolete) spare parts (OBS)) on financial performance measured by the net profit margin (NPM) of Arab Potash Company.

H_{01-4}: There is no statistically significant impact of the movements of spare parts (fast-moving spare parts (FMS), slow-moving spare parts (SMS) and unmoved (obsolete) spare parts (OBS)) on financial performance measured by the gross profit margin (GPM) of Arab Potash Company.

The second main research hypothesis of the study:

H_{02}: There is no statistically significant impact of the movements of spare parts (fast-moving spare parts (FMS), slow-moving spare parts (SMS) and unmoved (obsolete) spare parts (OBS)) at the level of indication ($\alpha \leq 0.05$) on financial performance measured by the liquidity of Arab Potash Company.

It follows the following three sub hypotheses:

H_{02-1}: There is no statistically significant impact of the movements of spare parts (fast-moving spare parts (FMS), slow-moving spare parts (SMS) and unmoved (obsolete) spare parts (OBS)) on financial performance measured by the return on assets (ROA) of Arab Potash Company?

2. What is the impact of inventory movements of spare parts on the financial performance measured by the return on equity (ROE) of Arab Potash Company?
3. What is the impact of inventory movements of spare parts on the financial performance measured by the net profit margin (NPM) of Arab Potash Company?
4. What is the impact of inventory movements of spare parts on the financial performance measured by the gross profit margin (GPM) of Arab Potash Company?
5. What is the impact of inventory movements of spare parts on the financial performance measured by the current ratio (CR) of Arab Potash Company?
6. What is the impact of inventory movements of spare parts on the financial performance measured by the working capital turnover (WCT) of Arab Potash Company?
7. What is the impact of inventory movements of spare parts on the financial performance measured by the operation ratio (OPER)) of Arab Potash Company?

1.3 Study Hypotheses

The study has two main hypotheses, The first main research hypothesis of the study:

H_{01}: There is no statistically significant impact of the movements of spare parts (fast-moving spare parts (FMS), slow-moving spare parts (SMS) and unmoved (obsolete) spare parts (OBS)) at the level of indication ($\alpha \leq 0.05$) on financial performance measured by the profitability of Arab Potash Company.

It follows the following four sub hypotheses:

H_{01-1}: There is no statistically significant impact of the movements of spare

(FMS), slow-moving spare parts (SMS) and unmoved (obsolete) spare parts (OBS)) on financial performance measured by the operation ratio (OPER) of Arab Potash Company.

1.4 Study Model

The research model of this empirical study is shown in Figure 1. It aims to study the impacts of three Independent Variables (fast-moving, slow-moving and unmoved (obsolete) Spare parts) on the financial performance indicators of the profitability and liquidity of Arab Potash Company.

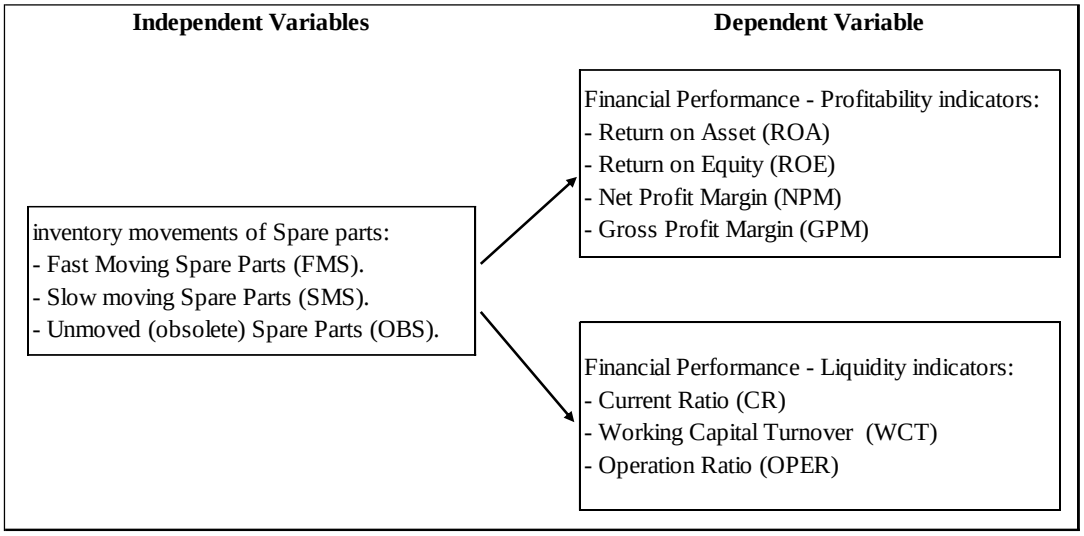

Figure 1

This model was prepared by the researcher based on the literature of the relevant study.

3. Determine the impact of inventory movements of spare parts on the financial performance measured by the net profit margin (NPM) of Arab Potash Company?
4. Determine the impact of inventory movements of spare parts on the financial performance measured by the gross profit margin (GPM) of Arab Potash Company?
5. Determine the impact of inventory movements of spare parts on the financial performance measured by the current ratio (CR) of Arab Potash Company?
6. Determine the impact of inventory movements of spare parts on the financial performance measured by

1.5 Objectives of Study

The main objective of the study is to Determine the impact of inventory movements on the financial performance measures of the profitability and liquidity of Arab Potash Company.

The following particular objectives were u sed to fulfill the main objective:

1. Determine the impact of inventory movements of spare parts on the financial performance measured by the return on assets (ROA) of Arab Potash Company?
2. Determine the impact of inventory movements of spare parts on the financial performance measured by the return on equity (ROE) of Arab Potash Company?

current ratio (CR) of Arab Potash Company.

H_{02-2}: There is no statistically significant impact of the movements of spare parts (fast-moving spare parts (FMS), slow-moving spare parts (SMS) and unmoved (obsolete) spare parts (OBS)) on financial performance measured by the working capital turnover ratio (WCT) of Arab Potash Company.

H_{02-3}: There is no statistically significant impact of the movements of spare parts (fast-moving spare parts

used to support maintenance workers with maintaining machinery in good condition. Spare parts aren't finished or intermediate products that can be sold to customers. When the machinery for which the spare parts were made becomes obsolete and is replaced, obsolescence will be a problem. An obsolescence problem arises as those replacement parts are no more used in the system because they are no longer used for repairing. (Teixeira et al., 2018, p. 3).

According to Teixeira et al. (2018, p. 1), The spare part management role supports maintenance activity through actual information on available quantities of spare parts and the implementation of inventory policies which ensure their availability whenever required as well as cost reduction.

Vereecke and Verstraeten (1994, p. 280) defined safety stock as the product of the demand standard deviation during the lead time and a factor relevant to the required service level. Where the service level is the likelihood of no stockout during an order cycle, i.e., the time interval between two successive supply orders that is also the amount of order cycles that do not result in a stockout as compared to the overall number of order cycles.

Slow moving items, according to Braglia et al. (2004, p. 62), are spares that have not been used during a predetermined interval of time (five months). This concept is displayed in Fig 2. Dead Stock (Unmoved) items are spares with an inventory level that has never dropped below a predetermined level (dead stock) in a specified time interval (generally two years). Figure 3 shows this idea.

the working capital turnover (WCT) of Arab Potash Company?

7. Determine the impact of inventory movements of spare parts on the financial performance measured by the operation ratio (OPER)) of Arab Potash Company?

2. THEORETICAL FRAMEWORK & LITERATURE REVIEW

2.1 Theoretical Framework

Arab Potash Company inventory consists of about 60,000 stock items with an average annual cost of around JOD 49 million over the past nine years. The inventory includes various types of direct maintenance spare parts, production raw materials, Fuels, industrial oils and chemicals and consumable items. In which, about 10% of items represent the value of slow-moving items that was purchased and had never been used for three years ago and about 3 % of the items represent the obsolete (written off) spare parts that are related for expired, not used and obsolete equipment’s items (APC, 2012-2020).

Spare parts are parts that are used to keep owned machinery in good working order by meeting replacement and repair requirements imposed by breakdowns, preventive, and predictive maintenance (Baluch et al., 2013, p. 69). A spare part is an item that is designed to substitute a corresponding item in order to restore the item's original function (NP EN 13306, 2007, as cited in Teixeira et al., 2018, p. 3). Kennedy et al. (2002, p. 201-202) mentioned that spare part inventories are

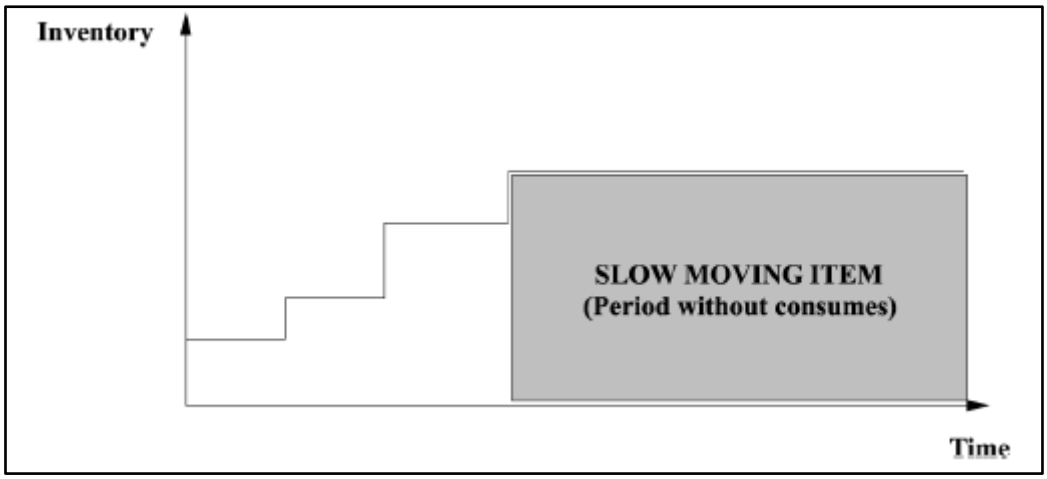

Figure 2
Slow moving concept. (Braglia et al., 2004, p. 61).

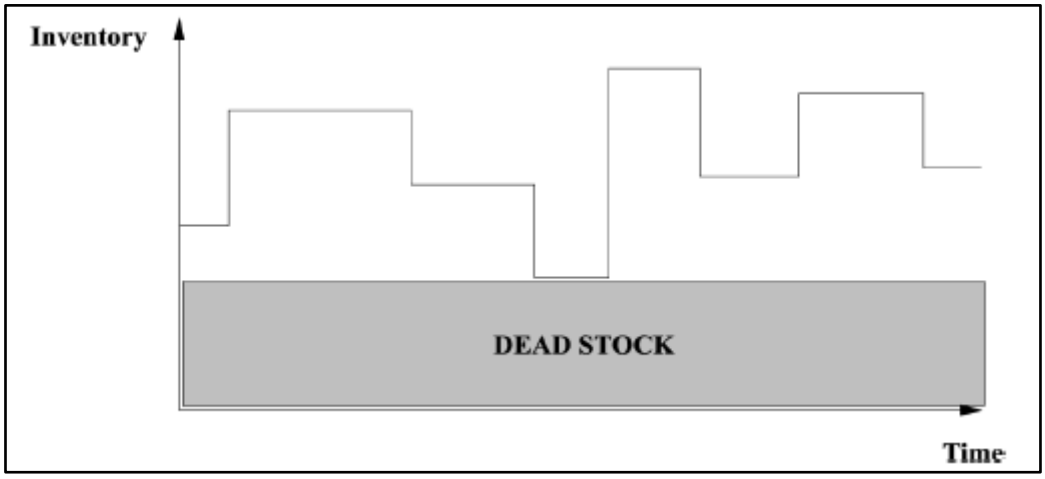

Figure 3
Dead stock concept. (Braglia et al., 2004, p. 61).

classification, according to Braglia et al. (2004, p. 57), is the most well-known and widely used classification system for managing spare parts inventory management problems.

Another quantitative method is the FSN, which separates items into three categories: fast (F), slow (S), and non-moving (N). The method is focused on demand pattern analysis, which leads to a specific type of classification that focuses on spare part movement rates (Bosnjakovic, 2010, p. 501), and (Cavalieri et al., 2008, p. 383). This classification is helpful because it is important to show that after several years, obsolete replacement parts are no longer moving (Cavalieri et al., 2008, p. 386).

The ABC analysis is a tool for identifying products that have a direct effect on total inventory costs, as well as a method for identifying various stock categories that need different management and controls (Lun & Cheng, 2010, p. 160). The objective of the study by ABC is to classify inventory products in three groups: (A, very relevant), (B), (moderately important) and (Relatively non-important) (Hatefi et al., 2014, p. 782), and (Prakash & Chin, 2017, p. 315). ABC analysis is easy to use and facilitates product inventory management in a reasonably homogeneous way (Flores, 1987, p. 83). The conditions for classification include annual product demand and average price per item (Ramanathan, 2006, p. 696). ABC

control in an organizational financial statement. When inventories are properly managed, capital inventory management has a productive influence on the financial performance of the enterprise, either directly or indirectly (Masudin et al., 2018, p. 35).

Kennedy et al. clarified the factors that differentiate maintenance inventories from WIP or finished product inventories in order to provide a concise overview of maintenance inventories (2002, p. 202) in greater detail. The following are the factors:

1. Maintenance regulations, not consumer demand, determine the need for spare parts inventories. One way to recover a machine's functionality is to repair a faulty component, for example. It's even possible to replace the part. The choice of whether to replace or repair has a big effect on maintenance inventory. Another consideration is how much redundant equipment to have in a machine. If there are so many redundant parts, it might be possible to repair all non-working parts at once and have a few replacement parts on hand; if there is no redundancy, there is a stronger need for quickly available spare parts.
2. In most cases, particularly for new equipment, reliability data is not available to the degree required for failure time prediction. Continuous computer monitoring has the benefit of allowing an operator to predict when a device may need to be repaired or replaced. However, due to the high cost of such surveillance devices, it is not possible to install it on all devices.
3. Failures of parts are also correlated. This is troublesome, especially if the dependency relationship is ambiguous.
4. Parts demand is sometimes met by cannibalism of other parts or components.

The Vital, Essential, Desirable classification (VED) is a qualitative tool for categorizing items. The VED classification system is dependent on a repair expert's knowledge (Mukhopadhyay et al., 2003, p. 13).

A multilevel hierarchy of priorities, parameters, sub-criteria, and options is developed through the analytical hierarchy process (AHP). The weight of each criterion and the relative performance metrics of alternates for each criterion are determined by these comparisons. In cases where the measurements are not consistent, this method both verifies their consistency and provides a way to improve it. (Triantaphyllou & Mann, 1995, p. 36), (Viriyasitavat, 2016, p. 20) and (Xu et al., 2003, p. 880).

2.2 Study contribution

The inventory management has positive impact on the financial performance of industrial firms. Inventory management is looking to minimize the investment on excess inventory and reduce the volume of slow-moving spare parts as a primary portion of the current asset, which influence inversely the profitability and financial index of capital-intensive firms. This study will be a new addition that tests the impact of inventory movement’s categories of fast-moving, slow-moving and unmoved (obsolete) spare parts together on the financial performance of industrial capital-intensive firm as Arab Potash Company.

The researcher will recommend the inventory policy matrix described by Braglia et al. (2004, p. 61) to formulate a new process of spare parts management, in order to have a lean inventory management without waste and excessive inventory of spare parts.

2.3 Literature Review

Cost management remains a crucial tool for ensuring competitiveness in the industry in today's competitive environment. Inventory management is seen as an essential function that guarantees

were considered sufficient because of maintenance and operations concerns regarding the need to always have the necessary MRO supplies and resources on hand (Timme & Christine, 2003, p.32). An effective asset management policy necessitates careful spare parts inventory preparation and monitoring. If the appropriate parts are not on hand when regular maintenance or upgrades are needed, slowdown is increased. When there are too many pieces on site, the business absorbs additional costs and overhead associated with inventory management.

According to Lwiki et al. (2013, p. 79), there have been numerous attempts to explain the financial performance of companies in the fields of corporate strategy, economics, accounting, management and marketing research. Because each of these areas depends on several explaining variables, the scope of this survey review would be limited to papers that are specifically applicable. Roumiantsev and Netessine (2005, p. 24-25) looked into the connection between inventory control and a company's financial efficiency. The aim of the study was to see how inventory management practices affected financial efficiency from 1992 to 2002. Explanatory variables included traditional firm-specific variables such as inventory levels, lead times, and margins. They discover no indications that relatively lower levels are linked to financial performance as determined by return on assets ROA.

A survey of twenty cement firms in India was conducted by Panigrahi (2013, p. 1437) to determine the financial effect of inventory management. He determined that the amount of time used to turn inventory into cash was inversely related to profitability. Similarly, an investigation was undertaken on 24 government-funded companies by Kilonzo et al. (2016, p. 40) and their findings showed that inventories involve unnecessary investment. They therefore suggested that the holding of inventory should be properly handled by

5. The costs of not having a part normally cover both quality and reduced production, which are both impossible to quantify. Increased risk to employees is another factor to weigh, and the associated costs with those risks are impossible to estimate.
6. Obsolescence may be an issue if the equipment with which the replacement parts were made become outdated and are replaced. It may be difficult to determine how many items of a part to have on hand with an obsolete machine, and it can be difficult to substitute a part that no one has on hand.
7. If the main unit of equipment is expensive, parts are more likely to be stored than complete systems, and maintenance would be preferred over replacement if possible.

Spare parts in the manufacturing industry include consumables such as welding rods and additives used in water treatment. Maintenance tools and supplies, which include hand tools, machine tools, and advanced equipment such as bearing assembly kits, weld sets, portable lathes, band saws, grinders, pipe benders, electric diagnostic meters, and many others, are often confused with replacement ones. The replacement parts for maintenance, repair and overhaul (MRO) are different from those for production, because their demand is producing dependent and stable, easier to estimate because of more reliable movement trends, and are normally input and output of a production process (Baluch et al., 2013, p. 69).

In several maintenance companies, the general philosophy was that high stock levels and enough SKUs are maintained on site to ensure machines can be serviced and repaired at the moment. The real cost of managing this ecosystem is very high but there is no consideration and examination of the overall costs directly related to this decision. Traditionally, the costs collected

practices are strongly linked to return on sales (ROS) and profitability.

Flint (1995, p. 105) estimates that the airline companies holds $45 billion in replacement parts and recommends reducing spare parts inventories aggressively through supply contracts, renting and accumulating inventories, shortening cycle times, and replacing non-productive stocks. He claims that the aviation industry is reluctant to respond to deregulation, and that it lags behind the other industries in reducing excess inventory. The financial effect of spares inventory in this sector is staggering, and when other considerations are taken into account, the need for improved spare parts management becomes explicit. Womack et al. (1990) pioneered the Lean production concept. This theory has been related to lower inventories. The argument is that profit will increase due to interest rate reduction, as well as a reduction in storage fees, waste and handling as inventory is decreased (as cited in Koumanakos, 2008, p. 356). Brigham & Gapenski (1993) Literature has calculated these savings to be in the region of 20 -30 percent.

In the intensely demanding world of today, Lean Management is gaining more and more recognition. Proponents of the lean inventory scheme contend that having too much inventory will hurt a company's operational cash flow. (as cited in Koumanakos, 2008, p. 367). Koumanakos (2008, p. 357) In a study that spanned the years 2000 to 2002, he looked at the effect of inventory control on company efficiency in 1358 manufacturing companies in Greece working in three industries: food, chemicals and textiles. The hypothesis tested the idea that lean inventory control increases an organization's economic performance. The findings show that the smaller the rate of return, the greater the volume of inventories kept by a company (departure from lean management).

Organizations with really large inventory levels are more likely to have poor profitability, according to Boute et al. reordering costs, holding costs and stocking out costs to ensure smooth running in a business. In order to determine how inventory management affects organizational efficiency, Koumanakos (2008, p. 366) conducted a two-year study of Greek manufacturing companies dealing with food, textiles and chemicals. Lean inventory control helps the company to maximize its financial efficiency as checked by the experiment, and the conclusion implies that if the organization keeps enough inventory in its possessions, the organization will earn lower return rates.

Sanghal (2005) investigated the effect of surplus inventory on long-term stock market performance in the United States (as cited in Lwiki et al., 2013, p. 79). The study calculated the long-run market effect of excess inventory using 900 overstock statements released by publicly listed firms between 1990 and 2002. Those statements are straightforward, consistent, and acknowledge that there is an inventory levels issue. Production terminates, price reductions, extended shutdowns, inventory write-offs, and promotions to liquidate inventory are all examples of ways to deal with surplus inventories. He discovered evidence indicating that the share market partially assumes surplus inventories and that businesses had a difficult time recovering from the detrimental effects of excessive inventory. He also mentioned that excess inventory has a significant economic and statistical effect.

Agus and Noor (2006, p. 16) in Malaysia investigated the relationship between Practices in inventory accounting and operating statements. The study examined managers' views of supply chain and inventory management processes, as well as the sector's level of efficiency. Lean inventory systems, infrastructure and mutual collaborations with vendors are used in the practice. They used a standardized questionnaire to evaluate the businesses based on the criteria set out. The findings show that inventory management

profitability was calculated by return on assets (ROA). The use of various financial performance measures according to Capkun et al. (2009, p. 792) and Koumanakos (2008, p. 358) makes it possible to evaluate both the level of profit above the cost of production (gross profit) and the level after operating expenses (operating profit). The addition of discrete inventory component output facilitates a search for any differential effects on production and operating expenses.

Sahari et al. (2012, p. 66) stated that firm performance is measured using ROA to assess financial performance, which is determined as the reported net income of a company divided by the net value of its total assets. According to Cannon (2008, p. 586) ROA is a strictly accounting metric and used the same calculation to study financial performance and inventory improvement among US manufacturing firms. Ionescu et al. (2018, p. 70-71) used two measurement classes to evaluate the financial performance; the financial performance and financial position indicators. The financial performance indicators are included in Table 1, while financial positions indicators are included in below Table 2:

(2006, p. 688). Chen et al. (2005, p. 22) found that firms with unusually high inventory levels have unusually poor stock returns, firms with unusually low inventory levels have normal stock returns, and firms with slightly smaller than average inventory levels perform better over time by studying how the share prices of businesses compare to their respective inventories' strategies. Eroglu and Hofer (2011, p. 365) used the Empirical Leanness Measure as a metric for inventory control and found a significant positive relationship among spare parts management practices and performance. They argued that the perfect instrument for inventory control is inventory leanness. Inventory is considered by Lean manufacturing itself as a form of waste that can be avoided and it has become synonymous with effective inventory management. Their research found that profit margins are positively influenced by leanness.

The findings of a strong relation between spare parts management practices and profitability are consistent with Makori and Jagongo (2013, p. 12), who found a significant relationship between inventory control and profitability and where

Table 1

Financial performance of an entity (Ionescu et al., 2018, p. 71)

Result Indicator	Profitability Indicators	Efficiency Indicators
(±) Value added	(±) Return on assets ratio (ROA)	(±) Operating expenses ratio (Operating expenses / Operating incomes)
(±) Gross operation surplus	(±) Return on equity ratio (ROE)	
(±) Operation results	(±) Return on sales (ROS)	(±) Total operation expenses ratio (Total expenses / Total incomes)
(±) Net operating result	(±) Return on consumed resources (ROCR)	

Table 2

Financial Situation / Position of an entity (Ionescu et al., 2018, p. 70)

Indicator of Financial Balance	Liquidity and solven indicators	Activity indicator
(±) Working capital (WC) (±) Working capital requirement (±) Working capital to current asset (Working capital /Current assets) (±) Working capital requirement to working capital (Working capital / Working capital requirement)	(±) Current liquidity (Current asset / Current liability) (±) Global solvency (Total assets / Total debt)	(±) Inventory turnover ratio (±) Inventory turnover period ratio

difficulties in obtaining a spare part against the inventory's keeping costs and the probability that the replacement parts stock will become redundant before it has been used. For items that are seldom used, obsolescence is a challenge. Parts which use is closely related to routine maintenance can be expected in the short and medium term (Geraerds, 1992, p. 212).

According to Durán et al. (2016, p. 20) obsolescence is a well-known issue that happens from time to time, involving the selection of parts that have become obsolete and the determination of new parts as replacements. This is largely due to environmental changes in the external context, whether or not the item is obsolete, which items should be purchased, and assessments of storage procedures, manufacturers, etc. are then needed towards the end of the life of the spare parts which are currently in use. The need to store spare parts and the possibility of obsolescence

We are talking of things which are replacement parts for actual plant equipment as we think about the stock of spare parts. The inventory of replacement parts is maintained as a precaution against extended downtime of machinery. The inventory of replacement parts is also comparatively expensive compared with the daily repair products, such as standard valves, etc. Since there are specialist uses in the inventory of replacement parts, if there is no need for equipment to use it, the replacement part remains in stock. It has no other purpose than to sit in stock as an insurance cost against slowdown. Since the replacement part is used in machines where excessive breakdown can be very expensive or risky, it is usually stocked because purchasing the parts from the vendor on convenient times is difficult. The volume of spare parts inventory is determined by balancing the risk/cost of extended replacement of a vital part due to

Walker (1996, p. 1301) states that obsolescence is taken into account only when using maintenance inventories that take the spares or spares "insurance" form into consideration and that are highly likely not to be used during lifespan of the machine. He claims that the rationale for buying insurance-type items would be that the cost is considerably lower if they are bought with new machinery than if they are purchased separately later. In comparison to most systems, which consider spare parts stock as if it were a reference population of endless part failures. He develops a model that defines a target performance measure and calculates the smallest number of spares required to meet the service standard. The EOQ model was used to determine the risk of an unexpected instant obsolescence in the stock of the replacement parts by Cobbaert and Van Oudheusden (1996, p. 245-246). In a variety of cases, they examine the impact of obsolescence on prices. In situations where no shortages are allowed, where there is a varying chance of obsolescence but no shortage is allowable and where the potential for obsolescence varies but such shortage may be permitted, which involves a constant risk of obsolescence. According to their findings, ignoring a 20 percent chance of obsolescence would result in a cost rise of up to 15% on average.

Despite the fact that all divisions of an organization are working for the same goal of cost savings, conflict persists due to fear of stock out, the perception of stock as "cheap insurance," and a lack of understanding of the overall cost of inventory keeping. “Cheap insurance” is built on the presumption that stock is normally deducted when received rather than released, and that the premium is insignificant in comparison to the potential sales loss if processes were suspended for any measurable amount of time due to a shortage of spare parts. The trading between inventory and basic service management shows the need for prediction accuracy, component production, and was revealed in a research released by Ikhwan and Burney (1994, p. 73), whom found that the most major problem for 34% of the firms they studied in Saudi Arabia was delays in purchasing replacement parts.

Spare item obsolescence is a bigger problem in some sectors than it is in other. For example, in the hardware and computing industry, where computer technologies are constantly changing, a computer sales business may not find it economically effective to maintain vast volumes of inventory in order to sell their older machines at a predetermined time. Key machine parts for servers, on the other hand, may be kept in storage. The opportunity to easily provide replacement parts is a critical aspect of after-sales operation in other sectors, such as a technology service supplier or a car dealer (Cohen and Lee, 1990, p. 61).

Many inventory systems do not take obsolete inventory cost into account. In fact, in their analysis of maintenance models, Cho and Parlar (1991, p. 12-13) found no research that took into consideration obsolescence. They looked at maintenance inventory systems that contained the costs of redundant spares in inventory keeping costs, but they didn't specifically understand the obsolescence risk distribution. They did note one pattern that involved non-repairable spare part disposal costs. In a scenario where purchasing lead time will escalate prices, Zohrul and Al-Olayan (1996, p. 175) use a simulation to decide the best age replacement strategy. They model a situation in which the keeping cost is considerably lower than the purchasing and shortages charges, as is the situation in most factories, according to them. Obsolescence costs are taken into account into the expense of maintaining a replacement parts inventory volume in a multi-echelon process by Kim et al. (1996, p. 295). They devised an efficient algorithm for calculating spare parts quantities that minimizes total estimated costs while maintaining a set service rate.

option by dividing the purchasing into two parts: the original purchase and the purchase over the machine's lifespan. Duration is modeled as a continuous variable rather than being divided into discrete cycles of equal length. The original provisioning is based on an endless life expectation, while the lifetime purchasing is based on a finite life expectation. Purchase, holding, and back-order costs are all included in the overall expected costs. The residual lifespan is determined. As a result, an initial acquisition estimation is obtained, which, when contrasted to the optimal outcome following initial provisioning, generates the best strategy for the machine's entire lifespan.

Kaio and Osaki (1978, p. 270) model regular and emergency ordering. They presume spare parts are bought on a daily basis and kept in stock, but also that they are only used for repair if a malfunction happens. In this scenario, a consistent lead-time is sometimes considered. If a unit fails before the ordering deadline (and lead-time) for receiving the spare, an urgent order can be placed, and the urgent lead-time covers the regular lead-time. And if the urgent lead-time is less than the usual lead-time, the costs associated with the shortfall and speeding up the order are higher than the value associated with inventory and the standard order, since the loss has already happened. The cost effectiveness function considers the total failure time as well as the costs of both the normal and expedited orders. This role is amplified to find the best solution that combines device efficacy (as described by stock availability) and cost (expected cost rate). Although the enhancement of a supply chain management is often focused at “how we buy,” asset maintenance's probabilistic essence necessitates consideration of “why we buy” (Mather, 2008, p. 5). Management of spare parts one of the core mechanisms that supports efficient maintenance planning and scheduling as well as equipment reliability enhancement is dispensing a coordinated strong analytical skill in spare parts control. The existence of spare parts and the availability of machinery for service asserts the maintenance as well as regular business activities; equipment breakdown means wasted manufacturing capability (Driessen et al., 2015, P. 1), (Baluch et al., 2013, p. 69).

Bridgman and Mount-Campbell (1993, p. 511) exclude the requirement that the machinery in need of a spare be working at all times. They find out that certain systems are not in service all of the time and could have planned downtime. As a result, the amount of inventory required is decreased. This lowers the cost of stock out in the event of a spare’s shortage. They look at warehouse inventory plans for the space shuttle, as certain inventory spares are expected to become redundant as the shuttle's subsystems are updated. This raises the likelihood of incurring costs as a result of obsolete inventory. When a replacement part is needed but not available, the cost of a shortage is always significant for many production facilities. Around the same time, the existing spare parts stock is unsustainable and must be drastically decreased. As a consequence, any improvement in the control of this inventory item is beneficial and useful in service, resulting in greater factory productivity and lower inventory costs (Braglia et al., 2004, p. 55).

A variety of researchers have developed optimization models. According to Petrovic et al. (1990, P. 367), to address the question of optimal spare stock solutions, knowledge processing should be combined with conventional data processing. Sparta (spare parts advisor), a microcomputer-based expert system, was founded by them. Haneveld et al. (1997, p. 192) propose a relatively close solution for slow-moving, costly spare item. The problem is important when it considers the huge costs involved where the lack of component resulted in the loss of expensive machinery and the occasional case for breakdown of the part. It seeks the best

at a reduced expense. The other big concern is raising consciousness about the importance of reform, and once opportunities have been established, implementing change within the company is crucial times (Timme & Christine, 2003, p.33).

In the world of maintenance, there is an implicit assumption of part availability. The expectation can be easily fulfilled in many cases. However, for certain parts classifications, the assumption is unrealistic due to part cost, MTTR and MTBF (Mean Time to Repair and Mean Time Between Failures) reliability profiles, or other component features. Those in charge of maintenance and the storeroom must communicate the appropriate expectations of service from the storeroom to the facilities and operations organizations. These criteria for parts availability are based on a study of the effect on downtime, failure probability, and component overhead expenses. In an ideal world, the decision to store parts can be taken before the new machinery is turned on. When new equipment is bought, factories and parts suppliers can work with maintenance to prescribe replacement parts to buy. Following that, maintenance can determine appropriate inventory levels or even stop handling certain items based on historical consumption data. In a broader repair and parts department, a parts stock planner is responsible for the amount of storage, reorder scheduling and refill of an item (York, 2003, as cited in Baluch et al., 2013, p.72). A large number of firms in these industries use and retain their own elevated working capital. Examples include airlines, public transit, and military agencies. The capital assets are maintained by a Maintenance Organization (MO) within these companies. Aside from repairs, resources like employees, supplies, and spare parts must be provided and prepared for. A Maintenance Logistics Organization (MLO) is in charge of managing the production and consumption for maintenance storeroom. Maintenance staff, managers, and daily maintenance staff would have more time due to better materials and spare parts management. It's not unusual for maintenance craftspeople to spend 20-30 percent of their time searching for parts and supplies (Evans, 2008, para.1).

The reliability and competitiveness of industrial facilities is a vital element in many western manufacturing and service industries. Machine downtime must be minimized in order for manufacturing plants to be more efficient. One of the significant factors leading to a reduction in downtime length is when a failure occurs is spare parts availability and prompt accessibility. As a result, keeping ample stocks of spare parts on hand for immediate disposal when required is a sensible solution to solving the problem of stock item availability. Storing, on the other hand, is limited by both financial constraints and space; as a result, planning an optimal spare parts reserve is a crucial and necessary activity for any parts inventory manager. When reviewing MRO materials and asset management systems, there are several factors to consider. Important opportunities for cost savings and process changes occur in companies where sourcing and materials acquisition aren't directly engaged with or allowed to affect program management and direction. Many times, departments other than Material planning or Management are responsible for choosing items to be maintained, replenished, stocked, and disposed of. (Why do departments that use and need these products not also buy, stock, restore, and preserve them?) is a question often asked about asset and MRO management by Maintenance and Operations. Many companies effectively “carve out” some of the financial responsibilities and commitments from Inventory and Procurement Management and place them under the direct supervision of Operations and Maintenance; the issue is not whether the required repairs and services are done, rather than how could this mechanism be managed and performed

maintenance used and lack of production should also be considered (Baluch et al., 2013, p. 71). Gajpal et al. (1994, p. 117) consider expected spares requirements before looking for the best solutions. To supplement the use of better prediction procedures, their approach is to classify the items using a variety of partitioning approaches, such as ABC analysis, VED analysis, and FSN analysis. Find out more over how important the spart are by measuring weights for each component that describe its significance at a VED scale, by Saaty's hierarchical analysis (AHP). The sort of spare, the lead time, and the stock out effect all influence the structural weight. This paper emphasizes the importance of forecasting spare part demand, which is a critical factor influencing the viability of not only this system, but also other model parameters in the literature.

The classification of spare parts, according to Dekker et al. (1998, p. 73) serves to demonstrate the most critical replacement parts that must be kept on hand in order to maintain demand. With the classification, a proper spare part control can be achieved. It helps with market forecasting and inventory management strategies, as well as setting various turnover goals and service levels for each segment (Huiskonen, 2001, p. 126). According to Lenard and Roy (1995, p. 687), material segmentation is indicated by the following factors:

1. It is possible to assess each group's results and determine if they meet management's goals.
2. Since management must make the final decision on the protocol to be adopted, the item segmentation provides for a fast and understandable analysis of the outcomes of each decision.
3. Material segmentation enables the same restrictions to be extended to items with common criteria, enabling for the selecting of parameters (service level, rate of maintenance replacement parts (Driessen et al., 2015, p. 1).

Teixeira et al. (2018, p. 9) mentioned that spare parts control is managed by procurement department (unrelated to maintenance) that manages the spares supplies that the facility's requirements are satisfied. The amounts of items to order and the value of the safety stock are determined by the details provided by equipment manufacturers, the expertise of the repair workers, and the use history of replacement parts. These figures are derived by considering factors such as system criticality (as determined by the maintenance organization) and unit expense.

In order to handle its inventory efficiently, NdiranguKung'u (2016, p. 10) stated that a company needs a management system. In reality, there are many control systems which differ from easy to very complicated systems. An organization must promise that the system it adopts must be the most innovative and successful. He suggests that small businesses can continue to implement basic two-bin systems and that very big companies can choose to adopt very sophisticated systems such as ABC inventory management systems or Just in Time (JIT) systems. A single criterion is often used to classify spare parts, the most common of which is annual expense use. Spares with poor use and stock are considered insignificant. Only obsolescence and depreciation problems must be considered carefully for this sort of article. A thorough analysis of the reorder points, safety stocks, and order quantities is typically needed to attempt to minimize the stocks. Improvements can be achieved using just-in-time paradigms, particularly for products that are really characterized by low levels of safety stocks. In addition to the quantifiable considerations that are weighed during these typical study forms, items prices, use rates and historic stock levels as well as other qualities relating to more intangible issues such as safety targets, features of provision, style of

such as qualitative vital, essential and desired (VED) and quantitative ABC (pareto like), have become standard techniques for component classifications. The three class ABC category (A, B, C) normally based on one criterion: the average dollar usage of replacement parts for inventories. It was also well recognized, however, that in fact the "traditional" Analysis of ABC cannot provide a good classification. The VED classification is a well-known qualitative tool. Despite its apparent ease, it can be difficult to organize a VED analysis, since its achievement can be influenced by the users' subjective judgments (Roda et al., 2014, p. 531-533), (Cavalieri et al., 2008, p. 384) and (Sharaf & Helmy, 2001, p. 257-261).

stock review) that are appropriate for each category, as well as the adjustment of the inventory management strategy to better match each category of materials.

Indeed, one of the central assumptions of this study is that classification of spares is a necessary first step in the decision-making process; literature indicates the classification using a multi-criteria approach. In order to evaluate criticality, groups of spare parts should be produced depending on the usage of many criteria that are objective and qualitative. In literature analysis reviews, a large number of such criteria are taken into account or used in practice. Table 3 lists several of them, divided into four clusters. Traditionally, basic and simple approaches,

Table 3

Criteria grouped in 4 thematic clusters (Roda et al., 2014, p. 532).

Cluster	Criteria
Plant criticality for spare parts	The issue of quality
	Loss in production
	The domino effect
	Environmental and safety considerations
Spare parts usage characteristics	Number of similar plant components
	Rate of use/value of use
	Failure frequency/probability
	Volume/predictability of demand
	Day of expiration
	Redundancy
Spare parts inventory problems	Cost
	The required space
	Rate of turnover
	Rate of obsolescence
	Problems of deterioration
Spare parts supply characteristics	Supply lead time
	The number of possible suppliers
	Internal repair cost/possibility

	Cost of substitution
	Period in the mask
	Cannibalization
	Standard parts (or specificity/specific parts may be used)

used for this reason. The probability of item non-supply and the value of spare parts are the two main criteria that are taken into account.

In their paper, Braglia et al. (2004, p. 56-60) present a new MADM classification model as a tool for warehouse inventory management. The operating system is based on the application of two different methods: reliability-centered maintenance (RCM) and (AHP). Multi Attributes Spare Tree Analysis is the name he gave to this new approach (MASTA). There are two stages to the MASTA cycle. In the first step, MASTA identifies four essential spare part groups and screens provisioning methods using a logic tree. The four groups are then cross-referenced with various inventory control techniques to create a "inventory management policy" (IMP) matrix in the second level. This matrix can be used to figure out which technique is better for each element. This two-step technique guarantees continuity in inventory management for all categories of plants equipment.

Figures 2-4 depict the logic tree used to determine the best category of criticality for each separate item of plant equipment. At each node of the diagram, an AHP model is used to help and implement the decision - making problem. The flow charts of the four AHP models employed are seen in Figure 5. As can be shown, all of the models are very basic, but they help one to think about and decision issue more thoroughly and rationally. A total of 17 individual attributes are listed at the end of the selection process. This is a larger number than in the previous studies mentioned above.

Unfortunately, these approaches rely on a one-dimensional (e.g., classical ABC-analysis) or two-dimensional (e.g., Duchessi et al. (1988, p. 11) selection method which does not allow for discrimination of all potential control factors of different categories of items to address this inconvenience, several writers have developed new models of multi-attributes that are capable of accommodating several variables which interfere with one another as well as interdependent units. Fuller et al. (1993, p. 96), and Huiskonen (2001, p. 126-128), used a categorization system with six distinct variables in their study. Petrovic et al. (1992, p. 298) suggest a classification expert method model. The considerations included in their model are the availability of the required system, the necessity, the price, the volume and weight of the item, the quality of repair and the availability of spare parts on the market. For assessing group-based organizational control strategies, Cohen and Ernst (1988, p. 6) propose a general grouping strategy. Studies on the use of multi-attribute decision making (MADM) approaches for spares grouping by de Almeida (2001, p. 223), Becker (1987, p. 89), Gajpal et al. (1994, p. 15), and Sharaf and Helmy (2001, p. 117) could also be addressed. Muniz et al. (2020, p. 61), Gajpal et al. (1994, p. 15-26), and Sharaf and Helmy (2001, p. 121-178) all present spare item classification using the analytic hierarchy process (AHP) technique. Attributes such as use size, regular spare features, stock lead time, and spare price are taken into account in their models. Becker (1987, p. 90) and de Almeida (2001, p. 230) suggest that the multi-attribute utility principle (MAUT) be

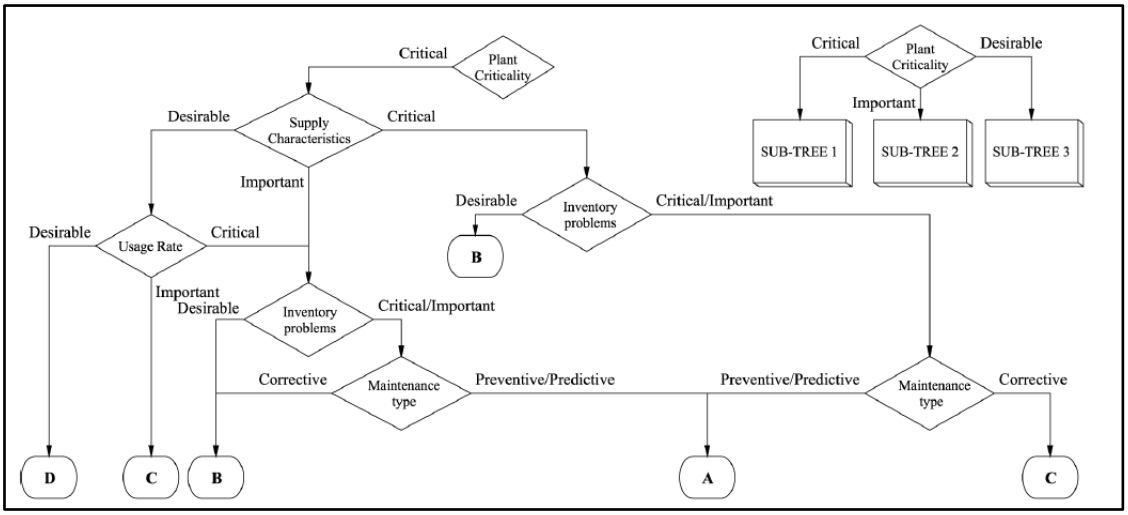

Figure 4
A sub-tree explosion. (Braglia et al., 2004, p. 58)

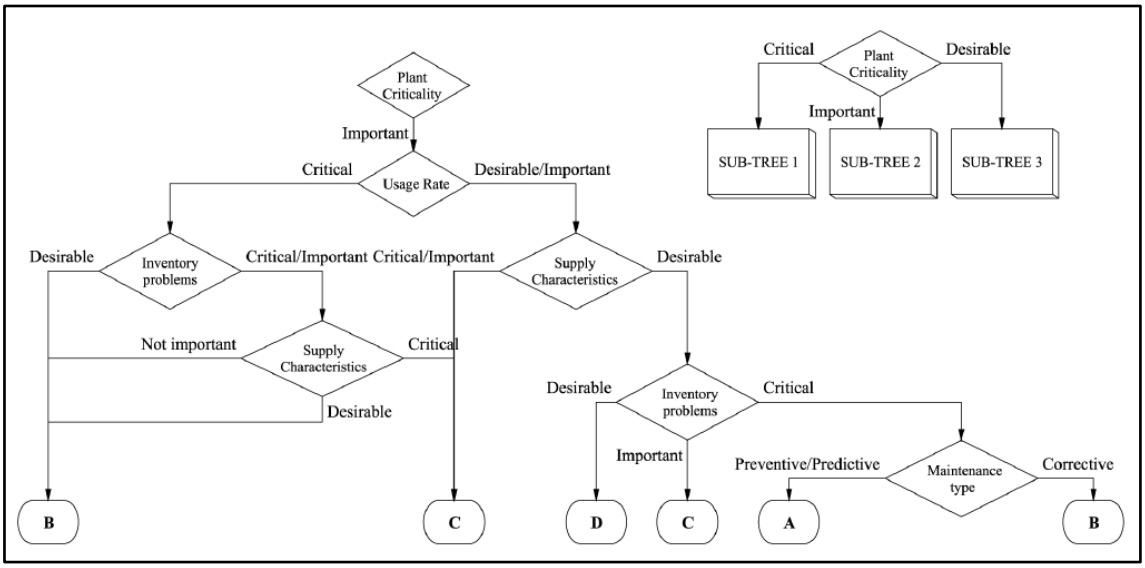

Figure 5
A sub-tree explosion. (Braglia et al., 2004, p. 59)

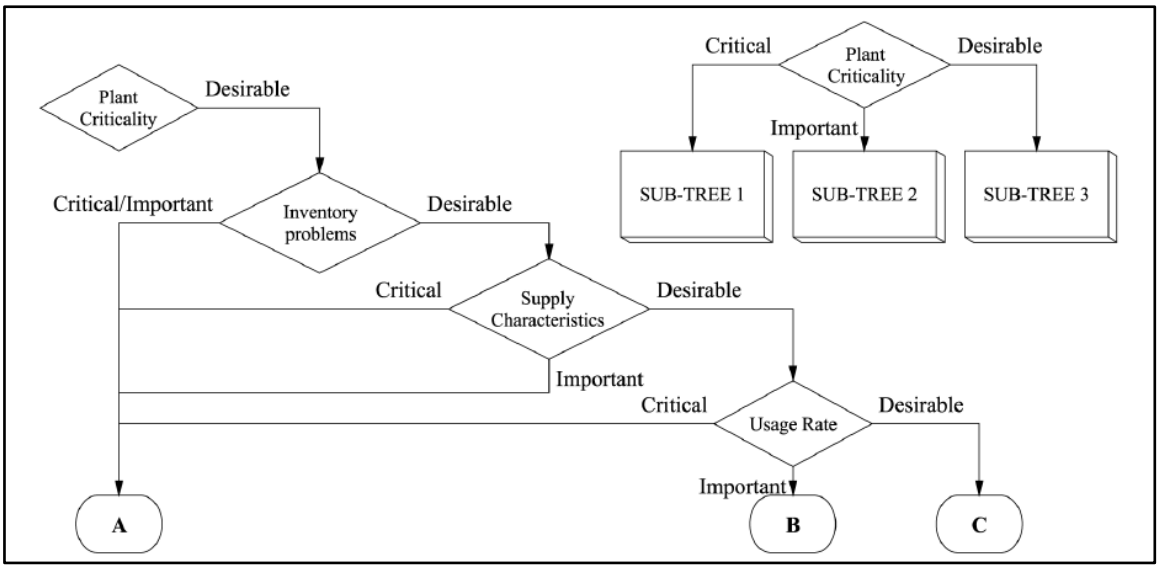

Figure 6
A sub-tree explosion. (Braglia et al., 2004, p. 59)

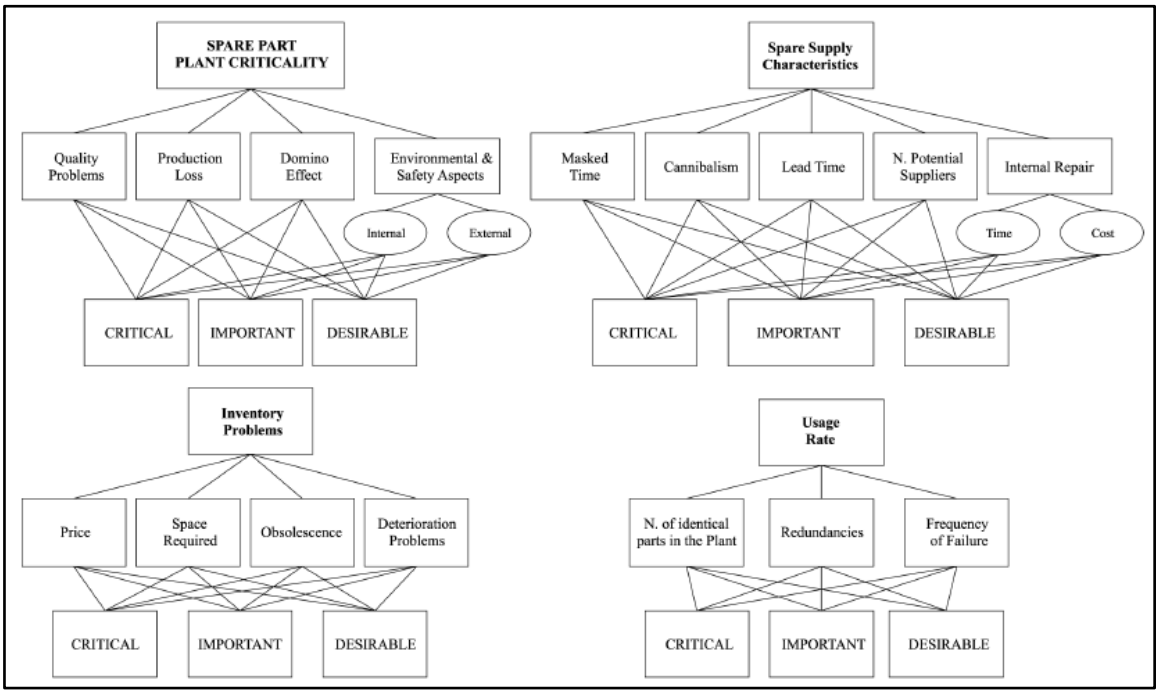

Figure 7
AHP models adopted in decision diagram nodes. (Braglia et al., 2004, p. 60)

table 4 below. Using these assessment judgments as a base, pairwise compares of the options (e.g., crucial, significant, and desirable) in relation to each spare is simple and quick:

As suggested by Gajpal et al. (1994, p. 190-235) and Sharaf and Helmy (2001, p. 217-289), For each parameter of the various AHP architectures, a mode of measurement is proposed and outlined in

Table 4

AHP Criterion quantification evaluation mode. (Braglia et al., 2004, p. 58–61)

Inventory Criterion		Critical	Important	Desirable
(1) Spare parts plant criticality	The issue of quality	Produce [0% - 85%]	Produce [85% - 95%]	Produce [95% - 100%].
	Loss in Production	Produce [0% - 90%]	Produce [90% - 97%]	Produce [97% - 100%]
	The Domino Effect	global economic impact	limited productive impact	There is no domino effect.
	Environmental and internal safety	one or two incidents	one or two individuals are seriously injured	There is a problem with one or more productive parts.
	External safety and environmental	large environmental contamination (water table contamination)	Reclamation of the ecosystem as a result of work	no environmental contamination
(2) Spare supply characteristics	Mask time	< 0.5 lead time	[0.5 - 1.0] lead time	≥ lead time.
	Cannibalism	The pieces cannot be replaced by a comparable plant discarded	The pieces can be replaced by a comparable plant extracted, but it is not recommended	It is possible without side effect to substitute the pieces with a similar plant withdrawn.
	Lead time	≥ 4 months	> 1 month and < 4 months	< 1 month
	The number of possible suppliers	Just one worldwide supplier	≤ 5 suppliers in the country	> 5 suppliers in the country
	Costs for internal maintenance	> substitution cost	[0.5 - 1.0] substitution cost	< 0.5 substitution cost
(3) Inventory	Cost	> $25K	[$1K - $25K]	< $1K

	Space necessary	> 10 percent available space	[1% - 10%] available space	< 1 percent available space
	Obsolescence MTBF	> mean time between new version	< mean time between new version	no obsolescence
	Deterioration issues	> 5 per cent spare parts budget	[1% - 5%] spare parts budget	< 1% spare parts budget
(4) Usage rate	Number of similar plant components	more than ten	between 2 and 10	Only one in the plant
	Redundancies	no redundancy	multiple redundancy	simple redundancy
	Frequency of failure	high	moderate	low

based on the item's criticality category (Ketikidis et al., 2006, p. 776). The IMP matrix created by Braglia et al. (2004, p. 61) study, which was based on the ideas and advice of organization maintenance specialists, is seen in Table Five.

As a result, four classes have been developed based on the item criticality (A, B, C and D). The inventory management policy matrix (IMP) is a useful method for developing inventory control strategies since it allows you to describe the approach

Table 5

Inventory management policy matrix. (Braglia et al., 2004, p. 61)

Inventory Policy	Spare Parts Classification			
	A	B	C	D
No Stock			√	√
Single Item Inventory			√	√
Just in Time Policy	√			√
Multi Item Inventory	√	√	√	

the item available immediately in the event of failure.

2. Single-item inventory: it is the most straightforward process. The holding of a separate unit of the spare item is based on the plant's likelihood of unavailability, the ability to prevent breakdown time with appropriate maintenance

As can be seen, each piece of equipment spare is allocated to one of four inventory strategies:

1. No stock: In a MASTA scheme, stockout of a spare part is a deliberate preference taken after analyzing the effect of the spare's absence on facility function(s) against the cost/problems of making

3. DESIGN AND METHODOLOGY

3.1 Scientific Method

This study adopted a descriptive research approach. It will be conducted on the past nine years' financial statements of Arab Potash Company to determine the impact of the inventory movements values on financial performance measures of the profitability and liquidity indicators of Arab Potash Company.

3.2 Study Population and Sample

The study population consists of Arab Potash Company annual reports listed on the Amman Stock Exchange (ASE). The study sample included (9) Financial statements for Arab Potash Company. The simple random sample of the study population included (9) Financial statements for the period of 2012 till 2020. The reason of choosing this sample period refers to the mentioned statement on the annual report of year 2013 (Arab Potash Company, 2013, P. 68). Which stated that:

"Effective 1 January 2013, the Group implemented the improvement to IAS 16, property, plant and equipment. As a result, strategic spare parts that met the definition of property, plant and equipment amounted to JD 3,677 thousand were reclassified to property, plant and equipment. The remaining spare parts, which do not meet the definition of property, plant and equipment amounted to JD 22,263 thousand were reclassified to current spare parts and supplies. 2012 figures were reclassified to correspond with 2013 figures."

Accordingly, the researcher aims to have the data of the independent variables (fast-moving spare parts (FMS), slow-moving spare parts (SMS) and unmoved (obsolete) spare parts (OBS)) based on the same accounting principle, to ensure their homogenous and avoid significant variations on the samples.

3.3 Data collection Method

The data of independent variables of spare parts movements' values will be

procedures, stock outs, and stock attributes.

3. Just-in-time policy: this is the most convenient choice. Regardless of the potentially disastrous repercussions of an item's unavailability for the facility, concerns for ease and speed of distribution, effective "control" of failure phenomena through appropriate maintenance policy, and storage issues (i.e., expense, capacity, etc.) all contribute to the absent of inventory. This is primarily due to a high level of cooperation between consumer and vendor, which enables rapid and stable supply in the case of a breakdown.
4. Multi-item inventory: this expensive approach is largely motivated by the high significant effect of a spare's unavailability on plant performance (efficiency, cost, and safety). The use of a just-in-time supply plan is forbidden by problems with spare availability.

Managers in the mineral industry face practical challenges when making logistical choices on spare parts. The recommended solution will help with operational and logistical spare parts inventory management decision-making. This method is particularly useful for mining companies dealing with a variety of constrained resources because it helps in the development of successful financial resource rationalization strategies. Such three-step methodology answers the most fundamental questions: which goods to stock as replacement parts during the preliminary provisioning process, while also enabling for sensitivity analyses by corporate management based on overall criticality and overall cost of each solution. We assume that this method should also be used to aid decision-making in other mining firms.

3.5 Procedure

From quantitative data analysis using SPSS, the empirical findings are presented. The descriptive analysis is presented first, followed by a Pearson correlation and regression analysis. The test of independent variables relationship will be measured by fast-moving, slow moving and unmoved (obsolete) spare parts values. The financial performance will be assessed using the profitability and liquidity financial indicators measures as stated by Ionescu et al. (2018, p. 70-71) for the measures of financial performance and position.

4. FINDINGS, DISCUSSIONS AND RECOMMENDATIONS

4.1 Findings

This part of study represents the results of statistical analysis, including descriptive measures, correlation matrix, and hypothesis testing results. The statistical processing depends on financial data of Arab Potash Company for the period 2012-2020.

4.1.1 Descriptive Statistics

4.1.1.1 Descriptive of dependent variables

Dependent variables represent financial performance, which measured by several measures, as follows:

collected from the financial statements of the annual reports of Arab Potash Company for the years of 2012 till 2020, while the dependent financial variables measures will be extracted from the summed-up tables on the Amman Stock Exchange website.

3.4 Statistical Analysis Tool

The basic cross-sectional linear multiple regression model will be used estimated by the representative Arab Potash Company for each of the nine years starting from 2012 till 2020, to figure out the independent impacts of inventory movements on financial performance profitability and liquidity indicators.

Stepwise regression tool will be excluded, since the study model tests the impact of the FSN quantitative classes of spare parts (FMS, SMS, OBS) together on the dependent variables (Bosnjakovic, 2010, p. 501), and (Cavalieri et al., 2008, p. 383). According to Smith (2018, P. 10) explanatory variables for multiple regression models are selected from the variables pool using stepwise regression based on their statistical significance. Since it is a very effective method of choosing a small number of explanatory variables from a large number of possibilities, stepwise regression has become common with Big Data.

Table 6
Descriptive statistic of financial performance measures of Arab Potash Company for the period 2012-2020

Measures	Mean	Max	Min	Steve.
Return on Assets (ROA)	12.10	18.66	6.79	3.14
Return on Equity (ROE)	13.99	20.63	7.73	3.52
Net Profit Margin (NPM)	24.92	33.91	16.84	5.19
Gross Profit Margin (GPM)	35.04	51.29	17.76	10.14
Current Ratio (CR)	5.64	8.13	3.60	1.53
Working Capital Turnover (WCT)	1.30	1.68	1.03	0.18
Operation Ratio (OPER)	0.65	0.82	0.49	0.10

(18.66%), while minimum value (6.79%).

2- The mean of return on equity (ROE) for Arab Potash Company, was (13.99%), with standard deviation

Table (6) above, shows that:

1- The mean of return on assets (ROA) for Arab Potash Company, was (12.10%), with standard deviation (3.14%). Maximum value was

Maximum value was (8.13), while minimum value (3.60).

6- The mean of working capital turnover (WCT) for Arab Potash Company, was (1.30), with standard deviation (0.18). Maximum value was (1.68), while minimum value (1.03).
7- The mean of operation ratio (OPER) for Arab Potash Company, was (0.65), with standard deviation (0.10). Maximum value was (0.82), while minimum value (0.49).

The above results show the closeness of value for all financial performance measures of Arab Potash Company, with some variation in gross profit margin (GPM). Figure (8) represents the values of the measures.

(3.52%). Maximum value was (20.63%), while minimum value (7.73%).

3- The mean of net profit margin (NPM) for Arab Potash Company, was (24.92%), with standard deviation (5.19%). Maximum value was (33.91%), while minimum value (16.84%).
4- The mean of gross profit margin (GPM) for Arab Potash Company, was (35.04%), with standard deviation (10.14%). Maximum value was (51.29%), while minimum value (17.76%).
5- The mean of current ratio (CR) for Arab Potash Company, was (5.64), with standard deviation (1.53).

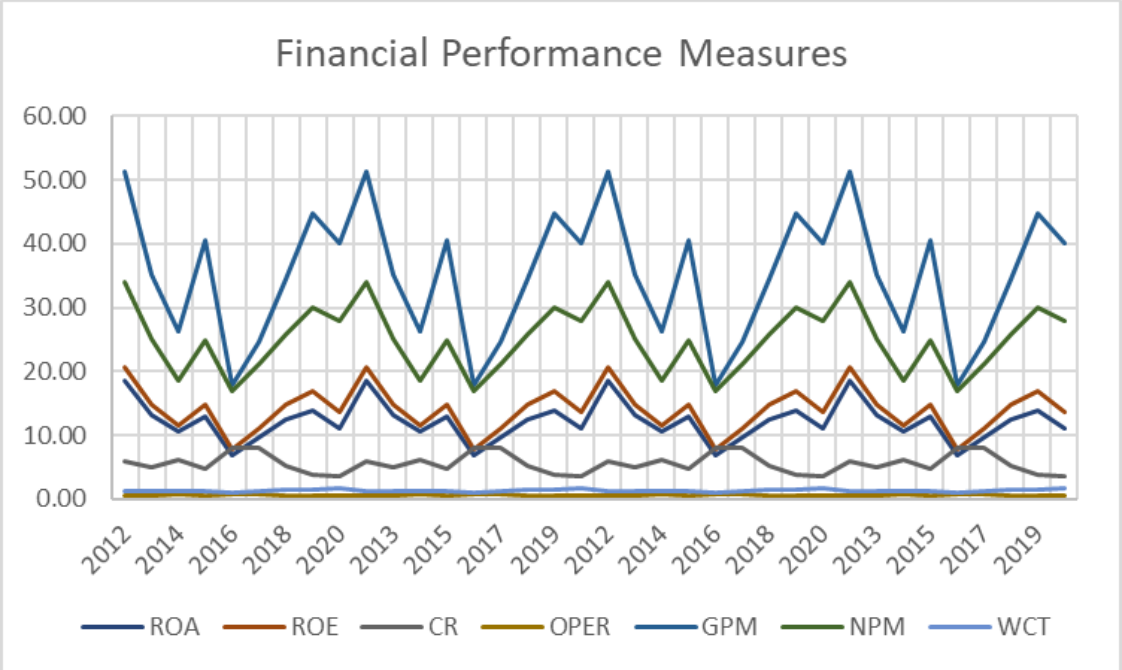

Figure 8
Financial performance measures of Arab Potash Company for the period 2012-2020

4.1.1.2 Descriptive of independent variables

Independent variables represent spare parts movements, that measured by three measures, as follows:

Figure (8) shows that, in spite of fluctuations in financial performance measures through the period from 2012 to 2020, the general trend is approached to constant trend.

Table 7
Descriptive statistic of spare parts' movements of Arab Potash Company for the period 2012-2020

Measures	Mean	Max	Min	Stdev.
Fast moving spares (FMS)	45,224,222	54,040,000	37,157,000	5,204,804
Slow moving spares (SMS)	3,478,667	4,755,000	2,144,000	697,529
Obsolescence spares (OBS)	810,667	1,547,000	135,000	503,943
All spare parts categories	49,513,556	57,388,000	42,557,000	4,658,629

million JOD. Maximum value was near to (4.8) million JOD, while minimum value near to (2.1) million JOD.

4- The mean of Obsolescence spares (OBS) for Arab Potash Company, was near to (0.8) million JOD, with standard deviation near to (0.5) million JOD. Maximum value was near to (1.6) million JOD, while minimum value near to (0.1) million JOD.

The above results show the closeness of value for all components of spare parts of Arab Potash Company. Fast-moving spare (FMS) showed highest values comparing to other parts. Figure 9 represents the values of spares parts components for the period 2012-2020.

Table 7 above, shows that:

1- The mean of all spare parts for Arab Potash Company, was near to (49.5) million JOD, with standard deviation near to (4.7) million JOD. Maximum value was near to (57.4) million JOD, while minimum value near to (42.6) million JOD.

2- The mean of fast-moving spares (FMS) for Arab Potash Company, was near to (45.2) million JOD, with standard deviation near to (5.2) million JOD. Maximum value was near to (54.0) million JOD, while minimum value near to (37.2) million JOD.

3- The mean of slow-moving spares (SMS) for Arab Potash Company, was near to (3.5) million JOD, with standard deviation near to (0.7)

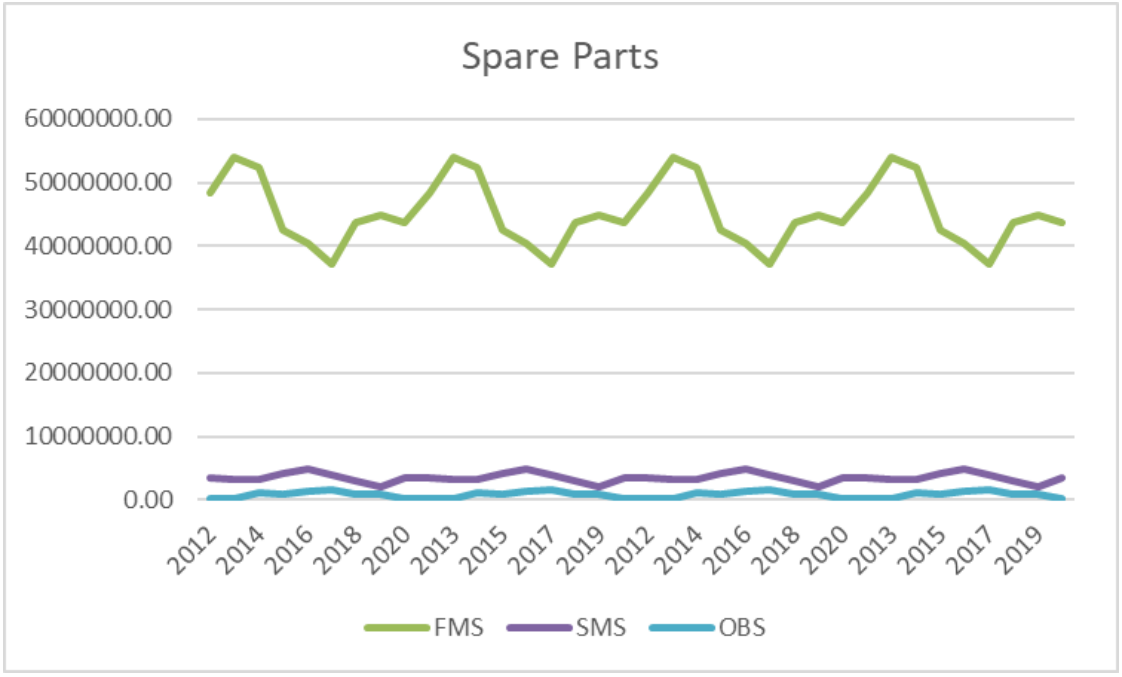

Figure 9
Spare parts components of Arab Potash Company for the period 2012-2020

test and serial correlation test were processed, the results were as following:

4.1.2.1 Normality test

Jarque-Bera test was processed to explore that study time series data distributed normally, this is achieved when the significant level of test is more than 0.05, mentioned test performed for all study model variables, the results as follows:

Figure 9 shows that, in spite of fluctuations in spare parts components through the period from 2012 to 2020, the general trend is approached to constant trend. Moreover, the fluctuation in fast-moving spares appears clearer than it for other two components.

4.1.2 Model Fit Tests

To test the data relevant for linear regression, normality test, multi collinearity variables are used to measure the presence of multi collinearity between model variables. The effects of measuring multi collinearity between independent variables are described using correlation matrices and the VIF test as follows:

Table 8
Normality test

Variable	J-B value	p-value	Results
Return on assets (ROA)	1.322	0.516	Normally distributed
Return on equity (ROE)	0.118	0.943	Normally distributed
Net profit margin (NPM)	1.052	0.591	Normally distributed
Gross profit margin (GPM)	1.412	0.494	Normally distributed
Current ratio (CR)	2.406	0.300	Normally distributed
Working capital turnover (WCT)	3.421	0.181	Normally distributed
Operation ratio (OPER)	1.562	0.458	Normally distributed
Fast moving spares (FMS)	1.137	0.566	Normally distributed
Slow moving spares (SMS)	3.007	0.222	Normally distributed
Obsolescence spares (OBS)	4.970	0.083	Normally distributed

Table 8 above shows that all values of test (J-B) were with significant level more than 0.05, which give a clear evidence that all variables normally distributed.

4.1.2.2 Multicollinearity Test

Pearson correlation coefficients measured between independent (predictor)

Table 9
Correlation matrix for predictor variables

	Fast moving spares (FMS)	Slow moving spares (SMS)	Obsolescence spares (OBS)
Fast moving spares (FMS)	**1.000**		
Slow moving spares (SMS)	**-0.386***	**1.000**	
Obsolescence spares (OBS)	**-0.614****	**0.195**	**1.000**

The maximal correlation coefficient (-0.614) was found between (FMS and OBS) in the table above; however, this

(**) Significant at 0.01, (*) Significant at 0.05

considered a measure of the presence of multicollinearity Gujarati (2004).

To ensure the above result, the variance factor inflation (VIF) was estimated, and the results are shown in the table below:

value does not indicate the presence of multicollinearity. Otherwise, the values have been less than or equal to (±0.80), indicating that the variables did not have a perfect relationship. In the statistical literature, a value of (±0.80) or higher is

Table 10
VIF for independent variables

Variable	VIF
Fast moving spares (FMS)	1.821
Slow moving spares (SMS)	1.179
Obsolescence spares (OBS)	1.612

from one period to another. Durbin-Watson (D-W) test is one of common test used to investigate the existence of this problem. As a rule of thumb, the value of test near number (2) gives an indicator that data free of serial correlation. This test performed for all study hypotheses.

In Table 10, all VIF values were greater than (1) and less than (10). This shows that all predictor variables are not multicollinear, Gujarati (2004).

4.1.2.3 Serial correlation

Serial correlation is the existence of relationship between error terms, this relationship enables error term to transfer

Table 11
Serial correlation test

Hypothesis	D-W value	Results
H01	2.073	No serial correlation
H01-1	2.105	No serial correlation
H01-2	2.186	No serial correlation
H01-3	2.280	No serial correlation
H01-4	2.087	No serial correlation
H02	2.333	No serial correlation
H02-1	2.125	No serial correlation
H02-2	2.279	No serial correlation
H02-3	2.090	No serial correlation

The first main research hypothesis:

H_{01}: *There is no statistically significant impact of the movements of spare parts (fast-moving spare parts (FMS), slow-moving spare parts (SMS) and unmoved (obsolete) spare parts (OBS)) at the level of indication ($\alpha \leq 0.05$) on financial performance measured by the profitability of Arab Potash Company.*

Table 11 above shows that all values close to number (2), which means there is no serial correlation for all study hypotheses.

4.1.3 Hypothesis Testing

This section of the research looks at the regression effects of the study's explanatory variables (FMS, SMS, and OBS) and the explained variables' financial performance measures. The OLS approach generated the effects of a multiple linear regression.

Table 12
Results of H_{01} testing

Variable	*Co-eff*	*Std Error*	*T-value*	*P-value**
FMS	-15.119	6.706	-2.254	0.031
SMS	-13.929	2.899	-4.804	0.000
OBS	-4.235	0.795	-5.329	0.000
Constant	553.729	145.112	3.816	0.001
R-squared	***0.646***			
Adjusted R-squared	***0.613***			
F-statistic	***19.486***			
Prob*(F-statistic)	***0.000***			

*Significant at 0.05 level.

"There is a statistically significant impact of the movements of spare parts (fast-moving spare parts (FMS), slow-moving spare parts (SMS) and unmoved (obsolete) spare parts (OBS)) on financial performance measured by the profitability of Arab Potash Company"

This finding is expected by the researcher, as stated by Panigrahi (2013, p. 1437), and Kilonzo et al. (2016, p. 40) the amount of time used to turn inventory into cash was inversely related to profitability. Similarly, the increasing of the spare parts values consumes cash of the company, increases the overhead, insurance and holding costs.

H_{01-1}: *There is no statistically significant impact of the movements of spare parts (fast-moving spare parts (FMS), slow-moving spare parts (SMS) and unmoved (obsolete) spare parts (OBS)) on financial performance measured by the return on assets (ROA) of Arab Potash Company.*

According to the above table, R Square has a coefficient of determination of (0.646), indicating that the model will describe around 64.6 percent of the variance in profitability. The F coefficient (F=19.486) has a significance value of less than 0.05 (Prob F = 0.000), indicating that the effect of the independent variables aggregated is significant.

Furthermore, the regression coefficients show that the (FMS) has a substantial negative impact on profitability, with a coefficient value of (-15.119), which is significant with (t= -2.254) and (P-value =0.031). (SMS) has a substantial negative impact with a coefficient value of (-13.929) and a significant (t= -4.804) and (P-value =0.000). The coefficient value of (-4.235) is significant with (t= -5.329) and (P-value =0.000), indicating that (OBS) has a significant negative impact.

So null hypothesis is rejected, and alternative is accepted, stated that:

Table 13
Results of H_{01-1} testing

Variable	*Co-eff*	*Std Error*	*T-value*	*P-value**
FMS	-1.607	4.476	-0.359	0.722
SMS	-6.212	1.935	-3.210	0.003
OBS	-1.971	0.530	-3.716	0.001
Constant	160.062	96.856	1.653	0.108

F-statistic	***0.000***
Prob*(F-statistic)	

R-squared	***0.536***
Adjusted R-squared	***0.492***
F-statistic	***12.311***

"There is a statistically significant impact of the movements of spare parts (fast-moving spare parts (FMS), slow-moving spare parts (SMS) and unmoved (obsolete) spare parts (OBS)) on financial performance measured by the return on assets (ROA) of Arab Potash Company"

The researcher notes that controlling the level of FMS has no significant impact on the ROA of the firm, and this is match with the finding of (Roumiantsev and Netessine, 2005, p. 24-25). The values of SMS and OBS spares have an inversely impact, since they are idle values that increase the value of the assets and thus reduce the return on assets ratio, this match with the finding of (Makori and Jagongo, 2013, p. 12).

H_{01-2}: *There is no statistically significant impact of the movements of spare parts (fast-moving spare parts (FMS), slow-moving spare parts (SMS) and unmoved (obsolete) spare parts (OBS)) on financial performance measured by the return on equity (ROE) of Arab Potash Company.*

Table 14
Results of H_{01-2} testing

Variable	***Co-eff***	***Std Error***	***T-value***	***P-value****
FMS	-5.926	4.552	-1.302	0.202
SMS	-9.097	1.968	-4.622	0.000
OBS	-2.374	0.540	-4.400	0.000
Constant	286.794	98.506	2.911	0.007
R-squared	***0.617***			
Adjusted R-squared	***0.581***			
F-statistic	***17.182***			
Prob*(F-statistic)	***0.000***			

*Significant at 0.05 level.

Furthermore, the regression coefficients show that (FMS) has no meaningful impact on ROE, with a coefficient value of (-5.374) that is not significant with (t= -1.302) and (P-value =0.202) greater than 0.05, and (SMS) has a significant negative impact, with a coefficient value of (-2.374) that is significant with (t= -4.622) and (P-value =0.000). The coefficient value of (-2.374) is *Significant at 0.05 level.

According to the above table, R Square has a coefficient of determination of (0.536), indicating that the model can describe about 53.6 percent of the variance in ROA. The F coefficient (F=12.311) has a significance value of (Prob F = 0.000) less than 0.05, indicating that the influence of the independent variables aggregated is significant.

Furthermore, the regression coefficients show that (FMS) has no significant impact on ROA, with a coefficient value of (-1.607) that is not significant with (t= -0.359) and (P-value =0.722) greater than 0.05, and (SMS) has a significant negative impact, with a coefficient value of (-6.212) that is significant with (t= -3.210) and (P-value =0.003). The coefficient value of (-1.971) is significant with (t= -3.716) and (P-value =0.001), indicating that (OBS) has a significant negative impact.

So null hypothesis is rejected, and alternative is accepted, stated that:

According to the above table, R Square has a coefficient of determination of (0.617), indicating that the formula accounts for approximately 61.7 percent of the difference in ROE. The F coefficient (F=17.182) has a significance value of less than 0.05, indicating that the effect of the independent variables aggregated is significant (Prob F = 0.000).

significant impact on ROE as well as ROA, while the values of SMS OBS have an inversely impact on ROE which indicates that they are influence the profitability of the firm.

H_{01-3}: *There is no statistically significant impact of the movements of spare parts (fast-moving spare parts (FMS), slow-moving spare parts (SMS) and unmoved (obsolete) spare parts (OBS)) on financial performance measured by the net profit margin (NPM) of Arab Potash Company.*

significant with (t= -4.400) and (P-value =0.000), indicating that (OBS) has a significant negative impact.

So null hypothesis is rejected, and alternative is accepted, stated that:

"There is a statistically significant impact of the movements of spare parts (fast-moving spare parts (FMS), slow-moving spare parts (SMS) and unmoved (obsolete) spare parts (OBS)) on financial performance measured by the return on equity (ROE) of Arab Potash Company"

This finding is consistent with the previous hypothesis, the FMS has no

Table 15
Results of H_{01-3} testing

Variable	***Co-eff***	***Std Error***	***T-value***	***P-value****
FMS	-24.213	5.283	-4.583	0.000
SMS	-14.932	2.284	-6.537	0.000
OBS	-4.810	0.626	-7.682	0.000
Constant	740.108	114.316	6.474	0.000
R-squared	***0.763***			
Adjusted R-squared	***0.740***			
F-statistic	***34.254***			
Prob*(F-statistic)	***0.000***			

*Significant at 0.05 level.

So null hypothesis is rejected, and alternative is accepted, stated that:

"There is a statistically significant impact of the movements of spare parts (fast-moving spare parts (FMS), slow-moving spare parts (SMS) and unmoved (obsolete) spare parts (OBS)) on financial performance measured by the net profit margin (NPM) of Arab Potash Company"

This finding has the highest determination coefficient values amongst the others, therefore explaining the negative impact of the inventory values of FMS, SMS and OBS on the profitability of the firm, due to the increase of storage fees, handling and cost of writing off obsolete parts. this is in consistent with the finding of (Womack et al., 1990).

H_{01-4}: *There is no statistically significant impact of the movements of spare parts (fast-moving spare parts (FMS), slow-moving spare parts*

According to the above table, R Square has a coefficient of determination of (0.763), indicating that the model will describe approximately 76.3 percent of the difference in NPM. The F coefficient (F=34.254) has a significance value of less than 0.05 (Prob F = 0.000), indicating that the impact of the independent variables aggregated is significant.

Furthermore, the regression coefficients show that the (FMS) has a negative significant impact on NPM, with a coefficient value of (-24.213) that is significant with (t= -4.583) and (P-value =0.000). (SMS) has a significant negative impact with a coefficient value of (-14.932), which is significant with (t= -6.537) and (P-value =0.000). The coefficient value of (-4.810) is significant with (t= -7.682) and (P-value =0.000), indicating that (OBS) has a significant negative impact.

gross profit margin (GPM) of Arab Potash Company.

(SMS) and unmoved (obsolete) spare parts (OBS)) on financial performance measured by the

Table 16
Results of H_{01-4} testing

Variable	***Co-eff***	***Std Error***	***T-value***	***P-value****
FMS	-28.729	13.264	-2.166	0.038
SMS	-25.475	5.735	-4.442	0.000
OBS	-7.786	1.572	-4.953	0.000
Constant	1027.953	287.020	3.581	0.001
R-squared	***0.608***			
Adjusted R-squared	***0.572***			
F-statistic	***16.571***			
Prob*(F-statistic)	***0.000***			

*Significant at 0.05 level.

(fast-moving spare parts (FMS), slow-moving spare parts (SMS) and unmoved (obsolete) spare parts (OBS)) on financial performance measured by the gross profit margin (GPM) of Arab Potash Company"

The researcher notes that the increasing of the inventory movements' values for all classes has an inversely impact on the level of profit above the cost of production (gross profit) for the firm, furthermore affecting the short-term financial decision. This in consistent with the findings of (Capkun et al., 2009, p. 792) and (Koumanakos, 2008, p. 358).

The second main research hypothesis:

H_{02}: *There is no statistically significant impact of the movements of spare parts (fast-moving spare parts (FMS), slow-moving spare parts (SMS) and unmoved (obsolete) spare parts (OBS)) at the level of indication ($\alpha \leq 0.05$) on financial performance measured by the liquidity of Arab Potash Company.*

According to the above table, R Square has a coefficient of determination of (0.608), indicating that the model will describe approximately 60.8 percent of the difference in GPM. The F statistic's significance value (F=16.571) is less than 0.05, indicating that the impact of the independent variables aggregated is significant (Prob F = 0.000).

Furthermore, the regression coefficients show that the (FMS) has a negative significant impact on GPM, with a coefficient value of (-28.729) that is significant with (t= -2.166) and (P-value =0.038). less than 0.05, (SMS) has a significant negative impact, with a coefficient value of (-25.475), (t= -4.442), and (P-value =0.000). The coefficient value of (-7.786) is significant with (t= -4.953) and (P-value =0.000), indicating that (OBS) has a significant negative impact.

So null hypothesis is rejected, and alternative is accepted, stated that:

"There is a statistically significant impact of the movements of spare parts

Table 17
Results of H_{02} testing

Variable	***Co-eff***	***Std Error***	***T-value***	***P-value****
FMS	0.483	0.695	0.696	0.491
SMS	1.300	0.300	4.329	0.000
OBS	0.247	0.082	2.999	0.005
Constant	-28.827	15.030	-1.918	0.064

R-squared	***0.534***
Adjusted R-squared	***0.490***
F-statistic	***12.217***
Prob*(F-statistic)	***0.000***

*Significant at 0.05 level.

moving spare parts (SMS) and unmoved (obsolete) spare parts (OBS)) on financial performance measured by the liquidity of Arab Potash Company"

The researcher justifies the finding of FMS, due to considering them as strategic and essential spares that kept in warehouses for future demand, and for reducing the risk of revenue losses as well as production stoppage costs due to miss them. SMS and OBS spares have a positive impact on the liquidity of the firm, since they are considered as a form of waste that can be avoided or through the liquidation promotion to deal with excess inventories. This is in consistent with the findings of (Eroglu and Hofer, 2011, p. 365) and Sanghal (2005).

$H_{02\text{-}1}$: *There is no statistically significant impact of the movements of spare parts (fast-moving spare parts (FMS), slow-moving spare parts (SMS) and unmoved (obsolete) spare parts (OBS)) on financial performance measured by the current ratio (CR) of Arab Potash Company.*

According to the above table, R Square has a coefficient of determination of (0.534), indicating that the model can describe approximately 53.4 percent of the difference in liquidity. The F coefficient (F=12.217) has a significance value of (Prob F = 0.000) less than 0.05, indicating that the influence of the independent variables aggregated is significant.

Furthermore, the regression coefficients show that (FMS) has no significant impact on liquidity, with a coefficient value of (0.483) that is not significant with (t= 0.696) and (P-value =0.491) greater than 0.05, and (SMS) has a significant positive impact, with a coefficient value of (1.300) that is significant with (t= 4.329) and (P-value =0.000). The coefficient value of (0.247) is meaningful with (t= 2.999) and (P-value =0.005), indicating that (OBS) has a significant positive impact.

So null hypothesis is rejected, and alternative is accepted, stated that:

"There is a statistically significant impact of the movements of spare parts (fast-moving spare parts (FMS), slow-

Table 18
Results of $H_{02\text{-}1}$ testing

Variable	***Co-eff***	***Std Error***	***T-value***	***P-value****
FMS	1.762	2.204	0.799	0.430
SMS	4.191	0.953	4.399	0.000
OBS	0.744	0.261	2.850	0.008
Constant	-98.334	47.684	-2.062	0.047
R-squared	***0.523***			
Adjusted R-squared	***0.478***			
F-statistic	***11.677***			
Prob*(F-statistic)	***0.000***			

*Significant at 0.05 level.

describe around 52.3 percent of the difference in CR. The F coefficient (F=11.677) has a significance value of less than 0.05 (Prob F = 0.000), indicating that

According to the above table, R Square has a coefficient of determination of (0.523), indicating that the model will

(obsolete) spare parts (OBS)) on financial performance measured by the current ratio (CR) of Arab Potash Company"

FMS has no significant impact on CR, due to the same justification of the previous hypothesis finding. SMS and OBS spares have positively impact on CR, since they form a significant portion of the current assets and they are considered as an idle value for long period time.

H_{02-2}: *There is no statistically significant impact of the movements of spare parts (fast-moving spare parts (FMS), slow-moving spare parts (SMS) and unmoved (obsolete) spare parts (OBS)) on financial performance measured by the working capital turnover ratio (WCT) of Arab Potash Company.*

the effect of the independent variables aggregated is significant.

Furthermore, the regression coefficients show that (FMS) has no significant impact on CR, with a coefficient value of (1.762) that is not significant with (t= 0.799) and (P-value =0.430) greater than 0.05, and (SMS) has a significant positive impact, with a coefficient value of (4.191) that is significant with (t= 4.399) and (P-value =0.000). The coefficient value of (0.744) is meaningful with (t= 2.850) and (P-value =0.008), indicating that (OBS) has a significant positive impact.

So null hypothesis is rejected, and alternative is accepted, stated that:

"There is a statistically significant impact of the movements of spare parts (fast-moving spare parts (FMS), slow-moving spare parts (SMS) and unmoved

Table 19
Results of H_{02-2} testing

Variable	***Co-eff***	***Std Error***	***T-value***	***P-value****
FMS	-0.611	0.287	-2.130	0.041
SMS	-0.548	0.124	-4.413	0.000
OBS	-0.080	0.034	-2.362	0.024
Constant	21.371	6.210	3.441	0.002
R-squared	***0.435***			
Adjusted R-squared	***0.382***			
F-statistic	***8.201***			
Prob*(F-statistic)	***0.000***			

*Significant at 0.05 level.

and is significant with (t= -4.413) and (P-value =0.000). The coefficient value of (-0.080) is significant with (t= -2.362) and (P-value =0.024), indicating that (OBS) has a significant negative impact.

So null hypothesis is rejected, and alternative is accepted, stated that:

"There is a statistically significant impact of the movements of spare parts (fast-moving spare parts (FMS), slow-moving spare parts (SMS) and unmoved (obsolete) spare parts (OBS)) on financial performance measured by the working capital turnover ratio (WCT) of Arab Potash Company"

According to the aforementioned table, R Square has a coefficient of determination of (0.435), indicating that the formula accounts for approximately 43.5 percent of the difference in WCT. The F coefficient (F=8.201) has a significance value of less than 0.05, indicating that the effect of the independent variables aggregated is significant (Prob F = 0.000).

Furthermore, the regression coefficients show that the (FMS) has a negative significant impact on WCT, with a coefficient value of (-0.611) that is significant with (t=-2.130) and (P-value =0.041). (SMS) has a significant negative impact with a coefficient value of (-0.548),

parts (fast-moving spare parts (FMS), slow-moving spare parts (SMS) and unmoved (obsolete) spare parts (OBS)) on financial performance measured by the operation ratio (OPER) of Arab Potash Company.

The researcher notes that impacts of the inventory movement's classes (FMS, SMS and OBS) are negative on the WCT, since the spare parts form a significant portion of the current assets which is affected by the fluctuation of the spare parts values.

H_{02-3}: *There is no statistically significant impact of the movements of spare parts (fast-moving spare parts (FMS), slow-moving spare parts (SMS) and unmoved (obsolete) spare parts (OBS)) on financial performance measured by the operation ratio (OPER) of Arab Potash Company"*

Table 20
Results of H_{02-3} testing

Variable	***Co-eff***	***Std Error***	***T-value***	***P-value****
FMS	0.300	0.133	2.254	0.031
SMS	0.257	0.058	4.462	0.000
OBS	0.077	0.016	4.866	0.000
Constant	-9.517	2.879	-3.306	0.002
R-squared	***0.601***			
Adjusted R-squared	***0.563***			
F-statistic	***16.030***			
Prob*(F-statistic)	***0.000***			

*Significant at 0.05 level.

The researcher notes that the operating expenses of the firm is positively impacted by the value of spare parts based on their movement's classes, there would be a reduction in operation expenses due to interest savings as well as a decrease in storage fees, handling and waste as inventory is reduced. Many firms are seeking for new process of spare parts management, in order to have a lean inventory management without waste and excessive inventory of spare parts. Those finding are in consistent with the findings of (Womack et al., 1990), (Brigham & Gapenski, 1993) and (Koumanakos, 2008, p. 357).

4.2 Results

Based on the analysis of descriptive data statistics and the testing of hypotheses, the following results were reached:

4.2.1 Result of Descriptive Statistics

1. Descriptive statistics showed that the overall trend of financial performance (profitability and liquidity) was towards stability, indicating that Arab Potash Company adopts stable policies and

According to the above chart, R Square has a coefficient of determination of (0.601), indicating that the model will describe around 60.1 percent of the variance in OPER. The F coefficient (F=16.030) has a significance value of (Prob F = 0.000) less than 0.05, indicating that the effect of the independent variables aggregated is significant.

Furthermore, the regression coefficients show that the (FMS) has a substantial positive impact on OPER, with a coefficient value of (0.300) that is significant with (t= 2.254) and (P-value =0.031). The coefficient value of (0.257) is significant with (t= 4.462) and (P-value =0.000), indicating that (SMS) has a significant positive effect. The coefficient value of (0.077) is significant with (t= 4.866) and (P-value =0.000), indicating that (OBS) has a significant positive impact.

So null hypothesis is rejected, and alternative is accepted, stated that:

"There is a statistically significant impact of the movements of spare parts (fast-moving spare parts (FMS), slow-moving spare parts (SMS) and unmoved (obsolete) spare parts (OBS)) on financial

and maintain very close levels of these expenses compared to the size of its operations, and this was shown by the stability of the operating ratio in the company.

9. It was found that APC is working to maintain close levels of spare parts in general, and it was found that the general trend of the values of spare parts was stable, and tends towards relative stability.
10. (FMS) formed the largest volume of the total spare parts in APC, with an approximate average of (45.2) million JOD, followed by (SMS) with an approximate average of (3.5) million JOD, while (OBS) formed the lowest volume, with an approximate average of (0.8) million JOD. This is an indication that the company is working to provide the necessary spare parts for its operations, and is also seeking to reduce the values of spare parts that are not needed and subject to obsolescence.

4.2.2 Results of Hypothesis Testing

1. The results of the first main hypothesis test showed the existence of a significant impact of spare parts (FMS, SMS, OBS) on the profitability of APC, and it was also found that the moral impact appeared on all items of spare parts, and the impact was negative, which indicates that increasing the volume of spare parts of all three classes leads to reduce profitability.
2. The results of H_{01-1} sub-hypothesis test showed the presence of the moral impact of spare parts (FMS, SMS, OBS) on the return on assets in APC, and it was found that the moral impact was negative, which is an indication of the inverse relationship between the profitability of the company and the volume of spare parts, especially (SMS, OBS).

seeks to maintain stable rates of financial performance, despite being exposed to fluctuations from time to time.

2. The return on assets values of APC varied from year to year, and this is an indication of the difference in the company's ability to utilize its available resources to achieve annual returns.
3. The return on equity values of APC differed from year to year, and this is an indication of the difference in the company's ability to achieve returns to the owners during the study period.
4. The profit margin percentage in the Arab Potash Company ranged between (16.84%) and (33.91%), and this is an indication of the difference in the business results of revenues and expenses during the study period.
5. The gross profit margin values fluctuated significantly in APC, where the minimum value was (17.76%) and the highest value was (51.29%). This is an indication of the difference in the company's sales, and the difference in its ability to manage sales costs from one period to another.
6. It was found that the current ratio in the Arab Potash Company was relatively stable, and this is an indication that the company follows clear policies in determining the size of its liquidity by matching current assets with current liabilities.
7. The working capital turnover rate in APC was marked by remarkable stability, as it reached a standard deviation of (0.18), and this is an indication that the company follows a clear policy to match sales levels with levels of liquidity and net working capital.
8. Arab Potash Company was able to rationalize its operating expenses

9. The results of H_{02-3} sub-hypothesis test showed the presence of a significant effect of spare parts (FMS, SMS, OBS) on the operation ratio in APC, and that the positive significant effect appeared on all types of spare parts.

4.3 Recommendations

Based on the results obtained and what was concluded from the findings, the researcher provides some recommendations to decision makers at Arab Potash Company:

1. APC are recommended to review its spending on purchasing, storing, insurance and holding of spare parts, thus enhancing its profitability indicators.
2. APC are recommended to increase the efficiency of utilizing the available resources to generate annual revenue and returns for shareholders.
3. APC are recommended to convert for a lean inventory management that leads to rationalize the volume of spare parts especially for slow moving and obsolescence spare parts, in order to increase the financial efficiency of the organization.
4. APC are recommended to review the way of planning supply and demand of spare parts for its operations, the controlling of such resources should be apart from maintenance to have the same or higher service level at a lower operation cost.
5. APC are recommended to review the way of classification the spare parts, follow a one-dimensional classification (e.g., classical ABC-analysis or VED classification) leads for increasing the level of cash tied in receivable accounts, inventories and operating cash flows.
6. APC are recommended to adopt new methodology for spare parts

3. The results of H_{01-2} sub-hypothesis test showed the presence of a significant effect of spare parts (FMS, SMS, OBS) on the return on equity in APC, and it was found that the moral effect was negative, which is an indication of the inverse relationship between the profitability of the company and the volume of spare parts, especially (SMS, OBS).
4. The results of H_{01-3} sub-hypothesis test showed the presence of the moral effect of the spare parts (FMS, SMS, OBS) on the net profit margin of APC, and it was also found that the significant effect was negative and for all spare parts categories.
5. The results of H_{01-4} sub-hypothesis test from the first main hypothesis showed the presence of the moral effect of spare parts (FMS, SMS, OBS) on the gross profit margin in APC, and it was also found that the significant effect was negative and for all types of spare parts.
6. The results of the second main hypothesis test showed the presence of the significant effect of spare parts (FMS, SMS, OBS) on the liquidity of APC as one of the areas of financial performance, and it was found that the significant effect was positive, especially (SMS, OBS).
7. The results of H_{02-1} sub-hypothesis test showed the presence of significant effect of spare parts (FMS, SMS, OBS) on the current ratio in APC, and it was also found that the significant effect was positive, especially (SMS, OBS).
8. The results of H_{02-2} sub-hypothesis test showed the presence of the significant effect of spare parts (FMS, SMS, OBS) on the working capital turnover in APC, and it was also found that the significant effect was negative for all type of spare parts.

Amman Stock Exchange. (2020, November 17). About us. https://www.exchange.jo/en/Corporate-Profile/About-Us/About-ASE

Arab Potash Company. (2012-2020). Annual Report (Arab Potash Company Annual reports 2012-2020 EN).

Arab Potash. (2020, November 13). Company Overview. http://www.arabpotash.com/En/Pages/Overview_EN

Balaji, K., & Kumar, V. S. (2013). Effects of Slow-Moving Inventory in Industries: Insights of Other Researchers. *International Journal of Trade, Economics and Finance*, *4*(4), 243.

Baluch, N. H., Abdullah, C. S., & Mohtar, S. (2013). Evaluating effective spare-parts inventory management for equipment reliability in manufacturing industries. European Journal of Business and Management, 5(6), 69-76.

Becker, A.J. (1987). The scaling of repairable spares. Maintenance Management International. Vol. 6 No. 1, pp. 239-47.

Bošnjaković, M. (2010). Multicriteria inventory model for spare parts. Tehnički vjesnik, 17(4), 499-504.

Boute, R., Lambrecht, M., Lambrechts, O., & Sterckx, P. (2006). An analysis of the variation in inventory performance in the Belgian manufacturing industry and the financial impact of inventories.

Braglia, M., Grassi, A. and Montanari, R. (2004), "Multi-attribute classification method for spare parts inventory management", Journal of Quality in Maintenance Engineering, Vol. 10 No. 1, pp. 55-65.

Bridgman, M. S., & Mount-Campbell, C. A. (1993). Determining the number of spares in an inventory/repair system which supports equipment

classification and demand analysis such as MASTA approach, which leads to increase the working capital turnover and avoiding the obsolescence of strategic and essential spare parts.

7. APC are recommended to develop an inventory matrix policy integrated with multi attributes spare parts classification that leads to increase return on assets and equity and reduce other operation expenses.
8. APC are recommended to use modern information systems and advanced technology to classify spare parts, and track their transactions and validity at warehouses, in order to avoid the risk of not meeting their needs and thus incurring exacerbating losses in production and profits.
9. APC are recommended to follow the most developed approach in inventory auditing and perpetual counting, in order to avoid any not inconsistent book values or keeping obsolete spare parts, that would lead to affecting the assets management and the operations.
10. The researcher is recommended for future research to study the impacts of inventory movements on other capital-intensive companies in the region, and study the impacts of multi attributes classification of spare parts on the inventory values of APC.

5. REFERENCES

Agus, A., & Noor, Z. M. (2006). Supply chain management and performance. An Empirical Study (Vol. 1, No. 1, pp. 4-19). A working paper university of Malaysia.

spares and contracts planning. European Journal of Operational Research, 129(2), 235-241.

Dekker, R., Kleijn, M. J., & De Roji, P. J. (1998). A spare parts stocking policy based on equipment criticality. International Journal of production economics, 56, 69-77.

Driessen, M., Arts, J., van Houtum, G. J., Rustenburg, J. W., & Huisman, B. (2015). Maintenance spare parts planning and control: a framework for control and agenda for future research. Production Planning & Control, 26(5), 407-426.

Duchessi, P., Tayi, G. K., & Levy, J. B. (1988). A conceptual approach for managing of spare parts. International Journal of Physical Distribution & Materials Management.

Durán, O., Macchi, M., & Roda, I. (2016). On the relationship of spare parts inventory policies with Total Cost of Ownership of industrial assets. In 3rd IFAC Workshop on Advanced Maintenance Engineering, Services and Technology AMEST 2016 (pp. 19-24). Elsevier BV.

Eroglu, C., & Hofer, C. (2011). Lean, leaner, too lean? The inventory-performance link revisited. Journal of Operations Management, 29(4), 356-369.

Evans. (2008, November 11). MRO Spares Optimization. Marcus Evans Malaysia Location: Malaysia Kuala Lumpur http://www.gulfoilandgas.com/WEBPRO1/Events/Event_Details.asp?id=752

Flint, P. (1995). TOO MUCH OF A GOOD THING. Better management of inventory could save the industry millions. Air Transport World, 32(9), 103-108.

Flores, B. E., & Whybark, D. C. (1987). Implementing multiple criteria with scheduled usage. International journal of production economics, 30, 501-518.

Cannon, A. R. (2008). Inventory improvement and financial performance. International Journal of Production Economics, 115(2), 581-593

Capkun, V., Hameri, A. P., & Weiss, L. A. (2009). On the relationship between inventory and financial performance in manufacturing companies. *International Journal of Operations & Production Management*.

Cavalieri, S., Garetti, M., Macchi, M., & Pinto, R. (2008). A decision-making framework for managing maintenance spare parts. Production planning & control, 19(4), 379-396.

Chen, H., Frank, M. Z., & Wu, O. Q. (2005). What actually happened to the inventories of American companies between 1981 and 2000. Management science, 51(7), 1015-1031.

Cho, D. I., & Parlar, M. (1991). A survey of maintenance models for multi-unit systems. European journal of operational research, 51(1), 1-23.

Cobbaert, K., & Van Oudheusden, D. (1996). Inventory models for fast moving spare parts subject to "sudden death" obsolescence. International Journal of Production Economics, 44(3), 239-248.

Cohen, M. A., & Ernst, R. (1988). Multi-Item Classification and Generic Inventory Stock Contr. Production and Inventory Management Journal, 29(3), 6.

Cohen, M. A., & Lee, H. L. (1990). Out of touch with customer needs? Spare parts and after sales service. MIT Sloan Management Review, 31(2), 55.

de Almeida, A. T. (2001). Multicriteria decision making on maintenance:

Hatefi, S. M., Torabi, S. A., & Bagheri, P. (2014). Multi-criteria ABC inventory classification with mixed quantitative and qualitative criteria. International Journal of Production Research, 52(3), 776-786.

Huiskonen, J. (2001). Maintenance spare parts logistics: Special characteristics and strategic choices. International journal of production economics, 71(1-3), 125-133.

Ikhwan, M. A., & Burney, F. A. (1994). Maintenance in Saudi industry. International Journal of Operations & Production Management.

Ionescu, L., Toma, M., & Founanou, M. (2018). Applied Analysis of the Impact of Inventory Valuation Methods on the Financial Situation and Financial Performance. *Valahian Journal of Economic Studies*, *9*(1), 67-76.

Kabir, A. Z., & Al-Olayan, A. S. (1996). A stocking policy for spare part provisioning under age based preventive replacement. European journal of operational research, 90(1), 171-181.

Kaio, N., & Osaki, S. (1978). Optimum ordering policies with lead time for an operating unit in preventive maintenance. IEEE Transactions on reliability, 27(4), 270-271.

Kennedy, W. J., Patterson, J. W., & Fredendall, L. D. (2002). An overview of recent literature on spare parts inventories. International Journal of production economics, 76(2), 201-215.

Ketikidis, P. H., Koh, S. L., Gunasekaran, A., Danas, K., & Roudsari, A. (2006). The applicability of a multi-attribute classification framework in the healthcare industry. Journal of Manufacturing Technology Management.

ABC analysis. Journal of Operations Management, 7(1-2), 79-85.

Forbes Middle East. (2020, November 10). Top 100 Listed Companies in the Middle East 2019. https://www.forbesmiddleeast.com/list/top-100-listed-companies-in-the-middle-east-2019

Fuller, J. B., O'Conor, J., & Rawlinson, R. (1993). Tailored logistics: the next advantage. Harvard Business Review, 71(3), 87-98.

Gajpal, P. P., Ganesh, L. S., & Rajendran, C. (1994). Criticality analysis of spare parts using the analytic hierarchy process. International journal of production economics, 35(1-3), 293-297.

Geraerds, W. M. J. (1992). The EUT maintenance model. International Journal of Production Economics, 24(3), 209-216.

Godana, B. E., & Ngugi, K. (2014). Determinants of effective inventory management at Kenol Kobil limited. European Journal of Business Management, 1(11), 341-361.

Grange, F. (1998, December). Challenges in modeling demand for inventory optimization of slow-moving items. In 1998 Winter Simulation Conference. Proceedings (Cat. No. 98CH36274) (Vol. 2, pp. 1211-1217). IEEE.

Grzegorz, M. (2008). Value-based inventory management. Romanian Journal of Economic Forecasting, 9(1), 82-90.

Gujarati, D. N., Bernier, B., & Bernier, B. (2004). Econométrie (pp. 17-5). Brussels: De Boeck.

Haneveld, W. K., & Teunter, R. H. (1997). Optimal provisioning strategies for slow moving spare parts with small lead times. Journal of the Operational Research Society, 48(2), 184-194.

Procurement Practices on Organization's Performance. Singaporean Journal of Business Economics and Management Studies (SJBEM), 6(3), 32-39.

Mather, D. (2008). Asset resource planning. New York, NY: Industrial Press Inc.

Mukhopadhyay, S. K., Pathak, K., & Guddu, K. (2003). Development of decision support system for stock control at area level in mines. IE (I) Journal-MN, 84, 11-16.

Muniz, L. R., Conceição, S. V., Rodrigues, L. F., de Freitas Almeida, J. F., & Affonso, T. B. (2020). Spare parts inventory management: a new hybrid approach. The International Journal of Logistics Management.

NdiranguKung'u, J. (2016). Effects of Inventory Control on Profitability of Industrial and Allied Firms in Kenya. *IOSR Journal of Economics and Finance (IOSR-JEF)*, *7*(6), 9-15.

Panigrahi, C. M. A. (2013). Cash conversion cycle and firms' profitability–A study of cement manufacturing companies of India. International Journal of Current Research, 5(6), 1484-1488.

Petrović, D., & Petrović, R. (1992). SPARTA II: Further development in an expert system for advising on stocks of spare parts. International journal of production economics, 24(3), 291-300.

Petrǿić, D., Petrović, R., Senborn, A., & Vujošević, M. (1990). A microcomputer expert system for advising on stocks in spare parts inventory systems. Engineering Costs and Production Economics, 19(1-3), 365-370.

Prakash, J., & Chin, J. F. (2017). Effects of inventory classifications on CONWIP system: A case study. Journal of Management Analytics, 4(3), 296–320.

Kilonzo, J. M., Memba, F. S., & Njeru, D. (2016). Effect of Inventory Management on Financial Performance of Firms Funded by Government Venture Capital in Kenya. Eur J Bus Manage, 8, 35-41.

Kim, J. S., Shin, K. C., & Yu, H. K. (1996). Optimal algorithm to determine the spare inventory level for a repairable-item inventory system. Computers & operations research, 23(3), 289-297.

Kocer, U. U., & Tamer, S. (2011). Determining the inventory policy for slow-moving items: a case study. In Proceedings of the World Congress on Engineering (Vol. 1, pp. 6-8).

Koumanakos, D. P. (2008). The effect of inventory management on firm performance. *International journal of productivity and performance management*.

Lenard, J. D., & Roy, B. (1995). Multi-item inventory control: A multicriteria view. European Journal of Operational Research, 87(3), 685-692.

Lun, Y. V., Lai, K. H., & Cheng, T. E. (2010). Shipping and logistics management. London: Springer.

Lwiki, T., Ojera, P. B., Mugenda, N. G., & Wachira, V. K. (2013). The impact of inventory management practices on financial performance of sugar manufacturing firms in Kenya. *International Journal of Business, Humanities and Technology*, *3*(5), 75-85.

Makori, D. M., & Jagongo, A. (2013). Working capital management and firm profitability: Empirical evidence from manufacturing and construction firms listed on Nairobi securities exchange, Kenya. International journal of accounting and taxation, 1(1), 1-14.

Masudin, I., Kamara, M. S., Zulfikarijah, F., & Dewi, S. K. (2018). Impact of Inventory Management and

NO. 4 (JULY/AUG. 2003), P. 30-37: ILL.

Triantaphyllou, E., & Mann, S. H. (1995). Using the analytic hierarchy process for decision making in engineering applications: some challenges. International journal of industrial engineering: applications and practice, 2(1), 35-44.

Vereecke, A., & Verstraeten, P. (1994). An inventory management model for an inventory consisting of lumpy items, slow movers and fast movers. International Journal of Production Economics, 35(1-3), 379-389.

Viriyasitavat, W. (2016). Multi-criteria selection for services selection in service workflow. Journal of Industrial Information Integration, 1, 20-25.

Walker, J. (1996). A graphical aid for the initial purchase of 'insurance type'spares. Journal of the Operational Research society, 47(10), 1296-1300.

Xu, S., Da Xu, L., & Chen, X. (2003). Determining optimum edible films for kiwifruits using an analytical hierarchy process. Computers & Operations Research, 30(6), 877-886.

Ramanathan, R. (2006). ABC inventory classification with multiple-criteria using weighted linear optimization. Computers & operations research, 33(3), 695-700.

Roda, I., Macchi, M., Fumagalli, L., & Viveros, P. (2014). A review of multi-criteria classification of spare parts: From literature analysis to industrial evidences. *Journal of Manufacturing Technology Management*, *25*(4), 528-549.

Rumyantsev, S., & Netessine, S. (2007). Inventory and its relationship with profitability: evidence for an international sample of countries. Available at SSRN 2319862.

Sahari, S., Tinggi, M., & Kadri, N. (2012). Inventory management in Malaysian construction firms: impact on performance. *SIU Journal of Management*, *2*(1), 59-72.

Sharaf, M.A. and Helmy, H.A. (2001). "A classification model for inventory management of spare parts". Proceedings of 7th International Conference on Production, Industrial Engineering, Design and Control (PEDAC 2001). Alexandria, Egypt, 13-15 February, Vol. 1, pp. 82-375.

Smith, G. (2018). Step away from stepwise. Journal of Big Data, 5(1), 1-12.

Teixeira, C., Lopes, I., & Figueiredo, M. (2018). Classification methodology for spare parts management combining maintenance and logistics perspectives. Journal of Management Analytics, 5(2), 116-135.

Timme, S. G., & Williams-Timme, C. (2003). THE REAL COST OF HOLDING INVENTORY. SUPPLY CHAIN MANAGEMENT REVIEW, V. 7,