

Inventory Management Strategy and Performance of Manufacturing Firms in India

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ABSTRACT

Inventory management is a determinant of operational efficiency and overall performance of manufacturing firms where it is readily apparent. The article focuses on the correlation between inventory management strategy and the performance of manufacturing companies in India and specifically the differences across the firm size. A structured questionnaire was used in order to collect primary data in 100 manufacturing firms in both small and large enterprises. The analysis of key dimensions of the inventory management strategy, such as inventory holding cost, inventory turnover, and production efficiency were put in the context of the firm performance indicators such as profitability. The Mann Whitney U was used to determine the level of differences in the perceptions and performance between small and big firms. The results have shown that there is a considerable variation in the size of firms in terms of inventory holding cost, inventory turnover and production efficiency and the size of firms can have a certain impact on the practices in inventory management, as well as the performance of operations. The difference between profitability of small and large firms was however not significant. According to the results, operational performance among firms of different sizes depends on the strategies of inventory management in different ways, but the impact on the profitability might be conditional by other organizational or market factors. The research offers useful findings to managers and policymakers in the development of inventory management strategies that are of size to fit in order to improve efficiency and competitiveness within the Indian manufacturing industry..

Keywords: *Inventory management, manufacturing firms, operational performance, supply chain, India and cost efficiency.*

1. INTRODUCTION:

The environment in which the manufacturing firms exist is quite competitive and dynamic and efficient utilization of the resources is paramount to survival and growth. Inventory is one of the most important investments that manufacturing organizations make among other resources of operation. Raw materials, work-in-progress (WIP), finished goods and spare parts are all classified as inventory and they have a direct impact on continuity of production, customer service and profitability. The manufacturing industry in the Indian setting has experienced significant change in the last 20 years with economic liberalization, foreign direct investment inflow,

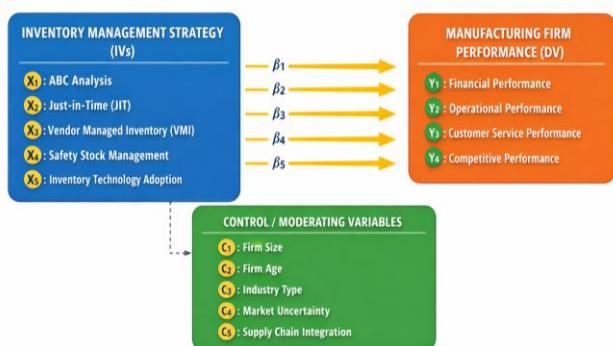
development of global supply chains, and steps like Make in India and Atmanirbhar Bharat. In spite of these changes, Indian manufacturing companies are still faced with inefficiencies that are associated with excess inventories, stock-outs, broken materials, and high carrying costs. Estimates of the industry show that inventory costs may take up 20-30 percent of the overall costs incurred in an operation of a manufacturing company and hence inventory management is strategic issue and not an operation one. Inventory management strategy: This is the premeditated approach, control and optimization of the inventory level with the aim of achieving a balance between the minimization of costs and service level requirements. An effective inventory

plan helps companies to satisfy the demand of customers in the shortest possible time and it reduces holding, ordering and shortage expenses. On the other hand, lack of effective inventory management may translate to delays in production, customer dissatisfaction, blockage of working capital and low profitability. This article will seek to offer an in depth discussion of inventory management practices and how they can influence the performance of manufacturing companies in India. It combines the theoretical views, practical approaches, performance measures, and situational issues to provide findings to researchers, practitioners, and policymakers.

Conceptual Framework of Inventory Management

The management of inventory has been an essential factor in defining the level of operational efficiency, cost structure and competitive performance of the manufacturing companies. Effective inventory management has also gained importance in India where manufacturing is a major contributor to GDP, employment and export because of globalization, supply chain disruptions, demand variability as well as changes in technology. The article will explore the phenomenon of inventory management strategy and its effects on performance of manufacturing companies in India. It addresses major inventory management practices, theoretical backgrounds, performance aspects, and issues of the Indian manufacturers, as well as the digital technologies. The article emphasizes the success of having good inventory management to improve cost effectiveness, customer satisfaction, flexibility of operations and financial performance. The article ends up by giving managerial implications of the study and the future research directions to the Indian manufacturing sector.

Figure :1 Conceptual Framework



Theoretical Perspectives on Inventory Management

Economic Order Quantity (EOQ) Theory: Economic order Quantity (EDOQ) theory is a classical inventory management theory which computes the best quantity of orders that will reduce the overall cost of inventory. EOQ total inventory cost is a combination of ordering costs, holding or carrying costs, shortage costs in case of certain

cases. The theory considers that demand is always constant, ordering cost is fixed, lead time remains constant and that there are no stock-outs. EOQ offers a mathematical model that assists manufacturing companies to determine the quantity of orders to make and the time to refill stock to generate economies of scale. In this situation, EOQ can be applied in manufacturing firms in India, especially when the demand trends of raw materials and standardized components are relatively consistent. Despite the shortcomings of the EOQ model because of its simplifying assumptions, the model is a basic instrument of inventory planning. EOQ has been taken as a standard model by many Indian manufacturing companies, and most of them have been combining it with the advanced methods of inventory management and demand forecasting, to increase the efficiency of operations and minimize the unnecessary expenses on inventory management.

Just-in-Time (JIT) Philosophy: Just-in Time (JIT) philosophy focuses on having a minimum inventory through synchronization of production and procurement with the real customer demand. With JIT, the materials are shipped and consumed as required in the process of production, which minimizes the holding costs, wastage, and inefficiencies. JIT was originally invented in Japan and it is characterized by much improvement, quality improvement, and good coordination of suppliers. JIT is used in manufacturing companies to reduce inventory amounts, reduce the cycle time, and increase the flexibility of the processes. JIT has been extensively implemented in the Indian manufacturing sector in the manufacture of automobile, electronic and consumer goods. Nonetheless, JIT implementation should be supported by quality suppliers, effective logistics and consistent demand patterns. Nevertheless, JIT is a method of controlling inventory despite the challenges in infrastructures and supply chains faced in India and firms that successfully adopt JIT enjoy lower inventory expenses, better quality of products and improved operations performance thus JIT is a method through which inventory is managed.

Lean Manufacturing Theory: Lean Manufacturing Theory is based on the eradication of waste and maximization of value addition during the process of production. Inventory is considered a waste in the sense that it occupies capital, adds more to the cost of storage as well as hiding faults in production processes. Lean manufacturing focuses on eliminating the non-essential inventory through the optimization of the processes, workflow, and enhancement of coordination throughout the chain of supply. The main tenets of lean are continual enhancement (Kaizen), value stream mapping and just-in-time manufacturing. Lean concepts in manufacturing companies facilitate the minimization of lead times, productivity and quality performance. Lean manufacturing has received much attention in India where companies are working towards enhancing their competitiveness in the world markets. Lean has been advocated by government programs and industry associations to small and medium enterprises. Lean manufacturing helps in enhancing operations and

financial performance of manufacturing companies by decreasing surplus inventory and enhancing efficiency in the production processes.

Resource-Based View (RBV) theory argues that sustainable competitive advantage of a firm comes as a result of unique resources and capabilities that are valuable, rare, inimitable, and non-substitutable. On the inventory management front, RBV reveals the strategic significance of capabilities of inventory of the companies which include demand forecasting accuracy, supplier relationship management, information systems, and process integration. Manufacturing companies, management of inventory is not an operational process, but a strategic resource that improves efficiency, responsiveness, and performance. The Indian manufacturing industry can have superior inventory capabilities and companies investing in superior inventory, professional human resources and integrated supply chain networks can build an excellent inventory. RBV describes the reason why certain firms manage to record higher performance results due to inventory management practices than others despite working within the same industry. Therefore, RBV has a significant theoretical basis on connecting inventory management strategy to the performance of firms.

Inventory Management Strategies in Manufacturing Firms

Vendor Managed Inventory (VMI): Vendor Managed Inventory (VMI) is an inventory management system whereby the supplier manages and replenishes inventory at the point of sale at the buyer end. In this system the vendor tracks the inventory levels, the demand trends and the consumption information to make sure that the inventory is refilled on time, thus minimizing pressure on the manufacturing company. VMI enhances coordination in the supply chain, improves the exchange of information and minimises the chances of stock-outs and oversupply. In manufacturing companies, VMI leads to a higher turnover of the inventory, lower cost of ordering and the level of service. VMI has been popularised in the Indian manufacturing environment in pharmaceutical industries, automotive parts and fast moving consumer products where the demand variability is high and the supply continuity of the products is of high importance. Nonetheless, the implementation of VMI needs a high level of trust, information systems, and long-term relations between suppliers and manufacturers. VMI is an effective strategic tool of operation efficiency and the general performance of the firm when well managed.

Safety Stock Management: Safety stock management is the attainment of extra inventory as an insurance against uncertainty in the demand, supply delays and production wastages. The key goal of safety stock is to avoid stock-outs and maintain a continuous production and customer service. Safety stock is essential in the manufacturing companies in reducing the risk of demand variations, supplier failure and logistical issues. Some of the reasons why firms may maintain a large level of safety stock in the Indian manufacturing environment are the infrastructural

limitations, delays in transportation and fluctuation in the market. But too much safety stock may raise the holding costs, utilize the working capital and create obsolescence. Safety stock management requires a balance between the risk and cost through demand forecasting, lead time analysis and service level targets. Optimizing levels of safety stocks helps manufacturing companies to ensure a high level of inventory availability with a minimum amount of unnecessary costs, the reduction of which positively affects the efficiency of operations and financial results.

Technology-Driven Inventory Systems: The technology-based inventory systems are using digital tools and information technologies to improve on the inventory planning, inventory control and decision making. The inventory systems that are supported by technology give real time information about the inventory levels, automate the replenishment of stock and enhance the accuracy of forecasting of demand. In the case of manufacturing companies, the systems also minimize the number of mistakes made by humans, improve the coordination of the operations between the departments, and contribute to the effective use of resources. In India, the move towards the use of technology-led inventory systems has gained momentum because of the digital transformation efforts and growing competence in global markets. Although the use of ERP based inventory systems among large manufacturing companies has become common, small and medium enterprises are confronted with issues that touch on cost and technical skills. However, inventory systems that are technology-driven are vital in enhancing efficiency in inventory and cost reduction as well as the overall performance of the firms in the manufacturing industry.

Performance Aspects of Manufacturing Firms.

Return on Assets (ROA): One of the most important financial performance ratios is the Return on Assets (ROA) which determines the level at which a firm uses its total assets to make profits. It is computed as net profit/ total assets. Inventory is a big part of total asset in manufacturing companies and this means that inventory management will directly affect ROA. Too much inventory creates assets base its returns without an equivalent growth hence decreasing ROA and the optimum level of inventory maximizes the use of assets. The Indian manufacturing environment presents firms that possess effective inventory planning and control systems as being more likely to attain high ROA through the reduction of idle stock, minimization of obsolescence and enhancement of production efficiency. Just-in-time (JIT), Vendor Managed Inventory (VMI) and technology-based inventory strategies are inventory strategies that are used by firms to streamline their use of assets and enhance profitability. ROA, therefore, is a significant indicator to estimate financial implications of inventory management approaches to the performance of manufacturing firms.

Working Capital Efficiency: The working capital efficiency measures how a firm can use the short-term assets and liabilities to facilitate the running of the firm. It is typically measured in terms of current ratio, quick ratio

and cash conversion cycle. Inventory is a significant part of working capital in manufacturing companies and can frequently constitute a large portion of the current assets. Poor inventory management may result in a situation whereby a lot of capital is invested in stock and this touches on the liquidity and flexibility in operations. Proper inventory control measures correct inventory flow, reduce cash conversion cycle and increase cash flow. In India, where manufacturing companies are characterized by the lack of financing and the high-cost of borrowing, the effective working capital management is the key to survival. Having less holding cost and high inventory turnover will help firms to be more efficient in their working capital, thereby enhancing financial stability and overall performance of the firm.

Inventory Turnover Ratio: The inventory turnover ratio is used to determine the number of times that a firm sells and replaces its inventory in a specified period of time. It is determined using the cost of goods sold/average inventory. When the ratio of the inventory turnover is high, then it means that the inventory is used efficiently and is highly demanded whereas when it is low, it means that the inventory is overstocked or poorly sold. In the case of manufacturing companies, it is necessary to have an efficient inventory level, which balances between continuity of production and cost effectiveness. ABC analysis, JIT, and demand forecasting are effective inventory management tools that help increase the turnover rates through minimizing the amount of excess inventory and matching production to the demand in the market. Within the Indian manufacturing industry, the companies that have greater inventory turnover ratios tend to have lower carrying costs, lower obsolescence and better cash flow. Inventory turnover ratio is therefore a very important measure to determine the efficiency of inventory management practices.

Cost of Goods Sold (COGS): The direct costs involved in the production of goods such as raw materials, labor and manufacturing overheads are classified as cost of Goods Sold (COGS). The inability to manage inventory appropriately can result in an increase in material waste, storage cost, and emergency purchasing at a higher price, which increases COGS. On the other hand, proper inventory management practices can help organizations to acquire materials at the ideal prices, minimize waste and enhance planning of production. In manufacturing companies, especially in India, it is imperative that COGS is controlled to enable the companies to be able to offer competitive prices and make profits. Through the use of organized inventory management procedures, companies can enjoy a higher cost control, operational efficiency and an overall improved financial performance.

Operational Performance: Operational performance is the efficiency and effectiveness of the internal processes which facilitates the manufacturing companies to produce goods, the most efficient way of using resources. The main aspects of the operational performance are efficiency of production, decrease in lead time, use of capacities, flexibility and uniformity of quality. Management inventory is a very important concept that will improve the operations performance by making sure that the raw materials and components are available on

time to prevent disruptions in production and idle time. Principles like Just-in-time (JIT), lean inventory, and technology based inventory systems are useful tools of working on effective inventory strategies to streamline the production flows and minimize the number of bottlenecks. In the Indian manufacturing environment, where the companies are commonly affected by the issues of variability of supply chains and the lack of infrastructure, effective inventory management enhances the timing of production and responsiveness. These are better operational performance leading to the reduction of the manufacturing cycles, cost of operations and process reliability resulting in increased productivity and overall firm performance.

Customer Service Performance: Customer service performance shows how a firm manages to satisfy the expectations of its customers in aspects of product availability, reliability in delivering products, accuracy in taking orders, and responsiveness. One of the main factors that determine the performance of customer care is inventory management, since a sufficient level of inventory is the guarantee of prompt fulfillment of orders and a decrease in cases of stock-outs. The manufacturing companies that implement powerful inventory planning and control systems are more capable of in-aligning production with demand of customers and this increases the reliability of services offered. Customer services performance in the Indian manufacturing industry has increasingly taken a central role in the industry given the stiff competition and customer expectations in the industry. The inventory solutions like safety stock optimization, demand forecasting and coordination with vendor can help firms maintain the high level of service without paying high costs. Improved customer services performance results in increased customer satisfaction, better customer relations and re-business hence the positive effect on the firm performance and long term sustainability.

Competitive Performance: The competitive performance is the capacity of a firm to attain and maintain a desirable market position over its rivals. It is manifested in market share, cost leadership, product differentiation, innovation ability and long term viability. The inventory management helps in competing effectively, because it permits firms to lower the costs, responsiveness and operational flexibility. Manufacturing companies that have effective inventory management are able to react promptly to market dynamics, launch new products more rapidly and stay at competitive prices. This is because in the Indian manufacturing business where companies acquire or sell products offered in a very competitive local and international market, inventory efficiency can be a very important source of competitive advantage. Choosing inventory management strategies in accordance to the overall business goals, the firms may enhance their position on the market, increase profitability, and attain sustainable competitive performance in the long run.

Relationship between Inventory Management Strategy and Firm Performance

Numerous empirical studies indicate a strong positive relationship between inventory management strategy and firm performance. Manufacturing firms that adopt structured inventory control techniques experience:

Reduced Inventory Holding Costs

Reduced inventory holding costs mean the reduction in the cost of holding and maintaining inventory such as warehousing, insurance, handling, deterioration, and obsolescence. Inventory holding costs may constitute a significant part of the total operational costs in manufacturing companies especially where the firms have excess stocks. Economic order Quantity (EOQ), Just in Time (JIT) and ABC analysis are some of the effective inventory management strategies that firms use to ensure that the inventory maintained is optimal; this does not lead to stock hoarding. The issue of minimizing holding costs is of particular concern to the Indian manufacturing setting with the capital costs high and the lack of storage facilities. Working capital is also available because of reduced inventory and this leads to better cash flow and reduced chances of inventory obsolescence. A lower cost of inventory holding has a direct impact on the financial performance on the operations and efficiency of the company and so it is a very important consequence of good inventory management practices.

Better Turnover of Inventory.

A better inventory turnover means efficient flow of inventory through the production and sales process. It is used to define the rate of inventory turnover and replacement within a given period and is typically utilized as a metric on inventory effectiveness. Increased ratio of inventory turnover is indicative of the manufacturing company being efficient to market demand, reduce surplus stock, and the carrying cost. Demand forecasting, JIT and technology-driven inventory system as strategies of inventory management are crucial in enhancing inventory turnover. Through better turnover, the liquidity in Indian manufacturing firms can be improved and the risk of obsolescence can be minimized in areas that run product life cycles on short run basis. A high inventory turnover is also a measure of good coordination among the functions of procurement, production, and sales. Subsequently, enhanced inventory turnover leads to an enhanced working capital management and general performance of the firm.

Enhanced Production Efficiency

Enhanced production efficiency is the capacity of the manufacturing companies to produce in the most effective manner and reduce the input cost and wastes as well as delays. An important factor in determining the efficiency of production is inventory management because the availability of raw materials and other components at the right time leads to continuous production processes. Good inventory strategies minimize shortages of materials, production delays and high work-in-progress inventory. Lean production, JIT, and real-time inventory movements are only some of the practices that help to smooth the production routes, and remove bottlenecks. In Indian manufacturing industry where companies usually

experience uncertainty in the supply chains and infrastructural issues, greater production efficiency increases operational reliability and responsiveness. Effective inventory management allows to schedule production, to use capacity and shortened lead times. Therefore, increased productivity is sustained through greater efficiency in production that reduces costs of operation and increases the overall performance of the firms.

Higher Profitability

Increasing the profitability is an indicator of how a manufacturing firm can make more profits compared to its expenditures and investments. Inventory control has a major impact on profitability given that it has an impact on cost structures and revenue generation. The result of poor inventory management is that it results in high carrying expenses, waste, inventory obsolescence and even emergency purchases all of which lower profit margins. On the other hand, good inventory management policies assist in maximizing the inventory, minimizing operational inefficiencies and enhancing customer services. Inventory efficiency is a key driver of profitability in Indian manufacturing companies where the competition and cost pressures are very high. The plans like EOQ, JIT and VMI and inventory based on technology are among strategies which help companies to save cost but at the same time be able to offer good service. The resulting outcomes of improved inventory turnover and low holding costs are an increase in the cash flow and efficiency in operations, which translates to increase in profitability and sustainable business performance.

Literature and Research Agenda

Dhannjay Singh Patel (2024) reviews the role and significance of the inventory management techniques in the manufacturing sector as the basis of the cost control, operational efficiency, and organizational performance. The article points out that proper inventory management will lead to an optimal level of inventory on hand and carrying cost and will eliminate problems associated with overstocking, stockouts and delays in production. Patel addresses the most popular inventory management strategies, among which are Economic order quantity (EOQ), Just-in-time (JIT), ABC analysis and safety stock management, and explains how each approach helps to provide a better movement of materials and the minimization of waste. The article emphasizes that effective inventory planning would improve the continuity of production, satisfaction of customers, and profitability. It also indicates that ineffective inventory operations may cause elevated holding expenses, inefficiency, and loss of money. The article arrives at the conclusion that systematic and technology-based inventory management practices are vital in ensuring the manufacturing companies survive and stay competitive in the contemporary market environment.

Mahajan et al. (2024) presented a systematic and bibliometric literature review on the research focusing on the combination of inventory management and Total Quality Management (TQM) practices and their role in the

performance of the firm. The study analyses a substantial amount of published research and reveals some influential themes, trends, and gaps in the current scholarship. The results indicate that effective inventory management that is in line with TQM principles like continuous improvement, process standardization and customer orientation makes great contributions to the organizations operational efficiency, costs and the overall performance of the organization. The bibliometric analysis shows that there is increasing academic attention to the joint use of inventory and quality management practices especially in the manufacturing environment and supply chain. Another gap that is indicated by the authors is the lack of empirical research in emerging economies and the role of exploring advanced technologies in the integration of TQM and inventory systems. The study concludes by stating that a combination of inventory management and TQM practice can result in sustainable competitive advantages and suggests future research employing empirical and longitudinal studies.

Narkhede and Rajhans (2022) examined how redesigned inventory management strategies will help to sustain the development of small and medium-sized enterprises (SMEs) in India. Based on an empirical research methodology, the study combines inventory management practices with sustainability goals and objectives such as cost efficiency, resource optimization and environmental responsibility. The conclusions show that conventional inventory management in the SMEs has majorly resulted in inefficiencies, including overstocking, large holding costs, and wastage. An integrated approach to demand forecasting, technology-driven inventory controls, and supplier partnerships can provide SMEs with a great chance to enhance the performance of their operations and their sustainability. Managerial commitment and employee involvement is also highlighted to play a role in successful implementation as this study highlights. The authors come up with the conclusion that strategic inventory redesign is the key to long-term sustainability, competitiveness, as well as resilience of SMEs in a dynamic business environment, especially in emerging economies such as India.

Research Gap

Although increasing literature is focusing on the management of inventory and performance of firms, there are still a number of gaps. First, there are few empirical literature specific to the Indian manufacturing environment and at the same time compares small and large companies. Second, the current literature tends to focus on financial performance only and neglects such aspects of operations as production efficiency and inventory turnover. Third, a lot of studies make use of descriptive analysis, with a smaller number of such using non-parametric methods to measure the variation in a firm across firm size. Lastly, it is not well examined how the mediators between the inventory management and performance relationship include technology adoption, supply chain integration, and market volatility. The possible solutions to these gaps may lead to a more detailed recognition of the effect of inventory

management strategies on firm performance in emerging economies such as India on performance.

Discussion, Results and Conclusions.

The research design used is a quantitative research design to investigate the correlation between inventory management strategy and performance of manufacturing firms in India and specifically on the difference in terms of size of the firms. A structured questionnaire was utilized to gather primary data on 100 manufacturing companies, both, small and large companies. It is an analysis of the important dimensions of inventory management strategy, such as inventory holding expense, inventory turnover and production efficiency and an assessment of how they are related to firm performance that is in form of profitability.

Null hypothesis: There is no significant difference in the relationship between inventory management strategy and firm performance across firm size.

Table: 1

DIFFERENCE IN THE OPINION BASED ON THE FIRM

Factors	Firm	N	Mean Rank	Test	Result
Inventory holding cost	Small	51	43.16	Mann-Whitney U	2201.00
	Big	49	58.14	Z	-2.718
	Total	100		Sig.	0.01
Inventory turnover	Small	51	43.15	Mann-Whitney U	2200.00
	Big	49	58.15	Z	-0.915
	Total	100		Sig.	0.007
Production efficiency	Small	51	52.94	Mann-Whitney U	2350.00
	Big	49	47.96	Z	-1.619
	Total	100		Sig.	0.002
Profitability	Small	51	46.14	Mann-Whitney U	2353.00
	Big	49	55.04	Z	-0.178
	Total	100		Sig.	0.781

The null hypothesis states that *there is no significant difference in the relationship between inventory management strategy and firm performance across firm size (small and big firms)*. To test this hypothesis, the Mann-Whitney U test was applied to compare small and big firms across selected inventory management and performance factors.

Inventory Holding Cost: The mean rank for big firms (58.14) is higher than that for small firms (43.16). The Mann-Whitney U value is 2201.000 with a Z value of -2.718 and a significance value of 0.01. Since the p-value is less than 0.05, the difference between small and big firms is statistically significant. This indicates that firm size significantly influences inventory holding cost management, with big firms differing from small firms in their approach or outcomes.

Inventory Turnover: Big firms again show a higher mean rank (58.15) compared to small firms (43.15). The Mann-Whitney U value is 2200.000 and the significance value is 0.007, which is below the 0.05 threshold. This result suggests a significant difference between small and big firms in terms of inventory turnover, implying that firm size plays an important role in inventory turnover performance.

Production Efficiency: In this case, small firms have a higher mean rank (52.94) than big firms (47.96). The Mann-Whitney U value is 2350.000 with a significance value of 0.002. As the p-value is less than 0.05, the difference is statistically significant. This indicates that production efficiency differs significantly across firm size, with small firms showing relatively better performance on this factor.

Profitability: The mean rank for big firms (55.04) is higher than that for small firms (46.14). However, the significance value is 0.781, which is greater than 0.05. This indicates that there is no statistically significant difference between small and big firms in terms of profitability.

2. CONCLUSION

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