

Exploring the Influence of Enterprise Resource Planning on Internal Streamlining Systems: The Mediating Effect of Order Fulfillment Rate in Egypt's Pharmaceutical Sector

Mohamed Abdelraouf^{1,2*} and Farid Moharram³

¹ Pennsylvania British International College, Loughborough, UK

² King Salman International University, South Sinai, Egypt

³ Ain Shams University, Cairo, Egypt

mohamedabdelraouf04@gmail.com

ABSTRACT

This study examines the impact of enterprise resource planning (ERP) on internal stream systems and order fulfillment rates in the Egyptian Pharmaceutical industry, focusing on Eva Pharma. It investigates the mediating role of internal stream performance between ERP adoption and order fulfillment rates. A quantitative approach was employed, using primary data collected through surveys, supplemented by secondary data for validation. To analyze the data, confirmatory factor analysis (CFA) was conducted to validate measurement models, paired T-tests were used to compare the effects of ERP implementation before and after, and structural equation modeling (SEM) was applied to identify the relationships between ERP, internal stream performance, and order fulfillment rates. The findings reveal that ERP has a significant positive impact on both internal stream performance and order fulfillment rates, with internal stream performance acting as a mediator which leads a unique strategic approach for Eva Pharma company. A significant difference was observed between the impact of ERP and manual methods on order fulfillment rates in the internal stream. Findings contribute to existing literature and serve as a guide for future research, helping to improve competitiveness, customer satisfaction, and long-term success in pharmaceutical industry.

Keywords: ERP, order fulfillment rate, internal stream system, internal stream performance

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1. Introduction

The operation of the pharmaceutical industry in the Egyptian market has been experiencing massive changes and expansion in the past few years with such players such as Eva Pharma (Elsayed and Al-Worafi, 2020). Eva Pharma company which is among the giant pharmaceutical manufacturing industries in Egypt and the Middle East has been facing problems with the firm order fulfillment rates and the internal stream systems that correspond to the manufacture's increased demand and competition. With the growth of the pharmaceutical industry that is becoming more complicated and saturated at the international level, companies such as Eva Pharma are trying to find new ways of improving their logistic performance since some of the challenges affecting Egyptian pharmaceutical companies include infrastructure restraints, lack of skilled human capital, cultural issues, fiscal volatility and legal frameworks (Hassanin and Hamada, 2022).

These challenges can adversely affect their capacity to run business effectively, meet legal requirements, and sustain competitiveness. Manual processes present these challenges to

companies, and ERP systems provide a solution to these problems because they are a structural approach to addressing issues of business processes across a range of company activities. Addressing these challenges requires a focus on using ERP systems to re-engineer the processes of the pharmaceutical industries, improve the quality of data available and utilize it in informed decision making to boost the operations of the pharmaceutical industries and maintain good compliance. The issues relating to these areas have called for the use of ERP systems as a solution to overcoming these problems with a view of optimizing on its process, management of data and overall performance (Jawad and Balázs, 2024).

The purpose of this research is to investigate the effects of adopting ERP system on the order fulfillment rates and internal stream performance in the Egyptian pharmaceutical sector with especial focal point on Eva Pharma. The main research goals are to find out the increase in order fulfillment rate by using ERP, to establish internal stream performance as a moderating variable between ERP and order fulfillment rate, and the degree of gain and loss between with and without the implementation of ERP systems. Key research questions guiding this study include: How does the implementation of an ERP system impact the order fulfillment rate of internal stream systems in the pharmaceutical industry in Egypt? Is order fulfillment a mediator in the relationship between ERP and internal stream performance?

The rationale behind this study is basically due to the challenges faced by the Egyptian pharmaceutical companies to raise their levels of productivity and competitive advantage in the international marketplace. This study seeks to examine the potential positive impacts that will be brought by the ERP implementation so that it can be of benefits to the firms, including Eva Pharma. Moreover, the problems of the pharmaceutical industry include specific demands, high legal regulation, and schedule development, complicated supply chains and precise inventory management that makes the application of ERP systems in the presented industry especially valuable for the study of its effect on the operational performance (Elgharably et al. 2016).

The implications of this research that will be presented below will enhance the knowledge of the current literature concerning ERP implementation in the context of the pharmaceutical industry and provide useful suggestions for companies like Eva Pharma on how to adopt and benefit from technology. Not only will this research assist Eva Pharma, but it will be instructive to other pharmaceutical companies in Egypt and more generally in the Middle East that are aiming to incorporate operation technologies to increase efficiency.

1.1. Conceptual Framework

A model is chosen to describe the impact of ERP on the order fulfillment rate and the mediator of internal stream performance of the internal stream system facing the companies in the pharmaceutical sector. The variables used in the model are mentioned in the following figure, which depicts the relationship between the variables.

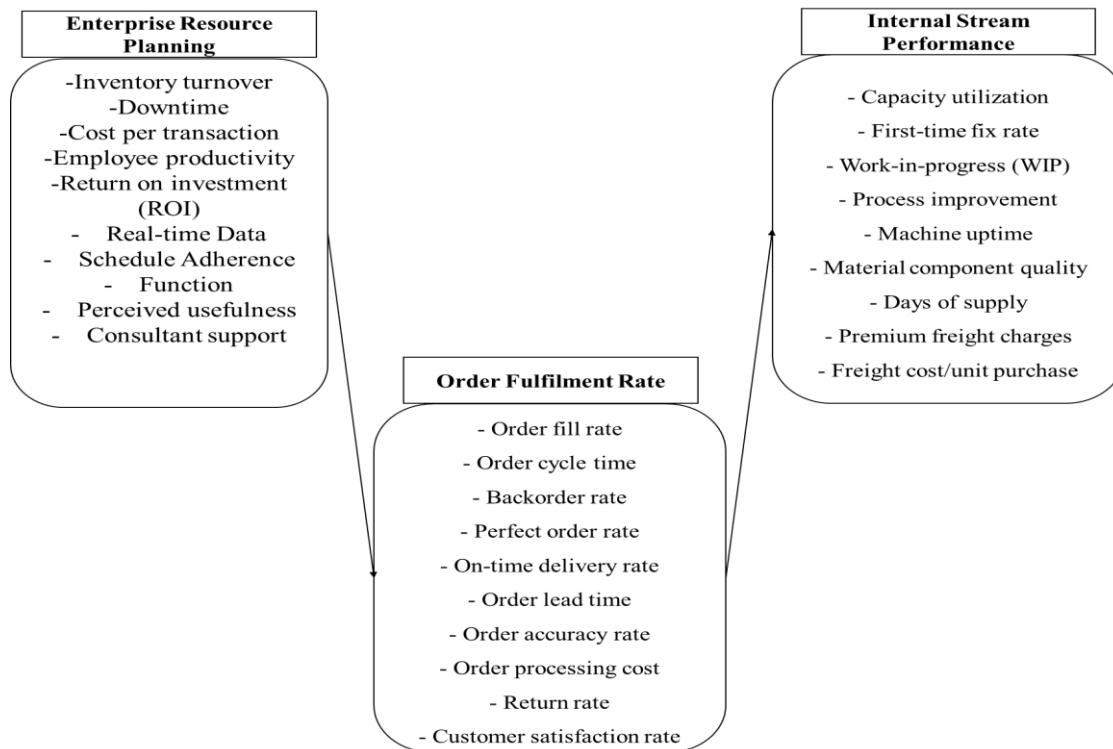


Figure 1. Theoretical Framework

Source: Developed by the authors

The experiment's results with regard to the dependent variable may be affected by changing and manipulating the independent variable. The major focus of the research and the foundation for its results is the behavior of the dependent variable. In this research, the ERP serves as the investigation's independent variable. Afterwards, it is included in the model as 10 variables for more research. There must be numerous statements in order to measure each variable separately. Each of the claims was evaluated using the Likert scale. On-time delivery, order accuracy, inventory turnover, cycle time, downtime, lead time, employee satisfaction, cost per transaction, staff productivity, and return on investment are just a few of the metrics that the ERP provides (ROI).

On the other side, the order fulfillment rate is the mediator variable, and the performance of this variable may be evaluated using a wide range of indicators. Some of the important performance metrics are the order fill rate, order cycle time, backorder rate, perfect order rate, on-time delivery rate, order lead time, order accuracy rate, order lead time, order processing cost, refund rate, and customer satisfaction rate.

The dependent variable of Internal stream performance and its dimensions are, Capacity utilization, First-time fix rate, Work-in-progress (WIP), Process improvement, Machine uptime, Material component quality, Premium freight charges, Freight cost/unit purchase and Days of supply. This study's main objectives are to better understand how ERP affects performance and the problems associated with order fulfillment rates. The research will start addressing the research issue after selecting the criteria that will be used in the investigation.

To analyze how ERP affects the percentage of successfully completed orders, a number of research challenges must be overcome and the mediating variable of Internal stream performance. Furthermore, from prior research, it is hypothesized that the implementation of ERP systems will lead to an increase in order fulfillment rates due to business process integration, increased visibility of data, and automation of processes. Research has also established that the implementation of ERP systems minimizes downtime, enhances order

accuracy and optimizes inventory turnover and processing time for orders (Beric et al., 2020). For instance, the enhanced supply chain integration capability of ERP increases the on-time delivery rate to customers and decreases the backorder rate, maximizing customer order fulfillment with minimal waiting time (Moons et al., 2019).

From this it can be deduced that ERP systems positively impact order fulfillment rates, which is a vital operational capacity metric in business sectors such as pharmaceuticals. Furthermore, order fulfillment rate serves as the moderator between ERP and internal stream performance. Similarly, better order fulfillment processes result in better order picking, inventory and resource management cutting down on material handling, stock control and delivery constraints which in effect improve machinery utilization, first time fix rates and overall machine time cycle (Hwang & Min, 2015).

The study shows that improved fulfillment rates have positive effects on internal operations as it reduces cycle time and errors, thereby enhancing efficiency (Nkwoleke, 2018). Therefore, the order fulfillment rate partially mediates the relationship between ERP and internal stream performance, as the enhancement of fulfillment by ERP leads to positive impacts on internal subsequent measurements such as process improvement as well as WIP. This relationship underscores the role of ERP systems in enhancing external order management as well as internal processes.

2. Literature Review

2.1. ERP

ERP software used to manage and connect fundamental business activities like finance, accounting, HR, and supply chain management. ERP systems evolved in the 1990s to address the constraints of prior business function automation tools. ERP originated in the 1960s when MRP systems were used to control industrial operations. ERP emerged as corporations realised the value of integrating their business processes (Habib, 2016). ERP software integrates financial, human resource, supply chain, and customer relationship management into one system. ERP systems aim to give companies a complete, real-time perspective of their operations. This is useful in the making of proper decisions, running efficient procedures as well as optimisation of the use of the resources in the company (Faccia and Petratos, 2021).

Sahoo et al. (2021) revealed that ERP systems can be composed of many modules where the organizations can make the customization according to its requirement. The financial management comprises of accounting, budgeting and cash management; human management comprises of payroll, benefit management and employees; the supply chain comprises of purchasing, stocking of inventories, order fulfillment; and lastly the customer management comprises of selling, marketing and servicing. It can also give a real-time, centralised database for departments and stakeholders to communicate, share information, and make educated decisions. Implementing an ERP system is complicated and takes time, resources, and experience. It requires strategy, design, development, testing, and deployment. It also involves an understanding of the organization's needs, processes, and workflows and rigorous training of system users (Beric et al. 2020).

2.1.1. ERP Key Performance Indicators (KPIs)

As a result, there are several aspects that make up ERP. The majority of research broke it up into 10 attributes. The divisions are shown in the following image.

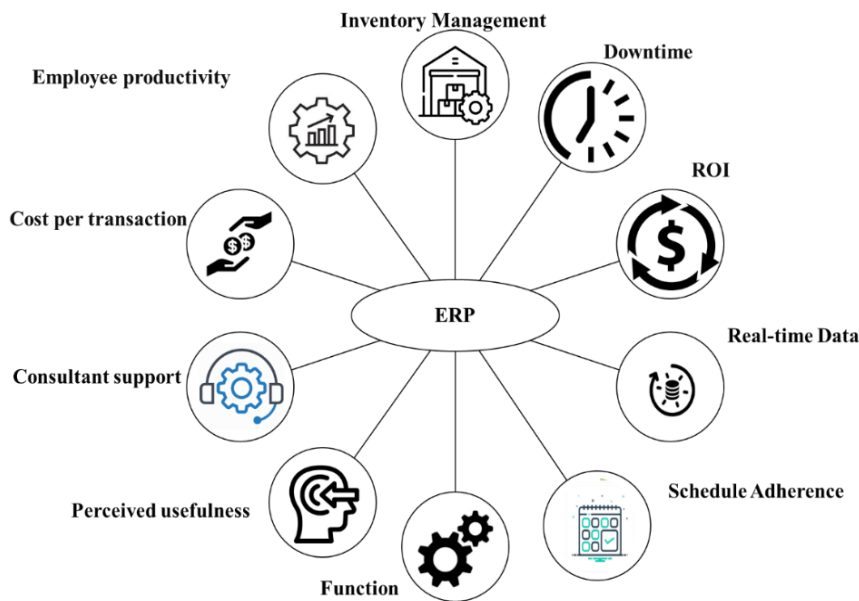


Figure 2. Attribute of ERP

Source: Based by the authors

2.1.1.1. Inventory Turnover

Inventory turnover is a commonly used KPI in the context of ERP systems. It is a measure of how quickly a company sells its inventory and replaces it with new stock (El Sakty et al. 2023). This KPI is critical in assessing the efficiency of a company's inventory management system, and it provides valuable insights into the company's supply chain performance (Brint et al. 2021).

2.1.1.2. Downtime

Time during which machine, manufacturing line or a system is not functional or is not available for usage in production is termed as downtime which is a KPI. A manufacturing business entity cannot afford to ignore it since it has a direct impact on productivity and degree of capacity utilization. There are various factors that may cause downtime; these include equipment breakdowns including tools and machines, require maintenance and repair, have new tooling installed or changes and no material available (Borg and Hirmas, 2024). Consequently, in the context of ERP, it is possible to define specific parameters and to study downtime using real-time information and methods of automation. Consumption actual data relating to the usage of equipment, maintenance plans, and supplies stock are made available through ERP systems (Chopra et al. 2022).

2.1.1.3. Cost per Transaction

Another composite performance metric involves cost per transaction; this is basically the cost that is incurred to complete any given transaction in a business process. It is arrived at by using the formula total cost for performing business process divided by the total number of transactions that passes through the process. Reduced cost per transaction goal is embedded into operation efficiency and effectiveness strategy by various companies (Majeed and Rupasinghe, 2017). Some of the findings done on the relationships between the ERP systems and their renowned effects on cost per transaction cannot be underestimated. Fernandez et al. (2017) also confirmed that from the same industry the use of an ERP system resulted in decreased cost per transaction. The audit unveiled that the cost per transaction reduce after the installment of the ERP system.

2.1.1.4. Employee Productivity

Productivity is a crucial performance metric that assesses the efficiency with which people achieve company objectives. It is a crucial statistic for firms to analyse the efficiency of their personnel and discover improvement opportunities. Employee productivity may be defined as the quantity of work accomplished in a particular time period by an employee. ERP systems have been found to have a significant impact on employee productivity. ERP systems provide real-time data on production processes, inventory levels, and supply chain management, which enables businesses to identify bottlenecks and optimize production processes. By using this data, businesses can make informed decisions to streamline workflows and reduce the time it takes to complete tasks (Ullah et al. 2017).

2.1.1.5. Return on Investment (ROI)

Return on investment (ROI) is a financial KPI that measures the profitability of an investment. In the context of ERP, ROI is used to evaluate the financial impact of implementing an ERP system on an organization. ROI is typically calculated as the ratio of the net profit generated by an investment to the total amount invested, expressed as a percentage (Edelheim et al. 2018). Numerous studies have been conducted on the ROI of ERP systems. For example, a study by Dinn (2021), found that the ROI of implementing an ERP system in a manufacturing company ranged from 49% to 151%, depending on the specific benefits realized by the company.

2.1.1.6. Real Time Data

ERP systems are defined as comprehensive application software's which links functional areas of a business and provides a real time data with focus on KPI such as Accounting, purchasing, inventory, and CRM. The one that is generated, analysed and judged within a short time frame where it can be used in decision making and action immediately is referred to as real-time data (Dev et al. 2019). Sarkar et al. (2022) concluded that another value proposition of ERP systems is that real-time data is used as a KPI because it offers businesses the ability to monitor activities as they occur and make decisions based on this information and applies ideal solutions that will fit into the market circumstances.

2.1.1.7. Schedule Adherence

ERP systems are software platforms that combine data and procedures across several corporate activities, including finance, procurement, inventory management, and manufacturing. ERP systems use Schedule Adherence as a KPI. ERP is an abbreviation for enterprise resource planning. The word "adherence to schedule" refers to the extent to which employees or production processes adhere to the given time for their scheduled labour or output (Oliveira, 2019).

"Schedule Adherence" is one of the most important key performance indicators (KPIs) for ERP systems, according to study done by Schmidt et al. (2014). This is due to the fact that it helps to ensure that activities are completed on time and within budget. Ensuring schedule adherence is also essential for optimising the usage of available resources and maximising overall output. Many more studies highlight the importance of Schedule Adherence as a Critical Performance Measure for Enterprise Resource Planning systems (Haberer et al. 2017).

2.1.1.8. Function

When discussing ERP systems, the term "Function" is often used to refer to the distinct business operations (such finance, human resources, manufacturing, or supply chain management) that are intended to be supported by the ERP system. Typically, these services

are included into the ERP system, which enables improved coordination and control of business operations throughout the whole company. The particular KPIs that are utilised may vary depending on the function that is being monitored; but, in general, they concentrate on aspects such as cost, time, quality, and customer satisfaction (Ullah et al. 2017).

2.1.1.9. Perceived Usefulness

In the context of ERP systems, a concept known as "perceived usefulness" (PU) has received a lot of attention from researchers. PU is an acronym that stands for "perceived utility," and it describes the extent to which a user feels that a certain technology or system, such as an ERP system, would improve their work performance and productivity. PU has been found to be an essential component, according to the findings of a number of studies, in the effective adoption and deployment of ERP systems (Grandón et al. 2021).

2.1.1.10. Consultant Support

Consultant support in the context of ERP systems refers to the assistance and guidance provided by external consultants to organizations during the implementation and use of the ERP system. This support may include services such as system selection, customization, training, and ongoing support. Several studies have examined the role of consultant support in the implementation and use of ERP systems (AlQashami and Heba, 2015).

2.1.2. Order Fulfilment Rate and KPIs

Order fulfilment rate refers to the percentage of customer orders that are successfully fulfilled within a given timeframe. It is a metric used to measure the efficiency and effectiveness of a company's order fulfilment process (Davis-Sramek et al. 2020).

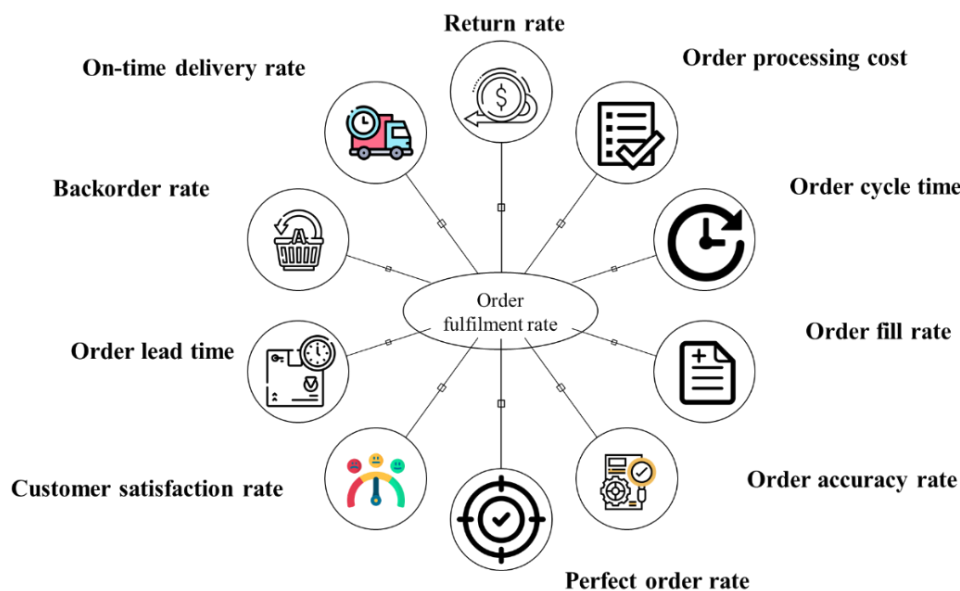


Figure 3. Metrics of Order fulfilment rate

Source: Developed by the authors

2.1.2.1. Order Fill Rate

Order fill rate is a KPI used to measure the percentage of customer orders that are fulfilled completely and on time. It is an important metric for companies that rely on efficient order processing and delivery to meet customer demands and maintain customer satisfaction. A high order fill rate indicates that a company is able to meet customer expectations and deliver

products on time, while a low order fill rate can lead to unhappy customers and lost sales (Teunter et al. 2017).

In a study by Moons et al. (2019), the authors found that improving order fill rate through the implementation of a new inventory management system led to an increase in order fulfilment rate in the manufacturing industry. The study reported that the new system enabled the company to better manage inventory levels and accurately fulfil customer orders, resulting in higher order fulfilment rates.

2.1.2.2. Order Cycle Time

Order cycle time is a KPI used in measuring the efficiency of the order fulfilment process in a business. It refers to the time taken from when a customer places an order to the time the order is delivered to the customer. The order cycle time is influenced by various factors, including order processing time, inventory availability, transportation time, and delivery time (Frazelle, 2016). The order fulfilment rate is also closely linked to the order cycle time. The order fulfilment rate refers to the percentage of orders that are successfully fulfilled within a specific time frame. A high order fulfilment rate indicates that a business is efficient in delivering orders to customers. Order cycle time is a separate KPI that measures the time it takes for an order to be fulfilled, from the moment the order is received to the moment it is delivered to the customer. It is not directly used in calculating the order fulfilment rate, but it can have an impact on it, as a longer order cycle time can lead to delays in order fulfilment and lower fulfilment rates (Nguyen et al. 2018).

2.1.2.3. Backorder Rate

The proportion of client orders that must be put on backorder because they can't be completed right away is tracked by a KPI called backorder rate. According to Gözaçan and Lafci (2020), a high backorder rate may be a sign of inefficiencies in the manufacturing, inventory, or supply chain management processes, which might have a negative effect on sales and customer satisfaction. The use of ERP systems can help to reduce backorder rates by providing real-time data on inventory levels, demand forecasting, and production schedules, allowing companies to optimize their supply chain processes and reduce lead times (Seiringer et al. 2022).

Studies have shown that reducing backorder rates can have a significant impact on order fulfilment rates and overall customer satisfaction. For example, in a study by Peinkofer et al. (2015), the authors found that reducing backorder rates by 50% led to a 20% increase in order fulfilment rates and a 30% increase in customer satisfaction. The study also highlighted the importance of real-time data and inventory management systems, such as ERP systems, in reducing backorder rates and improving order fulfilment rates.

2.1.2.4. Perfect Order Rate

Perfect order rate is a KPI that measures the percentage of orders that are delivered to customers without any errors, including complete and on-time delivery, accurate documentation, and damage-free products. It is a critical KPI that measures the effectiveness of order fulfilment processes and customer satisfaction. The formula for perfect order rate is:
$$\text{Perfect Order Rate} = \frac{\text{Number of Perfect Orders}}{\text{Total Number of Orders}} \times 100$$
 Studies have shown that perfect order rate is a valuable KPI in measuring order fulfilment rate (Sullo-Rosello et al. 2020). For example, in a study by Roh et al. (2019), the authors found that a focus on perfect order rate led to improved order fulfilment performance in a global supply chain context. The study reported that companies that prioritize perfect order rate are more likely to have streamlined processes, accurate and timely data, and effective communication with suppliers and customers.

2.1.2.5. On-Time Delivery Rate

On-time delivery rate is a KPI used in logistics and supply chain management to measure the percentage of orders delivered to customers within the agreed-upon time frame. On-time delivery is critical to customer satisfaction, loyalty, and retention, as late deliveries can result in dissatisfied customers and negative brand reputation (Dai et al. 2016). Several studies have explored the importance of on-time delivery in logistics and supply chain management. For example, Tontini et al. (2017) argue that on-time delivery is a critical element of customer service and supply chain performance, as it affects customer satisfaction, loyalty, and retention.

2.1.2.6. Order Lead Time

Order lead time is another KPI used in logistics and supply chain management to measure the time it takes to fulfil customer orders from the time they are placed to the time they are delivered. Order lead time is a critical factor in customer satisfaction, as customers expect their orders to be delivered quickly and efficiently. The order lead time is closely linked to the order fulfilment rate, which measures the percentage of orders that are successfully processed and shipped to customers (Ojha et al. 2019). In fact, order lead time is often considered a subset of order fulfilment, as it is one of the key elements of a successful fulfilment process. A low order fulfilment rate can result in longer order lead times, as orders may be delayed or cancelled due to stockouts, production issues, or other factors (Sterman and Dogan, 2015).

2.1.2.7. Order Accuracy Rate

Order accuracy rate is a KPI that monitors the proportion of orders that are dispatched without mistakes. All things ordered and delivered in the exact amounts and without faults are included in this. Customers' expectations of receiving their proper things in a prompt and efficient way make order accuracy rate an important determinant of their overall happiness. Order accuracy rate is closely linked to order fulfilment rate, which measures the percentage of orders that are successfully processed and shipped to customers. A low order fulfilment rate can result in a lower order accuracy rate, as errors may be more likely to occur during the order fulfilment process. Similarly, a high order accuracy rate can help improve order fulfilment rate, as customers are more likely to receive their orders correctly and on time (Ojha et al. 2019).

2.1.2.8. Order Processing Cost

Order processing cost is a KPI that measures the total cost associated with processing and fulfilling customer orders. This includes costs related to labour, equipment, materials, and other resources used in the order fulfilment process. Order processing cost is an important factor in logistics and supply chain management, as it can significantly impact the profitability of an organization (Wood, Li, and Daniel, 2015).

Order processing cost is closely linked to order fulfilment rate, which measures the percentage of orders that are successfully processed and shipped to customers. A low order fulfilment rate can result in a higher order processing cost, as more resources may be required to resolve order-related issues and delays. Similarly, a high order processing cost can be an indicator of inefficiencies in the order fulfilment process, which can lead to lower order fulfilment rate and decreased customer satisfaction (Christopher, 2016).

2.1.2.9. Return Rate

Return rate is a KPI that measures the percentage of orders that are returned by customers for various reasons, such as damaged or defective products, incorrect orders, or customer dissatisfaction. Return rate is an important metric in logistics and supply chain management,

as it can significantly impact customer satisfaction and retention, as well as the overall profitability of an organization. Return rate is closely linked to order fulfilment rate, which measures the percentage of orders that are successfully processed and shipped to customers. A high return rate can indicate issues with the order fulfilment process, such as incorrect orders, damaged or defective products, or poor customer service. Conversely, a low return rate can be an indicator of high order fulfilment performance, as customers are more likely to receive their orders correctly and on time (Giri et al. 2017).

2.1.2.10. Customer Satisfaction Rate

Customer satisfaction rate is a KPI that measures the level of satisfaction of customers with the overall order fulfilment process, including the quality of products or services, order accuracy, on-time delivery, and customer service. Customer satisfaction rate is an important metric in logistics and supply chain management, as it directly impacts customer loyalty, retention, and word-of-mouth recommendations (Nguyen et al. 2018). For example, Pham and Ahammad (2017), found that improving order fulfilment performance can significantly enhance customer satisfaction and loyalty.

2.1.3. Internal Stream System

An organizational theory concept known as the internal stream system describes the communication and information flow within a company or other type of organization. This system includes all methods and means of communication that are employed by the organization's members to exchange information, plan tasks, and reach decisions. The idea of communication flow, which can take many different forms depending on the organization and its objectives, is at the core of an internal stream system. Within an organization, downward, upward, and horizontal communication are some prevalent types of communication flow (Kalogiannidis, 2020). Downward communication refers to the transmission of information from higher-level management to lower-level employees. This type of communication is typically used to convey instructions, goals, and other types of information that are important for employees to know in order to carry out their duties effectively (Sahoo et al., 2019).

2.1.3.1. Internal Stream Performance KPIs

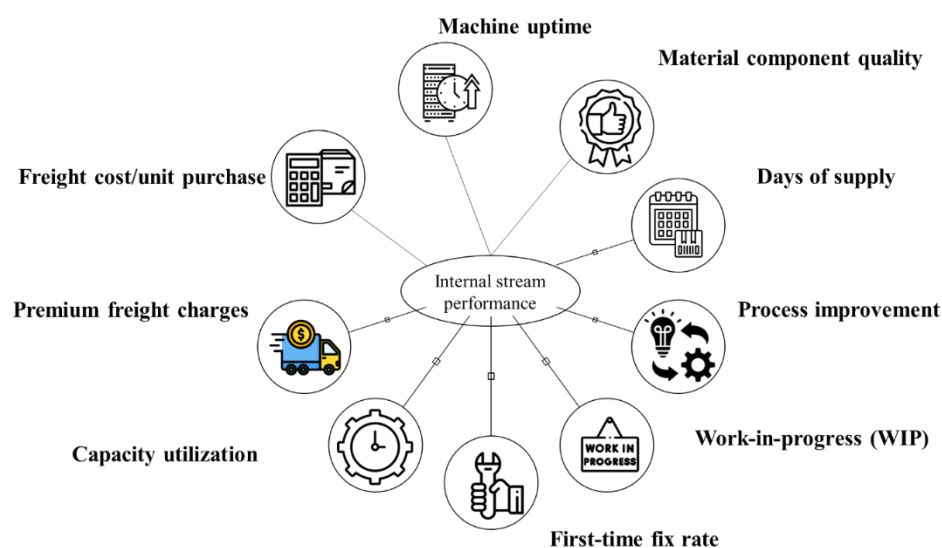


Figure 4. Metrics of Internal stream performance

Source: Developed by the authors

2.1.3.2. Machine Uptime

Machine uptime is a KPI used to measure the efficiency of manufacturing operations. It is a measure of the amount of time that a machine is available for production compared to the total amount of time it is scheduled to be available. Where "Total Available Time" is the total amount of time the machine was scheduled to be available, and "Downtime" is the total amount of time that the machine was not available for production (Gackowiec et al. 2020).

2.1.3.3. First-Time Fix Rate

First-time fix rate is fix operation measurement KPI applied in the analysis of service or repair. It is the proportion of the service or repair activities that are done right first time. First-time fix rate refers to the proportion of service or repair hitches that are fixed the first time that the customer seeks their attention or the first time that they get to speak to an attendant. The formula used is the first call resolution rate which is obtained by dividing the number of calls that were successfully solved on the first instance by the total number of service calls and then multiplying it by 100 to get a percentage (Zwetsloot et al. 2015).

2.1.3.4. Work-in-Progress (WIP)

Work-in-progress (WIP) is a KPI used to measure the amount of unfinished work or inventory in a production process. It is a measure of the value of all materials, components, and assemblies that are in the process of being manufactured but are not yet completed (Zhao and Sukkerd, 2019). According to Gerber, Gerber and Johnsson (2014) discusses the importance of work-in-progress as a KPI in production control and describes various methods for measuring and managing WIP, such as using kanban systems, implementing pull-based production, and reducing batch sizes.

2.1.3.5. Process Improvement

Process improvement is a KPI used to measure the effectiveness of efforts to optimize and streamline production processes. It is a measure of the success of initiatives aimed at improving quality, reducing costs, increasing efficiency, and enhancing customer satisfaction (Raihan et al. 2023). Recent studies highlighted the important of this variable.

So, according to Arora et al. (2023) provides a comprehensive review of the literature on the role of process improvement in achieving sustainable operations, highlighting the various factors that can affect process improvement and the methods that can be used to optimize processes. The authors describe various strategies for improving process improvement, such as using lean manufacturing principles, implementing Six Sigma methodologies, and adopting total quality management (TQM) principles. They also emphasize the importance of measuring and tracking process improvement using KPIs, such as cycle time, defect rate, and customer satisfaction.

2.1.3.6. Capacity Utilization

Capacity utilization is a KPI used to measure the efficiency of a manufacturing process by comparing the actual output to the maximum possible output that can be produced by the available resources (Gallo and Barbieri Góes, 2023). Previous studies have highlighted the importance of capacity utilization as a critical KPI in internal stream performance.

Such as Rüttimann and Stöckli (2016) presented a case study of a manufacturing system and discusses the use of lean tools for improving the system's performance. They emphasize the importance of measuring and tracking capacity utilization using KPIs to identify opportunities for improvement in the manufacturing process. They also describe various methods for improving capacity utilization, such as reducing setup times, optimizing

production rates, and improving the utilization of available resources.

2.1.3.7. Material Component Quality

Material component quality is a KPI used to measure the quality and reliability of the raw materials or components used in the manufacturing process. It is a measure of the consistency and conformity of the material/component with the specified quality standards (Roy et al. 2014). Another study by Luthra et al. (2017) presented an integrated framework for measuring supply chain performance in manufacturing industries, and highlights the importance of material/component quality as a key metric in assessing the effectiveness of the supply chain. The authors describe the various factors that can affect material/component quality, such as supplier selection, inspection processes, and quality control procedures, and highlight the importance of measuring and tracking material/component quality using KPIs. They also describe various methods for improving material/component quality, such as implementing quality control procedures, improving supplier selection processes, and using advanced quality control technologies.

2.1.3.8. Days of Supply

Days of supply is a KPI used to measure the effectiveness of inventory management in a manufacturing process. It is a measure of the number of days that the inventory is expected to last based on the current inventory levels and the rate of consumption (Wibowo and Sholeh, 2015). The higher the number of days of supply, the better the inventory management process is considered to be, as it indicates that the inventory is being managed effectively and efficiently. Previous studies have highlighted the importance of days of supply as a critical KPI in internal stream performance.

So, according to Estampe et al. (2013) presented a framework for measuring the performance of supply chain management in a manufacturing process, and highlights the importance of days of supply as a key metric in assessing the effectiveness of inventory management. They describe the various factors that can affect days of supply, such as inventory levels, production rates, and demand variability, and highlight the importance of measuring and tracking days of supply using KPIs. They also describe various methods for improving days of supply, such as implementing inventory management techniques like just- in-time (JIT) and economic order quantity (EOQ), optimizing production rates, and improving demand forecasting accuracy.

2.1.3.9. Premium Freight Charges

Premium freight charges can be defined as the extra cost incurred by a company for delivering goods or products faster than usual, typically through expedited shipping or air freight. This metric is often used as a KPI to measure the efficiency of a company's internal logistics and supply chain processes (Joo et al. 2017). The formula for premium freight charges can be calculated by adding up the total cost of expedited shipping or air freight for a given period and dividing it by the total number of shipments during that period (Barrot et al. 2019).

2.1.3.10. Freight Cost/Unit Purchase

Freight cost per unit purchase is a KPI that measures the transportation cost incurred by a company for each unit of goods or products purchased. This metric is often used to evaluate the efficiency of a company's internal logistics and supply chain processes (Choudhary and Shankar, 2014). The formula for freight cost per unit purchase can be calculated by dividing the total transportation cost by the total number of units purchased in a given period (Mirzapour Al-e-hashem et al. 2013).

2.1.4. ERP and Order Fulfilment Rate

Such that to analyze the correlation between ERP systems implementation and the order fulfillment rate, a literature review was done. According to Jevgeni, Eduard, and Roman, Z. (2015) a manufacturing firm's lead time and order fulfillment rate improved by 70% and 20% respectively with the help of an ERP system.

Woźniakowski, Jałowicki & Zmarzłowski K. (2018) revealed that operational flexibility achieved through ERP implementation helps in enhancing communication between suppliers, manufacturers and customers so as to enhance order processing and delivery time. The research also revealed that ERP systems are useful for tracking inventory status and orders, and organizations can easily adapt to the customers' needs with the help of this system and guarantee that stockout will not occur.

2.1.5. ERP and Internal Stream Performance

ERP systems are widely used in manufacturing organizations to integrate and streamline internal business processes. The implementation of an ERP system can have a significant impact on internal stream performance, as it can improve efficiency, reduce costs, and enhance overall organizational performance (Scurtu and Lupu, 2016).

Several studies have investigated the relationship between ERP and internal stream performance. According to Jayeola et al. (2022) examined the impact of ERP on internal stream performance. The review found that the implementation of an ERP system can have a positive impact on various internal stream performance metrics, such as capacity utilization, machine uptime, first-time fix rate, work-in-progress, and material component quality. ERP systems can improve capacity utilization by providing real-time data on production levels and identifying areas for improvement.

ERP systems can also improve machine uptime by providing data on machine performance and identifying potential maintenance issues before they result in downtime. The review also found that ERP systems can improve first-time fix rate by providing real-time data on production defects and identifying areas for improvement. ERP systems can also improve work-in-progress by providing real-time data on inventory levels and streamlining the production process (Hwang and Min, 2015).

2.1.6. Order Fulfilment rate and Internal Stream Performance

Order fulfillment rate is another working term that denotes the proportion of customer orders that is delivered within a given period. A high percentage of order fulfillment is necessary in order to retain clients and ensure that they are satisfied with the services provided. Stream performance within the organisation is also important to guarantee timely and efficient fulfillment of orders (Moons, Waeyenbergh and Pintelon, 2019). Some studies have examined the correlation between the order fulfillment rate and internal stream performance.

As highlighted by Nkwoleke (2018) The research established that order fulfillment rate has a significant positive relationship with internal stream performance. Significantly, the result unveiled that production lead time was a negative predictor of order fulfillment rate, which indicates that an organization experiencing longer production lead time may cause order fulfillment delay. The findings show that capacity utilization and machine uptime have a positive influence on order fulfillment rate, which means that, increased capacity utilization and machine up-time will increase order fulfillment rate and reduce the time necessary to fulfill each order.

2.2. Hypotheses Development

Based on the literature review, we can now more explicitly link our hypotheses to the existing research:

H1: Order fulfilment is a mediator in the relationship between ERP and Internal stream.

This hypothesis is supported by the findings of Jayeola et al. (2022), who found that ERP implementation can positively impact various internal stream performance metrics. Additionally, Woźniakowski, Jałowiecki & Zmarzłowski K. (2018) showed that ERP systems enhance communication and order processing, suggesting a potential mediating role of order fulfillment.

H1a: The adoption of ERP has a significant positive impact on the order fulfilment rate in internal stream.

This sub-hypothesis is directly supported by Jevgeni, Eduard, and Roman, Z. (2015), who found that ERP implementation improved order fulfillment rates by 20% in a manufacturing firm.

H1b: Order fulfilment has a significant positive impact on internal stream.

Nkwoleke (2018) provides support for this sub-hypothesis, showing a significant positive relationship between order fulfillment rate and internal stream performance.

H1c: ERP has a significant positive impact on internal stream.

This sub-hypothesis is supported by the findings of Scurtu and Lupu (2016) and Hwang and Min (2015), who demonstrated that ERP implementation can improve efficiency and overall organizational performance.

H2: Order fulfilment is a mediator in the relationship between Manual technique and internal stream.

While the literature review doesn't directly address manual techniques, this hypothesis is proposed as a comparison to H1, based on the assumption that manual techniques may also impact order fulfillment and internal stream performance, albeit differently from ERP systems.

H2a: There is a significant positive impact of Manual method on the order fulfilment rate.

This sub-hypothesis is proposed to compare with H1a, although the literature review suggests that ERP systems may be more effective (Woźniakowski, Jałowiecki & Zmarzłowski K., 2018).

H2b: There is a significant positive impact of Manual method on the internal stream performance.

Similar to H2a, this sub-hypothesis is proposed for comparison purposes. The literature suggests that ERP systems may offer advantages over manual methods in improving internal stream performance (Jayeola et al., 2022).

H2c: There is a significant positive impact of order fulfilment rate on internal stream performance.

This sub-hypothesis is supported by Nkwoleke (2018), who found a significant positive relationship between order fulfillment rate and internal stream performance, regardless of the method used.

H3: There is a significant difference between the impact of ERP and manual method on order fulfilment rate in internal stream.

This hypothesis is supported by the findings of Jevgeni, Eduard, and Roman, Z. (2015), who demonstrated significant improvements in order fulfillment rates with ERP implementation. It's also indirectly supported by Woźniakowski, Jałowiecki & Zmarzłowski K. (2018), who highlighted the advantages of ERP systems in enhancing order processing and delivery time.

By explicitly linking these hypotheses to the literature review, we strengthen the theoretical foundation of the study and provide clear justification for each proposed relationship. This approach also highlights areas where existing research directly supports our hypotheses and where we are extending current knowledge.

2.3. Literature Review Summary and Gap

ERP systems are vital for companies looking to streamline operations, especially in complex supply chains like pharmaceuticals. ERP unites finance, HR, and supply chain management. ERP solutions reduce downtime, boost employee productivity, and increase inventory turnover, according to research. Studies also show that ERP systems provide real-time data for informed decision-making, improving order fulfillment and corporate performance. ERP systems optimise internal streamlining system KPIs like machine uptime, cost per transaction, and employee efficiency, according to study. These improvements help companies meet client needs and cut costs. ERP installation improves order fulfillment rate, a key indicator of customer happiness and logistics efficiency, according to several studies. ERP implementation affects on-time delivery, order accuracy, and order processing expenses.

While the research shows the benefits of ERP systems, order fulfillment rate as a mediator variable between ERP adoption and internal stream performance is understudied. Order fulfillment rate is important, but few studies examine how it mediates the relationship between ERP and internal performance in the pharmaceutical sector. Although, ERP systems and operational performance have been extensively studied, yet there are gaps in the literature. First, most ERP system studies focus on their benefits but lack specifics on their effects on diverse businesses, particularly the pharmaceutical sector in emerging markets like Egypt. Pharmaceutical firms confront particular regulatory and logistical constraints that necessitate tailored ERP adoption studies to optimise internal streamlining processes.

Second, order fulfillment rate mediates ERP deployment and internal stream performance, although research is few. While some research imply ERP improves operational metrics, the mechanism by which order fulfillment rate mediates remains unknown. ERP and manual methods' effects on order fulfillment and internal performance are rarely compared. More research is needed to determine how these variables interact in various organisational situations and whether ERP outperforms manual solutions. Many studies focus on operational KPIs, but few assess ERP implementation's long-term strategic effects on organisational agility, sustainability, and customer satisfaction in dynamic industries like pharmaceuticals. To evaluate ERP's impact on internal performance and competitiveness, future study should examine these factors.

3. Methods**3.1. Data Source and Description**

This dissertation uses primary and secondary data. Both are bought for quantitative research. The goal is to strengthen the hypothesis choice as 146 Eva Pharma employees were

interviewed for the surveys. The company employs warehousing, quality, production, customer service, and logistics workers. These departments should understand ERP application process and results. Face-to-face interviews increased the response rate to nearly. Misconceptions about order fulfilment rate removed 43 interviews. Some warehouse workers were unaware. The dataset included 37 warehouse workers, 12 logistics workers, 7 customer service workers, 76 production workers, and 14 quality control workers. Since production had the most personnel and customer service the fewest, that makes sense. Officers understandably outnumbered managers. Six managers, 18 supervisors, and the rest were employees were interviewed.

3.2. Sampling Methods and Sampling Frame

The sampling technique selected for use in this study is the cluster random sampling, whereby a sampling unit is a particular cluster from a large population sampling frame. This approach is applicable when the targeted population is broken down into smaller groups of lots, and it is reasonable to select different quotas in each of the lots (Gopal et al., 2022). According to this research, the target population includes the pharmaceutical firms in Middle East and its strategic business units (SBUs). Eva Pharma was selected as the focus of the study due to its prominence in the pharmaceutical industry and its extensive operations across four continents: Forbes Magazine (2022) indicated key regions namely, Africa, Asia, North America, together with Europe.

Eva Pharma was selected for the following two reasons; Firstly, it is a company ranked as one of the biggest pharmaceutical companies in the Middle East, which is why understanding the effect of ERP on its internal circulation and the order fulfillment rate will be crucial. Second, the company has many organizational departments for instance the supply chain, logistics and quality control departments which offered a chance to capture the impact of ERP across different business functions. These diverse cases provided a broad knowledge of the effect of ERP systems in different organizational functions. Furthermore, since Eva Pharma is one of the largest firms in the industry, the results are useful for comparing the overall strategies of this or similar enterprises in the region.

Cluster random sampling was applied by selecting Eva Pharma from a pool of five major pharmaceutical companies in the Middle East, including Ibsina Pharma, Global Napi Pharma, Pharco Pharmaceuticals, and Amoun Pharmaceutical Co., making Eva Pharma the primary sampling unit. Although the decision to limit the study to Eva Pharma provides depth to the study, there are some limitations within the generalizability of the results gotten. While the research findings of this study are informative, some issues related to the generalizing results for other companies of the mentioned sector should be mentioned: 'First of all it is necessary to be calm about generalizations of the results for other companies of the pharmaceutical industry because the organizational culture and the size of Eva may differ from the size and activity of the smaller or fewer international firms.'

Because of this, the structured questionnaires were administered to key employees from the supply chain, logistics, and department of quality control at Eva Pharma to provide a broad view of the role of ERP. These questionnaires comprised of several closed questions that were then trailed with additional open questions by so as to elicit further details. face-to-face interview method was employed in the study because of its advantages of high response rates and low biases. A few participants who never used an ERP system were eliminated in order to obtain more valid and related data. By following this approach, there was ensure-ment of getting participants from different business areas, as well as having the capability to examine the impact of ERP on the operational as well as managerial level, thus adding credibility to

the findings.

3.3. Methodology

The research is conducted to understand the ERP application impact on the order fulfilment rate in the pharmaceutical industry. The purpose of the study that will be used is to understand the effectiveness of ERP. The research will take a descriptive approach. The approach chosen to tackle this problem would be the quantitative analysis approach.

A survey was conducted on warehouse, logistics and quality departments in the Pharmaceutical industry. The confirmatory factor analysis (CFA) and the structural equation modelling (SEM). For describing the sample collected in the research, the mean and standard deviation was computed along with using pie charts to observe the percentages of the variables.

CFA is the first stage of the suggested analysis about it. It is employed when an underlying model and latent variables are assumed, according to Brown and Moore (2012). The latent variables and the reliability of the KPIs used to assess the variables are determined via path analysis. Brown, Hecker, and Bok (2021) said that the SEM is built on the CFA. Additionally, it covered how recent improvements in statistical software made things simpler. According to Jöreskog (1970), a theoretical causal model is defined by a collection of expected covariances between variables, and its plausibility is evaluated by comparing it to observed data. It considers the existence of latent variables in addition to being concerned with the path building between the variables. Assumptions made by Bowen and Guo (2011) regarding SEM include: Multivariate normality assumption is satisfied, no outliers should exist in data, A relatively large sample size and Correct model specifications.

Ullman and Bentler (2012) mentioned the SEM. They discussed how PLS estimates are quite well performed. The SEM estimates are the superior estimates. It mentioned that it was applied on statistical packages a number of statistical packages as AMOS and SmartPls also preferred it for the Likert scaled variables and performance related ones.

Hair et al (2019) also discussed how it reduces the dimensionality of correlated variables to model information provided by dataset using the variables under the scope of our study. It is considered as a better alternative than the Ordinary Least Square (OLS) method in modelling, due to its loose assumptions as large sample size and multivariate normality assumption is satisfied knowing that if smart pls is used the normality assumption is not required.

Being robust means that the model parameters doesn't change much even though there are new samples taken from the total population. Therefore, it provides an amazing alternative, for those working on theory confirmation especially ones not supported by much literature. Also, they declared that after reviewing the previous literature, PLS does not require as many assumptions or conditions as SEM. To test difference between performance of ERP and manual in terms of order fulfillment rate, the T paired test or Wilcoxon signed test is calculated. Both tests are used to check the difference between the Order fulfillment rate before and after applying ERP. According to T- paired test. It is used to compare the difference between two population means in the matched sample design, the paired sample t-test is frequently utilized. the fundamental the fundamental premise of this test is that the distribution of observations is normal, and uncontaminated (Park, Wang and Hwang, 2020).

But in many instances, applications, this premise is frequently broken, this may have an unfavorable impact on the result. One of the most used statistical techniques for determining the statistical difference between two measurements, two conditions, two time periods, etc. is the paired sample t-test, also known as the dependent sample t-test or the repeated-measures t-

test (Mishra et al. 2019). Zeraati et al. (2019) showed how paired t test should be used in comparing different SCM. It used it on many levels of performance. The performance indicators varied from cost, knowledge sharing, social capability. It compared between two technologies RFID and NFC. This showed that t paired test can be used in real life application in SCM.

The Wilcoxon signed-rank test, which evaluates whether population mean ranks differ between two related samples, matched samples, or repeated measurements on a single sample, is a non-parametric statistical hypothesis. When the population cannot be assumed to be normally distributed, it can be used as an alternative to the paired Students t-test, the t-test for matched pairs, or the t-test for dependent samples (Shah and Sejal, 2018). It popularised the test in his well-known non-parametric statistics textbook. For a number that was comparable to but different from, Siegel used the sign T. As a result, the test is occasionally known as the Wilcoxon T test, and the test statistic is given the value T (Durango and Refugio, 2018).

4. Results

Table 1.

Spearman Correlation coefficients of the phenomenon

		Manual technique	ERP	Order rate	Internal stream
Spearman's rho	Manual technique	1.000	.909	.813	.157
	ERP	.909	1.000	.788	.156
	Order rate	.813	.788	1.000	.136
	Internal stream	.157	.156	.136	1.000

. Correlation is significant at the 0.01 level (2-tailed).

There is a significant strong positive relationship between Manual technique and order fulfillment rate at 95% confidence level. On the other hand, there is a significant positive relationship between Manual technique and internal stream at 90%. In addition to that there is a significant strong positive relationship between ERP and order fulfillment rate at 95% confidence level. On the other hand, there is a significant positive relationship between ERP and Internal stream performance at 95% confidence level.

4.1. Confirmatory Factor Analysis

Table 2.

Reliability and Validity analysis for phenomenon

	Cronbach's Alpha	Composite Reliability	Average Variance Extracted
Enterprise Resource Planning	0.945	0.951	0.519
Internal stream performance	0.830	0.890	0.502
Manual technique	0.946	0.952	0.526
Order fulfilment rate	0.950	0.955	0.519

Source: Based on calculations using Smart PLS

CFA is applied to observe reliability and validity of factors obtained from the application of EFA. The reliability was measured by Cronbach alpha. All of the variables had a Cronbach alpha higher than 0.7. Therefore, all the statements are reliable to represent the factors in the study. To approach the validity of the statements in expressing the factors, both the composite reliability and the average variance extracted were computed. The AVE of each factor were above 0.5 and the CR was above 0.7. This shows how the statements was valid to be used for the factors.

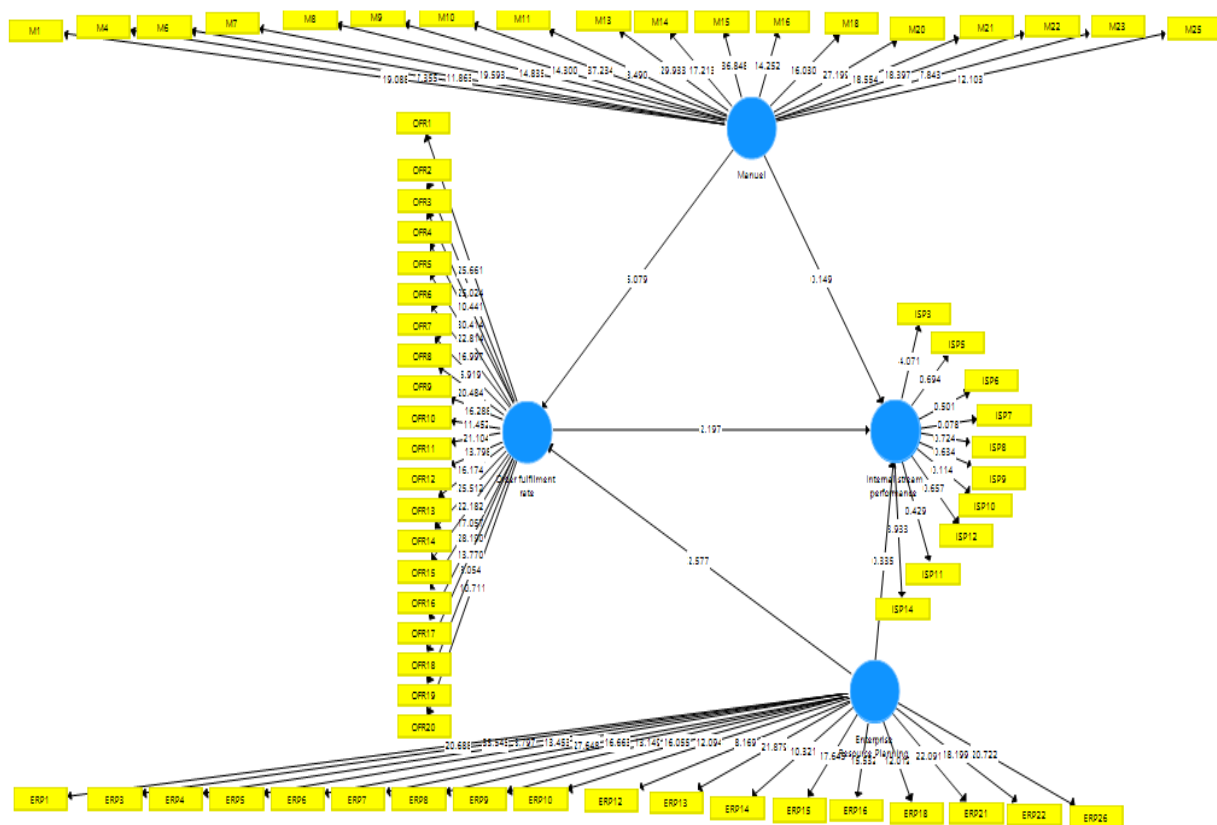


Figure 5. Structural equation model of the 4 factors provided by using SmartPLS

Source: Based on calculations using Smart PLS

The previous figure shows how the relationships are built in the structural equation model. All the loadings are above 0.7 which gives an indication that no statements shall be removed from the study. The Structural equation modelling is used to investigate the impact of variables on each other. It gives an understanding for the phenomenon. After using CFA, the SEM can perfectly model data due to its assumptions being satisfied.

Table 3.

Estimates of structural equation model of phenomenon

	Original Sample	Standard error
Enterprise Resource Planning -> Internal stream performance	0.287 *	0.210
Enterprise Resource Planning -> Order fulfilment rate	0.216 *	0.126
Order fulfilment rate-> Internal stream performance	0.247 *	0.127
Manual technique -> Internal stream performance	0.348 *	0.086
Manual technique -> Order fulfilment rate	0.508 *	0.229

p-value<0.01, * p-value<0.05, “.” p-value>0.05

Source: Based on calculations using Smart PLS

After applying SEM, the phenomenon was more understood. From the table above the results of the study indicate that Enterprise Resource Planning has a positive significant impact on internal stream performance (H1c approved). ERP was found to have a positive significant impact on Order fulfilment rate (H1a approved). Order fulfilment rate has a positive significant impact on internal stream performance (H1b and H2c approved).

Order is the mediator of Enterprise resource planning and internal stream performance (H1 approved). While the Manual technique has a positive significant impact on internal stream performance (H2b approved) and order fulfillment rate (H2a approved). This shows that order fulfillment rate is a mediator in the relationship between Manual technique and internal stream

performance (H2 approved).

Table 4.

Mediating effect in the model

	Original Sample	Standard error
ERP -> Order Fulfillment Rate-> Internal stream performance	0.401*	0.125
Manual technique -> Order Fulfillment Rate-> Internal stream performance	0.414*	0.199

p-value<0.01, * p-value<0.05, "" p-value>0.05 Source: Based on calculations using Smart PLS

This shows that the order fulfillment rate was a partial mediator in the relationship between the ERP and the internal stream performance (H1 approved). It was also a partial mediator in the relationship between the Manual technique and the internal stream performance (H2 approved).

4.2. Paired T-test

Since the number of observations was relatively high, the paired T test was established to be more suitable than Wilcoxon signed test as previously mentioned in methodology.

Table 5.

Paired T-test results

	Mean	Std. Error	T	df	P-value
Manual-ERP	-.41575	.01334	-31.158	145	.000

Source: Based on calculations using SPSS

From the table of Paired T-test there a significant difference between the Manual technique and ERP. Since the mean difference was -.41575 this indicates that the performance of ERP performance is better than the Manual technique at 95% confidence level. So, we will accept H3 which is there is a difference between the impact of ERP and manual method on order fulfillment rate in internal stream.

4.3. Discussion of Findings and Implications

This study identified several significant associations between ERP, manual techniques, order fulfillment rate (OFR), and internal stream performance. The results indicate that implementing ERP systems enhances both internal stream performance and OFR, aligning with earlier research on ERP system efficiency and performance gains. Specifically, ERP improves key metrics such as on-time delivery, order accuracy, and inventory turnover, which are critical to optimizing order fulfillment. Hwang and Min (2015) similarly found that ERP implementation enhances supply chain effectiveness by automating and streamlining several critical business processes.

One of the most notable findings of this study is the mediating role of order fulfillment in the relationship between ERP adoption and internal stream performance. The study demonstrates that order fulfillment partially mediates this relationship, indicating that ERP systems not only directly but also indirectly improve internal streamlining systems. This is consistent with the work of Moons et al. (2019), who emphasized the importance of order fulfillment efficiency in achieving operational excellence. The ERP system enhances performance by standardizing and optimizing internal business flows, improving key performance indicators (KPIs) like fill rate, backorder rate, and cycle time. This suggests that ERP implementation is a critical factor in achieving higher operational efficiency and performance within organizations.

The study also highlights that order fulfillment rates under ERP systems are significantly

higher than those under manual techniques. The paired T-test results showed a substantial mean difference in favor of ERP systems, with a t-value of 41.575 at a 95% confidence level. These results confirm that ERP systems reduce errors, enhance resource utilization efficiency, and provide real-time information that supports better decision-making and process control (Beric et al., 2020). This finding is particularly relevant to the Egyptian pharmaceutical industry, where efficiency and accuracy are paramount due to the high level of regulation and the critical nature of pharmaceutical products.

In industries like pharmaceuticals, where timely and accurate order fulfillment directly impacts patient outcomes, the efficiency gains from ERP systems can be a significant competitive advantage. The study also uncovered qualitative differences between the effects of manual techniques and ERP systems on OFR and internal stream performance. While ERP systems demonstrated superior performance, manual processes still play a role in environments where implementing such advanced systems may not yet be feasible. In the context of the Egyptian pharmaceutical industry, where some firms may still rely on manual processes due to resource constraints or organizational readiness, this finding suggests a pathway for gradual ERP implementation.

Organizations that still utilize manual methods can improve internal performance by focusing on enhancing their order fulfillment processes, as higher OFR from manual methods was shown to positively influence internal stream performance. Given these findings, it is recommended that Egyptian pharmaceutical firms gradually adopt ERP systems to enhance operational efficiency, competitiveness, and customer satisfaction. The moderate negative relationship between order fulfillment rate and the use of manual techniques with internal stream performance indicates that enhancement of the order fulfillment, even if not supported by the ERP system, can positively contribute to the efficiency of the business processes.

Nonetheless, for sustained superior performance, firms should strive to adopt the ERP systems that provide superior non-equivalent accuracy, constant tracking, and enhanced process reengineering. In conclusion, this study provides Egyptian pharma industry findings, showing how using ERP systems in different ways has the potential to unlock order fulfillment and internal stream performance. These findings provide directions and recommendations for the pharmaceutical industry in Egypt and stakeholders that may seek to advance organizational performance through the use of technology as the industry extends the global marketplace competition.

5. Conclusion

This work adds to the overall literature by presenting the quantitative findings on the effects of ERP adoption on order satisfaction and internal stream performance in the Egyptian pharmaceutical industry specifically Eva Pharma. Though earlier literature has paid a lot of attention in identifying the advantage accruing from ERP systems this research seeks to fill the gap detected in prior studies by establishing the moderating effect of order fulfillment rate in the link between ERP systems adoption and internal performance. The results justify that adoption of ERP positively and significantly affects both the order fulfillment rate and the internal stream performance, supporting the significance of ERP systems in enhancing the organizations' efficiency.

One of the most important contributions of this research is that this research has proved that the order fulfillment rate has a mediating role in the relationship ERP and internal performance, although this relationship has not been fully addressed in prior researches. The study has revealed that on going with ERP systems there is an enhancement of operational parameters such as on-time delivery and order accuracy and thereby increasing the internal

stream performance. Additionally, the study offers comparative understanding in relation to the fact that ERP systems out do the manual methods in enhancing order fulfillment rates and this forms a good basis on which firms can embrace change from the traditional/manual mode of operation to the more enhanced ERP systems.

From a pragmatic point of view, this study has major relevancy to the nature of the pharmaceutical industry, specifically in Egypt's society. According to the findings, pharmaceutical firms implementing ERP systems are likely to realize, order delivery rates, internal efficiency, and customer satisfaction that are crucial in enhancing competitiveness of operations in a highly competitive and a regulated industry. The existence of a relationship between ERP and operation performance presents good business rationale for pharmaceutical firms to implement ERP despite fulfilling other objectives of expansion and acquisitions. By implementing ERP, firms can better manage their supply chains, optimize resource allocation, and enhance overall productivity, contributing to long-term business success and sustainable growth.

5.1. Recommendations and Limitations

5.1.1. Academic Recommendations

As highlighted in this study, it is important to note that order fulfillment can be examined as a mediating factor between ERP adoption and internal stream performance, however, more studies should also seek to identify other mediating variables including customer service quality, financial performance and employee productivity. Subsequent research should measure how ERP affects these variables in different contexts so that there would be a better understanding of ERP initiatives' effects. Furthermore, future research should generalize the findings to other Egyptian industries including manufacturing, retail or health care industries to test the transferability effect of adopting ERP systems amongst industries other than that of the pharmaceutical sector. Subsequent research works should employ cross-sectional study to establish the impact duration of ERP systems with increased focus on order fulfilment rates, internal performance, and customer satisfaction subsequent to implantation.

This would enable the researchers to decide on the future reviews in attempts to see whether the performance is improving and whether the implementation process was able to predict any difficulties that may come up in future. Further, other success factors like, top Management support, Technological infrastructure, and Employee training programs need to be investigated in detail as these factors potentially act as key success factors in the implementation of ERP systems. There is also need for the scholars to extend their research on how technological advancements such as IoT and AI can be incorporated into the ERP systems to improve on the performance of the integrated systems and overall organizational performance.

5.1.2. Practical Recommendations

To succeed in adopting ERP systems in the Egyptian pharmaceutical industry, practitioners have to consider adopting a phased approach. It is recommended to begin with a comprehensive needs analysis in which specific problems that may be solved with ERP systems include order fulfillment problems, inventory management issues, and low internal stream performance. It is crucial to avoid an all-inclusive approach to ERP implementation but rather take bit by bit approach to implement the fundamental functions of the organization including supply chain management, inventory control etc. This way the adoption is gradual and does not interrupt efficient functioning of the organization and its easy for the ERP

systems to be incorporated into the existing systems.

It follows that firms need to train their employees properly so that they can use ERP systems optimally'. The best ERP learning programs should address the functional use of the software as well as address the issues of change management within the organizations. The employment of a project management protocol for the enterprise's ERP organization is also recommended for the constant observation of the system's deployment, efficiency, AND productivity for the proper management of ERP as a strategic tool in the company's strategic plan. Performance measurement with the focus on such values as order delivery rates, cycle duration, and cost per transaction must be conducted on an ongoing basis. This will in turn help managers to be in a position to counter check their decisions as well as tune the systems for maximum efficiency in real time.

Furthermore, to maximize the benefits of ERP systems, there is a need to integrate real time tracking of the inventory and automated ordering systems for improving the supply chain processes and minimizing on the instances of stock outs. System audits should be done from time to time in order to check on the suitability of the ERP platform in accommodating change in operational requirements. They can also be useful in finding out whether it is feasible to upgrade the ERP suits used or integrate AI and IoT systems in order to make more processes automated.

5.1.3. Limitations

This study is, therefore, conducted with data from one large firm, Eva Pharma and care should be taken to extrapolate the findings to different firms, particularly small ones or firms in a different industry. More research should be carried out on students across different companies as a way of increasing generality. Furthermore, this research did not analyze the role of such factors as disruption of the supply chain, fluctuation in market prices, or shifts in customer preferences on the ERP efficiency and order delivery performance. Future research should consider including these external variables to the model in a bid to enhance the analysis.

In addition, while the present investigation looked into internal factors, it will be necessary for subsequent investigations to include the external performance variables, which shall embrace the elements like customer satisfaction, supplier relation, and market response to evaluate the overall effects of ERP systems on the competitive advantage strategy of a firm. Perceiving and analysing how ERP affects not only the performance of a business organisation internally but also the performance of the market outside will help to describe the value of ERP for businesses in a broader way.

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Appendix

Applying enterprise resource planning on order fulfillment rate before and after Survey

		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Downtime (Before ERP)	1. System downtimes was infrequent, resulting in minimal delays in fulfilling orders before applying ERP system in Internal stream.					
	2. Resolving system downtimes is now automated, requiring little manual intervention before applying ERP system in Internal stream.					
	3. Downtime has had a minimal impact on revenue, and customer satisfaction has improved before applying ERP system.					
Downtime (After ERP)	4. System downtimes is infrequent, resulting in minimal delays in fulfilling orders after applying ERP system in Internal stream.					
	5. Resolving system downtimes is now automated, requiring little manual intervention after applying ERP system in Internal stream.					
	6. Downtime has had a minimal impact on revenue, and customer satisfaction has improved after applying ERP system in Internal stream.					
Return on Investment (ROI) (Before ERP)	7. The manual processes increase efficiency and reduce labor costs before applying the ERP in Internal stream.					
	8. Our organization has visibility into inventory and supply chain, resulting in a high number of stockouts before applying the ERP system in Internal stream.					
	9. The real-time data made helps business decisions before applying the ERP system in Internal stream.					
Return on Investment (ROI) (After ERP)	10. The manual processes increases efficiency and reduce labor costs after applying the ERP in Internal stream.					
	11. Our organization has visibility into inventory and supply chain, resulting in a high number of stockouts after applying the ERP system in Internal stream.					
	12. The real-time data helps business decisions after applying the ERP system in Internal stream.					
Cost per Transaction (Before ERP)	13. The data entry and processing have resulted in fewer errors and lower costs before applying the ERP system in Internal stream.					
	14. The supply chain is efficient and has lower material and shipping costs before applying the ERP system in Internal stream.					
	15. The visibility into the procurement process has lower purchasing costs before applying the ERP system in Internal stream.					
Cost per Transaction (After ERP)	16. The data entry and processing have resulted in fewer errors and lower costs after applying the ERP system in Internal stream.					
	17. The supply chain is efficient and has lower material and shipping costs after applying the ERP system in Internal stream.					

		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
	18. The visibility into the procurement process has lower purchasing costs after applying the ERP system in Internal stream.					
Employee Productivity (Before ERP)	19. Employees are productive on achieving tasks such as data entry and tracking before applying the ERP system in Internal Stream.					
	20. Employees has a real-time data access to make business decisions before applying the ERP system in Internal stream.					
	21. The processes have reduces errors, leading to faster turnaround times and improved productivity before applying the ERP system in Internal stream.					
Employee Productivity (After ERP)	22. Employees are productive on achieving tasks such as data entry and tracking before after the ERP system in Internal Stream.					
	23. Employees has a real-time data access to make business decisions after applying the ERP system in Internal stream.					
	24. The processes have reduces errors, leading to faster turnaround times and improved productivity after applying the ERP system in Internal stream.					
Inventory Management (Before ERP)	25. Inventory management has visibility into stock levels and material flows before applying the ERP system in Internal stream.					
	26. Inventory tracking lead less errors, resulting in fewer stockouts and overstocking before applying the ERP system in Internal stream.					
	27. Efficient inventory management led to less costs and high revenue before applying the ERP system in Internal stream.					
Inventory Management (After ERP)	28. Inventory management has visibility into stock levels and material flows before applying the ERP system in Internal stream.					
	29. Inventory tracking lead less errors, resulting in fewer stockouts and overstocking before applying the ERP system in Internal stream.					
	30. Efficient inventory management led to less costs and high revenue before applying the ERP system in Internal stream.					
Real time Data (Before ERP)	31. Real-time data provides me with valuable insights that I can use to make informed decisions before applying the ERP system in Internal stream.					
	32. I feel confident in the accuracy and reliability of the real-time data that I rely on before applying the ERP system in Internal stream.					
	33. I find it easy to understand and interpret real-time data that is presented in a visual format (such as charts or graphs) before applying the ERP system in Internal stream.					
Real time Data (After ERP)	34. Real-time data provides me with valuable insights that I can use to make informed decisions after applying the ERP system in Internal stream.					

		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
	35. I feel confident in the accuracy and reliability of the real-time data that I rely on after applying the ERP system in Internal stream.					
	36. I find it easy to understand and interpret real-time data that is presented in a visual format (such as charts or graphs) after applying the ERP system in Internal stream.					
Schedule Adherence (Before ERP)	37. I always adhere to my schedule and arrive at my designated workstation on time before applying the ERP system in Internal stream.					
	38. My team members are reliable and adhere to their schedules, which helps our project stay on track before applying the ERP system in Internal stream.					
	39. I believe that schedule adherence is an important factor in achieving success in both my personal and professional life before applying the ERP system in Internal stream.					
Schedule Adherence (After ERP)	40. I always adhere to my schedule and arrive at my designated workstation on time after applying the ERP system in Internal stream.					
	41. My team members are reliable and adhere to their schedules, which helps our project stay on track after applying the ERP system in Internal stream.					
	42. I believe that schedule adherence is an important factor in achieving success in both my personal and professional life after applying the ERP system in Internal stream.					
Function (before ERP)	43. The company process well before applying the ERP system in Internal stream.					
	44. The business function is well defined before applying the ERP system in Internal stream.					
	45. The necessary of business function is covered very well before applying the ERP system in Internal stream.					
Function (After ERP)	46. The company process well after applying the ERP system in Internal stream.					
	47. The business function is well defined after applying the ERP system in Internal stream.					
	48. The necessary of business function is covered very well after applying the ERP system in Internal stream.					
Perceived usefulness (Before ERP)	49. My performance improves before applying the ERP system in Internal stream.					
	50. My productivity improves before applying the ERP system in Internal stream.					
	51. My effectiveness improves before applying the ERP system in Internal stream.					
Perceived usefulness (After ERP)	52. My performance improves after applying the ERP system in Internal stream.					
	53. My productivity improves after applying the ERP system in Internal stream.					
	54. My effectiveness improves after applying the ERP system in Internal stream.					

		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Consultant support (before ERP)	55. Consultants led us to a right direction before applying the ERP system in Internal stream.					
	56. The consultants provided me with actionable recommendations before applying the ERP system in Internal stream.					
	57. I found the consultants to be responsive and timely in their communication before applying the ERP system in Internal stream.					
Consultant support (after ERP)	58. Consultants led us to a right direction after applying the ERP system in Internal stream.					
	59. The consultants provided me with actionable recommendations after applying the ERP system in Internal stream.					
	60. I found the consultants to be responsive and timely in their communication after applying the ERP system in Internal stream.					
Order Fill Rate	61. I receive all items that I order.					
	62. The percentage of my complete order is satisfactory.					
Order Cycle Time	63. The time between placing an order and receiving it is short.					
	64. The time between placing an order and receiving it is consistent.					
Backorder Rate	65. I have experienced instances where an item I ordered was out of stock.					
	66. The frequency of out-of-stock items is lower than I expect it.					
Perfect Order Rate	67. My orders are consistently accurate.					
	68. There has been NO instances where I receive the wrong item or quantity.					
On-time Delivery Rate	69. My orders from are delivered on-time.					
	70. I am satisfied with the percentage of on-time deliveries.					
Order Lead Time	71. I am satisfied with the lead time provided for my orders.					
	72. The lead time provided for my orders is consistent.					
Order Accuracy Rate	73. The accuracy of the information provided in my orders is high.					
	74. I am satisfied with the percentage of accurate information provided in my orders.					
Order Processing Cost	75. The cost of processing my orders is reasonable.					
	76 I am satisfied with the cost of processing my orders from Internal Stream System.					
Return Rate	77. The return process for items ordered from Internal Stream System is easy.					
	78. The frequency of items I have to return from Internal Stream System is low.					
Customer Satisfaction Rate	79.The ordering process is easy and user-friendly.					
	80.The delivery process is efficient and reliable.					
Capacity utilization	81. Our organization fully utilizes its available capacity to deliver its products or services.					

		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
	82. We have the necessary resources in place to effectively manage fluctuations in demand for our products or services.					
First-time fix rate	83. Our organization has a high first-time fix rate when addressing customer issues or problems.					
	84. Our organization invests in the necessary training and resources to ensure our staff are equipped to resolve customer issues or problems on the first visit.					
Work-in-progress (WIP)	85. Our organization actively monitors and manages work-in-progress to ensure that projects and tasks are completed on time					
	86. Our organization has effective processes in place to minimize work-in-progress and reduce delays in project or task completion.					
Process improvement	87. Our organization actively seeks out opportunities to improve its processes and procedures					
	88. Our organization measures the effectiveness of process improvements and makes adjustments as necessary to ensure continued improvement.					
Machine uptime	89. Our organization has high machine uptime, with minimal downtime due to maintenance or breakdowns.					
	90. Our organization invests in preventative maintenance and has effective repair processes in place to quickly address machine breakdowns and minimize downtime.					
Material component quality	91. Our organization uses high-quality materials and components in its products or services.					
	92. Our organization has quality control processes in place to ensure that materials and components meet our standards and specifications.					
Days of supply	93. Our organization maintains optimal levels of inventory to ensure we have sufficient supply to meet customer demand.					
	94. "Our organization has effective forecasting and inventory management processes in place to minimize excess inventory and reduce the number of days of supply.					
Premium freight charges	95. Our company effectively uses premium freight charges as a KPI to measure the efficiency of our internal stream performance					
	96. Our company has effective freight charges accurately that reflect the efficiency and effectiveness of internal stream operations					
Freight cost/unit purchase	97. Monitoring freight cost per unit purchase can help identify areas for improvement in internal stream operations.					
	98. Reducing freight costs per unit purchase can have a positive impact on the overall performance of internal stream operations.					