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Stock Management for a Sole Distributor of Smartphones in Saudi Arabia

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***Abstract*— The Arabs Computers Company receives Apple products and distribute it in the kingdom of Saudi Arabia. Apple fulfills the orders through Apple stage point located in Dubai, where the shipment is stored in the stage point and is forwarded to KSA via trucks to the Arabs computers company warehouses in Dammam, Riyadh and Jeddah. The shipments is processed in the Saudi customs, checked and released to the Arabs Computers Company Warehouses in order to prepare the shipments for retailers. The retailers of the Arabs computers company are complaining on the late deliveries of a specific iPhone product due to the late shipments. Arabs Computers Company seeks to reduce the late deliveries. To reduce the system delays and to improve the system, the author applied the DMAIC cycle. After defining the problem and stating the scope of the paper while drawing a value stream map for the process, the data was collected for the system parameters. Statistical analysis was performed to analyze the arrival rates and the processing times. After measuring the data, an analysis was performed to highlight the root causes behind the delays in the deliveries of a specific iPhones model. The Analysis and Improvement phases were made using Arena Rockwell Simulation Software. The control phase represents the implementation of the improvement. The new scenario has saved time and efforts for all of the 6 shipping routes. The average Total Time Saved by the new model is 43.32 Hours, which represents 10.36% savings on the Average Total Shipping Time in the Original Model.**

***Keywords*—Smartphones; Supply chain; Logistics; Stage point; Value Stream Mapping.**

I. INTRODUCTION

Arabs Computers Company is an authorized distributor for Apple products in KSA. They distribute Apple products via different retailers. Apple prepares the order and ships it to the Arabs Computers Company via vessels to Apple stage point in Dubai, where the shipment is stored in the stage point and is forwarded to KSA via trucks to the Arabs computers company warehouses in Dammam, Riyadh and Jeddah. After that, the shipment is processed in the customs bonded and released to the Arabs Computers Company warehouse. The retailers of the Arabs computers company are complaining on the late deliveries of specific iPhone model. The Arabs Computers Company aims to reduce the late deliveries by investigating the ordering process. The objective of this paper is to improve the ordering process of a specific iPhone model for the Arabs computers company in order to reduce the shipment process time, and save efforts. This paper also aims at generalizing the new process to be applied to other smart phones brands.

This paper has the following steps:

- Reviews the literature for quality tools (DMAIC cycle), supply chain management, procurement process, and simulation of the procurement process.
- Draw the value stream mapping of the ordering process and Apply DMAIC cycle in order to enhance the ordering process.
- Data collection and analysis of the different simulation options of the ordering process via discrete event simulation software (Arena Rockwell).
- Comparison between the current and the improved systems in terms of savings.

Apple has been ranked #1 in Supply Chain Management by Gartner Research since 2011 and achieved Masters Status in 2015. This rise to industry leadership in supply chain management began in 1998 when Tim Cook joined Apple as Senior Vice President of Worldwide Operations. He reduced the number of suppliers from 100 to 24.

For Mobile vendor market share in Saudi Arabia for the period December/2023-December/2024. Apple market share accounted for 23.71%, Followed by Samsung 18.73%, Xiaomi 11.08%, Vivo 7.84%, Oppo 5.77% [1].

Stamatis (2019) suggested that the DMAIC approach includes phases that facilitate understanding the project's purpose and scope, mapping the current project, determining the suitability of the DMAIC application, and discerning customer expectations, costs, and timelines [2]. The author argues that the DMAIC methodology aims to improve business process excellence and make the improvement more likely and recurrent. The flow generally contains aspects of purchasing, fabricating, capacity planning, operations management, production planning and control, production requirements planning, ordering system planning, logistics systems, warehouse, inventory and storage systems as well as incoming requirements from the sales and marketing processes. The results of the literature review performed by Yusuf & Dwi (2022) on 25 related papers issued between 2010 and 2021 showed that the effect of implementing supply chain management contributes to minimizing inventory supply chain management activities while reducing inventory levels through intensive control and information [3]. According to Ziari et al. (2022) who reviewed 166 papers published from 1983 to 2021, supply chain management (SCM) deals with various strategic, tactical, and operational level decisions in which pricing is of utmost importance to decision-makers. Most real-life supply chain pricing problems consider competition as a crucial factor in order to expand the market share and tackle emerging

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competitors [4]. Accordingly, competitive pricing in SCM has attracted great attention from practitioners and academicians in the last four decades.

Benabdellah et al. (2016) stated that for current industries, data generated by machines and electronic devices, product lifecycle management solutions, production planning systems, or quality and inventory management systems have reached a quantity of more than a 1,000 Exabyte per annum and is forecasted to increase in the next years. This has led to the need for "Big Data", which originally referred to the huge flood of data. It has extended the scope of technological capability to store, manage, process, interpret, and visualize the amount of data. Their study outlined the value that Big data offers for supply chains, which are increasingly complex [5].

II. METHODOLOGY

This paper uses the DMAIC cycle for service quality improvement combined with the Arena Rockwell to enhance the ordering process.

A. Collecting Data

The data that are of interest are the planned shipments of Specific iPhone model, the processes involved to place the order, and the needed time for those processes to complete. This step includes process value stream mapping. The current system is said to be a steady-state process where all of the orders have to be processed and the capabilities of supply meet the demand. This step is under the "Define" phase of the DMAIC Cycle. The point of interest is the number of delayed orders.

The Case iPhone Model has two sources. Shipments arrives from china or India via 20 feet containers through the sea. Shipments are forwarded to Dubai warehouse that holds and batch the shipments in order to release it to the Arabs Computers Company warehouses in Jeddah, Riyadh and Dammam. Once released the shipment is transported via trucks and go through the Saudi customs check. After the arrival to one of the Arabs computers warehouse, the separation and perpetration of the containers content takes place. See Fig. 1 below.

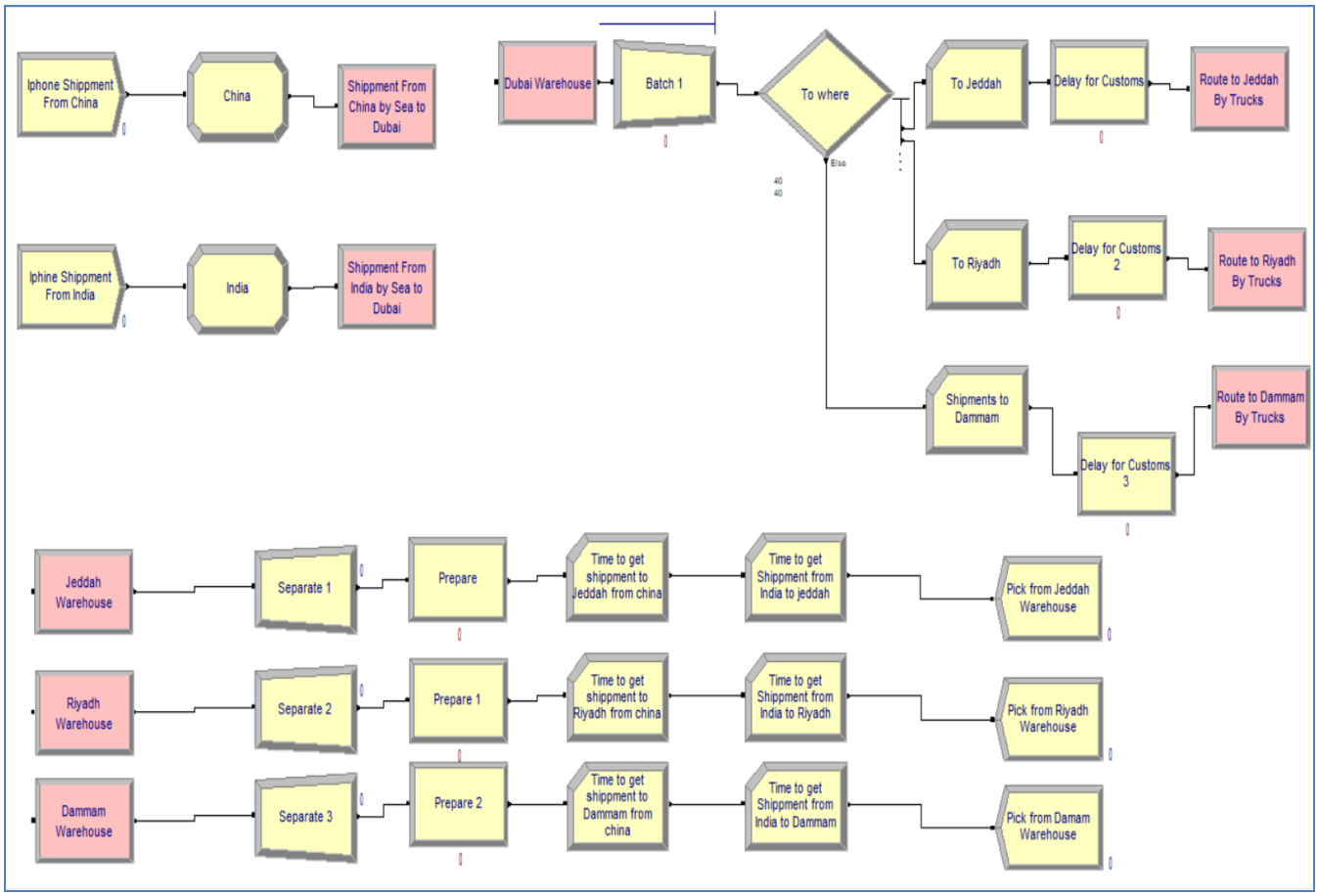

Fig. 1. *Original iPhone Supply Chain Process*

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B. Measuring the data

Data Measuring is made by the authors who work with the Arabs Computers Company. The measuring of data involves statistical data analysis of the arrivals and processing distribution rates. The data is analyzed using input data analyzer software. This step is under the "Measure" phase of the DMAIC Cycle. This involves the system resources.

For a Fiscal Month, Fig.2 shows that 10 scheduled shipments are planned from china ("20 Feet" containers), while Fig. 3 shows that 8 scheduled shipments are planned from India in a period of a month ("20 Feet" container).

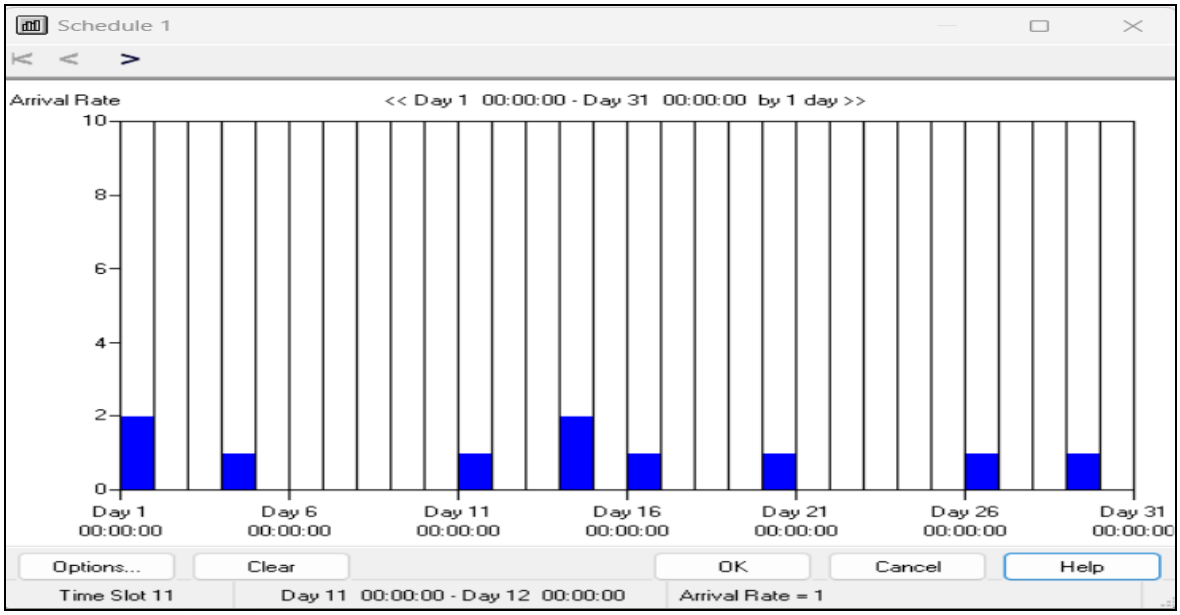

Fig. 2. Schedule for Sea Shipments from China

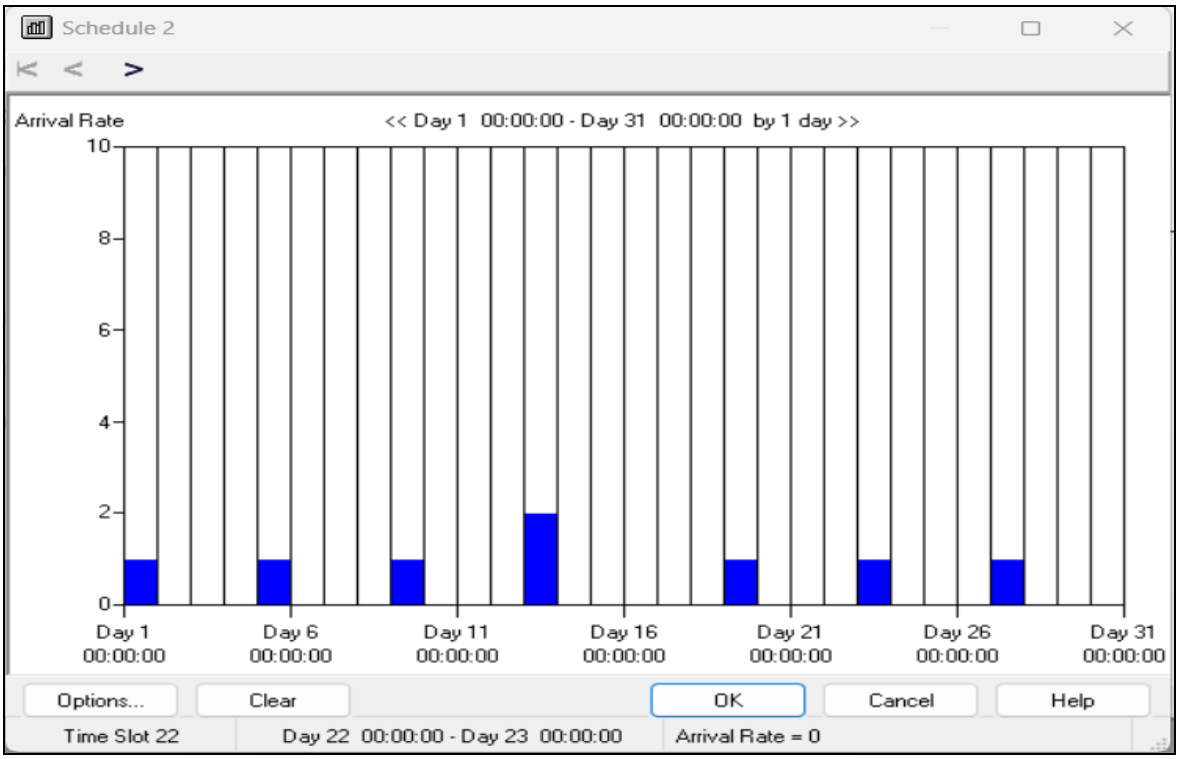

Fig. 3. Schedule for Sea Shipments from India

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Each Container will be tagged for his shipment time. Shipping of containers from china to Dubai needs 13 days. Shipping of containers from India to Dubai needs 10 days. Batching process occurs at Dubai for 2 "20-feet containers" to 1 "40-feet container". 40% of the orders go to Jeddah warehouse, 40% of the orders go to Riyadh warehouse and 20% go to Dammam warehouse. Customs inspection process takes 1 day as a minimum, 2 days (most likely) and 3 days as a maximum. Inland Shipping of containers by trucks from Dubai to Jeddah needs 2 days. Inland Shipping of containers by trucks from Dubai to Riyadh needs 1 day as a minimum, 1.5 days (most likely) and 2 days as a maximum. Inland Shipping of containers by trucks from Dubai to Dammam needs 0.5 day as a minimum, 0.75 day (most likely) and 1 day as a maximum. At each of the Arabs Computers Company Warehouses, the "40-feet containers" are separated. Preparation of shipments for collection by retailers takes 0.5 day as a minimum, 1 day (most likely) and 1.5 days as a maximum. Each shipment from china is tracked for time interval spent in the system. Each shipment from India is tracked for time interval spent in the system.

C. Analyzing the Data

This step oversees the system parameters and tries to find the root causes of the problems. This involves the investigation of the problems and system output parameters such as the time intervals to complete orders per month. This step is under the "Analysis" phase of the DMAIC Cycle.

The Modeling process has many advantages such as users being able to see the results of any changes in the system before implementing it in real life and building different scenarios to choose the best among them. The use of Arena Rockwell Simulation Software is considered under the "Analysis" phase of the DMAIC cycle.

company Planning Engineer point of view. (See Fig 5).The six categories are:

- Delays due to Personnel; inexperienced workers
- Materials used for Shipping; Small container size, from the factories it is 20 feet shipped through the sea. While, it is merged by a 40 feet containers by land shipping.
- Measurement; Low Demand Forecasts.

As per Arena Software Simulation Results, on a monthly average, there are 18 containers that are shipped to the Arabs Computers Company. For iPhones assembled in India, it takes around 14 days and 16.5 hours to receive the shipment for any of the Arabs computers company warehouses. However, For IPhones assembled in China, it takes around 17 days and 21.2 hours to receive the shipment for any of the Arabs computers company warehouses. To batch and merge shipments at the IPhone sorting hub at Dubai, the holding time to start batching 2 containers is 4.27 hours, this is due to the scheduling of some odd shipments to Dubai sorting hub. In 30 working days, 3 "40-feet" containers are shipped to Dammam, 2 "40-feet" containers are shipped to Riyadh, and 2 "40-feet" containers are shipped to Jeddah. Shipments from India has to arrive to Dammam by an average time of 14 days and 22.8 hours, Shipments from china has to arrive to Dammam by an average time of 15 days and 21.6 hours, Shipments from India has to arrive to Jeddah by an average time of 18 days and 16.56 hours, Shipments from China has to arrive to Jeddah by an average time of 18 days and 11.76 hours, Shipments from India has to arrive to Riyadh by an average time of 16 days and 16.8 hours and Shipments from China has to arrive to Riyadh by an average time of 17 days and 18.96 hours.

D. Improve

This step identifies the ordering system problems and applies practical solutions. The authors try to suggest an improvement through an analysis of the current system. Then, simulate the improved scenario. An assessment of the reorder point is made. This phase is under the "Improvement" phase of the DMAIC Cycle.

The cause and effect for the case iPhone Model Delays has been drawn from what the point of the Arabs Computers

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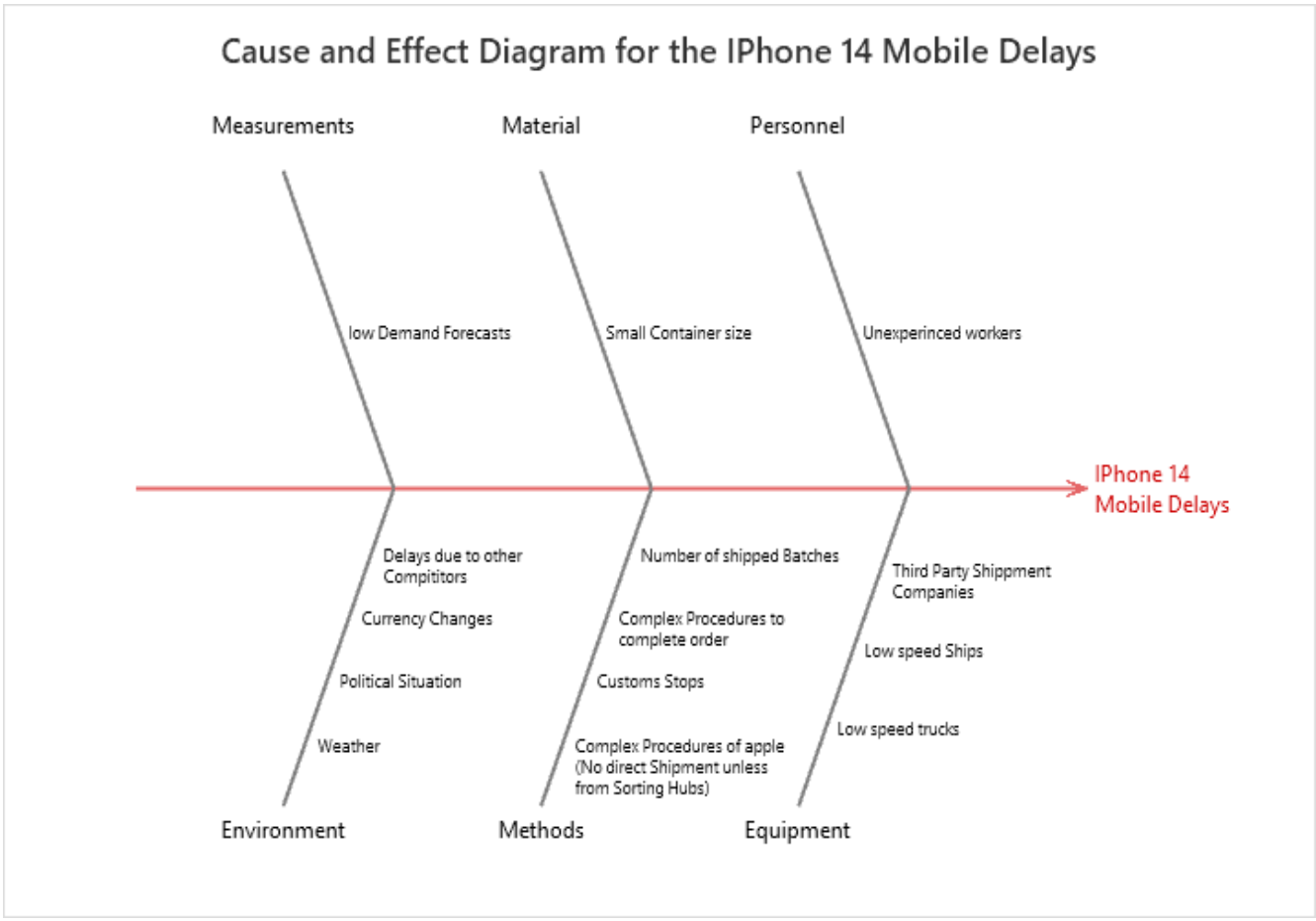

Fig. 4. Ishikawa Diagram for the root causes for iPhone Model Delays

In order to deal with the delays problem from the point of view of the Arabs Computers Company Planner Engineer, he suggested the following:

- Purchase orders shall be for "20-Feet" containers instead of "40-Feet" containers, thus saving time consumed on the batching process.
- Orders shall be directed towards Dammam Warehouse and from which it shall be redirected toward their destination points. Thus, this will allow the receivable of orders by the Arabs Computers Company from the third party delivery company in a faster manner.
- Arabs Computer Company Shall handles the transportation of orders directly towards their Riyadh and Jeddah Warehouses. Thus, Dammam is the nearest warehouse.
- Equipment; Low Speed Third Party Shipping Companies, Low Speed Ships, Low Speed Trucks.
- Methods; Number of Shipped Batches, Complex Procedures to Complete Order, Customs Stops and Complex Procedures of Apple (No direct Shipment unless from sorting Hubs).
- Environment; Bad weather Conditions, Political Situations, Currency Changes and Delays due to other Competing distributors.

The new logistical plan has been modeled using Arena Rockwell.

The number of containers is similar to the original scenario. Where, 18 "20-Feet" containers are sent from their manufacturing sites in china and India. The total average time needed to receive shipments from china is 16 days and 9.84 hours. While, shipments from India takes on average 13 days and 14.4 hours to be prepared for collection by the Arabs Computers Company partners. Among the orders, 8 orders has been directed toward Riyadh, 7 orders has been directed toward Jeddah and 3 orders has been directed toward Dammam for collection by the Arabs Computers Company Partners. Shipments from India has to arrive to Dammam by an average time of 13 days and 20.4 hours, Shipments from china has to arrive to Dammam by an average time of 15 days and 12.24 hours, Shipments from India has to arrive to Jeddah by an average time of 16 days and 6.72 hours, Shipments from China has to arrive to Jeddah by an average time of 16 days and 3.84 hours, Shipments from India has to arrive to Riyadh by an average time of 14 days and 21.36 hours and Shipments from China has to arrive to Riyadh by an average time of 16 days and 1.44 hours.

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E. Control

The last step focuses on comparing the results of the two scenarios based on the rate of productivity parameters improvement. The parameters are the ordering time interval. This phase is the last phase of the DMAIC cycle, which is "Control".

Table I below shows the comparison between times needed until the collection of the items from the Arabs Computers Company authorized resellers, the time savings due to the new scenario has reduced the total time for all the routes.

TABLE I. ALL ROUTES TIME INTERVALS COMPARISON

From	To	Original	New	Time Saving
India	**Dammam**	14 Days and 22.8 Hours	13 Days and 20.4 Hours	1 Day 2.4 Hours
China	**Dammam**	15 Days and 21.6 Hours	15 Days and 12.24 Hours	9.36 Hours
India	**Jeddah**	18 Days and 16.56 Hours	16 Days and 6.72 Hours	2 Days 9.84 Hours
China	**Jeddah**	18 Days and 11.76 Hours	16 Days and 3.84 Hours	2 Days 7.92 Hours
India	**Riyadh**	16 Days and 16.8 Hours	14 Days and 21.36 Hours	1 Day 19.44 Hours
China	**Riyadh**	17 Days and 18.96 Hours	16 Days and 1.44 Hours	1 Day 17.52 Hours

Table II below shows the time savings in hours. The highest time saving was for the shipments sent from India to Jeddah by 57.84 hours. Secondly, the time savings for shipments between India and Jeddah. After that, the time saving comes for the shipments between India-Riyadh and China-Riyadh with 43.44 hours and 41.52 hours, respectively. The least saving comes for the shipment sent between India-Dammam and China-Dammam with a time savings of 26.4 hours and 9.36 hours, respectively.

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TABLE II. TIME SAVING FOR EACH ROUTE

From	To	Original (Hours)	New (Hours)	Time Saving (Hours)
India	**Dammam**	358.8	332.4	26.4
China	**Dammam**	381.6	372.24	9.36
India	**Jeddah**	448.56	390.72	57.84
China	**Jeddah**	443.76	387.84	55.92
India	**Riyadh**	400.8	357.36	43.44
China	**Riyadh**	426.96	385.44	41.52

III. CONCLUSION AND FUTURE WORK

Apple prepares the order and ships it to the Arabs Computers Company via ships to Apple stage point in Dubai, where the shipment is stored in the stage point and is forwarded to KSA via trucks to the Arabs computers company warehouses in Dammam, Riyadh and Jeddah. After that, the shipment is processed in the customs and released to the Arabs Computers company warehouses, in which the shipment is prepared to be collected by the authorized seller. The retailers of the Arabs computers company are complaining on the late deliveries of specific iPhone model due to the late shipments. Arabs Computers Company seeks to reduce the late deliveries by investigating the logistics value stream map.

The Arabs Computers Company aims to reduce the late deliveries by investigating the ordering process. To reduce the system delays and to improve the system, the author applied the DMAIC cycle.

After defining the problem and stating the scope of the project while drawing a value stream map for the process, the data was collected for the system parameters. Statistical analysis was performed to analyze the arrival rates and the processing time. After measuring the data, an analysis was performed to highlight the root causes behind the delays in the deliveries of a specific iPhone model. The Analysis and improvement phase was made using Arena Rockwell Simulation Software. The control phase represents the implementation of the improvement. The new saved time and efforts for all of the 6 shipping routes. The highest time saving was for the shipments sent from India to Jeddah by 57.84 hours. Secondly, the time savings for shipments between India and Jeddah. After that, the time saving comes for the shipments between India-Riyadh and China-Riyadh with 43.44 hours and 41.52 hours, respectively. The least saving comes for the shipment sent between India-Dammam and China-Dammam with a time savings of 26.4 hours and 9.36 hours, respectively.

According to the planned distribution of orders among warehouses. 20:40:40 are the ratio of Dammam, Jeddah and Riyadh, respectively. The average Total Time Saved by the new model is 43.32 Hours, which represents 10.36% of the Average Total Time in the Original Model.

It is recommended for future studies to combine operational research models in order to optimize the transportation problem. Also, one can use the Transshipment model to find the optimum routing problem considering the transportation costs.

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Conflicts of Interest: The authors declare no conflict of interest.

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