Performance Optimization Through Business Process Re-engineering (BPR) in a Post Covid-19 Environment

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Abstract: Business process re-engineering allows organizations to transform their business processes to enhance their performance in terms of customers satisfaction and long-term strategies. In this research, business process re-engineering will be applied in shipping in one of the leading oil & gas companies. It all started when company has started to receive several complaints internally and externally during COVID-19. All types of complaints were related to one main root cause which is delay of ships, which were impacting customer's supply chain in terms of supply shortage which has led to several shutdowns. Internally, we have received several complaints from corporate planning, and finance departments state that delays of ships result in profit losses due to not achieving sales targets and increasing operational cost. Clearly, delays of ships were negatively impacting customer satisfaction and profitability of company. Therefore, the need of BPR implementation became a must at this stage. The approach of business process re-engineering will be applied in a logical framework starting with business direction to identify goals and objectives of the company. Direction of the company and research objectives are to improve customer satisfaction and to increase profitability of the company by improving the area of shipping in terms of delays of ships. After collecting the data and conducting surveys. we have found that the company is facing a poor customer satisfaction index of product delivery time which is equal to 68%. Customer satisfaction index and profits were directly related to the current logistics system of the company. At the end, a comparison between previous state and improved reengineered state shows how business process reengineering has highly contributed to achieving research objectives.

Keywords: Covid 19, Performance Optimization, Business Process Re-engineering, Shipping Volume

I. INTRODUCTION

Business process reengineering (BPR) is one of the leading strategies in improving customer satisfaction, and operational cost. Nowadays, the need of BPR has significantly increased since many companies have started to adapt such strategies to achieve outstanding results. The implementation of BPR starts after identifying the business direction and objectives. External uncontrollable factors may trigger the change, which leads companies to adapt BPR. Many companies have resisted the need of change since they were profiting, and no observations were found at that time. Post COVID-19, one of the leading companies in oil and gas industry in Middle East has noticed the need of BPR in shipping. Management has found that several key performance indicators such as customer satisfaction index and profitability are being negatively impacted. If business continues as is, the reputation and core values of the company will be impacted in the short and long-term future. In this study, several industrial engineering tools will be applied in order to support and enhance the process improvement [1].

BP Oil Australia and New Zealand started a project as a part of one of the company's wide strategies, in order to improve productivity and profitability. This project had three main phases. First phase

project was focusing on vision and how business is going to operate in the future, benefit of reengineered solutions, systems infrastructure, and implementation plan [2]. Project management team consisted of general managers, Middle management, divisional management, and consultants. The focus was to improve Order Management Cycle (OMC), since it represents almost 30%-40% of the total cost structure. Target has been set to reduce OMC by $30 million yearly. A long list of possible initiatives has been produced, and ranking matrix has been used as a decision-making tool for selecting the most important ones. The result was 8 potential projects. Potential projects are accounts receivable, improve scheduling & distribution process, improve order mechanism, improve stock forecasting, improve customer access to information through IT, improve customer support service through IT, simplify rebate processes, business advisory services to reseller. Business vision has four main bands, and they are Strategy, People, Technology, and Processes. Bands transformation will be in business strategy to transform from Maximizing volume, Geographic Coverage, and Channel Control to Maximizing profit, Segment Focus, and Channel Partnerships. In structure & people from Field Sales Force, Functional Management, and Transaction Processors to Customer Account Managers, Task Force Management, and Knowledge Workers. In Information technology, from Centralized Services Driven, Control Applications, Machines, and Wholly Internally Driven to Decentralized, Business Driven, Specify Data, Networks, and Partial Outsourcing. In business process, from Multiple Customer Contacts, Cycle Driven, and Functionally Managed to Common Customer Info. File, Event Driven, and Process Managed.

Second phase objectives were to identify options for cost effective solutions, and opportunities for process reengineering. First recommendation is process change in Billing, Personnel Management, planning & Control, and Procurement. Second recommendation is business change program. Third recommendation is system transition, services, and cost.

Third phase focus was on redesigning billing process, which was directly related with OMC. Billing process new design had a business owner responsible for tracking all KPIs and performance. The aim was to simplify billing process and to reduce defects by 60%, since 17% of total billing cost was spent on fixing cost [1].

1.1   BPR Implementation

For more than a decade, BPR have gotten a lot of attention. Many ways have been offered, and many promises have been made, but the dramatic outcomes that the reengineering revolution promised were never completely achieved, leading to growing skepticism about the entire process. concept. Apart from being eager, one of the numerous reasons is because ideas that are descriptive, as well as a technique that is systematic and repeatable.

It might be used to simulate business processes in general. It was never proven that progress was possible. In comparison to the big a variety of strategies for modeling business processes that have been presented, and Business process optimization has received limited attention in the literature when it comes to qualitative analytical methodologies. Improvement denotes a high-level approach to creating something new [3].

Optimization refers to the transformation of a current business process into a superior version. Business processes necessitate formal semantics. A second generation of formal models resulted from modeling. Formal models are those in which concepts are described exactly and formally such that mathematics may be used to analyze, extract knowledge, and reason about them. concerning them Formal models have the virtue of being repeatable [4].

Third generation of BM tools was developed in an attempt to address the formal model's complexity while maintaining their coherence and capacity for future study. The methodologies employed in software development heavily affected the first generation of business process modeling tools, and the

same is true for this generation. Perhaps business process models are similar to software development methodologies because of their dynamic, complicated, and continuously growing character. The third collection of examples shown here takes business process modeling a step further by designing and executing business processes using process languages. This is how business process languages grew to be what they are today. These context-specific executable languages are the newest trend in business process modeling, and they've already created some interesting results [5].

Without additional inspection and analysis of the business processes model, business process modeling does not bring much value. If it doesn't assist improve or optimize a business process, analysis isn't worth anything. It is possible to enhance processes with linked formal approaches that support both the theory and the practice.

Business process modeling and analysis A comprehensive approach to business processes should capture a business process (business process modeling), as well as supply the essential information and resources. a method for identifying bottlenecks and analyzing performance and, in the end, generate alternative enhanced business process in terms of defined goals. However, this final point is frequently overlooked. In the literature on business processes, part business process optimization is often underestimated, if not entirely ignored. Distinction between process improvement and optimization is discussed, as well as a classification of the existing company situation [6].

For a number of compelling commercial reasons, companies reengineer. To begin, management finds that there is a large difference between actual and desired performance, resulting in a business problem. Senior management can be difficult to work with at times. transforms this business issue into issues with process performance and opportunities. This allows the corporation to concentrate on substantially changing its business. the target process(es), hence enhancing business outcomes and resolving the issue. Senior executives are seeing the need for significant transformation at this early stage. In making the decision, managerial commitment and sponsorship are critical. to rework, to rework, to rework, to rework Historically, almost 70% of all reengineering attempts have failed. Lack of senior management has been blamed for the high failure rate [7].

Many researchers consider change management to be a critical component of any BPR efforts. Change management, which includes all human and social-related changes and cultural adjustment techniques needed by management to facilitate the insertion of newly-designed processes and structures into working practice and to deal effectively with resistance is considered by many researchers to the most significant variables connected to change management include incentive system revision, communication, empowerment, people participation, training and education, building a change culture, and boosting the organization's receptivity to change [8].

The efficient application of project management strategies and the management of people-related issues are also important in the process redesign stages. For tailoring a BPR implementation process to the most effective approach, a full piloting of the new design and learning from errors are very critical. Throughout a BPR project, continuous measurement of project progress should be maintained [9].

Internal and external stakeholders should be the focus of BPR initiatives, as well as finding re-engineering prospects. Business objectives should be always kept in mind. Many scholars and practitioners are increasingly seeing IT infrastructure as a critical component of effective BPR efforts. The most important factors that contribute to the success of BPR projects are effective alignment of IT infrastructure and BPR strategy, building an effective IT infrastructure, making appropriate IT infrastructure investment decisions, measuring IT infrastructure effectiveness, proper IS integration, effective re-engineering of legacy IS, increasing IT function competency, and effective use of software tools [10].

Each business action must be aligned to the company objectives, according to a key premise of business process reengineering. Logistics is both a core business activity and the underlying phenomena that drives most other business activities for companies that make and transport real goods. Without logistics, it's difficult to envisage BPR.

Despite the fact that logistics is intertwined with many other business processes, we still need to describe it in order to use scientific and technical methods to optimize the process. For the purposes of this study, logistics refers to the collection of resources (capital, labor, finance, information, and management) and their deployment for receiving, managing, and distributing goods [11].

This concept comprises all material handling operations in production, as well as standard transportation and distribution. To keep the subject focused, let's assume that logistics does not encompass purchasing, marketing, production, or inventory planning, despite the fact that these operations are clearly intertwined [12].

In the previous five years, the warehouse management system industry has evolved dramatically. In today's warehouses, WMS software is critical for cost control and attaining high levels of performance. Because WMS software is focused on warehouse operations, it relies on a small number of abstractions, and hence the abstraction gap is tiny. Take, for instance, a unit load warehouse [13].

At the strategic level, intelligent systems would pick the proper tactics and methodologies with the goal of making strategic judgments. Location of business, product portfolio, project finance, and so on. As changes and developments inside a company This sort of choice necessitates expertise and experience in picking the most appropriate approaches, technologies, and tools. Expert Systems (ES) can be used to make high-level strategic judgments. However, a review of the literature reveals that there aren't many different models [14].

1.2   COVID-19 Impacts

Hundreds of thousands of people have died throughout the world due to the pandemic COVID-19. It has also caused a huge economic impact on many countries worldwide. Since the restrictions have been implemented in many countries, many businesses were harmed as a result of COVID-19 [15].

Container industry has faced several new obstacles, including trade legislation, fleet deployment, green shipping, and green port concerns. COVID-19 arrival has posed new hurdles for shipping operations and management. Delays in berthing operations were one of the most critical events that have impacted the companies. The container shipping industry's freight and charter rates are affected by changes in trade volume, and shipping companies has faced loss in terms of return and market growth [16].

COVID-19 had a big impact on the marine sector. Damage to the marine industry, which plays a significant role in global trade, will show the impact of this negative in a short period of time. Even though we haven't yet felt the effects, it is apparent that this scenario will eventually result in an economic disaster [17].

Due to COVID-19 situation ships arriving at ports would be held for 14 days in order to allow for free practice. This circumstance will result in significant buildup, delays, and commercial losses [18]. Additionally, ship inspections will become more regular, and new checklists will be developed.

At the same time, ship personnel will find it more difficult to visit familiar ports. When the departing crew members return to the ship, they will be confined for a period of time, adding to the workload by requiring the necessary officers to take someone's temperature [19].

Maritime industries play an important role in the global economy. Since early 2020, the COVID-19 has had a considerable influence on the marine industry [17].

The operators of these businesses such as ship owners, exporters, importers, terminal operators, and shipping couriers have suffered operating losses and inconvenience. Due to the incubation of the virus. Many countries have opposed quarantine for 14 days to ship owners who have visited countries that were in the list. These limits and regulations had an impact on freight prices, charter rates, revenue, and profitability. The cruise industry, in particular, has suffered significant losses [20].

II. METHODOLOGY

Direction of the business is to increase customer satisfaction index and profitability of the company by improving the area of shipping. Shipping has negatively impacted both KPIs, and BPR will be the best approach to contribute to positive changes in the current system. In this step start reviewing existing processes in order capture opportunities and processes that need to be redesigned. Data will be collected based on customers' survey and historical data. In addition, different types of shipping strategies will be reviewed as well. Process Modeling of current voyage charter is shown in figure 1.
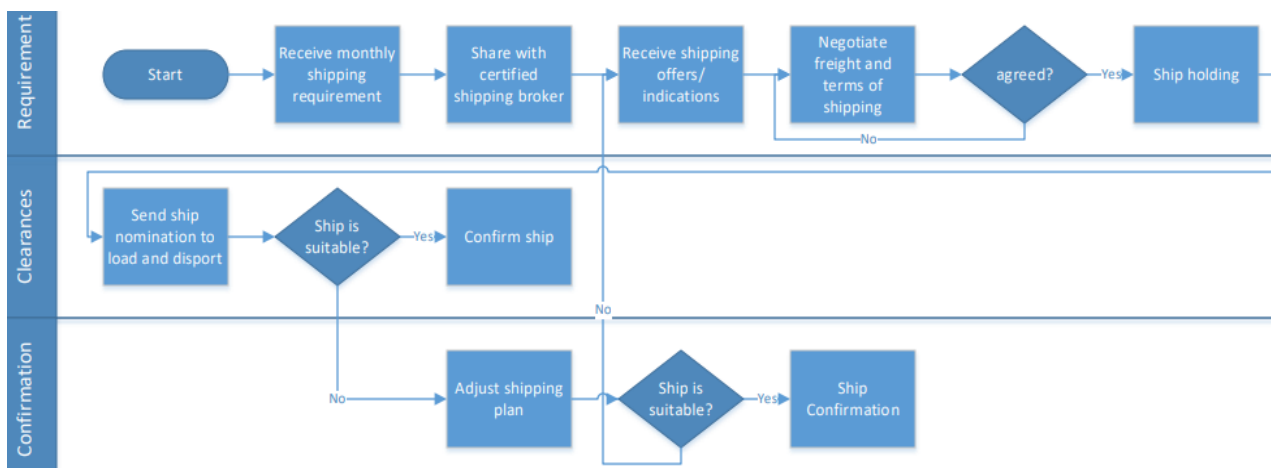

Figure 1: Process Modeling of Current State

Process starts by receiving monthly shipping requirement by commercial sales team for a specific month. Then, requirement is shared to certified shipping brokers in order to be shared with ship owners accordingly. Based on the shipping requirement, company will start receiving shipping indications from ship owners who are interested in carrying the requirement from point A to point B. Ship owners are usually interested in carrying the requirement if they have any suitable positions in the market that are economical for both ends. Company starts to review all indications and analyze which offer suits the requirement the most in terms of timing, and freight cost. If company has selected one potential offer, then it will select a strategy and tactic that will be used in the negotiation process. Most of the time, negotiation strategy targets win-win strategy since long term relationship is very important factor. Negotiation starts by sending a counter by the company to ship owners to achieve specific targets in terms of arrival time, delivery time, allowed number of hours, and freight cost. Negotiation is conducted through shipping brokers. Negotiation process may take some time depending on zone of potential agreement between both entities. If targets are achieved, then ship will be held by the company in order grant clearances at load port and disport before commitment. Once ship is cleared by load port and disport, then ship will be confirmed. Charter party will be the contract that represents this agreement of voyage charter.

III. RESULTS AND DISCUSSION

3.1   Customer Satisfaction Index (CSI)

In table 1, scale value identifies the survey score which is going to be reflected as a weight. Figure 2 illustrates the reduction of customer satisfaction index for delivery of the product within scheduled

delivery window in 2021. Historical data of customer satisfaction index is measured since 2015 till 2021. In 2021, total of the 34 customers attempted the full survey out of 60 customers. Therefore, responsive rate is 57%. We can clearly see that customer satisfaction index is decreasing therefore, delivery of the product within delivery scheduled is considered as an area of improvement.

Table-1: Scale and Weight of the Survey

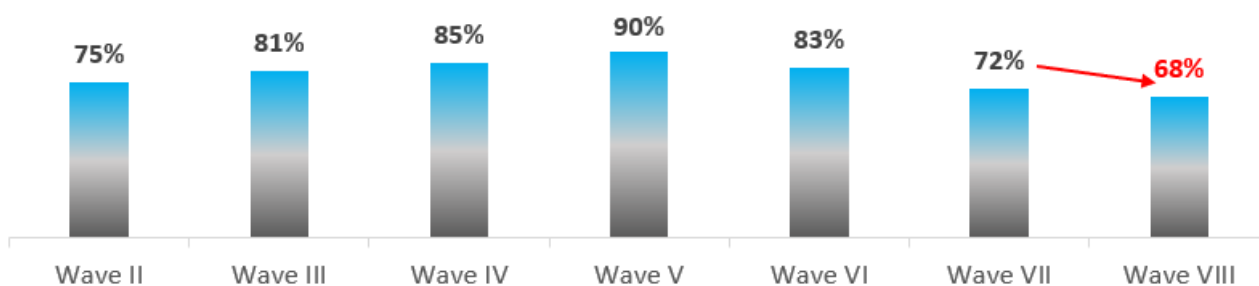| Scale	Scale Value	Weight
Very Dissatisfied	1	0
Dissatisfied	2	25
Neither Dissatisfied Nor Satisfied	3	50
Satisfied	4	75
Very Satisfied	5	100

Figure 2: Customer Satisfaction Index

3.2   Historical Shipping Performance

In this stage, we will measure the historical delivery performance based on number of delayed shipments. Data will be gathered for the full year of 2020 and full year of 2021 excluding Q4. In Table-2, historical data of all plan and actual deliveries was collected for the year of 2020. Total number of deliveries was 52 and total number of delayed deliveries was 7. Total ship schedule volume was 507k MT and total volume delayed is 78k MT. Overall Delivery Accuracy of deliveries is 87%, and Overall Delivery Accuracy of Volume is 85%. Figure-3 gives an overview of the performance in the year of 2020. We can observe that the number of delayed deliveries was higher in the 1st quarter of the month due to increased number of ships in 1st quarter.

Table 2: 2020 Delivery Accuracy

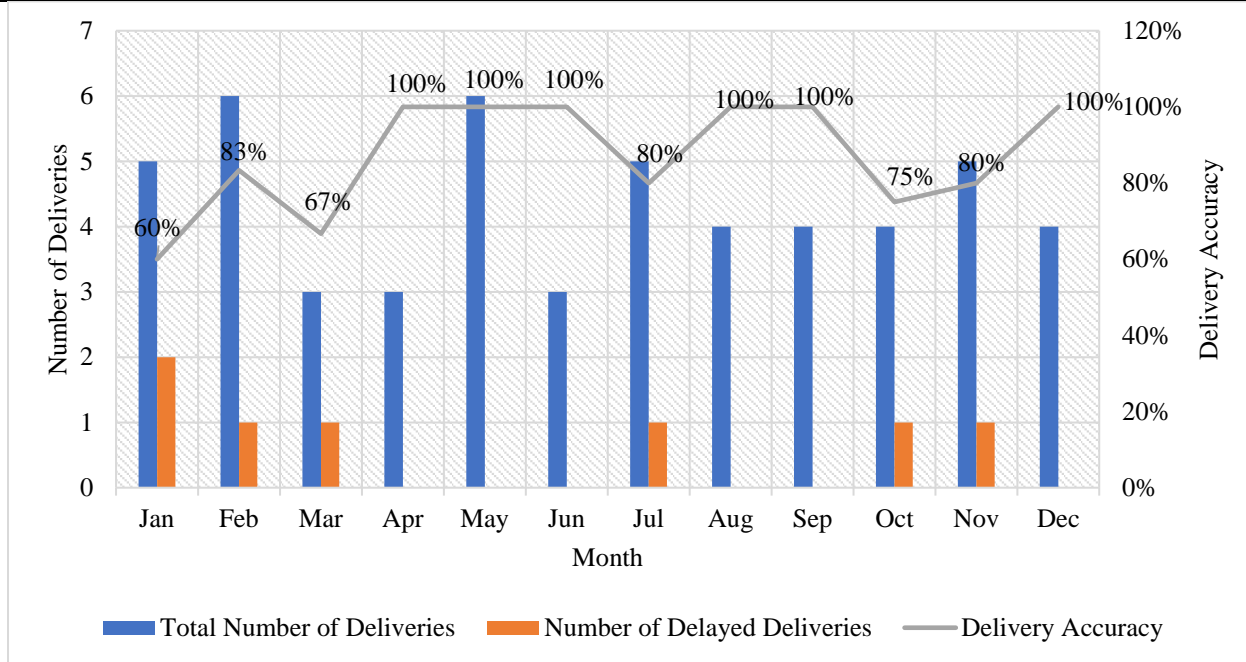| 2020	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Total Number of Deliveries	5	6	3	3	6	3	5	4	4	4	5	4
Ship Schedule Volume (x1000)	64	74	39	29	38	38	48	37	36	26	46	31
Number of Delayed Deliveries	2	1	1				1			1	1	
Delayed Volume (x1000)	20	10	8				10			10	20	
Delivery Accuracy (Deliveries)	60%	83%	67%	100%	100%	100%	80%	100%	100%	75%	80%	100%
Delivery Accuracy (Volume)	69%	86%	79%	100%	100%	100%	79%	100%	100%	62%	57%	100%

Figure 3: 2020 Monthly Delivery Accuracy

In Table-3, historical data of all plan and actual deliveries was collected for the year of 2021 excluding Q4. Total number of deliveries YTD was 44 and total number of delayed deliveries was 9. Total ship schedule volume was 500k MT and total volume delayed is 62k MT. Overall Delivery Accuracy of deliveries is 80%, and Overall Delivery Accuracy of Volume is 88%. We can notice that in the year of 2021, that total number of deliveries and volume were increased due to production increase. Therefore, number of delayed deliveries and volumes have increased accordingly.

Figure-4 gives an overview of the performance in the year of 2021. We can observe that there is inconsistency in terms of delivery accuracy. Performance in Q2 was better than Q1 and Q3. As a result of production increase that was occurred in 2021, we have noticed that performance of delivery accuracy was reduced, and data was inconsistent through all quarters.

3.3   Comparison Between Previous state and Improved Reengineered State

Figure 5 shows the previous process modeling of previous state, where company didn't have any long-term contract with ship owners, and it was highly depending on spot contracts. We can see high level of complexity since company had to go through long set of processes each time to find a suitable ship for product shipping. Company had to share requirement each time with brokers, receive shipping indications, selection, negotiation, and review contract terms.

Table-3: 2021 Delivery Accuracy

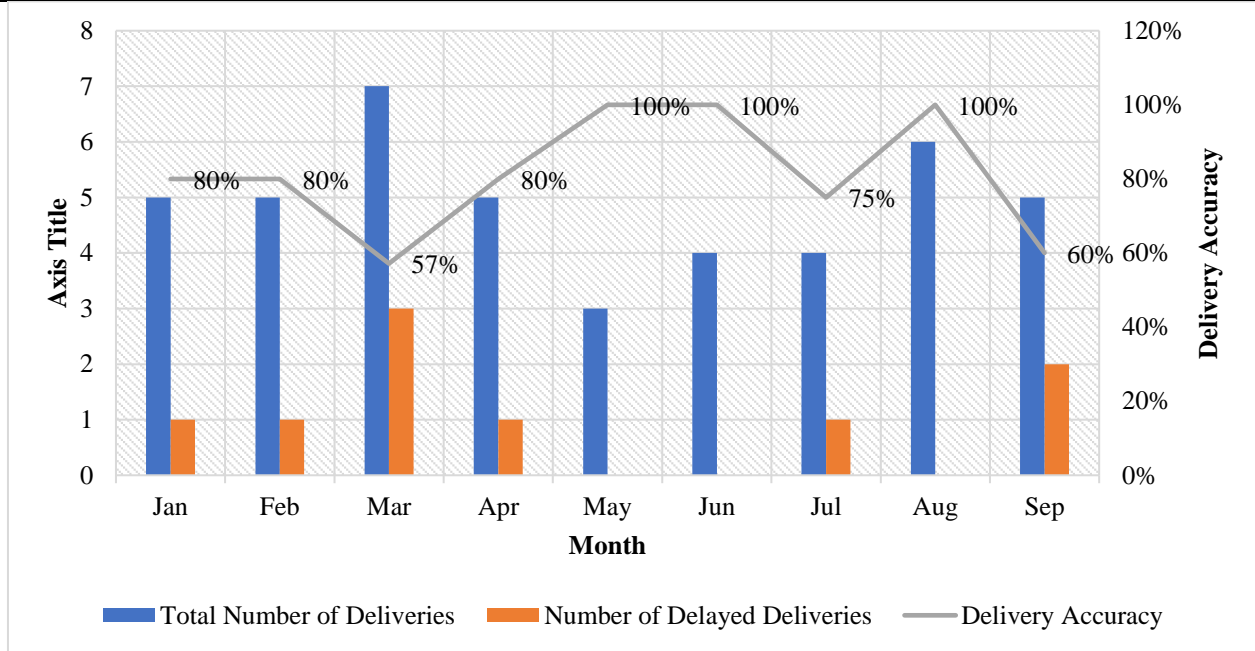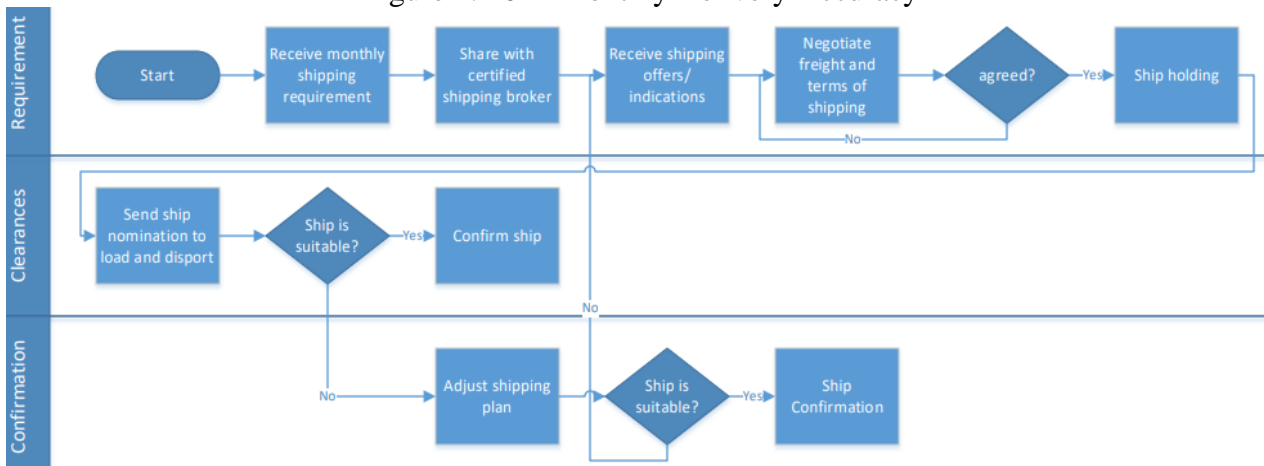| 2021	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Total Number of Deliveries	5	5	7	5	3	4	4	6	5
Ship Schedule Volume (x1000) MT	67	52	61	64	44	39	51	64	59
Number of Delayed Deliveries	1	1	3	1			1		2
Delayed Volume (x1000)	2	10	20	5			10		15
Delivery Accuracy (Deliveries)	80%	80%	57%	80%	100%	100%	75%	100%	60%
Delivery Accuracy (Volume)	97%	81%	67%	92%	100%	100%	80%	100%	75%

Figure 4: 2021 Monthly Delivery Accuracy

Figure-5: Process Modeling of Previous State

Figure 6 shows the improved state of the reengineered processes. Company has signed two long term contracts, therefore there was no need to go through all processes stated in Figure-5. In addition, after reengineering, processes have been reduced from nine processes to four processes which has improved the efficiency of the system and reduced the overall complexity.
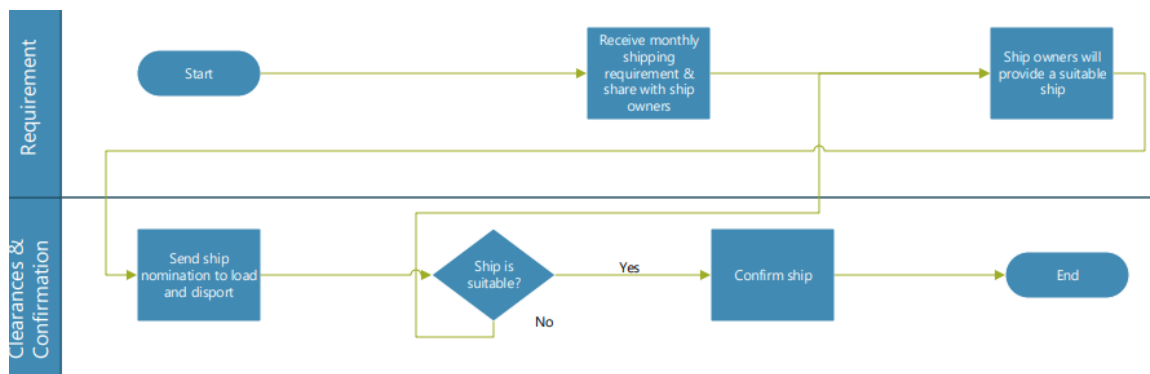

Figure 6: Process Modeling of Improved Reengineered State

IV. CONCLUSION

Business process re-engineering is a very powerful approach in business transformation. After setting business direction, which was focusing on customer satisfaction and profitability, we have started the process of data collection. Data collection process was based on two main data sources, and they were customers' surveys, and historical data. We have found that customer satisfaction index for product delivery was reduced from 90% in 2018 to 68% in 2021.

Furthermore, historical data was collected to validate the customer satisfaction index and we have found that the accuracy of deliveries was less than 90%. It has found that customer satisfaction index and profitability were negatively impacting the business due to not having an annual shipping contract with shipping companies. In the improvement phase we have concluded that the company needs to mitigate the risk for easy delivery destinations and to eliminate the risk for the difficult delivery destination by securing an annual shipping contract. Customer satisfaction and business profitability will be increased after a successful implementation of covering the shipping requirement by annual shipping contracts. For future research, different types of analytical tools can be used for further investigation and analysis.

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Ethical statement: The authors declare that they have followed ethical responsibilities.

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