



## Business Process Re-engineering to Support Sustainability of The Sales Commodities in Large Transaction with Quotation System

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### Abstract

**Purpose:** COVID-19 pandemic has an impact in almost all sectors, including economic and industrial sectors. The aim of this research is to support the sustainability of the sales commodities in large transactions due to pandemic conditions by business process re-engineering.

**Methods:** Using the moving average method as a forecasting method.

**Result:** It can get sustainable sales even during the COVID period, even seen an increase in transactions in the new period, along with the implementation of the quotation information system applied in the re-engineering business process.

**Novelty:** Business Process Reengineering as an engineering process to integrate the ERP and the bidding system or quotation system is needed.

**Keywords:** Business Process Re-engineering, ERP, Quotation System

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### INTRODUCTION

The COVID-19 pandemic plagued since the end of 2019 has become a problem currently faced by every country in various parts of the world. Almost all existing sectors involving humans were affected by this pandemic, not only in the health sector but also in other sectors. The entire sector's weakening is due to limited human activity, from social distancing to wearing a mask and Work From home policy. All of the policy is to prevent the spread of the virus, which is increasingly widespread. However, this limitation of social activity has had far-reaching effects [1]. One of the sectors that were heavily affected was the economic and industrial sectors. Any transaction that could be done manually by face-to-face, eye to eye and hand to hand cannot be done due to COVID and the social distancing policy.

The industry is one of the essential factors regarding business. Through industry, all commodities can be traded, including the construction business [2]. The industry is a part of the economy itself that produces goods and materials. The industry was the largest contributor to Indonesia's Gross Domestic Product (GDP) last year. The contribution given from this industry to the 2019 GDP was recorded at 19.62%. However, due to this pandemic, according to the Central Statistics Agency (BPS), during February 2020, the import value of all categories of goods decreased compared to January 2020 [3].

Cessation of business processes is intersects with business continuity management. A business must continue to run regardless of the conditions that occur [4]. Therefore, the authors seek a solution to the problem of the conditions that occur. The author's problem solving is done using an information technology approach because solving social distancing problems can be overcome with an information technology that allows people to meet without physically face to face. Information technology must be built in line with the needs of users [5]. To build technology also requires proper infrastructure; without the right infrastructure, technology cannot be implemented [6].

According to Anand [7], most companies started scrambling for a Business Continuity Plan when the pandemic was declared. To get a condition where the business can still run continuously in every condition

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is necessary to have a business process re-engineering. Through this business re-engineering process, the problems that exist in the business are identified, and solutions to solve problems are sought.

Based on Li [8] in making system changes (in this case, the business process re-engineering), the software can be reused if deemed sufficient according to the new system's criteria being created. The authors identify in the case study that the construction industry in general already has Enterprise Resource Planning (ERP), the sales and production processes have implemented ERP, but ERP cannot be run if there is no business transaction.

Since COVID-19, all business transaction processes have been hampered, whether it is business transactions local or international [9]. Large-scale business transactions began with a procurement [10]. There are various procurement methods there are Direct Procurement, Tender for Procurement of Goods, requests for proposals (asking for proposals), Request for Quotation, and a single vendor According to Chu and Zhen [11], Request for Quotation has many advantages if used to the right strategy.

Through this research, the authors will carry out a business re-engineering process by developing a strategy to use Request for Quotation as a method of procuring goods in an industry by implementing an information system in a business process with the hope that this procurement strategy is appropriate for use in any conditions, including the COVID-19 pandemic.

## METHODS

Systematically, the method used in this study uses the concept of Business Process Re-engineering where the re-engineering business process uses a dynamic flow, meaning that it can be restarted, there are deficiencies in implementation. Business process re-engineering starts from the analysis of the current business process, then the complexity of the business redesign, continues with the development and testing process of the technology or information system built, ending with implementation and monitoring. Here the author adds a process where the re-engineering process business application can run more sustainably by forecasting the data that has been obtained during the implementation period. The research flow can be seen in Figure 1:

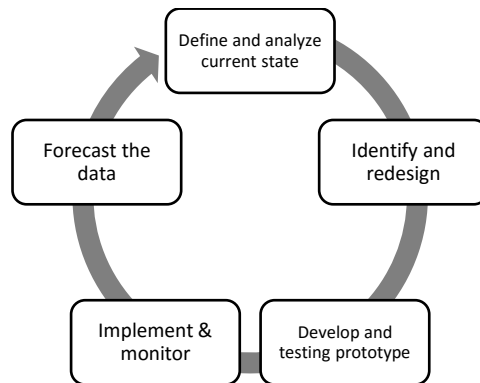


Figure 1. Business Process Re-engineering

## RESULT AND DISCUSSION

### Define and Analyze Current State

According to the author's case study, the construction industry in general already has a tool, namely ERP, but ERP has not been able to work optimally due to the presence of COVID-19, which prevents ERP from running. Before identifying what steps should be taken to deal with existing problems, the author identifies the ERP function that is generally found in the construction industry. In general, the construction industry has an ERP that functions only for the sales, production, warehouse, and shipping processes. ERP may still run in small-scale transactions, but ERP cannot handle large transactions where there is a bidding and procurement process. In general, the description of the existing ERP process in the construction industry shown in Figure 2.

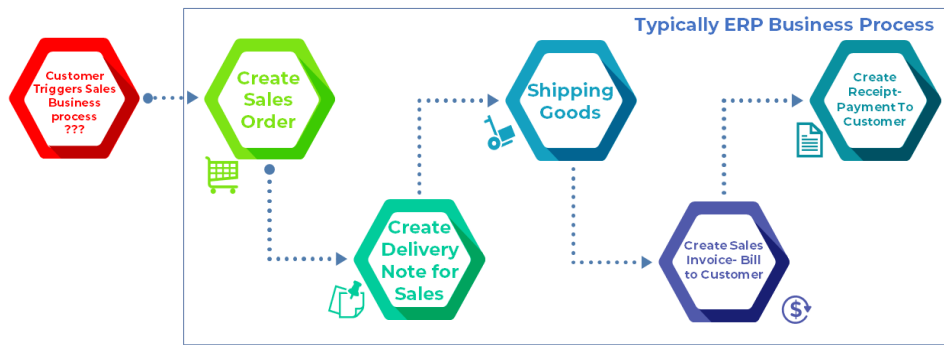


Figure 2. Typically ERP Business Process

It can be seen in Figure 2 that to lure a customer into the industrial system process is not yet in the industrial system. Therefore, a business process redesign process must be carried out in it.

**Identify and Redesign**

The next step after the process of defining the initial status is that in ERP, it only handles sales requests, making road papers, packaging and shipping, payments, and giving receipts to customers. Through this identification, it is found that the process of triggering customers to be directly involved in the industrial system is not yet included in the entire ERP process. To trigger customers to enter into business processes in the industry, one of them is by way of procurement. Through this procurement, customers can be involved in the negotiation process to determine product prices.

The authors then reconstructed the tender system business process using the request for quotation method; the authors designed the Business Process using the Business Process Model and Notation (BPMN) flowchart method. The reconstruction of the procurement implementation model that has been reconstructed by the author is shown in Figure 3.

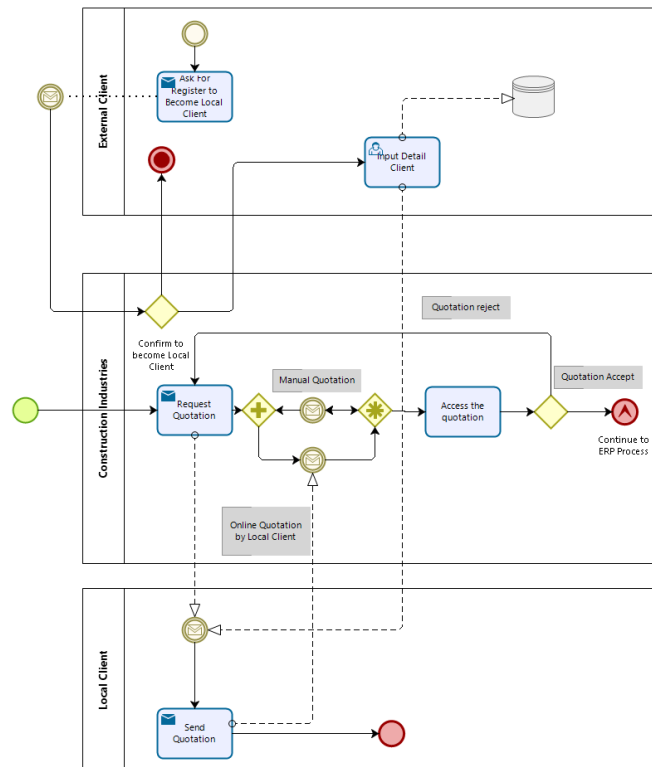


Figure 3. BPMN of Request for Quotation

The process illustrated in Figure 3 will be inserted before the ERP process. From this process, it is expected that all clients, from local clients and external clients, can carry out the negotiation process through this procurement system to obtain a price agreement.

### Develop and Testing Prototype

After creating a quotation business process, the authors develop a quotation information system. The development of a quotation information system is carried out by applying the SDLC prototyping model. The author seeks to create a developed system quickly with the hope that the industry can use this new system during the COVID-19 era and not cause more losses; in this period, everything is required to be fast-paced. Prototyping development stages can be seen in Figure 4.

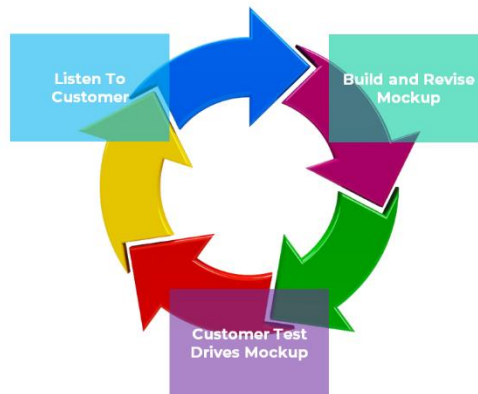


Figure 4. Prototyping SDLC Method

The quotation information system design process is carried out by applying extreme prototyping. The prototyping type choice uses the extreme prototyping model because the prototyping extension is appropriate for developing web-based applications. There are three phases in the application of the prototyping method. The first phase is a static display prototype consisting mostly of HTML pages. In the second phase, the screen is programmed and functions according to the information system; in the first and second stages. The third stage is applying services or Application Programming Interface (API) into the created information system. API is implemented as an intermediary from the quotation information system to the running ERP system so that it can run automatically. It can be seen in more detail in Figure 5.

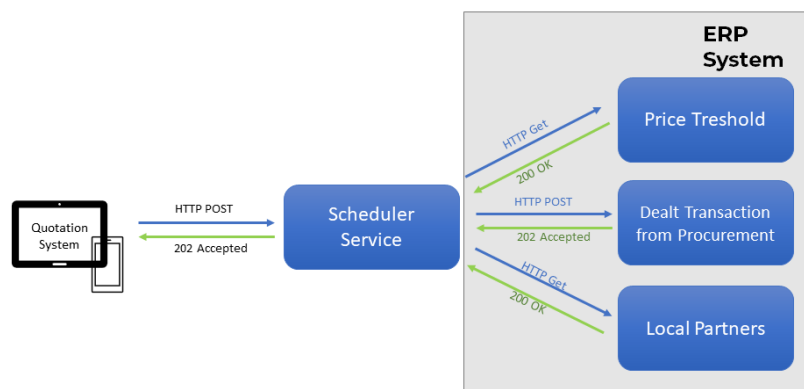


Figure 5. API Communication Between Quotation System and ERP System

In Figure 5, the data communication that occurs between the quotation system and the ERP is built using the API by retrieving price reference data and local partner data from the ERP system, while the data that comes from the quotation system are procurement transactions that have dealt with consumers to be placed in the ERP system.

At this stage, a prototype test is also carried out. The process writer facilitates testing by duplicating the ERP system and the Quotation system. The method of testing by the author is BlackBox testing. Blackbox testing is done to ensure that system functionality is working correctly or not. This test uses a questionnaire

instrument with respondents from PT. Allure Alumunio (Iron Construction Industry). The questionnaire's questions to measure the success of the interface, functions, and completeness of information and reports are shown in Table 1.

Table 1. Blackbox Testing Questionnaire

Interface	
1	Display Applications / System
2	Ease of reading
3	Application color composition
4	Menu structure presented
5	Display Consistency
Function	
6	Add Quotation
7	Edit Quotation
8	Cancel Quotation
9	Accept the Quotation
10	Search for Quotation
information	
11	Completeness of the required reports
12	Easy to get reports
13	Ease of updating information
14	The suitability of the information obtained

The questionnaire has been distributed to 33 respondents who are applicators or partners of PT. Allure Alumunio and give results as in Table 2.

Table 2. Blacbox Testing Result

Interface	Rating					Number of Respondents
	1	2	3	4	5	
1 Display Applications / System	-	-	3	6	24	33
2 Ease of reading	-	-	6	11	16	33
3 Application colour composition	-	-	8	8	17	33
4 Menu structure presented	-	-	4	14	15	33
5 Display Consistency	-	5	3	10	20	33
6 Add Quotation	-	-	9	9	15	33
7 Edit Quotation	-	-	7	8	18	33
8 Cancel Quotation	-	-	3	9	21	33
9 Accept the Quotation	-	-	2	6	25	33
10 Search for Quotation	-	-	2	7	24	33
11 Completeness of the required reports	1	2	1	14	18	33
12 Easy to get reports	-	-	3	1	29	33
13 Ease of updating information	1	2	5	9	19	33
14 The suitability of the information obtained	-	2	8	6	19	33

After calculating the mean in Table 2 shows that the assessment given to the interface, functions, and information are respectively 85.5%, 86%, and 87% of the applicator answered with a value of 4 or 5. This BlackBox testing shows that the system was created quite functional, the disadvantages only in the required report system.

### Implement and Monitor

The implementation method used in the development of the quotation system applies the parallel method; through this method, the quotation system's development continues without disturbing the existing business processes in the ERP system. After the Quotation system is completed, the quotation system is added to the ERP system using an API. This implementation method using a parallel system has advantages and disadvantages. The advantages of implementing the parallel method are the minimal risk of losing data because the old system, namely the ERP system, is still running; another advantage is that users can compare the output of the old system with the output of the new system to ensure that this system is running well. With this parallel method, a user is required to enter data into a different system, so that more effort is required in implementing the system; through the shortcomings that exist in this implementation method, the writer decides to carry out the data retrieval process using the API so that the effort required in implementation less system.

The implementation process runs for two months, namely in February and March 2020, after which the implementation process is considered complete and continues in the monitoring process. Until now, the

monitoring process has been running for seven months, namely April to October 2020; this monitoring process has entered 696 quotation data with the details in Table 3 below.

Table 3. Data given from the quotation system

Month	Deal	Pending On Process	Lost	Cancel	All Transaction
Apr-20	0	8	0	2	8
May-20	0	6	5	2	6
Jun-20	0	39	8	0	39
Jul-20	26	69	1	0	95
Aug-20	143	2	0	0	145
Sep-20	120	8	1	0	128
Oct-20	121	81	5	0	202

According to data in Table 3, it can be seen that along with the information system being built, transactions are increasing and continuing to be stable. The deal column shows the transaction that was approved through the negotiation process; the pending column shows the data being processed, lost shows that the negotiation failed, the cancel column shows the transaction that was canceled by the partner/applicator.

### Forecasting

In calculating the forecast, the writer applies the exponential smoothing method. An exponential smoothing method is a powerful tool for predicting calculations in time series, predicting future demand, and reducing investment costs [12]. The following is a formula for using exponential smoothing:

$$F_t = F_{t-1} + \alpha(D_{t-1} - F_{t-1}) \quad (1)$$

Where:

$F_t$  = Current Demand Prediction

$F_{t-1}$  = Previous Demand Prediction

$\alpha$  = Exponential Constants

$D_{t-1}$  = Real Request

The constant value used by the author is between 0.2 and 0.3, referring to research conducted by Mu'azu (2014). Mu'azu suggested that using a smoothing constant  $\alpha < 0.5$  and specifically for  $\alpha = 0.2$  and  $\alpha = 0.3$  would give good results [13]. The statement is in line with what Aritorang (2012) stated in his research, which reported that the use of smoothing constant  $\alpha$  close to the value of 0 would give good results on time series data that do not contain cyclic data and are free from irregular components [14]. That is, the use of  $\alpha$  near 0 will be good for the single exponential smoothing method. Forecasting data on the entire transaction data is presented in Table 4.

Table 4. Forecasting Data on the entire transaction data

Month	All Transaction (Real Data)	Forecast All Transaction Single Exponential Smoothing (Prediction Data)		
		Forecast	Lower Confidence Bound	Upper Confidence Bound
Apr-20	8	-	-	-
May-20	6	-	-	-
Jun-20	39	-	-	-
Jul-20	95	-	-	-
Aug-20	145	-	-	-
Sep-20	128	-	-	-
Oct-20	202	202	202,00	202,00
Nov-20	-	224,949326	179,20	270,70
Dec-20	-	258,1721832	211,01	305,34
Jan-21	-	291,3950403	242,84	339,95
Feb-21	-	324,6178975	274,70	374,53
Mar-21	-	357,8407546	306,59	409,09
Apr-21	-	391,0636118	338,50	443,62

From the data prediction graph using forecasting exponential smoothing, it is found that the tender data increases with time. Forecasting quotation data using exponential smoothing is shown in Figure 6.

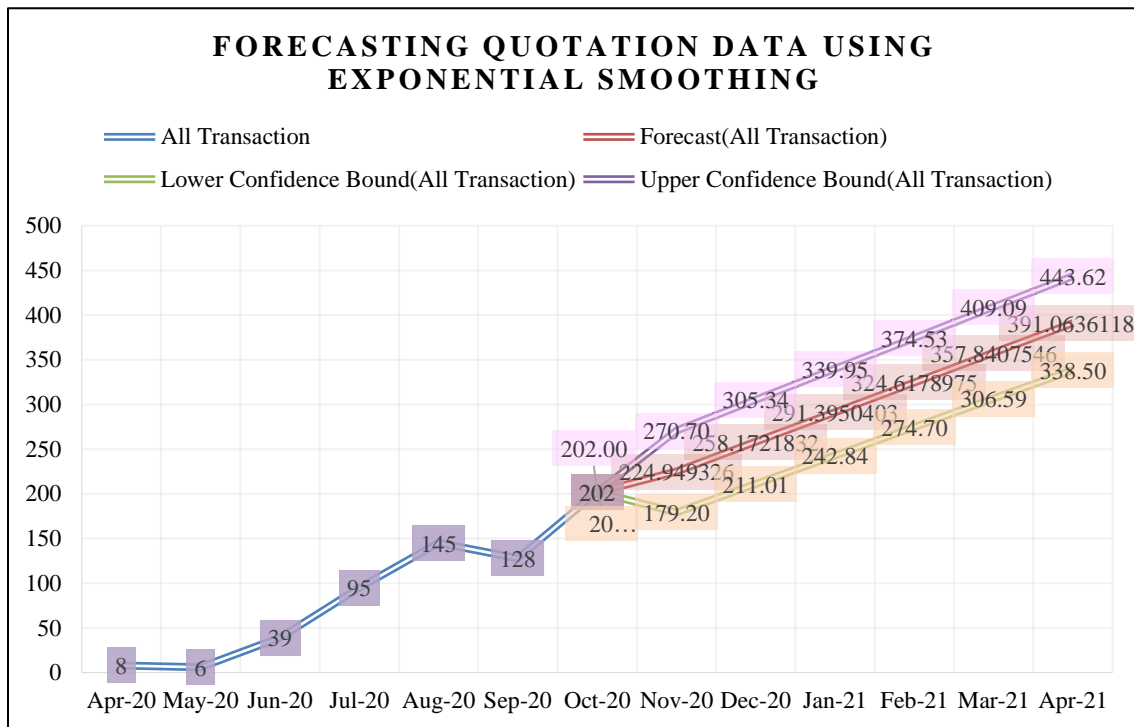


Figure 6. Graph of Quotation Data Forecasting using Exponential Smoothing

## CONCLUSION

Business process re-engineering can be used as a solution to a deadlock in a business. From this research on the re-engineering business process, where each process is from the initial status analysis process, the system redesign process using BPMN is continued with the development and testing prototype process using extreme prototyping and BlackBox testing. The implementation process using the parallel implementation method can increase the sustainability of the system. Implemented seen from forecasting data using exponential smoothing, it is found that transactions in the procurement system continue to increase. This shows that the business re-engineering process has succeeded in increasing commodities and keeping the business running during the COVID-19 period.

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