JOURNAL OF INDUSTRIAL PRODUCT DESIGN
RESEARCH AND STUDIES
Volume 1 No. 2 June 2023, p.51-60
https://ejournal.upi.edu/index.php/JIPDRS/article/view/59648

Weight-based and Digital Payment Process Flow Design to Decrease Quarry Sand Sales Fraudulence Risk

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Submitted/Received: 12 January 2023; **First Revised**: 06 March 2023; **Accepted**: 28 May 2023; **First available online**: 31 May 2023; **Publication date:** 21 June 2023
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Abstract. Databases have risen to the level of being one of the most important corporate assets. The availability of data in a company is required to make the right profit decision. In running a business aiming to achieve high profitability, companies must recognize profitable items by making decisions that require knowledge of the supply chain, knowledge of past, present, and future buying patterns, and costs derived from data obtained from many different systems. In this study, a company running a quarry sand mining business is experiencing disproportions of the resource availability of quarry sands, operating expense, and profit. It leads to suspicion of fraudulence risk during the operations and transaction of the product. This study aims to minimize the fraudulence risk of quarry sand sales by using data re-verification and analytical techniques. The study implemented a process analysis and root-cause method using process flowcharting and fishbone diagram tools. The root causes of this issue happen during the initial data input process caused by three main factors namely machinery or equipment, people, and systems. The newly designed system utilizes a digital weighing scaling system for trucks in recording the initial data and deposit payment system based on the accurate truck final weight.

Keywords: Fraud, Weight-Based, Digital Payment, Quarry Sand

INTRODUCTION

Data is becoming more precious all the time. Enterprises are using data to help them make important decisions. New trends in data warehousing, data mining, decision support, and customer relationship management systems highlight data's expanding role in organizations (Wilkin *et al*., 2020). In enterprises, data drives the process of material acquisition, manufacturing workflow, shipping, and billing. To be a profitable manufacturing company, managers need to be highly in tune with the information systems for just-in-time parts delivery, effective purchasing systems to adjust products to a dynamic customer's demand, highly accurate cost accounting systems, applications for customer care, etc.

In running a business that aims to achieve high profitability, companies must recognize profitable items and drop unprofitable products (Niraj, Gupta, & Narasimhan, 2001). This profitability-related decision requires knowledge of the supply chain, knowledge of past, present, and future buying patterns, marketing cost, and sales cost. The knowledge is derived from data obtained from many different systems. Thus, the availability of data is required to make the right profit decision.

Data has quality when the information satisfies the requirements of its intended use. To satisfy the intended use, the data must be accurate, timely, relevant, complete, understood, and trusted (Emeka-Nwokeji, 2012). Data is created by people outside IT and is used by people outside IT. The IT division is responsible for the quality of the systems that move data and store it. However, they cannot be responsible for the content. The problem of poor-quality data lies the outside of IT division, through poorly articulated requirements, poor acceptance testing of systems, and poor data creation process. Two factors influencing the contribution of poor-quality data are:

1. The rapid system implementations and changes have made it very difficult to control the quality
2. The methods, standards, techniques, and tools for controlling quality have evolved at a much slower pace than the systems they serve

Data accuracy refers to the data values stored for an object being the correct values which means the right value must be represented in a consistent and unambiguous form (Kaur *et al*., 2023). The characteristics of accuracy are form and content. The form of data eliminates ambiguities in the content. The discipline of creating the data value is important to generate accurate data. On the contrary, inconsistency creates an opportunity for inaccurate usage of the data. Data elements are value attributes of business objects such as personnel records, orders, invoices, payments, and inventory records (Ahlawat & Vincelette, 2012). The business objects represent real-world objects or events. Missing objects are difficult to detect. This is accurate data but an inaccurate database because of missing information. Missing sub-records are very difficult to detect, whereas missing master records are generally easier to detect.

Large databases generally have data flowing into them from many different sources. The company needs to define a method of determining when all of the data is consistent over some time of period so that the data can be used intelligently. The data inaccuracy problem surfaces when this data is moved and used for decision-making. Many of the data elements used only to record secondary information about the transaction become more important. Olsen (2011) believes that there will always be some amount of data in any database that is inaccurate. There may be no data that is invalid.

There are various ways inaccurate values get into databases. Data inaccuracy arises for six reasons (Saritas & Yasar, 2019):

1. Wrong values entered
2. Data entry people who do not care to do the job right
3. Confusing and contradictory data entry forms or screens
4. Procedures that allow for data to not be entered or not to be entered on time

5. Procedures or policies that promote entering wrong values
6. Poorly defined database system

There are many sources of data inaccuracies, and each contributes its own part to the total data quality problem (Aad *et al*., 2020). There are four general areas where inaccuracies occur:

Initial Data Entry	Data Decay	Moving & Restructuring	Application
1. Mistakes 2. Data entry process 3. Deliberate errors 4. System errors	1. Decay	1. Extract 2. Cleansing 3. Transformation 4. Loading 5. Integration	1. Faulty reporting 2. Lack of understanding

Table 1. Four general areas where inaccuracies occur

Databases have risen to the level of being one of the most important corporate assets. Corporations tolerate enormous inaccuracies in their databases. The data quality is not managed as rigorously as most other assets and activities. Corporations are losing significant amounts of money and missing important opportunities all the time because they operate on information derived from inaccurate data (Chen *et al*., 2023).

In this study, the company running its business in the quarry sands industry was facing an issue of fraud tendency in the transaction of quarry sands. There are disproportions of the resource availability of quarry sands, operating expense, and profit. The availability of quarry sands is decreasing too fast. The gasoline consumption level is highly increasing which is not in accordance with the targeted calculation of fuel use. This issue leads to risk and suspicion of fraudulence during the operations and transaction of quarry sand. The registration and payment system were using a conventional system whereby the buyer made direct payments to the on-site cashier. This conventional system increases the risk of fraudulence.

METHODOLOGY

This study employs the process analysis aiming to identify improvements to be made in the process. The methodology adopted for process analysis is process flowcharting which helps in evaluating the business operations of the company. This method begins with analyzing the activities associated with a process that affect one another. In analyzing the process, this study starts by mapping the process diagram using the basic elements of the process such as tasks, flows, decision points, and storage areas or queues symbolized by certain shapes in the diagram.

In collecting the data, this research uses primary and secondary data collection methods. The primary data is gathered through on-site observation, interviews, and focused group discussions with the operations, finance, and sales departments. The data collected through primary data collection is supported by secondary data gathered from the summary of daily sales data.

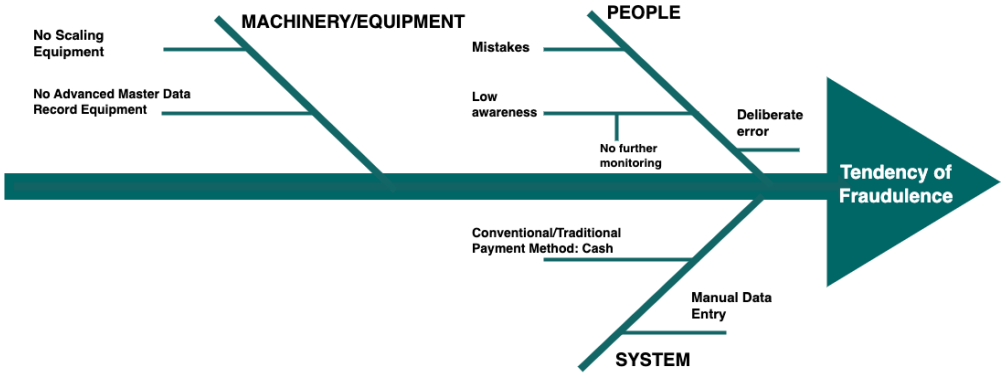

Figure 1. Cause and effect analysis of fraudulence risk in quarry sand sales

The data collected is analyzed using root-cause analysis by implementing the fishbone diagram tool. The analysis aims to find the root cause of the problem or the situation experienced by the enterprise. By implementing fishbone diagram analysis, the problem is seen and traced through different aspects or factors that have the potential to be the root cause of the problem (Xu & Dang, 2022). This study views the issue of fraudulence risk in three areas namely machinery or equipment, people, and systems. As shown in Figure 1, two factors contributing to the emersion of fraudulence risk in terms of machinery or equipment are no scaling equipment and no advanced master data record equipment. In terms of the system, the enterprise employs manual data entry and conventional or traditional payment methods.

RESULTS AND DISCUSSION

Without finding root causes, improvements in quality will not occur. As root causes are identified and corrections are made, improvement will follow. In detecting inaccurate data, there are two options to be taken namely re-verification and analysis (Elgammal *et al*., 2012). Re-verification refers to manually tracing the original source of information and checking every data value. Secondary information will help analytical techniques in correlating a valid data value. However, re-verification requires a longer process. Analysis involves the use of software in conjunction with the skills of a data or business analyst to search through databases to find the presence of inaccurate data (Taranto-Vera *et al*., 2021). To minimize the fraudulence risk of quarry sand sales, the study proposes both techniques. The re-verification technique can be implemented only after changing the flow of the payment system. While analytical techniques can be applied with the support of advanced master data record equipment.

Findings

A process, as stated by Chase & Jacobs (2011), is any part of an organization that takes inputs and transforms them into outputs that are of greater value to the organization than the original input. This study analyzed the existing process flowchart of the quarry sand sales and then compared it to the four general sources of areas of inaccuracies proposed by Olson (2003) to understand sources that need comprehensive assessment, monitoring, and improvement.

Figures 2 and 3 present the process flowchart of quarry sand sales. Based on the flowchart presented in both figures, two different cashiers are operating the transaction process in the company. The first cashier is located on site of the sand mining. This cashier is the center where every registration and direct transaction of selling and buying quarry sand occurs. The second cashier is located at the office and is responsible for receiving on-site transaction reports including collecting the physical money, daily sales summary, and sand sales invoices. In addition, the office cashier is responsible for cross-checking the physical amount of money and the sales summary.

Since the only source of data of on-site transactions is located on-site, the possible area of inaccuracy lies at the initial area of data entry which is the on-site cashier. By tracing the process starting from initial data entry until the closing process presented in Figure 3, it is found that the possible reasons for inaccuracy are mistakes, data entry processes, deliberate errors, and system errors.

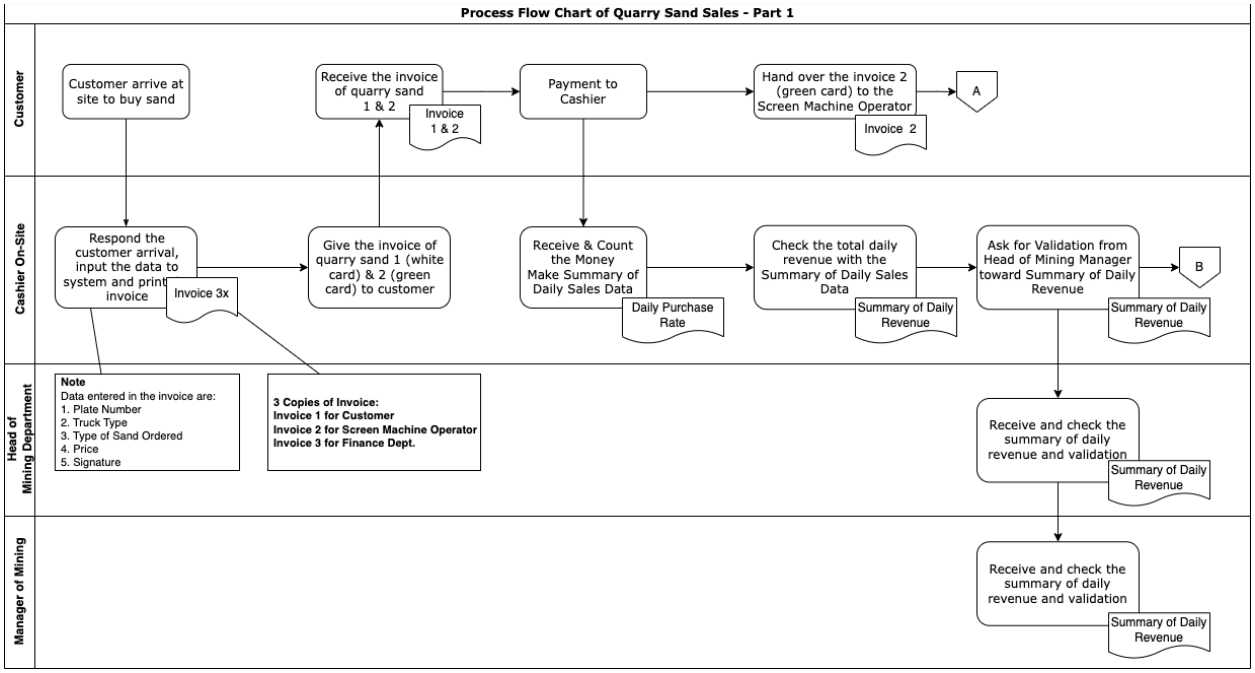

Figure *2.* Process Flow Chart of Quarry Sand Sales Part 1

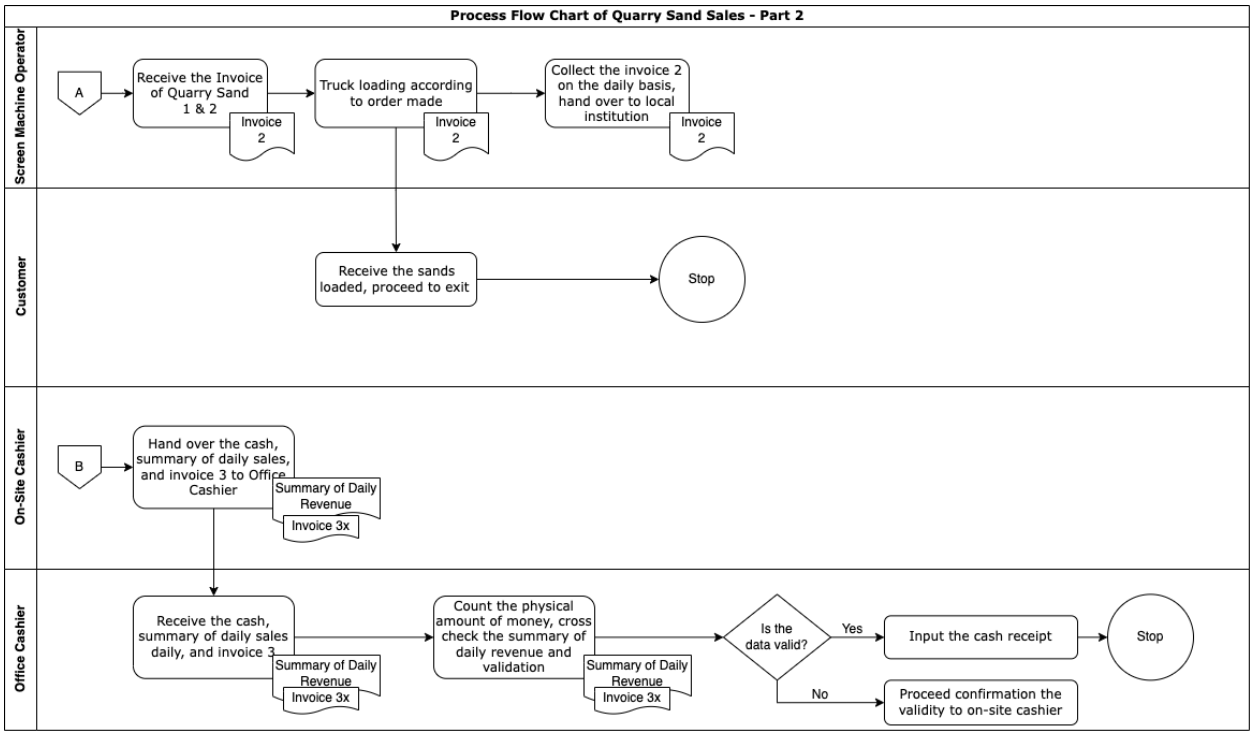

Figure 3. Process Flow Chart of Quarry Sand Sales Part 2

The mistakes, data entry processes, and system errors are considered as the suspected inaccuracy reasons. Those reasons are detected daily through total revenue checks and daily transaction summaries held by the head and manager of quarry sand. In addition, if mistakes occurred during the summary process by both persons in charge, they should be detected during the cross-checking held by the office cashier personnel.

Discussion

Based on the result of the revenue check and daily transaction summary analysis, the highly decreasing quarry sand availability on-site is not corresponding with the revenue obtained. In addition, the level of gasoline consumption is highly increasing. The issues confirm that inaccuracy during the initial data entry is a deliberate error. Olson (2003) states that deliberate occurs when the person enters a wrong value on purpose of the following reasons:

1. The data input personnel do not know the correct information
2. The data input personnel do not want the data user to know the correct information
3. The data input personnel get benefit from entering the wrong information

The input of buyers' information and its transaction is performed by the on-site cashier manually to the computer. It increases the risk of data inaccuracy which leads to fraudulence. Therefore, the enterprise is suggested to change the transaction data record and its payment system to assure the data quality. In assuring data quality, an enterprise can benefit from the technology advancement by operating software tools: the metadata repository, data profiling, and data monitoring (Andreescu *et al.*, 2014). Developing a new process flow of transactions can help in assuring the data quality. As a result, the new process can minimize the risk of quarry sand sales fraudulence and profit loss caused by fraud.

The new system utilizes a digital weighing scaling system for trucks in recording the initial data and deposit payment system. The process flow of the new system is represented in Figure 4. The truck scale is used to measure the mass of a large object. The current scaling system used by the company only depends on the dimension of the truck which is possibly inaccurate. The benefit of utilizing truck scale is the result can be used as the master data as the reference when there is an inaccuracy issue or manipulation effort. The second benefit is the high validity of automatic data records. The installment requires the permission of a legal institution related to the standard measurement.

In constructing and installing the truck scale, there are several criteria to be considered (Brown & Ghaffariyan, 2016):

1. The foundation of truck scale
2. Platform used as the flooring where the truck stands during the scaling process
3. Load cell which functions as a mass censor located between the foundation and the platform
4. A truck scale indicator is used to change the analog signal into digital to be read as a number which is supplemented by a data savings interface to the computer device
5. Truck scale software connects the indicator to a computer for data saving. The data, including date, time, and initial weight, cannot be manipulated because it is directly transferred data from the scale truck.
6. External display which is used to display the scaling result

The truck scale works when the truck enters the scale bridge. The load cell working as a censor will start detecting the energy of pressure of mass. Then it is converted into an electrical voltage which the voltage will be sent to the analogue in the indicator. The digital-analogue then immediately processes the change of voltage caused by the load cell until a digital number appears as the result of scaling. The role of the junction box or summing box is to adjust the corners of the plate.

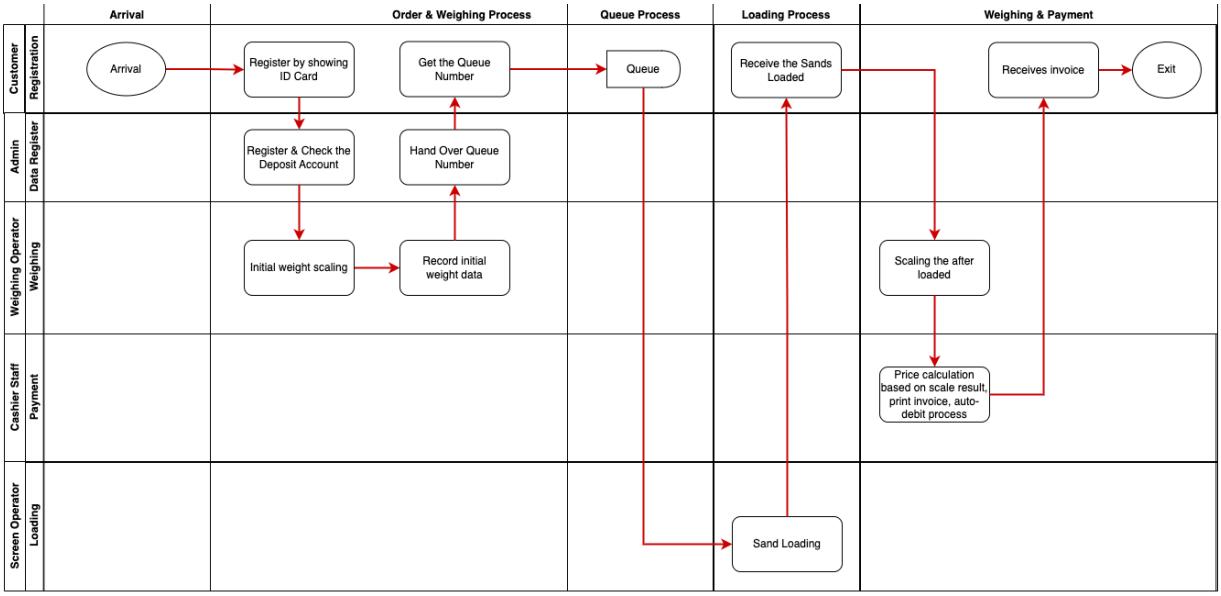

Figure 4. Process Flowchart of Weight-based Payment & Electronic Payment System

In the case of quarry sand transactions, the payment system will be performed automatically through electronic transactions. The buyer must be registered first to get an account and identification number. The registration itself can be performed at the office cashier. The aim of registration is to generate accurate data entry that can be used by internal users of data, especially the marketing and finance department which frequently use this data for decision-making. The buyer can deposit a certain amount of money through a bank or automatic transaction machine to make sure the flow of money is centered in one receiving area. The electronic payment implemented is barcode scanning through the buyer's smartphone. As a consequence, the system will change the role of the on-site cashier to the order taker. Their roles are making data records of initial and final weight and finalizing electronic payment by using barcodes.

In the whole process of quarry sand sales using the new system, the customer registers at the arrival gate, and the on-site personnel record initial data by scanning the customer's identification card. Then, the weighing operator proceeds with the truck scaling and records its initial weight upon arrival. This process is followed by queue number submission to the customer. After the sand loading completes, the customer will proceed with the final truck scaling. The weighing operator carries out the weighing process according to the procedure and sends the final data record to the office cashier. Then, the customer makes an immediate payment by scanning a barcode on customer's smartphone application for an electronic payment system. The amount of money paid is calculated by the accurate weight of quarry sand loaded in the customer's truck.

CONCLUSION

The availability of data in a company is required to make the right profit decision. In running a business aiming to achieve high profitability, companies must recognize profitable items by making decisions that require knowledge of the supply chain, knowledge of past, present, and future buying patterns, and costs derived from data obtained from many different systems. In minimizing the fraudulence risk of quarry sand sales, data re-verification, and analytical techniques are proposed to be implemented by making a new process flow system. Based on the process and root-cause analysis results, it is found that the root causes of this issue happen during the initial data input process. The issue is caused by three main factors namely machinery or equipment, people, and systems.

Therefore, a new process flow is designed to make the order-taking and payment system more secure, with less data modification and manipulation performed by humans, and digitally controlled which creates valid master data. The proposed process flow utilizes a digital weighing scaling system for trucks in recording the initial data and a deposit payment system based on the accurate truck final weight in which the master data will flow electronically to the office cashier and other internal data users. Creating master data that has quality in an enterprise requires a process flow system involving digitalization in the process which minimizes data modification and manipulation possibilities at the initial data recording. Valid and quality data can give a high impact on the profitability of a business as well as in making significant business decisions. In addition, to implement this new system, it requires an infrastructure investment that supports the flow of the new proposed system. The process flow proposed in this study can be further developed as human behaviour changes dynamically and technology advancement grows rapidly.

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