STUDYING THE IMPACT OF EFFECTIVE FACTORS ON GRAIN TERMINAL'S PERFORMANCE IN BIK USING MCDM METHODS

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Abstract
This applied research has been implemented to investigate the effective factors on improving BIK's Grain Terminal's performance using SHANON entropy and Electro Methods. At 1st, the reasons for lower performance of loading and discharging operations in the Grain Terminal of BIK to be determined and studied. To reach this end, the daily reports including loading and discharging slow and broken process then explaining the related reasons for the abovementioned. Next, the weight of the likelihood of occurrence scales, their impact on the process after the occurrence and the possibility of identifying it before its impact on the process, using SHANON entropy method, shall be measured. After that, considering the identified reasons at the very 1st step using the determination of probability for events occurrence (occurrence frequency), the rate of its impact on the process after the occurrence (intensity) and possibility of determination before applying its impact on the process (tracing), shall be treated as a case study and rated by the Terminal's experts. The mean of which to be calculated, individually. Then, the reasons to be classified based on the Electro method's indexes.
Key words: Grain Terminal's performance, Marine Transportation, loading and discharging operations, BIK, electric, SHANON entropy.

Introduction

One of the most important indicators for developing the countries' economy is said to be in the field of industrial development [1]. Nowadays the impact of transportation in the permanent development is undeniable [2]. This sector includes activities which are comprehensive in a way that implements as production, distribution and cargo consumption and also services and play a very noticeable role in the field of economic activities [3]. Marine transportation, as a very important factor in this industry and for enjoying advantages such as low prices and mass cargo transportation volume, is considered to have the major role in developing the countries' foreign commerce [4]. Iran, for its special geographical situation and accessibility to oceans (Free waters), enjoys a unique situation in the Marine transportation area. However, regarding our country's special situation in the region and being situated at the international paths of cargo transportation, Iran enjoys a significant potential for cargo transit [5, 6].

The role of ports in Marine transportation is regarded as one of the main global supply chain's node and ring [7]. Service complexes that in economists, businessmen and producers' point of views are among world trade foundations play a significant role in the process of distributing and optimizing cost of shipment. Quality of products presented, is considered

amidst the most important issues that are paid attention largely in the arena of world trade economic competiveness [8]. Those who run ports, by providing faster services to ships, try to encourage them to make more use of the port for loading and discharging purposes and by thriving their port to achieve more profits [9]. The constant investigations of port performance and its improvement, lead to enhancement of ports' competitive potentials, in addition, it shall have a great part in the country's development. Studying the impact of all the effective factors in improving the Grain Terminal's performance in BIK using the electro-entropy method, to be implemented [10].

Case Study

BIK is in the list of the most important ports of Iran that play a significant role in the economy. BIK is 1071 hectare, situated in the southwest part of Persian Gulf. This port enjoys 37 quay posts and a draft of 9-12.5 meter which is considered one of the largest Grain Terminal ports affecting the economy. This study has been implemented at BIK. Parsian Grain Terminal Persian Gulf possesses 42 strategic and non- strategic equipment, of the referred 13 shore cranes with capacities of 140 and 25 rons.in regard to the illustrated issues, the aim of this paper is to analyze the effective factors in developing the loading and discharging process of this Co. in BIK using Shannon Elector-entropy method which is the most accurate and state of the art multi-decision- making method.

Importance and Necessity of Research

Thoughts and reflection of how to exploit and use the existing sources and facilities more properly has been always chasing our minds [11]. This was enough to make us do more research and try harder than before to be able to eradicate or settle out all the problems and hardship on our way towards growth and prosperity with creative power of intellectual talent and tact and prudence. Efficiency, effective use of the input or sources is claimed to be for production or presenting outputs [12]. Identifying, measuring and analyzing the process performance leads to diagnose of the organization's dark spots such as useless jobs, incorrect usages of the sources and subsequently, making effort to remove/ rectify them [13]. Assessing and identifying the port's performance like any other ports have always been every manager's concern [14]. This evaluation eventuates in determining the strength and weak points of port's function that is able to classify the policies and strategies based on the prepared scale by the terminal's experts thru fixating the causes' probability (frequency occurrence), the degree of its impact on the process after the event (intensity) and possibility of identifying it before the impact on the process (tracking) and that the average score of which to be computed [15]. Next, the causes of loading- discharging operation's sluggishness and stopping in BIK to be classified using the Electro method based on probability indexes, states of the degree of impact on the process after the event and possibility of identifying it before effecting the process.

3-1 ELECTRE

The ELECTRE (the elimination and choice translating reality) has the capability of handling discrete quantitative and qualitative criteria in nature and provides complete ordering of the alternatives, are used in the case study. The ELECTRE method accommodates the imprecision and uncertainty in a way similar to human decision making process on the use of indifference, preference and veto. Relying upon the concordance (a majority of criteria support) and non-discordance (no criterion is strongly opposed to) principles, it defines that alternative A outranks alternative B meaning that A is at least as good as B. Moreover, weights do not depend on the nature of the criterion scales; therefore they possess the true meaning of relative importance given to the distinct criteria. The ELECTRE method is explained in steps as follow [16, 17],

Decision matrix, P, which represents the preference weights of alternatives with respect to each criterion [5]:

$$P = \begin{bmatrix} p_{11} & \cdots & p_{1n} \\ \vdots & \ldots & \ldots \\ p_{m1} & \cdots & p_{mn} \end{bmatrix} \quad (1)$$

Where m ($i = 1, \ldots, m$) is the number of alternatives and n ($j = 1, \ldots, n$) is the number of criteria considered [3].

2. The K matrix is formed by normalizing the elements of the P matrix into coefficients as:

$$K_{ij} = \frac{p_{ij}}{\sum_{i=1}^{m} p_{ij}^2} \quad (2)$$

3. Then, the weight matrix, W, usually obtained directly from subjects in its usual use [6]:

$$W = \begin{bmatrix} w_1 & \ldots & 0 \\ \vdots & w_2 & \ldots \\ 0 & \ldots & w_n \end{bmatrix} \quad (3)$$

4. The weighted normalized decision matrix, N, can be found as follows [7]:

$$N = K \times W = \begin{bmatrix} n_{11} & \cdots & n_{1n} \\ \vdots & \ldots & \ldots \\ n_{m1} & \ldots & n_{mn} \end{bmatrix} \quad (4)$$

5. The concordance matrix, C, is formed by using the concordance set. For each pair of alternatives k and I ($k, l = 1,2, \ldots, m$ and $K \neq I$) the set of decision criteria $j = j|j = 1, \ldots, n$ is divided into two distinct subsets. The concordance matrix C of A_k and A_i is composed of all criteria for which A_k is preferred to A_i. In other words [2].

$$C_{ki} = \{j|p_{kg} \geq p_{ej}\} \quad j = 1, \ldots, m \quad (5)$$

The relative value of the concordance set is measured by means of the concordance index. The concordance index is equal to the sum of the weights associated with those criteria which are contained in the concordance set. Therefore, the concordance index C_{ki} , defined as [9]:

$$C_{ki} = \sum_{j \in C_{kI}} W_j \quad (6)$$

The concordance index reflects the relative importance of A_k with respect to A_i Obviously, $0 \leq C_{ki} \leq 1$ A higher value of C_{ki} indicates that A_k is preferred to A_i as far as the concordance criteria are concerned. The successive values of the concordance indices C_{ki} ($k, l = 1,2, \ldots, m$ and $K \neq I$) form the concordance matrix C of (mxm) [3]:

$$C = \begin{bmatrix} - & C_{12} & \ldots & C_{1m} \\ C_{21} & - & \ldots & C_{2m} \\ \vdots & \vdots & - & \vdots \\ C_{m1} & \ldots & C_{m(m-1)} & - \end{bmatrix}$$

6. The disconcordance matrix, D, which is the complementary matrix of concordance matrix, is formed as:

$$d_{ki} = \{j|p_{kg} < p_{ej}\} \quad j - C_{ki} \quad (7)$$

The concordance index reflects the relative dominance of a certain alternative over a competing alternative on the basis of the relative weight attached to the successive decision criteria. In order to determine the degree to which A_k is worse than A_i another index is defined as [1]:

$$d_{ki} = \frac{\max\limits_{j \in D_{ke}} |n_{kj} - n_{ij}|}{\max\limits_{j \in J} |n_{kj} - n_{ij}|} \quad (8)$$

It is seen that, $0 \leq d_{ki} \leq 1$ A higher value of d_{ki} A higher value of A_k is less favorable than A_i and a lower value of d_{ki} on the other hand, implies the opposite. The discordance indices form the discordance matrix D of (*mxm*):

$$D = \begin{bmatrix} - & d_{12} & \dots & d_{1m} \\ d_{21} & - & \dots & d_{2m} \\ \vdots & \vdots & - & \vdots \\ d_{m1} & \dots & d_{m(m-1)} & - \end{bmatrix}$$

The concordance dominance matrix is calculated with the aid of threshold value for the concordance index which indicates A_k 's chance of dominating A_i the threshold value can be determined, for example, as the average concordance index [2]:

$$\bar{C} = \sum_{\substack{k=1 \\ k \neq i}}^{m} \sum_{\substack{i=1 \\ i \neq k}}^{m} \frac{C_{ki}}{m(m-1)} \quad (9)$$

On the basis of r threshold value, F matrix can be constructed, the elements of which are defined as:

$$f_{ki} = \begin{cases} 1, & and c_{ki} \geq r \\ 0, & and c_{ki} < r \end{cases} \quad (10)$$

An alternative's dominance over another one is numerically indicated as 1 in the F matrix.

8. In a similar fashion, the discordance dominance matrix is constructed and based on the threshold value, the elements of g_{ki} of the discordance dominance matrix G are calculated as:

$$Z = \sum_{\substack{k=1 \\ k \neq i}}^{m} \sum_{\substack{i=1 \\ i \neq k}}^{m} \frac{d_{ki}}{m(m-1)} \quad (11)$$

$$f(x) = \begin{cases} 1, & and d_{ki} \leq z \\ 0, & and d_{ki} > z \end{cases} \quad (12)$$

9. Finally, the T aggregate dominance matrix is found by calculating the intersection of the concordance dominance matrix F and discordance dominance matrix G. T is defined by means of its typical elements t_{ki} as:

$$t_{ki} = f_{ki} \cdot g_{ki} \quad (13)$$

The aggregate dominance matrix, T, gives the partial preference ordering of the alternatives. If t_{ki} element of T_{ki} matrix equals to 1, then alternative A_k is preferred to alternative A_I In this Case, alternative A_i is eliminated [2].

3-2 Shannon Entropy

Shannon and Weaver proposed the entropy concept, which is a measure of uncertainty in information formulated in terms of probability theory. Since the entropy concept is well suited for measuring the relative contrast intensities of criteria to represent the average intrinsic information transmitted to the decision maker, conveniently it would be a proper option for our purpose. Shannon developed measure H that satisfied the following properties for all pi within the estimated joint probability distribution P:

It is proved that the only function that satisfied these properties is:

$$H_{shannon} = -\sum_{i} p_i \log(p_i) \quad (14)$$

Shannon's concept is capable of being deployed as a weighting calculation method, through the following steps:
Step 1: Normalize the evaluation index as:

$$p \tag{15}$$

Step 2: Calculate entropy measure of every index using the following equation:

$$e \tag{16}$$

Where $K = (1n(m))^{-1}$ (17)

Step 3: Define the divergence through:
$div_j = 1 - e_j$ (18)
The more the div_j is the more important the criterion jth
Step 4: Obtain the normalized weights of indexes as:

$$p_{ij} = \frac{div_j}{\sum_j div_j} \tag{19}$$

3- 1st phase

Investigating operation's slowness and stopping and implementing brainstorming sessions by studying the statistics of loading and discharging operation's slowness and stoppings at BIK's Grain Terminal and stating its causes in 2012-2013 and also holding brainstorming sessions with the ports experts, 23 reasons of sluggishness and stopping of the loading- discharging operations in BIK Grain Terminal are illustrated in the following table1.

Table 1. Sluggishness and stoppages causes for loading and discharging operations

Row	Causes
1	Administrative and financial matters
2	Non-readiness of Cargo owners (debt of Cargo owner)
3	Equipment traveling
4	Documentation problems
5	Truck shortage
6	Quarantine and passing ceremonies
7	Offshore transportation Equipment break-down
8	Lack of gang
9	Vessel's shifting
10	Jetty's cleaning
11	Lack of discharging space (depot)
12	Fueling
13	Contractor's non-readiness
14	Employer's order
15	Power outage
16	Detention by port states
17	Adjustment of vessel's balance
18	Opening and closing of the storehouses' gates
19	Unpleasant climate
20	Official and public holidays
22	Displacement of accessories (loader)
22	Vessel's non-readiness

2nd step

At 1st the weight of each occurrence possibility criterion for all types of causes (occurrence frequency), degree of impact on the process after the occurrence (intensity) and identification possibility before the impact on the process (tracing), using SHANON entropy and subject software methods, are weighted. Table 2-4 illustrates the achieved outcomes thru SHANON entropy method.

3rd step

At this stage, regarding the identified causes at the very 1st stage thru determining causes occurrence possibility (occurrence frequency), degree of impact on the process after the occurrence (intensity) and possibility of identifying it before effecting the process (tracing), by the terminal's expert shall be studied and scored and the mean of each score to be calculated. Then, sluggishness and stoppages of port operations at Grain Terminal in BIK shall be classified by using the electric method based on the occurrence possibility indexes, causes types, degree of their impact on the process after the occurrence and identification possibility before affecting the process.

Table 2. Electro- Decision Making Method

Row	Causes	Intensity	Event	Identification
1	Financial and administrative affairs	6	7	8
2	Cargo owner non-readiness (cargo owner debts)	5	6	4
3	Equipment travel	8	6	8
4	Documentary problems	5	6	4
5	Lack of trucks	8	7	9
6	Pass and quarantine protocol	7	9	8.1
7	Shore transportation equipment breakdown	9	6	9
8	Lack of gang	7	5	6
9	Vessel shifting	4	9	7
10	Jetty cleaning	8	8.5	7.5
11	Lack of discharging space (depot)	8	3	4
12	Fueling	12	6	9.8
13	Contactor's non-readiness	3	5	6
14	Employer order	5	7	8
15	Power outage	9	3	3
16	Detention by port state	6	8	9
17	Arraignment of vessel balance	9	7	6
18	Opening- closing of warehouse gates	6	8	7
19	Inclement weather	2	7	7
20	Official holidays	6	6	3
21	Displacement of accessory equipment (loader)	7	4	6
22	Vessel non-readiness	9	4	4.3
	Lack of Toll man	6	5	4

Afterward, to compute the agreeing and opposing matrix, the agreeing and opposing criterion set per couple, was specified from the option and based on the said sets, the agreeing and opposing matrixes were attained. The referred matrixes are presented in tables 7-4, 8-4, 9-4 and 3.

Table 3: Agreeing Matrix (a)

	1	2	3	4	5	6	7	8	9	10	11	12
1	---	1	0.7	1	0.4	0	0.4	0.7	0.6	0.3	0.7	0.3
2	0	---	0.4	1	0	0	0.4	0.4	0.3	0	0.7	0.4

3	0.6	1	---	1	0.3	0.3	0.3	1	0.6	0.6	1	0.7
4	0	1	0.4	---	0	0	0.4	0.4	0.3	0	0.7	0.4
5	1	1	1	1	---	0.6	0.7	1	0.6	0.6	1	0.7
6	1	1	0.7	1	0.4	---	0.4	1	1	0.7	0.7	0.4
7	0.6	1	1	1	0.6	0.6	---	1	0.6	0.6	1	0.7
8	0.3	0.6	0	0.6	0	0.3	0	---	0.3	0	0.7	0
9	0.4	0.7	0.4	0.7	0.4	0.4	0.4	0.7	---	0.4	0.7	0.4
10	0.7	1	0.7	1	0.7	0.3	0.4	1	0.6	---	1	0.7
11	0.3	0.6	0.3	0.6	0.3	0.3	0	0.3	0.3	0.3	---	0.3
12	0.6	1	1	1	0.6	0.6	0.7	1	0.6	0.6	1	---
13	0	0.3	0	0.3	0	0	0	0.7	0	0	0.7	0
14	0.7	1	0.7	1	0.4	0	0.4	0.7	0.6	0.3	0.7	0.4
15	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.7	0.3
16	1	1	0.7	1	0.7	0.3	0.7	0.7	0.6	0.3	0.7	0.4
17	0.7	1	0.7	1	0.7	0.3	0.7	1	0.3	0.3	1	0.7
18	0.7	1	0.4	1	0.4	0	0.4	0.7	0.6	0	0.7	0.4
19	0.4	0.7	0.4	0.7	0.4	0	0.4	0.7	0.3	0	0.7	0.4
20	0.3	0.7	0.4	0.7	0	0	0.4	0.4	0.3	0	0.4	0.4
21	0.3	0.6	0	0.6	0	0.3	0	0.6	0.3	0	0.7	0
22	0.3	0.6	0.3	0.6	0.3	0.3	0.3	0.3	0.3	0.3	1	0.3
23	0.3	0.3	0.3	0.3	0.3	0	0	0.4	0.3	0	0.7	0

Table 4: The Agreeing Matrix (b)

C	13	14	15	16	17	18	19	20	21	22	23
1	1	1	0.7	0.3	0.7	0.6	1	1	0.7	0.7	1
2	0.7	0.3	0.7	0	0	0	0.3	0.7	0.4	0.4	0.7
3	1	0.6	0.7	0.3	0.3	0.6	0.6	1	1	0.7	1
4	0.7	0.3	0.7	0	0	0	0.3	0.7	0.4	0.4	0.7
5	1	1	0.7	0.6	0.7	0.6	1	1	1	0.7	1
6	1	1	0.7	0.7	0.7	1	1	1	1	0.7	1
7	1	0.6	1	0.6	0.6	0.6	0.6	1	1	1	1
8	1	0.3	0.7	0.3	0.3	0.3	0.3	0.6	1	0.7	1
9	1	0.4	0.7	0.4	0.7	0.7	1	0.7	0.7	0.7	0.7
10	1	0.7	0.7	0.7	0.7	1	1	1	1	0.7	1
11	0.3	0.3	0.7	0.3	0	0.3	0.3	0.6	0.3	0	0.6
12	1	0.6	0.7	0.6	0.3	0.6	0.6	1	1	0.7	1
13	---	0	0.7	0	0.3	0	0.3	0.3	0.7	0.7	0.7
14	1	---	0.7	0	0.7	0.3	1	0.7	0.7	0.7	0.7
15	0.3	0.3	---	0.3	0.3	0.3	0.3	0.6	0.3	0.3	0.3
16	1	1	0.7	---	0.7	1	1	1	0.7	0.7	1
17	1	0.7	1	0.3	---	0.3	0.7	1	1	1	1
18	1	0.7	0.7	0.7	0.7	---	1	1	0.7	0.7	1
19	0.7	0.4	0.7	0	0.7	0.3	---	0.7	0.7	0.7	0.7
20	0.7	0.3	0.7	0.3	0	0.3	0.3	---	0.4	0.4	0.7
21	0.6	0.3	0.7	0.3	0.3	0.3	0.3	0.6	---	0.7	0.6
22	0.3	0.3	1	0.3	0.3	0.3	0.3	0.6	0.7	---	0.6
23	0.7	0.3	0.7	0.3	0	0.3	0.3	0.6	0.4	0.4	---

Table 5. Opposing Matrix (a)

D	1	2	3	4	5	6	7	8	9	10	11	12	13
1	---	0	1	0	1	1	1	0.5	1	1	0.5	1	0
2	1	---	1	0	1	1	1	1	1	1	1	1	1
3	0.5	0	---	0	1	1	1	0	0.75	1	0	1	0
4	1	0	1	---	1	1	1	1	1	1	1	1	1
5	0	0	0	0	---	1	1	0	0.5	1	0	0.8	0
6	0	0	0.333	0	0.5	---	0.666	0	0	1	0.166	0.566	0
7	0.333	0	0	0	1	1	---	0	0.6	1	0	0.8	0
8	1	0.5	1	0.5	1	1	1	---	1	1	0.5	1	0
9	1	0.333	1	0.333	1	1	1	0.75	---	1	0.666	1	0
10	0.25	0	0.2	0	1	0.6	0.6	0	0.125	---	0	0.92	0
11	1	1	1	1	1	1	1	1	1	1	---	1	0.4
12	0.5	0	0	0	1	1	1	0	0.75	1	0	---	0
13	1	1	1	1	1	1	1	1	1	1	1	1	---
14	1	0	1	0	1	1	1	1	1	1	0.75	1	0
15	1	0.75	1	0.75	1	1	1	1	1	1	1	1	0.5
16	0	0	1	0	1	1	1	0.333	0.5	1	0.4	1	0
17	0.666	0	1	0	1	1	1	0	0.4	1	0	1	0
18	1	0	1	0	1	1	1	0.333	0.5	1	0.4	1	0
19	1	1	1	1	1	1	1	1	1	1	1	1	0.5
20	1	1	1	1	1	1	1	1	1	1	0.666	1	1
21	1	1	1	1	1	1	1	1	1	1	0.5	1	0.25
22	1	0.5	1	0.5	1	1	1	0.85	1	1	0	1	0.28333
23	1	1	1	1	1	1	1	1	1	1	1	1	0.66667

Table 6. Opposing Matrix (b)

D	14	15	16	17	18	19	20	21	22	23
1	0	0.6	1	1	1	0	0	0.333	0.810	0
2	1	1	1	1	1	1	1	1	1	1
3	0.333	0.2	1	0.5	1	0.166	0	0	0.270	0
4	1	1	1	1	1	1	1	1	1	1
5	0	0.166	0.5	0.333	0.5	0	0	0	0.212	0
6	0	0.333	0.9	0.952	0	0	0	0	0.4	0
7	0.25	0	0.666	0.333	0.666	0.142	0	0	0	0
8	1	0.666	1	1	1	0.4	0.333	0	1	0
9	0.5	0.833	1	1	1	0	0.5	0.6	1	0.5
10	0.166	0.181	0.75	0.666	0	0	0	0	0.222	0
11	1	1	1	1	1	0.666	1	1	1	1
12	0.333	0.147	1	0.263	0.714	0.166	0	0	0.181	0
13	1	1	1	1	1	1	1	1	1	1
14	---	0.8	1	1	1	0	0.2	0.666	1	0.25
15	1	---	1	1	1	0.571	1	1	1	0.666
16	0	0.5	---	1	0	0	0	0.25	0.638	0
17	0.5	0	1	---	0.333	0.142	0	0	0	0
18	1	0.6	1	1	---	0	0	0.25	0.75	0
19	1	1	1	1	1	---	1	1	1	1
20	1	1	1	1	1	1	---	1	1	1
21	1	0.666	1	1	1	0.6	0.666	---	1	0.5
22	0.925	0	1	1	1	0.428	0.666	0.85	---	0.333
23	1	1	1	1	1	0.75	1	1	1	---

Then to form the effective agreeing and opposing matrixes, the according threshold was considered as c= 0.2, subsequently the opposing threshold was considered as d= 0.7. Furthermore, they were established based on the agreeing threshold matrix, the Bolin F based on the opposing threshold Bolin G (with the component 1 and 0) that ultimately by combining these two matrix, the effective and comprehensive matrix to be formed. The referred matrix is shown in table 10-4. This matrix illustrates the sequence of different cause's superiority in comparison to each other…

Table 7. The comprehensive and effective matrix

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	0	1	0	1	0	0	0	1	0	0	1	0	1	1	1	0	0	0	1	1	1	0	1
2	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	1	1	0	1	0	0	0	1	0	0	1	0	1	1	1	0	1	0	1	1	1	1	1
4	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	1	1	1	1	0	0	0	1	1	0	1	0	1	1	1	1	1	1	1	1	1	1	1
6	1	1	1	1	1	0	1	1	1	0	1	1	1	1	1	0	0	1	1	1	1	1	1
7	1	1	1	1	0	0	0	1	1	0	1	0	1	1	1	1	1	1	1	1	1	1	1
8	0	1	0	1	0	0	0	0	0	0	1	0	1	0	1	0	0	0	1	1	1	0	1
9	0	1	0	1	0	0	0	0	0	0	1	0	1	1	0	0	0	0	1	1	1	0	1
10	1	1	1	1	0	1	1	1	1	0	1	0	1	1	1	0	1	1	1	1	1	1	1
11	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0
12	1	1	1	1	0	0	0	1	0	0	1	0	1	1	1	0	1	0	1	1	1	1	1
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	1	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	1
15	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	1
16	1	1	0	1	0	0	0	1	1	0	1	0	1	1	1	0	0	1	1	1	1	1	1
17	1	1	0	1	0	0	0	1	1	0	1	0	1	1	1	0	0	1	1	1	1	1	1
18	0	1	0	1	0	0	0	1	1	0	1	0	1	0	1	0	0	0	1	1	1	0	1
19	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	1	0	1	0	1	0	0	0	1	1	0	0	1
22	0	1	0	1	0	0	0	0	0	0	1	0	1	0	1	0	0	0	1	1	0	0	1
23	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0

Next, in regard to the extracted outcomes of the effective matrix, the classified causes are presented in the following table.

Table 8.final ranking

Row	Causes	Rank
1	Accessories Displacement (Loader)	7
2	Lack of Toll-man	10
3	Lack of truck	4
4	Fueling	10
5	Non-readiness of cargo owner	2
6	Inclement weather and climate	2
7	Administrative and financial issues	3
8	Vessel's shifting	8
9	Equipment travel	6
10	Documentation problems	1
11	General holidays	10
12	Lack of discharging space (depot)	2
13	Quarantine and passing bureaucracy	13
14	Contractor's non-readiness	8

15	Offshore transportation equipment's break-down	9
16	Lack of gang	3
17	Jetty's cleaning	4
18	Vessel's non-readiness	5
19	Detention by port state	12
20	Power outage	10
21	Employer's order	9
22	Adjusting the balance of the vessel	7
23	Opening and closing of the warehouses' gates	11

Conclusion

In reference to the attained results thru Electro method for the 1st period, clearance problems, was placed at the 1st rank, then inclement weather and environmental conditions, non-preparation of the cargo owner (his debts) and lack of discharging space (depot) commonly gained the 2nd rank and ultimately financial and administrative affairs along with lack of gang was placed as the 3rd. These are considered the most important causes in port operation (i.e. loading and discharging of grain) decreasing amount in BIK's Grain Terminal during the 1st period.

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