

Ability to Optimize Shipping Line Operations Using Information Technology

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Abstract

Shipping lines play a major role in economic development of a country by contributing to the international trade in every industry. Therefore, optimizing operations in these firms would be of a great importance and this could be effectively done through IT-based solutions. Therefore, this study was carried out to explore an in depth understanding on whether there is feasibility to optimize shipping line operations through increasing the usage of IT solutions. The study used both primary and secondary data to achieve its objectives. First, secondary data were used to identify current issues in shipping line operations and they were obtained from a database maintained by a selected shipping line in Sri Lanka. Secondly, primary data were used to identify current system issues, the benefits of system, and solutions to avoid the existing issues. To collect primary data, a survey was conducted where the respondents were 47 import and export staff in shipping line companies in Sri Lanka. After collecting data, A detailed descriptive statistical analysis, correlation analysis, independent sample t-test, and Chi-square test were performed to analyse the data. The findings of this study will lead to effective implementation of IT solutions for optimizing shipping line operations. Particularly it emphasizes the importance of installing integrated collaboration systems as their potential to overcome many optimization issues is very high.

Keywords

Shipping line operations, issues, barriers, information technology, system features

1. Introduction

Shipping lines are third party logistic companies mainly involve in import and export consignment of all types of consumer goods, raw material, and fuel. They are backbone of international trade in every industry of a country. They have to follow a huge, complicated process in the import and export trade. Well-optimized shipping line operations facilitate organizations to carry out their operations properly through properly handling import and export activities. To carry out shipping line operations properly, they have to make a lot of efforts to collect and manage right and timely information. Those efforts incur higher costs to organizations.

ABC Pvt Ltd is a shipping line and a clearing agency. There are several issues including bottlenecks, great uncertainty, unmanageable workloads and problem of effective use time that can be identified in the organization's operations. This study was conducted to identify the operational issue and to evaluate the ability to optimize shipping line operations using Information Technology.

2. Literature review

2.1 Challenges/Issues in Shipping Line Operations and Their Impact

According to IBM business consulting services, there are some identified future trends in shipping lines. According to their perspective, the market in future will be free and more open while the industry become more concentrated and more focused on customer relationships. Looking ahead of ten years, they believe that leading container shipping lines will have the following characteristics.

- i. Strategic clarity
- ii. Efficiency, quality and economy
- iii. Robust network profitability management
- iv. Targeted customer relationship management
- v. Advanced business intelligence

Current challenges identified by IBM Business Consulting Services are:

- i. Infrastructure constraints are on the rise
 - ii. Trade flows are becoming more imbalanced
 - iii. Customer demands are continuing to tighten
 - iv. Discipline is poor
 - v. New competitors are looming
- (Naresh Hingorani, Derek Moore, Keld Tornqvist, 2005)

2.2 Barriers in Shipping Line Industry

Durvasula, Lysonski, and Mehta (2000) identified the problems that shipping line customers face. These are:

- i. Shipping delays
- ii. Communication breakdown
- iii. Documents delays
- iv. Not being cooperative

2.3 Characteristics to Provide the Best Service to Customer

Durvasula et al. (2000) examined issues relevant to service recovery and service satisfaction in the business-to-business setting of ocean freight shipping. They found the following characteristics in shipping lines that have customers switched from another company.

- Regular service
- Good service
- Customer's choice
- Good relationship/flexibility
- Reliability
- Good reputation
- Punctuality
- Speedy documentation
- Wide network

2.4 Information Technology Based Solutions/Tools Used in Shipping Line Industry

Table 1 presents details about leading software solutions used in shipping line industry.

Table 1 : Features of software for shipping line operations

| Software | Operations facilitated by the available features |
|---|---|
| Marine Accounting and M.I.S. | Support of Voyage Accounting and Analysis Running cost reporting Suitable for ship management Ship owning |
| Vessel Budgeting Systems (for the Accounting department of a shipping company) | Managing running costs and financing costs Evaluating income and profit Credit line management Voyage budgeting |
| Freight Collection Software (for Post-fixture information) | Creating debit notes, credit notes automatically created vouchers |
| Voyage Estimation Software | Calculations associated with a voyage estimation. |
| Communications Software (Messaging and Collaboration Services) | Automatic filing and classification of documents according to ISO' requirements and company's policy. Easy search and quick presentation of information as per user's request. Ability to forward information to other authorized users. Ability to immediately locate additional information, which is possibly dispersed in other documents and is relative to the initial information requested. Direct availability of information to the user wherever he/she is working on. |
| Vessel Operations Software | Electronically fill up and transmit to the office noon, arrival and departure telegrams |

3. Methodology

3.1 Data Collection and Sample

This study used two types of data: primary and secondary. As secondary data, the study used previous three months data from the selected shipping company. The selection of the company was convenience based. The following information was obtained.

- Date
- Number of jobs received on a given date
- Job received time
- Number of jobs completed within the date

The secondary data were used for identifying the current issues in shipping line operations. For collecting primary data, this study used the survey method. An online questionnaire was developed for identifying current system issues, the benefits of system and potential solutions for the existing issues. The sample consisted of 47 import and export staff in shipping line organizations in Sri Lanka. Secondary data sample contained 62 records obtained from ABC Pvt Ltd.

This study mainly used descriptive statistical tools to summarize and analyze the collected data. Furthermore, the study performed a correlation analysis to test the correlation between various issues/challenges and IT features. Independent Sample T-Test was applied to test the relationships among variables such as future challenges, system features, impact of issues on shipping line operations, current issues in operations, barriers to satisfy customer requirements and characteristics of the organizations that provide best service. Independent Sample T-Test compares means of two unrelated groups. One Way ANOVA method was used to analyze secondary data. This analysis was used to understand whether there are current issues in shipping line operations. SPSS 22.0 statistical software was used to analyze the data.

4. Data analysis and discussion

First of all, the survey participants were questioned on their opinion about the optimizing shipping line operations. The results show that majority of respondents (74%) mean future improvement of existing process as optimizing.

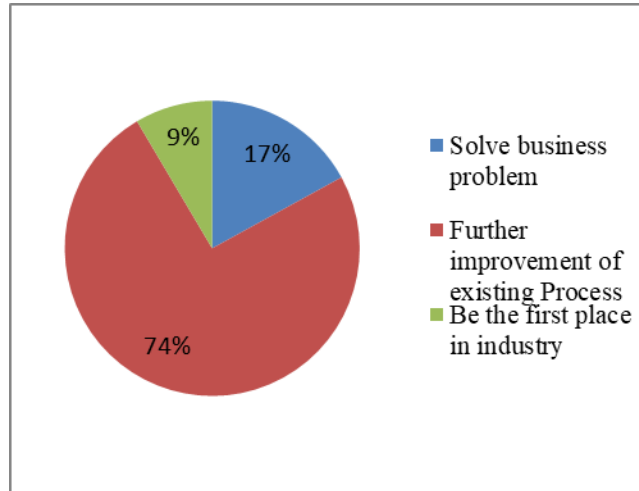


Figure 1. The meaning of optimizing shipping line operations

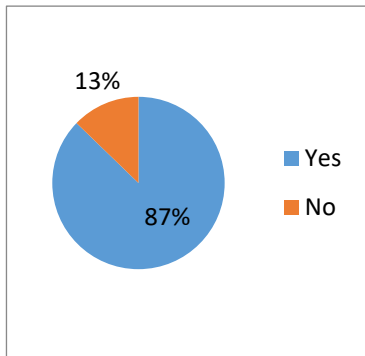


Figure 2. Capability to establish new system

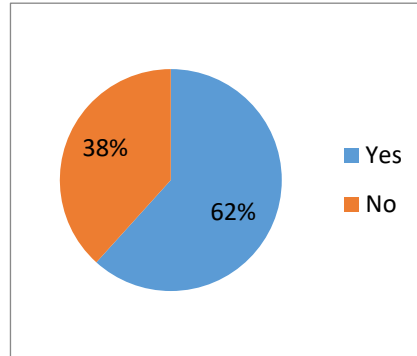


Figure 3. The integrated system will be a solution

Approximately 62% of respondents believe that integrated system will be a solution for minimizing the issues in shipping line operations and provide benefits by developing close relationships with other firms. According to the results nearly all the respondents (87%) think that their firm would be capable in adapting with future trends with integrated system.

As far as the capability of an organization to establish the new system is concerned, the following requirements should be there in the organization (Lyridis et al., 2005).

- Availability of the technology
- The cost of purchase
- The easiness of implementation

Through the secondary data analysis, it was observed that the job completion proportion within the date that the job received is 60% (one sample t-test p-value = 0.696 for the hypothesis: proportion = 60%). This implies the existing time efficiency of the shipping line operations is not satisfactory.

4.1 Correlation Analysis

A correlation analysis was performed to identify relationships between various variables in the study. The following table presents the correlations between future challenges in shipping line operations and features available in the existing information systems. Significant negative correlations obtained in this analysis will imply the importance of different features in facing the challenges.

Table 2 : Correlation between future challenges and features available in system

| | Automatic Filing and Classification procedures of documents | Easy search and quick presentation of information as per user's request | Ability to forward information to other authorized users | Ability to immediately locate additional information | Direct availability of information to the user wherever he/she is working on |
|---|---|---|--|--|--|
| Lack of Strategic clarity | -.380** | -.214 | -.395** | -.168 | -.295* |
| Lack of Efficiency, quality and economy | -.086 | -.180 | -.114 | .156 | .035 |
| Lack of Robust network profitability management | -.035 | .019 | .218 | .178 | .206 |
| Lack of targeted customer relationship management | -.218 | -.084 | -.209 | -.139 | -.145 |
| Lack of advanced business intelligence | -.044 | -.207 | -.065 | -.100 | -.038 |
| Infrastructure constraints are on the rise | -.139 | .102 | -.067 | .108 | -.245 |
| New competitors are looming | -.397** | -.517** | -.375** | -.413** | -.280 |

**correlation is significant at the 0.01 level (2-tailed)

* correlation is significant at the 0.05 level (2-tailed)

According to table 2, there are significant relationships(at 0.01 or 0.05 level)between lack of strategic clarity and there features, namely, automatic filing and classification procedure of documents (0.380), ability to forward information to other authorized users (0.395), and direct availability of information to the user wherever he/she is working on (0.295). Therefore, these three features in information systems seem to be highly important to overcome the problem of lack of strategic clarity in shipping line operations. Four of the features, automatically filing and classification procedures of documents (0.397), easy search and quick presentation of information as per user's request (0.517), ability to forward information to other authorized users (0.375), ability to immediately locate additional information (0.413) are important to face the challenge of new competitors looming. Easy search and quick presentation of information as per user's request is the most important feature, it has the highest negative correlation (-0.517).

Table 3 shows the correlations between future challenges and usefulness of the various software tools (at 0.01 or 0.05 level). There is a significant relationship between lack of robust network profitability and vessel budgeting system (.538). Therefore, that software seems to highly important to face the challenge lack of robust network profitability. Three of software, Marine Accounting and M.I.S. (-0.439), Freight Collection Software (-.463), and Communication Software (-.627) are negatively correlate with infrastructure constraints are on the rise. Therefore, these three systems seem to be not highly important to overcome the infrastructure constraints that are on the rise.

Table 3 : Correlation between future challenges and software

| | Marine Accounting and M.I.S. | Vessel Budgeting System | Freight Collection Software | Voyage Estimation Software | Communication Software | Vessel Operation software |
|---|------------------------------|-------------------------|-----------------------------|----------------------------|------------------------|---------------------------|
| Lack of Strategic clarity | .323 | .144 | -.146 | .209 | -.148 | .148 |
| Lack of Efficiency, quality and economy | -.040 | -.262 | .088 | .330 | -.009 | -.133 |
| Lack of Robust network profitability management | .082 | .538* | -.245 | .081 | -.344 | .346 |
| Lack of Targeted customer relationship management | -.117 | -.062 | -.025 | .060 | -.342 | -.346 |
| Lack of Advanced business intelligence | -.045 | .127 | .247 | .138 | -.018 | -.183 |
| Infrastructure constraints are on the rise | -.439* | .270 | -.463* | -.374 | -.627** | .008 |
| New competitors are looming | -.148 | .098 | .031 | .414 | -.154 | -.178 |

**correlation is significant at the 0.01 level (2-tailed)

* correlation is significant at the 0.05 level (2-tailed)

4.2 Independent Sample T-Test

Independent sample t-test was performed to test whether there is any effect of having information systems on finding challenges in shipping line operations. According to table 4, a significant relationship between standardized business process and lack of strategic clarity (.036) can be identified. Between standardized business process and infrastructure constraints are on the rise have a significant relationship (.020). There is significant relationship between integrated business process and infrastructure constraints are on the rise (.045). Another significant relationship can be observed within the standardized business process and lack of target customer relationship management (.020).

Table 4 : Relationship between future challenges and system features

| | Standardized business process | Integrated Business Process | Master database |
|---|-------------------------------|-----------------------------|-----------------|
| Lack of strategic clarity | .036** | .063* | .056* |
| Lack of efficiency, quality and economy | .799 | .708 | .094* |
| Lack of robust network profitability management | .659 | .056* | .264 |
| Lack of targeted customer relationship management | .100 | .934 | .020** |
| Lack of advanced business intelligence | .602 | .856 | .070* |
| Infrastructure constraints are on the rise | .020** | .045** | .179 |
| New competitors are looming | .446 | .200 | .058 |

** Significant at the 0.05 level

* Significant at the 0.10 level

Table 5 shows t-test results corresponding to the relationship between barrier to satisfy customer requirement and characteristics of the organization to provide best service. According to the results we can observe significant relationship not cooperative with regular service (.000), good service (.007), punctual (.001), speed documentation (.024). There can be observed highly significant variable between not cooperative and regular service (.000).

Table 5 : Relationship between barriers to satisfy customer requirements and characteristics of the organization to provide best service

| | Shipping delays | Communication breakdown | Documents delay | Not cooperative |
|----------------------|-----------------|-------------------------|-----------------|-----------------|
| Regular service | .384 | .055 | .162 | .000* |
| Good service | .179 | .110 | .194 | .007* |
| Punctual | .261 | .684 | .676 | .001* |
| Speedy documentation | .451 | .600 | .581 | .024* |
| Wide network | .052 | .917 | .810 | .123 |

**significant at the 0.05 level

According to the survey results, there are problems in time management, inefficient system and inefficient system usage. The independent sample t-Test was performed to test the relationship between the usefulness of software and issues in shipping line operations. According to table 6, there is significant relationship between time management problem and Voyage Estimation Software (0.030)

Table 6 : Relationship between perceived usefulness of software and issues in shipping line operations (T-test)

| | Marine Accounting and M.I.S. | Vessel Budgeting System | Freight Collection Software | Voyage Estimation Software | Communication Software | Vessel Operation software |
|--------------------------|------------------------------|-------------------------|-----------------------------|----------------------------|------------------------|---------------------------|
| Time management problem | .134 | .881 | .279 | .030* | .843 | .932 |
| Inefficient system | .195 | .309 | .775 | .163 | .169 | .272 |
| Inefficient system usage | .924 | .775 | .550 | .729 | .516 | .968 |

When analyzing the relationship between future challenges and current system features using t-test, no significant relationship was identified. This implies that current system features would not be sufficient to the face future challenges in shipping line industry.

5. Conclusion

This study examines whether there is ability to optimize shipping line operations using Information Technology. The study used both survey method and secondary data from shipping line companies. The study was also aimed to evaluate and understand the issues in shipping line operations and explore the IT related opportunities to overcome these issues.

Based on the findings, it can be concluded that time management, inefficient system, inefficient system usage and no punctuality as major issues in shipping line operations. To identify feasible IT based solutions, respondents were questioned about the software tools, various features in the software, and the ability to face future trends and minimize the current issues in shipping line operations. As per the results, organization should try to implement software and most importantly, vessel budgeting systems that will particularly help to overcome lack of robust network profitability. In addition, the results revealed that the current system features in Sri Lankan shipping lines are not sufficient to successfully face future trends. Organization should try to develop their current system with important features which have been identified through the study.

6. Implications of the Study

This study has many important practical and theoretical implications. As the study implies, to avoid the issues in shipping line operations, organization should focus on the Information Technology based solution. Shipping line

organizations should avoid operation delay situations, focus on their system capabilities, and try to get proper knowledge about the system usage. Shipping line companies should attempt to minimize the barriers to satisfy customer requirements through communication breakdown and document delays. Organization also should concern about provide punctual service through the use of right IT tools.

The study has some implications for the researchers and academics who explore knowledge about current issues and future challenges in shipping line operations and investigate how to overcome these issues using Information Technology tools. This study contributes to literature because there is very limited number of previous research focusing on shipping line operations particularly with reference to Sri Lanka. In addition, there was no previous research addressing the features of Information Technology tools and their ability to optimize the shipping line operations.

7. Limitations and Future Research

This study was conducted for identifying current issues in shipping line operations. For this study used secondary data from only one shipping line firm which may not represent the whole industry's issues. So future researchers can conduct research for the whole industry and through that they will be able to identify the issues in shipping lines and most suitable software can be introduced to Sri Lanka. This study only examined the possibility to optimize shipping line operations using Information Technology based solutions. Future researchers can explore the ways to overcome the mentioned issues using Information Technology tools. The small sample size is another limitation of this study. The time and resource constraints largely impacted the sample size.

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Biographies

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