

APPLICATION OF IT IN LOGISTICS ACTIVITIES: SURVEY OF EFFICIENCY AND IMPACT ANALYSIS

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Abstract

Logistics is one the leading sectors among the leading services which IT is penetrating the technological profile. Thanks to advanced IT and satellite technologies logistics has turned to modern face and logistic services providers have enjoyed IT's key benefits in operating the business and reshaping the logistics services markets. This article studied the effect of using IT in logistics activities on operational efficiency of logistics companies in unique methods of in-depth analysis. Obtained results revealed that use of IT in logistics positively impacts on operational efficiency and supports the overall service supply in performance, quality, timing and cost reduction standpoints in case of the largest logistics company in Uzbekistan.

Keywords: IT, logistics, operational efficiency, service supply, Uzbekistan

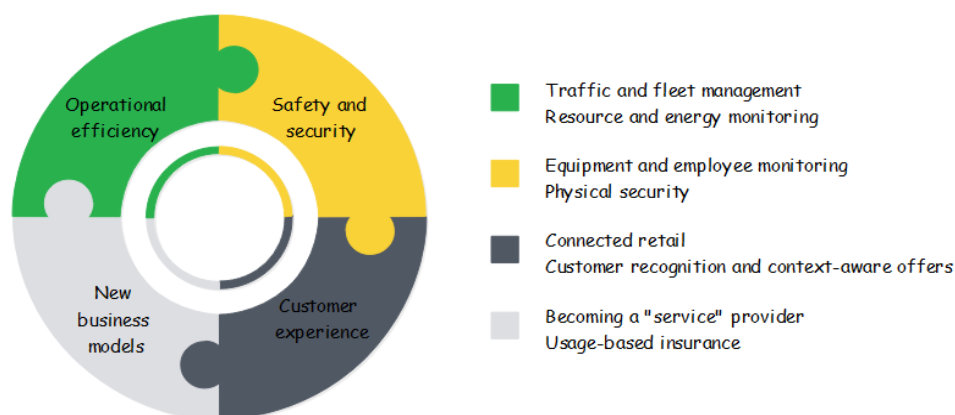
INTRODUCTION

Global competition and the rapid evolution of information technology (IT) have led to a significant trend toward outsourcing of logistics services (Lewis and Talalayevsky, 2000). IT penetrated all stages and aspects of logistic activities and integrated to the overall business environment of logistic service providers. Modern supply chain management is highly dependent on the use of IT which is directly necessitated in logistics. Modern logistics includes a lot of characteristics, such as systematic industry, combination of logistics and information technology, technology modernization, integration of supply, integration services, a full service and network architecture of logistics system (Tadejko, 2015). Current IT opportunities provides logistics operators with far-reaching pay-offs in communicating with customers through sophisticated logistic value chain. Expansion of introducing IT in logistics activity increases the

substantial impact on operational efficiency, safety and security, customer experience and new business models (See Figure 1).

Substantial impact of using IT in logistic service provision leads to improvements in the entire functioning of logistics companies. In international experience, leading logistic companies launched expansionary IT framework in order to increase operational efficiency, technological sophistication, quality enhancement, corporate decision making and overall business performance. Technological advancement and expansion enable logistics services providers to monitor, analyse and improve the working process, to control quality, performance and business operations, to optimize labour, transportation, cost structure, material use and timing, to automatize workflow and complex operations, to measure efficiency, quality, opportunities and risks.

Figure 1. Impact areas of IT in logistics



Source: Author's illustration, 2017.

The largest impact area of IT in logistics is in asset utilization, especially in optimization of vehicle management. Logistics service providers heavily apply IT in addressing traffic related issues and monitoring fleet performance. Moreover, current technologies facilitate logistic companies to increase operational efficiency and to lower costs through resource and energy-saving smart technology solutions in monitoring. Employee performance, vehicle safety and equipment exploitation are also a widely used area of IT in logistic activity.

This paper examines the attitudes of the managers of Angren Logistics Center, a leading and innovative logistics company in Uzbekistan with the largest market share of logistics services, towards the impact of IT in logistics service provision and analyses the effect of application of IT in its operational efficiency. The particular difference of this paper is seen in the

in-depth analytical approaches and detailed analysis of IT's impact on the operational efficiency of logistics service providers.

METHODOLOGY

In structuring the analysis, a survey was preferred to observe the effect of IT in the selected logistics company. Survey was aimed at collecting the data about attitudes of top and mid-level managers of Angren Logistics Center towards the impact of using IT in their operations. Managers were asked to answer and to assess the impact areas (operational efficiency, performance, service quality, timing, cost reduction) of IT by giving scores ranging from 1 to 5 as provided below.

Impact level	Score
Highly positive	5
Positive	4
Neutral	3
Negative	2
Highly negative	1

In order to know the general preference of managers Cronbach's alpha method is used. In consistence with Cronbach's internal consistency theory, given variables $x_1, x_2, x_3, \dots, x_k$ and $x_0 = \sum_{j=1}^k x_j$, Cronbach's alpha is specified as follows:

$$\frac{k}{k-1} \left(\frac{\sum_{i \neq j}^k cov(x_i, x_j)}{var(x_0)} \right) = \frac{k}{k-1} \left(1 - \frac{\sum_{j=1}^k var(x_j)}{var(x_0)} \right) \quad (1)$$

Here $x_j = t_j + e_j$ where each e_j is independent from t_j and all e_j are independent from each other. $x_0 = \sum_{j=1}^k x_j$ and $t_0 = \sum_{j=1}^k t_j$. So the reliability of $x_0 \geq \alpha$. Here α is Cronbach's alpha coefficient.

After obtaining survey data, following equation function is tested for estimating the linear relationship between

operational efficiency and IT's key advantages (performance, service quality, timing, cost reduction).

$$OEF = f(PRF, SQL, TMG, CRD) \quad (2)$$

In the final stage, OLS equation for econometric analysis is specified on the basis of equation (2).

$$OEF_i = \beta_0 + \beta_1 PRF_i + \beta_2 SQL_i + \beta_3 TMG_i + \beta_4 CRD_i + \varepsilon_i \quad (3)$$

Here, OEF- operational efficiency, PRF – performance, TMG – timing, CRD – cost reduction, ε – disturbance term.

ANALYSIS & RESULTS

We collected survey data and formed a table of responses by managers to all five impact areas (Table 1). As shown in Table 1, 22 managers out of 25 found the IT's role in logistics services positive, while three of them evaluated IT's added value zero. Mixed cases of evaluations were encountered with performance, quality and timing areas. Cost reduction was less supportive area of IT in managers' evaluation. Some of them found IT's role in reducing costs useless and counteractive.

Table 1. Responses of auditors to questionnaire

Respondents	Operational efficiency	Performance	Service quality	Timing	Cost reduction
Manager 1	4	5	4	4	4
Manager 2	5	4	5	4	4
Manager 3	4	4	3	4	2
Manager 4	4	4	4	5	5
Manager 5	5	5	4	4	3
Manager 6	3	3	3	4	4
Manager 7	5	5	5	4	4
Manager 8	3	4	4	4	4
Manager 9	5	5	4	5	4
Manager 10	3	4	3	3	2
Manager 11	4	4	4	4	4
Manager 12	5	5	3	5	4
Manager 13	5	4	4	5	3
Manager 14	4	4	4	4	4
Manager 15	5	4	5	4	4
Manager 16	4	4	5	5	5
Manager 17	5	5	5	5	5
Manager 18	4	4	5	4	3
Manager 19	4	4	4	4	5
Manager 20	4	3	3	4	4
Manager 21	5	5	5	5	5
Manager 22	4	5	4	4	4
Manager 23	4	4	3	4	4
Manager 24	4	3	3	4	4
Manager 25	5	5	4	4	5

In the second stage, Cronbach's alpha test was conducted using Real Statistics Analysis Pack 2010. Cronbach's alpha method was used to test the individual and overall impact of IT on the selected five areas (Table 2).

Table 2. Cronbach's alpha coefficients

Cronbach's Alpha	Cronbach's Alpha with missing item				
	OEF	PRF	SQL	TMG	CRD
0,747416	0,666667	0,712203	0,68673	0,697629	0,751174

Estimated by means of Real Statistics Analysis Pack 2010.

Table 2 shows overall impact of using IT is 0.747416, which shows the good reliability of responses. It means that positively evaluated the application of IT in all five areas. In terms of individual reliability coefficients, IT positively influenced on the performance and cost reduction of logistics companies compared to the impact level on operational efficiency and service quality management and timing.

In the final stage of analytical part, effect of IT application in logistics activities is estimated on the operational efficiency of Angren Logistics Center based on the survey data. In OLS test operational efficiency is fixed as dependent variable, performance, service quality, timing and cost reduction are chosen as independent variables (See Equation 3). OLS test is run by means of EVIEWS 9.5 analysis tool.

Table 3. OLS test results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.050196	0.987101	0.050852	0.9599
PRF	0.397661	0.180805	2.199397	0.0398
SQL	0.221479	0.164040	1.350151	0.1920
TMG	0.467501	0.243673	1.918560	0.0694
CRD	-0.081918	0.152897	-0.535775	0.5980
R-squared	0.506612	Mean dependent var		4.280000
Adjusted R-squared	0.407935	S.D. dependent var		0.678233
S.E. of regression	0.521872	Akaike info criterion		1.714066
Sum squared resid	5.446999	Schwarz criterion		1.957841
Log likelihood	-16.42583	Hannan-Quinn criter.		1.781679
F-statistic	5.134021	Durbin-Watson stat		2.377079
Prob(F-statistic)	0.005186			

Estimated by means of EVIEWS 9.5.

Absolutely contrary results are obtained in OLS test to Cronbach's alpha test results. OLS test reveals that benefits of IT use in timing of logistic activities have the most significant impact on operational efficiency with 0.467501 coefficient, where cost reduction negatively influences with power of (-0.081918) coefficient. Contribution of IT use supported operational efficiency with 0.397661 and 0.221479 coefficients respectively.

CONCLUSION

This study possesses a particularity of approaches, methods and analyses among all literatures and studies dedicated to IT's impact on logistics companies' operational efficiency. Despite strikingly distinguishing results from conducted tests, positivity of the application of IT in logistics is an absolute and unavoidable trend. Impact of IT on transportation and service sectors are clear and irrejectable in terms of benefit and convenience in operating the business. In empirical analysis conducted in this paper, an author attempted to measure the impact of IT in logistics service provision in the sample of the largest logistics company in Uzbekistan. Managerial responses showed that application of IT in logistics services positively impact on company's service quality, timeliness, operational efficiency and financial profile. Scope this small-scale research is limited with only one logistics company in Uzbekistan. Therefore, an author attempted to present general view of local logistics services market and extent of applying IT by selecting the largest logistics service provider.

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