

Performance Indicators of E-Logistic System with mediating role of Information and Communication Technology (ICT)

Shahid Nadeem¹
Lahore Garrison University Lahore, Pakistan

Waseem-Ul-Hameed
Universiti Utara Malaysia (UUM), Malaysia

Abdul Khaliq Alvi²
Lahore Garrison University Lahore, Pakistan

Jawad Iqbal
The Islamia University of Bahawalpur, Pakistan

Abstract

The prime objective of this study is to identify the factors that may influence e-logistic performance, including those which are ignored by prior studies, from the perspective of Pakistan. As the penetration and growth of e-logistic is very low in Pakistan. E-commerce market is much volatile and logistic industry facing several problems. The current research study is carried out to mitigate this problem by introducing three performance indicators namely, staff service quality, e-payment and information communication technology (ICT). To achieve these objective three hypotheses were proposed concerning the relationship of staff service quality and information communication technology (ICT), e-payment and information communication technology (ICT) and finally, information communication technology (ICT) and e-logistic performance. Five hundred (500) questionnaires were distributed by using the cluster sampling. The study found that, staff service quality and e-payment have significant positive relationship with information communication technology (ICT). Moreover, it is found that, information communication technology (ICT) has significant positive relationship with e-logistic performance. Finally, the current research study is contributing in the body of knowledge by determining the performance indicators of e-logistic industry. That is the reason this study is beneficial for practitioners to boost up the e-logistic industry, particularly in Pakistan.

Keywords: E-Logistic, staff service quality, E-payment, information communication technology (ICT), performance indicator

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1. Introduction

In the recent decade, due to the rapid development in technology, the logistics management has evolved and gained greater significance in doing business (Ristovska et al., 2017). Now, e-logistic success is one of the significant area worldwide to gain competitive advantage and grow more rapidly. Because logistics is strategically vital in most of the industries as it is key to achieve competitive advantage (Kenyon & Meixell, 2007) and get success in a competitive environment.

¹ Correspondence to Shahid Nadeem, Email: snadeem9@hotmail.com

² Correspondence to Abdul Khaliq Alvi Email: khaliquarvi@gmail.com

However, firms must respond to changing needs of different customers because logistics flexibility is one of the essential parts of response (Zhang et al., 2005).

However, various prior studies are carried out on the area of e-logistic (e.g., Anselmsson, 2006; Cichosz et al., 2017; Hsu, 2006; Hu et al., 2016; Kilibarda et al., 2016; Lan et al., 2016; Liu et al., 2008; Sheng & Liu, 2010) but the literature is missing with the indicators of e-logistic performance. In rare cases, any researcher formally documented the indicators of e-logistic performance.

E-commerce is no longer a new phenomenon in most of the developing countries such as Pakistan, but the penetration and growth is very low (Shed Khan & Bawden, 2005). That is the reason e-logistic services of Pakistan are facing many challenges and all these challenges effecting negatively on the performance of e-logistic. Because electronic commerce (e-commerce) market of Pakistan is a much volatile and logistic industry facing several problems (Shamsi & Syed, 2015). While the cost of transport as well as logistics services is decreasing worldwide due to global competition, however, these are normally higher in Pakistan (Transport-logistics, 2015). Additionally, in most of the developing countries particularly in Pakistan the growth of information communication technology (ICT) is low (Shed Khan & Bawden, 2005).

Logistic industry of Pakistan is also facing different issues regarding e-logistic goods payment system and staff service quality. Even though different security measures have been developed to alleviate payment problems, however, several security problems still exist (Chou et al., 2004; Dai & Grundy 2007; Kousaridas et al., 2008). Approximately, 95% of e-logistic customers show concern about security and trust regarding payment (Kim et al., 2010). Moreover, staff service quality includes problems related to communication, distribution of information, delivery services etc.

However, all these problems can be handled through information communication technology (ICT). The government of Pakistan is trying to enhance the use of information communication technologies (ICT) (Sulaiman et al., 2007). In recent years, with widespread use of the internet technology gained the close intention in logistic industry (Xiaomin & Yi, 2017). Because information communication technology is vital to solve the problems of e-payment and staff service quality which automatically improves e-logistic performance.

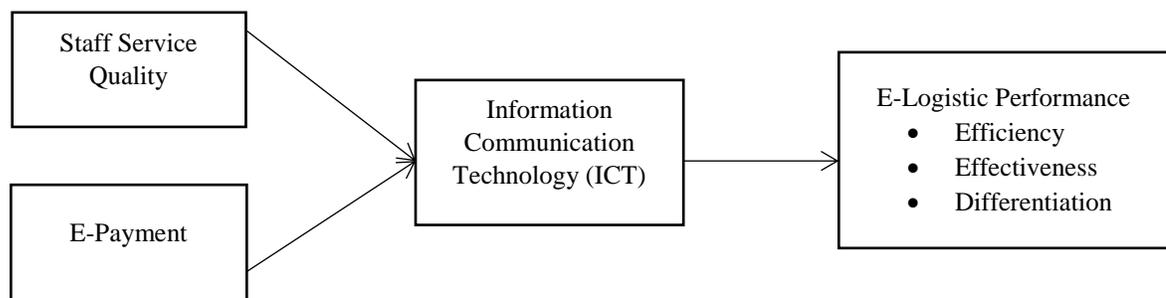


Figure 1: Theoretical Framework

The prime objective of the current study is to determine the performance indicators of e-logistic in Pakistan. To achieve this major objective, the current study has following sub-objectives;

- To examine the role of staff service quality to enhance e-logistic performance.
- To examine the role of e-payment to enhance e-logistic performance.
- To examine the mediating role of information communication technology (ICT).

The current research study is contributing in the body of knowledge by determining the performance indicators of e-logistic industry in Pakistan. That is the reason this study is beneficial to boost up the e-logistic industry, particularly in Pakistan. It is more helpful for practitioners to resolve various issues related to payment and staff service quality.

2. Literature Review

2.1 E-Logistic Performance

E-logistics denotes the transfer of various goods and services by means of internet communication technologies such as e-mail, World Wide Web (WWW) and electronic data interchange (EDI) (Gunasekaran & Ngai, 2003). In the recent decade, the management of logistics activities has become one of the valuable way to gain competitive advantage and to enhance organizational performance (Li et al., 2006). In case of logistic, Bowersox and Closs (1996), first highlighted the performance who described that measurement of logistics performance comprised of a methodology for analyzing resources of the logistic functions. After this logistics performance has become a crucial issue in the area of management (Mansidão & Coelho, 2014).

Various researchers measure logistic performance in different ways. However, the current study measuring the e-logistic performance based on three dimensions namely, efficiency, effectiveness and differentiation. The following Table 1 depicts the dimensions and various authors.

Table 1: Dimensions of E-Logistic Performance

<i>Dimensions</i>	<i>Authors</i>
Efficiency	Griff et al., (2004), Mentzer and Konrad (1991), Bobbit and Michelle (2004)
Effectiveness	Bobbit and Michelle (2004), Griff et al. (2004), Mentzer and Konrad (1991)
Differentiation	Flint et al., (2005), Lambert et al. (2005), Langley and Holcomb (1992)

According to the above studies mentioned in Table 1, logistic performance based on three key elements namely, efficiency, effectiveness and differentiation. These three dimensions have positive impact on logistic performance.

2.2 Staff Service Quality and Information Communication Technology (ICT)

Information communication technology (ICT) is a crucial role to mitigate the problems of staff services quality. Staff service quality based on image, attitude and communication of e-logistic company's staff (Yuanxiao, 2014). However, better information communication technology (ICT) system provides a good communication system and shows a good image to customers which enhance the e-logistic performance. Information communication technology (ICT) provides facility to design websites and better availability of information (Kidane & Sharma, 2016) which increase the staff service quality. Quality of information provided by staff, a good system and satisfaction has influence on e-commerce use (Pujani, 2011).

Information communication technology (ICT) provides a better communication system for staff to communicate with customers which increases the service quality. Service quality determines the level of customer satisfaction (Thai, 2013). Therefore, customer satisfaction is one of the indicators of good e-logistic performance which can be achieved through quality staff services. Nevertheless, field force automation (FFA) applications is a type of information communication technology (ICT) (Marchet et al., 2009) which controlled by the help of mobile and provide a connection between remote workforce and different business processes (Rodina et

al., 2003) and help to improve the staff service quality.

Additionally, according to the results of Hua & Jing (2015), staff service quality has significant positive relationship with e-logistic customer satisfaction. Therefore, there is a relationship between staff service quality, information communication technology and e-logistic performance. Hence, information communication technology (ICT) provides a good system to increase staff service quality which automatically increases the e-logistic performance. Thus, staff service quality and information communication technology (ICT) has significant relationship with each other. Therefore, it is hypothesized that;

H₁: There is a significant relationship between staff service quality and information communication technology (ICT).

2.3 E-Payment and Information Communication Technology (ICT)

E-commerce is built upon e-payment systems (Kim et al., 2010) and e-logistic based on e-commerce. Both need information communication technology (ICT) to work efficiently and effectively. Information communication technology (ICT) is one of the essential elements for e-payment. Because e-commerce is an important component in most of the business operations and e-payment has become a major issue in financial services as well as performance of business (Cotteleer et al., 2007; Hsieh, 2001; Kousaridas et al., 2008; Peha & Khamitov, 2004; Stroborn et al., 2004).

Furthermore, e-payment has a key role in e-logistic performance. Information communication technology (ICT) playing a role of bridge between customer and merchants for e-logistic goods payment. According to Marchet et al. (2009), transportation management (TM) is one of the types of information communication technology (ICT), and payment is one of the function of transportation management (TM) (Gilmore & Tompkins, 2000; Tyan et al., 2003). Hence, e-payment is one of the function of information communication technology (ICT).

Information communication technology (ICT) provides a facility of e-payment. E-payment has several key features such as security, convenience, acceptability, and privacy (Cotteleer et al., 2007; Linck et al., 2006; Tsiakis & Sthephanides, 2005). All these features have significant positive influence on e-logistic performance. These features increase the satisfaction level of e-logistic customers. That is the reason it has positive influence on e-logistic performance.

A better trustworthy system with regards to the privacy and security is required for e-logistic (Changchit et al., 2009; Chen & Barnes, 2007) which is only possible with the help of information communication technology (ICT). Therefore, to provide a trustworthy e-payment system for e-logistic customers, information communication technology (ICT) is a basic mechanism.

Thus, from the above discussion, it is concluded that, e-payment is one of the elements of information communication technology (ICT). Therefore, to develop a better e-payment system, information communication technology (ICT) is essential. Additionally, to increase the performance of e-logistic, information communication technology (ICT) is a basic mechanism. Therefore, it is hypothesized that;

H₂: There is a significant relationship between e-payment and information communication technology (ICT).

2.4 E-logistic Performance and Information Communication Technology (ICT)

E-logistic known as Internet-Enabled Logistics (Gunasekaran et al., 2007) which consists of several tools used by most of the companies accessible through the internet. According to Barcik and Jakubiec (2012), all these tools comprises of several electronic platforms, electronic catalogue,

internet portal, transactions systems, communication tools, data warehouses, systems of selling purchasing and other software's for planning, supply chains, and e-learning systems. However, this whole system is only possible by the help of information communication technology (ICT).

Inclusion of information communication technology (ICT) in e-logistics increase the efficiency of e-logistic services and decrease the error rate by enhancing the effectiveness of overall process which impact positively on e-logistic performance. Because electronic logistic depends heavily on information technology. Moreover, information communication technology (ICT) provides a competitive advantage by differentiation in e-payment services and staff service quality.

The investment in information communication technology (ICT) and its implementation is essential (Evangelista, 2013). Various previous studies focused on the applications of information communication technology (ICT) and found that it has a vital role for e-logistic system (e.g., Berglund et al., 1999; Larson & Gammelgaard, 2001; Peters et al., 1998; van Hoek, 2002). It has also a significant positive impact on staff service quality.

Finally, above discussion denotes that, information communication technology (ICT) has an important link with e-logistic performance. To increase the performance of e-logistic, information communication technology (ICT) is key element. It increases the efficiency by managing most of the operations through internet and enhances the effectiveness.

Additionally, information communication technology (ICT) has significant relationship with any online activity (Shih et al., 2006). As e-logistic is one of the online activity, therefore, information communication technology (ICT) has significant relationship with e-logistic performance. Hence;

H3: There is a significant relationship between information communication technology (ICT) and e-logistic performance.

3. Methodology

Choice of appropriate technique for the analysis is in accordance with the type of problem of the research and objectives of the study. This research study is identifying the determinants of e-logistic performance. Therefore, by considering the problem statement and objectives of the study, the current research study following the quantitative approach and based on descriptive research design. As the "descriptive design is to develop the respondent's opinions and views about the phenomenon under study" (Burns & Grove 1993; pp. 293). However, it is a cross sectional research study.

As the current research study is focusing on the e-logistic performance in Pakistan that is the reason the population of the study from all the managerial employees of e-logistic companies. Data were collected from the managerial employees of e-logistic companies by area cluster sampling. The whole area of Pakistan was divided into 20 clusters and 10 clusters were randomly selected for data collection. According to Sekaran & Bougie (2013), if the population is spread on wide area, then the area cluster sampling is suitable technique.

Comrey and Lee (1992) defined sample in a series for inferential statistics. According to this series sample having less than 50 participants will observed to be a weaker sample; sample of 100 participants will be weak; 200 will be satisfactory; sample of 300 will be considered as a good sample size; 500 very good, however, 1000 will be excellent. Hence, by following the Comery and Lee (1992) series, 500 sample sizes were selected.

Survey was conducted to collect the data. Questionnaires were distributed among the managerial employees of e-logistic companies in Pakistan. Questionnaire was divided into two

sections. First section was covered the descriptive statistics and second section was covered the main variables namely, staff service quality, e-payment, information communication technology (ICT) and e-logistic performance.

Out of 500 questionnaires, 396 questionnaires were received, and response rate was 79% which is sufficient to precede the analysis. Furthermore, SPSS version 21 was used to analyze the data. Missing value analysis, normality test, correlation and regression analysis were performed to test the study hypothesis.

3.1 Measurement

E-logistic performance measured based on efficiency, effectiveness and differentiation. Staff service quality measured with the help of communication skills of staff, attitude and timely delivery. E-payment measured through security, trust, privacy and ease to use. Finally, information communication technology (ICT) measured based on rapid adoption of needs, security for business transaction, communication with customers and supplier.

3.2 Reliability

Results of reliability analysis are shown in Table 3. The value of Cronbach's alpha (α) Alpha should be equal to or more than 0.7 for all scales (Nunnally, 1978). The results of reliability test show that all values are more than 0.7. Thus, it shows that all the items are reliable to measure the opinion of respondents.

Table 2: Reliability of Instruments

<i>Scales</i>	<i>Items</i>	<i>Cronbach Alpha</i>
Staff Service Quality	5	0.890
E-Payment	7	0.814
ICT	6	0.754
E-Logistic Performance	8	0.840

4. Results and Analysis

4.1 Profile of the Respondents

Demographic information of respondents such as gender, age, income and education level is given below in Table 3.

Table 3: Profile of Respondents

<i>Variables</i>	<i>Category</i>	<i>Frequency</i>	<i>Percentage</i>
	Male	310	78
	Female	86	21.7
Age (Years)	20-25 Years	12	3
	26-30 Years	82	20.7
	31-35 Years	110	27.7
	36-40 Years	138	34.8
	Above 36 Years	54	13.6
Income (PKR)	Below 30,000	70	17.6
	30,000-40,000	99	25
	40,000-50,000	86	21.7
	50,000-60,000	75	18.9
	60,000-70,000	43	10.8
	Above 70,000	23	5.8
Education	Matriculation	05	1.2
	Intermediate	28	7
	Bachelor	118	29.7
	Master	161	40.6
	MPhil	69	17.4
	PhD	15	3.7

4.2 Missing value analysis and Normality test

By the help of missing value analysis, it is confirmed that data is complete, and no missing value exists in whole data. To insure the normality of data, normality test was conducted. Skewness and Kurtosis value was observed to examine the normality of data. Skewness value must be within ± 1.0 and Kurtosis must be within ± 3.00 (Meyers et al., 2006). It is observed that all the values are in recommended range. Therefore, the data were normally distributed.

4.3 Correlation Analysis

By the help of correlation analysis, it is found that e-payment and information communication technology (ICT) has strong correlation with correlation values 0.55 and 0.6 respectively. However, staff service quality has moderate correlation, as the correlation value of staff service quality is 0.4. Furthermore, all the variables have positive correlation.

4.4 Multiple Regression Analysis

Multiple regression analysis is used to check the relationship between dependent variable and independent variables. To accept or reject the hypothesis, beta value and significant value ($p > 0.01$) is observed

4.5.1 Hypothesis Testing

Staff Service Quality and Information Communication Technology (ICT)

Regression results found that $\beta = 0.34$ and $p < 0.01$. It means that staff service quality and information communication technology (ICT) has significant positive relationship with each other. Moreover, beta value shows that e-payment contributing 34%. Hence, these results validating the H1. Thus, H1 is accepted.

E-Payment and Information Communication Technology (ICT)

Regression results found that $\beta = 0.661$ and $p < 0.01$. It means that e-payment and information communication technology (ICT) has significant positive relationship with each other. Moreover,

beta value shows that e-payment contributing 66%. Hence, these results validating the H2. Thus, H2 is accepted.

Information Communication Technology (ICT) and E-logistic Performance

Regression results found that $\beta=0.70$ and $p<0.01$. It means that information communication technology (ICT) has significant positive relationship with e-logistic performance. Moreover, beta value shows that information communication technology (ICT) contributing 70%. Hence, these results validating the H3. Thus, H3 is accepted. Table 3 summarizes the regression results of the current research study.

Table 4: Regression Results

<i>Hypothesis</i>	<i>Model Variable</i>	<i>Estimate</i>	<i>S.E.</i>	<i>C.R.</i>	<i>p</i>	<i>Results</i>
H1	ICT \leftarrow SSQ	0.34	0.049	6.938	***	Supported
H2	ICT \leftarrow EP	0.661	0.054	12.24	***	Supported
H3	ELP \leftarrow ICT	0.74	0.052	13.46	***	Supported

Where SSQ = Staff Service Quality, EP = E-Payment, ICT = Information Communication Technology
ELP = E-Logistic Performance

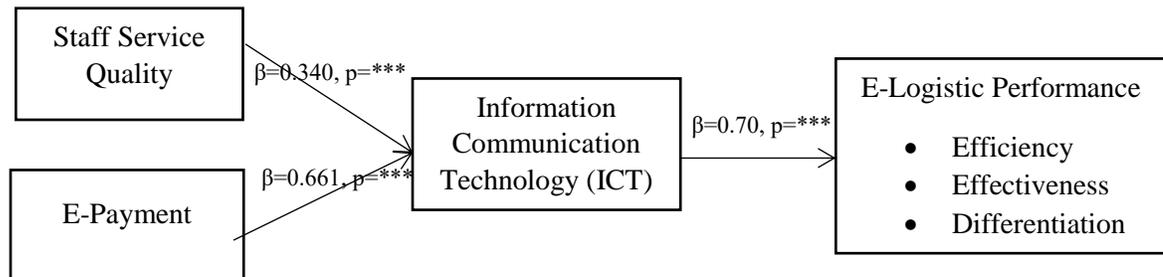


Figure 2: Results of Model

4.6 Research Findings

It is evident from literature, many factors contributing in the e-logistic performance. Apart from all other factors, staff service quality, e-payment and information communication technology (ICT) have more contribution in e-logistic performance. Therefore, these three factors are the indicators of e-logistic performance. Additionally, study found that information communication technology (ICT) is a mediator between the relationship of staff service quality and e-payment with e-logistic performance.

The current study found a significant positive relationship between staff service quality and information communication technology (ICT). Results of analysis shows that $\beta=0.34$ and $p=0.00$. P-value showing a significant relationship and positive beta value showing direct relationship. Both variables have direct relationship with each other. Moreover, the beta value showing that staff service quality contributing 34%. Additionally, correlation analysis showing a moderate correlation having value 0.4.

In case of e-payment, it is found that e-payment has significant positive relationship with information communication technology (ICT). Results of the study found a significant relationship with $p=0.00$ and $\beta=0.661$ showing a direct relationship with information communication technology (ICT). It indicates that e-payment contributing 66%. However, correlation analysis showing strong correlation value which is 0.55.

Finally, current study found that information communication technology (ICT) has significant positive relationship with e-logistic performance. It means that it has significant

positive relationship with e-logistic efficiency, effectiveness and differentiation. Correlation value is 0.6 showing a strong correlation. On the other hand beta value ($\beta=0.7$) showing the direct relationship with e-logistic performance and information communication technology (ICT) contributing 70%. Significant value is less than 0.01 ($p<0.01$) which is equal to 0.00 ($p=0.00$).

5. Discussion

Ding et al. (2012), conduct a study on Chinese logistic service providers (LSPs). He performed this study by examining total 76 valid responses. According to this study information communication technology (ICT) has significant relationship with performance. He found that information communication technology (ICT) strengthen the relationship of performance and distribution. It means that information communication technology (ICT) enhances the performance of e-logistic by facilitating the process of distribution such as delivery. In the current study distribution or delivery is also one of the measure of staff services quality. In the same direction, the current study found a significant relationship with information communication technology (ICT) and e-logistic performance. Hence, the current study is in line with the findings of Ding et al., (2012).

Hua & Jing (2015) conducted an empirical study on e-commerce logistics service quality and customer satisfaction. He found a significant positive relationship between e-logistic satisfaction and delivery service quality. In the current study, delivery is one of the measures of staff service quality. Findings of the study revealed that staff service quality has significant positive relationship with e-logistic satisfaction. Hence, this study is also in line with current study.

However, Hua & Jing (2015) found an insignificant relationship of communication service quality with e-logistic customer satisfaction. Nevertheless, Kim et al., (2010) found that e-payment is one of the trustworthy and secure process which has significant impact on e-logistic in respect to the customers. It means that it has significant positive impact on e-logistic performance, as customer satisfaction is one of the determinants of e-logistic performance.

Finally, the current research study is validating the results of previous studies. Hence, from the above discussion, it is concluded that the current research study is consistent with most of the prior studies on e-logistic.

6. Conclusion

The current research discloses that staff service quality, good e-payment system and information communication technology (ICT) are the indicators of e-logistic performance, particularly in Pakistan. Due to the rapid growth of e-logistic practices, information communication technology (ICT) has major role for better performance. E-logistic Staff service quality can be improved by the help of information communication technology (ICT). As, information communication technology (ICT) provides a better system to communicate with stakeholders and it provides a good system for staff of e-logistic to provide information's in a systematic way. Because it has a significant positive relationship with staff service quality. Moreover, e-payment is only possible with the help of information communication technology (ICT). It provides privacy and security while payment for goods which satisfy the customers and increases the performance of e-logistic companies. Mainly, improvement in information communication technology (ICT) improves the e-logistic performance. More the investment in information communication technology (ICT) more will be the e-logistic performance. Furthermore, information communication technology (ICT) facilitates the process of e-payment and improves the staff service quality which automatically impact positively on the performance of e-logistics companies.

Sufficient investment in information communication technology (ICT) is recommended to the e-logistic companies. E-logistic companies should introduce latest information communication technology (ICT) to improve the performance. Therefore, introduction of latest information technology for the payment of e-logistic goods and to improve the staff service quality is vital for e-logistic companies.

Finally, the current research study opening new ways of research in the field of logistics. This research study can be improved by including other performance indicators such as electronic tracking system of logistic goods and delivery time. However, the user acceptance is important which can be used as moderator in current research framework.

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