

Assessing the Level of Information Quality in Supply Chain Management in Vlore, Albania: a Statistical Analysis

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Abstract — nowadays information flow between supply chain partners is very important. Information sharing has become simpler due to information technology development, but it is very important that this information should be qualitative. The aim of this study is to estimate the level of information quality among SMEs located in Vlore city, Albania. The objectives of this research are: to identify the information technologies that are used by companies, to assess the level of information quality and to identify the company characteristics like experience, number of employees, sector, etc., that impact the level of information quality. Information quality is measured in terms of accuracy, timeliness, completeness, adequacy and reliability. The target population is composed of all small and medium enterprises operating in Vlore city, Albania. A questionnaire was distributed to top managers of targeted companies during November 2015. Statistical methods are used to analyse the data. It is found that the role of company in the supply chain was positively related with the level of information quality. The findings of this study provide useful information for business managers and IT specialists.

Keywords — information technology, information quality, cronbach's alpha, chi-square test, logistic regression.

I. INTRODUCTION

The development of Information Technology (IT) in supply chain management (SCM) facilitates the exchange of qualitative information between partners in the supply chain. Companies have realized that nowadays it is not enough to improve their internal efficiency, but their whole supply chain has to be made competitive. Since proprietary and confidential information is usually communicated along the supply chain, the preservation of the quality of the exchanged information is a crucial issue [1]. Today there are numerous technologies and softwares used in this field. EDI, bar codes, LAN, email, word processing, sales/marketing softwares and websites are included in our study.

The importance of Information Quality (IQ) in Supply Chain Management (SCM) it's discussed in many scientific researches ([2]-[6]). According to [3] and [5], information quality is a vital component for organizational success in companies. In order to improve supply chain performance, managers need qualitative information to take operational, tactical

or strategic decisions. Access to relevant information would enable firms to reduce uncertainty and improve planning which in turn improves their profitability [2].

Different studies have used different attributes to measure the quality of information. In their study, [7] noted that the quality of information shall include these attributes: accuracy, timeliness, suitability and reliability of shared information. Similar attributes are used in studies of [3] and [8]-[10]. In this study information quality it is measured in terms of accuracy, timeliness, completeness, adequacy and reliability.

Previous findings indicate that information quality has a positive impact in the whole supply chain performance ([1]-[3], [5], [6] and [10]). Commonly, organizations with high levels of information quality and information sharing are associated with high level of top management support and IT enablers, low level of environmental uncertainty, and high level of inter-organizational relationships [3].

In the first part of this study is introduced the material and used methods, in the second part the results and discussions are summarized, and finally the conclusions drawn from this study are presented.

II. MATERIALS AND METHODS

The population of the study consists of all the Small and Medium-sized Enterprises (SMEs) operating in Vlore City, Albania. In total, 150 questionnaires were randomly distributed to top managers, executives and IT specialists of targeted companies during November 2015. Only 44 questionnaires were returned and were useful for the data analysis, representing a response rate of 29.33%. The questionnaire included questions about: company profile, supply chain and supply chain management, information technology used by companies to manage their supply chain and the level of information quality.

This study measures the level of information quality of SMEs under study with their supply chain partners. All the items for assessing the level of information quality were adopted from the study of [3] and [10]. The five items were measured on a 1 to 5 Likert scale from 'strongly disagree' to 'strongly

agree'. Each item was subjected to reliability analysis. The Cronbach's alpha coefficient of internal consistency is used to determine that the items comprising the information quality variable produced a reliable scale. A higher score of Cronbach's alpha coefficient indicate a higher reliability, with a range from 0 to 1. The generally agreed upon lower limit of Cronbach's alpha is 0.7 [11].

The descriptive analysis, the chi-squared test of independence and logistic regression are used to analyze the data.

A company was considered with high level of information quality if the average value of information quality items is equal or higher than the overall mean of the sample.

The chi-square test for independence of two variables is a test which uses a cross classification or contingency table to examine the nature of the relationship between these variables. A limitation on the use of this test is that the sample sizes must be sufficiently large to ensure that the expected number of cases in each category is five or more. The test statistics is [12]:

$$\chi = \sum_{i=1}^n \sum_{j=1}^m \frac{f_{ij} - p_{ij}}{p_{ij}}^2$$

Where n indicates the number of columns and m the number of rows of the contingency table; f_{ij} are observed frequencies in the ij cell of the $n \times m$ contingency table, whereas p_{ij} are expected frequencies in the ij cell if the null hypothesis of independence was true. The null hypothesis of independence of two variables is rejected at the level of significance 5%, if p -value is lower than 5% [12].

A logistic regression model with a dichotomous response was modelled. The logistic regression equation has the following form [13]:

$$\ln\left(\frac{p}{1-p}\right) = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_k x_k$$

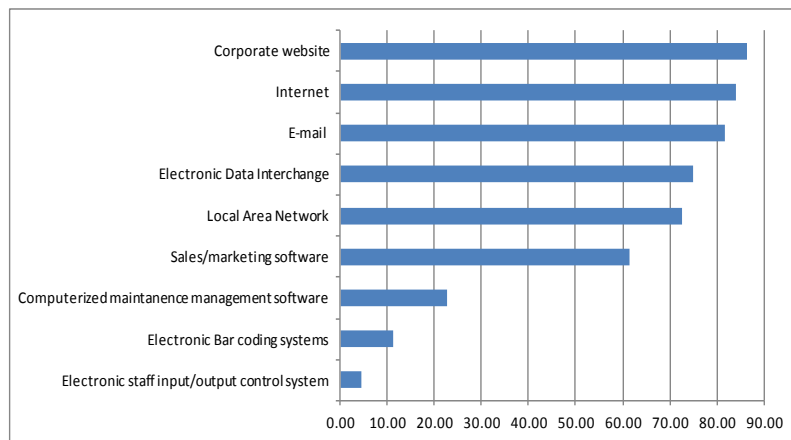


Fig.1 IT tools usage

The chi-square test of independence was used to evaluate the relation between the level of information quality with companies' characteristics and their role in their supply chain. A company was

Where p is the estimated probability of high level of information quality for the company and x_1, x_2, \dots, x_k are the independent variables of the model.

The estimated probability of the response occurring (p) divided by the probability of not occurring ($1-p$) is called the odds ratio. Values of odds ratios higher than 1 indicate positive association between the variables, odds ratios equal to 1 indicate no association, while odds ratios lower than 1 indicate negative association between each independent variable and the dependent variable of the model.

STATA15 was used to analyze the data.

III. RESULTS AND DISCUSSION

About 77% of the companies in the sample operate in the service sector, 40% of them have at least 10 years of experience, half of the companies have 10 or fewer employees, and about 51% of them are local businesses. Also about 75% of companies are retailers, 25% are producers and 88% of them share information electronically with members of their supply chain.

Fig. 1 shows the percentage of usage of some IT tools. The results indicated that more than 70% of the companies used Local Area Network, Electronic Data Interchange, Internet, E-mail and Websites. Less than 20% of companies in the sample used Electronic bar coding systems and electronic staff input/output control systems.

More than 52% of targeted companies uses website for online ordering. About 30% of companies receive online complaints and more than 18% have links or references to the enterprise social media.

considered a user of IT tools when it uses all four IT tools: e-mail, internet, company website and Electronic Data Interchange.

The results of Table 1 indicate that there were significant relations between business expansion at 5% level, and between the role of the company in their supply chain (retailer) at 1% level, and the level of information quality with members of supply chain. Experience, business sector, number of employees and the use of IT tools were not significantly related to the level of information quality at 5% level.

TABLE I. RESULTS OF CHI-SQUARE TEST (BINARY VARIABLE: INFORMATION QUALITY)

Variable	Chi-square value (df)	p-value
Service sector	5.77 (1)	0.016
Local business	2.12 (1)	0.146
Number of employees	0.11 (1)	0.741
Experience	0.48 (1)	0.488
Retailer	8.19 (1)	0.004
IT user	1.80 (1)	0.180

The correlation coefficients between independent variables of the logistic model were assessed to check for the problem of multicollinearity (Table 2). The service sector was highly correlated with the variable retailer ($r = 0.939, p < 0.01$).

The results of Table 3 indicate that all the items of the variable information quality have an average higher than three and that the item about reliable information has the highest average of 4.72. Only two items have Cronbach’s alpha value higher than the generally accepted lower value of 0.7.

TABLE II. RESULTS OF CHI-SQUARE TEST (BINARY VARIABLE: INFORMATION QUALITY)

Variable	1	2	3	4	5	6
1.Service sector	1.000					
2.Local business	0.563*	1.000				
3.Number of employees	- 0.217*	-0.303*	1.000			
4.Experience	- 0.319*	-0.124*	-0.047*	1.000		
5. Retailer	0.939*	0.563*	-0.157*	-0.350*	1.000	
6.IT user	0.350*	0.066*	0.140*	0.041*	0.296*	1.000

Note: * $p < 0.05$

TABLE III. LEVEL OF INFORMATION QUALITY

Items	Mean	Standard deviation	Cronbach’s alpha
Information exchange between our trading partners and us is timely .	3.77	0.86	0.85
Information exchange between our trading partners and us is accurate .	4.56	0.69	0.60
Information exchange between our trading partners and us is complete .	4.52	0.69	0.62
Information exchange between our trading partners and us is adequate .	4.52	0.70	0.65
Information exchange between our trading partners and us is reliable .	4.72	0.54	0.66
Information quality (all items)	4.38	0.48	0.73

The results of binary logistic regression model 1 (Table 4) indicated that the model was not statistically significant (LR chi2 (4) = 6.94, $p = 0.13$). The value of Pseudo-R² was 13.64% and the percentage of cases correctly classified was 76.74%. According to [11] the classification accuracy should be at least 25% greater than that achieved by chance.

The odds ratios of the model 1 indicated that the level of information quality was positively related to the role of the business in the supply chain, that is, retailers were more likely to have information with quality. Other independent variables were not significant at 5% level. Although non-significant, the number of employees, experience and local oriented business were positively related with the dependent variable, the level of information quality.

The results of model 2 indicated that the model was not statistically significant (LR chi2 (5) = 7.27, $p = 0.2$). The value of Pseudo-R² was 14.27% and the percentage of cases correctly classified was 76.64%. The odds ratios of the model 2 indicated that the level of information quality was not significantly related to the company characteristics at 5% level.

For both binary logistic regression models, the results indicated that the level of information quality was positively related to the role of the company in the supply chain at 10% level, whereas the other variable were positively but not significantly related to the level of information quality.

TABLE IV. RESULTS OF BINARY LOGISTIC REGRESSION (DEPENDENT VARIABLE: THE LEVEL OF INFORMATION QUALITY)

Dependent variable	Model 1		Model 2	
	Coefficient	Odds ratio	Coefficient	Odds ratio
Business Expansion				
Local	0.157	1.170	0.254	1.289
National/International		1.000		1.000
Number of employees				
Ten or least	0.633	1.000	0.522	1.000
More than ten		1.884		1.685
Experience				
Ten years or least	0.418	1.000	1.879	1.000
More than ten years		1.520		1.410
Retailer				
Yes	2.170	8.762**	1.879	6.540***
No		1.000		1.000
IT user				
Yes			0.473	1.605
No				1.000
Constant	-1.234	0.291	-1.234	0.106
LR chi-square (df)	6.94 (4)		7.27 (5)	
% correctly classified	76.74		76.74	
Pseudo-R ²	13.64%		14.27%	

Note: * $p < 0.01$, ** $p < 0.05$, *** $p < 0.10$

IV. CONCLUSIONS

The findings of this research provide useful information for companies in the study, as it is assessed which characteristics of the companies and also if the usage of IT tools influence statistically the level of information quality in their supply chain(s). The results of descriptive analysis indicate more than 70% of the companies in the sample used Electronic Data Interchange, and more than 80% used Internet, E-mail and their websites.

The results of the chi-square test indicated that there were significant relations between business expansion, and between the role of the company in their supply chain (retailer), and the level of information quality with members of supply chain. Both binary logistic regression models indicated that the variable retailer, this mean the role of the company in the supply chain, significantly impact the quality of information that is shared between members of the supply chain.

This study has some limitations. Firstly, the study identifies some characteristics of companies and the usage of IT tools that may influence the level of information quality. However, other factors can influence the level of information quality. Secondly, the sample was small and do not cover all the SMEs operating in Vlore City, Albania.

In the future, the research must be performed to identify other factors that can influence the level of information quality such as: security, trust, culture, information, etc. and also the sample size must be increased to use other multivariate statistical methods.

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REFERENCES

- [1] C. Marinagi, P. Trivellas and P. Reklitis, "Information Quality and Supply Chain Performance: The Mediating Role of Information Sharing", *Procedia-Social a Behavioral Sciences*, vol. 175, pp.473-479, Feb. 2015.
- [2] Roaimah Omar, Ramayah T., May-Chuin Lo, Tan Yen Sang and Rusinah Siron, "Information sharing, information quality and usage of information technology (IT) tools in Malaysian organizations", *African Journal of Business Management*, vol. 4(12), pp. 2486-2499, Sept. 2010.
- [3] Li S, Ragu-Nathan B, Ragu-Nathan TS and Rao SS, "The impact of supply chain management practices on competitive advantage and organizational performance", *Omega International Journal of Management Science*, vol. 34: pp.107-124, Sept. 2004.
- [4] Rabren J, "Technology, Integration and Data Drive Supply Chain Visibility. Material Handling Management", *Retrieved Business Source Complete database*, vol. 65(3), pp. 42, 2010.
- [5] Miller H, "Information quality and market share in electronic commerce", *Journal of Services Marketing*, vol. 19(2), pp. 93-102, 2005.
- [6] Raghunathan S, "Impact of information quality and decision-maker quality on decision quality: a theoretical model and simulation analysis", *Decision Support Systems*, vol. 26, pp. 275-286, 1999.
- [7] Monczka RM, Petersen KJ, Handfield RB and Ragatz GL, "Success factors in strategic supplier alliances: The buying company perspective", *Decision Sciences*, vol. 29(3), pp.553-577, 1998.
- [8] Forslund, H. and Jonsson, P., "The impact of forecast information quality on supply chain performance", *International Journal of Operations and Production Management*, vol. 27(1), pp. 90-107, 2007.
- [9] Moberg CR, Cutler BD and Gross A, Speh TW, "Identifying antecedents of information exchange within supply chains", *International Journal of Physical Distribution and Logistics Management*, vol. 32(9), pp.755-770, 2002.
- [10] S.Li and B. Lin, "Assessing information sharing and information quality in supply chain management", *Decision Support Systems*, vol. 42, pp.1641-1656, 2006.
- [11] J. F. Hair, W. C. Black, B. J. Babin and R. E. Anderson, *Multivariate Data Analysis*, 7th ed., 2009.
- [12] Aczel. A.D., *Complete Business Statistics*, Wohl Publishing, 8th ed., 2012.
- [13] Hosmer D.W., Lemeshow S. and Sturdivant R. X., *Applied Logistic Regression*, 3rd ed., Wiley Publication, 2013.