MODELLING THE DOCUMENTATION FLOW IN TRANSPORT SUPPLY CHAIN - RESULTS FROM THE SIMULATION EXPERIMENTS

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Summary:

The focal point of interest in the research was directed towards the communications flows within the logistics value chain, since the influence of the electronic commerce technologies has become more and more evident. In order to be able to define the characteristics of the system, these researches were primarily oriented to the analysis of the communications and interorganization links of the transport logistics value chain. However, the technical characteristics of the already existing information technologies have been pointed out in order to determine what is the real value that the electronic commerce technologies have within the transport logistics value chain.

Simulation has been used to define economic behavior of the model and its entities for two generic case studies – usage of the electronic and paper documents. The only difference in the models are different times to perform the activity.

The results show that electronic documents can decrease the transaction costs Electronic documents diminish the time used to obtain, create the documents, and thus the costs are decreased. For one shipment (total of 103 documents) electronic documents are 39% cheaper, then paper documents.and the difference between the electronic and paper documents is 295.44$ for one set of 103 documents in one shipment. It is interesting result that the dependence of the supply chain network on the government is minimal. Usage of the electronic documents diminishes the importance of the government further by 73%.

INTRODUCTION

Transport logistics cannot in authors' view be solved with Internet paradigms already in use. Interactive shopping will introduce big changes in transport sector. Shopping would be done all over the world, and usually every thing would be bought from separate merchant possibly in different countries. This will conduct to smaller packages; smaller quantities of the same goods, but increasingly bigger amount of transported goods. Every package has to be accompanied by the same amount of documentation. The emerging growth of documentation mass will ask for new models of transport logistics. Quantity of the documentation, and need for efficiency will demand strategic alliances, between involved parties. This will be very difficult task to achieve. Nowadays, there are more than 30 different parties involved in international transport. They are interchanging between 200 different types of document among them. Interactive communications using WWW are obsolete in this domain, because of the amount of documents and often lack of time.

There is no single theoretical perspective that explains the impact of electronic commerce on interorganizational relationships; existing approaches tend to be too narrow to address the complexity of the observable phenomena. Therefore, this study develops a

multidisciplinary framework for a more comprehensive understanding of the role of electronic commerce (EC) and related technologies. The framework is being applied in the context of a comparative case analysis of supply relationships in the transport industry. The framework acts as a foundation to examine the production network of supply relationships for international transport.

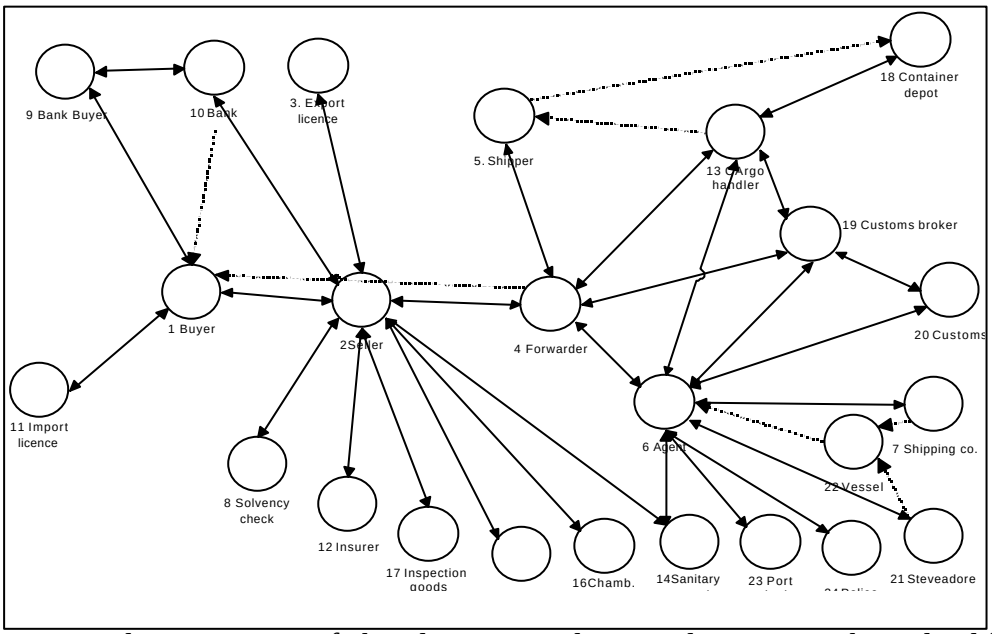
Taking network perspective, rather than individual dyadic relationships, offers significant insight at the cost of considerable complexity. To cope with the complexity, we defined our organization-set as a series of focal networks comprising the document, material and cash flow.

THE RESEARCH MODEL

The structure of a very complex system cannot be represented in one diagram, as such a diagram would be far too large and convoluted. The research model represented in figure 1 consists from 24 different generic companies with 103 generic documents interchanged. In order to keep the model relatively small a number of the companies and documents have been excluded.

There was also the problem of recognizing generic companies involved in the process, because of the differences in various countries. The customs broker or customs agent, for example, exists in some countries and it is a part of freight forwarder in other countries.

Figure 1. Network representation of the model



Simulation has been used to define economic behavior of the model and its entities for two generic case studies – usage of the electronic and paper documents. The only difference in the model is different time to perform the activity. For obvious reasons the time has been generated using the continuous distribution bounded on the lower side. Bounding of the distribution has been introduced because there has to be a minimum time for processing (retrieving, reading, processing, printing and sending) the document. From a multitude of the distributions a log-logistic distribution was chosen. A bound time of 5 minutes for electronic documents was chosen, and 30 minutes for classic documents. The costs of each document processing in model has constant value of 0.5$, and variable cost of 10$ per hour. Variable cost is dependent on the processing time and indicates, in accordance with a US freight transport statistics, a yearly income of 24 000 $.

THE RESULTS

The results show that electronic documents can decrease the costs. Electronic documents diminish the time used to obtain, create the documents, and thus the costs are decreased. For one shipment (total of 103 documents) electronic documents are 39% cheaper, then paper documents. The difference between the electronic and paper documents is 295.44$

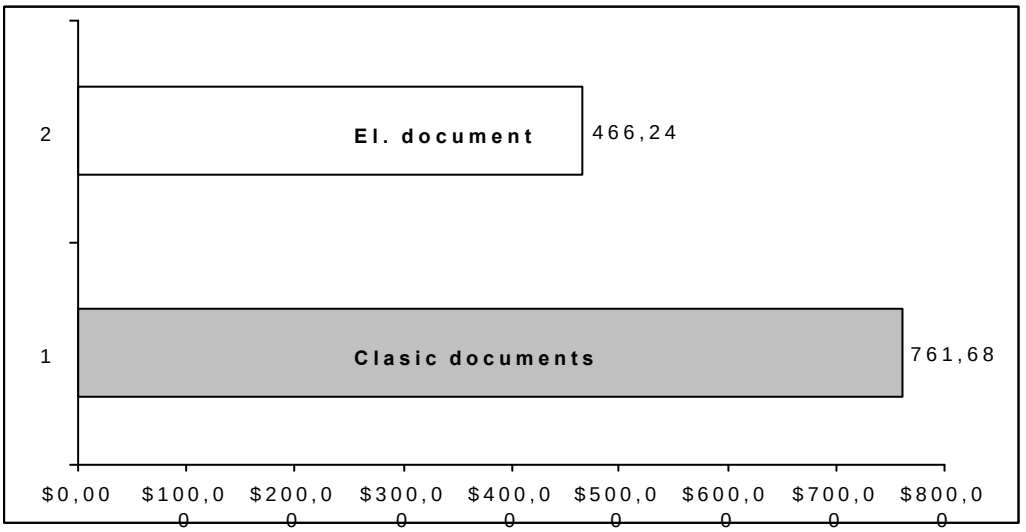
	Total time [min]	Total cost [$]
Average	3048,47	466,24
St. Dev.	36,79	5,41
99% confidence lower bound	3010,66	460,68
99% confidence upper bound	3086,28	471.80

for one set of 103 documents in one shipment. The difference in time is equal to 33 hours and 22 minutes.

	Total time [min]	Total cost [$]
Average	1721,235	270,073
St. Dev.	13,33172	2,25480
99% confidence lower bound	1711,698	268,460
99% confidence upper bound	1730,772	271,686

Table .1. Results for electronic documents

Table .2. Results for classic documents



Picture 2. Model 1. Electronic and clasic documents costs

The simulation has been introduced for all significant generic organizations, but the succinct of this paper does not allow us to present all the results. The most attractive results are perceived from the simulation of the grouped correlated organizations.

It is interesting result that the dependence of the supply chain network on the government is minimal. The government is represented by consulate, export and import licensing, health control, chamber of commerce, export and import customs, port authority and police. The government influence is 5,52% (42,03$) on the total cost. Usage of the electronic documents diminishes the importance of the government by 73%.

Main importance, from the research is contributed to port surrounding area – port community (agent, stevedore, health control, export and import customs, port authority, police, customs broker, port authorities and vessel.) The results represent a total of 181,95$ savings if all the companies situated around the port use electronic documents. The proportion of the port community in the cost of the documents is 29%.

Using these research findings one can very easily calculate the data for the cost- benefit analysis. Taking in a count the computer costs (1 mil $ for investment), the software costs (4200$ each computer and programs) and the labor costs (50 000 $ per anum) the result is shown in the figure 2. Savings are over 10 mil $ for more than 50 000 shipments.

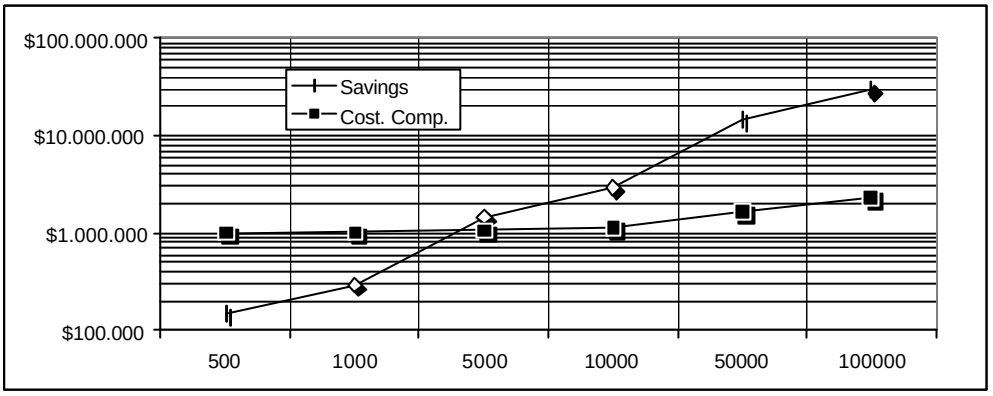


Figure 2. Costs and savings Vs number of shipments

CONCLUSION

The results have shown large savings with usage of the electronic documents. UNCID has estimated that the costs of the data flows associated with international trade to be between 4 to 7 % of the value of the goods, and that the complete distribution costs are up to 16% of the net value of the goods. This implies that the information data flow is from 25 to 47% of the transportation price. 39% of the decrease in the information cost flow leads to, as the transport consumes about 6 to 8 % of the GDP, the savings up to 1,46% of the GDP.

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