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Decision Support Systems: Usage And Applications In Logistics Services

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HIGHLIGHTS

- DSS consist of overall activities for logistics businesses in global competitive markets.
- DSS create meaningful information by modelling the complex data from logistics operations.
- DSS don't make a decision. DSS offer various information (choices) to decision makers.

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ABSTRACT

Competitive advantage in logistics operations is possible by analyzing data to create information and turning that information into decision. Supply chain optimization depends on effective management of chain knowledge. Analyzing data from supply chain and making a decision creates complex operations. Therefore, these operations require benefitting from information technology. In today's global world, businesses use outsourcing for logistics services to focus on their own field, so are seeking to achieve competitive advantage against competitors. Outsourcing requires sharing of various information and data with companies that provide logistical support. Effective strategies are based on well-analyzed the data and information. Best options for right decisions can be created only from good analysis. That's why companies that supply logistics services achieve competitive advantage using decision support systems (DSS) in industrial competition. In short, DSS has become driving force for every business in today's knowledge-based economy.

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Introduction

Today, with the help of information systems, logistic enterprises are able analyze sufficient amount of information and documentation to make a decision. However, decision support system (DSS) through data to information and information to decision, can get quite long and complicated. This complexity arises from the interaction of the complex and uncertain subsystems of logistics. DSS already taking advantage of the components of the existing databases, that will integrate decision-makers information with a synergistic way and using data models, to reduce the complexity and able to deliver the solutions to the problems⁽¹⁾.

It should be reminded that DSS never ma-

kes a decision. DSS offers various information (choice) by analyzing data to make the best decision. Decision-makers examines the options and try to make the best choice. It is not always easy to make a decision in logistic operations management. Therefore, in complex systems such as logistics in which information systems is difficult to define, DSS provides kind of logistical support to the decision-makers. DSS is important in today's competitive environment to take the right decisions⁽¹⁾.

DSS is important not only for logistic operations enterprises but also for manufacturing business as well. Business engaged in production should act carefully in supplier selection. Therefore, supplier selection is possible with

DSS based on multiple criteria ⁽²⁾.

Purpose and Method

This study investigates DSS in logistic processes worldwide by looking into which scientific methods used and important points.

Scientific databases and studies were reviewed and a compilation study is produced.

Logistics Information Systems

Considering global supply chain systems, it is necessary to work together in collaboration between 29 companies from 18 different countries even for a cup of coffee on our table. It is not possible to manage such extended and different complex processes without logistics information systems (LIS) ⁽³⁾.

DSS is used to meet customer demands and expectations in supply chain management. Decision support system is a must for special products supply chain. For example, historical artifact to be shown in a museum needs specified supply chain which will be developed considering specified criteria. Valuable diamond or an old cotton cloth would require different logistics planning and customer will demand special logistics planning for each item in a safe way ⁽⁴⁾.

DSS in Dangerous Goods Logistics

It is crucial to manage risks in dangerous goods logistics. Good risk management requires to be proactive. Being proactive requires to guess one step further, therefore benefiting from decision support systems at that point may prevent catastrophic accidents. Cargo volume in United States grow by 20% and road transportation covered 53.9% of these cargo volume. 89% of road accidents include dangerous goods. According to US Ministry of Transport data, yearly cost of these accidents is 31 million dollars while cost per accident is 80 thousand dollars. Therefore logistic information systems are important to prevent serious life and goods loss ⁽⁵⁾.

Decision support systems in dangerous goods logistics would provide suggestions

to decision makers about cost optimization, resource productivity, risk assessment, appropriate dangerous goods storage, low risk transportation, fast and effective evacuation in case of accident, lifesaving, environmental protection, road safety, emergency intervention and crisis management ⁽⁵⁾.

The most important part of LIS is to record data for long periods, organize the data and keep record of data for long time. Especially in Turkey, public institutions and companies don't pay enough attention to data storage and act secretive when it comes to sharing data with relevant bodies. It is not possible to perform data analysis without data, getting information from data and making a decision based on information. Therefore, database regulations should be done in Turkey both in public institutions and private sector.

Passenger Transportation and DSS

Traffic and transportation are the biggest problems in densely populated cities like Istanbul. Therefore use of idle capacity is important for passenger transportation and energy efficiency. Traffic jam increases fuel consumption however well planned logistics would provide savings in energy and increase efficiency of passenger transportation therefore it would make a positive impact on efficiency.

DSS may calculate passenger distribution against time and location to plan smart routing systems. Therefore, passenger transportation would be optimized and traffic density would be reduced while increasing energy efficiency ⁽⁶⁾.

DSS in Multimode Transportation Systems

Decision Support Systems in multimode transportation systems optimizes not only products and vehicles but also transportation modes as well. The most appropriate transportation mode is chosen while identifying transport mode according to product and client expectations. Choosing air transport-



tation for lightweight but valuable goods or choosing sea transport for heavy but less valuable goods might be an example of this. It may seem simple but it gets so complicated in logistics operations that without DSS it is not possible to offer an optimized solution.

The most important point for using DSS in multimode transportation systems is to synchronize databases for each transport mode and creation of a new database which cover all transportation modes. Therefore, conducting data analysis for whole of multimode system, DSS may provide right choices for decision makers ⁽⁷⁾.

Logistics Area Management and DSS

Area Management in logistics operations consist of important operations from container to port. Bad placement of goods in containers reduce container carriage efficiency while bad placement of containers on vessels may result in serious accidents even capsizing of the ship. Therefore, DSS covers various systems with different algorithms in storage, in containers, in ports and ships.

DSS in area management suggests optimal choices for decision makers by combining different and complex data such as product flow rate, product location planning, stacking plan, product label etc. ⁽⁸⁾.

DSS in Railway

Railways are complicated transport modes with its complex structure, multiple carriage and routing and railways need decision support systems to provide high efficiency and optimized solutions in cargo and passenger planning.

LIS in railways is used in both tactical capacity and operational capacity management for passenger and cargo transportation. Especially it is often used in;

- *Cargo and passenger capacity optimization
- *Identifying departure and arrival times
- *Railway and highway modes logistics adaptation
- *Railway harmonization
- *Energizing railway terminals
- *Price incentive applications

- *Developing and sharing information
- *Reducing unutilized capacity
- *Area and carriage capacity usage in 100% productivity⁽⁹⁾.

DSS in Highway

Highways have important role in transporting goods from point to point and most critical issues for highways are fleet, traffic and route management. In big cities with dynamic traffic density, product deliveries are coordinated and DSS became an integral part of highway logistics which is coherent with other modes. DSS enables fast food chains to supply needs of restaurants depending on emergency, to define priorities and plan routes easily. Therefore, company can focus on their main duties. Synchronized supply chain management is easily and frequently used in highway mode with simple interfaces in DSS. Other part of this process is planning transportation of products from macro logistical areas such as ports, airports, railway stations to storage area for distribution. This results in totality term in logistics with DSS and it reduces costs significantly. Therefore, product flow is planned, ABC analysis is performed in storage parallel to distribution and region specified for product is selected by help of DSS automatically⁽¹⁰⁾.

A research in Spain showed that route planning with the help of DSS reduces

- *distance by 7-12 %
- *costs by 9-11%⁽¹¹⁾.

DSS in Maritime

Petroleum and petroleum products are the most common cargo transported in the world. Therefore, in maritime operations, tanker routing and planning is an important problem. DSS is used for generally;

- *Demand forecasting
- *Line optimization
- *Freight identification
- *Cargo positioning
- *Container distribution
- *Added-value analysis

- *Ship and route compatibility
- *Ship and port compatibility
- *Ship stability
- *Cargo and tank compatibility
- *Ship capacity
- *Cargo delivery time
- *Cargo loading time
- *Port authority working hours
- *Stock limits
- *Fuel-oil consumption and purchase
- *Maritime related ecological limits⁽¹²⁾⁽¹³⁾.

On the other hand container positioning is crucial for vessel and cargo safety. False loading may risk ship stability and safety thus DSS provides significant support for decision makers on this aspect⁽¹⁴⁾.

Multivariate DSS enables to plan loading according to arrival port, ship type and age and ship route specialties in a short time⁽¹⁴⁾.

Conclusion

LIS provides decisions thorough analyzing variable information for cost optimization, flexibility, collaboration for common goals, speed, transparency, efficient communication, efficiency and client specified solutions in global competitive environment.

Logistical process totality is only possible with DSS for competitive advantage.

DSS provides fast and efficient solutions for instantaneous planning.

LIS enables decision makers to distribute risks and remove possible risks urgently.

Generally LIS relies on multinational sharing between companies which appears as strategic partnership, role sharing, model partnership and collaboration etc.

Multimode transportation solutions trigger fuel-oil type standardization, global logistic market, controlling all logistical activity from one point and global distribution from one point.

LIS is an overall system which creates added-value in strategic and tactical logistics operations.

Information based logistics systems emerged from LIS. LIS take logistics operations



parameters and turn them into organizational knowledge and experience which determines competitive strategies.

Information management systems are nothing without information and information is nothing without data. It is necessary to record data and store data in databases to transform data to information.

Some meaningless data for business may be useful for some other purposes. Therefore, it is important to store logistical operations data and analyze them when necessary to be competitive in global market.

In Turkey, data and database related studies are necessary not only for logistics but also

for all other fields. Regulations may provide vision for companies.

It is not possible for a business without understanding the power of data to compete with other business which performs data analysis with 98-99% accuracy predictions for the future. Economy depends on information and knowledge.

In near future, if not all, big part of service industry will depend on information technologies. Decision makers which provide global logistical services and aim to manage an efficient supply chain need to understand information management systems and develop DSS according to their business needs.

In the next 10 year, information systems will be crucial factors for variety of businesses in many sectors. Therefore, young and large fleet logistic service providers in Turkey need to understand the power of information technologies to be competitive. Numerical quantity is only numbers if they cannot make right decisions. Making right decisions will provide flexibility, velocity and efficiency to the numerical quantity and enable them to be competitive in global markets.

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