Application of Data Mining Technology in Modern Agricultural Logistics Management Decision

LIU Dejun, ZHANG Guangsheng
Shenyang Agricultural University, Shenyang, 110161
ldjldj@126.com

Abstract The modern agricultural logistics information-based networking and intelligent development demands data mining technology application. This paper introduces the significance of data mining in modern agricultural logistics and analyses the processes in data mining and the key technology regarding data warehouse and data mining technology as emphasis. In addition it pointed out that the data mining technology is becoming more and more powerful in the decision of modern agricultural logistics management.

Keywords data mining, the modern agricultural logistics, data warehouse

1. Preface

The agriculture logistics separated from the modern logistics system gradually, numerous scholars analyzed our country agriculture logistics development condition and run mode, and put forward the objective and rigorous development strategy and suggestion, becoming the foundation of the decision maker and posterity. The data mining technology was regarded as high value by the domestic and international enterprise, academic field and the government. Making use of data mining technique can provide more valid method and path for the decision maker. As the concrete application of data warehouse technology, data mining digs out unknown valuable knowledge and rule from a great deal of data, these rules contain the particular contact of the data in the database and some useful information, and provide a basis for making management policy, drawing up strategy and making decision. It is the modern agriculture logistics development inevitable trend that studying the modern agricultural logistics management decision combining data mining technology.

2. The applied analysis of data mining in the modern agriculture logistics management decision

The modern information technical application is the essence difference between modern logistics and traditional logistics, therefore modern agriculture logistics also cans not get away from the computer network technique and information technology, and have a few basic characteristics as systematic, information-based, automation, networking, intelligent, standardized, acculturate. The agriculture logistics of China haven't take modern information technique as foundation still, haven't put transport, pack, store, circulate process, physical distribution, the information processing etc. together, become an efficiently, unimpeded comprehensive logistics system. In recent years, the information technology starts to be applied in the agriculture realm with development. But because of history and various reason of the modern development, for example the agriculture is neglected, the village population personnel's quality is lower, computer application is less, the information-based consciousness is not strong. Our country information-based degree of the agriculture logistics is very low, organic coordination logistics network system in our country have not yet constituted. So the application data mining in the modern agriculture logistics management decision being studied have much meaning.

2.1 The important function of data mining in the modern agriculture logistics management decision

The data mining technology applied in the modern agricultural logistics management decision can raise agricultural product circulating speed and lower logistics costing. The development of the modern logistics with large-scale distribution, quick speed the wide radiation noodles, high efficiency as
direction. Particularly to agricultural product, most products are fresh and lively, so it has very high request to time and fresh degree. Developing modern agriculture logistics and reducing circulate link can make good use of the professional modern conveyance tool to carry to consume place quickly and in time, and raise circulate speed of agricultural product and lower the agricultural product cost stored in the producing area. In the meantime it can lower the operating cost through large-scale operation, reduce breakage because of many times packed and unload, thus lower logistics cost available.

The application of data mining in modern agricultural logistics management decision can promote the professional logistics value added service and agricultural product value, it is the demand that raises international competition ability. Because of low value of the agricultural product it can develop professional third part agriculture logistics organization to Provide a professional logistics value added service for the agricultural product to discover the inside value of the agricultural product. The value added service includes to carry on a further deep process to the agricultural product, to provide standardized and rational packing, to provide a different storage condition according to the different request of the different product, to Provide the supply information in time, to distribute product reasonably, to make the agricultural product have reasonable moving etc. so as to promote agricultural product value from multi-layer and all-directions. In the reality, our country agricultural products not only lack a competition ability at quality and exterior but also consume high value and exhaust with the waste greatly in the period of circulation . The data mining applying in the modern agriculture logistics management decision is to make farmers agricultural product transported to the consumer through a low cost and high-efficiency logistics system . In addition, researching the application of data mining in the modern agriculture logistics decision is also the demand of developing the logistics industry and lowering the logistics cost. Two kinds of agricultural product logistics method in the international, the first form is constituting cooperative with farmers to engage in circulate market such as Denmark, New Zealand, Australia etc. The second form is that the broker or the business agent sign contract with the third part logistics the logistics business is engaged by the professional logistics company. Currently, two kinds of modes have not developed in our country. At the future society, the design and manufacturing of the logistics equipments and system have to abide by an unified international standard to carry out a high-efficiency logistics. Two kinds of modes have not developed in our country. At the future society, the design and manufacturing of the logistics equipments and system have to abide by an unified international standard to carry out a high-efficiency logistics. The application data mining in the modern agriculture logistics not only can carry out the logistics rationalization in the certain scope, thus save a great deal of logistics expenses, but also can economize a great deal of society fluxion funds to raise economic performance and social performance. Obviously, the perfection and development of modern agriculture logistics is necessary means of circulate internationalization and exaltation our country international competition ability compared with developed nations.

2.2 The information technology demand analyzes of the modern agriculture logistics decisions.

The development of the modern agriculture logistics is also with information-based, networking intelligent as characteristic, the data mining can promote the development of the modern agriculture logistics being applied in the modern agriculture logistics decision and the development of the modern agriculture logistics also requests a technical application of the data mining urgently. The development of the electronic commerce promotes the agriculture logistics of information-based, the agriculture logistics of information-based include: Agricultural product data information commercialization, the database of the agricultural logistics information, the electronic of agriculture logistics information handle, the standardize of agricultural logistics information deliver etc. Therefore, the advanced logistics information technique such as the code bar technology, database technique, GPS and GIS technique, the electronics data exchanges EDI technique, electronic order system, ERP etc. will get an extensive application in the management information system of agricultural logistics.

The agricultural logistics information-based development and the development of the electronic commerce make the networking of the agriculture logistics become inevitable. The networking of the agriculture logistics on the one hand is agriculture logistics enterprise, produce peasant household, agricultural product consumer go together with each other, the logistics enterprise according to own marketing scope and the target in agricultural product distribution and supply build up own logistics network system to exaltation the service quality and distribution efficiency of logistics system.
other hand it is the logistics information communication network among the agriculture logistics business enterprise, customer, agriculture produce unit. Under the propping of computers network each network node can realize the information exchanges and share.

The information-based, networking development of agriculture logistics produces intelligent demand of agricultural logistics, so the intelligence of the agriculture logistics is advanced application of the agriculture logistics information-based and networking. In the agriculture logistics management the agriculture management section, agriculture produce management unit, agricultural product distribution enterprise, peasant household all involve the problem of the strategy and the decision, for example agricultural product stock level, choice of transport route, the agricultural product management center etc. all these need to ask for help a great deal of management knowledge, experience and information to resolve. The intelligence of the logistics and then need to have the support of a series logistics information system, such as the logistics management expert system, the agriculture logistics estimate system, the agriculture logistics distribution center management decision system etc.

2.3 The advantage of data mining technology used in the modern agricultural logistics decision

Nowadays some logistics information systems provide for the governor common of the business processing data and simple analysis data, don't have the function of the data mining and knowledge detection, can't provide stereoscopic multi-view permeate data, can't even provide a latent information of have the estimate, can't satisfy manager timely need of logistics network in each layer. The agricultural logistics information system basing on data mining can withdraw the correspond business data to analysis, the analysis process can not escape from the logistics business enterprise and the customer's operation process, can overcome a great deal of subjective decision appearing in the decision of management, can avoid the creation cow whip effect. Data mining being applied to the agriculture logistics decision not only can enhance the function of the agriculture logistics system currently and carry out the adjustment of the logistics structure but also can establish effective control mechanism in the aspect of stock control, the agriculture logistics park area or logistics center design, transportation and distribution and so on to make the logistics system adapt the variety of the market and exalt the efficiency of system and accuracy of decision. Moreover the business enterprise leaders and government can convert their information to the basis of the decision to exalt decision ability, decision effect and decision accuracy. the data mining technology can also reduce decision subjective factor within process, overcome decision as one's pleases and blindness, reduce the economy lose because of decision error.

3. The realization of data mining applied to the modern agriculture logistics decision

3.1 The structure and the characteristics of the modern agriculture logistics information system basing on data mining technology

The structure of the modern agriculture logistics system basing on data mining mainly has a few parts to constitute as figure 1 shown:

(1) Customer port. The customer interviews system through the WEB interface of the HTTP agreement, This step can complete the search, goods of tracking, the stock information search, trades of requesting etc.

(2) The information processing platform. Various information of the logistics activity is collected, handled, delivered in this platform, and according to unified file format deposited a database.

Figure 1 Based on Data Mining Modern Agricultural Logistics Management System Architecture
(3) The database and data warehouse. Collecting all the inner and exterior data information in database relating to the business and choosing applied data of is applicable to data mining.

(4) The data mining module. Make sure the mission or purpose of the data mining according to the demand for make decision, and simplify, withdraw and pre-process related data in the data warehouse applying various model calculate way, excavate out valid information, rule or knowledge saved the knowledge storehouse from the simplified data.

(5) Management and decision support system. For manager and governor the system provide latest and most worthy knowledge, information to help them to make right and valid decisions.

One of Characteristics of the agriculture logistics system basing on data mining is organizing the manage data by adopting data warehouse technology. The method can describe completely various agriculture logistics data related each analytical object, can make all supply chain member's information combined together which lets peasant household, agricultural product distribution business enterprise, agriculture produce management unit biggest limit share information. The other characteristic of this system is storing history data of the long time period than database storage as an important characteristic of data warehouse technology, to carry on the estimate analysis of the long-term trend. In addition, of the agriculture logistics information system basing on data mining, the model database and knowledge storehouse are unify design and realization, the governor didn't need to study comprehensively the decision system, data warehouse and data mining knowledge, and carry on the choice exploitation to the knowledge very easily by visualization interface.

3.2 The realization of data mining in the modern agriculture logistics decision

3.2.1 The data mining process

The process of data mining in the modern agriculture logistics decision is as figure 2 shown.

3.2.2 Data source

The data source that the data excavation needs comes from the database of the logistics information system, the main data source has four mostly. The main business data, the main member information, the main management report, public information. The main business of agriculture logistics data is most of include farmers and operating unit distribution, agricultural output, demand, storage quantity, capital goods demand, supply quantity, each time volume of ordering, location and time of ordering, agricultural product and capital goods deliver batch, transport voucher, invoice and payment records etc. The main member information means what logistics enterprise member and farmers important information being not recorded in letter; they can provide important data concerning market need, sales forecasting, the market competition and capital goods procurement etc. The main operating report mainly is the finance report, the business report etc. The public information mainly means professional magazine, policy information and industry association research paper. These data mostly gathered in database which withdraw to handle, convert to process by data warehouse technology become the data source of the data mining.

3.2.3 The data preparation

The data preparation is important function to data mining which reprocess to the agriculture logistics system data, check the integrity and consistency of data, process to the inaccuracy and worthless data. The process of data prepare includes data integration, the data choice, and the data conversion. The data integration mainly withdraws and integrates data from several differences operability databases, documents, or remnants system. The data choice means choosing data from the database, and
recognizing data set need to be analyzed to narrow the scope of data mining, avoid blind search, and exalt data mining speed and quality. The data conversion is scouring treatment to the selected data before mining and guiding mining direction interactive mode by experts inputting interesting knowledge.

3.2.4 The choice of data mining tool

The hidden novel mode withdraw from the data set which through iterating and searching again and again with the appropriate data mining technology and algorithm basing on data mining task determined which is the knowledge that the customer need. The knowledge can represented with some particular way or methods, such as the association rules. The neural network, decision tree, cluster analysis technology, the association rule detection, sequence found, the BP algorithm are all data mining technology or algorithm.

3.2.5 The explanation and evaluation of the knowledge

The data mining gain may be not satisfied to the users, since the different data mining process get also different result. Carry on analysis to the information withdraw according to the decision purpose of the end customer and distinction the most worthy information, finally hand over decision maker through the decision support system .The process of explanation and evaluation is to percolation processing of information, which is to decide whether to deposit gained rules to knowledge base. If it can't produce meaning to the decision of users, that the data mining process repeated.

3.2.6 The customer interface and knowledge base

The usage of visualization technology and choice of suitable visualization tools make users confirm the reliability of discovered knowledge. The knowledge in the knowledge base of the saving related realm and the summary detective knowledge through the data mining method and the other science method, which are likely to be varied on the manifestation, such as chart or the rule representation, provide a strong decision support for the decision maker. The decision makers can understand the knowledge by visualization interface and do a decision.

4. The key technology of data mining realization in the agriculture logistics decision

4.1 Data warehouses establishment

The establishment of data warehouse is a key of data mining realization. The data warehouse establishes in relating to a database, but differs from the organization structure of the database system again. The traditional database withdrawing, collating and transformation to the data warehouse is the process of establish the star type or the snowflake type mode structure database in the servers of data warehouse management system, such as in the Server2000 of MS SQL. The logic name that establishes a main data document of database with the Create Database Wizard is a dw_data, the operation document is a dw_mdf. In addition the IBM, Oracle also all releases an own data warehouse solution one after another.

4.2 Data analysis and processing

Although the data warehouse saves a great deal of data, the information demand of the assistance decision need to use various analytical tool, such as the online analytical processing OLAP tool, statistics analysis and query optimization tools. With the technical development the function of data analysis tool is more and more strong and intelligence, not only can collect and analysis data at the system circulating, but also support the data collection of other business systems in the meantime. The DTS tool supports various data formats in the Server2000 of MS SQL, can make use of the DTS conversion guide to converts data, duct into the SQL Server2000 from the data in the Foxpro ,then make use of SQL language to clean, integrate, convert these data according specific rules, complete the whole data processing.

4.3 The data mining

Classification of knowledge discovery, data clustering, and association rules found, the sequence
pattern discovery, dependence relation dependence model detection, trend estimate all are data mining. The choice of mining mission is to match the characteristic of the analytical problem . The data sources management and dimensions cube of the data establish can realized by Analysis Services of the MS SQL Server2000 system. Analysis Management tool provided by the MS SQL Server2000 include two kinds of mathematics models which can used for the data mining, namely the decision tree model and clustering analysis model.

5. Conclusion

The data mining new technology applying to the modern agriculture logistics decision is to raise agricultural product circulate speed, lower the logistics cost, promote the profession logistics value added service, raise our international competition ability, promote the agricultural product industry management level, exalt farmers income, it's notable advantage lies in raising the modern agriculture logistics decision level, the accuracy and efficiency of decision ,modern logistics system, reducing subjective and blindness of decision. This paper applies the decision support system in the information system basing on the foundation of developing agriculture logistics data mining system, which provide strong decision support to the main agriculture logistics business, the governor and decision maker of the agriculture logistics to adapt the development demand of the modern agriculture logistics.

Reference


About the author:
Liu Dejun, male, is born in April in 1972, Shenyang agriculture university engineering college, associate professor, Doctor degree, the Master tutor, now agriculture logistics post-doctorate studies Communication author:
Zhang Guangsheng, male, be born in October in 1970, Shenyang agriculture university economy trade college director, professor, the Doctor tutor. Contact:
Shenyang agriculture university engineering college, Dongling Road 120, Dongling Area,Shenyang City ,Post code: 110161 telephone number: 13609886104