EMBEDDING DECISION SUPPORT FACILITIES IN AN E-COMMERCE SYSTEM

Zaitun A. B. and Ramin Vakilian
Department of Information System,
Faculty of Computer Science and Information Technology,
University of Malaya,
50603 Kuala Lumpur, Malaysia.

ABSTRACT:

E-commerce is beginning to get accepted in a developing country like Malaysia. The e-commerce systems developed were mainly supports the activities or functions related to selling and buying. This includes providing product and service information, ordering and payment, delivery, customer forum and after sales support. As the users get increasingly sophisticated, there is a demand for these e-commerce systems to support some decision making functions from both the sellers and buyers. In this paper, we present to the readers our effort in introducing decision support facilities in e-commerce systems for buyers. The paper starts with an introduction of e-commerce and decision support system. Next we describe how elements of decision support are embedded in an e-commerce system. We have chosen an e-procurement system to

Index Terms: e-commerce, embedded decision support, decision making, e-commerce system

1. INTRODUCTION

E-commerce can be defined as doing business electronically. Turban in [1] defined E-Commerce as a process of buying, selling, transferring, or exchanging products, service, and/or information via computer network, including the Internet. E-commerce revolution has started in Malaysia since 1970's banking sector [2]. The revolution started in 1981 when Malaysians were introduced to Automated Teller Machines (ATM) usage by banks. [3]. E-commerce continually evolved after the Malaysia government introduced Multimedia Super Corridor (MSC) in

Decision Support Systems (DSSs) are systems designed to assist in the decision making process by providing the necessary information to the analyst. Laudon and Laudon in [4] defined DSS as information systems at the management level of an organization that combine data and sophisticated analytical models or data analysis tools to support semi structured and unstructured decision making. A more comprehensive definition quoted by Turban in [5] defined DSS as an interactive, flexible, and adaptable CBIS that utilizes decision rules, models, and model base coupled with a comprehensive database and the decision maker's own insights, leading to specific, implementable decisions in solving problems that would not be amenable to management science optimization models per se. Thus, a DSS support complex decision making and increase its effectiveness.

Current research in DSS covers topics ranging from '*Comparative effectiveness of different interactive structures for DSS*'to '*Use of computer-based information and analyses in decision making*' [6]. Swanson and Ramiller in [7] have compiled a comprehensive list of research activities in DSS. They noted that research on Model-Driven DSS; focus on the management of models and model components for advancing the state of the art. This research examines Supporting Database Technologies, Model Formulation, Model Maintenance, Model Management in Distributed Computing Environments. Research on Knowledge-Driven DSS and Expert Systems Applications, concentrates on the application of knowledge-based technology for addressing specific applications and raising more general issues regarding the application / applicability of expert systems. Of particular interest in this research is the use of expert systems to support decision making and problem solving particular domains. The research on Data-Driven DSS is related to Data Modelling and Database Design, which focus on Improving Effectiveness of Database Modelling and Database Design. The interest is on differences in approach, characteristics of the modeller as predictors of effectiveness, and problem context [8].

Research on e-commerce are mostly concentrated around the aspects of security, social engineering, web-based design of e-commerce systems and consumer related topics such as, improving customers' trust, integrating other enterprise systems

such as e-CRM, ERP and e-PRM [1]. In e-commerce, DSS is mainly used by some e-commerce companies to assist customers of making decisions on the products that they want to buy and the merchants that they want to purchase the products from.

In e-commerce organizations, decisions need to be made quickly with regards to promotions and sales campaign in order to attract customers and most importantly to retain existing customers. At the same time managers need to make quick and accurate decisions with respect to production scheduling involving their supply chain partners. These decisions rely to a certain extent on the data captured by their e-commerce systems. Therefore, the need for a DSS functions embedded within the existing e-commerce systems is paramount. The DSS however needs to be designed so as to have the functionalities of a communication-driven DSS, data-driven DSS, document-driven DSS, knowledge-driven DSS, and model-driven DSS. Therefore the new DSS will be a hybrid of all these different classifications of DSS.

In this research project, we focus on assisting customers of making decisions on the products/services that they want to buy and the merchants that they want to purchase the products/services from.

2. THE RESEARCH PROBLEM

Each business has its own particular transport needs. These depend on the nature of the business and the type of products or services it buys and sells. When deciding which method of transport to use, one needs to weigh up the advantages and disadvantages of each. Depending on the distance, destination, volume and type of goods that need to be delivered, if a customer wants to transport goods directly from door-to-door, he/she can choose between different types of road transport, such as bikes, cars, vans or trucks or use alternatives such as rail, air, sea or electronic delivery. Transport and distribution are key considerations when planning for international trade. Choosing the right mode of transportation is essential to ensure that the customer's import or export operation is efficient and cost-effective. The choices for international transport and distribution include road, rail, air and sea.

Various factors will influence the customer's decision on which type of transport to use - including your business' requirements, the destination country, and the type of goods the customer is importing or exporting. These factors include:

- What does the customer wants to distribute? Size and weight will affect the cost.
- How quickly does the product need to reach its destination? This affects what type of delivery service you use and the cost - sending goods by air is significantly more expensive than by sea.
- How does the cost of transport impact on the customer's overheads?
- Where do the goods need to go? For example, Europe has a large rail and inland waterway network, but we may encounter problems if the destination is especially remote.
- How valuable are the goods? Get quotes from insurance brokers before deciding on the appropriate insurance level.
- Do the customers have any special requirements?

There are many decisions that need to be made before the final decision is taken on the type of transportation is chosen. We need to develop a web-based e-procurement system with some embedded decision making facility to assist customers in making the best decision. The target users will be transportation companies, freight forwarding companies, B2B and B2C e-commerce companies and government agencies.

Figure 1 is a decision making model described by Turban in [1]. From the model, we can see that there are many factors that influences an individual when he is making a decision whether to buy or not to buy, what to buy, from whom to buy, when to buy, how much to spend and how to pay. For each step of the transaction, there is a decision to be made. One of the decision making factor is the e-commerce system itself. A good e-commerce system has Logistic support, technical support and customer service functions. If we can implement some decision making facilities, customers can make accurate decisions in order to get good value for money.

In our research project we will incorporate features that can help a customer select the best transportation mode, best/suitable route and the best transportation company for the best price. We call the prototype e-commerce system; Transportation DSS Module for e-procurement systems.

3. THE DEVELOPMENT OF A TRANSPORTATION DSS MODULE

To develop the system, we have used WSDM approach, for the database we used Mysql and PHP

Admin. For data manipulation we used PHP and Java script. For the user interface, we have used HTML, Java script and Google maps. When considering the different types of routes we highlighted the advantages and disadvantages of each choice as in Table 1.

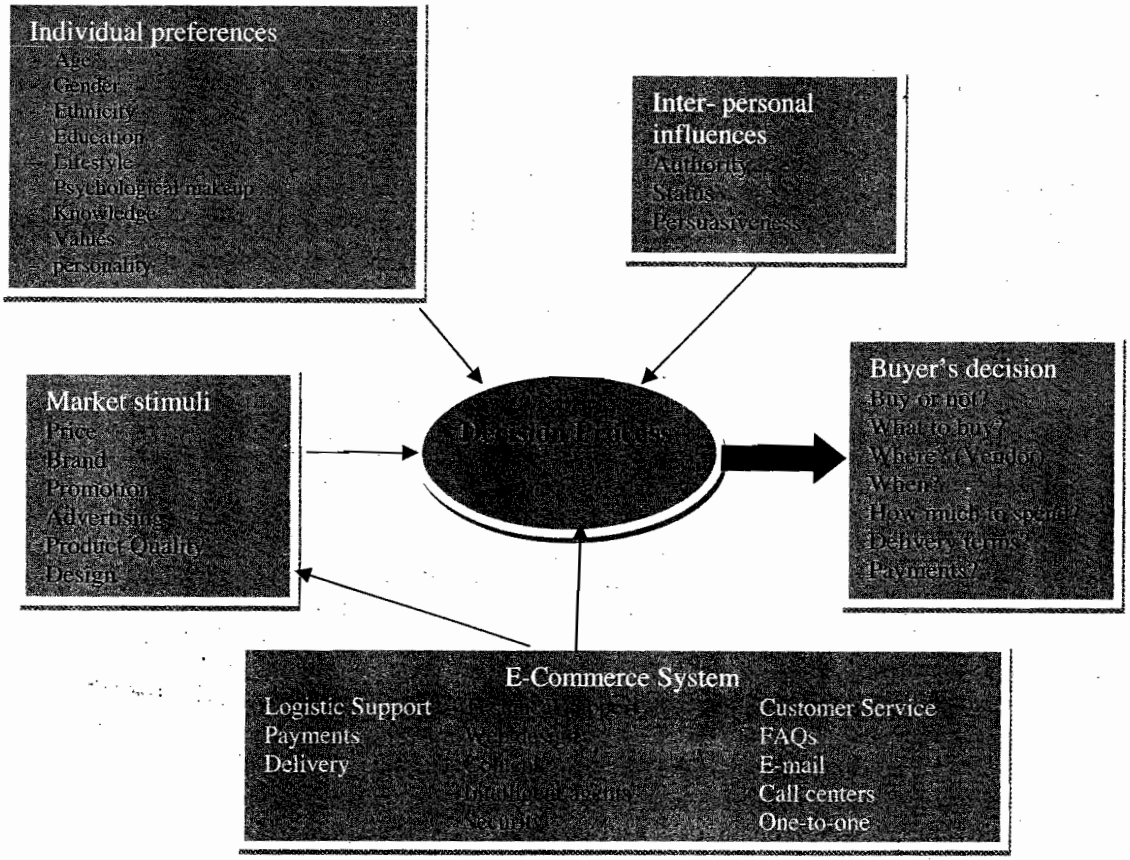

Figure 1: Buying Decision Model (Turban, 2008)

Based on Figure 1, we try to incorporate all the characteristics of an e-commerce system that can assist customers to make correct decisions on a product or service. Table 2 describes the functions that we have developed for each category of users. Figure 2 – 5 shows screen shots of some of the important pages of the system.

4. DISCUSSION

Using the decision making model in Figure 1 as a guide we develop our Transportation DSS Module for e-procurement Systems, to demonstrate how DSS capabilities can be embedded in an e-commerce system. In Table 2, we have listed out the functions that have been provided for each category of users. When all these capabilities have been incorporated, we found that the system can benefit three different groups of end users. For the customers, they can find the best route, the cheapest service provider (transportation companies), the most reliable insurance company and post recommendations or feedback on their experience with any transportation company or route. For the transportation companies, they can advertise their services and get new clients. Similarly, for the insurance companies, they can advertise all the different types of insurance policies and packages that they have, for the clients to choose from. As for the e- commerce system provider he can earn a small commission for each transaction from all parties

Table 1: Possible delivery modes

Method	Advantages	Disadvantages
Road	Cheap, convenient, flexible, private	Noisy, pollutes the environment, less safe than alternatives, stressful for drivers, potential delays, can be expensive where there are congestion or road charges
Rail	Fast, safe, more environmentally friendly than alternatives, does not add to congestion	Limited routes, inflexible routes and timetables, expensive, sometimes unreliable
Air	Fast for long distance deliveries, safe	Expensive, unsuitable for some goods, limited routes, inflexible timetables, pollutes the environment, airport taxes
Sea	Cheap for large volumes	Very slow, relatively few ports, inflexible routes and timetables, port duty or taxes - requires inland transportation for door-to-door delivery
Courier	Fast, reliable, secure	Expensive, weight of deliveries is limited
Electronic delivery	Instant, cheap, for international and domestic deliveries	Insecure due to viruses and hackers, limited to certain goods and services

Table 2: User Functions

Unregistered users	Registered users	Transportation Company	System Admin
1. Registration on the website 2. Signing in 3. Choose source and destination 4.Define cargo specifications: weight /volume/ temperature and other conditions 5.Choose alternative solutions: cheap/safe/green solutions 6. View transport companies information. 7.View the report of alternative routes	1. Signing in 2. Upgrade to gold member 3. Choose source and destination 4. Define cargo specifications: weight /volume /temperature and other conditions 5. Choose alternative solutions: cheap /safe /green solutions 6. Choose special offers: insurance and etc. 7. View transport companies information. 8. Manage its own profile. 9. Contact with transport companies. 10. Post comments and vote. 11. View the Report of alternative routes	1. Signing in 2. Choose source and destination 3.Define cargo specifications: weight /volume /temperature and other conditions 4. Choose alternative solutions: cheap/safe/green solutions 5. Choose special offers: insurance and etc. 6. View transport companies information. 7. Manage its own profile. 8. Contact with transport companies. 9. Post comments and vote. Company registration (monthly charges) 10. Manage their company profile. 11. Manage their pricing policy.(injecting a pricing table plus hidden fees base on cargo specifications) 12.Define source/destination points 13. View reports 14. Manage relationship with the company's customers 15. Offer special services such as insurance and promotions	1. Approve membership applications 2. Moderate forum 3. Maintain database 4. Maintain system

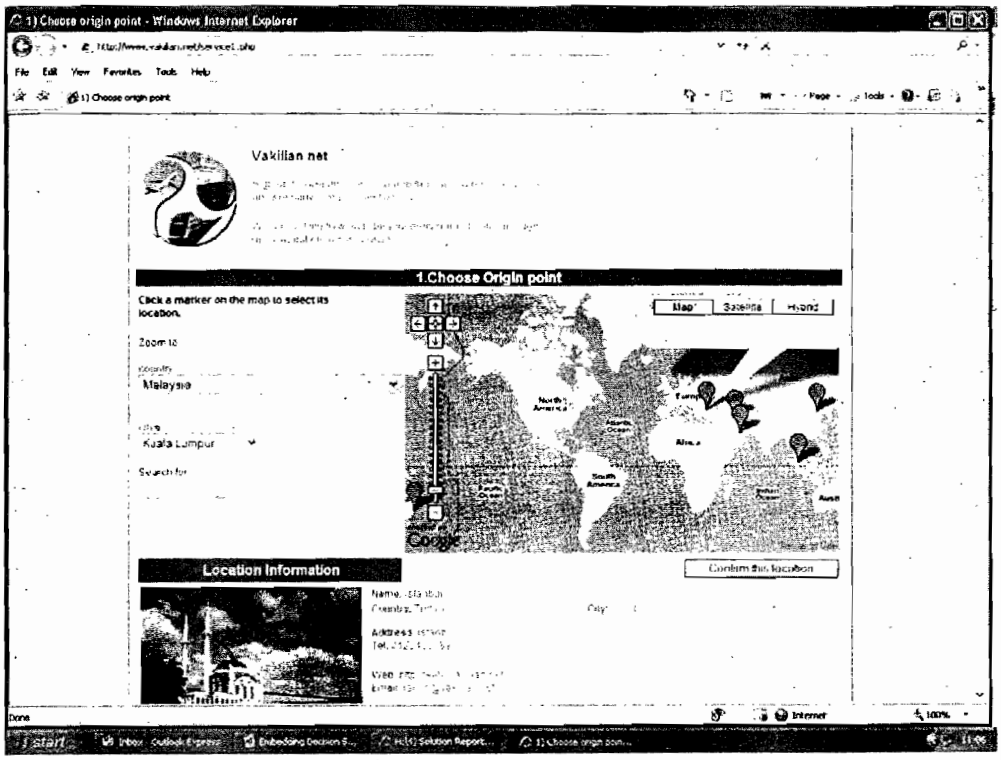

Figure 2: Selecting the starting point of the route

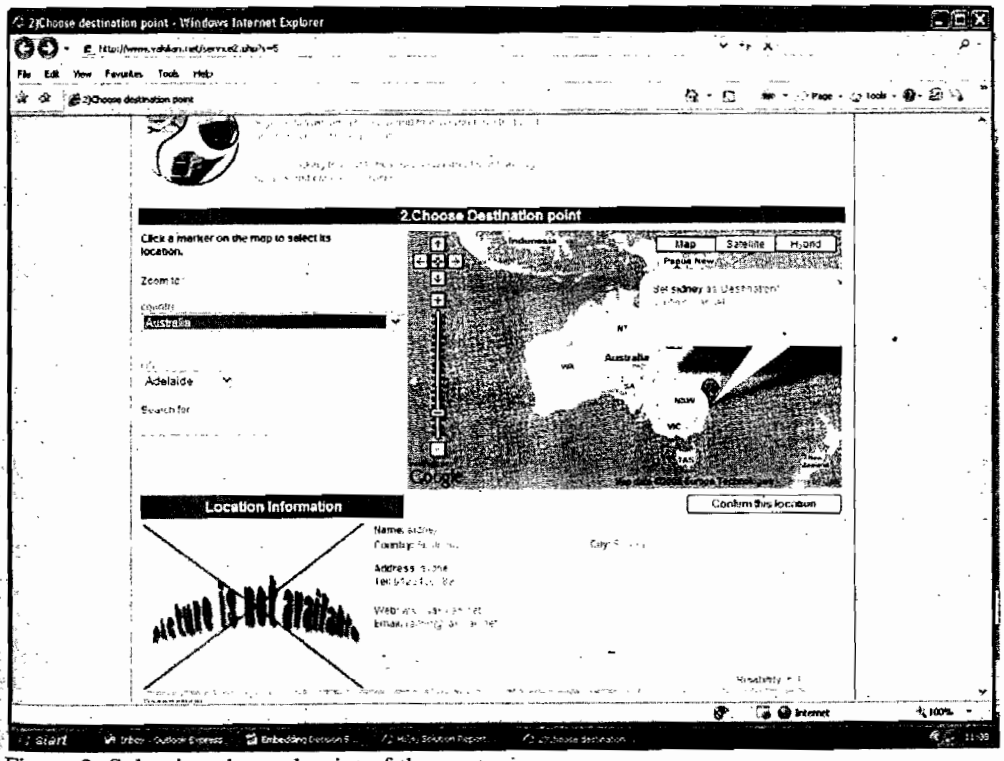

Figure 3: Selecting the end point of the route

– clients, transportation companies and the insurance companies. Without much effort, the e-commerce system can and will serve as a platform where B2B and B2C transactions are carried out. The success of the system will be on the high level of information provided for all possible routes, the reliability of the service providers and the trust that it can build in the prospective clients.

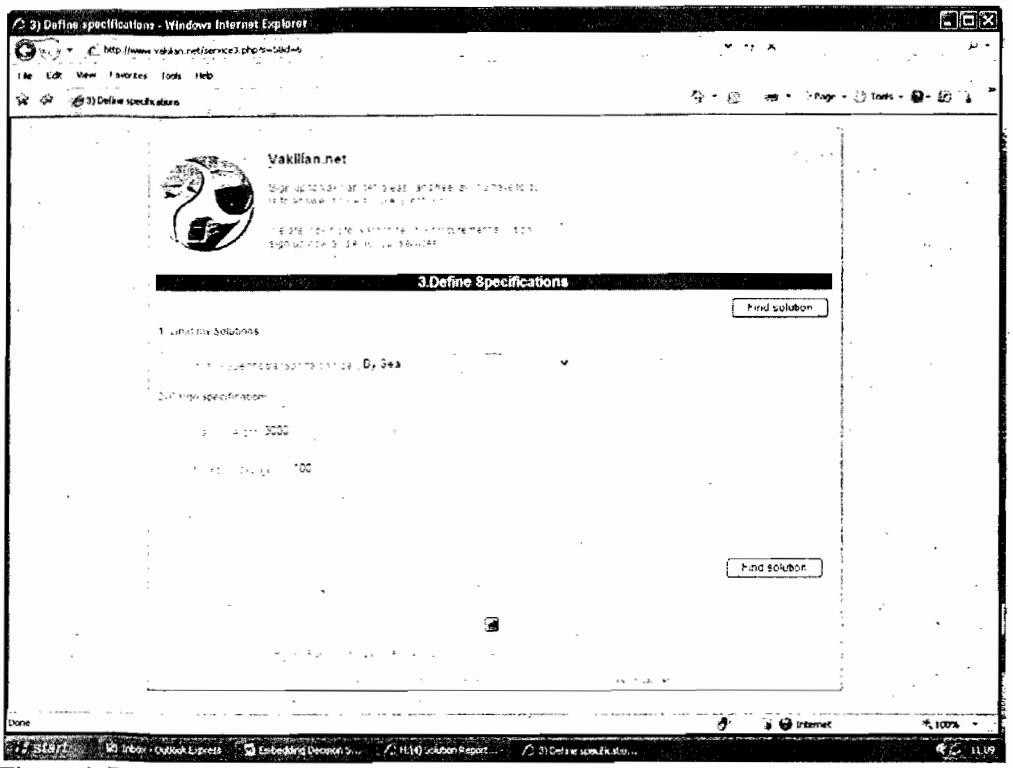

Figure 4: Providing information about the cargo to be transported

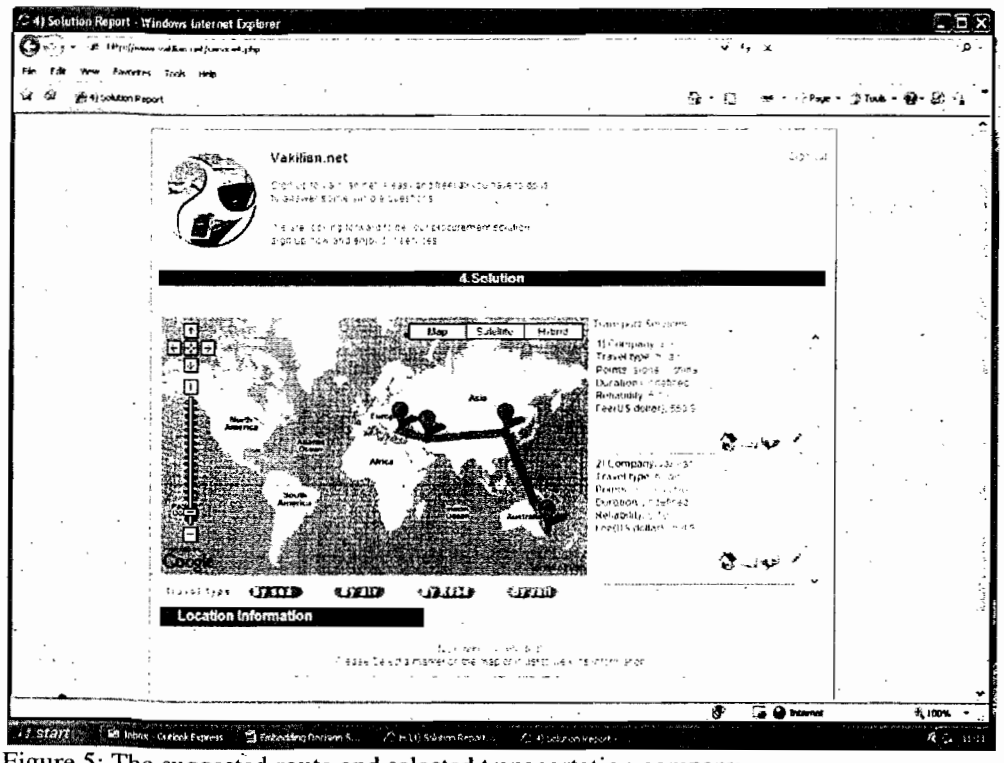

Figure 5: The suggested route and selected transportation company

5. CONCLUSION

We have developed an e-commerce system with embedded DSS facilities to assist customers in difficult and correct decision before purchasing a product or service. Decisions that these customers have to make may involve more than one decision at different stages of their transaction and may involve multiple service providers. When we attempt to assist customers in making decisions in such a scenario, we have indirectly provided a platform where various parties can collaborate together, just like in a supply chain. This enhances e-commerce activities.

The success of such an e-commerce system relies on the richness of the information that is made available for the customers to use in their decision making process. The testimonies from satisfied clients are another source of information that can help build the trust amongst the e-commerce users of this system. Our future work on e-commerce systems will be looking at features that can increase or build customers trust and confidence to buy a product or service from a website.

References:

[1] E.Turban, D. King, D. Viehland and J. Lee, Electronic Commerce: A Managerial Perspective, Pearson Education 2006, pp 224-253, ISBN 0-13-197667-2

[2] Pang, Johnson (1995), Banking and Finance Malaysia, Federal Publications Sdn. Bhd., Malaysia Philip, Jim (1996) " Bytes of Cash: Banking, Computing and Personal Finance." at http://www.firstmonday.

[3] Shanmugham, B, Suganthi, R & Balachandher, KG 2002, 'Malaysian regulation versus e-banking', *Journal of International Banking Regulation,* vo. 4, no. 1, pp.84-95. .

[4] Essentials of Management Information Systems. Laudon and Laudon. 3rd Edition. 1999, Prentice Hall.

[5] Decision Support System and Intelligent Systems, E. J.E. Aronson, Sixth Edition, Prentice Hall, 2001

[6] D. Power, "What are major DSS research topics?" Available at: www.dssresearch.com, last access date: 17 August 2007.

[7] Swanson, E.B. & Ramiller, N.C. "Information Systems Research Thematics: Submissions to a New Journal, 1987-1992," Information Systems Research, 4(4), 1993, pp. 299-330

[8]. E. Turban and J. E. Aronson, "Decision Supprot Systems and Intelligent Systems", Prentice Hall, 2001, pp 224-253, ISBN 0-13-032723-9