Using Information Systems in Business Decisions

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ABSTRACT**:** The paper presents the benefits of usage of information systems in decisions for businesses, which can reveale the optimal choice of the solution in order to increase competitivity in a strategic economy. Within a company's computer system, systems for decision support are classified as systems for the management / management decision. They take data from specific transaction processing systems and helps management process at the various levels of decision making. These systems help to implement the decisions, orders and the decisions decomposition that is occurring in the system of management of the company. Operational decisions are found in specialized compartments and are available in the directive needed to conduct operational departments that have the peculiarities of origin. For simulation models are created the required applications and helps decision-makers to make the choice based on the measures imposed by reality and the actual conditions in which the business operates in the specific part. Assisting decision means a permanent dialogue with the user, so that the interface has a much greater importance than other systems. The user, person or group of persons through the role they play in making the decision, is considered part of the system.
KEY WORDS: Assisted decisions, system support decisions, knowledge database, analytical tools and management decision.

Introduction

Systems of decision support have great applicability in the economic field, to help the decision maker to take the best decision based on existing data in different types of databases and are based on selection, interpretation and processing (data) through specific mechanisms.

To achieve concrete results are not performed repetitive and complex calculations, but there are performed operations like sorting, selection, classification and evaluation, designed to organize information, reduce uncertainty, leading to propose options/ solutions and possible recommendations.Within a company's computer system, systems for decision support are classified as systems for the management/management decision. They take data from specific transaction processing systems and helps management process at the various levels of decision making. These systems help to implement the decisions, orders and the decisions decomposition that is occurring in the system of management of the company.

Decision Support Systems are used for decision making made by the management. These systems are implemented in various stages of decision making and tactical or strategic elements put emphasis on general applications easily predictable, and analytical applications. Decision Support Systems based on different models; provide decision-makers options for solving a fundamental decision or a set of interrelated decisions. Decision support systems differ from management information systems which provide management's periodic reports on demand or standard, depending on certain criteria or needs to cover the information needs of a department that has some functionality. On the other hand the information systems of management have different functions in tactical management and focus on current and with some accuracy, data on the elements necessary to manage the company's resources and support systems for driving into consideration elements necessary strategic direction of the company taking more information outside firm/business.

The transactional process management systems are designed to automatically process data, store and report data entered

transactions. The recorded data from current transactions may maintain the database updated with the latest data entered. Even if the data volume and quality increased and their processing led to an increased number of information, however, has not increased the quality of decisions. At present there are numerous options for data processing and evaluation of the data obtained and these were adapted to changes. If trading systems have regard to data quality, integrity and their consistency (compliance with business rules) and are managed as a single unitary, systems for decisions take data from multiple disparate databases that are well defined and the manage data organized especially on topics of analysis according to the needs of business.

Operational decisions are found in specialized compartments and are available in the directive needed to conduct operational departments that have the peculiarities of origin. For simulation models are created the required applications and helps decision-makers to make the choice based on the measures imposed by reality and the actual conditions in which the business operates in the specific part. Management systems are presented and used independently, so they make up a unitary system at the company they manage. Integrating their specific information and communication on different managerial levels, based on data recorded in the primary documents of the company, built around firm decisions taking account of business rules. To substantiate a decision, there are sets goals and are allocate resources that are needed to achieve them. This is achieved through analysis and simulation and is considered the participation of several elements, as follows:

The decision maker is the person or group of persons. An end user can adopt the right solution decisional process based on learning and experience from working effectively. The decision maker:

- Structure and standardize information needed for data analysis procedures
- Increment issues streamlines structure, operate individual alternative set of decision

- Change informations depending on context data and sequence of operations that is not known in advance.
- Communicates results

The component that usually works with the user, the interface subsystem, must give to the decision maker the feeling of direct manipulation of information, facilitating creativity and associative thinking, stimulating the ability to formulate different alternatives under those that are poorly structured.The interactive API (interface) allows him to develop individual strategies with the flexibility afforded by set of intuitive tools available for modeling and analyzing the input in the decision represented by data, variable decisions, models, restrictions that limit possible solutions, situations similar decision that already exists.

In the process of making decisions, the input data are from internal and external sources, from several databases managed in different programming environments. Those data must be filtered, tested and strengthened to fulfill the generated objection of appropriate indicators and made on the spot reports for decision making according to the business rules.[1]

The Main Features of Decision Support Systems

In order to build models, the decision is based on information provided far more comprehensive than reports and other economic indicators required or provided by the business itself. Quantitative mathematical models are embedded in base models, managed by subsystem a management model that requires separate users from the physical aspects of data processing and storage that extract, create, delete and modify models.

Decision making process, conducted with the help of tools, methods and techniques, conduct to the scenarios constructed according to a definite objective. Interaction replaces classical execution, procedural, with a performance conducted by decider according to the stages of solving a problem decisions that necessitate different inputs. The activity of the coordinations of

inputs is done in most cases with specialized software systems that create analytical databases or modeling languages. In the first case, the user is provided customized views of data stored by performing a diverse set of operations on transactional data.

To build specifications the optimal approach is based on the analysis of data to extract information from data and obtaining knowledge for decision making. To be more precise, a specific problem highlighted in a model is called one of the most used tools in the decision making simulation. The next logical of optimization and forecasting, simulation assists with the running complex patterns, resulting variables whose analysis highlights the value adopated lead to a decision. The outputs from the process of decision making, represented by analytical indicators reflecting the performance of the system analyzed variables results the evaluation criteria or implementation plans of the decisions.

Evaluation of search results depends on the method of presenting results and depends on the facilities of component dialog with users that provide inputs. Besides maintaining traditional information representation formats like charts, maps and diagrams used currently to represent multidimensional data there are used new types of dynamic graphs. The decident system uses a dialog interface with the key users of the company, enabling connectivity and communication between networks with different topologies and areas.

After analyzing the results achieved and the objectives of their reporting, signaled differences and after identify problems it was reveal the need to take action. Trying to solve them in a particular category determined tackling by a standard method employment. The information is selected factors that have caused the deviation from the desired result and appreciate the importance they have in context. In complex cases, the problem breaks down into sub-problems more manageable, easier structured. Solving the result of communication between all stakeholders, sharing the general manager responsibilities both at decision-making levels and the corresponding subproblems defined. The result of the information stage is a formal description of the problem identified the category to which it belongs and responsibilities involved.

For example, after the first phase, the scope may relate to excessive spending decisions of a functional department, inventories too high or adoption of a draft research and evaluation on the introduction of computers.

In the model design phase defines a model for decision shall be tested and validated under real system. Modeling takes expression of reality by means of abstract entities possessing quantitative and qualitative attributes. Based on patterns defined by an efficient simulation can generate alternatives. Intuition, creativity and experience allow decision-makers compare alternatives; predict outcomes of each alternative separately.

For choosing the solution which takes the results of the previous stages, the action is chosen according to the criterion of selection and decision-making model. From model design and solution choice there is a strict demarcation, certain activities may be conducted during both phases, and return of election phase in phase. After the final resolution of the model, select the best alternative is chosen implementation plan. The choice of solution is closely linked to proper evaluation of the results of said solution. The assessment in turn depends on the search method.

Structural problems use mathematical formulas and analytical method to achieve an optimum solution. In order to improve efficiency the best solution search algorithms are used. When the number of alternatives is too large, then testing some or all of the possible solutions is possible by using an incremental search method. Time and memory space limit searches, in most situations the decision maker stopping at the best of the tested solution to a certain moment. For complex problems, solving is carried progressing from one situation to another, until a final statement, which is the solution. Methods called heuristics, based on a thorough analysis of the issue. Basically successive tests are performed, the search progressing from a solution to another.

Implementation is the phase that involves the integration model chosen solution in context and simulating the real system. Issues raised by the communication solution, accepting the decision or the additional costs of implementation are sluggish, and the decision-maker plays the important role of mediator.

Assisting decision states that the decision is the responsibility of the user. It receives relevant and substantiated elements on activity in the real system and builds models for solving future decision making on the basis of current assessments.Of the foregoing that a decision support system provides a filtering of information provided to decision makers and indicates certain restrictions. Basically, it helps the decision maker during operation and defining the problem, generating satisfactory solutions and retention strategy. The role of a decision support system is to automate the decision making process manager, but rather to assist and develop the capacity of its intuitive, helping him to react as quickly and with greater efficiency.

The architecture of a system aimed at its components and how they interact, types and operations allocated to each component.

For an interactive decision support system architecture includes the following subsystems:

- Data management subsystem
- Subsystem management models
- User subsystem dialog

Data management subsystem consists of the following elements: database management system oxidase data, data dictionary and declarative query language. The database is built to meet the information requirements of the system and is an interrelated database operated by one or more users, one or more applications. The database contains no internal data, external data and personal data. Internal data consist from the current activities of the organization and operations of various functional departments image. Data external economic information circulated nationally and internationally and usually come from the industrial sector of which the company, legal regulations. Personal data is data that relates to the behavioral aspects of decision-makers in making decisions. Whatever the nature of their data is stored in relational databases, transactional system data or data warehouse, built on subjects of interest. In current systems, the company's intranet, are increasingly present data accessible through web browsers and multimedia items such as maps, images, sounds.

The data source, internal or external, data is extracted and managed by a management database. The management of the database depends on the organization of data. In most cases there is SGBS transactional relational data system and a management database for multidimensional data warehouses created. The data dictionary is a catalog of all data from the database. It contains data definitions, data sources and their intrinsic significance. The data dictionaries are permitted operations to add new data, deletion or retrieval of existing information according to certain criteria. The most common data dictionary used in the first phase of decision making is data mining to identify their problems and opportunities. The SQL language is used, which accepts requests for data from other systems.

The subsystem management model consists of the following components: base models, the management models, dictionary and processor execution models and integration patterns

Base models contain the set of models that make it possible to analyze the facts and the choice of options in terms required by the user. It is the component that differentiates interactive decision support systems to other systems. The models are domain-specific and models can be classified into strategic, tactical and operational models models. Strategic models assist decision makers in developing the overall strategy of the company in matters concerning the development of corporate objectives, choice of location of equipment, environmental impact analysis on the work of the organization. Tactical models are applied to the organizational subsystems and assist the user in taking decisions for allocation and management subsystem resources available.

The models are used currently in operational and transactional system that aims of the organization. Database management system allows creating new models models using programming languages, update and modify existing models, establish interdependencies between models. Manage in a logical manner a variety of models to consistency of the data model and provides integration of application systems components maker.

The dictionary is a catalog of all models modelelelor containing the definitions used, the main functions of their scope. The processor

execution and integration patterns to be seen in the light of the functions performed by him as follows:

- Execution processor models interpret instructions received from the user and send management system models; check the conduct of the programs that are built models;
- Integration processor combines operations in several models depending on the requirements of decision making and decision support system integrates other applications.

The subsystem contains a dialog with the user management system user interface and a processor that takes inputs through outputs languages and provides control through language presentation. It is the only system component with which the user works directly.

Define an efficient interfaces should consider choosing devices input / output, design screens, the format of the data and information. Generators interactive decision support systems provide multiple interface styles: menu-based interaction design question-answer style, dialogue based on natural language processing, graphical user interface. Choice is an option and is dependent on decision-making team which ensures information management; the complexity of the real system will be implemented.

Assisting decision means a permanent dialogue with the user, so that the interface has a much greater importance than other systems. The user, person or group of persons through the role they play in making the decision, is considered part of the system. It is involved in all phases. Studying the specific context, correctly defines the problem and lead to choosing an alternative from a set of possible solutions. Quality and efficiency of the decision depends on how they react in the context of decision making on how the adopted solutions.

Managers or specialists in various professional fields, expects the system conclusions or details. It is working in teams constituted for a period of time, according to some temporary tasks. In complex situations there are analysts who arrange the connection managers with decision support systems, are people who have knowledge about management problems, and experience in decision support

technologies. Harmonisation with the working environment, the transfer of responsibility to lower levels, seeks the participation of all the success of the business. Communication between managers and other employees, communicating with other sources of information is accomplished precisely through this component dialog. Thus, interactive decision support systems are no longer used just for the planning, organization and coordination but also for inter-personal communication, the establishment and execution of daily tasks.

Developing an Interactive Decision Support System

Design an interactive decision support system is a complex process that takes into account the main features of such a system, the specificities of its components, the specific links between decision makers and system. It must be considered the following aspects:

- Uncertainty decision does not allow anticipating future circumstances or the precise terms of the solution. They are therefore designed as a set of tools and not solutions to a predetermined set of problems;
- Emphasizing the partnership between man and computer is found in a blend of computing resources with human skills.
- Being a cooperative and distributed system components that comunicate using information resources dispersed, distributed, involving a distributed architecture;
- Exercising centralized control over decision-making environment, intervention is on several levels, with makers working concurrently on different aspects of the problem and communicates the information discovered;
- Decision maker is the one who identifies conflicts, which determines the type of conflict and the factors that favored the appearance of the focus is on identifying conflicts rather than solving them automatically;
- The existence of different types and categories of interactive decision support systems involving different approaches in building the system. The main strategies are permissible;

- Programming an interactive decision support system customized. In time, they used classical programming languages or fourth generation languages;
- Using a generator of interactive decision support systems. Even if he succeeds in writing the elimination of numerous instructions, this integrated development tool is limited in terms of flexibility and level of complexitate.Recent occurred generating interactive decision support systems for specific areas. Designed to build powerful systems for textual statistical applications, management and financial analysis.

Decision Support Systems based models have emerged and have been developed with the advent of graphical modeling languages. They are used to assist decision-making situations that require a certain degree of repeatability for which there are specific methods of solving. Their operation is based on building a quantitative model combined with a friendly interface and involves further analysis of "what-if".[2]

Total or partial automation of the process of decision-making depends on the context and limitations of the extent of the problem structurabilitate. For example, if structured decisions, receives computer model and he provides the optimal solution. The decision maker decides not only whether to apply the model. Among the components that make up the architecture of an interactive decision support system based on modeling the most important subsystem management models.Base models consists of theoretical models and practical models. Theoretical models are useful in the formulation of very general recommendations for economic policy because it merely describes the facts from a powerful schematic representation of reality. There are references to economic data or real developments. The equations are essential features of analysis and highlights links cauzalitateale studied phenomenon. Practical designs express the real system behavior restriction taking into account the work is done. Check adequacy of existing theoretical schemes to available statistics; identify conflict situations, possible actions to be taken. They practical finality of the decision-election

by a set of precise measures imposed in the real system. Model as simplified representation of reality, has the following components:

- Decision variables, random elements that determine the evolution of a system state. Generate random variables occupies an important place, due to the correlation with the random element. The decision maker that determines their level at the choice of methods for generating random numbers, so that they respect the laws operating scheme has studied;
- Parameters that influence the outcome, but that can not be controlled by the governor. Take the form of restrictions limiting the possible solutions of the problem. Ex: infletion rate and the interest rate for financial, production capacity, price of raw materials for production;
- Varying results, depending on the parameters and decision variables. Ex profit expected profitability of to finance the total cost of data processing cost for the production.

Models can be built with certainty, I know exactly future economic events or conditions of uncertainty or risk in situations where every future event is associated with a probability. In the first case we rely on methods of optimization. Where decisions under uncertainty for choosing the forecasting and decision-making, we rely on historical knowledge of economic events. The decisions under risk, based on criteria mathematical expectancy choose the lowest standard deviation. For each type of problem constructing a model, it defines a procedure for obtaining the solution. The model must measure the expected effects of various alternatives for action. To achieve this, it starts to specify the objectives (maximizing turnover, profit, minimizing cost) and establish possible ways of action; different scenarios are built based on the events that could influence the results of the action.

The management model ensures the creation, maintenance and handling models. The full cycle of building and maintaining models requires specialized software or modeling language. Handling models include formulation and testing scenarios, selecting the best of several possible solutions. It performs the following functions:

- Integration function, which ensures the incorporation of a model in a model-based classification and allocation of parameters that allow the selection of pattern;
- Selection function that provides choice model based on user-specified selection criteria;
- Executive function, which provides assistance in running user patterns;
- Display and interpretation function, which provides display and interpretation of results.

The objectives of the decision-making process aimed at adopting the best solution from many possible alternatives. The optimal solution is obtained using either satisfactory or algorithms or formulas within optimization models, or by experiencing various possible alternatives in a process simulation. For each class there are methods to solve specific, which is selected based on the small number or large number of alternatives, the availability of statistical formulas or methods. Among the methods most commonly used are decisional analysis and mathematical programming.

Decision analysis applies to situations which have a relatively small number of alternative solutions. Each alternative are attached estimates and the probability of occurrence. Solving the problem is to build decision tables or decision trees, from which it selects the best alternative. Decision tables highlight possible alternative schematic characteristic information. Decision trees, in addition to decision tables, graphically highlight the problem of relationships between variables, making it possible representation of complex situations.

Apply mathematical programming problems which lead to the formalization of a mathematical relationship between decision variables and purpose. In addition to the measurable values are seeking optimum value, the model states and restrictions on them also. The optimal solution is obtained in a finite number of steps. If between variables include at least one non-linear relationship and are satisfied only under explicit finally obtain a feasible solution.

Simulation, directed experimentation process is carried out using computers on a defined model. It is used in complex systems,

where it is difficult or impossible to predict beforehand structural and functional changes, or various influences from the environment. It is the only method that can be applied to unstructured problems. Among the advantages are:

- Support the simulation model provides a functional form of expression of the links between the phenomena studied. Such testing may be actions that can be made explicit in the model framework;
- Enable better decision-making structure of the problem, allowing exploration of information flows and operating procedures without interfering with the functioning of the real;
- Using cybernetic control system that underlies decision making in practice;
- There are a large number of parcel simulation program;
- Simulation models have a procedural nature, their resolution experiments involving processing created in the system;
- Data used in model construction can be real observations (numerical values) or knowledge.

These are translated into algorithms that are executed by a computer system. This led to consideration of simulation as one of the most powerful tools in decision making. Simulation becomes a technical coordination of procedures using the computer. Simulation of the limits includes:

- Support the simulation model is a simplified built pursuing one goal, one key criterion. The solution offered is one spot that does not always corresponding real system;
- Taking into account the unique factors of a problem, specific results can not be transferred to other problems;
- Results are difficult to interpret, being dependent on random factors; no matter how powerful your computer is, the optimal solution is difficult to obtain a model that has many equations and a significant number of parameters.

These limitations have led to the use of simulation only when the interactions between the components are complex when factors random have a significant and requires a large number of

observations on the behavior of the data, the problem can not be solved by an algorithm or experiments direct. If there are problems which can directly apply optimization methods, the optimum results from different experiments possible alternatives. They tested different values of decision variables and highlights the consequences of decisions on the result of values.

- The problem and research purposes;
- Model development and data collection system;
- Model verification and validation;
- Describing experiments on the computer;
- Simulation execution and achieving results;
- Analyze the simulation results.

A Prolog program is a database where data are facts and rules. Any change in the data requires updating software program itself. In traditional programming languages, software update, namely the addition or deletion of data and control flow change in the program are made by the programmer. Prolog database consists of facts and rules of the program is "static" in the sense that it can be modified only between two executions of the program, but there is possibility to define the bases of dynamic data that can be updated automatically during program execution.

A dynamic data base is a collection of facts. The programmer can define in the program more dynamic basis. Predicates associated dynamic database must be stated in the section corresponding database form:

```
database [-name]
attribute1(type_arg1, type_arg2, …., type_argn)
attribute2(type_arg1, type_arg2, …., type_argk)
```

A predicate in a dynamic database can be used anywhere in the program, but can not be defined in the program. Updating dynamic data is done using predefined predicates assert (deed) assertz (deed) and retract (the act). Asserta predicates and facts assertz allow adding a dynamic database. The difference between the two

is that at the beginning of the base asserta added and assertz at the end of the base.

The contents of a dynamic database can save them for reuse. Saving is performed using predefined predicate save (Filename) where Filename is the name of the external file that contains the basic facts. The resulting file will be a collection of works, the only difference being that a program contains sections. Any other program will be able to use this base. This is achieved by using predefined predicate consult (name) where name is the file name that is stored in the base.

The following is a model support system for decision support, using a knowledge base. As an example consider the following program. The program defines a dynamic basic facts as:

```
Client_tst(Name, Surname, List_of_products)
```

With predicate acts such records are inserted

```
Client_tst("Name", "Surname", [])
```

based on dynamic (customer records) and using predicate update this basic facts updated when a customer purchases a product or return the product.

```
domains
name,surname,product=string
list_of_products=products*
database
client_tst(name,surname,list_of_products)
predicates
id_client(name,surname)
register
client_ach(name,surname,integer,product)
add_product(product,list_of_products, list_of_products)
remove_product(product, list_of_products, list_of_products)
actual(name,surname,integer,product)
update_act
```

```
lst_products(list_of_products)
execution_line
start
base
menu
save
selection(char)
clauses
id_client(X,Y):-write("Name="),readln(X),write("Surname="),readln(Y).
inregistreaza:-id_client(X,Y), assertz(client(X,Y,[])),
write("Continuati ?[d|n] "),readchar(Z),nl,Z='d',inregistreaza.
register:-save.
client_ach(X,Y,I,P):-id_client(X,Y),write("Enter\n "),
write("1 if buy one product\n 0 if returns one product\n"),
write("Option="),readint(K),K>=0,K<=1,I=K,
write("Product= "),readln(P).
add_product(P,X,[P|X]).
remove_product (P,[P|X],X):-!.
remove_ product (P,[H|X],[H|Y]):-remove_product (P,X,Y).
list_products ([]):-nl,!.
list_products ([P|X]):-write(P,", "),list_products (X).
actual(X,Y,I,P):-I=1,client(X,Y,L),add_ product (P,L,L1),
retract(client(X,Y,L)),asserta(client(X,Y,L1)),list_products (L1).
actual(X,Y,I,P):-I=0,client(X,Y,L),remove_product (P,L,L1),
retract(client(X,Y,L)),asserta(client(X,Y,L1)),list_ products (L1).
update:-client_ach(X,Y,I,P), actual(X,Y,I,P),
write("Continue ?[d|n] "),readchar(Z),nl,Z='d',update.
update:-save.
base:-existfile("client1.dat"),consult("client1.dat"),!.
base.
save:-system("del client1.dat"),save("client1.dat").
execution_line:-makewindow(1,113,36,"Shop",0,0,24,79).
start:-base, execution_line, menu,removewindow.
menu:-clearwindow, cursor(10,20),write("r -> for register client"),
cursor(11,20),write("u -> for updating the list of products"),
cursor(12,20),write("e -> for exit"),cursor(13,25),
readchar(X),X<>'e',selection(X),menu.
```

```
menu.
selection('r'):-clearwindow,register.
selection('u'):-clearwindow,update.
selection(X):-X<>'r',X<>'u',menu.
```

In the code above there are methods implemented in the logic of the application and those can make the process of decision making more easy and adaptive for the decision makers and other types of users.[3]

The advantage of using a custom commands is that the user can write own set of rules based ob a knowledge database. These types of instructions are more flexible to the requirements of getting the opportune solution by interrogating this database of facts and knowledge. The inputs in this types of databases includes rules and results from the processes specific to the domains they operate.

Conclusions

The Decision Support Systems based on different models and they provide decision-makers options for solving a fundamental decision or a set of interrelated decisions. Decision support systems differ from management information systems which provide management's periodic reports on demand or standard, depending on certain criteria or needs to cover the information needs of a department that has some functionality.[4] The decisions may be made based on results given by systems that store data in knowledge database and are according to the rules and facts that implement the business logic. Prolog database consists of facts and rules of the program is "static" in the sense that it can be modified only between two executions of the program, but there is possibility to define the bases of dynamic data that can be updated automatically during program execution.[5] The decisions are choosed from alternatives offered to the decident by systems that include logic and rules, so the best alternative is calculated in such manner that the risk is with the minimum probability.

NOTES

[1] Danny Weathers, Scott D. Swain, Varun Grover, "Can online product reviews be more helpful? Examining characteristics of information content by product type", Decision Support Systems and Electronic Commerce, ISSN: 0167-9236, 2015. See also Jun Chen, Xiao-Liang Shen, "Consumers' decisions in social commerce context: An empirical investigation", Decision Support Systems and Electronic Commerce (ISSN: 0167-9236): 2015.

[2] Wang Chengwei (2014) "*Prolog to the special issue on DSS decision making support system (DSS) — A synthesized and integrated crystallization of systems engineering, artificial intelligence and electronic technologies*. www.researchgate.net/publication/Prolog_to_the_special_issue_on_DSS_decision_making_support_system_(DSS) (Last Accessed: July 29, 2016.)

www.researchgate.net/publication/A_synthesized_and_integrated_crystallization_of_systems_engineering_artificial_intelligence_and_electronic_technologies (Last Accessed: July 29, 2016).

[3] Danny Weathers, Scott D. Swain, Varun Grover, "Can online product reviews be more helpful? Examining characteristics of information content by product type." in *Decision Support Systems and Electronic Commerce* (ISSN: 0167-9236): 2015. See also Nijas N, (2014) "Decision Support System." Available online at: www.slideshare.net/nijazn/decision-support-system-management-information-system (Last accessed July 29, 2016).

[4] K. Coussement, D.F. Benoit, M. Antioco, "A Bayesian approach for incorporating expert opinions into decision support systems: A case study of online consumer-satisfaction detection." in *Decision Support Systems and Electronic Commerce* 2015. (ISSN: 0167-9236) See also Jun Chen, Xiao-Liang Shen, "Consumers' decisions in social commerce context: An empirical investigation." *Decision Support Systems and Electronic Commerce* 2015 (ISSN: 0167-9236).

[5] Dan Power, "Types of Decision Support Systems (DSS)," 2014. Available online at: www.gdrc.org/decision/dss-types (Last accessed on July 29, 2016). See also Danny Weathers, Scott D. Swain, Varun Grover "Can online product reviews be more helpful? Examining characteristics of information content by product type," in *Decision Support Systems and Electronic Commerce*, 2015 (ISSN: 0167-9236).

ADDITIONAL REFERENCES

URI: https://www.techopedia.com/definition/770/decision-support-system-dss

URI: http://www.journals.elsevier.com/decision-support-systems/

URI: http://ieeexplore.ieee.org/xpl/articleDetails.jsp?reload=true&arnumber=6073193

URI: http://stackoverflow.com/questions/6762286/find-all-solutions-to-a-predicate