http://dx.doi.org/10.24212/2179-3565.2018v9i1p27-34

RISUS - Journal on Innovation and Sustainability
volume 9, número 1 - 2018
ISSN: 2179-3565
Editor Científico: Arnoldo José de Hoyos Guevara
Editora Assistente: Lívia Lopes Aguiar
Avaliação: Melhores práticas editoriais da ANPAD

A DECISION MAKING AID MODEL FOR PROJECT MANAGEMENT: A STRATEGIC DECISION PROCESS

Um Modelo de Auxílio à Tomada de Decisão para Gerenciamento de Projetos: Um Processo de Decisão Estratégica

Djamil Mohamed, Yu Jintian
School of Management, Wuhan University of Technology, Wuhan, P.R.China
E-mail: djamil.moha@gmail.com; yjt8188@126.com

Abstract: The implementation of a decision support system and decision-making plays an important role for the outcome on the objective of a project. As important tools, the knowledge from the internal and external of a project and the experiences of project managers and experts are significant assurances to make a better decision, therefore a better concrete aggregate alternatives decision. The purpose of this paper is the development of a Decision Making Aid model with alternatives decisions and solutions (DMAM) to help the process of decision-making. By choosing the most appropriate model and alternatives, the proposed model aims to solve given problems pinpointed on the ―Framework for Classifying the Project Management Research‖. The model takes into account the complexity of the project and the existing alternatives decisions and solutions of previous cases. The results indicate that this model significantly reduces time and marginal error for decision-making.
Key words: Decision making; Project management; Alternatives decisions; Decision aid

Resumo: A implementação de um sistema de apoio à decisão e tomada de decisão desempenha um papel importante para o resultado no objetivo de um projeto. Como ferramentas importantes, o conhecimento interno e externo de um projeto e as experiências de gerentes de projetos e especialistas são garantias significativas para se tomar uma decisão melhor, portanto, uma melhor decisão a partir de alternativas concretas agregadas. O objetivo deste artigo é o desenvolvimento de um modelo de Ajuda a Tomada de Decisões com decisões e soluções alternativas (DMAM) para auxiliar no processo de tomada de decisão. Ao escolher o modelo e as alternativas mais adequadas, o modelo proposto visa resolver determinados problemas identificados no "Framework para a Classificação da Pesquisa em Gerenciamento de Projetos". O modelo leva em conta a complexidade do projeto, as decisões alternativas existentes e soluções de casos anteriores. Os resultados indicam que este modelo reduz significativamente o tempo e o erro marginal para a tomada de decisão.
Palavras-chave: Tomada de Decisão; Gerenciamento de Projetos; Decisões Alternativas; Auxílio a decisão.

Recebido em: 27/09/2017
Aceito em: 01/03/2018

INTRODUCTION

A project that described as a complex system in a complex environment and the project management is the process designed to organize a project from start to finish. It is all the operational and the tactic that makes a project end in the equilibrium time, cost and quality. The interior of a project consists of several natures of activities, which are organized in the project network. The parameters of a project are multiple and above all multi-dimensional. The project is limited in time; non-repetitive.it consumes time, money, human and material resources. It requires coordination, and monitoring. A project meets its objectives by achieving results. These results are obtained through the execution of activities or tasks, supported by resources. The sequence of each activity constitutes a process; the disposal of human resources constitutes the organization. In every project there is added value and risks; and it certainly experiences uncertainties, thus the need to make decisions in an uncertain and changing environment.

Decision support system (DSS) like TOPSIS, Multi-attribute utility theory (MAUT), weighted product model (WPM), weighted sum model (WSM) and analytic hierarchy process (AHP) aid to go from an environment judgment to a decision making but not appropriate to all environment. For some researchers it is important to give the decision makers the opportunity to evaluate the attributes independently hence, the proposed excel system, on decision-support system for evaluating and ranking R&D projects (Henriksen, Palocsay, 2008). A new multi-dimensional project performance measurement system that would empower the executives to processes a volume of data was introduced (Marques et al., 2011). And by enhance evaluation of project risk and initial investment decision-making; a fuzzy mathematics to assess the levels of income risk and cost risk in real estate investment is applied (Mao &Wu, 2011). So in terms of prediction accuracy, three forecasting methods based on EVA metrics were developed and compared (Vanhoucke, Vandevoorde, 2007). In addition, activity sensitivity measures the relationships with forecasting and use it in deciding on project control strategy were investigated (Elshaer, 2013; Vanhoucke, 2010). Decision in a project can determine its course of direction, so forecasting the outcome is good and important but also having alternatives in case of bad outcome is better. These alternatives could be assessed by knowledge and experiences of experts. So decision can be improved with the implementation of expert experience in a system. With supporting decision-making ability, the use of knowledge-based expert system could implicitly improve the learning process (Antony, santhanam, 2007). DSS has to be implement as appropriate criteria for choosing a model for software development (Janczura, Golinska, 2010). DSS use in Software Project Management could avoid the possible erroneous results and help companies to perform the managing and planning functions easier (Besir, Birant, 2010). Project management is an experience driven and knowledge-centralized activity (Yang, Wang, 2009) so that collecting and store the experience of project managers and experts on their decision not only helps skip the same mistake they may had but also aids to put together a strong and better set of alternatives decision and solutions.

THE STEPS FOR A MUCH EASIER AND SAFER DECISION MAKING

In a project, there are many decisions to make. They are of very varied nature and can have a very strong influence on the progress of the project or/and on its final orientation. A decision being a choice among several alternatives regarding several criteria, there may be difficulties, to identify these alternatives or to make the choice. These difficulties are disturbances, which result in additional efforts or risks of error in the decision taken. These disruptions are discussed; including uncertainty related to the future, changes inherent in the project, the presence of the human factor and the complexity of the project in general.

Whether in everyday life or in a project, human beings take a wide range of decisions, strides and issues. It can be instantaneous or very long, but it always corresponds to the same succession of 'phase'. In general, there are five phases:

1) Creative phase and systematic analysis: the generation of potential solutions. It is a selection, generation of possible solutions and elimination of impossible solutions phase and must at the same time be creative and rigorous. This phase can be advantageously assisted by the knowledge of the necessary information and data and by the knowledge of historical solutions of previous solutions or similar.

2) The synthetic and subjective phase: the assessment of potential solutions: It is a sorting phase, which classifies the potential solutions chosen according to criteria, whether conscious or unconscious. This phase therefore theoretically relies on: Knowledge of the choice criteria and the weights of the respective criterion.

3) The decision-making phase: after the potential solutions have been classified, the choice has to be made between the alternatives solution, decision and even models and methods to use. This is the critical phase.

4) The procedural phase: the application of the decision: A decision in this phase can therefore be summarized as a procedure to be executed once the decision is made, this procedure varying for each type of decision.

5) The surly but essential phase: the capitalization of the decision: This phase is crucial because it informs the correctness of the decision. If there was an error, was it due to a bad decision, a bad execution of a good decision? The goal of capitalization is to keep a record of what happen, so that in the future every necessary information, can be re-use. The question is when, how and in what shape.

Figure 1 Phases of Decision-making Process

Figure 1 summarizes the phases considered when making a decision in general. Decision is an irreversible elementary process that transforms the state of the project or changes the orientation to a new state of equilibrium. A decision therefore has consequences, which may be negative.

THE APPROACH OF A DECISION PROCESS AID IN A PROJECT AND ITS INTERACTIONS

The nature of decision aid is a technique, method and tool that help the optimization, the simulation and the approximation of a decision that gives the decision maker the advantage to make a better decision. On closer inspection, the problem is not to have a method of automatic estimation of duration, but a procedure, a method to follow when it comes to make a decision on a particular situation

The management's classification of the different decisions (strategic, tactical and operational) is very important because it determines the development of an internal decision-making processes adapted to their specificities.

The internal decision-making process generally follows different stages:

1) Objective analysis: this first step aims to define precisely and formally the purpose of the future decision-making (on which the decision-making is concerned).

2) A data collection, information gathering: This involves both external factors and internal factors (inventory of available resources that can be used in the decision-making process).

3) Definition of the possible alternatives: the analysis of the information makes it possible to define a set of decisions likely to provide an answer to the problem posed.

4) Comparison and evaluation of these alternatives: in the decision-making process, it is necessary to be able to compare the different alternatives, which necessitates an evaluation of the costs and the probable gains.

5) Choosing an alternative, an option: the decision itself consists on choosing a rational alternative, i.e. choosing the one that allows the project to be optimized and stay on course with it objectively, although the approach may be the same for all project decision-making, it is possible to identify certain characteristics specific to each type of decision.

Let us suppose that a decision is represented by X, A is the set of all alternatives decision and that the objective is an application F(X), where a decision X associate its evaluation.

So the general form of solving a problem will be: min F(X) or max F(X), with X in A

From problem to model

To solve this problem is to find among all the possible values of X in A that will give the objective the smallest or the largest possible value. Without specifying the nature of X, A, or F, the only possibility of solving the problem is to enumerate all the solutions. Since enumeration is generally complex and sometime impossible. In order to solve a problem, it is necessary to construct a model adapted to it, to specify the nature of X, A, and F(x). The model should be used to explore solutions or simulate all relationships between data and variables. Before the development or the use of the model, the problem must be analyzed rigorously. In project management, there are many models that can be used and knowing where the problem is located, makes it easier to choose the right model. Table1 illustrates a "Framework for Classifying the Project Management Research"where a problem can be precisely located and helps choose the right model for the problem in the area.

From model to solution

Once the problem is correctly represented, it will be necessary to solve it. For this, for each type of model, many methods of resolutions are available. The nature of the problem can lead to models from which it is still very difficult today to obtain an optimal solution. In this case, we will concentrate on constructing a good model in a reasonable time using approximate methods known as "fuzzy logic". The model can be used to simulate the consequence of variation of certain data or parameters of the problem and to measure the impact of certain decisions in a context where experimentation is often impossible.

From solution to decision

Once a solution is elaborated, it can first be analyzed (sensitive analysis) in order to validate the model. We have seen that the model was only a schematic representation of reality. One solution might show that some constraints have not, or have been, taken into account. If this is not the case, then it will be necessary to translate the solution obtained in terms of the problem as it was posed and leave it to the decision-maker to accept it, modify it or reject it!

From decision to action

Once the decision maker made his/her decision among the alternatives decision he/she must act. The decision maker must take action, but sometimes this action can face some set back so it is up to the manager to either find an alternative decision or alternative solution.

Scheme of the approach

The preceding approach, which illustrates the passage from the problem to the decision, can be represented in the following diagram - which itself is only a model.

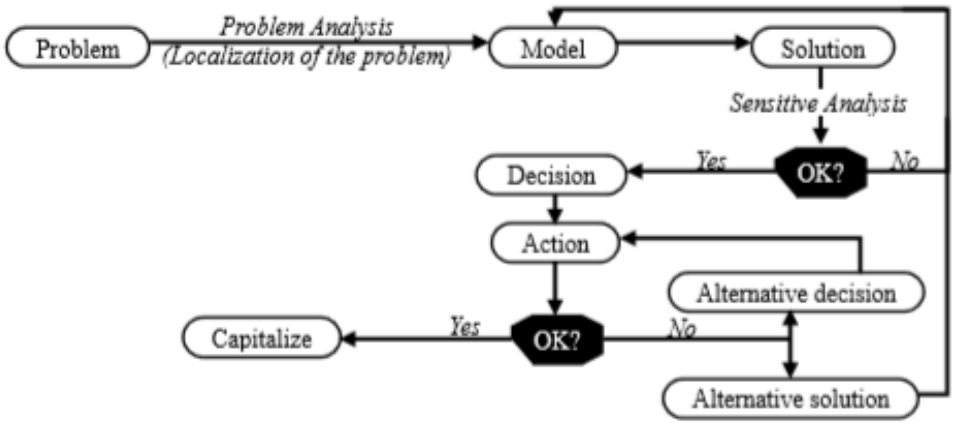

Figure 2 An Approach of a Decision Process Aid

Table 1 Conceptual Framework for Classifying the Project Management Research (Adapted from the PMBOK Guide, 2008)

Knowledge Areas	Project Management Processes Groups				
	Initiating	Planning	Executing	Monitoring and Controlling	Closing
Integration Management	Develop project Charter Develop preliminary project scope statement	Develop project management plan	Direct and manage project execution	Monitor and control project work Integrated change control	Close project
Scope Management		Scope planning Scope definition Create WBS		Scope verification Scope control	
Time Management		Activity definition Activity sequencing Activity resource estimating Activity duration estimating Schedule development		Schedule control	
Cost Management		Cost estimating Cost budgeting		Cost control	
Quality Management		Quality planning	Perform quality assurance	Perform quality control	
Human Resource Management		Human resource planning	Acquire project team Develop project team	Manage project team	
Communications Management		Communications planning	Information distribution	Performance reporting Manage stakeholders	
Risk Management		Risk identification Qualitative risk analysis Quantitative risk analysis Risk response planning		Risk monitoring and control	
Procurement Management		Plan purchases and acquisitions Plan contracting	Request seller responses Select sellers	Contract administration	Contract closure

CONCLUSION

There are many different theories related to decision-making and decision process. There are several models from complex mathematical ones to a few word frameworks, providing aid and guidance for decision-making. By introducing the "Framework for Classifying the Project Management Research", by developing an overall model for decision process and by defining the process and the linkages of different parts in the process, the application and aims of it should become clearer. The idea of this simple model is to reduce the uncertainties and the unknowns by being precise on where the problem occurs and how in the past project manager dealt with it. This model can be used as individual or group decision makers, in addition to this process each of its steps is documented to identify roles, interfaces, prerequisites for each, who is or should be involved in each step. It should be documented how the process should be understood and which parties are involved in what phase, who has the responsibility to for example decide in what area a problem belong to, what alternatives are taken into account. After establishing the model for the process, the next step is to decide what information should go through the process. To screen the demands, it is recommended of the use of the concept of a "Framework for Classifying the Project Management Research". To ensure proper impact resulted from the decisions, they have to be carried out properly.

The model has procedured in place to make a decision, and in terms of bad outcome a quick better alternative is in place to help. The outcomes of this paper have presented some interesting possibilities for further research, in the field of data mining and big data. The research on big data as a collection of information on experiences of previous cases associate with the "Framework for Classifying The Project Management Research" and the model makes an interesting topic.

REFERENCES

De Piante Henriksen A., Palocsay S.W. An Excel-based Decision Support System for Scoring and Ranking Proposed R&D Projects[J]. International Journal of Information Technology & Decision Making, 2008,7(3):529-546

Marques G., Gourc D., Lauras M. Multi-criteria Performance Analysis for Decision Making in Project Management[J]. International Journal of Project Management, 2011, 29(8):1057-1069

Mao Yihua, Wu Wenjing. Fuzzy Real Option Evaluation of Real Estate Project Based on Risk Analysis[J]. Systems Engineering Procedia, 2011,(1):228-235

Vanhoucke, M., Vandevoorde S. A Simulation and Evaluation of Earned Value Metrics to Forecast the Project Duration[J]. Journal of the Operational Research Society, 2007, 58(10):1361-1374

Elshaer, R. Impact of Sensitivity Information on the Prediction of Project‘s Duration Using Earned Schedule method[J]. International Journal of Project Management, 2013,31(4):579-588 Vanhoucke, M. Using Activity Sensitivity and Network Topology Information to Monitor Project Time Performance[J]. Omega., 2010,38(5):359-370

S. Antony, R. Santhanam. Could the Use of a Knowledge-based System Lead to Implicit Learning[J]. Decision Support Systems, 2007,43(1):141-151

G. H. Janczura, I. Golinska. Decision Support System for Choosing Model for a Software Development Life Cycle[J]. Operations Research and Decisions, 2010,20(1):61-77

S. Besir, K. U. Birant. A Case for Decision Support Systems on Project Management, in ICT Innovations[J]. Web Proceedings, 2010:71-76

H. L. Yang, C. S. Wang. Recommender System for Software Project Planning One Application of Revised CBR Algorithm[J]. Expert Systems with Applications, 2009,36(5):8938-8945

Project Management Institute (PMI). A Guide to the Project Management Body of Knowledge (PMBOK)[M]. 4th Edition, 2008