TITLE

"A FRAMEWORK FOR ACHIEVING AN EFFECTIVE PROBLEM - SOLVING AND DECISION - MAKING SYSTEM"

By
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“A FRAMEWORK FOR ACHIEVING AN EFFECTIVE PROBLEM - SOLVING AND DECISION - MAKING SYSTEM”

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Always with Respect
Kapriniotis Argiris

Curriculum Vitae

Argiris Kapriniotis has studied Business Administration in the University of Patras. He graduation grade was seven point three (7,3). The theme of his first degree dissertation was about the profession extinguishing factors and engagement in the working environment (grade =10/10). Additionally, he has received a certificate of European Computer Driving License. He has partly worked in an insurance company as a team in a risk underwriting department.

It is worthy of note that his first degree highlighted the difficulties to manage different cultures and personnel according to specific objectives and strategies. What is more, this knowledge instigated the author to choose the Project management specification as an effective way to broaden his knowledge and upgrade his administrative skills.

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Abstract

The initial and fundamental intention of this study is to highlight with specific details the difficulties that every project manager face during the decision making and problem solving processes. More specifically this thesis will spotlight the factors which jeopardize our decision ability and provoke significant problems to the organization life cycle. The systemic approach will be mentioned and used to describe how the decision process influenced by the interrelations and interactions among the systems of the organization environment.

The outcome of the above research will be a development of an anthropocentric decision making and problem solving model. To be more precise, the author strongly supports the opinion that the key to success in order to make effective decisions is the human brain. Therefore, the "line to attack" model is a systemic decision approach based upon the essential skills that every decision maker must have in view of analyzing the aspects of the situation, determining clear objectives, designing accurate strategies and finally, implementing profitable decisions. What is more, crucial tools and techniques will be available according to the significant of the decision or problem.

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CHAPTER 1

Nature of the study

We all make decisions of varying importance every day, so the idea that decision making can be a rather sophisticated art may at first glance seem strange. In other words, Herbert A. Simon points out that "every decision requires attention, setting goals, finding or designing suitable courses of action, and evaluating and choosing among alternative actions". The first three of these points (fixing agendas, setting goals, and designing actions) are usually called *problem solving;* the last two (evaluating and choosing), are usually called *decision making.* So it is clear that decision making and problem solving are not simple processes and need specific requirements in order to achieve the desirable results.

Additionally, the increasing emphasis on using project management approaches, in combination with the increasing number of people who participate in these processes, make problem solving and decision making procedures critical elements forundertaking difficult objectives, implementing strategies and achieving high quality outcomes. Above all, regardless of the field, every organization has its own expert personnel and technological advanced equipment which contribute to making a final decision.

However, this does not guarantee success. There are many examples which show that the final decision caused bigger problems or was not as profitable as the members predicted when they decided to implement it. What is more, it is worthy of note that there is one more parameter which can sabotage our decisions. This is the way that human brain works in view of evaluating a situation and reaching a conclusion. The human factor is probably the most crucial factor in the whole decision making and problem solving process, so we have to pay extremely attention in view of comprehending the significance of the human participation in the project management approach.

In addition, the complexity of each project can affect the effectiveness of the decision making process and generally, the quality of the final result. To explain what I mean, a wide range of literature about the complex projects has proved that the failure to make effective decisions or the disability to handle complex problems occurs as a consequence of a multiple interactions (linear and non-leaner)[1], high levels of risk and uncertainly, people incapability to understand how systems works and so on. Peter Senge supports the opinion that the only way to understand the organizations complexity is to determine first how systems work and how it interacts each other.

So, this study will describe the nature of the problem solving and decision making processes and will provide adequate solutions which can help decision makers make outstanding decisions and avoid pitfalls and disagreeable results.

Need Assessment

Decision making and problem solving processes *lie at the heart of each company's activity*[2]. In other words, organizations are decision making units made up of a variety of decision makers such as project managers, employees, functional managers, top level management and so on.

The stakeholders in the decision making process can be separated in two general categories. The first refers to the members who participate in the decision making process and make the decision. The second one includes the members who receive the impact of the decision. For instance, each company's purpose is to make effectual decisions in order to satisfy the customers. However, both of these categories include a variety of personnel who have different levels of participation and expectations from the final decision. To be more

[1] Chris Ivory, Neil Alderman, (2005). Can project management learn anything from studies of failure in complex systems? *Project Management Institute*, Vol. 36, No. 3, 5-16
[2] A student and teachers business studies resource center. Retrieved June, 2006 from www.thetimes100.co.uk

precise, the first group contains the company, the decision makers, and management. All these people are in charge of resolving problematic situations and making profitable decisions through the application of an effective decision making and problem solving model. On the contrary, the second group includes the customer who is affected by the decisions. These groups represent the primary stakeholders and composed of individuals with different cultures, ways of thinking and expectation. Therefore, the big challenge for the decision maker (project manager) is to develop a strategy which will synthesize all the different points of view in one common acceptable decision.

It is important to understand that the stakeholders contribution in the decision making process emerge from the necessity of the kind of the decision that should be made. To be more precise, there are three primary types of decisions which demand separate participation and contribution from the stakeholders. The first one is the *short term operational decisions* which are frequently and refers to the organization activities. In this type of decision the management and the supervision of activities are the main participants. The next type of decisions is the *periodic control decision*s which are made less frequently and are in charge to keep the organization in track. The final kind of decisions is the *strategic decisions* which refer to the long term plans of the organization. The people who participate in this process belong to the senior management. What is more, this type of decision are extremely important and thus, the external stakeholders must be informed in view of support the final outcomes.

In conclusion, it is worthy of note that the classification of types of the decision are based upon the predictability of the decision. In other words, the more repetitive, routine and linear the decision may be, the easier to implemented without being trapped by the unclear areas. In the same way, each type of the decision demand different way of handling from the decision makers and different tools and techniques.

Purpose of the Study

The purpose of this study is to identify the problems, errors and circumstances which can affect negatively the problem solving and decision making process. What is more, this study will examine current tools and techniques which are used in problem solving and decision making procedures and underline the most common mistakes. Special attention will be given to the risk factors and their impact in the decision procedures. Furthermore, the author will provide a set of guidelines and information in order to avoid pitfalls, and will emphasize the fundamental ways to improve the problem solving and decision processes in order to achieve highly successful decisions. In brief, author's final intention is to combine all the above aspects in an anthropocentric decision making and problem solving model.

Relation to the Program of Study

Project management is directly interwoven with the problem solving and decision making processes. More analytically, every aspect in project management life cycle such as planning, monitoring resource allocation and so on, is based on a decision procedure.

Project manager is in charge of making a numerous decisions. Each of them needs specific handling. However, there are no light - handed decisions because each of them needs separate analysis in order to identify the levels of uncertainty and complexity, the alternatives and impacts, and finally to evaluate and design the implementation strategy. So, it is clear that decision making models are necessary in the project management processes in order to achieve effective decision according to the company's objectives and customer expectations.

In simple terms, decision making theory provides a logical framework for solving different level of problems and confronting difficult dilemmas which appear in every project management process.

The PM 501 course provide the fundamental principles of the project management. More specifically, Jack R. Meredith (Project Management: A Managerial Approach, 8th edition) refers to the decision making process as the most important element in the project selection process. However, this systematic process can be applied to any area of the organization in which choices must be made between competing alternatives. Furthermore, Harold Kerzner. (Project Management: A System Approach to Planning, Scheduling and Controlling) illustrates the importance of decision making in the approaches of the project management.

Definition of Terms

This part of thesis has as a purpose to point out some significant terms and analyze the complexity of them in order to help the reader to understand the meaning of these terms. The definitions are drawn from bibliography and economic dictionaries.

Table 1: Definition of Terms

Analysis Paralysis	Analysis paralysis applies to any situation where analysis may be applied to help make a decision and may be a dysfunctional element of organizational behavior. Often phrased as paralysis by analysis, in contrast to extinction by instinct
Balancing loop	A causal loop where an action(s) effectively balances or reverses the behavior over time in a system.
Butterfly effect	The phenomenon whereby a small change at one place in a complex system can have large effects elsewhere
Chaos theory	The theory of non-linear functions, such that small differences in the input of the function can result in large and unpredictable differences in the output.
Continuous Improvement	A quality philosophy that assumes further improvements are always possible and that processes should be continuously reevaluated and improvements implemented.
Decision making	The cognitive process of selecting a course of action from among multiple alternatives.
Dilemma	A dilemma is a problem offering two solutions, neither of which is acceptable. The two options are often described as the horns of a dilemma, neither of which is comfortable

DSM	Design Matrix Structure
DSS	Decision Support System. Application for analyzing large quantities of data and performing a wide variety of calculations and projections.
DUP	Diagnoses Uncertainty Process
Mental Model	Meanings you automatically construct in your mind from information you receive through multiple sensory inputs. The meanings stem from past experiences and prior knowledge.
Personal Mastery	Is the discipline of continually clarifying and deepening an individual's personal vision, focusing energies, developing patience, and trying to see reality objectively in order to live life in the service of the individual's highest aspirations.
Problem solving	A systematic approach utilizing multiple perspectives to uncover the issues related to a particular problem, design an intervention plan, and evaluate the outcome.
Reinforcing loop	A causal loop where each action reinforces the increase or decrease in each of the components (behavior over time).
Risk	The chance of something happening that will have an impact upon objectives. It is measured in terms of consequences and likelihood
Risk Based Decision Making (RBDM)	A process that organizes information about the possibility for one or more unwanted outcomes occur into a broad, orderly structure that helps decision makers make more informed management choices
Risk management	The process of evaluating and selecting alternative regulatory and non-regulatory responses to risk. The selection process necessarily requires the consideration of legal, economic, and behavioral factors.
System Thinking	Systems thinking is a holistic approach to analysis that focuses on the way that a system's constituent parts interrelate and how systems work over time and within the context of larger systems
Theory of game	A theory of decision making under conditions of uncertainty and interdependence. Components of a game include players, strategies, actions, payoffs, outcomes and an equilibrium
Knowledge management	Capturing, organizing, and storing knowledge and experiences of individual workers and groups within an organization and making this information available to others in the organization
Learning organization	An organization that actively seeks to monitor change in the environment and adapt and learn from the change. Such organizations often incorporate Scenario Building in their planning efforts.

Source: Wikipedia (The free encyclopedia)

CHAPTER 2

Problem statement

Problem solving and decision making procedures are crucial in making more effective project management decisions. What is more, they are dependant on a variety of factors, which have different levels of importance in the critical decisions, problems or dilemmas. However, many enterprises are unable to adapt an efficient decision making system because of a lack of qualified people with appropriate backgrounds who can identify, quantify, assess and manage all the aspects of the decision making process. What is more, there are some obstacles which appear from the inexplicably operation of the human brain during the decision-thinking process.

Rationale

It is commonly accepted that a decision making process is at the core of all project management functions. Herbert A. Simon, points out that "the whole process of managerial decision making is synonymous with the practice of management[3]". What is more, a decision making process is an effective way for a company to achieve competitive advantages and a fundamental tool for the specialist who can combine it with their knowledge in order to make more profitable and successful judgments.

We have to separate the decision making process from the outcomes. In other words, an effective decision making process does not guarantee a beneficial outcome and also, an effective outcome does not imply a well established decision making process. The key point between them (process and outcomes) is the human factor. It is not an accident that project managers' rate decision making ability as the most important skill, but only a small percentage of them have the training or knowledge to support good decisions constantly.

[3] Herbent A. Simon, (1960) The new science of management decision, New York: Harper & Row

Russo and Shoemaker support the opinion that "becoming a good decision maker requires coaching just like becoming a good athlete[4]". In other words, excellent performance (the ability to make correct decisions) depends on techniques that can be taught.

However, many companies have a weakness in making crucial decisions. There are many reasons for this situation and the most significant are:

- Group failure: Some people support the opinion that a group of smart people can make only smart decisions. So, they show no interest in the decision process, and as a result they fail to make outstanding decisions.
- Risk assessment: It is a common mistake for companies to ignore potential risks as impossible to happen, and as a result such companies they lose control when problems occur.
- Plunging in: This factor resembles analysis – paralysis. More analytically, there are a lot of times in a decision making process where numerous data are gathered and a conclusion is reached without taking into account the root cause of the issue. As a result, the outcome of the process is far from the core of the problem.
- Authority's vanity: Previous successes have driven some managers to feel too self-confident to upgrade and expand their skills and knowledge of the decision making process, as a result to decrease their capability of handling and manipulating difficult situations.
- Lack of frame control: This element refers to the failure of defining the problem in more than one way or being unduly influenced by the perspective of others, so as to make inaccurate estimations and fail to define the situation precisely.
- Lack of System Thinking Knowledge: A big amount of manager neglect the system thinking theory with a consequence to be incapable to manage complex projects. In addition, the have no idea about the fundamental principles/tool and techniques of system thinking

[4] Russo, J. Edward and Shoemaker, Paul J. H.,(1989) Decision traps, Doubleday, New York, N.Y.

such as organization learning, archetypes and mental model with a result to be unable to implement them in difficult situation in view of determine the problem and provide useful solutions.

For all the above reasons it is clear that enterprises suffer from poor or defective decision making processes. Irving Janis expresses this opinion as, "when all vital decision are made on the basis of a simplistic strategy, the gross misperceptions and miscalculations that remain uncorrected are likely to lead to disaster sooner or later – usually sooner rather than later[5]". What is more, evidence from number of studies indicates that managers still lack many of the basic problem solving skills (Kharbabda and Stallworthy 1990, Mintzberg 1994, Gordon 1997)[6].

As a result, enterprises need qualified managers who will have the capacity to undertake complicated problems and provide efficient decisions. Additionally, the problem solving and decision making processes are directly dependable on the type of the problem to be solved, thus there are specific tools and techniques which can overcome difficulties and provide adequate ways to solve problems and make accurate decisions.

Hypothesis

Problem solving and decision making processes can be improved through the use of a well established decision making and problem solving model and the appropriate human selection processes in order to make thorough decisions, as well as to handle all the external and internal factors concerning the complexity and the uncertainty of each situation.

[5] Irving L. Janis, (1989) Crucial Decisions – Leadership in Polycymaking and Cricis Management, New York, The free press
[6] Andrew O' Loughlin, Elspeth McFadzean. (1999) *Team Performance Management*, Vol5 No. 3, pp. 103-120

CHAPTER 3

Preliminary Literature Review

The preliminary literature review summarizes the thesis resources used so far. Additionally, it gives some important information about the usefulness of the resources and the ways that the author will follow to reach the results of this research.

The preliminary literature review is composed of four sections, which are the framework of problem solving and decision making procedures in the enterprises' operation. Additionally, the author will describe with specific details the factors which can affect the decision processes and provoke obstacles in the problem solving areas. What is more, the author will pay precise attention in the significance and necessity of qualified people in the decision making and problem solving processes in view of determining with details the conditions that cause the problem in view of reaching a valuable outcome. Finally, we will try to analyze the importance of risk management in the decision making process in order to help decision makers to avoid potential drawbacks and eventuate in effectual decisions.

A project manager is a supreme manager if he makes the correct decision at right time. In the same way, football players judged for their decisions from the final game result. A doctor must be able to examine a patient, recognize the importance of each situation and finally make the most effective decision in view of curing the patient. All these people are obligated to make rapid and accurate decisions, taking into account risk factors and uncertain levels and complex conditions.

It is commonly accepted that the decisions are the essence of people life. Without regard to the speciality of each person or the type of situation, every people are coerced to

make decisions and resolve problems. Nevertheless, there are many factors which influence these processes and provoke significant obstacles to the decision makers.

Problem Solving and Decision Making Procedures

Decision makers in projectize companies are faced every day with many types of problems. Some of the most famous are which products option should we choose (product development decision), which project are most valuable to undertake (project selection process), which employees are most appropriate to participate in the project team (project team selection process) and which software or tool we need to determine and analyze the project risks (project risk management process) and so on.

Initially we have to elucidate that all the above issues separated into problems and dilemmas. The main difference between these issues is that the problem is possible to have more than two solutions (alternative actions) or choices while the dilemma refers only in two specific solutions or choices. In any case, the decision makers should follow a concrete methodology in view of achieving the most desirable results (Senge[7], 2005).

The author's purpose is to contrast the theoretical point of view with the more technical decision making and problem solving process. Furthermore, we will underline the advantages and shortcomings of each model in order to designate the importance in the whole companies operation. The point of this thesis is not to relegate the value of each model or to overestimate any other, but to highlight their operation and pinpoint crucial issue which can affect the solidity of our decisions.

Helga Drummond focuses on the decision making process through his book *The Art of Decision Making* (Mirrors of imagination, Masks of fate). It is worthy of note that this book was prompted by an invitation to teach risk management in the University of Harvard.

[7] Peter, S., (2005). The fifth Discipline Fieldbook: *Strategies and tools for building a learning organization.* London, Nicholas Brealey

The basic question that this book tries to answer is **How** and **Why** decisions go awry. In other words, how and why the final outcome of our decisions is far away from the initial estimation. What is significant in this book comparing to others that have similar contents (decision making aspects) is the theoretical view without mathematical models and techniques of risk management that Helga Drummond choose to highlights the importance of decision making and problem solving approaches.

The author wishes to "lift the veil" of the rationalism decision making theory in view of uncovering the way decisions are made in reality. This means that for the Helga Drummond the decisions are a consequence of emerge situations which provoke stress and pressure for a proper decision. She uses a big number of case studies where something has gone evidently wrong in order to emphasize and prove that *things happen often without decisions and decisions are often made without a thing happen*[8] (Thomas W., 2003).

In regard of the decision making process in the business situations, she strongly supports the opinion that organization cultures and structures pose the decision makers to develop images and myths which increasing the dubiousness and affect the credibility of the final choice. What is more, Helga Drummond pays specific attention to the role of the information in the decision making process. To be more precise, she believes that the information can actually lead the decision makers away from the reality. This happened because the charts, graphs and other statistic forms focus on different aspects of the company's operation. Therefore, controversial information about the same issue disorientates the decision makers and provokes significant incoherence in the final outcome.

It is commonly accepted that the more information we gathered, the more precise decisions will be. However, Helga Drummond believes that ones of the frustrations of decision making are that a big amount of information tells us everything except what we need

[8] Thomas, W. Walde. (2007) The art of decision making: *Mirrors of imagination Masks of fate* , Retrieved may, From http://www.gasandoil.com/ogel/samples/freearticles/bookreview_16.htm

to know. In other words, the exaggerative collection of information is possible to mislead the decision makers and increase the uncertainty of the final decision. As Lewis says (2001) *analysis paralysis*[9] may block decision making process and distract the interest of the decision maker out of the core problem. The main reason which is responsible for the uncertainty is that information includes assumptions which enclose risks and generalizations. Thus, the decision makers must be very careful with the information that they gather to substantiate their decisions.

When we examine the usefulness of the information in the decision processes, we need to illuminate first how the information related with the knowledge. The information is composed of data organized to characterize a particular situation while the knowledge consist of facts perspectives and concepts, mental references models, truths and beliefs, judgments and expectations, methodologies, and know-how (Karl Wiig, 2004). The combination of these issues in the decision making process began when we use the information to describe a situation and the knowledge to evaluate and handle this situation.

The purpose of the decision theory is to solve problems with accurate and effective solutions. Nevertheless, there are many cases where the solution is the problem. As the Peter Senge has said in his book the Fifth Discipline, *today's problem is the yesterday's solution*[10]. This means that solution can shift the problem from one part of the system to another while we will have the illusion that the problem has been resolved for ever. In accordance with the above issue, Helga Drummond describes the paradox of consequence and explains that *our problem/ solution mentality condition us to believe that we can solve problems just like we can take an aspirin for the headache*[11]. This means that there are some problems which seem at first glace easily to resolve but demand specific handling from the decision makers. To

[9] James, P., Lewis, (2001). Project Planning, Scheduling and Control: *A hands – on guide to bringing projects in on time and on budget*. pp239
[10] Peter M. Senge. (2006)The Fifth Discipline: *The art & Practice of the Learning Organization*. p.58
[11] Helga Drummond, (2001). The art of decision making*: Mirrors of imagination, Masks of fate*. P.152

explain what I mean the attitude that if A cause B and B is good, the more A can bring better results is catastrophic in some situations. The golden section in this tactic is to bring B by avoiding it. In other words, the decision maker should have the ability to recognize the objectives and investigate all the alternatives in view of choose the most optimum solution.

There is a variety of opinions if an optimum (best) solution exists or not. Different mental models can focus on different aspects of the problem, so as to provide different best solution (Senge, 2006). The Beer Game[12] is a logistics game that was originally developed by MIT in the 60s. The main purpose of this game is to illustrate how the human behavior can be affected by a simple change in a part of the system. The astonishing point in this game is that there is no a best solution but only possible best solutions. Each individual who participates on this game can affect the decision of the other personnel and simultaneously can be affected by them.

Effective decision-making means that you can make things happen, instead of just letting things happen (Katey Walker, Nayda I. Torres, and Josephine Turner, 2006)[13]. However, there are many times where decision makers are trapped and unable to make an accurate decision. Helga Drummond describes in her book the situations where the decision maker is locked into specific decision margins because the lack of time to make a well documented choice. This phenomenon called *entrapment* and represent a big percentage of situations that project managers called to face every day. The basic treatment that the author provides throughout her book is that decision makers should have the perspicacity to arrest the problems before it reaches *the point of no return* because beyond this point the time margins are strictly limited. The basic cause of this phenomenon is that people expect to call attention to problem and ignores the symptoms which signal the problem. However, when

[12] Beer Game from http://beergame.mit.edu/default.htm
[13] Make up your mind: *Improving your decision making skills*. from University of Florida, Web Site http://edis.ifas.ufl.edu/HE691

the problem appears, the margins of action are limited and the decision makers are obligated to resolve it immediately.

As we say in the previous paragraphs this book is based upon case studies and avoids using complex mathematical models. The fundamental author's target is to describe the decision making and problem solving process under utilization of simple methods and processes in view of underlining the deeper meaning and each operation of daily live. In other words, Helga Drummond highlights the way that people live the decision making and tries to delineate simple manners in view of helping them to make better decisions with less uncertainty and danger.

Above all, the intention of this book is to make sense that the real knowledge of an effective decision making and problem solving approach is in our ability to understand the doubt and uncertainty in every decision, to recognize the risks and dangers surround us, a consciousness of the limits of our capacity to handle every condition and finally "*to through away the illusions that we can forecast the next days weather*".

Dr Robert W. Lind is one more specialist who focuses on the human side of the decision making process. The article "It is your choice: Decision making and Goal setting[14]" pay attention to the factors that cause pressure and stress and affect our ability to make effective decisions. To be more precise, such of these factors are necessary to make crucial decisions and solve intricate problems under limited margins of time. Moreover, the consequences of a bad decision are disproportionate with the time that people have to think and decide. What is more, there are restrictions as to how much energy, money and moral we have available to spend in order to determine all the conditions, prioritize our needs, estimate the dangers and finally conclude in a profitable decision.

[14] Dr Robert W. Lind. (2006). It is your choice: *Decision making and Goal setting*. MSU Extension Services

According to Dr Robert W. Lind view, personal and business problems are often easier to solve (or to confront at least) if we have a good understanding of our goals and values. He proposes a physiological model which is composed of five simple steps. The acronym of the word SOLVE is the central model's idea, as we can see in the next figure.

Figure 1: The Solve Approach

S	=	State the problem in precise language
O	=	Outline your usual response
L	=	List your alternatives and their consequences
V	=	Vitalize the concept by selecting an alternative, formulating a plan of action and implementing the plan
E	=	Evaluate your success of your choice

Source: It is your choice: Decision making and Goal setting

This is a clear case of a simple model which can be added in many situations. There are so many similar models in the world bibliography but their effectiveness is controversial because it simplifies the decision making process as to seems puerile. However, there are scientists who feel that these types of models can provide general instructions or ways to solve simple problems and make easy decisions.

System theory is a different point of view about the decision making and problem solving process. It provides a theoretical framework that can help us to understand and comprehend human behaviour such as learning, thinking decision making and problem solving (Walmsley[15], 1972, Evered[16], 1980, Senge 1992). The basis of system thinking is upon Darwin theory (theory of evolution) and has been developed during the 1950 and 1960 in the natural science. Until now, there are many scientists who have been involved with the system theory and have expressed a big number of definitions. System thinking is a discipline

[15] Walmsley D. J., (1972). System theory: *A framework for human geographical enquiry, research school of pacific studies, depart of geography*, Austrian National University

16 Evered R., (1980). *Consequences of and prospects for system thinking in organizational change in system theory for organizations development*. John Wiley &sons

for seeing wholes, recognizing patterns and interrelationships, and learning how to structure those interrelationships in more effective and efficient ways." (Senge, P. 2006, Lannon-Kim, C., 1991). Anil B. Jambekar (1995) characterizes the system thinking process "as an effective way of looking at the world", as an effective way to determine your own big picture (Senge, 2005).

Peter Senge was one of 24 men and women who have had the greatest impact on the way we conduct business today. For this reason, he was named a Strategist of the Century by the *Journal of Business Strategy*[17] *(*September/ October 1999). What is more, the *Financial Time*[18] (2000) and the *Business Week*[19] (October 2001) rated Senge as one of the top management gurus in this century (Table 2).

Table 2: The Top Management Gurus

The Top Management Gurus		
1	**Dave Ulrich**	Human Resources - Michigan
2	**Ram Charan**	Independent adviser - Various companies and schools
3	**John P. Kotter**	Leadership -- Harvard Business School
4	**Gary Hamel**	Strategy International Management - London Business School/Strategos
5	**Jay Conger**	Leadership -- London Business School
6*	**Peter F. Drucker**	Strategy, Business Policy -- Various companies and schools
6*	**Michael E. Porter**	Strategy - Harvard Business School
7	**Peter M. Senge**	Organizational learning, organizational change -- MIT (Sloan)
8	**Stephen R. Covey**	Author The 7 Habits of Highly Effective People
9	**Noel Tichy**	Leadership – Michigan
10*	**C.K. Prahalad**	Strategy, International Business - Michigan/PRAJA
10*	**Tom Peters**	Leadership -- tompeterscompany!

*Tie

Source: Rankings were determined by a Business Week Online survey sent to 514 companies. 210 replied, for a response rate of 41%. Companies were asked to rank the best providers of executive education and to list the "10 professors or management gurus" they considered "the most effective at teaching or facilitating learning." Professors, authors, and speakers with too few mentions were disqualified.

[17] Journal of business strategy, September, 1999
[18] Financial time, *The resilient revolutionary*, August 18, 2000, by Simon London
[19] Business Week, *Rating Management Gurus*, October 15, 2001. B-School news

Peter Senge focuses on the idea of decentralizing the role of leadership in organizations so as to enhance the capacity of all people to work productively toward common goals. In other words, organizations should be support learning practices in order to develop *continues improvement*, *share vision* and *mental model* processes[20] (Senge, 2005). Furthermore, he strongly support the opinion that all people who participate directly or indirectly (external or internal stakeholders) in a project are crucial parts of a subsystem which belongs to a general system, the organization. As a result, everybody should be informed about the project progress and must be enclosed in the decision making process in light of reducing company's inabilities, acquire a competitive advantage and upgrade the ability to learn faster than the competitors.

The framework of Peter Senge theory is based upon the system thinking theory. System thinking is seen by many as a powerful decision making and problem solving tool and encompasses a great and fairly body of methods, tools and principles. The most famous book that we use in this thesis literature is the Fifth Discipline (The art & practice of the learning organization) which honoured as on of the five greatest business books of all time by the Financial Times and one of the seminal management books of the past seventy – five years by the Harvard Business Review.

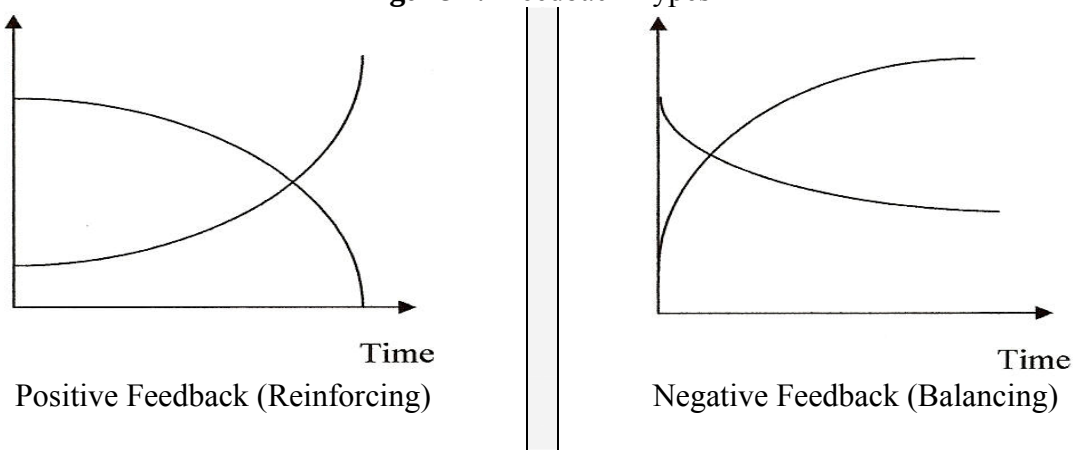
As we see, system thinking it is a method for solving organizational problems and helping organizations change. The central concepts in systems thinking are interconnections, feedbacks, and time delays. What is more, systems thinking encourage managers to identify the larger pattern of interconnections, or causal links, of which problems are a part. Thus, a problem to solve is seen as a symptom of an underlying pattern (Senge, 1999).

Dr Jo Warwick (2005) divides the feedback operation into positive and negative feedback. The main difference is that positive feedback illustrates a reinforcing process in

[20] See Chapter 1, Definition of terms

which a variable can increase or decrease without a limits. On the other hand negative feedback is a balancing process where trying to reach a constant, unchanging position. The following diagrams present the graph of positive and negative feedbacks.

Figure 2: Feedback Types



Source: Dr Jo Warwick presentation in London South Bank University (2006)

The embodiment of system theory appears in archetypes structure. There are many types of archetypes and each of them focuses on a specific situation. However, archetypes are very flexible tool so as to modified or combined in order to accommodate for a specific purpose. All in all, system thinking theory is an outstanding way to examine the problem from a broad perspective that includes organization structures, behaviours, cultures and interrelationships rather than a static analysis of cost and time (Carter Mcnamare, 2006)[21].

The extension of system theory is the **chaos theory**. Characteristically, Brigid L. Bechtold[22] (1997) pointed out that to understanding chaos theory as a model for strategy development, it helps to look first at general system theory. This theory was born out of mathematical sciences during the 1960 and 1970 (Williams, 1997). During the decade, scientists come in agreement that the simple linear models are inadequate for most important organization decision (Mintzberg, 1976). The chaos theory refers to complex systems which

[21] Free management library: *Thinking about organization ad a system.* Retrieved June, 2007 from http://www.managementhelp.org/org_thry/org_sytm.htm
[22] Brigid, L., Bechtold, (1997). Chaos theory as a model for strategy development. *Empowerment in Organization*, Vol. 5 No.4, pp.193-201

are deterministic, dynamic and non-linear. The butterfly effect is a most famous example world wide and delineates the phenomenon where a small change in one part of the system can bring the disaster in another part (Gleick, 1987)[23]. The first person who talks about the butterfly effect was the Lorenz at the December 1972 meeting of the American Association for the Advancement of Science in Washington, D.C., vividly illustrates the essential idea of chaos theory.

The application of the chaos theory concerning the decision making process is localized in 1970. It was the moment when managers started to understand that complex problem and multipart systems demands something more than simple techniques of decision making. The fundamental advantage of chaos theory is the applicability in each problem or situation. What is more the concept of self-regulation provides the opportunity to the system to correct itself after a crisis or disaster. However, the mathematical structure of chaos theory provokes some significant obstacles in the ambitious users (Lorenz, 1970).

It is commonly accepted from the scientific community that the framework of the mathematical decision models was developed from the **Theory of Games**. Game theory is the science of strategic decision-making. To be more precise, a decision theory is a particular case of game theory which simplest form is two person game where the first player is the nature and the second the person who receive the decision. Generally, it is a powerful tool in understanding the relationships that are made and broken in the course of competition and cooperation (Kelly & Anthony, 2003[24])

So far, we have examined valuable source which refers only to the theoretical view of the decision making and problem solving process. However, there are two sides one every

[23] Glerck J.,(1987). Chaos: *Making a new science*, Retrieved june, 2007, from http://www.around.com/chaos.html

[24] Kelly, Antony (2003), Decision making using game theory: *An introduction for managers*, Retrieved may, 2006, Cambridge University Press, From http://eprints.soton.ac.uk/9782

coin. So, the next step is to examine the different point of view of the decision making process.

There are many types of mathematical decision model that each company use to solve complex problems and make effective decisions (**D**ecision **S**upport **S**ystems). Nevertheless, the most of them are extremely difficult to be understood from the big percentage of people and is beyond of the main concepts that this study depicts. A.T. de Almeida and G.A. Bohoris (1995) tried to clarify the basic ingredients[25] of an efficient decision model and consumed in eight steps which are appeared below.

1. *The circumstances and basic laws*

The circumstances and basic laws governing the environment for a particular problem analysed or a specific decision we need to make. These issues are referred to as the state of nature and denoted by θ. It is worthy of note here that decision makers can not take under control the state of nature. The set of all possible states of nature is denoted by $\underline{\theta}$. The next movement is to indicate the set of all possible conditions in which a system can be found by a probabilistic behavior. For each particular problem or decision, θ can be either discrete or continuous. This distinction makes the treatment of the problem totally different depending on the situation that we encounter. This is made possible by dividing the continuous θ into ranges represented by a discrete set $\theta_1, \theta_2, ..., \theta_\kappa$.

2. *The set of possible actions*

The set of possible actions illustrates the possible choice that decision maker has to select in order to confront the problem. In other words, this step contains a set of all the available alternatives A and the specific action of this set denoted by α. The variable A can

[25] A.T. de Almeida, & G,A, Bohoris, (1995). Decision Theory in maintenance decision making. *Journal of Quality in Management Engineering*. Vol.1 No.1, pp.39-45

be either discrete or continuous, like θ, and simplified to a discrete action space

$A = (\alpha_1, \alpha_2, ..., \alpha_m)$

3. *The consequence*

The consequence p_{ij} refers to the outcome or the pay-off. In other words, it is the result from the decision maker action α_j which given a set of circumstances θ_i. Generally, the set of possible consequences is denoted by R. The figure 3 a common deterministic case where A, θ, and R are all discrete.

Table 3: Consequences for a simple decision problem

	α_1	α_2
θ_1	p_{11}	p_{12}
θ_2	p_{21}	p_{22}

Source: Journal of quality in management

The consequence of p can be determined be searching for the relation between p and θ given α. In terms of the conditional probability the above expression is $P(p \mid \theta, \alpha)$. The decision makers make some assumptions about the probabilistic behavior of the variables p and θ which based upon typical characteristics of the organization system, previous knowledge, historical data and results of experiments.

4. *The loss and utility functions*

The loss (L) and utility (U) functions $L(p) = L(\theta, \alpha)$ and $U(p) = U(\theta, \alpha)$, measures with quantify conditions the loss or the gain incurred to each consequence. You have to make sense that there is no real difference between these two functions because $L(p) = -U(p)$. Loss function uses from the statistician scientists while decision theorist prefer to

measure data using the utility functions. According to the above, the figure 3 can be expressed with the utility and loss functions as figures 4 & 5 represented.

Table 4: Expected gains for a simple decision problem

	α_1	α_2
θ_1	$U(\theta_1,\alpha_1)$	$U(\theta_1,\alpha_2)$
θ_2	$U(\theta_2,\alpha_1)$	$U(\theta_2,\alpha_2)$

Source: Journal of quality in management

Table 5: Expected losses for a simple decision problem

	α_1	α_2
θ_1	$L(\theta_1,\alpha_1)$	$L(\theta_1,\alpha_2)$
θ_2	$L(\theta_2,\alpha_1)$	$L(\theta_2,\alpha_2)$

Source: Journal of quality in management

The final expression for the loss $L(\theta,\alpha)$ and utility function $U(\theta,\alpha)$ are obtained from $L(p)$ and $U(p)$ through the conditional probability $P(p\,|\,\theta,\alpha)$ as follows:

$$L(\theta,\alpha) = L[P(p \setminus \theta,\alpha)] = E[L(p)]$$

Or

$$U(\theta,\alpha) = U[P(p \setminus \theta,\alpha)] = E[U(p)]$$

Simplest, $L(\theta,\alpha)$ and $U(\theta,\alpha)$ are the expected value of the $L(p)$ and $U(p)$ corresponding. The distinction of continuous p and discrete p provide the following results.

Table 6: Calculation of loss and utility function according top (Continuous and discrete)

	L (loss)	**U(utility)**	
If p **continuous**	$L(\theta,\alpha) = \int_0^{+\infty} L(p)P(p\,|\,\theta,\alpha)dp$	$U(\theta,\alpha) = \int_0^{+\infty} U(p)P(p\,|\,\theta,\alpha)dp$	(1)
If p **discrete**	$L(\theta,\alpha) = \sum_p L(p)P(p\,|\,\theta,\alpha)$	$U(\theta,\alpha) = \sum_p U(p)P(p\,|\,\theta,\alpha)$	(2)

5. *The multi-attribute utility theory*

The multi-attribute utility theory (MAUT) is closely related to multi-criteria decision making and quantifications and aggregations of multiple objectives even worse these objectives are composed of conflicting attributes, or when they are subjective. To be more precise, the multi-attribute utility theory refers to the situation where there is more than one attribute for $p = (p', p'', ...)$.

Let's see an example in order to examinee the importance of this theory. In our case there is a power generating company where p might be associated with two conflicting attributes which are the interruption time $(p' = TI)$ and the cost $(p'' = C)$. If $U(p')$ and $U(p'')$ are single – attribute utility functions, then if p' and p'' are additive independent, the multi-attribute function is:

$$U(p', p'') = k_1 U(p') + k_2 U(p'')$$

Where k_1 and k_2 are scaling constants and $k_1 + k_2 = 1$

However, there is on more scenario where p' and p'' are not mutually independent. In that case, the multi-attribute function is:

$$U(p', p'') = k_1 U(p') + k_2 U(p'') + k_3 U(p') U(p'')$$

Where k_3 is another scaling constant and $k_1 + k_2 + k_3 = 1$

In conclusion, the multi-attribute utility theory strikes a trade-of so that the optimization procedure obtains the best combination of the consequences by the choice of an appropriate action.

6. *Elicitation And consistency checking*

The elicitation of the utility function is one of the most important steps in the whole decision theory process because we will carry into effect the prior methodology regarding the

consequence p. Cultural differences and organization policies are very influential here. The two steps that we should follow are:

- Modeling the multi-attribute utility function
- Modeling the conditional utility function for each attribute, this effectively is a measure of the preference for each value of p.

However, we must to secure that no errors or mistakes have been dedicated in the elicitation process. Therefore, a number of consistency checks are available such as the comparison of the various consequences. More specifically, the $U(p', p'')$ is compared with the decision makers preferences when all the possible consequences are considered.

7. Optimization

The fundamental purpose of each decision model is to acquire an optimum solution. There are many ways – criteria that we can use, according to the characteristics of the problem.

- **Minimax** (minimum of maxima - conservative)

This is applied when no data or information is available. The optimization consists of the action a_j which minimizes the maximum loss $L(\theta_i, a_j)$ for any θ_t that the nature might choose. Then, the equation which gives the solution is:

$$\min_a [\max_\theta L(\theta, \alpha)]$$

- **The Bayesian approach**

This is applied when some prior knowledge $\pi(\theta)$ on θ is available. The optimization consists of choosing the action a_j whose expected utility is maximum

$$\min_a \{\mathrm{E}[U(\theta, \alpha)]\} where E[U(\theta, \alpha)] = \int_\theta \pi(\theta) U(\theta, \alpha) d\theta$$

Without reference to the optimization phase, there two more famous criteria that deserve to be mention for educational and instructive reasons.

- Maximin (maximum of minima - pessimistic)

According to Harold Kerzner[26] in this method a pessimistic rather than an optimistic position is taken with the viewpoint of minimizing the maximum loss.

- Maximax (maximum of maxima - optimistic)

8. Sensitivity analysis

Sensitivity analysis is a helpful way to investigate the robustness of the solution, or alternatively the sensitivity of the obtained solution to the assumptions made so far. These assumptions is based upon the prior probabilities and utility functions

After the above analysis it is clear to everyone that the statistical view of decision theories are incredibly complex and difficult for a big amount of people to use. It demands specific knowledge in order to be operated with success. What is more, keep on ice the human logic and embodies the originality and creative forward thinking of a mathematical equitation. Finally, provide a false promise to the decision maker about the validity of the final decision, so as to narrow the reaction limits when a potential problem exists.

On the other hand, the theoretical view that we have described in the prior paragraphs provide an inadequate way because of the lack of the effectiveness. In other words, it is obvious that those theoretical models provide efficient introductions and ways of thinking in order to confront general problem but suffer in real case conditions. It is

[26] Kerzner, H. (2003). Project Management: *A Systems Approach to Planning, Scheduling, and Controlling* (Eighth Edition). New Jersey: John Wiley & Sons, Inc

composed of simplifications and generalizations rules which are unable to operate in real life circumstances.

Despite considerable discussion about the effectiveness of theoretical and mathematical approach of decision making model there is one aspect which not includes clearly in the forgoing methodologies. More specifically, Jozef Loermans[27] (2002) points out the opinion that organizations still seem to be unclear as to how the concept of synergizing between learning organization and knowledge management can improve their ability to make more valid decisions. Peter Senge theory take into account learning process and highlights how learning organization works, as a way to learn faster than competitors do and increase their capability to take effective actions. However, this approach does not considerate the knowledge management process or supporting that a learning organization is the same thing as managing knowledge at a business level. This problem was identified by Nonaka and Takeuchi[28] (1995) who stated that organization learning theories basically lack the view of knowledge management and focus on individual learning rather than learning at an organization level.

The author believes that the true lies somewhere in between the theoretical and mathematical view of the decision making and problem solving process. Additionally, it is false to confuse the learning process operation with the knowledge management. As we will analyze in chapter 4, these are different and interconnected processes where focuses in different levels of organization function. In other words, the implementation of learning organization processes is not feasible without taking into account the operation of knowledge management.

[27]Jozef Loermans (2002). Synergizing the learning organization and knowledge management. Journal of Knowledge management, Vol 2, No 3. PP.285-294

[28] Nonaka, I. & Takeuchi, H. (1995), The knowledge creating company. Oxford University press, New work, NY, pp8,10, 44-5

In conclusion, it is a fact though that all the decision models are tools and techniques which can be applied under certain conditions. However, the human factor is the only generators and the major contributor of the decision making process. Thus, in the next section of the literature review we will try to analyze this opinion with accurate and specific argumentation.

Factors which affect the decision process

An effective decision making and problem solving system in combination with the specialist decision makers is not a panacea for a success. Peter F. Drucker, Hammond J., Keeney R, Raiffa H., Alden M. Hayashi, (2001) pay extra attention in identifying decision traps that may challenge in the decision making process, in order to avoid devastating effects if these elements are ignored.

The first factor refers to the decision makers' bias in some ideas or believes. This phenomenon called **the anchoring trap** and creates momentous problems when appear in the decision making process. Anchors take many appearances according to the personality of the person who participate in a decision process and the type of problem that they called to solve. Some of these biases are inconsequential and unable to affect the decision making and problem solving process. However, there are many cases where prejudice opinions provide significant obstacles and lead the whole decision process to fail. Researches have showed that our minds tend to give disproportionate weight to the first information we receive when we are required to make decisions (Manie Spoelstra[29], International Negotiation Academy).

The next trap refers to the situation where people using the past successful experience as the only way to deal with specific problems. This trap named **the status – quo trap** and enclose crucial dangerous for the effectiveness of the decision making process. To be more

[29] Manie Spoelstra. (2007). *Negotiation Traps*, Retrieved June, from http://www.directionservice.org/cadre/spoelstra.cfm

precise, some manager who had followed with success a specific decision model in view of resolving a past problem feel uncomfortable to use a different way. The main reason for this behavior is that they afraid a potential failure by using another way and tries to protect our egos from potential damage. Other experiments which encourage the above opinion have shown that the more choices we are given, the more pull the status quo has[30].

What is more, strict organization cultures and policies invigorate status quo processes because increase the use of static decisions and decrease the decision maker ability to use different decision methods. It is worthy of note, that companies which follow this manner decrease the opportunity to create learning processes and acquire new models and techniques. In the same way, **the sun-cost trap** based upon the status-quo trap and focuses on the situation where decision makers can not free their selves from past effective decision.

It is fact that a traumatic or dramatic event in someone life can also distort their thinking (Peter F. Drucker, 2001). In other words, prior experience influence our way of thinking. The traumatic behaviors are divided in a natural force outside of our control and by the action of another human (Flannes, 2001). The effect of this behaviour called **the framming trap** and refers to the first decision making step which is to determine the problem (frame the problem). The way that a decision maker frame a problem can affect the choices they make. For the book authors there are two fundamental frames which are *frames as gain vs losses* and *framing with different references point*. The only treatment that authors provide is to examine the inital frame of a problem in order to identify and highlight specific points of the problem. What is more, if we understand that the initial frame is inefficacious, we must be react and reframe the problems in various ways.

The next decision making trap which is solidly connected with project management approach is **the estimating and forecasting trap**. The project managers are obligated to

[30] Harvard business review (2006)

make effective and fast estimation about time, cost and performance. Additionally, in some case the available data or information about these values are extremely restricted and vague. Furthermore, the risk factors which enclose these issues make these estimations or forecasts more and more difficult. Peter F. Drucker, Hammond J., Keeney R, Raiffa H., Alden M. Hayashi broaden their focus on the uncertainty (that affect our decisions) and provide three more specific uncertainty traps.

The first one is *the overconfidence trap* which portray decision maker tend to be arrogant about the accuracy of their decisions. In order to explain the importance of these factor let's see an example where a successful project manager undertake to manage a routine project. In that case, the overself-reliance of the project manager may eliminate its capability in the decision making process resulting in not taking into account all the risk parameters, criteria that the problem to be addressed inflict. Consequently, project manager's wrong or rough estimations can affect the project processes and finally, pose the whole project at risk.

The next factor describes the opposite side of the problem where the decision making pays enormously attention and demand enormous information in order to make the safe decision. The phenomenon called *the prudence trap*. In prior example, the project manager now tries to collect as more data as he can in order to secure the final estimation. However, he has spent precious time and money just only to be safe and neglected other important issues. So, the conclusion of this case is that too much prudence can be as dangerous as too little[31].

The last sub-trap refers to the estimation or forecasts which based upon past memory event. *The recallability trap* is also dangerous because traumatic experiences, limited time and pressure conditions may distort our memory and affect our ability to recall specific information. For instance, the case study project manager may fail to remember all the

[31] Harvard business review (2006)

information about the prior project estimations, so as to make the new estimation under uncertainty and pose the whole project at risk.

The last factor that prevents our ability to make effective decisions and traps our thinking is called **forewarned is forearmed**. This trap highlights the psychological aspect of the decision making and spotlight the way that human brain works. More specifically, there are times when our brain works in ways that hold back than help us to make effective and accurate decisions. The best protection that authors provide against these traps is to determine them and isolate as it possible. It is unfeasible to exterminate them off our brains but we can learn to live with them and manage to restrain their effects.

On different aspect which can affect the final outcome of the decision making process is the people emotions. **Judith Chapman**[32] focuses his research to group thinking model and expressed the opinion that "*the groupthink can be driven by to very different forces according to the group psychology*".

The first force is related with the pessimistic view about the ability of the group to solve the problem with success. This emotion provokes the resentment and disappointment of the people involved with the result to feel unable to collaborate and make an effective decision. What is more, lack of self-esteem and stressful condition increase the levels of uncertainty and lead the team members to resign to their failure. On the other hand, the optimistic view of the group members that they can solve a presenting problem with success may lead them to over-estimate their capacity. As a consequence, they will lack their attention to important information and they make a rough decision which will eternalize the initial problem.

To sum up, groupthink is an outstanding and easy to use model for the most decision makers. However, external and internal conditions can affect the well operation of the group

[32] Judith Chapman. (2006). Anxiety and defective decision making: elaboration of the groupthink model. Management decision, Vol.44 No 10

thinking process and lead the group members on undesirable results (Neck, C.P. & Moorhead, G. 1995)

Qualified people with appropriate backgrounds

The whole scientific community are in agreement about the importance o human factor in the whole decision making process. All the above models and techniques are made by humans and are allocated for helping them to resolve complex problems and make outstanding decision. However, we should focus on how people work with their minds and how knowledge management can affect their effectiveness (Karl Wiig, 2004). Consequently, the effectiveness of its theory is depended from the effectiveness of each person who called to make the decision.

When we make decisions, we're not always in charge (Gardiner Morse, 2006). This means that people are not responsible for some of the decisions that they do every day. There are impenetrable areas in our brain which may be affecting or preventing our capacity to make effective decisions. For this reason, expert scientists using scanning devices tried to measure brains activity in order to identify how different parts of our brain collaborate and compete when we make decision.

The results showed that the human brain has many similarities with the animals' brain (Harvard Business review, 2006)[33]. More specifically, they discovered that human brain is composed of three layers which are the evolutionarily in the center, the most modern and the complex on the outside. The first one is in charge to control basic survival functions, such as breathing, hunger, aggressive and fear. The second one which is larger (from animals) is responsible to manage advance brain processes like hearing and vision. The last one called as the executive part of our brain and is in charge for our decisions. Even the researches, the

[33] Harvard business review (2006)

scientist are unable to present incontrovertible evidence about the exactly operation of humans' brain in decision making process.

There are a lot of known cases where people are incapable of creating a solution for a difficult problem or situation. In project management approach, an effective project manager must be at first an outstanding decision maker (Flannes, 2001). To be more precise, there are four crucial "hats" that an effective project manager must have the ability to wear and change according to situation demands. These hats are the role of leader, manager, facilitator and coach. Each of them cover a different aspect of project management skill and all together accomplish the profile of a successful project manager.

The Myers – Briggs type indicator (MBTI) is an exceptional instrument used to explain the effects that personal preferences have on decision making and problem solving by looking at eight behavioural preferences that all people use to some degree (Alma M. McCarthy & Thomas N. Garavan, 1999[34]). The structure of Myers –Briggs type indicator is composed of four preferences - attitudes which are Extraversion or Introversion, Sensing or Intuition, Thinking or Feeling and Judgement or Perception. Each person character incorporates four of them which present his or her personality.

Myers and Briggs[35] have focused in skills that a successful project manager must have. More specifically, they have posted a test[36] in the internet site in order to provide the opportunity to everyone to identify their personality. Through this process we can determine our strength, weaknesses and limitations. After that, we should work hard in this way in view of improving them and increasing our ability to make flexible and outstanding decisions. Furthermore, MBTI is a valuable tool so as to decode the personality and the unique characteristics that compose the individual profile of the person that creates dysfunctions in

[34] Journal of European Training, 1999. pp.437-445
[35] Myers and Briggs indicators (MBTI), Retriever May 09, 2007 from http://www.myersbriggs.org
[36] Carrier and personal test, From www.DiscoverYourPersonality.com

the decision making process and simultaneously facilitates the efforts of the decision maker to reach an optimum solution for the company.

In the research that conducted respondents where asked to evaluate the MBTI model by using 1 to 7 rating scale. The results showed that MBTI helping them to understand their personal decision making styles (mark=6.00) and encourage them to improve their skills (mark=5.68) (Alma M. McCarthy & Thomas N. Garavan, 1999). As a consequence, it is obvious that Myers and Briggs model is a valid method for the ambitious project managers to examine their selves and upgrade their decision dexterity.

There are many books which focus on ways to make better decisions, such as solid operating methods and advanced tools, but few of them underline the importance of human contributions in those processes, as a major and significant factor. Karl W. (2004) focuses on how people learn, remember, make decisions, solve problems and act in general. In this way, we can identify the root cause of the decision making problem. This knowledge in combination with some advanced models will provide a new perspective in this process.

First of all we have to understand that people prefer to think and act in ways that are natural and convenient for them or according to their personal mental model (Karl W, 2004). What is more, there decision can be separated into three fundamental tasks which are the *simple decision making*, *the complex decision making* and *the novel decision making*. The significance of the decision, problem or dilemma determines the behaviour of the decision maker. This behaviour can be divided into single-stage and multistage decision making. Mental simulation process can be more or less tacit according to the type of the decision (Klein, 1998). The following figure[37] analyzes with specific details the style of the decision making according to the problem importance.

[37] Karl Wiig, (2004). People-Focused knowledge management: *How effective decision making leads to corporate success*. Oxford: Elsevier Butterworth – Heinemann

Figure 3: Situation Understand governs the mode of Decision Making/ Problem Solving, that is, how the tasks are performed and which kinds of mental models are used

Situation Understanding Categories	Dominant Decision-Making/Problem-Solving Mode	
Situation is unimportant Situation is too difficult to handle	No Decision, No Action Needed Decision: No Action Possible	
Situation is routine and well known		*Simple Decision-Making*
	Mental Models Used	■ Concrete situation-specific Decision-Making reference models with close correspondence to the situations-at-hand
	Tasks Performed	■ Reference models are operationalized tacitly and executed automatically to generate desired action-options
Situation is generally known and follows scripts and abstract patterns		*Complex Decision-Making*
	Mental Models Used	■ Primarily abstract situation-specific and methodological Decision-Making reference models (scripts, schemata, metaknowledge) ■ Concrete situation-specific Decision-Making reference models all with characteristics similar to situations-at-hand
	Tasks Performed	■ Reference models are operationalized and executed consciously (at times tacitly) to generate desired action-options
Situation is insufficiently known or novel but is still considered to be important		*Novel Problem-Solving*
	Mental Models Used	■ Concrete situation-specific Decision-Making reference models all with characteristics similar to situations-at-hand ■ Abstract and generalized methodological and situation-specific Problem-Solving reference models (metaknowledge, scripts, schemata)
	Tasks Performed	■ Methodological reference models guide Problem-Solving process tacitly for smaller and simpler situations and consciously for complex teamwork situations ■ All reference models are operationalized and executed to generate desired action-options

Risk management

Risk is an unavoidable part of every decision. For most of every choices people make, the risks are small. However, on a business scale the levels of risks behind decisions can be enormous. In other words, the only way for the organizations to make profitable decisions is to be in position to calculate and manage the potential and prospective risks.

Bernstein P.L. (1996) demonstrates how human beings have made decisions over long periods of time. Characteristically, he claims that "people believed that the gods determined the course of events and human beings had no concept of risk management." However the circumstances are changing and the need for effective decision making methods is becoming bigger and bigger, day after day. He provides the core of strategies in order to solve crucial problems and make effective decisions under risk conditions.

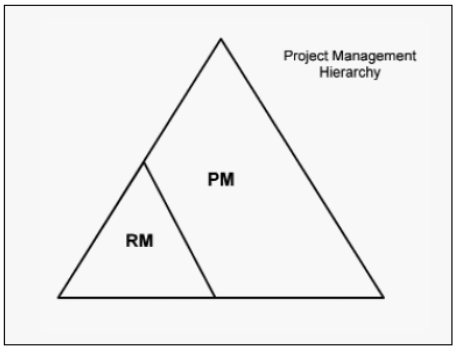
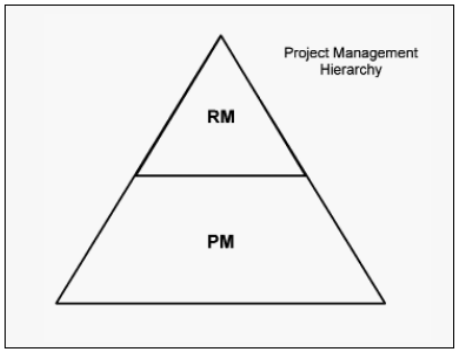
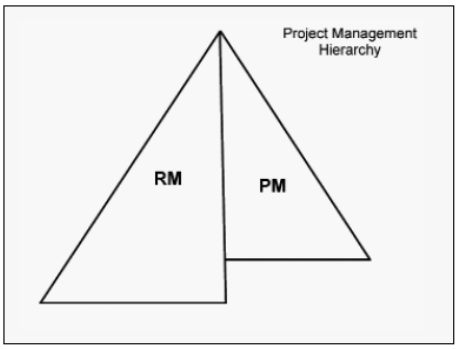
The essence of risk management is to maximize the areas where we have under control the final outcome and to minimize the areas where the connection between the effect and cause is hidden from us (Bernstein, 1996). At best , risk management must be an integral part of the decision making process in order to determine uncertain areas and risk factors and design the ways to handle them (Minnesh Kaliprasad, 2006).

There are many people in the project management community who identify the risk with the uncertainty. In fact, the risk is defined as the cumulative effect of the probability of uncertain occurrences that may positively or negatively affect project objectives (Pritchard, C.L., (2001). On the other hand, uncertainty considers the event where the probability is completely unknown. From the issues outlined above isolation of *unknown unknowns risks* (unk unks) must exist. To be more precise, unk unks risks referring to events for which the team had no expectations at all (unforeseeable uncertainty), no hint, and no prior model (Christopher H. Loch, Arnoud DeMeyer, Michael t. Pich, 2006)

Ensuing to the above, there are three fundamental relationships between the project management and risk management. We have to note that each of them is equal importance

and represent different case with low, medium and high risk conditions. The following figure refers to them separately.

Figure 4: The relation between risk management & project management

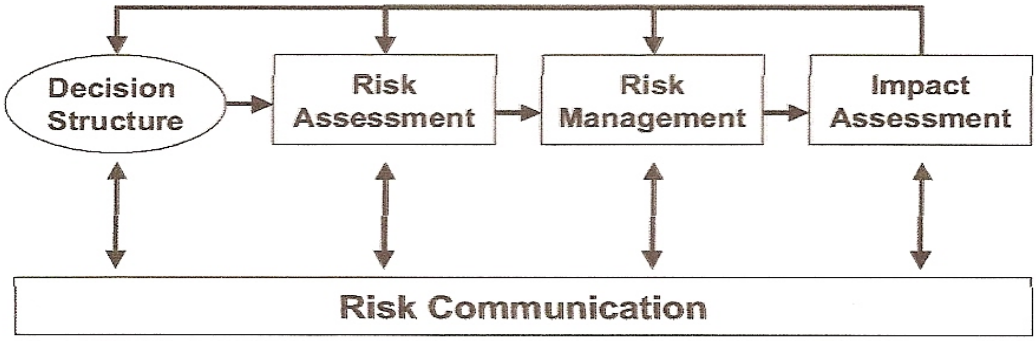
	**Risk management supporting Project Management** This scenario refers to projects with low risks. In that case the project manager or an executive team member is in charge to monitor the risk factors. The risk interference in decision making process is low.
	**Risk Driven Project Management** In that case the primary purpose of project manager is to handle risk conditions. The participation of risk management in the decision making process are big. In other words, the PM should take into account all risk in view of making a decision.
	**Risk Management Permeates all of Project Management** This is the most dangerous scenario because of the high probability of the risk to appear and the huge impact in the project performance. This situations demands external specialist or consultants in view of determine an outstanding risk management plan. Moreover, the decision and made under uncertainty and risk.

Source: Minnesh Kaliprasad, CCE, (2006). Proactive Risk Management. Cost Engineering Vol. 48 No. 12

One model which is oriented to the importance of risk management in the decision making and problem solving process is the Risk – Based Decision Making model (RBDM). This is a process that organizes information about the possibility for one or more unwanted outcomes occurring. As a tool, it can be used by decision makers to make more informed

management choices. Additionally, RBDM is becoming of great significant when we consider the number of the efficient decisions that had no success because of the sudden appearance of a forgotten risk. The main structure of RBDM model uses the fundamental principles of the risk management as it has been recorded by PMI (Project Management Institute). The following figure illustrates the model's operation.

Figure 5: Risk – Based Decision Making



Source:

Finally, the PMBOK Guide (2004), provides information and tools that can be applied to a great extent on many aspects of project management. However, these resources based upon project conditions and are out of the target of this thesis to be examined. In other words, it describes thoroughly the risk management process and provides effective ways in order to predict clarify and manipulate the potential risks. We will use some important information in the methodology part in order to highlight with details effective ways to manage potential risk factors.

The preliminary review provide key points and factors that should be followed in order to identify the weaknesses of problem solving and decision making procedures, so as to determine appropriate methods of improvement. Fundamental issues that should be taken into account are human contribution, negative effects in the decision making process and the risk with management involvement.

CHAPTER 4

Description of Methodology

It is commonly accepted that problem solving and decision making is one of the most momentous challenges in the organization life cycle. However, complex system behaviors and ineffective estimating ways provoke formidable problems and increase the uncertainty of the final outcome. Therefore, the fundamental objective of this thesis is to find the ways to improve these processes and provide a practical framework for handling difficult decisions with success.

The above literature examined different point of views (models, techniques and factors) about the operation of the decision making and problem solving process. It is obvious that there are many resources which focus on different aspects of decision. Some of them use the theoretical background in order to provide crucial introductions and help decision maker to recognize the problems and provide effective solutions. On the other hand, supporters of the mathematical equitation based upon functions and probabilities and provide arithmetical norms for an effective decision making process.

Initially, the author's priority is to illumine the hidden depths of human factor in the decision making process and develop a model oriented by the human nature. On this account, the author will try to clarify some important skill that every decision maker must have in order to support good decisions consistently. Thereafter, we will try to develop a decision making model which will be a combination of the theoretical and systemic approach as we examined in the above chapter.

The basic categories of decision, that the model will be in charge to administrate, are the *simple or routine decision*, *more complex decision,* and finally, *the novel or innovative decision.* What is more, the model will be capable to support dilemmas solving approaches with appropriate techniques and tools. Author's fundamental priority is to take

into account how the level of uncertainty and complexity impact the decision process in view of supporting complicated decisions. The risk factors will be calculated too in order to address their behaviours and avoid potential hazardous consequences.

Decision making is a cognitive process which is commonly used by the companies to handle difficult circumstances and support crucial decisions. Nevertheless, some problems and decisions are extremely challenging and require specific handling from the people who are involved. Hence, the author will take into consideration past decision making cases which failed to provide effective decisions. Furthermore, he will try to analyze the conditions that may affect the decision process, and will provide some useful tools and techniques in order to improve the problem solving and decision making procedures.

To sum up, this research will be structured in order to provide a useful decision making and problem solving model that companies could follow in order to upgrade their operation to manage difficult conditions and avoid pitfalls and potential threats.

The profile of an effective decision maker

Some people strongly support the opinion that decision making is an inherent attribute. While others claim that such traits can be acquired by enriching their knowledge, cultivating relevant personal skills and experiencing business situation that facilitate the development of decision making issues.

The author's judgment mostly fits in the second position and corroborated by the fact that there are a huge amount of references in the scientific community which provide specific introductions to help the decision maker to upgrade his decision skills. After research in the global bibliography, the author comes to a decision that there are nine

fundamental skills where each of them and all together as well, create the profile – frame of an exceptional decision maker and problem solver.

1. **Communication skill**

Effective communication skills are essential for success. These include decision maker ability to share the problem aspects, establish an ongoing relationship with the team members and provide articulate instruction about the problem circumstances. Likewise, the establishment of a concrete mental model demand high quality communication skills. However, mental model issue is more complex and requires a package of skills in order to be effective and well operated.

2. **Coping Skills**

Coping skills are constituted of four fundamental skills that must be adopted for every decision maker. Currently, he needs to be flexible in order to overcome potential obstacles and gain significant time for the decision process. What is more, his creativity is essential in order to handle potential changes and provide adequate alternatives. On of the most common reason for the decision fails is the decision maker lack of patience. Particularly, the decision maker must be patient and persistent in order to keep stressful conditions away and focuses on the problem.

3. **Technical skills**

Decision maker is not a technical expert. However, he must incorporate a basic knowledge about the technical aspects of the problem in order to illuminate specific technical issues of it and provide more accurate estimations. Imagine the situation of problem solving process where the decision maker has no idea about the technical specifications of the

problem. It is obvious that he will be unable to understand the problem and find the most profitable solution. Additionally, the experience in technical issues increases the respect their team has toward him and facilitates the teams operation.

4. Leadership Skills

Leadership skills are the most critical issue in the project management process. To be more precise, the project manager (decision maker) must be able to lead the decision making group by examples. He/ she should explain with details the functions of the problem, clarify and quantify the effects and finally, lead the team members to find a common (most acceptable) solution. In other words, he should depict the problem in a "big picture". The leadership attribute is extremely necessary in group thinking process where the decision maker play the role of the conditioner in the decision making and problem solving process. More specifically, a common problem in a group thinking process is the appearance of conflict conditions between the team members. What is more, prior failure can decrease the team's morel and affect their ability to examine the problem and find a profitable solution.

5. Analytical/ Cognitive skills

An effective decision maker should have the ability to search beyond the symptoms in view of finding the cause of the problem. Furthermore, he must gather as more as possible data/ information that are essential to make accurate diagnosis about the problem effects. Systemic approach is critical in order to concentrate on the problem as a whole. The consequences of the problem define the number of the possible solutions. To explain what I mean, an effective decision maker must be in position to secure that effectiveness of the final decision and provide enough alternative actions for any upshot of the problem.

6. Team Management skills

As we describe in the above chapters, complex decisions demand more than one people to make it. Hence, the foremost person of the decision making process is in charge to structure cross-functional and interdisciplinary teams. Moreover, resource and responsibility allocation is one more necessary characteristic that every decision maker must have. The decision maker should know all the aspects of the problem and through the well established communication channels to demand specific feedback from the team members. Feedback processes is extremely necessary too because provide useful information from the decision making process and give the opportunity to the decision maker to improve past inabilities and upgrade their readiness in similar or more complex decisions. Finally, the spirit of collaboration and synergy should be adapted in every team.

7. Interpersonal/ Human Skills

Interpersonal skills are out of the decision process and deal with the personality of the decision maker. The decision maker position gives him/ her enormous leverage in influence the behaviors or think of other team members. This means that decision maker should have the ability to handle their angry and pressure in view of providing a support profile to the other team members. More specifically, every person who participates as a leader in a team process needs to be a dynamic personality with high levels of self –esteem. All in all, interpersonal skills are essential for understanding ourselves and collaborate effectively with the others.

8. Perception Skills

Everyone has the aptitude less or more to "smell" the problems. The talent is not only to identify the problematic behavior but also to be prepared to manage it. The ability to

recognize potential problems or to identify the problematic behavior of a potential solution refers to the perception skills of the decision maker. In other words, an outstanding decision maker must be a discerning person. The likelihood of success is increased by identifying alternate options in advance. Their cognize capability to detect hidden dangers and potential pitfalls secure the success of the final decision and decrease the levels of uncertainty.

9. Psychological Skills

This type of skills refers to advance decision makers who believe in the importance of psychological factor in the whole decision making process. To explain what I mean, psychological skills involve momentous introductions about the ways that the brain acts and react in the decision making phase. Though these skills, decision makers can improve his aptitude to control personal emotions and prevent it to influence with negative effects the decision process. More over, people with high psychological dexterity maintain their ability to pose clear objectives, measure disproportional factors and prepare flexible strategies for the most complex decisions.

It is worthy of note that it is impossible to find a decision maker with all the above skills. Every decision maker has strength and weaknesses. The fundamental purpose of this model is to motivate the decision makers to upgrade their skills and improve their ability to handle difficult situations. However, the operation of the above principles is not to design the profile of a perfect or ideal decision maker but only to spotlight the hardness and complexity of the decision making process. Easy solutions and encouragement statements, such as fix the problem, may misjudge the significance of the situation and lead the decision makers to prepare a strategy for a disaster.

Decision/ Problem Process

The author believes that there is not a simple way to solve a simple problem. In other words, an effective decision maker should pay the same attention in every problem or dilemma. The only thing that changes according to the problem graveness is the tools and techniques that we use to come in the final outcome. The following process illustrates the basic framework of an effective decision making and problem solving model.

Framing

Framing is the initial and the most important phase of the decision making process. It is the moment where the decision maker identifies the problem and called to make a decision or to choose between a dilemmas.

The first thing is to **determine** the problem, **recognize** the affected areas and **clarify** the consequences. Though this process the decision maker will diagnoses the complexion of the problem, so as the importance of the situation. The result of this examination will specify the whole methodology that the decision maker will follow to solve the problem. The next step is to **gather specific information** about the problem function. To be more precise, information may be historical data, expertise opinion, charts and graphs, past knowledge in similar problems and so on. What is more, every personnel who engaged in to the problem must be informed about it. This happens in order to avoid potential dissatisfactions which may lead the decision process to unsuccessful results.

It is possible for the seriousness of the problem to demand the **establishment of capable a team** in order to attain an effective solution. In that case, the decision maker should reexamine the essence of the problem/ decision and make appropriate selection of the group members. After that, he or she must **share the problem** with the team and **allocate**

well defined responsibilities to the team members and collaborate all together in view of achieving the most profitable result.

The expectations of the decision can be an effective quantity characteristic in order to measure the decision progress. Therefore, common targets/ expectation of the decision must be examined and commit to paper.

☞ Plan

The next crucial step is the proper selection of strategy (tools and techniques) that the decision maker has to use to confront the problem. There are many useful tools and techniques in the global bibliography. Each of them, as we describe in the literature review, is based upon a theoretical or mathematical background and provide specific ways to reach a profitable outcome. Nevertheless, each model specializes in a particular type of decision or dilemma. The author's decision making and problem solving models will be in position to administer four decision types.

Simple or routine Decisions

The basic characteristic of simple or routine decisions is the low levels of risk and uncertainty. In other words, people feel comfortable to make simple or routine decisions because they based upon past experience and personal mental models. The "rookie" decision can be made without finishing the operation of the model. However, there are many cases where simple decisions that did not include dangers lead to a tragedy. This happened because the decision maker overestimates the hidden risks and provide rough solutions based upon similar past situations.

The first tool to make simple decisions is ***PMI pros and cons table of decision***. The basic idea of this tool is to fill a table with the advantages, disadvantages and interesting

which arise for the possible decision. The next movement is to grade the positive, negative and interesting aspects of the decisions. Finally, we sum the scores and compare it. The higher of them illustrate the effectiveness of the decision (Figure 10).

Figure 6: PMI pros and cons table of decision

Plus	**Minus**	**Interesting**
Pros 1 (+5)	Cons 1(-6)	Interest 1? (+1)
Pros 2 (+5)	Cons 2 (-3)	Interest 2? (-2)
Pros 3 (+3)	Cons 3 (-3)	
	Cons 4 (-2)	
+13	**-11**	**-1**
$Srore = +13 - 11 - 1 = +1$		

It is obvious that it is a matter of a very simple process and refers to very simple circumstances. However, the usefulness of this technique ends when the score of the table is zero. The decision is still simple but the decision maker is unable to decide and must be find other tools to encounter the problem. The SWOT analysis is an effective way to overcome the above obstacle and make more accurate decisions.

Complex Decisions

Most real-world business decisions are considerably more complex than the example decisions discussed by academics in decision theory. The fundamental question which can help to understand the complexity condition is what makes some decisions more complex than others.

Initially, the more unique is a decision, the more complex is the way for the decision maker to make it. When the impact of a decision encloses multiple stakeholders and demand expertise to implement it, it increase the levels of complexity and needs complicated models to make it. Furthermore, the uncertainty levels can define the complexity of the decisions.

One more reason which determines the decision complexity is the necessity of alternatives actions when we plan the decision. To be more precise, complex decisions commands many alternatives in order to secure all possible threats. Unforeseeable changes are additionally crucial characteristics in complex decisions because of the interrelationship among the system parts. Last but do not least factor is the risk management necessity.

The most successful way to measure the complexity in decision is to establish a **D**esign **S**tructure **M**atrix (DSM). DSM map provide useful information about the interactions among different parts of the decision making process. Interactions may take the form of, for example information (one task requires input for other), space or resource (both tasks require the same resources), expectations (one outcome of the decision opposed to the initial expectations), or constraints (final outcome may produce negative effects that constraints other parts of the system). DSM analysis can also be used to manage the effects of change.

A system thinking approach is the most suitable to deal with complex problems. To be more precise, having the information about the decision complexity and uncertainty, we should apply scenario practices in view of design all the possible alternatives actions. According to systematic thinking we can secure the coherence of the system and make a holistic decision. In the same way, on aspects which characterize the complex decision is it's tending to change. More specifically, recurrent changes can affect the behaviour of the whole system and provoke the effectiveness of the final decision.

Novel Decisions

Novel decisions have many similarities with the complex one. However, one factor which differentiates these issues is the role of risk in novel decisions. To be more precise, it is important for a decision maker to know with details the risks that arise from a particular decision. Howbeit, the main characteristic of novel decisions is that contains risk we do not

know that exists. As a result, the final outcome of the decision is unprotected of potentials unknown risk factors.

Additionally, uncertainty and complexity are to more characteristics of novel projects. According to the complexity, we can use the DSM map, as we describe in the complex decisions making. On the other hand uncertainty can be measured through the **diagnosis uncertainty process**. This tool is composed of several questions that measure the levels of uncertainty for each decision aspect. The questions are answered according to a grading scale (0-4).

Table 7: Diagnosis Uncertainty Process (DUP) grading scale

0	Easy to manage
1	Foreseeable
2	Low opportunity for unk unks
3	Medium opportunity for unk unks
4	High Opportunity for unk unks

The most profitable way to manage novel decision is to try to identify where the major knowledge gaps in regard of the decision are. The first step is to break the decision into specific pieces in view of being easier managed. The next step is to apply risk management methodology for each piece of a decision. After this step we have identify all known risk factors and we have planned how to manage them. However, the problem of unk unks is also existent. The first crucial point is to measure the uncertainty (DUP) and complexity (DSM) of the decision pieces in order to define the factors that we have to focus. It is possible that points with high percentage of uncertainty and complexity include unk unks risks. One effective way to recognize unknown consequence is the decision trees. What is more, group thinking and brainstorming methods can help the decision maker to discover hidden aspects of the problem. For many cases, this time step seems as an impasse area. The

final decision is based upon different risk management practices (according to each piece demands) and requires exceptional manipulation from the decision maker

Finally, it is worthy to remember that feedback and learning processes play crucial role in the novel decision. To be more precise, every phase of the novel decision process (independent of the result) disclose major information regarding inefficiently manage conditions or unknown.

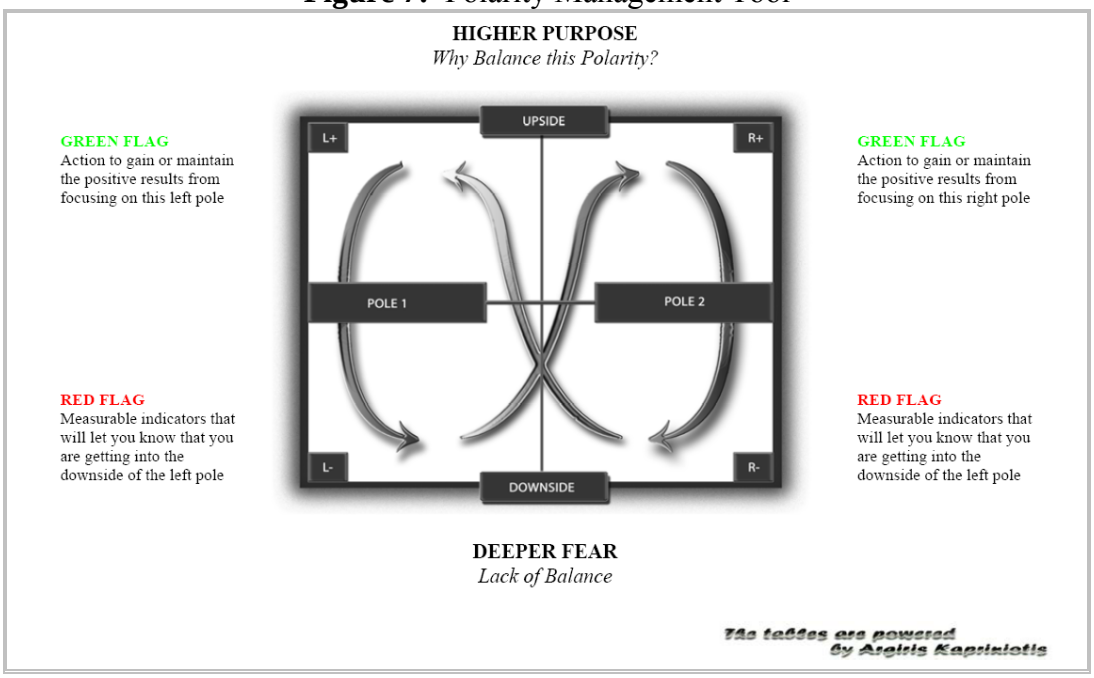
Dilemmas

As we point in chapter 3 dilemmas is a problem between two choices. More specifically, the decision maker is entrapped between two alternative options and the only way to decide is to examine them and choose the most optimum according to situation needs.

The **polarity management** is the most famous and may the most profitable tool in view of resolving challenge dilemmas. Polarity is the situation where the solution is between two optimum choices. Characteristically, Dr Bary Johnson expressed the opinion (1997) that *some of our seemingly unsolvable problems are actually "polarities," which can not be solved, but may be effectively managed*. This statement means that we can manage a big amount of Company problems accomplishing a balance among the solution

The purpose of the Polarity management theory is to underline the ways of thinking and develop the necessary skills in order to identify and manage unsolvable dilemmas (polarities). The main structure of the Polarity Model is the two poles. These poles illustrate the dilemmas or problem or paradoxes (Figure 11).

Figure 7: Polarity Management Tool



Decision maker ought to safeguard that the situation which demand a solution is a dilemma and not a problem.

After the choice of the appropriate tool the decision maker has to **schedule the time frame of the decision**. More specifically, he or she must determine specific milestones in order to control the decision in the implementation phase. This schedule is very important because it provides practical information about the decision progress and help the decision maker to identify rapidly potential errors and reexamine the decision strategy or make some corrective actions.

☞ Implementing

After the design phase, the next step is to implement our strategy. Most of the decisions fail in this point because of the lack of concentration in the establishment "*line of*

attack". To explain what I mean, decision makers rely on the successfulness of the strategy and ignore the monitoring of how the plan works in real conditions.

The decision maker has established **clear time objects** in the prior phase in order to monitor the decision progress. As a result, in this phase he or she should keep their eye in the effects of the decision. It is a fact that some problems will exist. However, the point is not to eliminate this to happen but to be prepared to diagnose them immediately. One more effective way to do that is to **use the expectations of the decision as measure tool**. Any perversion or aberrance of the initial expectation will be a sign that something goes wrong. In that case the decision maker is obligated to scan the decision process and identify the root cause of the problem.

Finally, the decision maker is in charge to define specific reports that each person who participated in the decision must send. Though this action, the decision maker will keep the process under control and will be in position to identify potential pitfalls and drawbacks. In the same way, specific reports can be used as a precious historical data for future decision (as we describe in the following paragraph).

☞ Evaluating/ Feedback

The only way for a decision maker or a company to improve their decision making ability is to evaluate current decision process and keep feedback from them. This way, errors or difficulties that appear during the decision process can be recorded and avoided in future similar situations. As well, the more advance option of this process is to develop a knowledge management system (**knowledge Data Base**) that will receive – send feedback to all company's members or departments. Through this way, important information about past decision will be recorded in order to support future decision and resolve complicated problems.

Knowledge management

We can compare the operation of knowledge management with the operation of a library. The framework for a well function library is the detail classification of books and resources. The employees can design a search system where can explore the book requested and can find its accurate location. In the same way, each company should establish an explicit library in order to collect and clarify crucial experiences and essential knowledge which adapted by prior decision.

This library is called knowledge management process and must be adapted by every organization in order to secure the created knowledge during the project life cycle. To be more precise, through the knowledge management companies can increase their ability to learn and adapt. The fundamental aspect of the knowledge management are the Artificial intelligence, business process reengineering, information systems, information technologies and data mining and data warehousing and so on.

In spite of the value of the knowledge management process, there is a significant trap that every company has to avoid. The effort to substitute the human judgment for automate decision making which will deduce data form the knowledge management database may be hazardous for the progress of the decision making process. This happed because whatever the accuracy of each technology, it is unable to overshadow the value of human thinking. The knowledge management is an outstanding way to collect, clarifies, share and use knowledge to augment learning and performance in organization.

Learning processes

Some people support the opinion that learning process is the continuing of knowledge management. However, the author feels that it is a synergy where the knowledge management supports and improve the organization learning capability and the organization

learning share this knowledge to each individual who participates in the business lifecycle. In other words, having established the synergy between the learning organization and knowledge management the organization will be in a position to handle complex situation with high level of risk and uncertainty. This step refers principally in the organizations which want to improve their ability through the expansion of knowledge by the individuals as a part of the system and the organization as a whole system.

CHAPTER 5

Results of this Study

The author's initial intention was to highlight how humans make decision, which are the most common obstacles in this process and finally, to structure a coherent model for an effective decision making and problem solving process.

During the research, the author recognized that the key to successful decision is not only the effectual techniques and the precise models but also the human skills that every decision maker should have. More specifically, the last characteristic (skills) is the most important factor in order to take into accounts all the problem/ decision dimensions and eventuate in the most profitable result. The author believes that there are not perfect solutions. Every choice we made enclose advantages and shortcomings. The point is to identify them, measure and reach a verdict about the effectiveness. This means that we can not feel absolutely secure about the effects of our decisions because behind every success hiding significant dangers.

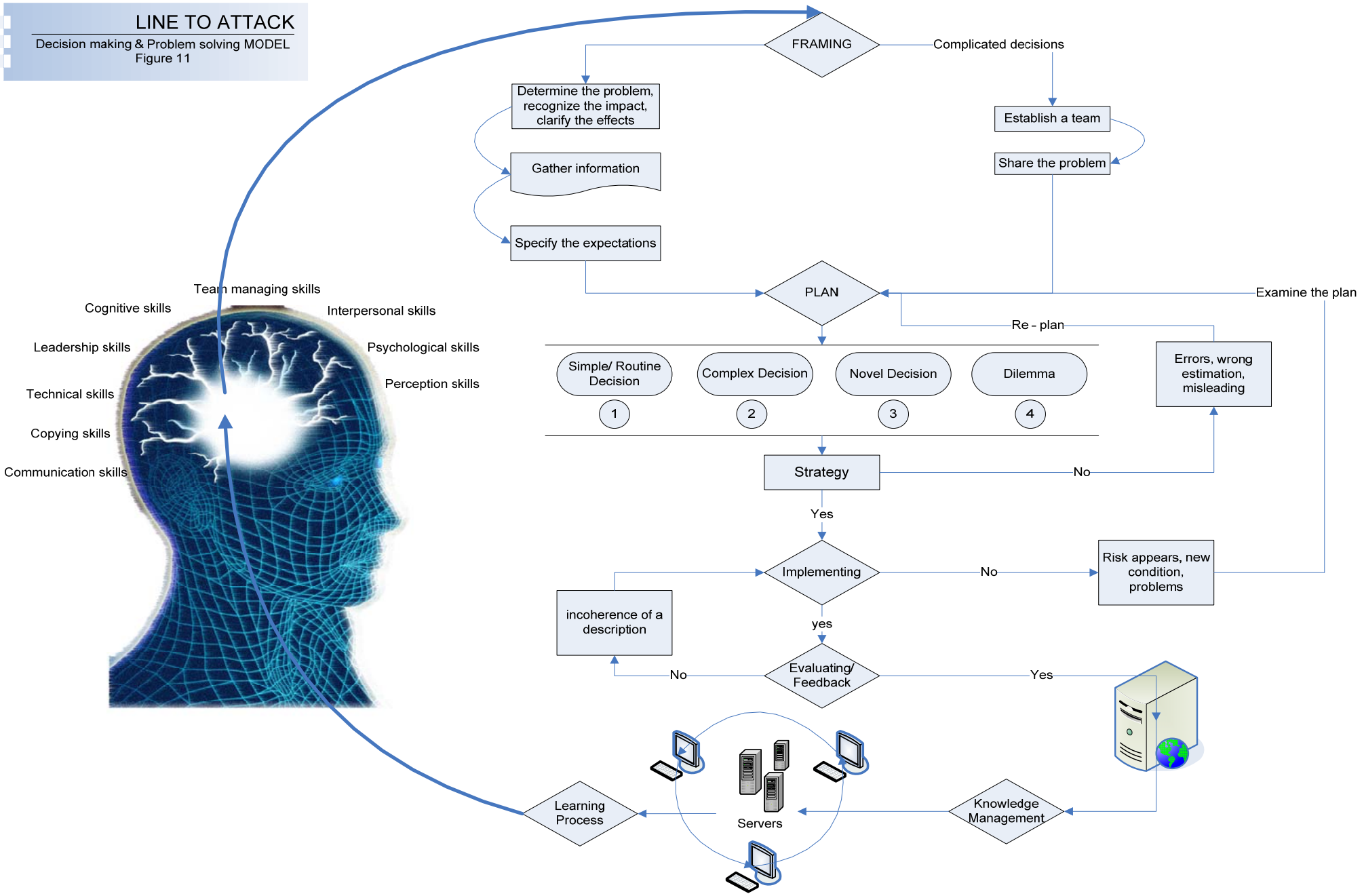
"***The best is the enemy of the good***"

Voltaire (François-Marie Arouet)

The next figure (11) illustrated the decision making and problem solving model which named "**the line to ATTACK**". The basic structure includes all the possible decisions (simple, complex, novel and dilemmas). However, according to the decision we want to make, the plan phase can be adapted, as we will see in the following analysis. What is more, it is worthy of note that the chosen techniques are not a panacea for the model success. Every user has the opportunity to modulate them with more comfortable to him. This happens because it is a flexible model which aims to support decisions and not to encircle the user in farrago of useless tools and techniques.

LINE TO ATTACK

Decision making & Problem solving MODEL
Figure 11

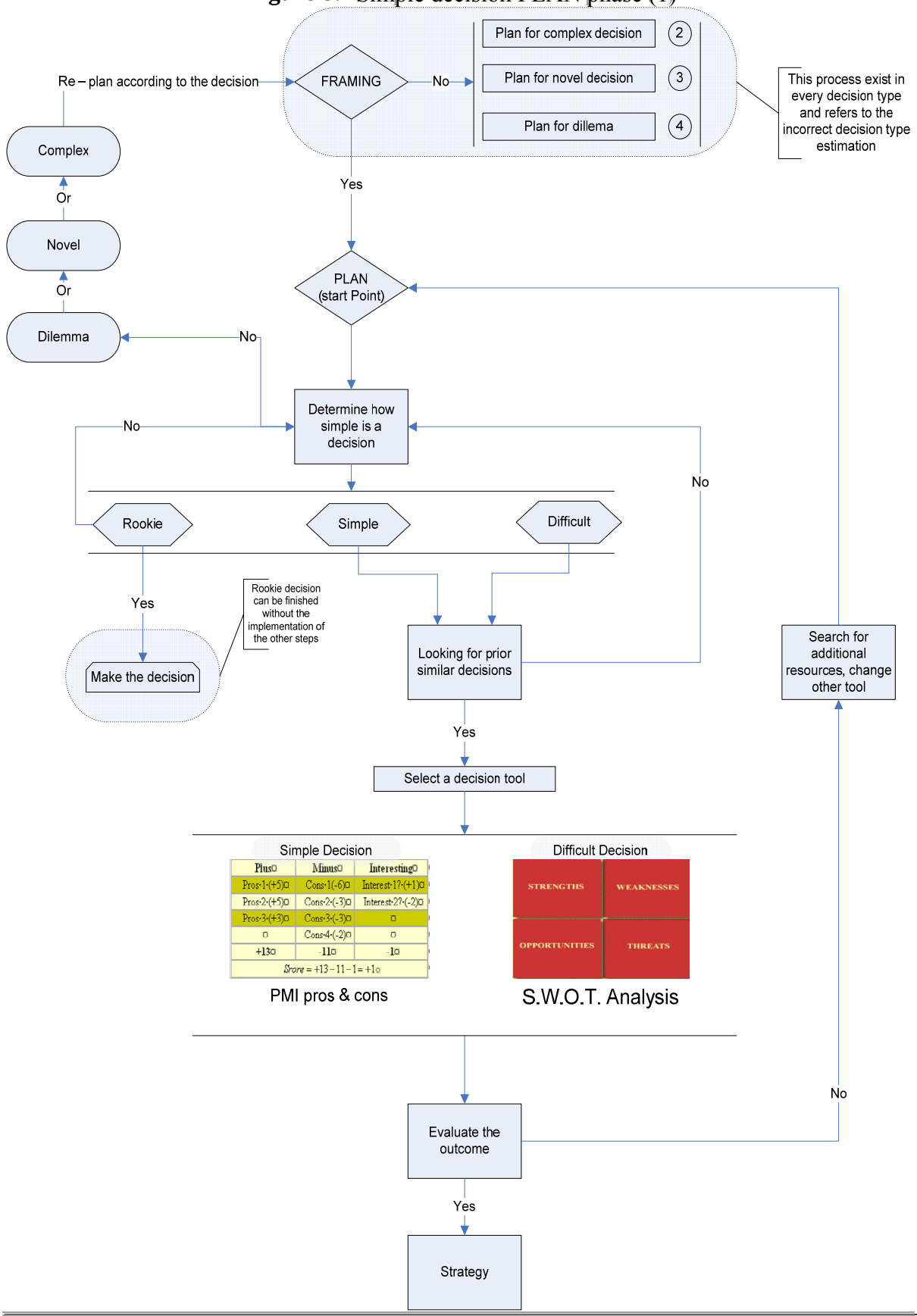


As we note in the above paragraphs, "line to attack" is a flexible model which can adapted in every type of decision. The model is consisted of six steps/ phases. The first one is to frame the problem. In other words, we have to delineate all the aspects of the problem in order to prepare the most profitable solution/ decision. What is more, framing phase encompass the gather of specific information about the problem. We can collect these applications through the past experience in same conditions, experts' knowledge, and graphs and so on. The framing phase refers to one people decision or to build a team in view of making the decision. The next step and maybe the most important is the planning phase. The figures in the next pages depict the operation of the planning phase when we came to make a decision. There are four possible decisions which refer to most common types of decision that every project managers called to face in every project.

The type of the decision changes the operation of the models and focuses on the problems separately. However, the decision maker has the opportunity to return in the initial phase of the model (frame) if he/she detect that the problem/ decision based upon different type. The author's priority is to establish a practical decision making models in order to support the decision maker effort and not trap them in complex process. Furthermore, the selected tools can be modified in order to attend the decision maker needs.

The **figure 8** illustrates the simple decision plan phase. The main point that we have to pay attention is the gradation of the simple decision. More specifically, rookie decisions are out of the model operation while simple and difficult (linear) decision can be made through the selected decision tools. The PMI pros and cons is the first tool in order to handle simple decisions. When the decision being more difficult, the SWOT analysis tool can be an effective way in order to measure the strengths, weaknesses, opportunities and threats of the decision and make the most valuable choice. The final outcome should be evaluated and reexamined if need it.

Figure 8: Simple decision PLAN phase (1)

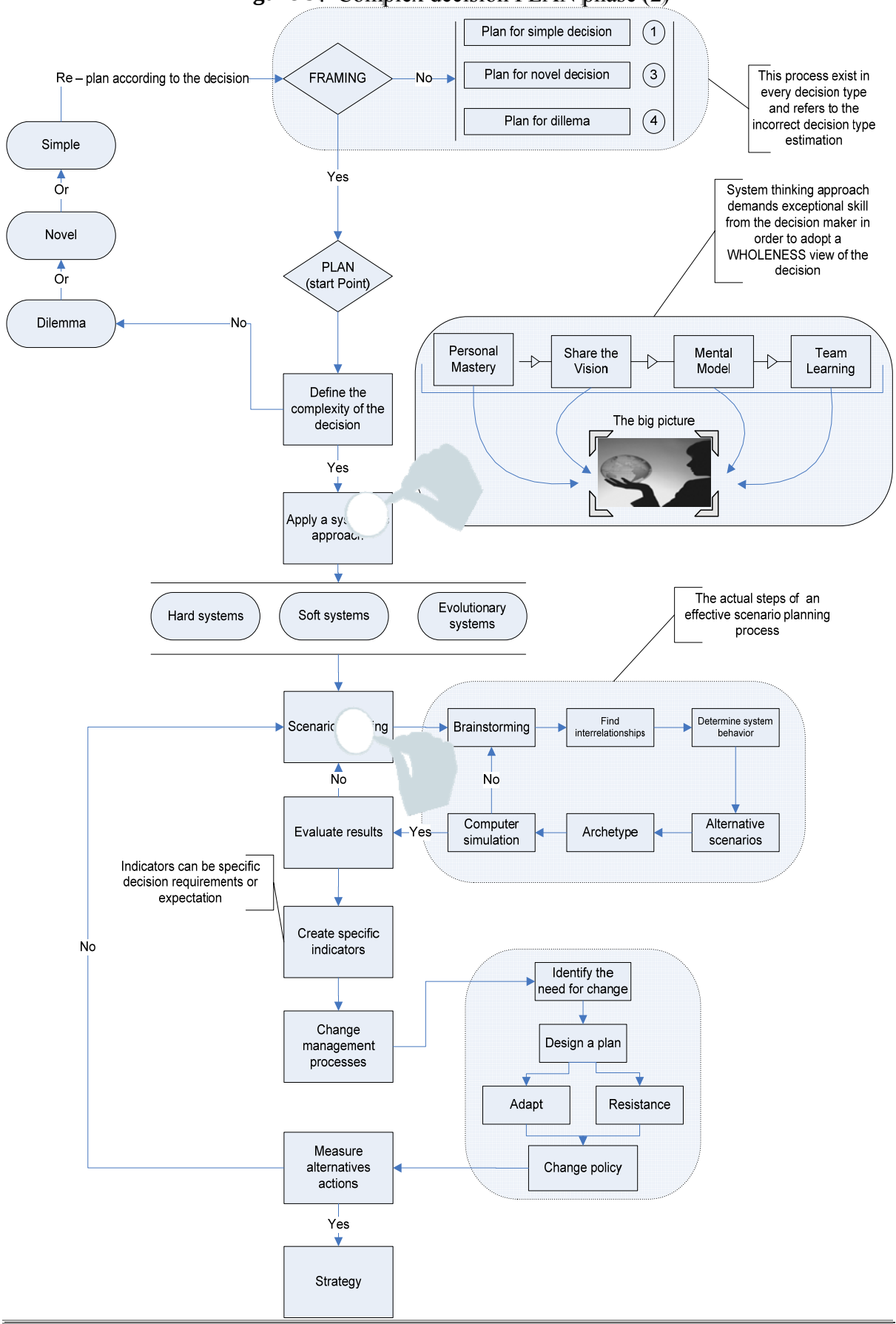


The next **figure (9)** portrays the planning phase for the complex decisions. The classification based upon the complexity of the system and refers to soft, hard and evolutionary systems. The main reason of this scale is to capture (catch) the focus of the person who performs the decision making process so as to manipulate the problematic situation in accordance with the needs of the system. The only way for the decision maker to acquire a wholeness view of the system is to adapt a systemic approach. To explain what I mean, personal mastery, share vision, mental model and team learning are the essential aspects in order to build the big picture of the problem.

The first one, personal mastery refers to people behavior to continually clarifying their personal vision, focusing in their energies and seeing reality objectively. The share vision aspect focuses on the decision maker ability to share the vision to the team members, to diffuse a positive energy and lead the team by the big picture of the system. What is more, everybody must be enrollment in the decision processes in order to cognize the system behavior and act according it. The mental model aspect denotes the person ways of thinking. In other words, explain to us how the people understand the world and how they participate and take action on it. Finally, team learning is the last aspect and represents the people ability to thinking together and learns each other. The incipience of this point is the dialogue. The Greek word which symbolize the human process in view of, resolving arguments, come in agreement, learn and learning…. communicating.

The next move is to simulate the conditions of the problem in a scenario methodology. Through this process the decision maker can identify the interrelationships of the problem, determine the systematic and problematic behaviors and finally, by the use of archetypes provide useful information-introduction about the final decision. Also, the change is the most famous characteristic of complex systems. For this reason, change management strategy (change policy) is necessary before we structure the final line to attack.

Figure 9: Complex decision PLAN phase (2)



The **figure 10** refers to the novel decision planning phase. At first, risk management process is required in order to address all the known risk factors. The main point of this structure is to address unk unks risks through the DSM and DUP process. However, this is an extremely difficult process and demand specific handling for the decision maker. The results of the uncertainty and complexity measurement should be examined and evaluated two or three times and in combination with the selectionism process can help the decision group to identify the existent of unknown threats and potential dangers. The outcome of the process must be adapted in a risk management and scrutinized with simulation methods in order to conclude in a concrete strategy.

The fundamental different in novel decision plan phase is the obligation to record the outcomes of the selectionism process in order to avoid the opportunity to waste time in case of adapt similar decision or apply analogous solutions. Moreover, knowledge management and learning processes are required in this type of decision in view of upgrade organization ability to handle innovative projects.

Finally, **figure 11** represent the dilemma planning phase. The only threat of the well operation of this process is to determine that the decision we want to make is a polarity and not a problem. The most common technique to secure this to happen is four simple questions. The positive answer enforces the decision maker opinion about the polarity and support the subsequence of the process.

The next movement is to create the polarity map in view of determine the pros and cons of dilemma. The green flags are precise actions to gain or maintain the positive results from focusing on the first (L+) or the second (R+) pole of the dilemma. On the other hand, red flags are specific indicators which measure the negative effects of the two poles (L-, R-). The fundamental operation of polarity model is to understand that it is a dynamic process, so as the final solution must be a balance between the dilemmas.

Figure 10: Novel decision PLAN phase (3)

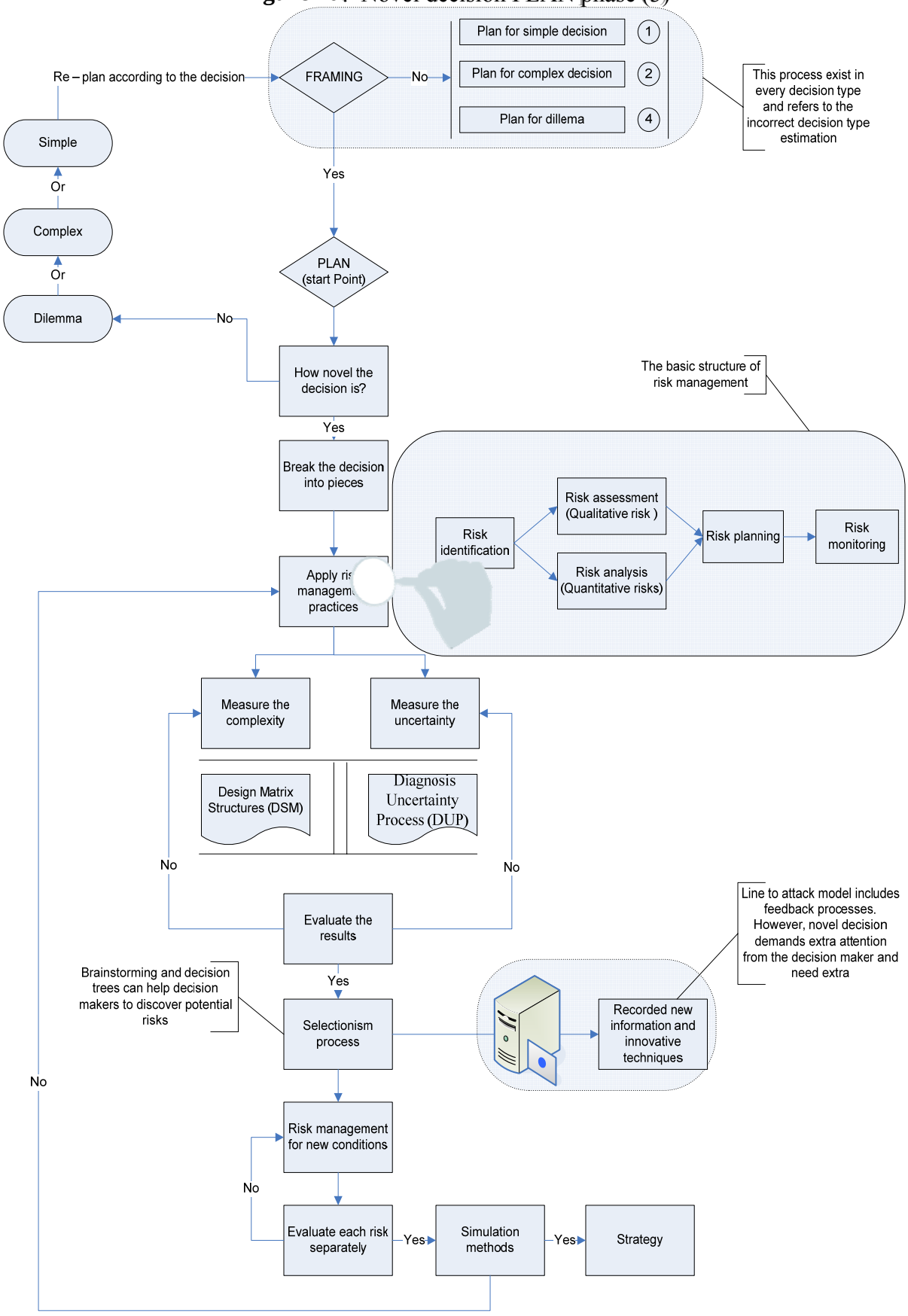
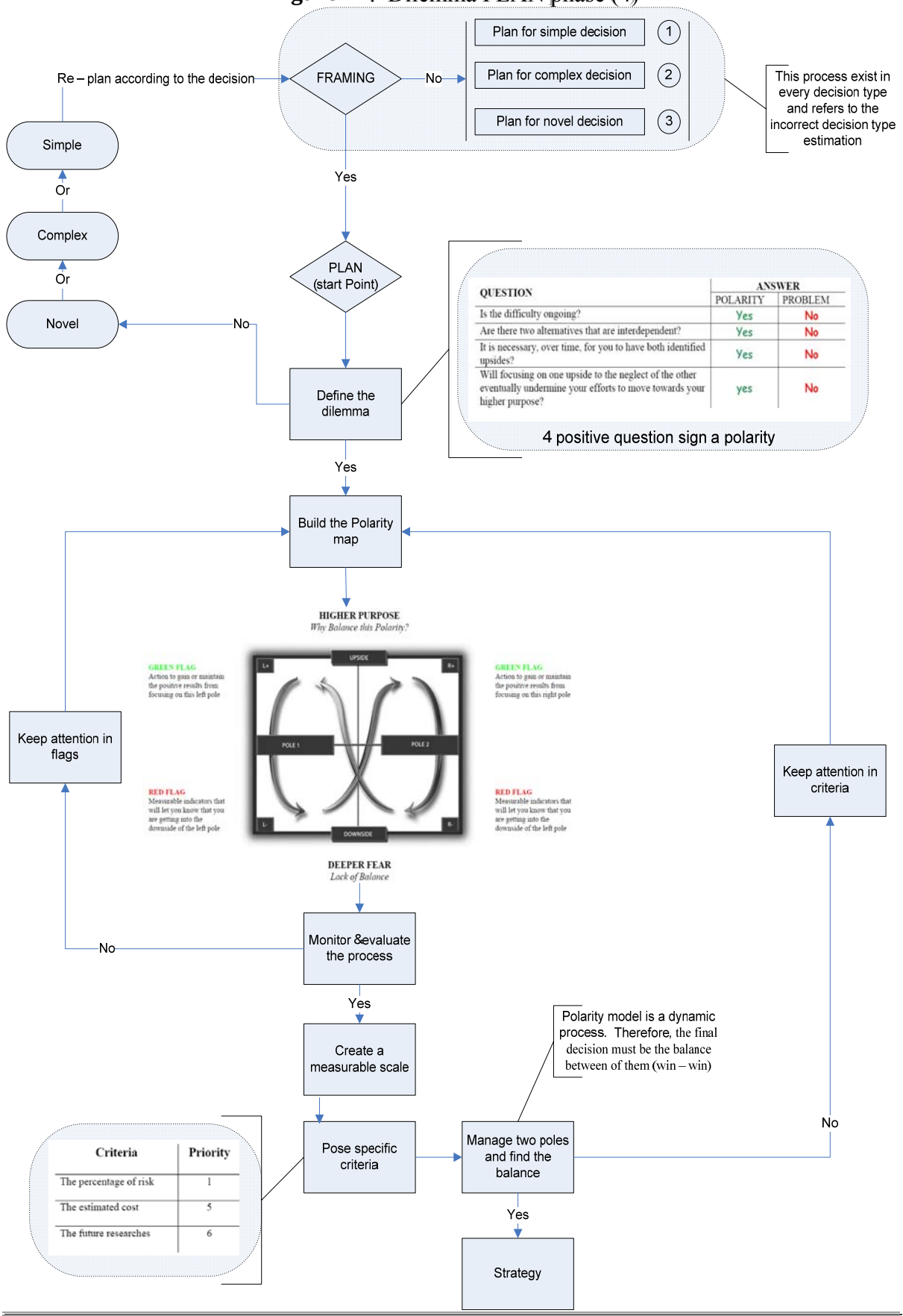


Figure 11: Dilemma PLAN phase (4)



It is impossible to represent the whole model in one page, so it is indispensable to break the line to attack model into specific pieces. Although, the author has enclose in the last cover page a portrait with the whole operation of the model.

As the figure described above, the outcome of the planning phase is the strategy. The next step is to implement this strategy. However, it is possible to become visible during this phase potential errors, risk and problems. In that case, the decision maker should go back to the model (planning phase) in order to confront the new conditions. In the same way, luck of concentration and problematic behaviors are possible to emerge in this step. Thus, the decision maker must be able to expose high leadership skills in view or motivating the team members and keep them in track.

The fourth step is to evaluate the result of the implementing process. During this approach significant information and crucial data must be recorded and keep it as a feedback for future similar situations. Information mapping techniques must be adapted in order to determine the type of the information that we want to record, the mode that will be documented, communicated and presented. The following table illustrates the basic step of information mapping technique.

Table 8: Information Mapping Technique

Analysis: The goal of the analysis component of the technique is to determine the purpose of the information, the decision needs and the information types.
Organization: This step is exactly about dividing and labelling the information for easy comprehension, use and recall. The main purpose is to organize the existing content into "information blocks".
Presentation: The goal of the presentation component is to format the information to make it clear and accessible to your audience. This last step occurs after analyzing the client's needs, breaking down the content into information blocks, and labeling them. For each information type, Information Mapping has format information so that it is easy to use. These formats are called presentation modes.

The fifth step is the establishment of knowledge management process. This part of the model operation comprises a range of practices used by organizations to identify, create, represent, and distribute for reuse, significant information about the past experience. As we examine in the above paragraphs, there are many ways to adopt a knowledge management. However, we should not underestimate the human factor but achieve equilibrium between adoption of knowledge management approach and the humans abilities in performing the decision making process.

The last step is the development of learning processes in order to share the knowledge between the departments and upgrade the individuals' ability to handle complicated decisions. One point that makes the difference in the line to attack model is that decision begin from the human brain and eventuate in it through the learning approach. The key think in the operation of learning organization is to capture and systemize the benefit of knowledge and share it to the individuals. The individual learning became organization learning and eventuates to be systems learning. The structures are upgraded, polices becoming more flexible, goals more accurate and finally the human factor being a lever in the whole organization function.

Conclusively, line to attack is coherent model which means that demand the accomplishment of all steps in view of providing powerful decision. In other words, any omission to follow the six steps may leads to non desirable results and can be provoke significant problems to the whole operation of the model.

CHAPTER 6

Discussion, Conclusion and Recommendation

During the projects life cycle, project managers make numerous decisions. Some of them are of crucial importance and demand specific manipulation on them. There are many explanations about the question why decision making is so difficult. The most common is that it is impossible to know all the aspects of the problem or all the alternatives solutions. What is more, every person who participates in a project has a different point of view about the importance of the problem or the impact of the solution. Furthermore, there is usually no way to gather the entire information about the decision and evaluate them with the most successful way. Finally, the main characteristic of the decision process is the consecutively changes which lack project team attention-concentration and lead the project to unmanageable circumstances.

On the other hand, project management is an extremely forceful process full of uncertainty and undefined conditions. Characteristically, there is no possibility to finish a project without changing the initial planning. As the project managers say, the purpose of the plans it to change or upgrade it in other plans. This means that the project management environment demands specific and rapid decisions from the individuals in view of delivering the project according to schedule (on time, in budget and with the appropriate performance), keeping the customer satisfied and upgrading the team's ability to confront difficult ventures.

Every problem or decision has multiple solutions but the key in that case is to decide which is the right or the best solution to choose according to the time we have to select, the cost and the effects of this selection. The golden section is to achieve a balance between these factors. It is unfeasible to find a unique solution that fulfills the above three criteria. The rule of **two evils chooses the lesser** can be profitable in some difficult situations and extricate from a quandary position the project manager.

The decision making and problem solving is a dynamic and sometimes non linear process which resolves or jeopardizes the organization's life cycle. Particularly, people tend to be proud of the success and avoid taking their responsibilities when failures occur. However, people are not full of control concerning this paradox. Organizational policies and enterprise structures increase the individual insecurity and establish stressful structures which affect their ability to make effective and well estimated decisions. What is more, complex models and multifarious techniques embarrass individual operation and provoke significant obstacles in the human logic. There is no model in the global economy which can supersede the human thinking. All models and techniques are tools whose role is to support human decisions.

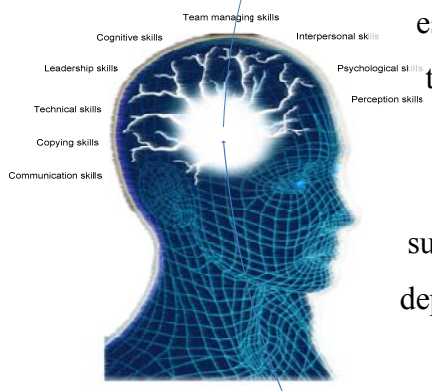
Initially, the problem begins when a mistake or failure occurs and no proper analysis and inspection of possible root causes is taken place. What happens in such cases is that individuals are considered responsible for the dysfunctions without paying attention to the process itself. The most common consequence of this perception is the collapse of the individuals' morality and their panic for the expected punishment. In other words, the dominating premises of "fix the process do not blame the individual" (Senge, 2004) seems to be neglected by those who run the business. The effects of this behavior can trap the individual decision capability and lead them to unsuccessful decision.

Correspondingly, one additional factor which prevents the effectiveness of the decision is people's arrogance. In essence, prior success creates the feeling of certainty to the decision makers so as the improper assessment of the factors of the problematic situation is made. However, the lack of documentary analysis of the situation provides disinformation about the complexity and the uncertainty and leads the decision maker to the enforcement of a useless strategy. The problem is getting more difficult when these arrogant persons are

incapable to face the exact reason of failure and try to understate the failure in the lack of information or systems' incorrect operation.

Accordingly, the absence of collaboration and well established communication channels can influence the interrelationships among the decision team members and bring out problematic behaviors among them. This problem refers to the human aspect of the decision making and requires exceptional skills from the decision maker in view of overcoming these obstacles and restores the balance and the affective team thinking in the group members. The next figure represents the usefulness of the initial to attack models under a theoretical point of view.

Figure 12: Theoretical view of the line to attack model



The operation of the line to attack model symbolizes a logic way of thinking that people have to follow in view of handling difficult decision.

There are many instances where pressure and stressful circumstances lead the human brain to make exaggerated estimations and rough calculation, loose the concentration of the initial target, pose impossible or undesirable objectives, leading to unsuccessful decisions.

Crucial to the effectiveness of the model, the secret of success is not the structure. More specifically, the two arrows depict the flow of the process which begins by the human brain (i.e. the framing of the problem) and ends in it (i.e. the exploiting of the power of learning process).

As a result, line to attack is a model which was conceived, structured and created by human to **serve individuals instead of processes**.

It is important to say that the value of this model is based upon the skill of the decision makers and group members and not on the effectiveness of the included tools, techniques and processes. There is a big amount of similar tools (more complex or less) and techniques that every user can adapt but there is only one way to collaborate them with success that is the human thinking. Imagine a scenario where an inexperienced individual called to drive a very fast car. It is impossible for this person to achieve a fast driving without bad consequences for his/ her health because their knowledge is less than the situation demands. In the same way, it is almost impossible to expect from an inexperienced project manager to make successful decision, being supplied only with an effective decision making model. Imperative need in the decision making and problem solving process is the advanced exploitation of the human skills and behaviors.

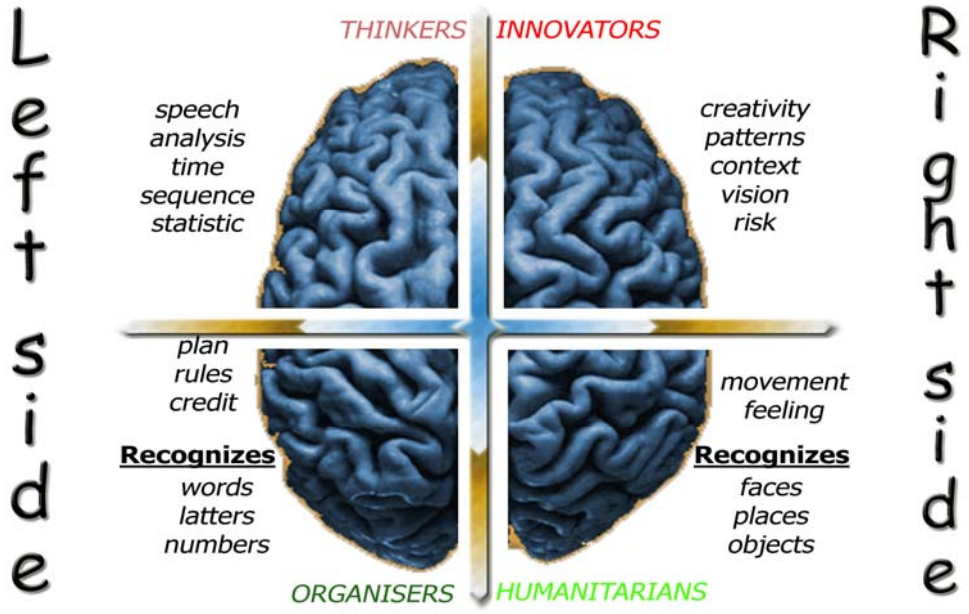
There are many ways which can improve the individuals' judgment and decision ability. The adoption of knowledge management and organization processes is one of them. More specifically, knowledge management refers to the process of creating, transferring and using knowledge to enhance organization performance. There are many ways to share information according to the type of the knowledge. Explicit knowledge is expressed in formal communication and can be easily transmitted among individuals. On the other hand, tacit knowledge based upon individuals' experience and appears on insights, skills and intuitions. It is more difficult to transmit this knowledge and demands close association, ongoing relationships and effective communication channels.

Correspondingly, learning processes underline the way that organization should follow in view of sharing the knowledge and improving individual's skills. It is a mistake to separate the knowledge management from the learning process because the first depends on of the second. Well operation of knowledge management increase the usefulness of learning process and correspondingly.

It will be hopeless to use the knowledge management and learning process as a way to add value in the organization process because we pay attention to increase the productivity and we neglect the human factor. To be more precise, the closing objective can be that but the fundamental priority must be to share the knowledge among the individuals, to upgrade their skill and improve the whole company's function. If we achieve this, the increase in productivity must be as sure as fate.

The following picture illustrates some of the most common actions that each quarter of human brain can take (according to the decision making process). Even though this viewpoint is very scientific and out of the purpose of this study, the author's intention is to illuminate how the "thinking lab" of each person works. To be more precise, every quarter is in charge of receiving and analyzing specific part of the whole action – decision. Moreover, the result of this collaboration and interactions is summarized in one or more actions. Nevertheless, there are cases where the thinking processes are unable to conclude because of the lack of information or the interruption of external environment threats.

Figure 13: Thinking Lab



It is important to note that the function of human brain is not so simple and linear as it is illustrated in the above figure. All the quarters are contributed effectively in order to produce a coherent action. The human brain has the ability to make scenarios, analyze conditions and conclude in results very rapidly. It is obvious that no words can describe this process with explicitness because we do not know the interrelationships and interactions of this extremely complex system. However, we can state with absolute certainty that the secret of outstanding decision making and problem solving process underlies in the comprehension of the complex system's function. Only when we are in a position to identify how the decision environment affects the humans thinking, then we can design and implement perfect decisions.

In conclusion, the result of this study is to design a model based upon human behavior and provide a framework of an effective decision making and problem solving process. The authors' priority was to underline specific factors that jeopardize organization's decision ability and offer specific solution for it. However, the effectiveness of the model is depended on the efficiency and mastery of the decision maker to analyze the situation, clarify the effects and expectations, prepare a well structured strategy and finally implement an accurate decision. Alternatives actions and safety valves are requested too in order to be prepared for unexpectedly results. Finally, documentation and learning process must be adapted by every organization in view of empowering their knowledge and upgrading their decision skills.

Although the result of this thesis, it is understandable that additional research is necessary so as to highlight the interaction between the decision making function and the hidden aspect of human brain which participates in this process. The fundamental tool in the operation of a decision process is the human brain.

APPENDICES

Appendix A (Archetypes)

The word **archetypes** comes from the Greek *archetypos*, meaning first of its kind. The archetype is a fundamental way to tell a store from a picture. What is more, we can identify and illustrate complex relationships in view of highlighting them and prevent potential confrontation.

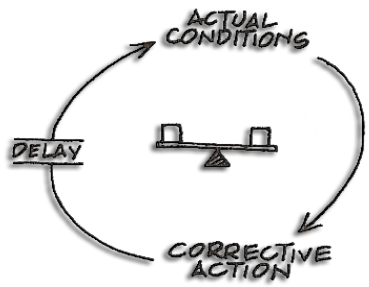
In system thinking, from an image we can identify and discover many useful things. A basic structure of an archetype depends upon ***links*** and ***loops***. From any element in a situation, we can trace links in order to represent influence on another element. These reveal cycles that repeat them, time after time, making situations better or worse. A loop can tell us a story of a situation. We have basically two buildings blocks, the *reinforcing loops* and the *balancing loops*. Reinforcing loops generate exponential growth and collapse, in which the growth or collapse continues at an ever-increasing rate. Moreover, in reinforcing lops we note that events occurs simultaneously and not just linear or sequential. Additionally, we observe system behavior and acquire a sense of timing. In all reinforcing processes a small change builds on itself and high rates lead to higher rates.

On the other hand, balancing loops generate the forces of resistance, which eventually limit growth. Balancing processes generate the forces of resistance, which eventually limit growth. Balancing processes are always bound to a target or goal which is often implicitly set by the forces of the system. Finally, it is worthy of note that both reinforcing and balancing loops that we mentioned provide feedback processes.

The next pages illustrate with details the most famous archetypes, as Senge represented them in his book, the Fifth Disciplines[38].

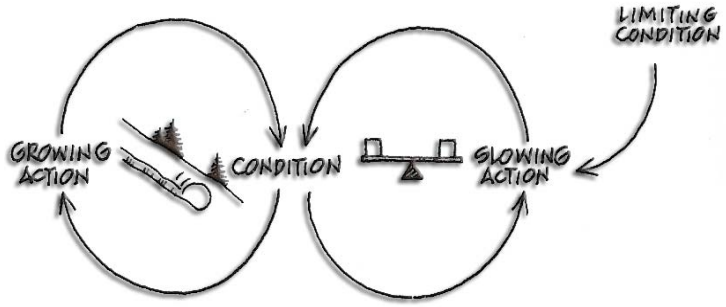
[38] Peter, M. Senge (2006), The Fifth Discipline: The art and practice of the learning organization. pp. 390-400. New York, Doubleday

Balancing process with delay



Balancing process with delay illustrate the most common scenario that archetypes can be used. To be more precise, it refers to a person, a group or an organization which having a specific target or goal. The delay symbolize the time that we need ro react or to correct an action. The feedback of this scenario can help as to upgrade our effectiveness in similar situations.

Limits to growth

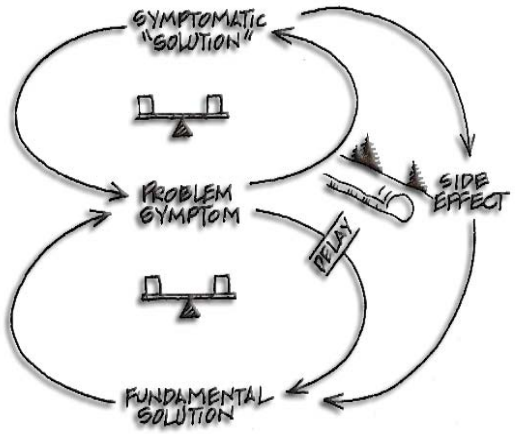


The limits to growth illustrate a scenario of growth or expansion. However, as it is widely known, the development phase can not last for ever.

There is a point where problems or limited conditions occur and we need specific action in view of continuing or maintaining our growth. The growth phase is symbolized by a reinforcing feedback process. On the other hand, the slowing process arises due to a balancing process which is connected with the limiting conditions. Peter Senge has described this situation with the expression that *"the harder you push, the hard the system pushes back"* (Senge, 2006).

There is a different version of this model which named *limits to success*. This archetype has the same operation with the previous and focus on the potential problem by specific questions.

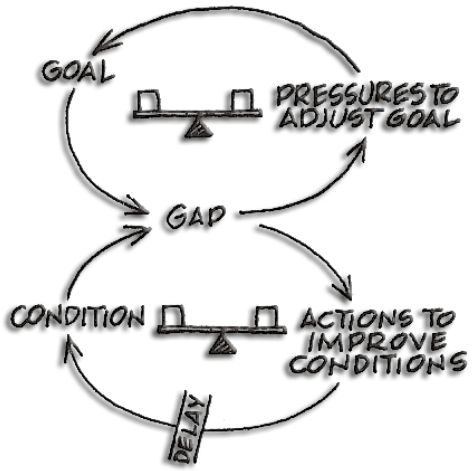
Shifting the burden



In a shifting the burden scenario, a problem is solved by applying a symptomatic solution which track our attention (delay) from the fundamental solution. The symptomatic solution is commonly the most obvious solutions which provoke two negative effects. The first one that skip our attention to the fundamental solution and the second that we need more time (reinforcing process) in view of apply a corrective action.

Nevertheless, when the symptomatic solution is necessary or imperative (side effect), use it for a short time while working hard to apply the fundamental solution. Peter Senge highlights the importance of this model throughout the principles, *"the easy way out usually leads back in"*, *"the cure can be worse than the disease"* and *"faster is slower"*.

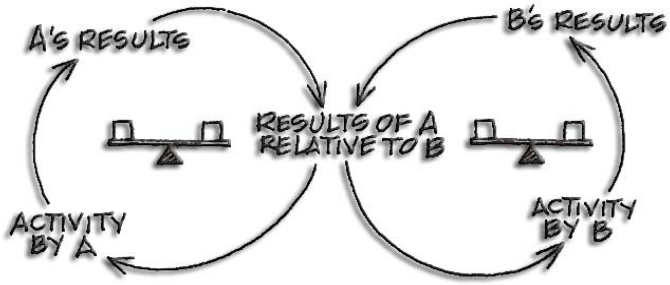
Eroding goals



Eroding goals scenario using the same framework with the structure of the shifting the burden archetype but focuses on crises conditions. The gap refers to the time we lost between the action under pressure and the action to improve conditions.

The purpose of this archetype is to keep the company in track in order to identify the problem which push the system back and design the corrective actions.

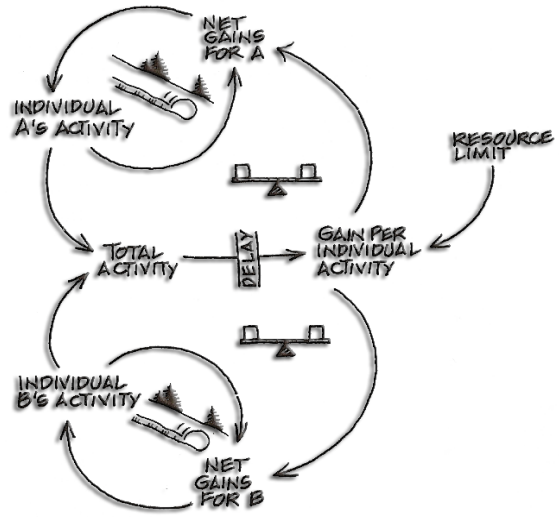
Escalation



The main idea of escalation scenario focuses on a dynamic system where two or more parties feel threatened by the actions of the other. In other words, the insecurity feeling bring in the surface competitive behaviors and obligate the participants to defend their positions.

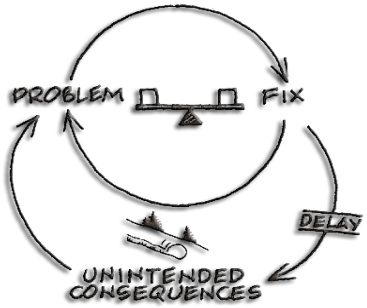
To be more precise, in the escalation archetype, one party (A) receives action by the other party (B) as a threat while the other party (B) responds in the same way, increasing the threat to the first party (A). However, the common point is that each parties attempts to keep things under control by managing their own balancing process. The lengthily operation of this model can lead the participants to incontrollable situation with tremendous effects.

Tragedy of the common



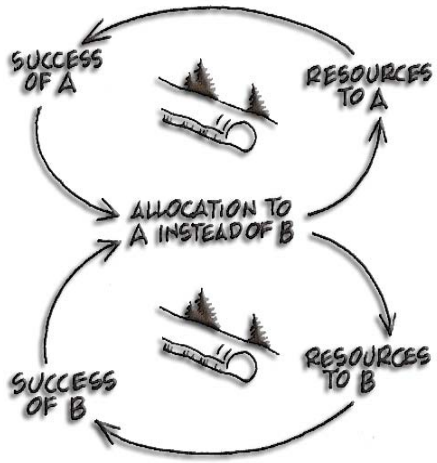
Tragedy of the common scenario illustrates the situation where each person pursue action that are individually valuable. The two reinforcing loops present this beneficial action. However, there is a critical point where after that the commons benefit becomes overloaded and more action diminishing benefits. The limitations gain appears separately in each individual because of the slack of the system.

Fixes that fail



Fix that fail highlights the event that short term solutions bring long term negative consequences. Therefore, the cognitive obligation is to pay our attention in long term solution in order to avoid undesired effects. However, Peter Senge pointed out that short term solution can be used in view of "buying time" while working on long term remedy.

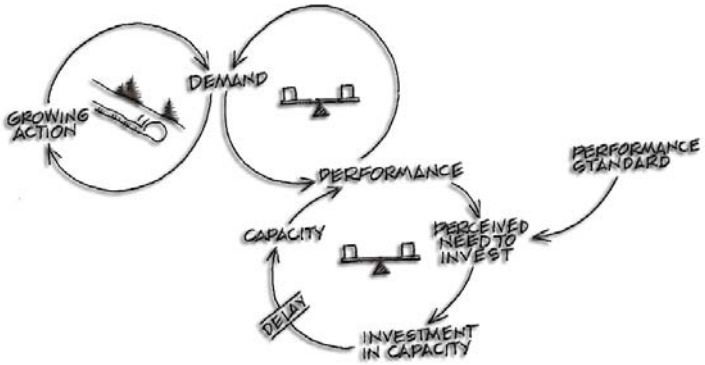
Success to the successful



Success to the successful archetype underlines the point that effectiveness may depend more on structural forces than in each person innate ability or talent.

The first loop represents a group (A) and the second a group (B). We assume that each group is composed of equally members. The importance of the structure arise when we release that one group is given more resources against the other. As a consequence, the structure supports the success on group A and provokes obstacles to group B.

Growth and underinvestment



Peter Senge characterizes this archetype as a special case of the Limits to success scenario.

The core of this archetype is a reinforcing loop which symbolizes the growth action. Also, the balancing loop refers to the factors the bring obstacles and jeopardize the development process. The next balancing loop indicates the performance we need in order to overcome the obstacles and achieve the desire outcome. Peter Senge supports the opinion that lower goals lead us to lower expectation which lead us to poor performance and poor results.

Appendix B (Theory of Games)

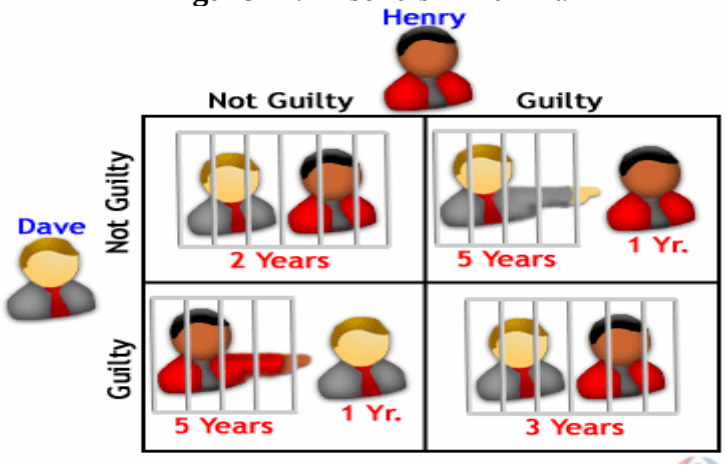
Game theory is a mathematical analysis which created to study decision making in conflict situations. The basic concept of theory includes two or more decision makers (players) who have different strategic objectives to implement in the same system environment or share the same resource during the implementation phase. The purpose of game theory is to find the most optimum strategy in relation with the opponent who has a strategy of his own.

Every player has to design his strategy and taking into account the strategic reactions of the other player. This is a clear case of systematic approach where the effects of one player actions affect and determine the reaction of the other players. What is more, the final game result will be based upon the interactions and interrelationships among the players behavior.

The usefulness of game theory is that helps us to understand the behavior of game players and underline the ways that they react under pressure or conflict conditions.
Game theory uses mathematics to express its ideas formally. However, most game theoretical ideas are not *inherently* mathematical, though a mathematical formulation makes it easy to define concepts precisely, to verify the consistency of ideas, and to explore the implications of assumptions (Martin J. Osborn & Ariel Rubinstein, 1994).

The prisoners' dilemma is the most famous example in order to describe the operation of the game theory. Suppose there are two brokers accused of fraudulent trading activities: Dave and Henry. Both Dave and Henry are being interrogated separately and do not know what the other is saying. Both brokers want to minimize the amount of time spent in jail and here lies the dilemma. The following figure illustrates these interrelationships and highlights the most possible scenarios.

Figure 14: Prisoners' Dilemma



Source: Owned and Operated by Investopedia Inc (2006)

1. If Dave pleads not guilty and Henry confesses, Henry will receive the minimum sentence of one year, and Dave will have to stay in jail for the maximum sentence of five years.
2. If nobody makes any implications they will both receive a sentence of two years.
3. If both decide to plead guilty and implicate their partner, they will both receive a sentence of three years.
4. If Henry pleads not guilty and Dave confesses, Dave will receive the minimum sentence of one year, and Henry will have to stay in jail for the maximum five years.

Obviously, pleading guilty is the most attractive should the other plead not guilty since the sentence is only one year. However, if the other party also chooses to plead guilty, both will have to serve three years. On the other hand, if both parties plead not guilty, they'd have to serve two years in jail. Consequently, the risk of pleading not guilty is a five-year sentence, should the other choose to confess (Investopedia[39], 2006).

[39] Prisoners' Dilemma, Retrieved June 10, 2007 from www.answers.com

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