The Human Factor: How to consider it in Decision-Making for a Successful Management

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Abstract

Projects in all industries both public and private need proper management to be successful. Proper management may sound easy at a first glance, but in practice it has many difficulties as unforeseen events and actions that turn the project to a success or to a failure. To some extent the difficulties in the projects are related to the human factor as level of uncertainty or lack of experience, understanding or simply stated the lack of knowledge for certain situations. These are the voids in the management practice that if filled wisely may improve the potential of successful project delivery. Depending on a project the issues may start right from the initiation phase of the project and carry over the rest of the project phases. Stakeholders, technical issues, financing, contracting, risk management, negotiations, procurement are some of the important areas for a careful consideration. The question is: How to analyze these for informed decision-making and how to count for the human factor or preference in such decisions? This paper proposes the application of the management science techniques for quantitatively assessing and addressing the human factor impact on project management decision-making that can allow to plan in advance and maximize the chances of success.

Introduction

Every project manager has a goal in mind for their project be it in construction industry or elsewhere. The goal is to get the project completed on time, within budget and within acceptable quality requirements while complying with all contractual documents both from technical and nontechnical perspectives. Such a goal, while it is extremely desirable, is almost always hard or impossible to achieve. The question is: why? Many times it is believed that for failed projects there was a lack of communication, lack of understanding of the project scope and requirements, lack of details in specifications, owners' bias and so on. Certainly, these are aspects that are closely related to the success or failure of projects, but some projects fail if above mentioned components where in place. The question again is: why? To justify the failure some will refer to the soft skills that project manager lacked to keep the team motivated, engaged, cooperative, and many more. Another angle of view for failed projects would be the possibility of a cooperative and non-cooperative behavior of involved parties. Is it actually the surrounding world causing the preferential justification of actions that later lead to a failure or is it a result of self-empowerment and feeling of authority and unnecessary self-confidence that causes the ill decisions followed by failure? Overall, it can be said that in such instances the project manager did not consider the human factor. Human factor depending on the conceptual use may refer to different things. In some instances if a product or a machine is not well designed then the user who fails operating it may not be accountable for the failure because there was a design flow. The ergonomic designers would take additional steps for understanding on what needs to be improved to reduce the cases of failure due to the ineffective design. Can this same approach be adopted in Project Management and if so what are the possibilities and ways for doing so?

Some researchers tried to define the human factor in decision-making process. This is not a new concept and for decades it is extensively documented also by military industry that humans behave differently under certain conditions, they tolerate pressure differently, they take risk differently, they think differently, and most importantly human does all of it inconsistently. It is also documented that training can improve the decision-making capability of a human in order to improve the overall outcome of detail evaluation and response under given circumstances (Jacobs, 1998). Yet even after all the training people will act inconsistently under specific circumstances that are unique for every project. Many times humans will rely on heuristic options for figuring out the possible action plan. In many cases the heuristic approach will be based on the experience and past performance (Dietrich, 2010; Shah and Oppenheimer, 2008; Juliusson, Karlsson, and Gärling, 2005).

It was also documented that that the human judgment significantly varies from what would have been resulted from decision theory based analysis (Anderson, 1970; Hammond et al 1975). Some algebraic models were developed and used to highlight how the information is being processed and evaluated the impact of information source on the final decision-making (Wallsten and Barton 1982, Wilkening and Anderson 1982). In contrast Payne (1982) suggested that in fact a human can use any number of possible strategies for cost-benefit analysis in order to arrive to a decision.

Based on extensive analysis there seems to be a possibility of considering a human factor in decision-making process with a more structured approach compared to traditional yet probably biased heuristic method. It can be achieved through evaluation and assessment of circumstances for projects combined with analysis of possible preferences of a decision-maker to maximize the potential of a successful and consistent decisions making. The proposed method can be used for informed decision making at any stages and steps along the lifespan of a project. The proposed approach is based on applications of modified Analytical Hierarchy Process (AHP) and Game Theory. The next section describes the steps and details for development of human factor in decision making for a successful project management (SPM) technique.

Methodology

In 1970s Thomas Saaty developed Analytical Hierarchy Process (AHP) to help in making complex decisions using math and psychology concepts. The method allows selection among different options where the trivial heuristic approach would not provide the possible best outcome.

AHP allows to check for the decision-maker's consistency of pairwise comparisons of attributes and if the decision-maker is not consistent they would need to revise the evaluation and check for the consistency again to proceed with evaluation. The process was further improved over the years. Reader is referred to Saaty (1994) for further details on the steps involved in AHP. In this research we will refer to the original steps but will also present the initial steps before adopting the AHP to generate results.

The problem with decision-making in management using AHP is related to the cumbersome evaluation process of relative importance values for comparison parameters or attributes. For instance if a person in charge has to make a decision for selecting a project to proceed with and if there are only five attributes or parameters to consider in decision making then the traditional AHP method requires values to be decided for 5 by 5 comparison matrix. To decide on 25 relative importance values and keep those choices consistent without use of any technique is a challenging or unachievable task even for a well-trained and analytical thinking person. The situation is even worse for someone whose training is not from such a perspective. The sample problem below demonstrates the traditional AHP and then expands on certain aspects of the proposed SPM technique principles without diving into specific details due to space limitations.

Sample problem:

The decision-maker needs to decide on a selection of a project to proceed with for a company. The choice must be based on reliable approach that requires consistency in the evaluation of projects. The decision-maker decides to set up some attributes for comparing the project and then decide which project meets the needs most. From this perspective the attributes are decided to be:

A – Stakeholder satisfaction potential

B – Profit generation potential

C – Technical feasibility potential

D – Early completion potential

E – Immediate resource availability potential

To be able to compare projects according to the identified attributes the decision-maker would first need to prioritize the importance of attributes. For instance, the decision-maker needs to identify how important is the “stakeholder satisfaction potential” attribute over to “early completion potential” attribute. Similarly all possible combinations among attributes must be evaluated for their relative importance. If the decision-maker is not consistent in defining the relative importance values of attributes within acceptable range as described in AHP the decision-maker needs to revisit their choices of relative importance values and adjust again and again with a hope of reaching the acceptable consistency. This is where the process can become challenging, time consuming or even unachievable. Then the decision-maker will move forward with some other self-developed approach, justified or unjustified beliefs for making “right” the decision. Such process can rely on a heuristic approach or other feasible options and in fact may result to ill decisions by leaving better options on the table. Table 1 presents a possible data in pairwise comparison matrix that a decision-maker may come up with when trying to follow the AHP method in order to select a project.

Table 1: AHP attributes pairwise comparison matrix with traditional setup

Attributes	**A**	**B**	**C**	**D**	**E**
A	1.0	7.0	6.0	5.0	3.0
B	3.0	1.0	5.0	7.0	4.0
C	2.0	0.2	1.0	3.0	1.0
D	0.2	1.0	0.3	1.0	0.3
E	0.2	0.2	1.0	4.0	1.0

From the table data, it is easy to observe that the diagonal elements of a pairwise comparison matrix are one. That will always be the case as it is the attribute’s comparison to itself. Yet, other values in the matrix need to be decided by the decision-maker. For instance the row A and column B indicate that the decision-maker has significant preference towards “stakeholder satisfaction potential” attribute over to “profit generation potential” attribute. Similarly, from the data it can be observed that attribute D over B is set to one, meaning equal importance. At this stage it is important to notice that the decision-maker also indicated that attribute B over D is significantly important with a value of seven. This matrix has many inconsistences similar to the one discussed here. The beauty of AHP is that it still allows to make the correct choice if such inconsistences are not too much and/or many.

AHP defines that the decision-maker is consistent if Consistency index (CI) ratio to Random Index (RI) is less than 0.1 and if the value is larger than 0.1 then the decision-maker needs to revisit their choices of relative importance values for the attributes. Completing the calculations for the data in Table 1 it is found that the CI/RI is 0.9024, meaning that there are significant inconsistencies in the pairwise comparison matrix. After extensive trial and error the acceptable range was reached through calculations, but not as a result of preference adjustment.

In reality such pairwise comparisons are hard to manage in mind or follow on paper, which eventually needs to be revisited and adjusted. In fact the less effort put the decision-maker in confusing procedures the better would be the time spent on doing something useful for the project in hand and more desire there would be to rely upon useful techniques. Given the observations as described in the reviewed literature a person might have a better judgment in assigning value ranges to attributes rather than exact numbers. A person might be have a better capability of recalling the best outcomes resulted from certain choices or the worst outcomes based on such choices. Yet, there will be cases that the decision-maker came across more frequently than others. With incorporation of such approach on selecting or defining values for attributes the first segment of successful project management (SPM) technique was developed. As such the SPM technique allows the decision-maker to define the optimistic relative importance values for attributes in pairwise comparison matrix. Similarly the decision-maker needs to define the pessimistic and most likely values and the estimated value then would be calculated by making it the most accurate approach given the expertise and experience level of the decision-maker.

The second segment of successful project management (SPM) technique is allowing the decision-maker to define the most important attribute for them and then compare other attributes by defining their preference level in relation to the most important attribute. Then SPM tool completes the rest of the values for a consistent pairwise comparison matrix. As such if refer to Table 1 data and apply the first to segments of SPM we get Table 2 that is now perfectly consistent. Due to space limitations, some steps omitted from the rest of this document.

Table 2: AHP attributes pairwise comparison matrix with SPM setup

Attributes	A	B	C	D	E
A	1.0	7.0	6.0	5.0	3.0
B	0.1	1.0	0.9	0.7	0.4
C	0.2	1.2	1.0	0.8	0.5
D	0.2	1.4	1.2	1.0	0.6
E	0.3	2.3	2.0	1.7	1.0

With similar approach, the decision-maker will compare the project to project per defined attribute and SPM tool will detect which project to select as the best option that satisfies defined attributes as closely as possible. After calculations, one can arrive to the outcome that may look as given in Table 3.

Table 3: Final output from SPM complemented AHP

Attributes i	A	B	C	D	E

Weights i Project j	0.543	0.078	0.090	0.109	0.181	Alpha
Project 1	**0.21**	**0.12**	**0.5**	**0.63**	**0.62**	**0.349**
Project 2	**0.55**	**0.55**	**0.25**	**0.3**	**0.24**	**0.440**
Project 3	**0.24**	**0.33**	**0.25**	**0.07**	**0.14**	**0.211**

From the data in Table 3, Project 2 will have the highest final Alpha score indicating that is the project the decision-maker should select as it satisfies their preferences per attribute the most. Then Project 1 will be the next best option, yet Project 1 will be the least desirable project to select. Likewise, if the decision to make is for selecting an action item instead of a project the SPM tool will help the decision-maker to detect the right action to adopt. The decision-maker can decide the attributes that are important for such decisions by the level of importance and proceed similarly.

The following section analyzes on how to use the Game Theory to reach to a point in discussions or negotiations that both parties will prefer not to deviate from and reach an agreement. In project management, negotiations when considered from Game Theory perspective can be a non-cooperative game where the gain of one party is a loss of another.

SPM complements Game Theoretic analysis and allows considering the human factor in even more advanced level in the process of decision-making. As such, the scenario below explains the process of application. The scenario is about two potential Prime Contractors (K and J) brought into the picture for their professional opinion and recommendation to stakeholders to decide which project to support. Due to the limited resources, not every project is possible to support, but stakeholders announced that given the magnitude of the projects they would be able to support two projects. For continuity let’s assume that contractor K is the decision-maker in the SPM example analysis above who now knows which project to push forward given their attribute preferences. Similarly, J has his own analysis and knows which project to target given the results in Table 4. Yet, both K and J know that if they get their most desirable project funded they can contract the other contractor as a general contractor. This means that each of these contractors still benefit if any of the projects receive funding. To apply Game Theoretic setup the payoff matrix is set as presented in Table 5. Numbers in Table 5 come from Alpha values obtained by both Primes Contractors K and J using SPM.

Table 4: Contractor J's output from SPM complemented AHP.

Project j	**Alpha**
Project 1	**0.411**
Project 2	**0.340**
Project 3	**0.249**

Payoff matrix allows adjusting the strategies that both potential Prime Contractors may exercise. The options for assigning the same project to both Primes would be infeasible and the decision-maker cannot select it as an acceptable outcome. From the payoff matrix the numbers indicate that Project 3 is not desirable by both K and J. Therefore, the payoff matrix will be reduced to Table 6.

Table 5: Contractors K and J payoff matrix

	Alpha Values	J: Project 1	J: Project 2	J: Project 3
K	Project 1	0.349 / 0.411	0.349 / 0.340	0.349 / 0.249
	Project 2	0.440 / 0.411	0.440 / 0.340	0.440 / 0.249
	Project 3	0.211 / 0.411	0.211 / 0.340	0.211 / 0.249

Table 6: Contractors K and J reduced payoff matrix

	Alpha Values	J: Project 1	J: Project 2
K	Project 1	0.349 / 0.411	0.349 / 0.340
	Project 2	0.440 / 0.411	0.440 / 0.340

If analyze information in Table 6 and given the stakeholders announcement for funding two projects both Project 1 and 2 could be selected. The next question would be to strategize who gets which project and how to strategize the steps at this point. Given the Alpha values in Table 6 the discussions would be targeted in assigning the projects accordingly for the overall preference of both Primes.

Conclusions

It is noticeable that if Project 1 gets funding then J will be more interested in getting it, as K's payoff is lower for Project 1 compared to Project 2 (Table 6). Similarly, J prefers Project 2 less than Project 1. Without such evaluation, even if both projects get funding but assigned in the opposite way, both Primes would be worse off. Clearly, both Primes will still get a project to proceed with, but the outcome would be completely different. Given the attributes defined for prioritizing, the projects many problems would materialize later on that can decide the success or failure of the projects. Many situations are present in all projects and programs and therefore the applications of the developed methods for consistently evaluating the human preference in the decision-making while applying it in business strategy development could benefit all informed parties.

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