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PRIORITIZATION OF PROJECT STAKEHOLDERS: AN AHP BASED APPROACH

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Abstract

Prioritization of project stakeholders is inevitable, as all competing demands of stakeholders cannot often be met. In this paper, an Analytic Hierarchic Process (AHP) based model is proposed for prioritization of the stakeholders. This model is based on critical stakeholder attributes and utilizes collective knowledge and wisdom of the project management team. The critical attributes of the stakeholders are identified and AHP is used to arrive at the stakeholder order of priority. How this priority information can improve the project management processes and how this can enable project teams to respond to stakeholders in a coherent manner, has also been explored.

Keywords: Group Decision, Project Management, Stakeholder, Prioritization, AHP.

1. Introduction

Stakeholder is "any group or individual who can affect or is affected by the achievement of the organization's objectives" (Freeman, 1984). According to Project Management Institute, the term project stakeholder refers to, "an individual, group, or organization, who may affect, be affected by, or perceive itself to be affected by a decision, activity, or outcome of a project" (PMI, 2013, p. 29). Project teams in their day to day work often face situations, when all competing demands of stakeholders cannot be met under the constraints of time and resources and it becomes inevitable to give priority to one stakeholder over the other. The project team member handling the situation generally exercises his or her discretion to decide the priority. However, the stakeholder priority judged by an individual team member may not always be the best judgment for the project.

Further, the project manager and the members of the project management team may not hold a common perception about importance of various project stakeholders. The customers may be important for the client facing project management team member, so may be the suppliers to the team member responsible for purchase and the technology partner organization may be equally important for the design team. The project management team members responsible for various aspects of the project will have different perceptions about the importance of different stakeholders, based on their individual experiences with the stakeholders they interact with. Hence, the collective knowledge and wisdom of the project management team should be utilized to estimate the priority of stakeholders.

The remainder of this paper is organized in the following order. Section 2 is a brief overview of relevant research literature on stakeholder analysis and prioritization, collective knowledge and group decision making. Section 3 describes the research aims and research questions. Section 4 is an overview of data and methods used in this research. The topics discussed in this section are survey design, identification of criteria for prioritization and Analytic Hierarchic Process (AHP) model. The results of survey and analysis of AHP model are discussed in Section 5. The article ends with the conclusions in the section 6.

2. Related Research Literature

Scholars have made efforts in the past towards analysis and prioritization of Stakeholders. Jackson (2001) disputes the fact that it is true or self-evident that the customer always comes first, in his analysis. Bryson (2004) reviews a range of stakeholder identification and analysis techniques. Boesso & Kumar (2009) have shown in their study that the power and legitimacy that managers associate with a stakeholder group cumulatively are the most important determinant of how managers go about prioritizing competing claims. The model of Mainardes et al. (2012) proposes six stakeholder types - regulator, controller, partner, passive, dependent and non-stakeholder. Their study contributes both in simplifying stakeholder classification and in explaining the relationships between parties (Mainardes, Alves, & MárioRaposo, 2012). Aragonés-Beltrán et al. (2017) present a methodology to measure stakeholders' influences within a project using Analytic Network Process (ANP) from the point of view of the Project Manager (Aragonés-Beltrán, García-Melón, & Montesinos-Valera, 2017). It is a novel proposal for the assessment of "influence" among stakeholders based on a multi-perspective approach. Hage et al. (2010) suggest stakeholders prioritization based on criteria-Scientific or other knowledge, stake or interest, values, representativeness and communication and social skills (Hage, Leroy, & Petersen, 2010). The study of Hujainah et al. (2018) identifies Seventeen Stakeholder Quantization and Prioritization (SQP) attributes along with their description, usage impact, and degree of importance. The importance of the attributes is measured by

calculating the frequency of usage from the selected studies (Hujainah, Bakar, Al-haimi, & Abdulgabber, 2018)

The Stakeholder attributes give insight into individual stakeholders, but this information should be used in a systematic way to prioritize the stakeholders. So that it is not based only on the individual judgment of the team member responding to the stakeholder, but on the collective wisdom of the organization. Each member of project management team has unique perception about the importance of different stakeholder attributes and the degree to which the stakeholders possess these attributes.

3. Aim of the research and Research Questions

This research aims to equip the project team with the order of priority of the stakeholders, which is based on the collective knowledge, experience and wisdom of the project management team. This information can then be shared with all concerned team members, so that the response to the stakeholders, by any team member, through action or behaviour is based on this pre-decided priority and is uniform across the project team. It is expected that this will enable the project team to respond to its various stakeholders, in a more coherent manner.

However, before proceeding further with the development of a method for prioritization of the stakeholders, it will be prudent to investigate whether the need for prioritization really exists or not.

RQ1: Is there a need to prioritize the stakeholders of the projects?

The next step was identification of the stakeholder attributes critical for deciding order of Priority.

RQ2: What Stakeholder attributes are most critical for deciding order of Priority?

These identified Stakeholder attributes through the answer of RQ2 shall be used systematically for obtaining prioritization. The third and last research question is:

RQ3: How to accord order of priority to the stakeholders of the projects using their critical attributes?

4. Data and Methods

The research method for RQ1 i.e. the need for stakeholder prioritization was informal semi-structured interviews followed by a survey.

The researchers verified the seriousness of the problem by informal interviews of eight other practicing project managers. All these project managers were working in the

same organization and were heading their respective projects. All of these were PMP (Project Management Professional) Certified by PMI (Project Management Institute). These informal interviews helped in getting exposure to difficulties being faced by the project managers, in the absence of a clear order of priority of various stakeholders of the projects. These interviews gave necessary insight for design of the survey also. The survey was used to triangulate the findings of the interviews.

The answer to RQ 2, i.e. identification of list of critical attributes of the stakeholders for prioritization, was obtained using literature survey and informal interviews, and findings of these methods were triangulated through survey. The list prepared with the help of literature (Hujainah et al., 2018) was further augmented by one more attribute namely- 'Difference between Current and Desired levels of Stakeholder Engagement' after informal interviews of the eight project managers, wherein it was suggested. This list was given in the survey and participants were asked to select the attributes they thought were most critical for prioritization. The result of this survey answered RQ2 and critical stakeholder attributes for prioritization were identified.

The RQ3 was answered by conceptualizing and developing a prioritization method. The prioritization method was developed keeping in view the requirements of the practitioners i.e. ease of implementation, simplicity, use of collective wisdom of project management team etc. And finally, the developed framework and method was applied on a project to prioritize stakeholders.

4.1 Survey Design and data collection

A survey was designed to measure the need for a method of Stakeholder Prioritization and to identify Stakeholder attributes critical for prioritization. An online questionnaire of 15 questions was developed. There was a provision to enter name and email ID of the respondent, but these fields were optional. The first ten questions were designed to assess need for stakeholder prioritization. The first two questions (Q1 & Q2) had to be answered by selecting appropriate verbal answer from the multiple choices and remaining 8 questions (Q3-Q10) were designed to measure need for stakeholder prioritization on Likert scale of 5. The Cronbach's alfa was computed for these 8 questions to measure consistency of the scale and value of 0.73 was reported. The next question (Q11) was to identify the critical stakeholder attributes for prioritization from a list of identified attributes. In the next four questions (Q12-Q15), the participants were asked if there is need for a separate framework for estimation of 'Power' attribute of the stakeholders.

The target population of the survey included all personnel, who performed project management function in the organization under the case study. The total strength of personnel associated with project management cost centres in the company was 526. This was taken as the target population of the survey. Census approach was

followed and all the members were requested to provide their response to the questionnaire. The prospective participants of the survey were located in the several cities of the country; hence electronic method of data collection was opted. All the members were approached electronically through social media and emails. There were 246 certified Project Management Professionals (PMPs) in the company. These PMPs were members of a social media group. There was another social media group of project managers of the organization, who have received PMP training and are aspiring to acquire certifications. This group has a total strength of 197. The survey questionnaire was shared on both of these groups. The cell phone number and email of the remaining 83 members were taken from the company telephone directory and the questionnaire was forwarded to them electronically through phone and email.

The Google forms tool was used for creating, administering and managing the survey. The participants were reminded on the social media and through individual telephonic calls and messages to participate in the survey. The participants had the option of not disclosing their identity. This option was given to increase participation and reduce the possibility of response bias.

The response to the survey could be obtained from 103 participants. Out of which only 4 respondents chose to remain anonymous and remaining participants responded with their name and email ID. The profile of these 99 respondents was examined and any particular pattern was not observed with regard to PMP certification status, type of project, strategic business unit, years of experience and gender. The researchers assume that the non response was due to heavy work load of project management teams uniformly across the company and the obtained responses are representative of the population.

The results of this survey endorse information obtained through informal interviews of project managers. The detailed findings of the survey are discussed in the section 4.

4.2 Identification of Criteria for AHP (Critical Stakeholder Attributes)

The most critical attributes of Hujainah et al. (2018) (Power, Interest, Experience, Knowledge and Role/ Responsibility) are endorsed by this survey also. These top 5 attributes are explicitly included in this model. 'Difference between Current and Desired levels of Stakeholder Engagement', which was included in the list of attributes for survey was chosen to be a critical attribute by 33.7%. This attribute is not included in the prioritization framework as majority of the respondents do not consider this attribute critical. 'Other Factors' criterion is introduced to address any context specific prominent attributes. It can be any other left out attribute, which is prominent in the context of the project under consideration or it can also be a combination of more than one attributes.

54.8% of the respondents of the survey said that it is not possible to always assess Power attribute of the Stakeholders. 81.7% recognized need for a separate framework for assessment of Stakeholder Power for the purpose of prioritization. The model proposed by Aragonés-Beltrán et al. (2017) to measure the influences of stakeholders (i.e. Power) was adapted in this study. This model is based on criteria grouped into four clusters. The first cluster is Knowledge. It is composed of elements that give information about stakeholders' intangible skills. It includes Expert knowledge, Professional competence and Experience. The second cluster is Social Skills. It represents intangible values closely related to social interactions of an actor. It includes representativeness, affiliating with others and manipulating others. The third cluster is Assets. It covers all the properties an actor possesses that have monetary value including financial security, providing resources and providing financials. And the fourth and final cluster is External. It is composed of elements that allow external dependence e.g. external factors such as politics or regulatory bodies, public image and hierarchical position. Cluster Knowledge is not included in the framework for estimation of Power, as it is a separate criterion in the overall prioritization process.

4.3 Analytic Hierarchy Process (AHP)

AHP is a Multi Criteria Decision Making (MCDM) technique developed by Saaty (1980). The AHP is method of relative measurement. This method is used to assess the preferences of the decision maker using relative scales that do not have a zero or a unit. Ratio scale should be used to rate the decision maker's preferences. The steps to solve a multi-criteria decision-making problem using AHP are discussed in detail by Aragonés-Beltrán et al. (2014).

4.3.1 Selection of AHP method

There is a need for a method which can address many variables involved in the prioritization process, in a structured way and use collective wisdom, experience and knowledge of the project management team to derive the solution.

The AHP method is considered to be well suited for group decision making by many researchers as it acts as a synthesizing mechanism (Dyer, Forman 1992; Bard, Sousk 1990). The group members make use of their knowledge and experience to structure a problem into a hierarchical order and solve it by applying steps of AHP (Kamal, Al-Subhi 2001). The AHP method is selected for prioritization of stakeholders for the following reasons. First, AHP method has ability to measure and synthesize the several factors in a hierarchical structure (Forman & Gass, 2001) and hence provide a structure to otherwise unstructured problem. The factors that affect the decision are identified and hierarchically organized in a structure of homogenous clusters of factors (Forman & Gass, 2001). Second, AHP supports group decision. The AHP can be used for group decision by taking geometric mean of preferences of individual experts (Saaty, 2008). Third, the prioritization decision might be based on both tangible and non-

tangible criteria and AHP can efficiently deal with both tangible (i.e. objective) as well as non-tangible (i.e. subjective) attributes (Rao, 2007). Fourth, this problem has qualitative criteria and assigning weights to qualitative criteria can vary extremely from one decision maker to another. Saaty (1977) suggested transformation of qualitative data into quantitative on a numerical scale (0-9). This scale is used in AHP. `1'indicates equal importance or preference and '9' indicates extreme importance or preference.

Fifth, AHP is a simple and powerful tool (Forman & Gass, 2001) and it is one of the most widely used MCDM tools (Vaidya & Kumar, 2006) by decision makers and researchers.

The suitability of AHP as a group decision making tool of multi criterion decision making is further endorsed by another research (Peniwati, 2007). She compares 18 group decision making methods on 16 evaluation criterion, in her study. AHP ranks 'Very High' on 7 criteria, 'High' on 8 criteria and medium on 1 criterion and emerges as best rated group decision making alternative. This study ranks AHP either 'High' or 'Very High' on the criteria- faithfulness of judgments, breadth and depth of analysis (what-if), prioritizing group members, applicability to intangibles, psycho-physical applicability, consideration of other actors and stakeholders, scientific and mathematical generality and validity of outcome(Peniwati, 2007). AHP emerges as a natural choice for multi-criteria group decision making problems such as this and high ranking on the above mentioned criteria makes it even more attractive choice for stakeholder prioritization. AHP has been successfully used and recommended for use by many scholars successfully in similar studies (Palamides & Gray, 1993; Brice & Wegner, 1989; Hosseini & Brenner, 1992; Singh & Mukherjee, 2021).

4.3.2 AHP Software

There are several commercial software packages available for AHP such as Expert Choice, Super Decisions etc. (Baby, 2013). The Super Decisions software was used for development of the model, pair-wise comparisons and final calculations, in this study. First, the structure of the model was created using the drag and drop tools, thereafter, pair-wise comparisons were done for each node above the last layer of hierarchy and inconsistency check was done for each such node. The acceptable limit for inconsistency is 0.10; hence value of inconsistency should always be less than this. The last step was to check sensitivity of each node of the model.

4.4 The AHP Model

A defence production project is selected for prioritization by using AHP. A set of 9 stakeholders are identified for prioritization. The stakeholder names are confidential in nature and hence cannot be revealed. But the names of the stakeholder are not critical for application of the method and subsequent analysis for this research. The stakeholders are coded as S1, S2, and S3…….S9.

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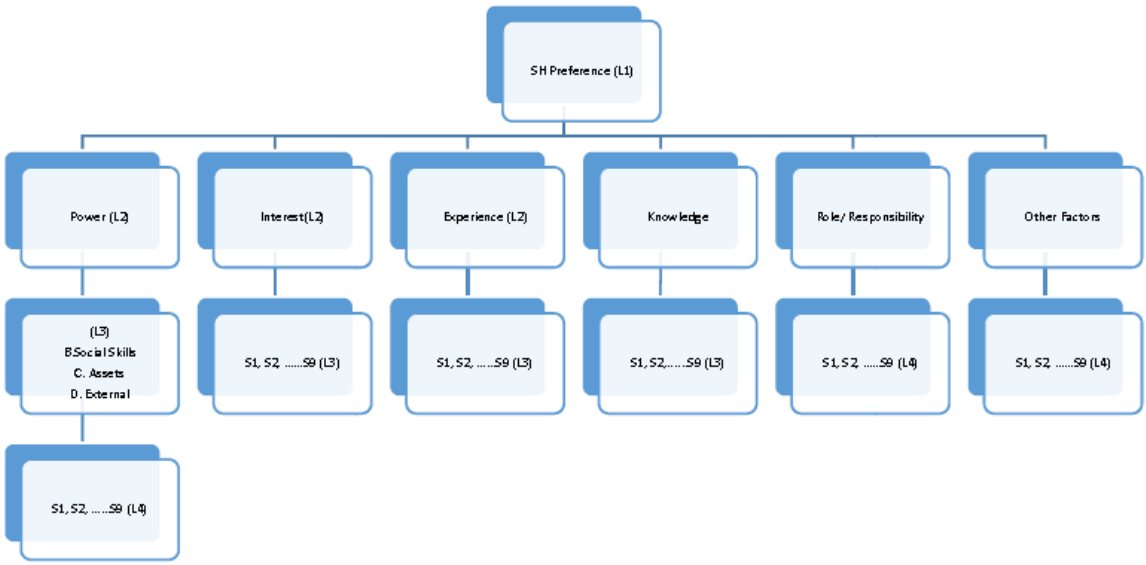
The conceptualized AHP structure is shown in Fig. 1. The top layer is Stakeholder preference also called the goal of the model. Stakeholder attributes - power, Interest, Experience, Knowledge, Role/ Responsibility and Other Factors are in the next layer. The stakeholders S1- S9 are in the third layer, except for the attribute Power, where there is an additional layer to assess Power. This layer consists of factors social skills, assets and external. These factors are explained in section 2.1.

4.5 Pairwise Comarisons and consistancy check

There are several methods of pair wise comparison of alternatives (Matrix, Direct Questionnaire etc.) in the super decisions software. Any of the methods can be chosen to compare the aternatives, direct questinaire method was chosen in this case. The comparison was done for each level of hierarchy.

The comparisons can be done by individuals or a group. If the decision has to be taken by a group, the individual preferences of the members of the group can be combined to know the group preference. However, in such cases, the geometric mean, not the frequently used arithmetic mean, of the individual preferences should be taken. If the individuals are experts and do not want to combine their judgements, in that case the geometric mean of the final outcomes should be taken (Saaty, 2008). In the case of this study, the project manager had a team of 5 managers assisting him in the project management work. The primary work areas of each of these team members were – Design and Engineering, Purchase, Production, Customer Co-ordination and Communication.

Fig.1 The AHP structure for Stakeholder Prioritization



The project manager and his management team (a total of six persons) agreed to do the pairwise comparison in accordance with the Table 1, and then combine it by taking the geometric mean before giving it to the researchers. The values received from project management team were rounded to the nearest preference value in table 1 and entered in the pairwise comparison matrix. The next step was to test these judgements of pairwise comparison for inconsistancies. The preferences are conversion of the subjective preferences of individuals into numerals.

Table 1. Preference sheet for pairwise comparison

Compared to the second alternative, the first alternative is	Rating
extremely preferred	9
very strongly preferred	7
strongly preferred	5
moderately preferred	3
equally preferred	1

It is not possible to avoid inconsistencies all together in the comparison matrix. Saaty (2012) has shown that a consistency ratio (CR) of 0.10 or less is acceptable to continue the AHP analysis. Consistency Ratio (CR) is calculated by comparing the Consistency Index (CI) of the matrix in question (the one with our judgments) versus the consistency index of a random-like matrix (RI). In other words, the consistency ratio is defined as CR; where CR = CI/RI. A random matrix is one where the judgments have been entered randomly and therefore it is expected to be highly inconsistent. More specifically, RI is the average CI of 500 randomly filled in matrices.

All nodes except the nodes at the bottom of the hierarchy should be tested for inconsistancy. The inconsistancies were tested accordingly and found to be less than 0.10 for all the nodes.

5. Results and Discussion

5.1 Findings of the Survey

The first question in the survey was what the participants find most difficult at work. 60.2 % of the respondents find managing different persons and groups associated with their work or in other words stakeholders most difficult, 19.4% found clarity about their work most difficult, 14.6% found meeting the deadlines most difficult and only 5.8% found working within the allocated budget most difficult. Among the participants of the survey, 44.7% strongly agree and 35.9% agree that managing stakeholders is most critical part of managing projects. Managing stakeholders is more

critical than managing cost, quality and schedule for 52.4%. And 54.4% think that stakeholder management is underemphasized in project management. 69.9% think that projects fail due to inappropriate management of stakeholders. It was also found that majority of the participants face situations where they have to handle two or more stakeholders simultaneously whereas they have time and resources barely enough for one. It was also found that most of the managers rely on their gut feeling or intuition while giving one stakeholder priority over the other. An overwhelming majority of 85.6% either strongly agrees or agrees that a method to prioritize stakeholders will add a great value in the overall project management process. This answers the RQ1 i.e. "is there a need to prioritize the stakeholders of the projects?" unambiguously in affirmative.

Hujainah et al. (2018) suggest a comprehensive list of attributes. The usage frequency against each attribute refers to the number of times it is used in quantifying and prioritizing the stakeholders: "influence or power (85%); interest (70%); role responsibility (job scope), knowledge, and experience (60% each); skills, legitimacy, training, skills, and educational background (30% each); and urgency, personality, managerial abilities, objectivity, risk, environment, and instability (15% each)". The more frequently used attributes are taken as the most important one as the frequency of use indicates preference of an attribute over the other. This preference of the attributes is measured through the survey also. These attributes were included in the survey questionnaire also, and participants were asked to select the attributes, which they thought were most critical for prioritization of stakeholders. And based on the input given by the project managers in the informal interview, the attribute 'Gap between Current and Desired levels of Stakeholder Engagement" was also included in the list. The participants could select any number of attributes from the list. The result of the survey is given in the Fig. 2.

The primary purpose of this survey was to validate the findings of a previous research (Hujainah et al., 2018) about the importance of critical stakeholder attributes in the context of projects of this company. The most critical five attributes from the study of Hujainah et al. (2018) (Power, Interest, Experience, Knowledge and Role/ Responsibility) are also most critical five attributes identified by the survey. The survey reinforces the importance of these five attributes and these are included in the prioritization framework.

5.2 Sensitivity Analysis

The result of running the model is priority vector of alternatives in raw and normalized forms. Ranking or order of priority is also generated. The results shown in Fig. 2 were discussed with the project management team. The team was also asked to prepare ranking of the stakeholders by discussing it in the team before telling them the result of the AHP model. They confirmed that there was consensus on stakeholders-1

and stakeholder-6 being 1 and 2 in ranking respectively. There was a member of the team who didn't agree on according rank 3 to stakeholder-5. The team was fully divided on the ranking of other stakeholders.

The overall priorities will depend on the weights given to the criteria. A "what-if" analysis shall be done to see how the results will change with the change in the weights of the criteria. This is called sensitivity analysis and is final step of AHP methodology. Sensitivity analysis is done to understand the robustness of our original decision and the drivers, which influence the original results. This is an important part of AHP and, in general, final decision should be made only after performing sensitivity analysis (Mu & Pereyra-Rojas, 2017) .

There are a number of matrices and graph options available for sensitivity analysis and stability of the model can be evaluated using these options. The node sensitivity was closely examined for all the nodes. It was found that this model is stable for the changing weights of nodes Experience, Interest, Knowledge and other factors. There is change in weitage of Stakeholder priorities with change in weightages of Power and Role/ Responsibility and it is leading to rank reversal also. The External and Social nodes linked to Power are stable. Instability in Power node is due to Assets node. So it can be said that this model will give correct priority vector of the Stakeholders as long as the weitages of Asset and Role/ Responsibilities remain constant.

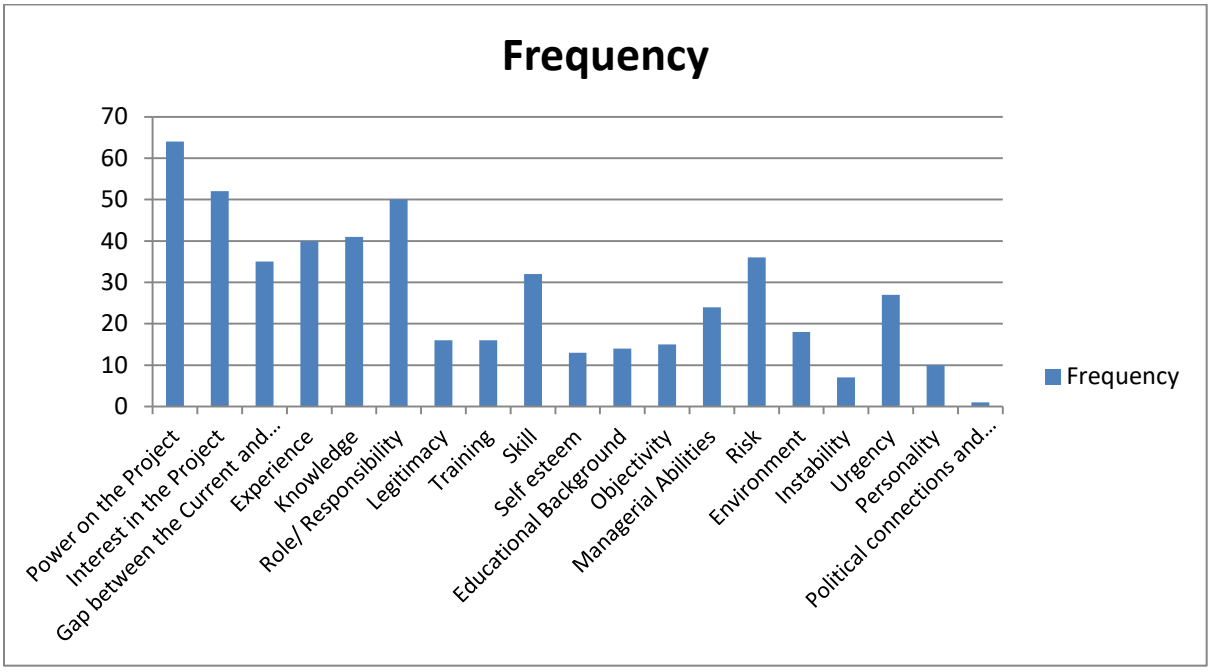


Fig. 2 Stakeholder attributes: Result of the survey

6. Practical Implications

This paper contributes to the practice of management in two ways. First, it provides a method for prioritization of project stakeholders. This method is based on inputs from both literature and practice. It also has advantage of being directly usable by the practicing managers. And second, this paper also recommends how the priority of the stakeholder can be used in the project management process, so as to deal with situations of conflicting or competing requirements from the stakeholders. To the best of author's knowledge, this paper is first to propose strategic dissemination of assessed stakeholder priority information among the project team members, to deal with their competing demands.

As, discussed in section 2, it is very unlikely that any one member in the project team will have as much knowledge about all aspects of all the stakeholders as the entire team combined together. Hence, the systematic group decision method presented in this paper will be more appropriate (Curseu et al., 2013; Cooper and Kagel, 2005) for deciding priority of stakeholders, so as to be able to effectively manage their competing demands.

This paper also highlights the place of the priority thus obtained, in the project management process. The process of generating the priority and distribution of this information to the concerned team members is pictorially depicted in Fig. 3.

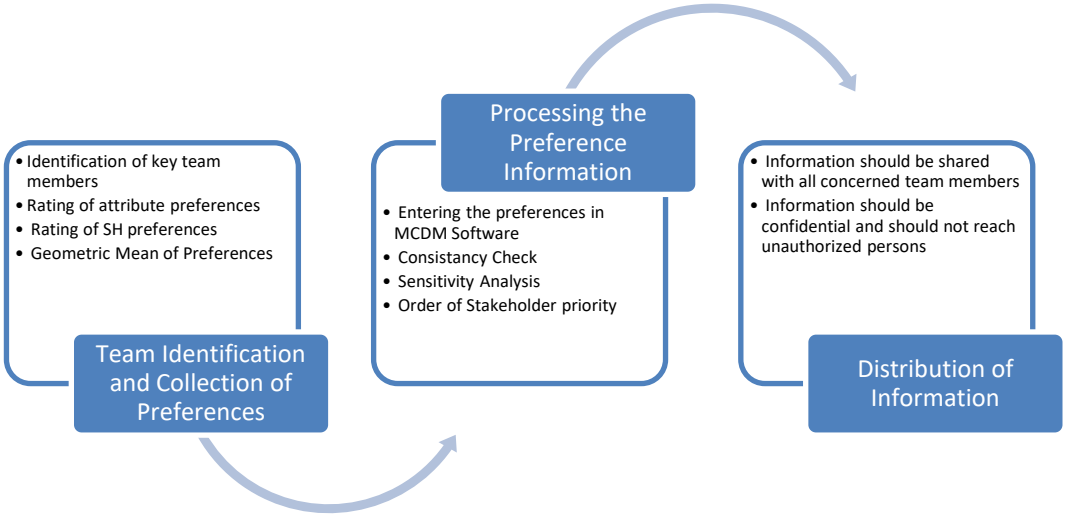


Fig. 3 Summary of proposed solution

The order of priority obtained through the proposed AHP model can be included in the stakeholder Register, which is a project document and contains the details related to the identified stakeholders including, but not limited to: Identification information- Name, organizational position, location, role in the project, contacts information; Assessment information- Major requirements, main expectations, potential influence in the project, phase in the life cycle with the most interest; and Stakeholder classification- Internal/external, supporter/neutral/resistor, etc. The estimated Order of Priority can be included as a column in the Stakeholder Register. The Stakeholder Register is a very important project document. It is used as an input or is updated as an output in the following Project Management Processes. The inclusion of order of priority in the stakeholder register will affect several project management processes. It will give more clarity to the project manager while handling the stakeholder issues. The project management processes, which make use of stakeholder register, will be positively affected by inclusion of order of priority. This information may be conveyed to the team members who are expected to handle multiple stakeholders, so that they can also respond to the stakeholders accordingly. It can save project team members from many difficult situations and ensure that the entire team is handling stakeholders in line with a coherent organizational policy. The method developed in this paper can be utilized by practicing managers using the standard AHP software packages.

7. Limitations and Conclusions

The model proposed in this paper has few limitations. The first limitation is that the numbers of stakeholder attributes in this model are limited to five identified attributes and one other attribute that the project manager thinks is appropriate in the context of his project. It is assumed that effect of ignored attributes on estimated priority will be very less. However, in highly complex project environments, even more number of attributes may be significant and hence the proposed model should be adapted accordingly for application to those projects. Second, the AHP becomes too much involved, when the stakeholders are more than ten in number, as it doesn't support paired comparison. The model can be modified in that case, to increase the number of levels so that maximum number of stakeholders in a group does not exceed ten. For example, another level can be added and the stakeholders may be divided as Internal and External. Third limitation is that the priority obtained through this method is static in nature, but as the project progresses new stakeholders come into prominence and the attributes of existing stakeholders also vary. This method doesn't address the dynamic nature of stakeholder priorities. In addition to the limitations of the method of prioritization, the identification of attributes to be used for prioritization was also done through a survey of limited size to validate findings of the previous studies. The projects are managed in variety of continuously changing settings and backgrounds, and hence new stakeholder attributes may emerge or existing attributes may rise or fall in importance.

This study establishes that there is a need for a method of Stakeholder Prioritization and proposes a model to accord order of priority to the stakeholders of projects. It provides a basic framework which can be used as it is, tailored or augmented in accordance with the requirements of the project manager. The future research may be directed towards extending and/ or validating this method in different industrial, geographical and cultural settings.

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