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Effect of Hybrid Annuity Model on Road Projects

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ABSTRACT: Indian road network is one of the biggest road network in world and need huge funding for maintaining and construction of recent project. And in India time and cost overrun on infrastructure project are quite common. BOT was one among most successful model from PPP type. But from last few years BOT model is lagging behind to achieve financial closure within budget. Most of the BOT project fails because of not generating minimum revenue. Recent modification of PPP is HAM (Hybrid Annuity Model). Hence to beat from this kind of difficulty government of India introduce the new PPP model called Hybrid Annuity Model (HAM) in 2016. This model was introduced to reduce the financial burden from the contractor. HAM model is a contractual arrangement made by government to overcome the limitations from BOT model. As per the case study The financial strategy of HAM model is different than BOT model. In HAM model 60% funding made by authority during construction phase and remaining 40% is on annuity basis. In this paper we carried case study of HAM project to identify the strength and limitation of HAM model and also to identify most influencing factor for success of HAM model by using Relatively Importance Index (RII) technique.

KEYWORDS: hybrid annuity model, relative important index, influencing factors.

I. INTRODUCTION

In 2016, government of India launched new PPP model that is hybrid annuity model (HAM) to minimize the financial burden from concessionaire and also to overcome the limitation of BOT toll model. Initially BOT model was one of the most popular model from PPP. BOT model was widely used in India for road projects and it was one of the simplest model which generate initial private funding. In BOT model all initial funding have to be done by concessionaire. But from last few year BOT model was lagging behind in earlier and on budget project completion. To overcome from such problem government of India develops the Model Concession Agreement and introduce the HAM model. New PPP model called Hybrid Annuity Model (HAM) to overcome the limitations of BOT model and to encourage the contractors to invest money in PPP project. HAM model is contractual arrangement made in such way that it covers all positive and overcome all negative points from BOT model. The major focus of HAM model is on the things that leading BOT model towards failure, like risk of revenue generation, financial viability of project etc. The major changes in HAM model is regarding funding for project where most of the BOT model fails. In HAM model government also invest 60% money during construction work and HAM model is having equal risk shearing strategy, the risks are allotted properly.

II. LITERATURE REVIEW

1. ANMOL TANEJA & DR. ROSY KALRA (APRIL 2019) – Roads in India could not be completed at that point because of certain problems such as the threat of financial availability, road hazards that had to be borne by the permit holder. All of those factors have led to delays within the completion of the road construction project. Hence so as to enhance the development industry, the government has introduced a hybrid annuity model that is more advanced than other existing models.
2. MAYUR GHAYAL & ROHIT SALGUDE (AUGUST 2019) : The HAM model is agreement between government and private player which is designed by the government to overcome restriction from the BOT model. The economical strategy of the HAM model is dissimilar from the BOT model. Also a structured representation of the HAM income model is formed using the Model Agreement.
3. SWAPNIL GARG (JAN 2019) : A new public-private partnership model, that is, a hybrid annuity model was announced in 2016, to revive investment in India's highway infrastructure and to deal with the strained relationship between public and private sectors. Recognizing that true performance testing is not possible in this first phase of HAM, the paper adopts more analytical approach to identifying potential pitfalls supported on the descriptive



features presented by project bidding and prize data. This study provides new insights and adjustments to studies on the role of government and other private players in the newly launched PPP model.

4. MITHUN K SAWANT, AMRUTA P. KULKARNI (2018) : The HAM financial framework was introduced to invigorate the road sector and reduce the financial burden of on distressed developers. As even HAM projects face some financial hurdles such as a absence of funding and aggressive bids, NHAI has initiated on a move to provide initial funding for integration and implementation. Government building financing under HAM projects makes up 60% of the total project cost and is paid by NHAI in five equal annuity and historic phases of 20% of project work, while a 40% balance is set by the private sector.
5. Kumar (2017) - Evolution is a continuous process and MCA is expected to develop further based on the experiences gained by the PPP stakeholders in the industry.
6. NIKHIL KUMAR, AKASH AGRAWAL - The Public Private Partnership has really been a strength for good in the development of national infrastructure in majority sectors but a huge portion of the shares are given to roads and highways development. Both of these models and similar models in the PPP play an insignificant role in the careful allocation of alarming productive resources within the construction work. With the appearance of the HAM model which is a mix of both BOT and EPC models, the financial burden is now allocated at 40:60 levels between the private and public groups respectively, which encourages more private parties to participate in new projects.
7. VISHVANDRA SINGH MANGESH MADURWAR (APRIL 2019) - India has launched on a rapid pace of highway development following a changing the policy in the mid-1990s that prioritized the progress of highways in India. The Public Private Partnerships model was adopted for the development of the highway in India, considering the internal benefits associated with it in addition to the standard models. In line with the policy decision, a large number of highway development contracts were awarded under the BOT version of the PPP model and other alternatives for the continuous development of the DBFOT policy models, finally now the NHAI has approved the HAM for high speed development.

III. PROPOSED METHODOLOGY

A. Data Collection - The first step is to collect the data to apply Relative Importance index technique to generate hierarchy of most important factor. For study data collection was done from government office.

B. Generating income flow Model - Financial model is generated by using Model Concession Agreement and contract document. Schematic representation of cash flow for HAM project is generated

C. Identification of most important factor from RII - technique is applied on feedback taken from 30 respondent like government officials, contractors and consultant. The RII gives most influencing factor for successful implementation of Hybrid Annuity Model.

D. Classification of Risk - Risk from Hybrid annuity model is identified from contract document and allocation of those risk according to client and contractor. To identify equal risk shearing attribute.

E. Result and Discussion - Finally the result generated of RII technique and most important factor for success and most influencing factor for failure from Hybrid Annuity Model is identified. This study helps to successful implementation of HAM model for success of PPP road project.

IV. PROPOSED ALGORITHM

A. Relative Importance Index:

The RII is the mathematical toll which is use to analyse the qualitative data. The feedback is taken from respondent to find out various influencing factor and its influence and impact. The questions was designed so that respondents can give the rank to the question based on their experience and knowledge. For analysis the quality of work from RII technique a questionnaire have to prepare which gives answer of questions on one to five scale. Based on response from respondent the answer is collected in the form of rating. After that the RII technique is applied on that respond to find the most influencing success and failure factor from contract of HAM.

Formula use to find relative important index

$$RII = \Sigma W / (A * N)$$

$$RII = \Sigma W / (A * N)$$



Where,

W= Weightage given by the respondent to every factor

A= Highest Weightage

N= Total number of respondent

TABLE NO 1. RII RARING SCALE

Sr.no.	interpretation	rank
1	Disagree	1
2	Cannot Say	2
3	Moderately Agree	3
4	Agreed	4
5	Strongly Agreed	5

shows the RII ranking and its interpretation. Rank one means disagree on the question asked in questionnaire and rank five means strongly agree with the statement made in questionnaire.

Table no 2 list of factors to achieve the success of HAM model

Sr no	Important factors for success of HAM
1	Maintenance of road
2	Quality of maintenance
3	Penalty for delay in site procurement
4	Penalty for delay in project
5	Monthly progress report
6	Involvement of independent engineer
7	Providing 60% initial cost
8	Revenue generation policy
9	Bonus on early completion
10	Compensation for change in law
11	Interest rate on annuity payment

Table no 2 shows most important factor for successful implementation of Hybrid Annuity Model. This factors are identified from the conducting personal interview. The respondent are government officials, contractor and consultants. And person having adequate experience from field of road construction. From the response of respondent eleven most important factor which may concern to successful implementation of HAM model are identified. In this high value of RII shows the more important factors for success of HAM.



Table no 3 shows the rating given by each respondent for each factor influencing for successful implementation of

Respo ndent no.	Mainte nance progra m	Quality of mainte nance	Penalty for site procure ment	Penalty for delay in complet ion	Monthl y progre ss report	Indepe ndent engine er	60%ini tail fundin g	Revenu e Generat ion Policy	Bonus on early completi on	Compens ation For change in law	Intrest rate on Annuity payment
1	4	5	2	5	5	4	5	4	5	3	3
2	4	4	2	2	4	3	4	3	5	2	5
3	5	5	2	4	4	3	4	4	5	5	3
4	5	5	3	5	4	4	4	2	5	2	4
5	4	4	5	3	4	4	4	4	5	3	5
6	4	3	4	2	4	4	4	5	5	3	3
7	4	4	3	4	4	5	4	3	5	3	3
8	3	5	2	2	3	3	4	3	5	4	4
9	5	4	3	2	4	4	4	2	5	2	5
10	4	4	2	3	4	3	4	4	5	2	5
11	3	4	2	5	5	5	4	3	5	2	5
12	4	4	2	4	5	4	4	4	3	3	3
13	4	5	2	5	3	3	4	4	4	3	3
14	3	3	4	5	3	3	3	3	5	3	3
15	5	4	4	5	3	3	4	3	5	4	3
16	3	5	5	3	3	2	4	3	5	4	3
17	3	5	5	2	4	2	5	3	5	2	2
18	5	4	2	1	5	4	4	5	4	1	4
19	4	3	3	2	3	4	5	4	3	2	5
20	3	5	4	2	4	4	4	3	4	4	4
21	5	4	4	3	5	3	4	5	4	3	3
22	5	4	3	5	5	4	4	5	3	2	4
23	5	4	3	4	5	4	5	5	4	4	4
24	4	4	4	2	5	4	5	3	5	4	4
25	3	5	5	3	5	3	5	4	5	4	3
26	5	5	3	3	5	5	4	5	5	3	2
27	4	5	3	3	3	3	4	3	4	2	3
28	3	3	4	2	4	4	4	3	4	2	4
29	5	4	4	2	5	4	5	4	4	1	3
30	4	3	4	1	3	3	5	4	4	4	4
avg weight age	122	126	94	98	123	109	127	118	135	91	108
sumati on	4.0	4.2	3.1	3.2	4.1	3.6	4.2	4.0	4.5	3.0	3.6
RII	0.81	0.84	0.62	0.62	0.82	0.72	0.84	0.78	0.90	0.75	0.72



HAM project.

Table no 3 shows the rating given by each respondent for each factor influencing for successful implementation of HAM project. Total 30 respondent given response for each factor from five point scale starting from Disagree to strongly agree. The RII technique is applied on above table to find out most important factor for success of HAM model.

$$RII = \Sigma W / (A * N)$$

Where,

Where:

W= Weightage given by the respondent to every factor

A= Highest Weightage

N= Total number of respondent

$$RII = \Sigma W / (A * N)$$

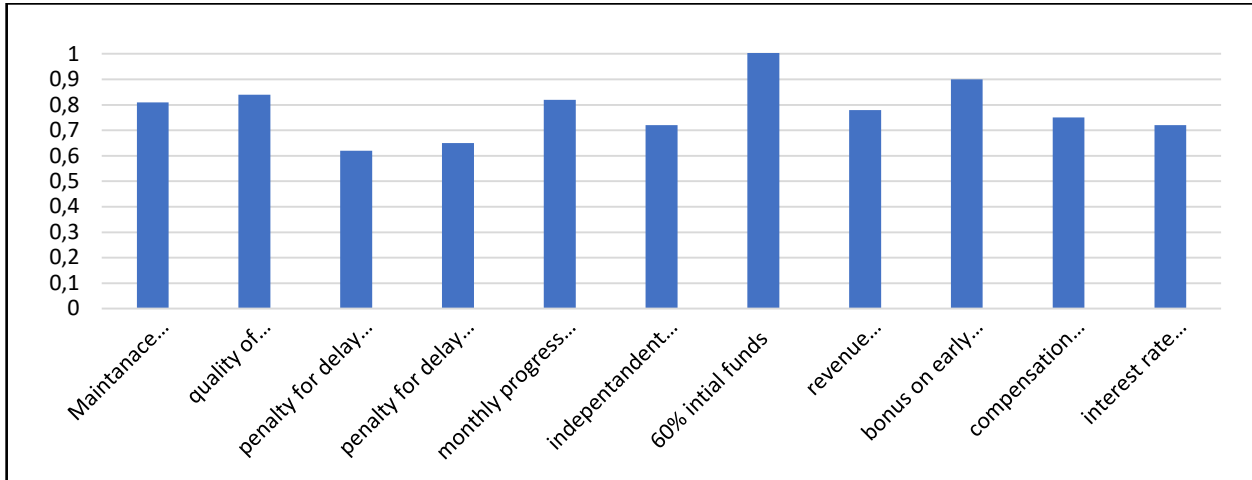
E.g. $RII = \Sigma 91 / (5 * 30)$

Hence, Similarly all calculation for above factor is done to find the importance of each factor then the RII for all eleven factor is identified to find the importance for each factor. Higher rating of RII indicates the more importance of that factor for successful implementation of HAM project.

Table 4 Important success Factor from RII

RII Rating	Success factors of HAM
0.90	Bonus on early completion
0.84	60% initial funding
0.84	Quality of maintenance
0.82	Monthly progress report
0.81	Maintenance programm
0.78	Revenue generation policy
0.75	Compensation for change in law
0.72	Involvement of independent engineer
0.72	Interest rate on annuity payment
0.65	Penalty for delay in project
0.62	Penalty for delay in site procurement

Table no 4 shows the hierarchy of RII rating for each factor leading towards success of HAM project. Higher the value of RII indicate more importance of that factor. As per RII most important factor for success is Bonus on early completion, 60% initial funding, revenue generation policy of HAM, and compensation for change in law. The following figure shows the RII rating vs. important factor for success of HAM project the graph clearly shows the influence of factor in success of HAM project. The graph given below shows the percentage contribution of each factor in success of HAM project

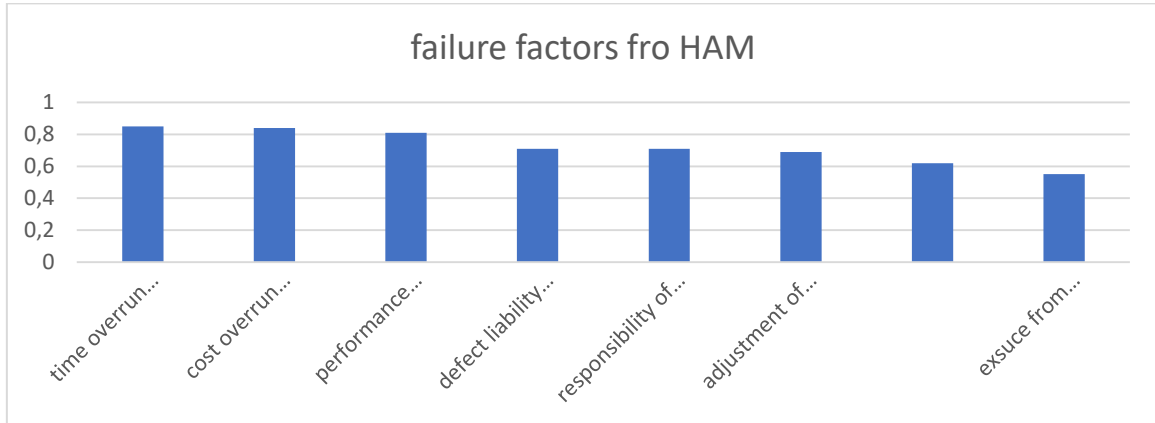


Performance of each success factor of HAM model

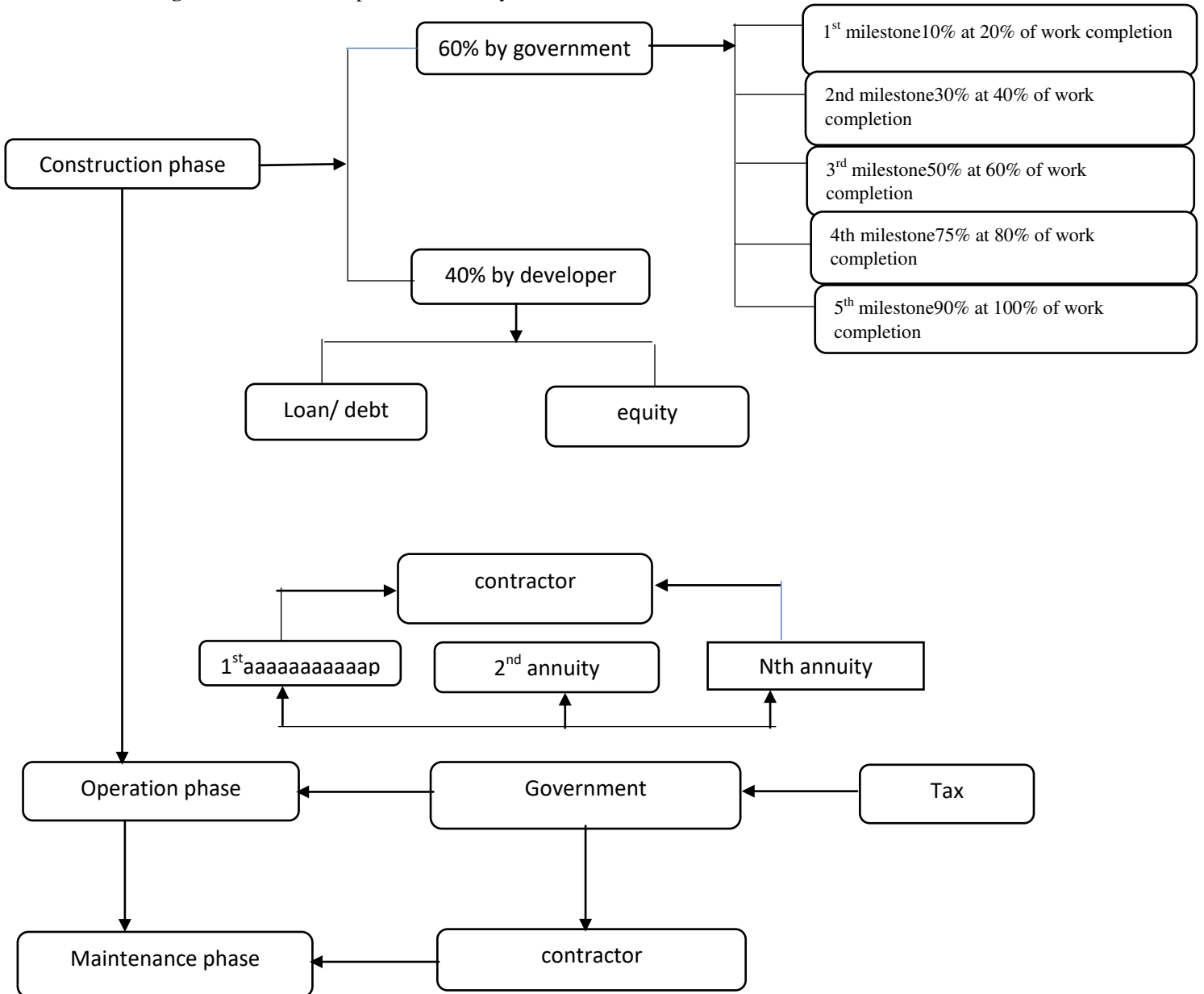
Table no. 5 most influencing failure factors from RII

RII Rating	Failure factors of BOT
0.85	Time overrun due to change in scope
0.84	Cost overrun due to change in scope
0.81	Performance security
0.71	Defect liability period
0.70	Responsibility of unknown risk
0.69	Adjustment of bid cost project
0.62	Modification of maintenance
0.55	Excuse from performance of obligation

Table no 5 is generated from the RII spread sheet which shows the hierarchy of most influencing factor for failure of HAM project. From which Time overrun due to change in scope, then Performance security, responsibility of unknown risk are most critical factor for failure of BOT project.



Generating income model: as per the case study





This income model of ham is prepared as per the case study of HAM project which is pandharkawda to zharjamni road which is located in yavatmal district by using model concession agreement, this financial model is generated. Which is divided in three phase build, operate and maintenance phase. During the construction phase authority will provide 60% initial funding project. Initial 60 is given by authority in five equal instalment of every 20% of work completion. And the 40% amount have to arrange by contractor either by debt or by equity.

V. RESULT AND DISCUSSION

Table no 5 – success factors of HAM

RII Rating	Success factors of HAM
0.90	Bonus on early completion
0.84	60% initial funding
0.84	Quality of maintenance
0.82	Monthly progress report
0.81	Maintenance programm
0.78	Revenue generation policy

This table shows the success factors of HAM as per RII Rating scale given by govt officials, contractors and consultant and the result is 60% initial funding and bonus on early project completion reduces financial burden from contractor because contractor only have to invest 40% during construction phase.

Table no. 6 most influencing failure factors from RII

RII Rating	Failure factors of BOT
0.85	Time overrun due to change in scope
0.84	Cost overrun due to change in scope
0.81	Performance security
0.71	Defect liability period
0.70	Responsibility of unknown risk
0.69	Adjustment of bid cost project
0.62	Modification of maintenance
0.55	Excuse from performance of obligation

This table shows the most influencing failure factors of HAM as per RII Rating scale given by govt officials, contractors and consultants. From this time and cost overrun due to change in scope are the most influencing failure factors of HAM projects and also performance security, responsibility of unknown risk affects the quality of work.

VI. CONCLUSION

The economical strategy is the biggest strength of HAM model. As the authority Investing 60% amount at initial stage will reduces the problem related to failure of project because of financial availability.

The disadvantage of HAM model are change of scope, this clause may lead the project to cost and time overrun this may cause delay and uncertainty in project work.

The HAM model is the solution over the problems associates in BOT model like revenue generation, financial availability, quality of maintenance is achieve.

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