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A Study on Factors Affecting Success of Independent Power Producers' Projects in Rwanda, A Case of Mudasomwa Pico Hydropower Plant

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Abstract: ***The study aimed at assessing the factors affecting success of independent power producers' projects in Rwanda. Its specific objectives were to analyze the effect of planning factors on success of Mudasomwa Pico Hydropower Plant; to analyze the effect of stakeholder involvement on success of Mudasomwa Pico Hydropower Plant and to assess the effect of operational risk management on success of Mudasomwa Pico Hydropower Plant. The study adopted a descriptive survey. The target population of the study equaled to 54 respondents. Since the target population of this study was quite small in number; the researcher preferred to adopt a census whereby all 54 targeted respondents were considered as the sample size. The primary data for this study were collected using questionnaires. Questionnaires were designed by the researcher and distributed to the respondents by the researcher herself. Before analyzing data; errors were first identified and eliminated as soon as possible in order to enable the researcher to cross-examine the relationship between the questions and the corresponding responses so as to ensure accuracy, consistency, and uniformity. Descriptive and inferential statistics were used to analyze data after being processed by Statistical Package for Social Science (SPSS). The study findings showed that 57.4% of all respondents agreed that during the planning process of Mudasomwa Pico Hydro Power Plant; the cost of activities have been well estimated, 63 % of all respondents agreed that that during the planning process of Mudasomwa Pico Hydro Power Plant activities have been well scheduled, 68.5% of all respondents agreed that during the planning process of Mudasomwa Pico Hydro Power Plant all needed resources have been identified, 79.6% of all respondents agreed that in Mudasomwa Pico Hydro Power Plant stakeholders are involved in project implementation, 16.7% of all respondents strongly agreed that in Mudasomwa Pico Hydro Power Plant stakeholders are involved in project implementation. The findings further revealed that 66.7% of all respondents agreed that in Mudasomwa Pico Hydro Power all stakeholders are involved in decision making, 20.4% of all respondents strongly agreed that in Mudasomwa Pico Hydro Power all stakeholders are involved in decision making. The researcher concluded a strong and significant relationship between planning factors and success of independent power producers' project in Rwanda, the researcher also concluded a significant relationship between stakeholder involvement factors and success of independent power producers' projects, lastly the researcher concluded a strong and significant relation between risk management factors and success of independent producers' project in Rwanda. The study recommends that the managers and funders of independent power producers' project should put much emphasis in planning so as to ensure that project costs are well estimated and the project scope is well defined, the researcher recommends the project management team to involve the stakeholders in needs identification so as to ensure that they are implementing the projects that are relevant to stakeholders especially beneficiaries, the researcher further recommends that all stakeholders should be involved in the project implementation so as to keep the project on track, on time, on budget and on scope and the project implementation team should always adopt serious measures to manage risks so that they become aware of all sources of risks that may hinder the project success.***

Keywords: Planning factors, Stakeholder involvement factors, Operational risk management, Success of independent power producers' projects

1. Introduction

Energy is a complex and diverse sector requiring prudent planning and significant capital investment. Currently in Rwanda around 85% of the overall primary energy consumption is based on biomass (Over 90% of all households using biomass for cooking), 11% on petroleum products (for transport, electricity generation and industrial use) and 4% on electricity. Rwanda's energy sector is complex given its systemic link and influence on the performance of almost all the sectors of the economy. The sector encompasses water resources, solar, methane gas, peat resources, geothermal, waste-to-energy and wind that still unexploited. It covers other sources of energy like biomass (biogas, bio-fuels and charcoal) and oil products (petroleum, kerosene, Liquefied Petroleum Gas and natural gas (MININFRA, 2013).The energy sector is strongly linked to other crucial economic sectors such as transport, manufacturing, agro processing and mining. The Government of Rwanda (GoR) aims at modernizing its economy and hence it will be paramount to supply sufficient, reliable and affordable supply of energy products to end users. The new Economic Development and Poverty Reduction Strategy (EDPRS II) defines the following target for the energy sector of increasing the electricity generation capacity by leveraging large-scale private sector investment. As the target is 100% access to electricity, national electrification plan has been elaborated to ensure that this target is reached in 7 years by 2024; (2017-2024), (MININFRA, 2014) . Public finance will be used to de-risk electricity generation projects for the private sector and thereby attract a wider range of investors on better terms (MINECOFIN,2013).

GoR gives high level support for private sector delivery, by strongly reducing corruption, ambitious plans for economic development and setting up a one-stop shop for private investors (at Rwanda Development Board (RDB) and the Energy Investment Unit (EIU) at former EWSA (currently split into two companies which are Rwanda Energy group Ltd (REG) and Water and Sanitation Corporation (WASAC). The latest Energy Sector Strategic Plan (2013-2017) confirms the need to encourage private sector participation in all phases of the project lifecycle, including

design, build, and finance, maintain and operate (MININFRA, 2013).

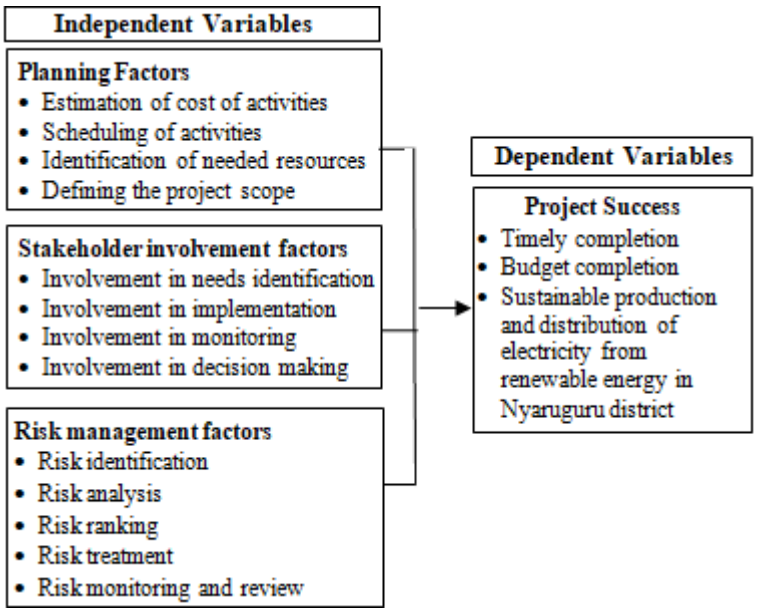
2. Statement of the Problem

In the last 30 years, investments in power generation were mainly executed by the government. However in the EDPRS II, a new strategy surged engaging the private sector labeled as IPP. The government's target is to increase the power generation to 556MW by 2024. To date,218MW and 46.4% Rwandan households have access to electricity, connected to the national grid (35.1%) or through off-grid systems (11.3%), (MININFRA, 2018). Given that IPPs' projects are expected to solve the problem of electricity shortage that the country is currently facing, and that the strategy to engage IPPs is recent, there are factors that affect them that needs to be taken into consideration targeting the success of energy projects. Hence the study intended to analyze the factors affecting success of independent power producers' projects in Rwanda by taking into consideration the case of Mudasomwa Pico hydropower plant. A case study was used for enriching data and findings and deepening understanding of these factors.

3. Objectives of the Study

The general objective of this study was to assess the factors affecting success of independent power producers' projects in Rwanda. Its specific objectives were to analyze the effect of planning factors on success of Mudasomwa Pico Hydropower Plant, to analyze the effect of stakeholder involvement on success of Mudasomwa Pico Hydropower Plant and to assess the effect of operational risk management on success of Mudasomwa Pico Hydropower Plant.

4. Conceptual Framework of the Study



5. Methodology

- **Research Design**: The study used descriptive research design.
- **Target Population**: The target population in this study equaled to 54 respondents from private investors in Rwanda who were in the categories of IPPs who have developed power plants in Rwanda and private investors who were in the construction phase of their power plants in Rwanda.
- **Sample size**: In this case the size of the population is not such big and census was used as sample design which means that all 54 elements in the population were part of the research.
- **Data Collection Instruments:** The quantitative data were collected using questionnaires and they were made of close ended questions.
- **Data Analysis:** The data for this study were analyzed quantitatively using percentages, frequencies and multiple linear regressions.

6. Research Findings

6.1 General respondents' information

The following subsection presents the biographical data of respondents involved in this study. Data presented are gender, highest level of education and position occupied in the project.

Table 1: Distribution of respondents by gender

Sex	Frequency	Percentage	Cumulative Percentage
Female	16	29.6	29.6
Male	38	70.4	100
Total	**54**	**100**	**100**

Source: Primary Data (2018)

The findings from the Table1 demonstrated that in 54 respondents 70.4% from them were male while 29.6% were female. As per the findings it is clear that the majority of respondents who were involved in this study were male.

Table 2: Distribution of respondents by highest level of education

Education		Frequency	Percentage	Cumulative Percentage
	Diploma (A2)	8	15	15
	Advanced diploma	12	22	37
	Bachelor's degree	23	42	79
	Master's degree	10	19	98
	Doctorate degree	1	2	100.0
	Total	**54**	**100.0**	

Source: Primary Data (2018)

The findings from the Table 2 demonstrated that the majority of the respondents which is to 42% completed bachelor's, 22% of all respondents degree completed advanced diploma, 19% of all respondents completed master's degree, 15% of all respondents completed diploma while only 2% of all respondents completed doctorate degree.

Table 3: Distribution of respondents by their responsibilities in the project

Position		Frequency	Percentage	Cumulative Percentage
	Member of client's project team	10	18	18
	Project Manager	2	4	22
	Engineer	7	13	35
	Procurement Officer	1	2	37
	Accountant	1	2	39
	Member of Owner's Engineer	4	7	46
	Member of Contractor's team	6	11	57
	Craft's man	9	17	74
	Geologist	14	26	100.0
	Total	**54**	**100.0**	

Source: Primary Data (2018)

The findings from Table 3 demonstrated that 26% of all respondents were geologists, 18% of all respondents were members of the client's project team, 17% of all respondents were craftsmen, 13% of all respondents were engineers, and 11% of all respondents were members of contractor's team while only 4% of all respondents involved in this study were project managers.

6.2 Analysis of the effect of planning factors onsuccess of Mudasomwa Pico Hydropower Plant

Table 4: Correlation between planning factors and success of Independent Power Producers Projects

Variables		Planning Factors	Project Success
Planning Factors	Pearson Correlation	1	.993**
	Sig. (2-tailed)		.000
	N	54	54
Project Success	Pearson Correlation	.993**	1
	Sig. (2-tailed)	.000	
	N	54	54

Source: Primary Data (2018)

The findings in Table4 revealed that, the results of correlation between planning factors and success of independent power producers' project was at 0. 993 meaning that planning factors affect success at the level of 99.3% which prove a strong and significant relationship between planning factors and success of independent power producers' projects. If the researcher considers the level of significance which is 0.05, there is therefore a significant relationship between them because their p-value (0.000) is statistically significant at 5% level of significance.

6.3 Analysis of the effect of stakeholder involvement on success of Mudasomwa Pico Hydropower Plant

Table 5: Correlation between stakeholders' involvement and success of independent power producers' projects

Variables		Stakeholders Involvement	Project Success
Stakeholders Involvement	Pearson Correlation	1	.993**
	Sig. (2-tailed)		.000
	N	54	54
Project Success	Pearson Correlation	.993**	1
	Sig. (2-tailed)	.000	
	N	**54**	**54**

Source: Primary Data (2018)

The findings in Table 5 revealed that the results of correlation between stakeholder involvement factors and success of independent producers' project was at 0. 993 mean that stakeholder involvement factors affect success of independent producers' project at the level of 99.3% which prove a significant relationship between stakeholder involvement factors and success of independent power producers' projects. If the researcher considers the level of significance which is 0.05, there is therefore a significant relationship between them because their p-value (0.000) is statistically significant at 5% level of significance.

6.4 Assessment of the effect of operational risk management on success of Mudasomwa Pico Hydropower Plant

Table 6: Correlation between operational risk management and success of Independent Power Producers' Projects

Variables		Operational risk management	Project success
Operational risk management	Pearson Correlation	1	.627**
	Sig. (2-tailed)		.000
	N	54	54
Project success	Pearson Correlation	.627**	1
	Sig. (2-tailed)	.000	
	N	54	54

Source: Primary Data (2018)

The findings in Table 6 revealed that the results of correlation between risk management factors and success of independent producers' project was at 0. 627 mean that risk management at the level of 62.7% which prove a significant relationship between the effect of operational risk management and success of independent power producers 'projects. If the researcher considers the level of significance which is 0.05, there is therefore a significant relationship between them because their p-value (0.000) is statistically significant at 5% level of significance

6.5 Success of Independent Power Producers' Projects

Table7: Descriptive Statistics on Success of Independent Power Producers' Project

Indicators	N	Minimum	Maximum	Mean	Std. Deviation
Planned time	54	1	5	2.43	1.597
Planned budget	54	1	4	1.93	1.147
Sustainable production and distribution of renewable energy in Nyaruguru district	53	1	5	3.94	1.336
Valid N (listwise)	53				

Source: Primary Data (2018)

From Table 7 the mean values for the first, second and the third statements are 2.43 and 1.93 are respectively rounded off to 2 (the code for strongly disagree) and 4 (the code for agree) on Pico Hydro Power Plant is being completed on planned time, planned budget and sustainably of production and distribution of electricity from renewable energy in Nyaruguru district. The standard deviation of all statements is above 0.5 meaning that respondents' answers on these statements were far different from the mean, in other words, their answers to the statement were heterogamous. This means that respondents' views on the above statements were varied.

6.6 Estimated parameters for Planning Factors, Stakeholders Involvement Factors and Risk Management Factors and success of Independent Power Producers' Projects

Table 8: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.993[a]	.986	.985	.139

Source: Primary Data (2018)

a. Predictors: (Constant), Planning factors, Stakeholders involvement factors and Risk management factors.

As from Table 8 An R^2 = 0.986, indicates that 98.6% of Planning factors, Stakeholders involvement factors and Risk management factors can be explained by the success of independent power producers' projects leaving only 1.4% of the variation in the dependent variable being explained by the error-term or other variables other in Mudasomwa Pico Hydropower Plant.

Table 9: ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
	Regression	68.743	3	22.914	1192.037	.000[b]
	Residual	.961	50	.019		
	Total	69.704	53			

Source: Primary Data (2018)

a. Predictors: (Constant), Planning factors, Stakeholders involvement factors and Risk management factors.
b. Dependent Variable: Power Producers' Projects

The Table 9 shows that predictors Planning factors, Stakeholders involvement factors and Risk management factors have effect on dependent variable which is success of independent of Independent Producers' Project. This is statistically significant with a p-value (.000).

Table 10: Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
	(Constant)	.020	.060		.332	.741
	Planning factors	.010	.016	.012	.591	.557
	Stakeholders involvement factors	.995	.022	1.001	44.654	.000
	Risk management factors	-.014	.023	-.016	-.607	.547

Source: Primary Data (2018)

a. Dependent Variable: Producers' project

The results indicate that Planning factors, Stakeholders involvement factors and Risk management factors have statistically significant effect on power producers' projects with a positive coefficient of determination of 0. 993 (Table 9) indicates that there is a strong positive correlation between Planning factors, Stakeholders involvement factors and Risk management factors with success of independent power producers' projects. The coefficients of independent variables (Planning Factors, Stakeholders Involvement Factors and Risk Management Factors) β_1, β_2 *and* β_3 are respectively 0.010; 0.995 and -0.014 with a statistically significant ($p = 0.00$). Therefore, the model equation derived is $y = 0.020 + 0.010x_1 + 0.995x_2 - 0.014x_2 +$ e.The positive coefficient further demonstrates that a 1% increase in the planning factors attributed to 0.010% improve performance of independent power producers' projects. The t-statistic value (0. 591) indicates the effect is statistically significant at 95% confidence level. An increase of 1% in stakeholder factors will increase success of independent power producers' project given by 0.995 % at a high t-statistic value (44.654) indicates the effect is statistically significant at 95% confidence level while a coefficient demonstrates that a 1% decrease on risk management of -0.014 on success of independent power producers' projects at t-statistic value (-0.607) indicates the confidence level of 95% the effect is statistically significant.

7. Conclusions and Recommendations

7.1 Conclusions

According to the interpretation of collected and analyzed data during the course of this study the researcher came up with the following conclusions:

1) As the results of correlation between planning factors and success of independent power producers' project was at 0. 993 meaning that planning factors affect success of independent power producers' project at the level of 99.3% which prove a strong and significant relationship between planning factors and success of success of independent power producers' projects. Therefore the researcher concluded a strong and significant relationship between planning factors and success of independent power producers' project in Rwanda.

2) Since the results of correlation between stakeholder involvement and success of independent producers' project was at 0.993 mean that stakeholder involvement factors affect success of independent producers' project at the level of 99.3%, the researcher therefore concluded a significant relationship between stakeholder involvement factors and success of independent power producers' projects.
3) The results of correlation between risk management factors and success of independent producers' project was at 0. 627 mean that risk management affect success of independent power producers' projects at the level of 62.7% which prove a significant relationship between the effect of operational risk management and success of independent power producers 'projects. Therefore the researcher concluded a strong and significant relation between risk management factors and success of independent producers' project in Rwanda.

7.2 Recommendations

1) The managers and funders of independent power producers' project should put much emphasis in planning so as to ensure that project costs are well estimated and the project scope is well defined.
2) The project management team should involve the stakeholders in needs identification so as to ensure that they are implementing the project that is relevant to stakeholders especially beneficiaries
3) All stakeholders should be involved in the project implementation so as to keep the project on track, on time, on budget and on scope. The project implementation team should always adopt serious measures to manage risks so that they become aware of all sources of risks that may hinder the project success.

7.3 Suggestions for further research

This research has been limited only on Mudasomwa Pico Hydro Power Plant in Rwanda therefore other similar studies may be done in other projects and locations to confirm or to contradict its findings.

References

[1] Abou J. (2010). *Risk Management in Construction Projects from Contractors and* Akintoye, A. (2007). *Risk Analysis and Management in construction*.
[2] Alen, J. (2014). Stakeholder analysis in projects: Challenges in using current guidelines in the real world. *2009*, 335–343.
[3] Amani, Q. (2017). *Risk assessment of International construction Projects using the analytic Network Process*. School of natural and applied sciences East Technical and Environmental Engineering. Chalmers University of Technology. Sweden Applications, 1-6, Damascus.
[4] Assudani, R. (2010). Managing stakeholders for project management success: an emergent model of stakeholders. *Journal of General Management*, 67-80.
[5] Baker, S et al (2009) *Risk response techniques employed currently for major projects*
[6] Bourne. (2015). *Project relationship management and the stakeholder circle.* Melbourne: RMIT University.
[7] Brian. (2008). Stakeholder Management in Construction. *Journal of Construction Management and Economics*, 55-59.
[8] Bryson, J. (2014). *What to do when Stakeholders matter.* Public Management Review .
[9] Chapman. (2008). Stakeholders and uncertainty management in project. *Construction Management and Economics,* , 26: 6, 563-577.
[10] Clark, R. (2010). *Risk Analysis in the Evaluation of Non-Aerospace projects*.International Construction Management & Economics, Vol. 17, No. 2,pp. 205-213.
[11] Doloi, H. (2011). Understanding stakeholders' perspective of cost estimation in project management. *International Journal of Project Management* , 622–636. .
[12] Drew. (2011). Stakeholder management in construction: An empirical study to address research gaps in previous studies. *International Journal of Project Managemen*, 29, 900-910.
[13] Elias, A. (2012). *Stakeholder analysis for R&D Project Management.* R&D Management.
[14] El-Swalhi.M. (2015). Factors affecting stakeholder management in construction projects in the Gaza Strip. *International Journal of Construction Management*, 157-169. Environmental Engineering.
[15] Eskerod.P. (2013). *Project stakeholder management concepts and Issues behind project stakeholder management.* Gower Publisher.
[16] Ewer, et al, (2008). *The Impact of Risk Management on IS Projects Success in Syria*,
[17] Friedman. (2012). Developing stakeholder theory. *Journal of Management Studies*, 1-1.
[18] Hietbrink, H. (2012). *Stakeholder Expectation and Satisfaction in Road Maintenance. Procedia-Social and Behavioral Sciences.*
[19] Hill. (2012). Stakeholder-agency theory. *Journal of Management Studies*, 131-154.
[20] Hillson, A, (2006). Integrated *Risk Management as a Framework for Organizational Success, Industry*:a survey, International Journal of Project Management, pp. 51-61. International Journal of engineering Science and Technology (IJEST).
[21] Isaac, I, (2005). *Training in Risk Management*, International Journal of Project Management 13
[22] Jepsen. (2009). Stakeholder analysis in projects: challenges in using current guidelines in the real world. *International Journal of Project Management* , 27, 335 – 345. Jouranl of Risk Management, 18-25. Journal of Project Management, 25 (6): 601–614.
[23] Karlsen, J. (2012). Project Stakeholder Management. *Engineering Management Journal*, 19-24.
[24] Karlsen. (2008). The role of trust in project-stakeholder relationships: a study of a construction project. *International Journal of Project Organisation and Management*, 1(1), 105-118.
[25] Kerzner. (2009). *Project Management: A systematic Approach to Project stakeholder management, Scheduling and controlling tenth Edition.* John Wiley & Sons, Inc.*knowledge:* PMBOK.3rd edition. Pennsylvania: Project Management Institute, Inc.

[26] Lyons, T et al (2014). *Project risk management in the Queensland engineering construction Management.*International Journal of Project Management,97-105.
[27] Mikaela R; (2011). *Risk management practices in a construction Project*. Department of Civil
[28] Mitchell, R. (2007). *Toward a theory of stakeholder identification and salience,defining the principle of who and what really counts* . Academy of Management Review.
[29] Mulcahy, R. (2003). *Risk Management - Tricks of the Trade for Project Managers*. USA: RMC *Network process*. School of Built environment. Liverpool, United Kingdom
[30] Newcombe. (2013). From client to project stakeholders: a stakeholder mapping approach. *Journal of Construction Management and Economics*, 21: 8, 841-848 of New South Wales.
[31] Olander, S. (2008). A comparative study of factors affecting the external stakeholder management process. *Construction Management and Economics*, 553-561.
[32] Olomolaiye, P. (2010). *Construction Stakeholder Management.* Oxford: Wiley-Blackwell. *Owners' Perspectives*, Master Thesis, Islamic University Of Gaza
[33] Patric et al, (2012).*Identifying Keys Risks in construction projects:Life Cycle and* PMI Global Congress Proceedings, Seattle Washington
[34] Prager, K. (2009). Stakeholder involvement in Agri Environmental policy making. *Journal of Environmental Management*, 1154- 1167.
[35] Project Management Institute, (2008). *A guide to the project management board of* Project Management, 4-32.Publications.
[36] MININFRA (2013). *Energy Sector Strategy plan 2013-2018*. Government of Rwanda.
[37] MININFRA *(2014). Energy Sector Strategy plan 2017-2024*. Government of Rwanda.
[38] MINECOFIN (2013). *Economic Development and Poverty Reduction Strategy II, 2013-2018*[leaflet] Government of Rwanda.
[39] REG Ltd (2014). *Energy Investment Process for unsolicited projects in Rwanda*
[40] Ropel, (2011). *An approach to risk quantification in construction projects using EMV analysis*.
[41] Simu, K., (2016). *Risk management in small construction projects.* Department of Civil and
[42] Skitmore, M. (2013). *Evaluating stakeholder satisfaction during public participation in major infrastructure and construction projects.* Automation in Construction.
[43] Smith, J. (2014). Stakeholder management during project inception: Strategic needs analysis. *Journal of Architectural Engineering*, 22 –33.
[44] *Stakeholder Perspectives: Sydney*: Faculty of Built Environment, University *Study From China*, International Journal Of Project Management 29(2): 209–219
[45] Sutterfield, S. (2016). *A Case Study Of Project And Stakeholder Management Failures: Lessons Learned.* The Project Management Institute Vol. 37, No. 5, 26-35, ISSN 8756-9728/03.
[46] Takim, R. (2009). *The management of stakeholders' needs and expectations in the development of construction project in Malaysia.*
[47] Taylor, H. (2006). *Risk management and problem resolution strategies for IT projects:*
[48] Tinnirello. (2005). *Best Practices in Risk Management*. USA:Auerbach: Project Management University.
[49] Walker. (2006). sing a visualizing tool to study stakeholder influence – two Australian examples. *The Project Management Journal*, 37 (1), 5–21.
[50] Wang et al, (2011). *Factors Affecting Contractors' Risk Attitudes in Construction Projects: Case*
[51] Yang, J. (2015). Stakeholder management studies in mega construction projects: A review and future directions. *International Journal of Project Management* , 446–457.
[52] Zhen Chen, (2009). *Risks assessment in Real Estate Development: an application of Analytic*
[53] Zolin. (2012). *Project managers' understanding of stakeholders' satisfaction. Project Perspective.*
[54] Zou et al (2013). *Understanding the Key Risks in Construction Projects In China*, International Journl of Research.