FRAMEWORK OF EFFECTIVE STAKEHOLDER MANAGEMENT USING CRITICAL SUCCESS FACTORS TO IMPROVE PROJECT PERFORMANCE IN CONSTRUCTION: CAUSAL LOOP DIAGRAM APPROACH

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Certified that final copy of MS thesis written by Aakif Saeed Iqbal (Registration No. NUST2016MSCE&M0800000172648), of National Institute of Transportation (NIT) – SCEE has been vetted by undersigned, found complete in all respects as per NUST Statutes / Regulations, is free of plagiarism, errors, and mistakes and is accepted as partial fulfillment for award of MS/MPhil degree. It is further certified that necessary amendments as pointed out by GEC members of the scholar have also been incorporated in the said thesis.

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ABSTRACT

Stakeholder management plays an important role in the successful implementation of construction projects. There is an increasing number of studies and realization for the significance of stakeholder management in construction projects. The poor record of construction projects due to its complex nature has led to little or no development of this important aspect of construction management process. Even though stakeholder management research has been done but it has been limited to identification of factors and strategic formulation and management aspect of project management body. The understanding of critical success factors and their relationships has not been achieved specifically for the under developed construction industry of the developing countries and economies. This research focuses to cover this gap to determine the critical success factors required for effective stakeholder management in developing countries and development of framework using causal loop diagrams. A total of 51 success factors are shortlisted by virtue of a thorough literature review which were shortlisted to 18 critical success factors after conducting of preliminary survey with construction management professionals. The 18 critical success factors were used to develop Causal loop Diagram and feedback loops after floating of the main survey to the construction practitioners. 3 reinforcing causal loops and 2 balancing causal loops were developed and analyzed to understand qualitative causal relationships between the critical success factors of effective stakeholder management. The causal feedback loops serve as graphical guide for industry professionals to understand and develop stakeholder management practices in construction projects being undertaken in the developing countries.

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LIST OF ABBREVIATIONS

Critical Success Factors	CSF
Success Factor	SF
Analysis of Variance	ANOVA
Causal Loop Diagram	CLD

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Chapter-1

INTRODUCTION

1.1 Background

Stakeholder management has important part in the successful implementation of projects in the construction industry (Newcombe, 2003); (Olander & Landin, 2005). There are many academic studies which support the significance of need for stakeholder management in the infrastructure and development projects (El-Gohary, Osman, & El-Diraby, 2006). However due to complexity of construction projects there is poor record of stakeholder management. Operational knowledge of stakeholder management practice is found in literature, software packages, and current practice (R. J. Yang & Shen, 2015). Problems faced during stakeholder management are result of inadequate stakeholder engagement, unclear objectives of stakeholder management, improper identification of stakeholders and communication with stakeholders (Lynda Bourne, 2008). Importantly, there has been remarkable progress and development of stakeholders management practices and processes in the line and manufacturing industry but there is still need for improvement and development of stakeholder management processes in the construction industry (Loosemore, 2006) due to lack of systematic framework for effective stakeholder management (Karlsen, 2002).

Different critical success factors have been identified by researchers to competitively better manage project stakeholders. CSFs are viewed as those parameters that are critical and are required to be addressed for effective management of stakeholders as also used by several researchers (Hunter, 2006), (Albert P. C. Chan, 2001). This approach was first developed by Rockart in 1979 (Rockart, 1979). The research aims to identify CSFs and present groupings and relative importance of these factors for the successful stakeholder engagement. This approach presents the management professionals to comprehend the logical processes to address the critical success factors to ensure stakeholder management in an effective procedure. Many problems for stakeholder management are presented by researchers including inadequate engagement of stakeholders, unclear project objectives, stakeholder identification and inadequate communication with project stakeholder (Lynda Bourne, 2006), (Rowlinson & Cheung, 2008). In order to identify essentials for project stakeholder management, critical success factors (CSF) approach is used for this study. Extensive literature review is conducted to identify CSFs and questionnaire surveys are carried to obtain ranking and data from the

construction industry professionals. The groupings and interrelationship of these factors and their relationship with effective stakeholder management is established using the system dynamic model. Flexibility management in stakeholder management is incorporated for improving decision making process for project managers.

1.2 Level of Research Already Carried Out on the Proposed Topic

Different studies and research have been carried out to address the subject matter of effectively managing stakeholders in construction management. Numerous studies have adopted different methodologies and analysis techniques to address the vital stakeholder management knowledge area for effective project management. Some of the researches as mentioned are outlined below:

A framework depicting importance and underlying relationship of CSFs for stakeholder management was developed for Hong Kong projects (Yang Jing 2010). 15 CSFs were identified and 183 sample size questionnaire survey was conducted to obtain input from project managers in Hong Kong. Factor analysis was used to determine five groupings namely precondition factor, stakeholder estimation, information inputs, decision making and sustainable support. The groupings along with their relationship were included in the framework for effectively managing stakeholders. The findings of the study were not completely relevant due to bias understanding of questionnaire statements by respondents but the framework was not validated by case studies.

Furthermore, a study was conducted to determine critical success factors for large scale construction project in Thailand (S. u. R. Toor & Ogunlana, 2009). 76 questionnaires and 35 interviews conducted at single construction project revealed that project planning and control, project personnel, and involvement of client were critical success factors for success of large scale projects. Generic success of project rather than successful stakeholder management was catered for in the study. Project specific study captured the perception of construction professionals of that project and could not be adopted for all construction projects.

Another study for the developed relationships between the factors that contribute to successful project delivery was carried to provide important understanding for success of future projects. Questionnaires and interviews were conducted from construction professionals of large scale construction project of Thailand and factor analysis was carried out to develop groupings and

relationships among the success factors (S.-u.-R. Toor & Ogunlana, 2008). The analysis resulted in four critical factor groupings of project success and were labeled as comprehension, competence, commitment, and communication. Project success factors were included in the study and the grouping and framework depicted views from professionals of single large scale construction project. The findings were not validated for other projects of similar nature to remove any bias in the research.

Similarly a study was carried out in which conceptual structured equation model was developed for the identified 23 CSFs for effectively managing stakeholders of construction projects after extensive literature review (Molwus, Erdogan, & Ogunlana, 2017). Questionnaire survey data was used for SEM analysis to develop best fitting model with 16 CSFs. The study was carried out in UK and hence portrays UK construction professionals' opinion.

Success factors for large projects of Vietnam were analyzed in another research (Duy Nguyen, Ogunlana, & Thi Xuan Lan, 2004). The twenty success factors were grouped into four categories of comfort, competence, commitment and communication through factor analysis. It was used as guideline to manage construction projects in Vietnam and other emerging economies of Asia in successful manner.

Stakeholder management performance attributes were extracted through extensive review of available literature (Oppong, Chan, & Dansoh, 2017). Nineteen stakeholder management performance objectives, twenty five success factors and twenty two performance indicators were identified to measure project success and evaluate stakeholder and organizational satisfaction in the construction industry.

1.3 Reason/Justification for Selection of Topic

Following are the reasons for selection of this topic:

1- Construction projects face difficulties in successful completion due to improper stakeholder management practices and lack of any established practical framework.
2- Construction project activities are constrained by time and resources, hence successful stakeholder management is essential to prevent any delay and misuse of resources.

3- Projects are diverse in nature and are immensely influenced by limited budget, schedule, quality standards, complex interrelated activities, technical and managerial expertise, competence of contractors and diverse objectives of different stakeholders. Hence, effective stakeholder management is critical for success delivery of a project.
4- There is a lack of research that identifies critical success factors and proposes framework for stakeholder management for developing countries.
5- Most studies and researches are based on developed countries and focus on only specific project.
6- To include opinion and views of construction professionals for effective stakeholder management, working in developing counties such as Pakistan.
7- To develop a practical framework for effective stakeholder management using CSFs that can serve as a guideline or framework for the construction management professionals to implement effective stakeholder management practices and processes in their managed construction projects.

1.4 Objectives

The objectives of this research are:

a) To identify critical success factors for successful stakeholder management from literature and industry.
b) To determine interconnectivity among critical success factors for effective stakeholder management using Causal Loop Diagrams (CLDs).
c) To develop a framework for effective stakeholder management using CLDs.

1.5 Relevance to National Needs

Construction projects in developing countries like Pakistan are prone to multiple challenges in effectively managing project stakeholders to achieve project success. Due to lack of any formulated framework or tool for effectively managing project stakeholders, difficulties arise that hinder smooth execution of project and its success. Projects get delayed, costs overrun, quality compromised, resources wasted etc. due to ineffective project stakeholders coordination and communication.

Many mega projects are being developed in countries like Pakistan which involve multiple stakeholders during the project lifecycle. Construction of Zero Point interchange in Islamabad faced huge variation in cost and delays in funding. The project of New Islamabad International Airport also faced several reasons related to project stakeholder management (Ejaz N, 2013). Delays and cost overrun risks in bridge projects of Pakistan are highly associated to fund delays, poor site management and supervision, inadequate planning and ineffective stakeholder coordination and communication (Choudhry, Aslam, Hinze, & Arain, 2014).

However, challenges and management problems in the construction industry are faced due to lack of any systematic framework and model to effectively manage project stakeholders based on the local construction industry parameters, inputs and practices. This would assist local construction professionals by providing guidelines to effectively manage project stakeholders for any project.

1.6 Advantages

1- Framework and system model for stakeholder management for developing countries like Pakistan will be available.
2- Critical success factors for stakeholder management in construction projects for developing countries will be identified and incorporated in the model and framework.
3- Assisting construction professionals in decision making process by providing guidelines to effectively manage stakeholders in complex construction projects.

1.7 Areas of Application:

1- Project planning and Decision making process
2- Stakeholders coordination and management
3- Project management and effectiveness

Chapter-2

LITERATURE REVIEW

2.1 Introduction

This chapter presents summary of various past studies, stakeholder management importance & use of success factors to develop framework to be used in the construction industry. It discusses different streams adopted by researchers in published literature to effectively manage construction stakeholders. The concept of factor relationships using causal loops is also discussed in this chapter. Significance of stakeholder management in construction projects of developing countries is also included in this section.

2.2 Stakeholders

There are multiple and different definitions of stakeholders. Juliano in 1995 defined the stakeholders as simply the individuals, groups, teams, organizations and coalitions that are affected and influenced by the project.

Stakeholders have also been defined in the PMBOK Guide originally published in 1996. The stakeholders have been described as the individuals and organizations which have active involvement in the project or are directly related to a project. Stakeholders have also been defined to have a positive or negative affect due to the outcomes of project decisions and project completion. The significance and importance of stakeholders has also been stressed on in the Guide to the Project Management Body of Knowledge (PMBOK guide) published in 2013. It is also pertinent to observe that the stakeholder has been included as a new, separate and distinct knowledge area in the new PMBOK Guide. Previously it was not given separate area of knowledge but made part of the existing communication knowledge area.

The projects can be made more complex and complicated by increasing the number of stakeholders as this increases the communication channels and complexes the influences and relations between various stakeholders. The different stakeholders that are involved or part of a project may have different interests in achieving project goals and objectives. As a result of different interests of the stakeholders, the stakeholder priorities and needs may alter

accordingly along with the coalitions formed between the stakeholders to obtain the planned goals and objectives of the project. Furthermore, different trials have been made to differentiate between the different stakeholder types based on either their relation with the project such as being internal or external stakeholders, or their relevance to project such as being primary or secondary stakeholders (McGrath & Whitty, 2017).

Similarly, the literature also makes distinction and classification of stakeholders by which they can also be categorized according to stakeholders role in the project in diverse roles of client, contractor, users, sponsors, sub-contractors, local community members, Non-governmental organizations, print and digital media, pressure groups/ lobbying organizations, financial institutions, government agencies and litigation organizations (Cova & Salle, 2005).

As described earlier, the stakeholders can be classified broadly as both internal and external. The internal stakeholders involves those individuals and groups whose interests in a company or project comes through a direct relationship with that project or company. This direct relationship can be a result of employment of the stakeholder for that project, ownership of those particular stakeholders or investment interests shared by the stakeholder. On the contrary, the external stakeholders includes those individuals and groups which do not have direct relationship with the project's interests. These stakeholders are not directly employed or work with the company or the project but have influence and affect in some manner either by the actions, procedures or the outcomes of the decision making process within the project life cycle. Stakeholders such as material and services suppliers, financial creditors and public groups are all categorized under the external stakeholders.

Another approach that is popularly used to categorize and classify the stakeholders is based on the power and strength of stakeholder to affect or the level of influence that stakeholders can have on the project. Hence, the stakeholders are divided into those that encourage and stimulate the projects to be successful by influencing the project objectives in positive and beneficial manner. They are also divided into those stakeholders that discourage projects to become successful by negatively influencing projects from achieving their objectives and success parameters.

2.3 Project Stakeholder management

The development and introduction of the concept of stakeholders in the strategic management of the projects occurred after the famous book tiltled ‘‘Strategic Management: A Stakeholder Approach” was published by Freeman in 1984. After the publication of the famous work, there was a considerate progress in the development of interest in the stakeholder management approach both in the general management and specifically in the project management avenues due to its wide acceptability and reliability among the managers and project professionals.

There has been an excessive and continuous effort to obtain improved project success in the construction projects, but there has been little success and result to attain successfully delivery and completion of construction projects. This is because there are many factors and variables that hamper the successful completion and delivery of projects such as the cost, quality, time, satisfaction etc. Construction projects have unique and distinct nature because they have different type of processes and relations with different stakeholder groups and individuals that are related or are involved with them. As mentioned previously the construction projects are restrained and different variables including the critical time and resources. These factors play a vital role in achieving successful completion and delivery of construction projects (Nissen, 2003). Since the construction projects are complex and complicated in nature, they involve important phases of project planning, execution and monitoring. These project processes require different interaction, integration, collaboration, conflicts, associations, negotiations and coalitions between different types of project stakeholders. Some of the identified stakeholders among the multitude of stakeholders include clients, contractors, designers, local authorities, public and the environmental agencies and associations (Cheeks, 2003).

All the parties and individuals that are involved in a project either directly or indirectly are described as the construction project stakeholders. The project stakeholders have certain expectations and goals to achieve through delivery of the project which change as the project progresses and therefore, it is very important to satisfy stakeholders with their expectations It is really essential to satisfy and meet the dynamic changing expectations of the project stakeholders through the life and progression of the project which makes it important to ensure successful completion and delivery of the construction projects (Atkin & Skitmore, 2008). Project success is achieved by satisfying and effectively managing the project stakeholders.

Project stakeholders should be managed to ensure that they contribute towards the achieving of project goals and objectives which helps in successful completion and delivery of project. The management of stakeholders through the project aids in achieving project outcomes that can be better achieved through stakeholder's coalition and collective efforts (Akintoye, Hardcastle, Beck, Chinyio, & Asenova, 2003).

Stakeholder management is related to the relationships between different organizations and their multitude stakeholders that not only impact the project but also the individual groups and organizations that are linked to that project in any aspect. They may be impacted and effected both positively and negatively. Therefore the purpose to implement stakeholder management for an organizations is to identify, analyze, comprehend and effectively manage their stakeholders (Olomolaiye, 2010). It is interesting to understand that the theory of stakeholder management started as a concept for the field of business management, but it has been increasingly applied and implemented across other knowledge domains particularly in the construction management. Due to the complexity of construction projects and processes, it is essential to formulate stakeholder management principles and frameworks that are specifically modelled and designed for construction sector management issues only.

It is important to carry out stakeholder management in the construction sector so that the projects are completed and delivered successfully to the client as per their perceived plans and ambitions. However, the comprehension and measurement of project success is not simple and easy because success may be valued differently by various stakeholders and project partners depending on their level of interest and benefits that they may achieve through the project. Some stakeholders may consider parameters such as on schedule completion of project as success of project others might value on budget completion of project as a measure of success. Furthermore, some stakeholders consider quality of finished product or project and other factors as representative of project success (S.-u.-R. Toor & Ogunlana, 2008). Hence, the traditional approach and understanding of the success measurement considering conventional simplistic parameters and constraints like cost, quality and time have been displaced by new parameters such as the stakeholder satisfaction, conflicts resolution, disputes addressal, and environmental accreditation. Therefore it is important to include the benefits and interests of the project stakeholders so that what they intend to achieve through successful completion of

project can be ensured and maximized for them. (Cooke-Davies, 2002), (S.-u.-R. Toor & Ogunlana, 2010).

Since the objective of construction projects are to be completed successfully by attaining planned objectives, it is important to understand the key performance indicators or the factors that affect the project stakeholders most effectively and they need to be analyzed and acknowledged accordingly to assert maximum benefits into the project. The success factors of the construction projects are inclusive of the key success indicators that ensure successful delivery of the projects. These factors include completion of projects in timely manner; completion of projects within the budget; conformance to specified quality standards; compliance to stakeholders' requirements and satisfaction etc. (Kam Jugdev, 2005). The process of effective stakeholder management is dependent on the understanding and relevance of the critical success factors for stakeholder management to the construction projects and industry (Yang Jing 2010) because it facilitates the project management professionals to implement and execute effective stakeholder management practices in their project s and organizations.

While formulating the stakeholder theory, the basic assumption that is made is that the organization or individual involved in a project has different type of relationships with others individuals and groups which can be directly part of the project system or indirectly associated with the project in one form or the other. These types of stakeholders are categorized into the internal and external environment stakeholders. The explained types of stakeholders affect the project during the time of decision making and strategies formulation and are also affected by the project decisions positively and negatively. Therefore, in order to manage the stakeholders in the prevalent increasingly difficult and challenging environments faced by the construction projects in developing countries, the identification of critical stakeholders along with stakeholder analysis is to be ensured.

The research conducted on stakeholders has mostly been focused on explaining the real processes of decision making that is involved in stakeholder management of the projects. Stakeholders and their stakeholder management processes highlight the significance of different streams of stakeholder management such as the stakeholder identification, their classification, analysis, and strategic formulation and stakeholder engagement processes.

2.4 Significance of stakeholder management

Stakeholder management is an important issue in construction project management. The presence of different stakeholders in a project can be viewed as source of coalitions and conflicts to the project and the concerned organization. The collective interests between the stakeholders dictate their behaviour and relation with the other stakeholders and the project organization. Building up on Freeman's description, (Karslen, 2005), defined project stakeholder as an individual or a person, that are either affected and influenced by the project or are in position and power to influence and affect the project's progress and its circumstances. The development of relationships between the construction stakeholders is in continuous development process to model and adjust the relationships to serve the interests of the stakeholders to achieve project's success.

The global construction projects are complex and intricate in nature which makes the stakeholder management as the most crucial and significant factor in them. The global projects include different actors and participants who have diverging interests and objectives that are sought for in the complex project environment. There are many studies that portray the challenges faced due to the conflicts and constraint slinked to project stakeholders that are critical and powerful to influence and affect the project. Therefore, critical stakeholders have made notable affect and influences in the large infrastructure and engineering construction projects, thereby affecting the project constraints of quality, cost and time (Roger Miller, 2005).

2.5 Success factors

Critical success factors (CSFs) have been defined as the areas of management that if given due diligence and attention by project managers would result in improved and competitive project performance leading to successful delivery of project outcomes and objectives. The success factors are useful in protecting and supporting the business and strategic interests of the organization which are important for the development and flourishing of the organization. To summarize, CSFs are those actions, conditions and circumstances in which the right and relevant decisions have to be undertaken which is critical to attain project's desired goals and objectives. (Rockart, 1979).

The critical success factors are used by the management of an organization to determine the needs and requirements for a project. Critical success factors act as performance indicators which ensure the progression of strategic interests and refinement of management processes to keep the organization competitive and successful. The identification of critical success factors can assist the project management to focus on the issues of developing measures for critical success factors and structured management in needed areas of the project. The use of CSF in assessing requirements and needs of the organization and enterprises to be successful and competitive is considered as effective by researchers.

Critical success factors (CSFs) are determined as a practical and conducive variables to obtain the requirements of management success in construction projects (Zmud, 1984). However for stakeholder management, it is considered to be significant for the project team and management to understand whether the stakeholders that are part of the project are being effectively managed or not. There are various factors and variables that have been identified in the research publication that support the successful management of stakeholders in the construction projects. These factors include effective communication between project stakeholders, analyzing the stakeholders' needs and interests along with many others (Aaltonen, Jaakko, & Tuomas, 2008).

The researchers have utilized and adopted different terminologies and key words to describe the most important and critical success factors of construction stakeholder management which facilitate in better management of project stakeholders. However, it can be assessed after the evaluation of the published research studies about the critical success factors for stakeholder management that very limited investigations on construction industry professionals' preferences of critical success factors CSFs are conducted. (El-Gohary et al., 2006) and (Ward & Chapman, 2008) also imply that there is dissimilar attention in between different types and categories of projects and no comprehensive approach of study is carried out for stakeholder management critical success factors CSFs. The study of stakeholder and management uncertainty is focused and limited to some aspects such as project definition, limitations in the management processes, identification of sources, streamlining the issues and problems, determining ownership of project risks and constraints, estimating variability and divergence in factors, evaluating implications, harnessing plans and strategies, and managing implementation of plans and processes only. Many scholars have also proposed different

number of success factors for stakeholder management. Decision making processes adopted by the organizations along with their the organizational skills and efforts utilized in the decision making process helps in effectively management of project stakeholders with satisfaction and success.

Similarly the research conducted by (Dr. George F. Jergeas, 2000) used interviews to identify different aspects to make improvements for managing stakeholders. The most important aspect of managing stakeholder in construction projects was identified to be the effective and channeled communication with and between the different stakeholders involve in the project. The second most critical aspect of research finding was the significance of setting collective interests, goals, objectives and project priorities between the involved parties and organizations of a project. (Bakens, Foliente, & Jasuja, 2005) has also pointed and identified the importance of effective communication as predecessor for effective stakeholder management and project management. Effective and structured communication between different parties can effectively resolve conflicts, set common goals and objectives, resolve constraints and mitigate risk effects in a project.

(Aaltonen et al., 2008) states that one of the most vital problem that arises in the project stakeholder management is the development of relationships between different stakeholders and the project outcomes. The proposed factors identified through professional experiences in the published research can be considered as the critical success factors for management of construction stakeholders. But the factors' relative impact and importance have not been evaluated and tested from construction professionals and there is also no comparison according to different types of projects to validate the significance and reliability of the factors.

2.6 Framework design for stakeholder management

The previously carried our researches have analyzed the different ways by which stakeholder management efforts in construction projects are improved by stressing on the different faucets of construction stakeholder management in the projects such as involving factor groupings, risks identification, stakeholder mapping, decision making and effective communication etc. (Bourne & Walker, 2005) (Chinyio & Akintoye, 2008). In the recent studies, (Yang Jing 2010) (R. J. Yang & Shen, 2015) have developed a schematic framework for successfully managing

stakeholders in the construction projects. These frameworks were developed using exploratory groupings of the critical success factors (CSFs) to ensure effective construction stakeholder management.

Most importantly, the framework developed using the constructs of stakeholder management factors or variables does not incorporate quantified relationships as developed between the factors. The knowledge of the relationships developed between the factors is significant in understanding the inter connectivity between the variables in a more logical and practical way that can be useful for implementing on the construction projects. Factor analysis technique is used to reduce the large number of factors and variables into a smaller number of constructs or groups but it does not encompass the interrelationships among the factors. The interrelationships and connectivity between the variables can be developed and presented using multivariate analyses techniques.

The CSFs used by Yang et al. in their proposed framework were not diverse and did not cover wide array and faucets if stakeholder management issues and constraints. The factors such as the use of appropriate procurement strategies and systems and transforming to flexible project organization were not considered and included in the research. Therefore, it is important to empirically and logically investigate the relationships among the critical success factors CSFs to ensure effective stakeholder management in construction industry. Furthermore the relation of these important critical factors with the project success also needs to be evaluated and analyzed. Therefore the effect of these factors on successfully managing stakeholders and their constraints can facilitate in resolving project constraints and ensure successful project execution and completion. The constraints of time, cost and quality can be assisted along with the resolution of the important factors of stakeholder management. Hence, these variables need to be understood to enable effective project stakeholder management and ultimately the project success.

It is pertinent to mention that the identification of the critical success factors for effective stakeholder management in the construction sector is considered as vital and important step to achieve complete understanding and knowledge of stakeholder management (Yang Jing 2010). However, in order to further equip and develop practical framework for the industry professionals and to ensure the successful stakeholder management, the relationships linking

the critical factors should also be emphasized upon on along with their groupings and factor groupings.

2.7 Identified success factors

Different research papers were studied to have understanding and to identify the important success factors that have been presented in the academia and publications. The researches carried out by different researches involving different methodologies and evaluation criteria were studied and after vigorous assessment of relevancy, a total of twenty research papers were selected to extract the success factors for stakeholder management. The average publication year of the shortlisted study papers was determined to be of 2011 which represents that recent and updated researches were incorporated to include modern knowledge areas in this study. The research papers were analyzed to extract a total of fifty one success factors as listed in the Table 2.1 along with their research paper references.

Table 2. 1 Success Factors identification via literature review

S. No.	Stakeholder Management Success Factors	Factors Literature Reference	Factor Frequency	Qualitative Score	Literature Score	Factor Rank
1	Clear project mission and objectives	(El-Gohary et al., 2006; Leung, 2004; K. Y. Mok, Shen, & Yang, 2015; Molwus et al., 2017; Oppong et al., 2017; J. Yang, Shen, Ho, Drew, & Xue, 2011; Yang Jing 2010; R. J. Yang & Shen, 2015)	8	5	0.400	8
2	Favorable procurement method	(M. K. Y. Mok & Shen, 2016; Molwus et al., 2017)	2	5	0.100	28

3	Identifying and listing the project stakeholders	(Jepsen & Eskerod, 2009; Karlsen, 2002; Lynda Bourne, 2006);El-Gohary et al., 2006;(Elias, 2002);(Mathur, Price, & Austin, 2008); K. Y. Mok, Shen, & Yang, 2015;(Yu, Liang, Shen, Shi, & Wang, 2019);(Xia, Zou, Griffin, Wang, & Zhong, 2018);(Francisco de Oliveira & Rabechini Jr, 2019); M. K. Y. Mok & Shen, 2016; Oppong et al., 2017; Molwus et al., 2017; J. Yang, Shen, Ho, Drew, & Xue, 2011; Yang Jing 2010; R. J. Yang & Shen, 2015)	16	5	0.800	2
4	Flexible project organization	Molwus et al., 2017	1	5	0.050	39
5	Understand stakeholder areas of interests	(Jepsen & Eskerod, 2009; Karlsen, 2002; Lynda Bourne, 2006;(Olander & Landin, 2008); El-Gohary et al., 2006; Elias, 2002;(Mathur et al., 2008);(K. Y. Mok et al., 2015); Yu, Liang, Shen, Shi, & Wang, 2019; Xia, Zou, Griffin, Wang, & Zhong, 2018; (Francisco de Oliveira & Rabechini Jr, 2019; Oppong et al., 2017; Molwus et al., 2017; J. Yang, Shen, Ho, Drew, & Xue, 2011; Yang Jing 2010; R. J. Yang & Shen, 2015	16	5	0.800	2

6	Stakeholders power, urgency, legitimacy and proximity	Jepsen & Eskerod, 2009; Karlsen, 2002; Lynda Bourne, 2006;(Olander & Landin, 2008);(Aaltonen et al., 2008);(Elias, 2002);(Chinyio & Akintoye, 2008); Francisco de Oliveira & Rabechini Jr, 2019;(K. Y. Mok et al., 2015; M. K. Y. Mok & Shen, 2016);(Oppong et al., 2017); Molwus et al., 2017; J. Yang, Shen, Ho, Drew, & Xue, 2011; Yang Jing 2010; R. J. Yang & Shen, 2015;(Yu et al., 2019);	16	3	0.480	7
7	Classification of stakeholder attributes/characteristics	(Jepsen & Eskerod, 2009);(Karlsen, 2002);(Olander & Landin, 2008);(El-Gohary et al., 2006);(Elias, 2002); (K. Y. Mok et al., 2015; (Yu et al., 2019); Xia, Zou, Griffin, Wang, & Zhong, 2018;(M. K. Y. Mok & Shen, 2016); (Oppong et al., 2017); Molwus et al., 2017;	11	5	0.550	6
8	Stakeholders' behaviours mapping	(Karlsen, 2002);(Aaltonen et al., 2008); (K. Y. Mok et al., 2015; (Oppong et al., 2017); Molwus et al., 2017; J. Yang, Shen, Ho, Drew, & Xue, 2011; Yang Jing 2010; R. J. Yang & Shen, 2015;	8	5	0.400	8

9	Stakeholders' influence on each other	(Lynda Bourne, 2006); Molwus et al., 2017;	2	3	0.060	34
10	Stakeholders' influence on the project	(Karlsen, 2002); (Lynda Bourne, 2006); (Olander & Landin, 2008); (El-Gohary et al., 2006); (K. Y. Mok et al., 2015; (Yu et al., 2019); (M. K. Y. Mok & Shen, 2016); (Oppong et al., 2017); Molwus et al., 2017; J. Yang, Shen, Ho, Drew, & Xue, 2011; Yang Jing 2010; R. J. Yang & Shen, 2015;	12	5	0.600	5
11	Identifying conflicts & coalitions among stakeholders	(Karlsen, 2002); (Yu et al., 2019); Xia, Zou, Griffin, Wang, & Zhong, 2018; (M. K. Y. Mok & Shen, 2016); (Oppong et al., 2017); Molwus et al., 2017; J. Yang, Shen, Ho, Drew, & Xue, 2011; Yang Jing 2010; R. J. Yang & Shen, 2015;	9	3	0.270	13
12	Resolving stakeholders conflicts	(Leung, 2004); (Olander & Landin, 2008); (El-Gohary et al., 2006);(Mathur et al., 2008); (Yu et al., 2019); Xia, Zou, Griffin, Wang, & Zhong, 2018; Molwus et al., 2017; J. Yang, Shen, Ho, Drew, & Xue, 2011; Yang Jing 2010; R. J. Yang & Shen, 2015;	10	3	0.300	11

13	Change of stakeholders' interests	(Lynda Bourne, 2006); (Olander & Landin, 2008); (Elias, 2002);(Chinyio & Akintoye, 2008); (M. K. Y. Mok & Shen, 2016); Molwus et al., 2017;	6	3	0.180	20
14	Change of stakeholders' influence	(Lynda Bourne, 2006); (Olander & Landin, 2008); (Chinyio & Akintoye, 2008); (Chinyio & Akintoye, 2008); (K. Y. Mok et al., 2015; Francisco de Oliveira & Rabechini Jr, 2019; Molwus et al., 2017; J. Yang, Shen, Ho, Drew, & Xue, 2011; Yang Jing 2010; R. J. Yang & Shen, 2015;	9	3	0.270	13
15	Change of relationship among stakeholders	(Leung, 2004); (M. K. Y. Mok & Shen, 2016); (Oppong et al., 2017); Molwus et al., 2017; J. Yang, Shen, Ho, Drew, & Xue, 2011; Yang Jing 2010; R. J. Yang & Shen, 2015;	7	3	0.210	17
16	Change of stakeholders' attributes	(Olander & Landin, 2008); (Elias, 2002); (M. K. Y. Mok & Shen, 2016); (Oppong et al., 2017); Molwus et al., 2017;	5	5	0.250	15
17	Affect of project decisions on stakeholders	(Aaltonen et al., 2008); (Chinyio & Akintoye, 2008); Xia, Zou, Griffin, Wang, & Zhong, 2018; Molwus et al., 2017;	4	5	0.200	19

18	Reaction to implement project decisions	(Karlsen, 2002); (Aaltonen et al., 2008); (Chinyio & Akintoye, 2008); Xia, Zou, Griffin, Wang, & Zhong, 2018; (Oppong et al., 2017); Molwus et al., 2017; J. Yang, Shen, Ho, Drew, & Xue, 2011; Yang Jing 2010; R. J. Yang & Shen, 2015;	9	1	0.090	30
19	Redefine (refine) project mission with relevant stakeholders	(K. Y. Mok et al., 2015; Molwus et al., 2017;	2	1	0.020	49
20	Strategies to manage/engage different stakeholders	(Jepsen & Eskerod, 2009); (Karlsen, 2002); (Lynda Bourne, 2006); (Chinyio & Akintoye, 2008); (K. Y. Mok et al., 2015; (Yu et al., 2019); Xia, Zou, Griffin, Wang, & Zhong, 2018; (M. K. Y. Mok & Shen, 2016); (Oppong et al., 2017); Molwus et al., 2017; J. Yang, Shen, Ho, Drew, & Xue, 2011; Yang Jing 2010; R. J. Yang & Shen, 2015;	13	5	0.650	4
21	Positive relationships among the stakeholders	(Olander & Landin, 2008); (El-Gohary et al., 2006); (Chinyio & Akintoye, 2008); (M. K. Y. Mok & Shen, 2016); Molwus et al., 2017; J. Yang, Shen, Ho, Drew, & Xue, 2011; Yang Jing 2010; R. J. Yang & Shen, 2015;	8	3	0.240	16

22	Proper and frequent communication with stakeholders	(Karlsen, 2002); (Lynda Bourne, 2006); (Leung, 2004); (Olander & Landin, 2008); (Aaltonen et al., 2008); (El-Gohary et al., 2006); (Elias, 2002); (Chinyio & Akintoye, 2008); (Mathur et al., 2008); (K. Y. Mok et al., 2015; Francisco de Oliveira & Rabechini Jr, 2019; (M. K. Y. Mok & Shen, 2016); (Oppong et al., 2017); Molwus et al., 2017; J. Yang, Shen, Ho, Drew, & Xue, 2011; Yang Jing 2010; R. J. Yang & Shen, 2015;	17	5	0.850	1
23	Social responsibilities inc econ, legal, envir & ethical issues	(Karlsen, 2002); (Lynda Bourne, 2006); (Leung, 2004); (Olander & Landin, 2008); (Aaltonen et al., 2008); (El-Gohary et al., 2006); (K. Y. Mok et al., 2015;(Elias, 2002); (Chinyio & Akintoye, 2008); (Mathur et al., 2008); Francisco de Oliveira & Rabechini Jr, 2019; (M. K. Y. Mok & Shen, 2016); (Oppong et al., 2017); Molwus et al., 2017; J. Yang, Shen, Ho, Drew, & Xue, 2011; Yang Jing 2010; R. J. Yang & Shen, 2015;	6	5	0.300	12

24	Stakeholders' needs and constraints to projects	(Olander & Landin, 2008); (Chinyio & Akintoye, 2008); (Mathur et al., 2008); (K. Y. Mok et al., 2015; (Oppong et al., 2017); J. Yang, Shen, Ho, Drew, & Xue, 2011; Yang Jing 2010; R. J. Yang & Shen, 2015;	8	5	0.400	8
25	Analyzing the change of stakeholders	(Karlsen, 2002); (Lynda Bourne, 2006); (Elias, 2002); (M. K. Y. Mok & Shen, 2016);	4	3	0.120	25
26	Categorizing and grouping of stakeholders	(Jepsen & Eskerod, 2009); (Lynda Bourne, 2006); (K. Y. Mok et al., 2015; (Yu et al., 2019); Xia, Zou, Griffin, Wang, & Zhong, 2018; Francisco de Oliveira & Rabechini Jr, 2019; (M. K. Y. Mok & Shen, 2016);	7	3	0.210	17
27	Updated project stakeholder list	(Jepsen & Eskerod, 2009)	1	3	0.030	43
28	Influencing through communication (interview/data collect)	(Jepsen & Eskerod, 2009); (Olander & Landin, 2008); (El-Gohary et al., 2006); (Chinyio & Akintoye, 2008);	4	3	0.120	25
29	Access to stakeholders	(Jepsen & Eskerod, 2009); (K. Y. Mok et al., 2015;	2	1	0.020	49
30	Consult project team for stakeholders' interests and needs	(Jepsen & Eskerod, 2009); (Chinyio & Akintoye, 2008);	2	1	0.020	49
31	Front end stakeholder analysis	(Jepsen & Eskerod, 2009); (Chinyio & Akintoye, 2008); (K. Y. Mok et al., 2015; Francisco de Oliveira & Rabechini Jr, 2019;	4	3	0.120	25

32	Communication throughout the project	(Karlsen, 2002); (Chinyio & Akintoye, 2008); Xia, Zou, Griffin, Wang, & Zhong, 2018;	3	5	0.150	23
33	Defined Stakeholder management plan processes	(Karlsen, 2002); (Chinyio & Akintoye, 2008); (Mathur et al., 2008); (K. Y. Mok et al., 2015; Xia, Zou, Griffin, Wang, & Zhong, 2018;	5	3	0.150	22
34	Communicate assessment result to project team	(Karlsen, 2002); (K. Y. Mok et al., 2015;	2	3	0.060	34
35	Monitoring and reporting of engagement strategies	(Lynda Bourne, 2006); (Aaltonen et al., 2008); (El-Gohary et al., 2006); (K. Y. Mok et al., 2015; (M. K. Y. Mok & Shen, 2016); (Oppong et al., 2017);	6	3	0.180	20
36	Risk management with prioritized stakeholders	(Lynda Bourne, 2006); Xia, Zou, Griffin, Wang, & Zhong, 2018;	2	5	0.100	28
37	Effective leadership style	(Lynda Bourne, 2006); (Chinyio & Akintoye, 2008); Francisco de Oliveira & Rabechini Jr, 2019;	3	1	0.030	43
38	Understand project goals and outcome expectations	(Leung, 2004);	1	3	0.030	43
39	Commitment to project work	(Leung, 2004);	1	5	0.050	39
40	Motivate/Engage through incentives and awards	(Leung, 2004); (Chinyio & Akintoye, 2008);	2	3	0.060	34
41	Effective two-way communication	(Olander & Landin, 2008); (El-Gohary et al., 2006); Francisco de Oliveira & Rabechini Jr, 2019;	3	5	0.150	23

42	Transparency and trust in decision making	(El-Gohary et al., 2006); Francisco de Oliveira & Rabechini Jr, 2019; (Oppong et al., 2017);	3	3	0.090	30
43	Stakeholder management and skills training	(El-Gohary et al., 2006); (Chinyio & Akintoye, 2008); (K. Y. Mok et al., 2015;	3	3	0.090	30
44	Top level support	(Chinyio & Akintoye, 2008); (Oppong et al., 2017);	2	3	0.060	34
45	Proactive engagement	(Chinyio & Akintoye, 2008);	1	3	0.030	43
46	Consensus building and learning	(Mathur et al., 2008);	1	5	0.050	39
47	Prioritizing stakeholder interests	(K. Y. Mok et al., 2015; (M. K. Y. Mok & Shen, 2016);	2	3	0.060	34
48	Understanding stakeholder influencing strategies	(K. Y. Mok et al., 2015;	1	3	0.030	43
49	Trust between stakeholders	Francisco de Oliveira & Rabechini Jr, 2019; (M. K. Y. Mok & Shen, 2016); (Oppong et al., 2017);	3	3	0.090	30
50	Interdependencies of issues	Francisco de Oliveira & Rabechini Jr, 2019; (M. K. Y. Mok & Shen, 2016);	1	5	0.050	39
51	Allocation of resources	(Oppong et al., 2017);	1	3	0.030	43

2.8 Causal Loop Diagrams

System dynamics involves utilizing several different diagramming tools to represent and encompass the structure of project systems, which includes different approaches such as the causal loop diagrams and also the stock and flow maps. However, System dynamics has its own criterion which has established it as a powerful analytical tool and method used to model

and study the dynamic behaviours of different systems and their interactions (Love, Mandal, & Li, 1999).

Causal Loop Diagrams (CLDs) are classified as an important tool to represent the causal structures within different dynamic systems. It has the advantage of quickly capturing the hypotheses related to the causes of dynamics. The development of causal loops helps in communicating the important and critical feedbacks that are determined to be the reason for the development of a problem in a causal system. The modelling process of the causal loop diagram is iterative in nature, even though the stages and steps needed to be undertaken look to be sequential.

Causal loops can help to incorporate a complete and holistic view of different construction phenomenon such as construction causal relationships, identification of feedback mechanisms and also searching for the behavioral changes and interactions of the system. The primary focus and goal in system dynamics is to examine and analyze the effect that one variable or factor has on the other. System dynamics can be used as a modelling tool to identify different factors that are required to be improved and managed so that unwanted construction phenomenon can be mitigated or completely eliminated.

The technique of causal loop diagramming provides the platform to link the major causal factors and variables as being utilized to develop framework for this research. A causal loop diagram specifically and completely shows the direction and the type of causation relation among the prominent inter related factors, which is really significant in understanding the working of the project system. The causality is used to understand the influences of variable inputs on the variable outputs for the area under study.

A causal diagram is composed of factors and variables which are connected through arrows depicting the causal relation direction between the variables. The causal loops that are important are closed forming complete cycles which are depicted by a loop identifier. The loop identifier represents the positive/ reinforcing or the negative/ balancing nature of the causal feedback system. A positive causal loop shows that if the factor variable increases or decreases in one direction, it results in corresponding increase or decrease in the next in line variable also in the same direction. Similarly, for a negative or balancing causal loop, if there is an increase

or decrease in a variable or factor in one direction then the corresponding effect in the loop or system will be opposite and contrasting to the initial change effect. An initial increasing effect is balanced by a final decreasing effect and vice versa in the closed loop or cycle.

The causal network helps to demonstrate the causal relationships between different factors and variables. This technique has also been previously adopted for various construction aspects including site safety assurance, quality control and environmental protection (Spillane, 2011). Therefore, this approach is also being used for the study of construction stakeholder management.

Chapter 3

RESEARCH METHODOLOGY

3.1 Introduction

Research methodology used and developed to achieve the objectives of the research are introduced in this chapter. Research strategy depicts the path researchers undertake to carry their research to determine outcome of their objectives (Cornett, Marcus, Saunders, & Tehranian, 2007) . Different techniques can be used for research depending on the type and approach of the research being carried out. This includes literature review, surveys, interviews, technical equipment and softwares. This research uses combination of literature, surveys and analysis software to perform analysis on subject factors (Walker, 1997). There are multiple techniques that will be used to carry achieve certain objectives, these techniques include structured questionnaires/ surveys, literature study, content analysis and causal diagrams/ relationships.

3.2 Research Design

Research design gives an outline for the way the research is conducted. It conveys the path undertaken to achieve research objectives in a systematic manner. The research design includes the complete procedure which is adopted to combine the different constituents of the research study in a coherent, logical and meaningful manner. This helps to ensure that the research problem and statement of the study is properly addressed. The research design comprise the layout and plan for the collection of data, measurement of variables and tools used to analyze the subject data.

A comprehensive research methodology is developed to achieve the said research objectives as explained ahead. The research methodology that is adopted for this research is given in the Figure 3.1. As depicted in the methodology flowchart, the research objectives were derived from the research problem statement. The lack of effective stakeholder management framework for developing countries in the field and literature paved way to establish research objectives to develop stakeholder management framework using critical success factors. The focus on developing countries in establishment of the stakeholder management framework is vital to ascertain the subject research problem and statement identified.

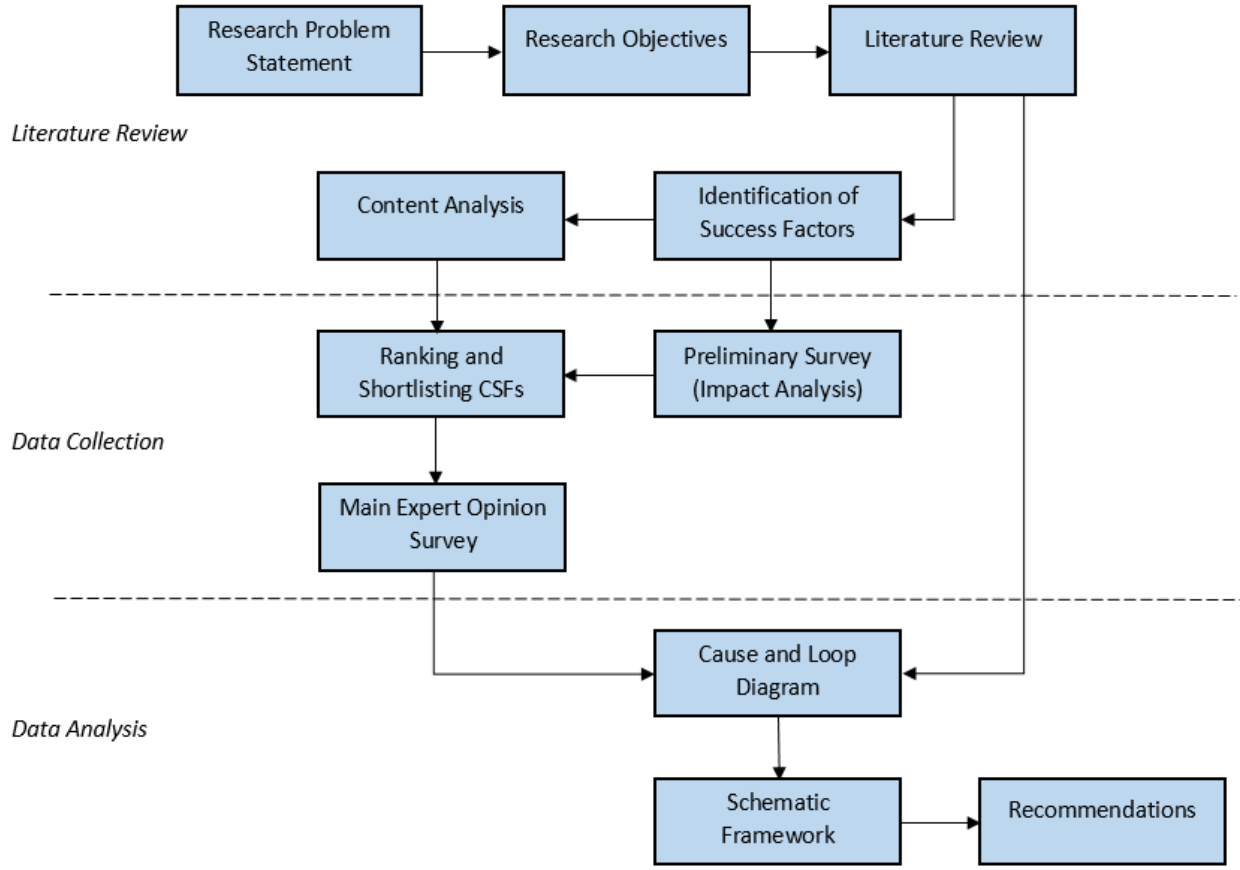

Figure 3. 1 Flow Chart of Research Methodology

3.2.1 Identification of success factors

In the first phase, important success factors required for effective stakeholder management for general construction projects were identified from a substantial amount of literature. Different research papers published in well-known construction and management journals were scanned to obtain a list of these factors. Important and relevant research papers were shortlisted from pool of large research papers. A total of twenty (20) research papers published between 2002 and 2019 were made part of literature study to extract these success factors. The average publishing year of the research papers was determined as 2011.

As a result a total of fifty one (51) success factors were extracted that were considered important to effectively manage stakeholders in construction projects. Owing to overlapping of factors, the factors were reviewed and shortlisted to forty one (41) marked as SF1 to SF41. This was done by merging similar factors that were repetitive and had different wordings.

3.2.2 Content Analysis

The research was further advanced with the content analysis which assesses the quantitative and qualitative scores of the factors in order to filter out the factors that are less significant (Hsieh & Shannon, 2005). The quantitative scores were based on the frequency of success factors appearance in the research papers of literature study. The quantitative assessment was made on basis of number of papers with factors mentioned in the research papers.

The qualitative scores were based on the described level of impact and stress in the studied research papers. The qualitative assessment was made on basis of high, medium and low impact of factors in the research papers. Combined literature score was determined using frequency and qualitative scores. The analysis was performed on excel sheet using formulae. As a result of combining qualitative and quantitative literature score, literature significant rankings for the success factors was achieved. The success factors such as Prioritizing stakeholder needs and interests (SF5), Frequent two way communication between stakeholders (SF22), Classify stakeholder attributes (SF7), Identify and update project stakeholder list (SF3) and Strategies to manage different stakeholders (SF20) were given high stress and focus in the subject literature study by the researchers and academia as shown in Table 3.1.

Table 3. 1 Top Ranked Literature Success Factors

Factor No.	Factor Description	Literature Score	Normalized Score	Cumulative Score	Rank
5	Prioritize stakeholder needs and interests	1.300	0.123	0.243	1
22	Frequent two way communication between stakeholders	1.000	0.095	0.829	2
7	Classifiy stakeholder attributes	0.900	0.085	0.374	3
3	Identify and update project stakeholder list	0.850	0.080	0.115	4
20	Strategies to manage different stakeholders	0.700	0.066	0.711	5

3.2.3 Sample Size

The preliminary and final main survey were both conducted online using professional platform such as LinkedIn, Email and Facebook. These platforms were chosen due to ease in communication and interaction with the respondents. The professionally experienced and knowledgeable respondents were structurally selected for both the surveys. The sample size selected was based on the general acceptable criteria set up by different researchers in the similar type of researches conducted in the construction industry and involving similar type of professional managerial respondents.

The research conducted to study the risk-chasing behaviour of the construction professionals in the on-site construction decision-making used sampling size of fifty three (53) to gather the responses and decision choices of construction professionals in different risk related conditions faced in typical construction projects (Fiolet, Haas, & Hipel, 2016). The sample size of selective and targeted professionals of the construction industry having understanding of risk managing behaviour was adopted as it was considered sufficient and reliable for such type of researches and data analysis.

Similarly, the factors for different risk responses for different probability of occurrences was analyzed in the research in which the experiment was conducted involving respondents of relevant field knowledge and understanding. Random respondents without biased selection participated totaling to the number of forty seven (47) (Bouchouicha & Vieider, 2017). The number of sample respondents were selected based on relative sufficient information and views required for conducting the research analysis.

The study to study the barriers and factors that are responsible in the hindrance of adoption and acceptance of green building technology was conducted for developing country of Ghana (Albert Ping Chuen Chan & Ameyaw, 2018). The study involved taking input from professional and experienced construction experts having expertise in the green building technology. A total of forty three (43) professional experts were included and involved in the sample of the survey.

Therefore, both the Preliminary Survey and the Main Final Survey were floated to targeted global respondents/ industry professionals having construction projects experience in the developing countries. Only construction professionals having experiences in the projects of the developing countries of South East Asia, Middle East, Far East etc. were asked to participate in the surveys. This was done to ensure the study and research objective of addressing their problem of ineffective

stakeholder management could be properly investigated with project specific input from construction professionals.

The selected construction professionals with specialized knowledge of construction management and experience of managing different stakeholders were targeted in the surveys. Responses more than sixty (60) were taken for both the surveys as per research practice in the already carried out researches in similar construction industry researches as mentioned earlier.

3.3 Questionnaire Surveys

Different researchers have proposed and evaluated the effectiveness and importance of various data collection methodologies. There are pros and cons of each method and approach based on the type of data collection, respondent type and accuracy of data required. However, there is a recent approach of internet-based surveys which are still relatively new, and researchers have just started to begin to articulate the best practices for questionnaire design. The web-based questionnaires have multiple advantages for being robust and specific in design, as they have the potential to include instructions, error messages, and guiding illustrative graphics. They can also be used for having worldwide approach to receive targeted responses from research specific individuals and professionals. These advantages and capabilities are not achievable in other self-administered modes of data collection such as direct face to face interviews etc. Therefore these unique capabilities necessitate guidelines and approaches that are specific for the creation of online questionnaire surveys (Ritter & Sue, 2007).

3.3.1 Preliminary Survey

The approach used to take responses from the construction industry professionals for the research was conducting of online questionnaire surveys. The first preliminary survey was conducted and divide into two sections (Appendix 1). The first section of the questionnaire survey was designed to take the information regarding respondent profile including the organization type, organization role, countries of experience, years of relevant respondent experience and academic qualification. The second section of the survey was aimed to take respondent's views about the significance and importance of identified success factors for effective stakeholder management. The identified success factors through literature review were ranked in likert scale ranging from least important to most important. This was done to determine the ranking of the success factors based on the

professional construction industry individuals having ample experience in managing different stakeholders.

3.3.2 Main Research Survey

The second main final survey was conducted and again divide into two sections (Appendix 2). The first section of the questionnaire survey was designed to take the information regarding respondent profile including the organization type, organization role, countries of experience, years of relevant respondent experience and academic qualification. The second section of the survey was aimed to take respondent's views about the relations between the shortlisted critical success factors after the content analysis and the preliminary survey results were aggregated. The relation between the shortlisted critical success factors was determined on two scales. The first scale was to determine the causal strength between the two factors which was measured from low to high on three point scale. The second scale was to determine the polarity of the relation which was determined as either direct or indirect. This was done to determine the important and significant relations between the factors that can be considered for further causal loops. This survey took professional knowledge and understanding of construction industry individuals having diverse experiences in managing construction stakeholders with success.

Chapter 4

RESULTS AND ANALYSIS

4.1 Introduction

The results of the preliminary and final questionnaire surveys are explained in this section which is being followed by the development of causal links and causal loop diagrams. The causal loops developed are explained in detail with context to literature review and respondents survey responses. The causal loops are explained to understand the flow of causation to develop knowledge of effective tools and methods required to manage stakeholders in the construction projects in the developing countries.

4.2 Preliminary Survey

The assessment of success factors significance was not limited to literature review scores only. A detailed systematic impact analysis based on the subject professionals from the construction industry of developing countries was carried out through a preliminary survey (Ullah, 2016). This survey was distributed to global targeted respondents having experience in managing the construction projects in developing countries through online professional platforms like LinkedIn, social networking sites like Facebook and emails. The respondents were selected from different developing countries having similar construction constraints as Pakistan. 30% responses were taken from within Pakistan but the majority 70% responses were collected from other international developing countries. The number of targeted respondents were designed keeping in view the response rate of survey respondents of professionals in the construction industry.

A total of seventy seven (77) construction professionals having experience in different construction sectors gave their opinion on significance of success factors for stakeholder management in developing countries. These professionals belonged to different construction organizations having ample experience in different construction sectors such as infrastructure, buildings, transport, and industrial. The frequency distribution of respondents' categories, job title, professional experiences and education is reflected in Table 4.1. Furthermore, the respondents belonged from different developing countries of South Asia, Middle East etc. as per the scope and study objectives of the research which is displayed in the Figure 4.1.

Table 4. 1 Frequency distribution of responses (Preliminary Survey)

Profile	Frequency	Percentage
Category		
Contractor	44	57%
Consultant	17	22%
Client	16	21%
Job Title		
Project Chief	8	10%
Planning & Control Manager	24	31%
Project Manager	18	23%
Planning Engineer	14	18%
Project Engineer	13	17%
Years of Experience		
0 to 5 years	14	18%
5 to 10 years	27	35%
10 to 15 years	18	23%
15 to 20 years	13	17%
Above 20 years	5	6%
Education		
Bachelors	33	43%
Masters	30	39%
Project Management Certification	14	18%

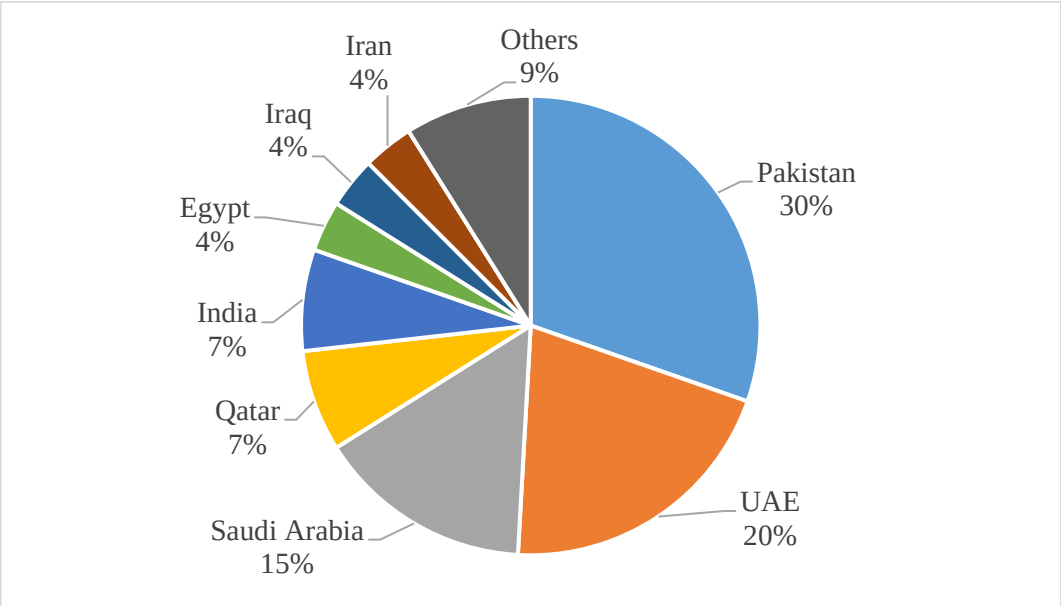

Figure 4. 1 Countries Distribution of Responses (Preliminary Survey)

The data of the responses received for the preliminary survey was statistically tested for its reliability and consistency. The test that was used to determine the reliability and internal consistency of the respondent's data is the Cronbach's Alpha test. The reliability of a sample data signifies that how well a test measures what it is aimed for. It is an important measure to measure the reliability of the multiple question type surveys involving Likert scales. The ANOVA statistical test was conducted to determine the Cronbach's Alpha Test which came out to be 0.97 which is well above or greater than the acceptable limit of at least 0.7 as shown in Table 4.2. The Cronbach's alpha constant value greater than 0.9 depicts excellent internal consistency of the responses data. The result signifies that the data is reliable and internally consistent for being accepted for being used for further analysis and in the research study.

Table 4. 2 Cronbach's Alpha Constant for Preliminary Survey Respondents Data

Source of Variation	**SS**	**df**	**MS**	**F**	**P-value**	**F crit**
Rows	1848.544	76	24.32294984	45.44194094	0	1.285837993
Columns	288.635	40	7.215869496	13.48122319	1.10072E-80	1.39802967
Error	1627.170	3040	0.535253322			
Total	3764.349	3156				
Cronbach Alpha			0.98			

These professional individuals were engaged to rank the shortlisted 41 success factors on likert scale of 1 to 5 (Not Important-Very Important) based on their experience and sound judgement. Their opinion was subsequently accumulated in the form of a significance survey score. According to the received survey score, top five success factors given high significance by the respondents included Clear project objectives (SF1), Communication throughout the project (SF28), Stakeholders' influence on the project (SF10), Resolving stakeholders conflicts (SF12) and Prioritizing stakeholder needs and interests (SF5) as listed in Table 4.3.

Table 4. 3 Top Ranked Respondents Success Factors

Factor No.	Factor Description	Respondents Score	Normalized Score	Cumulative Score	Rank
1	Clear project objectives	0.917	0.029	0.029	1
28	Communication throughout the project	0.860	0.027	0.057	2
10	Stakeholders' influence on the project	0.852	0.027	0.084	3
12	Resolving stakeholders conflicts	0.847	0.027	0.111	4
5	Prioritize stakeholder needs and interests	0.839	0.027	0.137	5

4.3 Ranking and Shortlisting of CSFs

The success factors ranking was carried out by combining scores of literature as well as professionals' survey. It is important to mention that the construction industry of developing countries is still going through initial progress (Naveed, Thaheem, Khurshid, & Farooqui, 2016); (Razzaq, Thaheem, Maqsoom, & Gabriel, 2016). Therefore, the success factors required for effective stakeholder management presented in international published literature may not completely represent the complexities of construction industry in the developing economies.

Hence, the scores of the factors achieved both from the literature and the survey might require different understanding and usage for further analysis. The weighting split between the literature and the survey scores is not authentically documented in any publication primarily due to subjective and contextual understanding and combination of the scores. Therefore this has helped to pave way to improvise the weighting splits based on logical reasoning that are used to test and analyze the factors according to the subjective weighting addition method.

Different combinations of weighting ratios of literature score to survey score were used to determine combined score of the critical success factors. The ratios of 20/80, 30/70, 40/60 and 50/50 were analyzed and tested statically using one-way ANOVA analysis and rank correlation method. The p value was determined to be 0.95 along with the correlation values ranging between 0.80-0.95 as shown in Table 4.4 which suggests that there is no significant difference between the various tested weighting split combinations.

Table 4. 4 Correlation values of different weighting ratios

	20/80	**30/70**	**40/60**	**50/50**
20/80	1.000	0.977	0.924	0.870
30/70	0.977	1.000	0.977	0.943
40/60	0.924	0.977	1.000	0.989
50/50	0.870	0.943	0.989	1.000

Hence, due significance is given to construction professionals survey score over literature review score and 40/60 weighting split is used to combine the two scores. The combined factor score is statistically analyzed and ranked to select the most important eighteen (18) critical success factors based on over 50% combined significance that incorporates the maximum influence (Ahmad, Thaheem, & Maqsoom, 2018) (Rasul, Malik, Bakhtawar, & Thaheem, 2019) . These eighteen (18) critical success factors were subsequently carried forward to establish framework for effective stakeholder management. The shortlisted critical success factors according to combined weighted score along with their rankings are listed in Table 4.5.

Table 4. 5: List of Shortlisted Success Factors

Factor No.	**Factor Description**	**Combined Score**	**CSF Rank**
SF5	Prioritize stakeholder needs and interests	1.023	1
SF22	Frequent two way communication between stakeholders	0.866	2
SF3	Identify and update project stakeholder list	0.822	3
SF7	Classify stakeholder attributes	0.772	4
SF10	Stakeholders' influence on the project	0.751	5
SF20	Strategies to manage different stakeholders	0.734	6
SF6	Stakeholders power, urgency, legitimacy and proximity	0.678	7
SF10	Clear project objectives	0.658	8
SF12	Resolving stakeholders conflicts	0.628	9
SF11	Identify conflicts & coalitions among stakeholders	0.585	10
SF28	Communication throughout the project	0.576	11
SF30	Monitor and reporting engagement strategies	0.570	12
SF8	Stakeholders' behaviours mapping	0.570	13
SF21	Positive relationships among the stakeholders	0.559	14
SF23	Social, economic, legal, environmental & ethical responsibilities	0.555	15
SF17	Affect of project decisions on stakeholders	0.554	16
SF29	Defined Stakeholder management plan processes	0.543	17
SF31	Risk management with prioritized stakeholders	0.542	18

4.4 Expert Opinion Survey

The shortlisted eighteen (18) critical success factors are used to establish the framework for effective stakeholder management. A final expert opinion survey is conducted to determine causal relationships. The most important causal links among shortlisted factors and project's key objectives are developed thorough structured survey involving professional and experts with significant experience and knowledge in the construction industry of the developing countries. These relationships will further validated by the literature review. The structured and targeted survey helps to provide significant information regarding the polarity and strength of causal links among selected factors and the objective of effective stakeholder management.

The critical success factors shortlisted after preliminary survey and content analysis numbering to eighteen (18) were used for further analysis in this survey. The relationships between these factors were analyzed to get a better understanding of dynamic qualitative relation of the critical factors. The interdependencies and interaction between these shortlisted factors are assessed qualitatively using causal link approach. The respondents were required to define the strength of relations between the corresponding factors in a scale of low, medium and high. Besides the causal strength the polarity of the relations between the critical success factors was also analyzed. This was achieved through getting responses about the relations being direct or indirect in polarity. Direct or positive polarity determines that change in one direction in the first factor is compounded by more change in similar direction in the other factor. However, indirect or negative polarity determines that change in one direction in the first factor is compounded by more change in opposite or reverse direction in the other factor.

This survey was distributed to targeted global professional respondents having experience in managing the construction projects in the developing countries through various online professional platforms like LinkedIn, social networking sites like Facebook and emails. The respondents were selected from different developing countries having similar construction limitations and problems as in Pakistan. 25% responses were taken from within Pakistan but the majority 75% responses were collected from other international developing countries of the Middle East, Central Asia, South East Asia and Far East. Once again the number of targeted respondents were designed keeping in view the response rate of survey respondents of professionals in the construction industry similar to the way it was done for the preliminary survey.

A total of one hundred and ten (110) construction professionals having experience in different construction sectors gave their opinion on the strength and polarity of the causal links between the critical success factors required for effective stakeholder management in the developing countries. of success factors for stakeholder management in developing countries. These professionals belonged to different construction organizations having ample experience in different construction sectors such as infrastructure, buildings, transport, and industrial. The frequency distribution of respondents' categories, job title, professional experiences and education is reflected in Table 4.6. Furthermore, the respondents belonged from developing countries as per scope and study objectives of the research which is displayed in the Figure 4.3.

Table 4. 6 Frequency distribution of responses (Main Survey)

Profile	**Frequency**	**Percentage**
Category		
Contractor	64	58%
Consultant	27	25%
Client	19	17%
Job Title		
Project Chief	9	8%
Planning & Control Manager	41	37%
Project Manager	24	22%
Planning Engineer	21	19%
Project Engineer	15	14%
Years of Experience		
0 to 5 years	16	15%
5 to 10 years	31	28%
10 to 15 years	36	33%
15 to 20 years	19	17%
Above 20 years	8	7%
Education		
Bachelors	33	43%
Masters	30	39%
Project Management Certification	14	18%

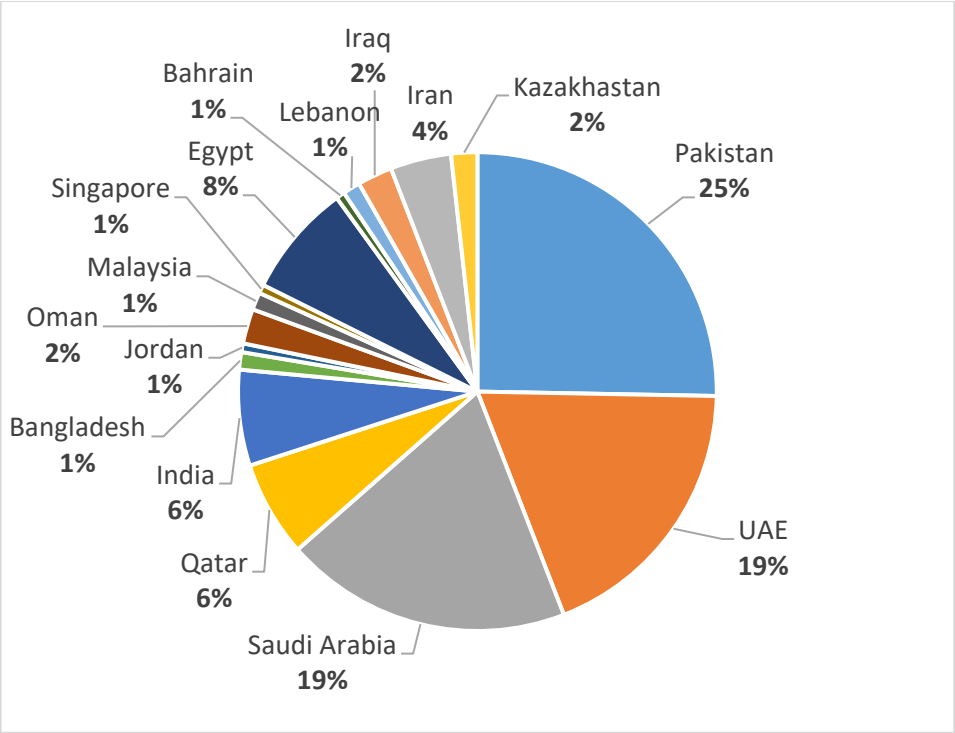

Figure 4. 2 Countries Distribution of Responses (Main Survey)

The data of the responses received for the final survey was statistically tested for its reliability and consistency. The test used to determine the reliability and internal consistency of the respondent's data is the Cronbach's Alpha test. The reliability of a data signifies that how well a test measures what it is aimed for. It is important measure to measure reliability of the multiple question surveys involving Likert scales. The ANOVA statistical test was conducted to determine the Cronbach's Alpha Test which came out to be 0.89 which is well above or greater than the acceptable limit of at least 0.7 as shown in Table 4.7. The Cronbach's alpha constant value greater than 0.8 and less than 0.9 depicts good internal consistency of the responses data. The result signifies that the data is reliable and internally consistent for being accepted for analysis and further use in the research study.

Table 4. 7 Cronbach's Alpha Constant for Final Survey Respondents Data

Source of Variation	SS	df	MS	F	P-value	F crit
Rows	1886.795	109	17.31004595	8.773773378	3.5978E-133	1.233248249
Columns	8719.073	305	28.58712331	14.48967508	0	1.137565205
Error	65590.078	33245	1.972930598			
Total	76195.945	33659				
Cronbach Alpha's constant			0.89			

4.5 Factors Inter Relationships Analysis

The data of the main final survey was analyzed to determine the relative importance and value of the relations in between the shortlisted eighteen factors. The causal strength of the relations between each two factors was individually by calculating the relative importance index or the mean value of the respondents' responses received for the causal strength. The causal strength was measured in three point likert scale ranging from low, medium and high strength. The mean value for each corresponding relation was determined through weighted scores of three point causal strengths.

The corresponding causal strength mean value of the 306 relations between eighteen critical success factors is determined through detailed analysis which is displayed in the influence matrix which depicts the causal strength and relation strength between the critical success factors. The influence matrix with corresponding relative importance mean values are listed in the Table 4.8.

Table 4. 8 Influence matrix of Causal Strength Mean Values/ Relative Importance Index

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8	Factor 9	Factor 10	Factor 11	Factor 12	Factor 13	Factor 14	Factor 15	Factor 16	Factor 17	Factor 18
Factor 1	5.00	4.07	2.42	2.24	3.89	3.11	2.64	3.96	2.89	3.18	2.55	2.75	2.49	2.96	2.85	2.89	2.84	2.96
Factor 2	3.78	5.00	2.40	3.96	2.56	3.05	2.76	2.89	4.04	3.42	2.75	2.76	2.76	3.87	2.75	4.49	2.56	3.16
Factor 3	2.75	2.65	5.00	4.38	2.53	2.84	3.89	2.62	2.82	2.85	2.71	2.82	2.73	2.96	2.91	2.67	2.56	2.95
Factor 4	2.65	3.93	3.89	5.00	2.53	2.98	2.75	3.76	2.75	3.04	2.75	2.85	2.73	3.05	2.96	2.75	2.55	4.05
Factor 5	3.98	2.55	2.75	2.75	5.00	3.04	4.05	2.82	2.73	3.09	2.75	2.84	4.33	4.24	2.93	3.96	2.80	3.93
Factor 6	2.82	2.56	2.69	2.47	2.82	5.00	2.85	2.91	2.75	4.35	2.78	3.67	2.75	2.76	2.98	2.78	2.75	3.11
Factor 7	2.84	2.58	4.13	2.45	3.89	3.11	5.00	2.56	2.29	2.75	2.76	2.75	2.73	3.00	2.71	2.75	2.56	2.73
Factor 8	4.16	2.55	2.62	3.89	2.82	3.15	2.65	5.00	2.35	3.84	2.75	2.69	3.87	2.99	2.51	2.56	2.95	2.98
Factor 9	2.84	3.89	2.53	2.75	2.69	2.75	2.65	2.35	5.00	3.60	2.69	4.20	2.67	4.42	2.67	3.71	2.56	3.93
Factor 10	2.76	3.85	2.58	2.53	2.80	3.89	2.47	4.16	2.75	5.00	2.73	2.98	2.82	2.75	2.73	2.75	2.55	2.84
Factor 11	2.78	2.73	2.55	2.55	2.75	2.80	2.75	2.82	2.27	3.58	5.00	3.02	2.55	2.91	2.75	2.62	2.56	2.84
Factor 12	2.71	2.58	2.75	2.53	2.71	4.38	2.47	2.51	3.76	3.55	2.75	5.00	2.73	2.98	2.73	2.78	2.56	3.11
Factor 13	2.69	2.31	2.53	2.60	3.91	2.75	2.44	4.27	2.20	3.51	2.71	2.64	5.00	2.82	2.75	2.56	2.84	2.84
Factor 14	2.64	4.42	2.55	2.76	3.98	2.78	2.76	2.87	3.80	2.75	2.75	2.55	2.69	5.00	2.64	2.84	2.65	2.75
Factor 15	2.73	2.75	2.60	2.75	3.15	2.53	2.75	3.11	3.15	2.78	2.73	2.78	2.58	3.02	5.00	2.73	2.91	2.84
Factor 16	2.80	3.87	2.51	2.51	4.18	2.71	2.51	3.15	3.71	2.71	2.82	2.73	2.64	2.95	2.73	5.00	3.09	3.15
Factor 17	2.76	2.35	2.49	2.53	2.75	2.69	2.47	3.02	3.18	2.64	2.82	2.55	2.78	3.05	2.58	2.62	5.00	2.85
Factor 18	2.67	2.44	2.55	3.73	4.18	2.69	2.38	3.00	3.85	2.55	2.78	2.65	2.95	2.96	2.75	2.56	2.84	5.00

However, the presence of significantly large number of relations between the critical success factors would result in the development of complex interactions and relationship loops between these factors. Therefore, researches have provided solutions (Chong, Fan, Sutrisna, Hsieh, & Tsai, 2017) to reduce the large number of values up to manageable and comprehensive limits so that it can ease in further analysis of the relations. The mean value of the relations that were above the relative importance index/ mean value of 0.8 were filtered to be used for further analysis. As a result the large number of 306 relations were filtered to nominal number of 19 relations which were used in the development of the causal loop diagram as further analysis. The filtered relations that were used for further development of CLDs are shown in Table 4.9.

Table 4. 9 Influence matrix of Filtered Causal Strength Mean Values/ Relative Importance Index

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8	Factor 9	Factor 10	Factor 11	Factor 12	Factor 13	Factor 14	Factor 15	Factor 16	Factor 17	Factor 18
Factor 1	5.00	+4.07																
Factor 2		5.00							+4.04							-4.49		
Factor 3			5.00	+4.38														
Factor 4				5.00														+4.05
Factor 5					5.00		-4.05						-4.33	+4.24				
Factor 6						5.00				+4.35								
Factor 7			+4.13				5.00											
Factor 8	+4.16							5.00										
Factor 9									5.00			+4.20		+4.42				
Factor 10								+4.16		5.00								
Factor 11											5.00							
Factor 12						+4.38						5.00						
Factor 13								+4.27					5.00					
Factor 14		+4.42												5.00				
Factor 15															5.00			
Factor 16					-4.18											5.00		
Factor 17																	5.00	
Factor 18					+4.18													5.00

4.6 Causal Loop Diagram (CLD)

The causal relations shortlisted based on mean value of 0.7 and more are used for the development of the Causal Loop Diagrams. The Causal Loop Diagrams are developed using the VENSIM tool which provides a graphical modeling interface using the causal loop diagrams.

The developed CLD is presented in the Figure 4.4 which gives and provides a provides a better understanding of what and how the system of critical factors is derived to comprehend the causal effect of critical success factors of effective stakeholder management in the construction projects of the developing countries. The causal diagram aids in graphically presenting the causation chains and links developed between the different critical success factors (CSFs) which are also validated from the literature study.

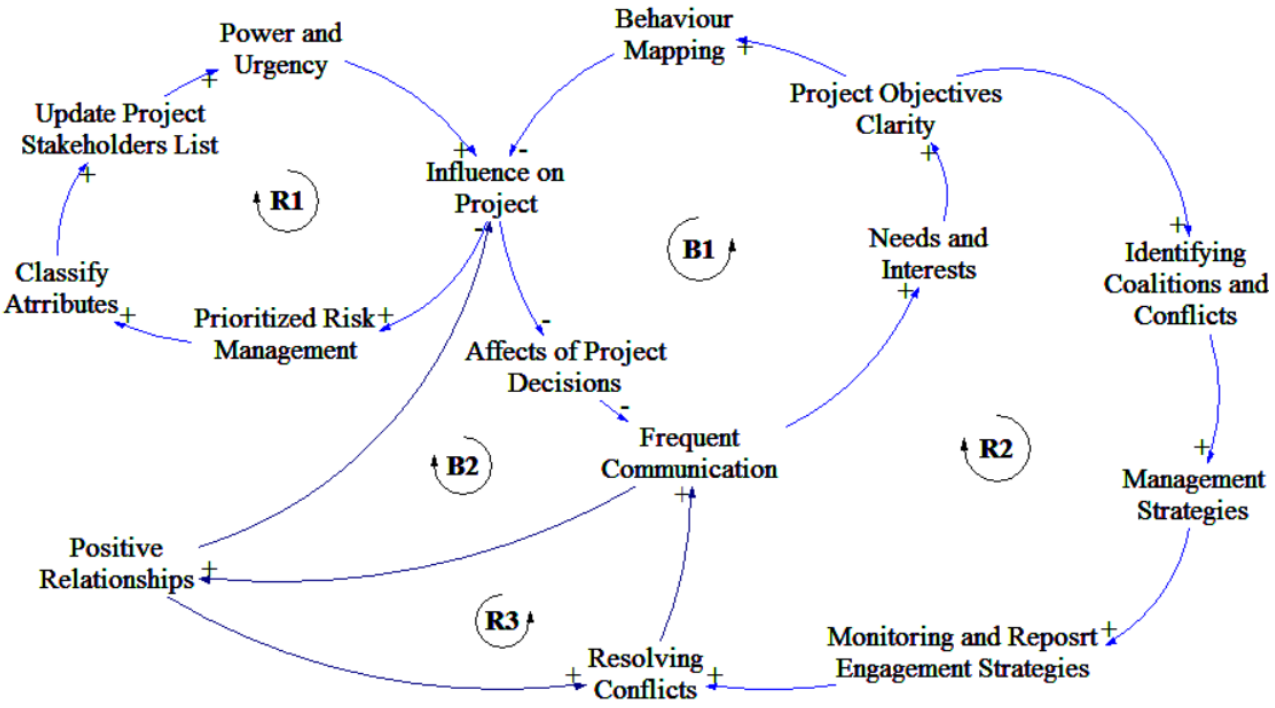

Figure 4. 3 Causal Loop Diagram of Critical Success Factors (CSFs)

The CLD was broken down into feedback and causation loops based on their interaction and linkages in the causal system. Overall, five major loops were identified through visual, logical inspection and contents of the literature review. There are two defined forms of feedback loops in the causal loop diagram depending on their performance known as the reinforcing and balancing loops. The reinforcing loops which are also known as the positive loops have an increasing or decreasing effect continuously in the feedback loop. On the contrary, the balancing loops which are also known as the negative loops have counter or opposite change in the complete feedback loop or cycle. An increase in a causal relationship will end in a decrease in the causal relationship at the end of the loop in the case of the balancing loop. There are three reinforcing loops in the feedback system developed (R1, R2 and R3) which make the entire loop or causation cycle flow in one direction. As explained before, the positive causation loops are reinforcing in nature which supports either the quick descending or the quick ascending trend in the project performance. The remaining two loops were the balanced loops in the system (B1 and B2). In the balancing loop, the change in one direction of system causation and direction is balanced by the counter change in the opposite direction. The resultant effect is of balancing systems flow as explained in the causal loop analysis part. The detailed analysis of all the loops is described in detail in the aforementioned section.

4.7 Causal Loops Analysis

The identified causal loops from the Causal Loop diagram are individually analyzed and their impact is assessed based on the construction industry knowledge available in the literature and causal relations ascertained by construction industry professional working in the developing countries as per the scope and objective of the research.

4.7.1 Reinforcing Causal Loop 1

The first reinforcing closed loop was developed involving five critical success factors namely "Prioritized Risk Management", "Classify Attributes", "Update Project Stakeholder List", "Power and Urgency" and "Influence on Project" as shown in Figure 4.5.

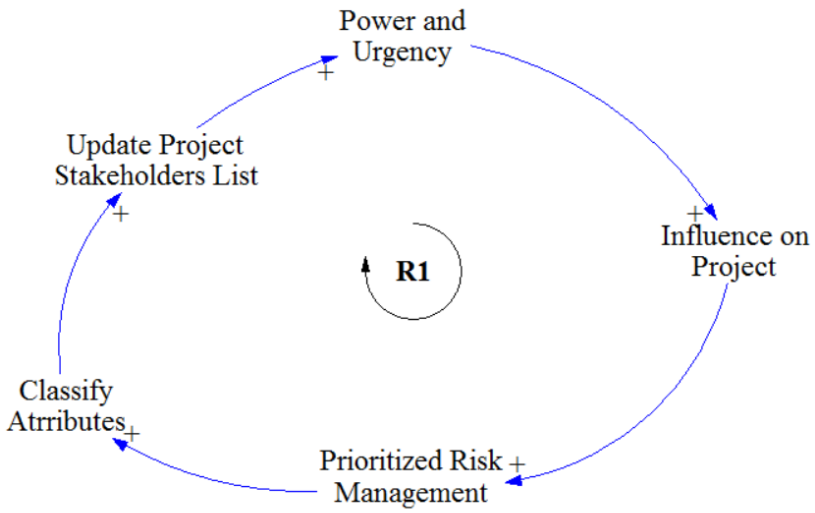

Figure 4. 4 Reinforcing Loop 1

The reinforcing loop explains the relation between the classification of stakeholders and prioritized risk management to ensure effective stakeholder management and success in a project. It is observed in various researches and literature that the stakeholder and risk prioritization is useful for assisting in the decision-making situations. This can be substantially achieved by simply classifying and updating the stakeholders list in a project.

Stakeholder prioritization is significantly helpful in assisting for the project decision-making situations where multiple stakeholders may have competing and overlapping interests. Limited

resources prevent in addressing of all the requirements of project stakeholders. Therefore, it is important to classify stakeholders according to their influence, power and urgency in a project. The categorized stakeholders can then be proactively addressed to resolve the prioritized risks and constraints of a project. (Bendjenna, Charre, & Eddine Zarour, 2012)

Stakeholder classifications and attributes are commonly dependent on the level and extent of influence that a stakeholder individual or group has on the organization. Hence the stakeholder classifications often reflects the criteria which represents the stakeholder's ability to affect and influence the project's behaviour, direction, processes and outcomes.

Similar system behaviour can be analyzed through the developed reinforced causal loop. Stakeholder classification and identification of stakeholder attributes can help to identify stakeholders that have more power and urgency to affect and influence the construction project. These stakeholders have higher level of influence in the project due to their power and urgency. The higher influencing stakeholders warrant prioritized management of their constraints and risks. Hence, such approach can be adopted to resolve critical stakeholder risks and constraints so that project is least affected by highly influencing stakeholders. The prioritized resolution of risks aids in further refining of the classification and attributing of stakeholders. This is because the stakeholders influence is minimized due to prioritized risk management and constraint resolution.

4.7.2 Reinforcing Causal Loop 2

The second reinforcing closed loop was developed involving seven critical success factors namely "Project Objectives Clarity", "Identifying Coalitions and Conflicts", "Management Startegies", "Monitoring and Report Engagement Strategies", "Resolving Conflicts", "Frequent Communication" and "Needs and Interests" as shown in Figure 4.6.

Stakeholder engagement in the construction projects can be postulated through various methods and ways. The stakeholder engagement process can be visualized as a strategic management perspective. The aim of this process is to obtain maximum knowledge and increase the acceptance of the project by the project stakeholders which is in turn achieved through conflict resolution and strategic stakeholder engagement processes. Effective communication and assessment of stakeholder needs and interests help to develop relevant management strategies that engage different stakeholders according to their relevant interests and influence on the project. This approach facilitates in

clarifying project objectives and removes any misunderstandings and divergent attitudes and project goals of stakeholders involved in the project.

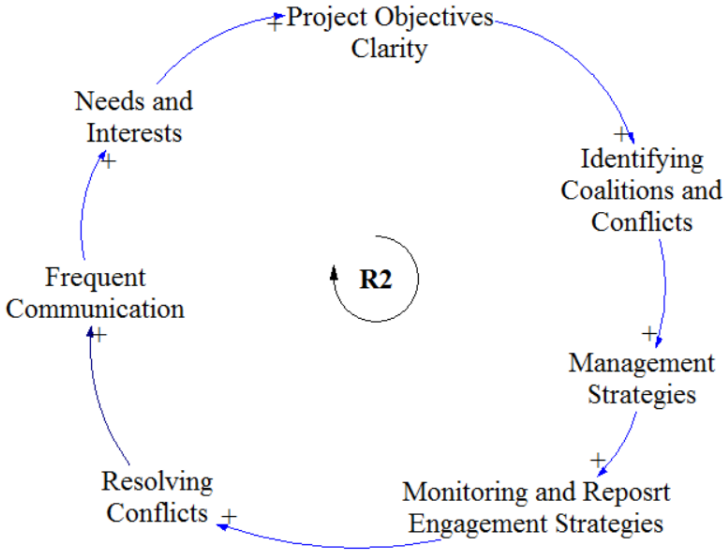

Figure 4. 5 Reinforcing Loop 2

The reducing of conflicts between the stakeholders and encouraging innovation and meaningful interaction and dialogue can be seen as a turning stone to enhance inclusive decision making of a project. Healthy and constructive communication and interactions between different stakeholders emerge as a result that serve to achieve the common objective and goal of successful project completion.

The need to get involved with the construction project stakeholders in the decision-making processes is greatly linked to improving the sense of ownership and relevance for the involved construction stakeholders. This collective approach to pursue for the project objectives brings fruitful results for the project outcome and delivery. The effectiveness of stakeholder interactions that take place within the assessment process depends on the relationships developed between the project decision-making and assessment processes (Mathur et al., 2008).

Similar system behaviour can be analyzed through the developed reinforced causal loop. Stakeholder communication and interaction helps to ascertain the needs and interests of different involve project stakeholders. The identification of needs and interests can then help to develop clarity in the project objectives that the stakeholders are striving for which is ensured through alignment of stakeholders for common objectives and interests. Stakeholders having clarity in project objectives can align their

interests with other stakeholders which helps in identification of stakeholder coalitions and conflicts. The developed coalitions and conflicts based on their interest and objectives helps the managers to develop efficient management strategies. The developed strategies require effective monitoring and engagement so that they can be efficiently utilized to resolve conflicts between the stakeholders. Mitigating the conflicts and constraints in the project can strengthen the communication and interaction between the stakeholders.

4.7.3 Reinforcing Causal Loop 3

The third reinforcing closed loop was developed involving three critical success factors namely "Positive Relationships", "Resolving Conflicts" and "Frequent Communication" as shown in Figure 4.7.

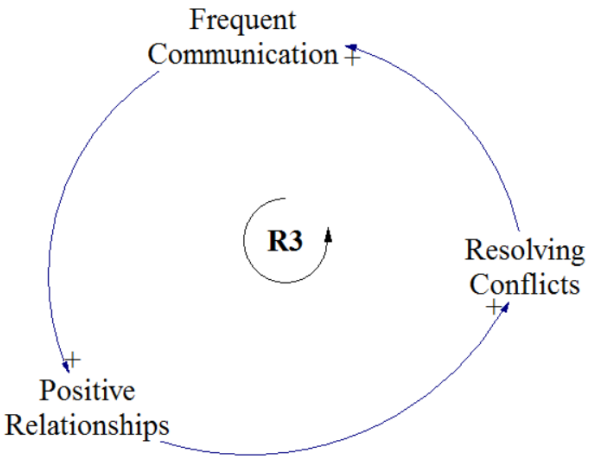

Figure 4. 6 Reinforcing Loop 3

There is a rising need and understanding for the study of resolving project crisis and conflicts through communication. This is because it can provide a better understanding of the role of communication at not just the time of building up of crisis but also during the recovery processes in the course of a project. The communication following a conflict and constraint plays an integral role in the successful resolution of the conflict. There is a great deal of importance in developing strong relationships with project stakeholders, so that the project organization should focus on building the mutually beneficial relationships with the stakeholders. It also helps to focus on significantly important and vital project and organizational responsibility through the development of communication channels.

Similarly, the importance of two-way communication between project stakeholders is determined. It is important that the information is transferred through effective communication channels to and from the project stakeholders so that project specific interests and goals are developed between the stakeholders. This symmetrical communication process ensures significance of all stakeholders and helps in raising project risks and constraints effectively before any conflict arises.

The role of efficient leadership is detrimental for this process since the leadership's authority and lead ascertains the project direction and future path. Leadership should possess strong management and engagement attributes that can be utilized to build positive relationships and linkages between the project stakeholders. The importance of leadership communication is effective after a conflict arises as the skills and management knowledge is tested to resolve the conflict and improve the relationship with the stakeholders to ensure mutual project objectives are achieved. As a result of effective communication channel developed within the project stakeholders, the project's leadership get the benefits of improved and positive attention, instrumental communication channels with different levels and categories of stakeholders and stakeholder advocacy (Ulmer, 2001).

To summarize the causal loop system, effective communication between stakeholders is important for developing positive and long lasting relations with project stakeholders. This positive relations and communication skills and channels help to resolve project constraints and conflicts. The resolution of conflicts improves relations between the stakeholders as common project objectives and goals are materialized which further improves and strengthens the communication and interaction between the stakeholders.

4.7.4 Balancing Causal Loop 1

The first balancing closed loop was developed involving six critical success factors namely "Needs and Interests", "Project Objectives Clarity", "Behaviour Mapping", "Influence on Project", "Affects of Project Decisions" and "Frequent Communication" as shown in Figure 4.8.

The causal portrays the need for attention and prioritization of stakeholders having more interests in the project (Aaltonen et al., 2008). The frequent communication between the stakeholders and the project managers facilitates in identifying the needs and interests of the stakeholders involved in the project. Communication channels between the stakeholders can determine the needs and requirements of the stakeholders from the project. This ascertainment of needs and interests of the

stakeholders results in the clarification of project objectives and goals. The stakeholders can model their behaviour based on the clarification of the project goals and objectives.

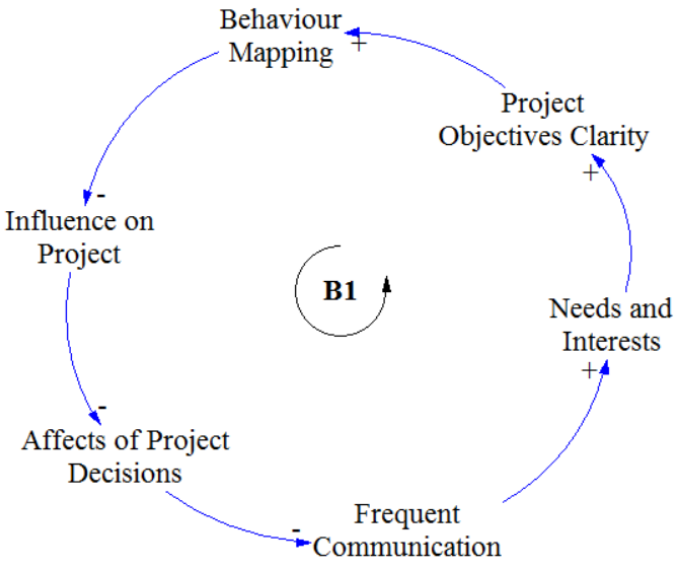

Figure 4. 7 Balancing Loop 1

The identification of stakeholder needs and their corresponding influence on the project objectives presents the behaviour and interests of the stakeholder in the project. This stakeholder influence and interests are more categorically monitored due to dynamics of stakeholder influence and needs. This is achieved through behavior mapping of the important and more relevant stakeholders who have higher interest in the project objectives.

The behaviour mapping can formulate strategies to manage stakeholders and predict their responses before any conflict or project constraint arises. The engagement strategies developed to timely manage the stakeholders prevent the stakeholders from negatively or adversely influencing the project at time of constraints. This is due to efficient stakeholder mapping and development of engagement strategies and response plans. The stakeholder influence can be reduced to minimize its effect on the project and its decisions.

Since the influence and effect of stakeholder on project decisions is minimized and mitigated due to effective stakeholder interest identification and behaviour mapping, the stakeholder require less communication channels and engagement due to their less influence on the project.

4.7.5 Balancing Causal Loop 2

The second balancing closed loop was developed involving four critical success factors namely "Positive Relationships", "Influence on Project", "Affects of Project Decisions" and "Frequent Communication" as shown in Figure 4.9.

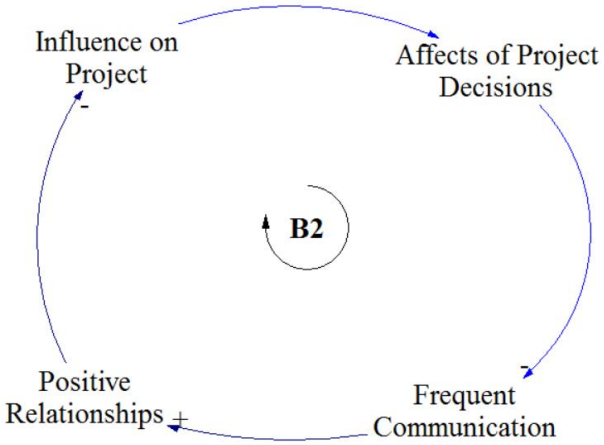

Figure 4. 8 Balancing Loop 2

The causal loop defines the need of positive relationship developed by trust and communication between stakeholders to reduce and minimize stakeholder negative influence and ability to affect project decisions that adversely hamper project progress and performance.

There is a great deal of importance of the attribute of trust as a facilitator of positive relationships between the project stakeholders. Positive relationship developed through stakeholder's trust is said to have improved a multitude of organizational and project based relationships, which include the dynamic behaviour of project teams, support from top management and coordination between different functional departments of the organization.

Positive relationship between project stakeholders and level of trust is developed through effective and two way proactive communication between them. Therefore, trust is seen and strongly acknowledged as an important component for developing and maintaining strong, healthy and cooperative partnerships between the stakeholders working in similar projects (Jeffrey K. Pinto, 2009).

Therefore, the significance of effective communication between the stakeholders helps to develop positive and positive working relationship between the stakeholders of a project. The effective relationship developed between the stakeholders reduces the stakeholder ability to affect and influence the project. This is due to resolution and management of constraints in effective manner through developed relations based on trust and understanding.

Since the influence and effect of stakeholder on project decisions is minimized and mitigated due to effective stakeholder communication and development of positive relationships, the stakeholder require less communication channels and engagement due to their less influence on the project. Stakeholders influence and effect on the project is minimized due to working relationship and less communication is required due to improved trust and understanding between the project stakeholders.

Chapter 5

CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

The outcome of this research study and data analysis is discussed in this section to draw conclusions for the professional managers to comprehend and understand. The recommendations in terms of limitatios and scope of improvement and further research work is discussed in the recommendations section.

5.2 Conclusions

Results indicate that ‘Communication’ and ‘Stakeholder Influence’ are the most important success factors for effective stakeholder management. This can be analyzed by the involvement of these critical success factors in multiple system causal loops. Therefore the researches have also stressed on communication and stakeholder interests and influences as important and significant to effectively manage stakeholders in construction projects to ensure project success.

Attributing and classifying stakeholders effectively also helps to determine power and urgency of more critical and influencing stakeholders which can be managed through prioritized resolution of the project risks and constraints. Effective communication can clarify needs of stakeholders that can be used to form engagement strategies to resolve conflicts. Behaviour mapping of stakeholders can reduce the stakeholder influence and effect on the project which helps in reducing need for communication for less influencing and important stakeholders.

The CLD provides a more comprehensive way to understand the stakeholder critical success factors (CSFs). The developed causal loops provide logical and systematic flow of causation to realize the problems of effectively managing stakeholder in construction projects. Strategies to manage stakeholder constraints and conflicts can be graphically analyzed through the causal loops and significant causal links and success factors can be applied to resolve real project issues related to effective stakeholder management. This improves the overall project management practices in the developing countries and economies thereby increasing the project success rate.

Large number of relations were developed between the shortlisted eighteen (18) critical success factors. The relations between the critical factors were reduced based on average mean value or relative importance of these relations. Therefore, large number of relations between the factors that had less relative significance and mean value were not incorporated in the causal loop diagram and the corresponding feedback loops. As a result, some important and critical linkages and relations that may have formed further closed loops in the system were not materialized. This way some important aspect of factors causation may have not been incorporated in the causal lops and system analysis.

5.3 Recommendations

Only Qualitative/Logical interrelations among risk factors that provide the perception of project stakeholder management. The causal lops do not provide quantitative relationships and system dynamics through the corresponding related success factors. Future studies can focus on developing a System Dynamics model to include dynamic quantitative relationships between these related critical success factors (CSFs).

Furthermore, project specific studies modelled for particular types of project such as infrastructure, industrial and buildings can be undertaken to provide a holistic knowledge of causal relations for specific types of projects that can be applied and utilized by industry professionals associated with those projects only.

References

Aaltonen, K., Jaakko, K., & Tuomas, O. (2008). Stakeholder salience in global projects. *International Journal of Project Management, 26*(5), 509-516. doi: 10.1016/j.ijproman.2008.05.004

Ahmad, Z., Thaheem, M. J., & Maqsoom, A. (2018). Building information modeling as a risk transformer: An evolutionary insight into the project uncertainty. *Automation in Construction, 92*, 103-119. doi: 10.1016/j.autcon.2018.03.032

Akintoye, A., Hardcastle, C., Beck, M., Chinyio, E., & Asenova, D. (2003). Achieving best value in private finance initiative project procurement. *Construction Management and Economics, 21*(5), 461-470. doi: 10.1080/0144619032000087285

Albert P. C. Chan, D. C. K. H., and C. M. Tam. (2001). Design and Build Project Success Factors: Multivariate Analysis. *J. Constr. Eng. Manage, 127*, 93-100.

Albert Ping Chuen Chan, A. D., Ayokunle Olubunmi Olanipekun, Ernest, & Ameyaw, E. (2018). Critical Barriers to Green Building Technologies Adoption in Developing Countries:

The Case of Ghana. *Journal of Cleaner Production*. doi: 10.1016/j.jclepro

Atkin, B., & Skitmore, M. (2008). Editorial: stakeholder management in construction. *Construction Management and Economics, 26*(6), 549-552. doi: 10.1080/01446190802142405

Bakens, W., Foliente, G., & Jasuja, M. (2005). Engaging stakeholders in performance-based building: lessons from the Performance-Based Building (PeBBu) Network. *Building Research & Information, 33*(2), 149-158. doi: 10.1080/0961321042000322609

Bendjenna, H., Charre, P. J., & Eddine Zarour, N. (2012). Using multi-criteria analysis to prioritize stakeholders. *Journal of Systems and Information Technology, 14*(3), 264-280. doi: 10.1108/13287261211255365

Bouchouicha, R., & Vieider, F. M. (2017). Accommodating stake effects under prospect theory. *Journal of Risk and Uncertainty, 55*(1), 1-28. doi: 10.1007/s11166-017-9266-y

Bourne, L., & Walker, D. H. T. (2005). Visualising and mapping stakeholder influence. *Management Decision, 43*(5), 649-660. doi: 10.1108/00251740510597680

Cheeks, J. R. (2003). Multistep Dispute Resolution in Design

and Construction Industry. *JOURNAL OF PROFESSIONAL ISSUES IN ENGINEERING EDUCATION AND PRACTICE, 129*(2), 84-91. doi: 10.1061//asce/1052-3928/2003/129:2/84

Chinyio, E. A., & Akintoye, A. (2008). Practical approaches for engaging stakeholders: findings from the UK. *Construction Management and Economics, 26*(6), 591-599. doi: 10.1080/01446190802078310

Chong, H.-Y., Fan, S.-L., Sutrisna, M., Hsieh, S.-H., & Tsai, C.-M. (2017). Preliminary Contractual Framework for BIM-Enabled Projects. *Journal of Construction Engineering and Management, 143*(7), 04017025. doi: 10.1061/(asce)co.1943-7862.0001278

Choudhry, R. M., Aslam, M. A., Hinze, J. W., & Arain, F. M. (2014). Cost and Schedule Risk Analysis of Bridge Construction in Pakistan: Establishing Risk Guidelines. *Journal of Construction Engineering and Management, 140*(7), 04014020. doi: 10.1061/(asce)co.1943-7862.0000857

Cooke-Davies, T. (2002). The ‘‘real’’ success factors on projects. *International Journal of Project Management, 20*, 185-190.

Cornett, M. M., Marcus, A. J., Saunders, A., & Tehranian, H. (2007). The impact of institutional ownership on corporate operating performance. *Journal of Banking & Finance, 31*(6), 1771-1794. doi: 10.1016/j.jbankfin.2006.08.006

Cova, B., & Salle, R. (2005). Six key points to merge project marketing into project management. *International Journal of Project Management, 23*(5), 354-359. doi: 10.1016/j.ijproman.2005.01.006

Dr. George F. Jergeas, E. W., Gregory J. Skulmoski, Dr. Janice L. Thomas. (2000). Stakeholder management on construction projects. *AACE International Transactions*, P12.11-P12.16.

Duy Nguyen, L., Ogunlana, S. O., & Thi Xuan Lan, D. (2004). A study on project success factors in large construction projects in Vietnam. *Engineering, Construction and Architectural Management, 11*(6), 404-413. doi: 10.1108/09699980410570166

Ejaz N, H. J., Shabir F, Shamim M A, Naeem U A, Tahir M, Ahmad N, Farooq Q U. (2013). Assessment of most critical success factors for mega construction projects in Pakistan. *Life Sci Journal, 10*(10s), 255-261.

El-Gohary, N. M., Osman, H., & El-Diraby, T. E. (2006). Stakeholder management for public private partnerships. *International Journal of Project Management, 24*(7), 595-604. doi: 10.1016/j.ijproman.2006.07.009

Elias, C., Jackson. (2002). Stakeholder analysis for R&D project
management. *R&D Management, 32*(4), 301-310.

Fiolet, J.-C., Haas, C., & Hipel, K. (2016). Risk-chasing behaviour in on-site construction decisions. *Construction Management and Economics, 34*(12), 845-858. doi: 10.1080/01446193.2016.1207790

Francisco de Oliveira, G., & Rabechini Jr, R. (2019). Stakeholder management influence on trust in a project: A quantitative study. *International Journal of Project Management, 37*(1), 131-144. doi: 10.1016/j.ijproman.2018.11.001

Hsieh, H. F., & Shannon, S. E. (2005). Three approaches to qualitative content analysis. *Qual Health Res, 15*(9), 1277-1288. doi: 10.1177/1049732305276687

Hunter, A. T. W. Y. Q. S. J. K. a. K. (2006). Investigation of Critical Success Factors in Construction Project Briefing by Way of Content Analysis. *Constr. Eng. Management, 132*, 1178-1186. doi: 10.1061//asce/0733-9364/2006/132:11/1178

Jeffrey K. Pinto, D. P. S., Brent English. (2009). Trust in projects: An empirical assessment of
owner/contractor relationships. *International Journal of Project Management, 27*, 638-648. doi: 10.1016/j.ijproman.2008.09.010

Jepsen, A. L., & Eskerod, P. (2009). Stakeholder analysis in projects: Challenges in using current guidelines in the real world. *International Journal of Project Management, 27*(4), 335-343. doi: 10.1016/j.ijproman.2008.04.002

Kam Jugdev, R. M. (2005). A RETROSPECTIVE LOOK AT OUR EVOLVING
UNDERSTANDING OF PROJECT SUCCESS. *Project Management Journal, 36*(4), 19-31.

Karlsen, J. T. (2002). Project Stakeholder Management. *Engineering Management Journal, 14*(4), 19-24. doi: 10.1080/10429247.2002.11415180

Karslen, A., Birkley. (2005). What Characterizes Successful IT Projects. *International Journal of Information Technology & Decision Making, 4*(4), 525-540.

Leung, C., Ng, Cheung (2004). Demystifying stakeholders' commitment and its impacts on construction projects. *Construction Management and Economics, 22*(7), 701-715. doi: 10.1080/0144619042000300736

Love, P. E. D., Mandal, P., & Li, H. (1999). Determining the causal structure of rework influences in construction. *Construction Management and Economics, 17*(4), 505-517. doi: 10.1080/014461999371420

Lynda Bourne, D. H. T. W. (2006). Visualising Stakeholder Influence-Two Austrailian Examples. *Project Management Journal, 37*(1), 5-21.

Lynda Bourne, D. H. T. W. (2008). Project relationship management and the Stakeholder Circle. *International Journal of Managing Projects in Business, 1*(1), 125-130. doi: 10.1108/17538370810846450

Mathur, V. N., Price, A. D. F., & Austin, S. (2008). Conceptualizing stakeholder engagement in the context of sustainability and its assessment. *Construction Management and Economics, 26*(6), 601-609. doi: 10.1080/01446190802061233

McGrath, S. K., & Whitty, S. J. (2017). Stakeholder defined. *International Journal of Managing Projects in Business, 10*(4), 721-748. doi: 10.1108/ijmpb-12-2016-0097

Mok, K. Y., Shen, G. Q., & Yang, J. (2015). Stakeholder management studies in mega construction projects: A review and future directions. *International Journal of Project Management, 33*(2), 446-457. doi: 10.1016/j.ijproman.2014.08.007

Mok, M. K. Y., & Shen, G. Q. (2016). A network-theory Based Model for Stakeholder Analysis in Major Construction Projects. *Procedia Engineering, 164*, 292-298. doi: 10.1016/j.proeng.2016.11.622

Molwus, J. J., Erdogan, B., & Ogunlana, S. (2017). Using structural equation modelling (SEM) to understand the relationships among critical success factors (CSFs) for stakeholder management in construction. *Engineering, Construction and Architectural Management, 24*(3), 426-450. doi: 10.1108/ecam-10-2015-0161

Naveed, M. H., Thaheem, M. J., Khurshid, M. B., & Farooqui, R. U. H. (2016). Performance Assessment of Construction Engineering and Management (CEM) Degree Program in Developing Countries: Case of Pakistan. *International Journal of Construction Education and Research, 13*(1), 3-23. doi: 10.1080/15578771.2016.1183732

Newcombe, R. (2003). From client to project stakeholders: a stakeholder mapping approach. *Construction Management and Economics, 21*(8), 841-848. doi: 10.1080/0144619032000072137

Nissen, R. I. a. M. (2003). *Emerging Technology to Model Dynamic Knowledge Creation and Flow among Construction Industry Stakeholders during the Critical*

Feasibility-Entitlements Phase. Paper presented at the Fourth Joint International Symposium on Information Technology in Civil Engineering, Nashville, Tennessee, United States.

Olander, S., & Landin, A. (2005). Evaluation of stakeholder influence in the implementation of construction projects. *International Journal of Project Management, 23*(4), 321-328. doi: 10.1016/j.ijproman.2005.02.002

Olander, S., & Landin, A. (2008). A comparative study of factors affecting the external stakeholder management process. *Construction Management and Economics, 26*(6), 553-561. doi: 10.1080/01446190701821810

Olomolaiye, M.-y. L. a. P. (2010). Construction

Stakeholder Management E. C. a. P. Olomolaiye (Ed.) *Risk and Construction Stakeholder Management*

Oppong, G. D., Chan, A. P. C., & Dansoh, A. (2017). A review of stakeholder management performance attributes in construction projects. *International Journal of Project Management, 35*(6), 1037-1051. doi: 10.1016/j.ijproman.2017.04.015

Rasul, N., Malik, M. S. A., Bakhtawar, B., & Thaheem, M. J. (2019). Risk assessment of fast-track projects: a systems-based approach. *International Journal of Construction Management*, 1-16. doi: 10.1080/15623599.2019.1602587

Razzaq, A., Thaheem, M. J., Maqsoom, A., & Gabriel, H. F. (2016). Critical External Risks in International Joint Ventures for Construction Industry in Pakistan. *International Journal of Civil Engineering, 16*(2), 189-205. doi: 10.1007/s40999-016-0117-z

Ritter, L. A., & Sue, V. M. (2007). The survey questionnaire. *New Directions for Evaluation, 2007*(115), 37-45. doi: 10.1002/ev.234

Roger Miller, B. H. (2005). Governance Regimes For Large

Complex Projects. *Project Management Institute, 36*(3), 42-50.

Rowlinson, S., & Cheung, Y. K. F. (2008). Stakeholder management through empowerment: modelling project success. *Construction Management and Economics, 26*(6), 611-623. doi: 10.1080/01446190802071182

Spillane, L. O. O. J. V. M. A. K. B. E. J. I. K. T. J. P. (2011). Confined site construction: A qualitative investigation of critical issues affecting management of health and safety. *Journal of Civil Engineering and Construction Technology, 2*(7), 138-146.

Toor, S.-u.-R., & Ogunlana, S. O. (2008). Critical COMs of success in large-scale construction projects: Evidence from Thailand construction industry. *International Journal of Project Management, 26*(4), 420-430. doi: 10.1016/j.ijproman.2007.08.003

Toor, S.-u.-R., & Ogunlana, S. O. (2010). Beyond the 'iron triangle': Stakeholder perception of key performance indicators (KPIs) for large-scale public sector development projects. *International Journal of Project Management, 28*(3), 228-236. doi: 10.1016/j.ijproman.2009.05.005

Toor, S. u. R., & Ogunlana, S. O. (2009). Construction professionals' perception of critical success factors for large-scale construction projects. *Construction Innovation, 9*(2), 149-167. doi: 10.1108/14714170910950803

Ullah, F., Ayub, B., Siddiqui, S.Q. and Thaheem, M.J. (2016). A review of public-private partnership: critical factors of concession period. *Journal of Financial Management of Property and Construction, 21*(3), 269-300.

Ulmer, R. R. (2001). Effective Crisis Management through established Stakeholder Relationships. *Management Communication Quarterly, 14*(4), 590-615.

Walker, D. H. T. (1997). Choosing an appropriate research methodology. *Construction Management and Economics, 15*(2), 149-159. doi: 10.1080/01446199700000003

Ward, S., & Chapman, C. (2008). Stakeholders and uncertainty management in projects. *Construction Management and Economics, 26*(6), 563-577. doi: 10.1080/01446190801998708

Xia, N., Zou, P. X. W., Griffin, M. A., Wang, X., & Zhong, R. (2018). Towards integrating construction risk management and stakeholder management: A systematic literature review

and future research agendas. *International Journal of Project Management, 36*(5), 701-715. doi: 10.1016/j.ijproman.2018.03.006

Yang, J., Shen, G. Q., Ho, M., Drew, D. S., & Xue, X. (2011). Stakeholder management in construction: An empirical study to address research gaps in previous studies. *International Journal of Project Management, 29*(7), 900-910. doi: 10.1016/j.ijproman.2010.07.013

Yang Jing , G. Q. S., Manfong Ho , Derek S. Drew & Albert P. C. Chan. (2010). Exploring critical success factors for stakeholder management in construction projects. *Journal of Civil Engineering and Management, 15*(4), 337-348. doi: 10.1061//asce/co.1943-7862.0000180

Yang, R. J., & Shen, G. Q. P. (2015). Framework for Stakeholder Management in Construction Projects. *Journal of Management in Engineering, 31*(4), 04014064. doi: 10.1061/(asce)me.1943-5479.0000285

Yu, T., Liang, X., Shen, G. Q., Shi, Q., & Wang, G. (2019). An optimization model for managing stakeholder conflicts in urban redevelopment projects in China. *Journal of Cleaner Production, 212*, 537-547. doi: 10.1016/j.jclepro.2018.12.071

Zmud, A. C. B. R. W. (1984). An Assessment of Critical Success Factors. *Sloan Management Review, 25*(4), 17-27.

Appendix 1

Success Factors for effective Stakeholder Management in construction projects

Stakeholder management plays a significant role in the successful delivery of construction projects. Increasing number of studies have identified importance of stakeholder management in construction projects.

Construction projects in developing countries face difficulties in successful completion due to improper stakeholder management practices and lack of any established practical framework.

This study aims to develop a practical framework and model for effective stakeholder management using critical success factors (CSFs) that can serve as a guide for construction professionals undertaking construction projects in developing countries.

This survey aims to take expert opinion and input from construction industry professionals about important success factors required to effectively manage different stakeholders involved in a typical construction project.

Development of Survey

Research papers published in top journals were studied to extract different success factors that play significant role in effectively managing stakeholders in construction projects. The common factors mentioned in these papers are presented in this survey to determine experts' opinion on their importance and validity.

Respondents Information

This section of the survey collects data/information about respondents construction professionals' roles and experiences.

Respondent Name *

Your answer

Name of Organization *

Your answer

Type of projects worked on *

Your answer

Country of experience *

Your answer

Position title *

Your answer

Qualification maximum *

Your answer

Which category of construction project stakeholder do you belong to? *

Contractor
Consultant
Client
Other:

Construction industry experience *

Less than 5 years
5 to 10 years
10 to 15 years
15 to 20 years
More than 20 years

Stakeholder Management

In this section respondents are required to provide their opinion about the importance of the listed success factors required for effective stakeholder management in construction projects based on their professional experiences and knowledge.

How important are the following factors to ensure effective stakeholder management in construction industry? *

	Not Important, Slightly Important, Moderately Important, Important, Very Important
Clear project objectives	
Favorable procurement method	
Identify and update project stakeholder list	
Flexible project organization	
Prioritize stakeholder needs and interests	
Stakeholders power, urgency, legitimacy and proximity	
Classify stakeholder attributes	
Stakeholders' behaviours mapping	
Stakeholders' influence on each other	
Stakeholders' influence on the project	
Identify conflicts & coalitions among stakeholders	
Resolving stakeholders conflicts	
Change of stakeholders' interests	
Change of stakeholders' influence	
Change of relationship among stakeholders	
Analyze change in stakeholders' attributes	
Affect of project decisions on stakeholders	
Reaction to implement project decisions	
Redefine/refine project mission with relevant stakeholders	
Strategies to manage different stakeholders	
Positive relationships among the stakeholders	
Frequent two way communication between stakeholders	

Social, economic, legal, environmental & ethical responsibilities
Influencing through communication (interview/data collection)
Accessibility to stakeholders
Consult project team for stakeholders' interests and needs
Front end stakeholder analysis
Communication throughout the project
Defined Stakeholder management plan processes
Monitor and reporting engagement strategies
Risk management with prioritized stakeholders
Effective and committed leadership
Motivate/Engage through incentives and awards
Transparency and trust in decision making
Stakeholder management and skills training
Top level support
Proactive engagement
Consensus building and learning
Trust between stakeholders
Interdependencies of issues
Allocation of resources
Clear project objectives
Favorable procurement method
Identify and update project stakeholder list
Flexible project organization
Prioritize stakeholder needs and interests
Stakeholders power, urgency, legitimacy and proximity
Classify stakeholder attributes
Stakeholders’ behaviours mapping
Stakeholders’ influence on each other
Stakeholders’ influence on the project
Identify conflicts & coalitions among stakeholders
Resolving stakeholders conflicts
Change of stakeholders’ interests
Change of stakeholders’ influence
Change of relationship among stakeholders
Analyze change in stakeholders’ attributes
Affect of project decisions on stakeholders
Reaction to implement project decisions
Redefine/refine project mission with relevant stakeholders
Strategies to manage different stakeholders
Positive relationships among the stakeholders
Frequent two way communication between stakeholders
Social, economic, legal, environmental & ethical responsibilities
Influencing through communication (interview/data collection)
Accessibility to stakeholders
Consult project team for stakeholders' interests and needs
Front end stakeholder analysis
Communication throughout the project

Defined Stakeholder management plan processes
Monitor and reporting engagement strategies
Risk management with prioritized stakeholders
Effective and committed leadership
Motivate/Engage through incentives and awards
Transparency and trust in decision making
Stakeholder management and skills training
Top level support
Proactive engagement
Consensus building and learning
Trust between stakeholders
Interdependencies of issues
Allocation of resources

Appendix 2

Framework of effective stakeholder management using critical success factors to improve project performance in construction: Causal Loop Diagram Approach

This questionnaire survey is aimed for MS thesis research titled “Critical Success Factors for effective stakeholder management in projects of developing countries: A system dynamics approach”.

The main objective of this survey study is to determine level of influence (causal strength) and relationship (polarity) of contributing critical success factors of stakeholder management in the construction projects and develop a framework to understand and implement successful stakeholder management strategies to ensure success of construction projects.

Personal Information

This section of survey deals with personal information of the respondents. Please be assured that your personal data and information will only be used for study purpose and no personal information will be disclosed and shared at any forum.

Name *

Your answer

Name of Organization *

Your answer

Type of projects worked on *

Building
Infrastructure
Industrial
Transportation
Water Supply
Other:

Which category of construction project stakeholder do you belong to? *

Contractor
Consultant
Client
Other:

Country of Project Management experience *

Your answer

Construction industry experience *

Less than 2 years
2 to 5 years
5 to 10 year
10 to 15 years
15 to 20 years
More than 20 years

Position Title *

Your answer

Highest academic qualification *

Bachelors
Masters
Doctorate
Diploma/Certification
Other:

Level of influence and relationship of contributing critical success factors for effective stakeholder management in construction projects

Different contributing success factors were shortlisted after extensive literature review and available research studies carried out regarding construction stakeholder management. The factors were analyzed and shared with construction management professionals of developing countries through a preliminary survey whereby these factors were ranked by these professionals.

A total of 18 critical success factors were shortlisted after analyzing the responses and rankings from literature and preliminary survey. These factors are included in the final framework design of effective stakeholder management to be developed with system dynamics approach.

The aim of this questionnaire survey is to determine level of influence (causal strength) and relationship (polarity) of contributing factors of effective stakeholder management on each other and for success of construction projects.

You are kindly requested to give your valuable input by rating each factor relationship in accordance with your knowledge and experience.

How "Prioritize needs and interests" is influenced by the following contributing factors of stakeholder management. (Please choose two options in each row; one from low, medium or high as level of influence and the other from direct or indirect as relationship) *

	Low	Medium	High	Direct	Indirect
Two way communication					
Identification and listing					
Classify attributes					
Influence on project					
Strategic management					
Power, urgency, legitimacy					

Clear project objectives
Resolving conflicts
Identifying conflicts & coalitions
Throughout communication
Monitor and Report engagement strategies
Prioritized Risk management
Positive relationships
Social, economic responsibilities
Affect of project decisions
Defined management plan processes
Prioritized risk management
Two way communication
Identification and listing
Classify attributes
Influence on project
Strategic management
Power, urgency, legitimacy
Clear project objectives
Resolving conflicts
Identifying conflicts & coalitions
Throughout communication
Monitor and Report engagement strategies
Prioritized Risk management
Positive relationships
Social, economic responsibilities
Affect of project decisions
Defined management plan processes
Prioritized risk management

How "Two way communication" is influenced by the following contributing factors of stakeholder management. *

	Low	Medium	High	Direct	Indirect
Prioritize needs and interests					
Identification and listing					
Classify attributes					
Influence on project					
Strategic management					
Power, urgency, legitimacy					
Clear project objectives					
Resolving conflicts					
Identifying conflicts & coalitions					
Throughout communication					
Monitor and Report engagement strategies					
Prioritized Risk management					
Positive relationships					
Social, economic responsibilities					

Affect of project decisions
Defined management plan processes
Prioritized risk management
Prioritize needs and interests
Identification and listing
Classify attributes
Influence on project
Strategic management
Power, urgency, legitimacy
Clear project objectives
Resolving conflicts
Identifying conflicts & coalitions
Throughout communication
Monitor and Report engagement strategies
Prioritized Risk management
Positive relationships
Social, economic responsibilities
Affect of project decisions
Defined management plan processes
Prioritized risk management

How "Identification and listing" is influenced by the following contributing factors of stakeholder management. *

	Low	Medium	High	Direct	Indirect
Prioritize needs and interests					
Two way communication					
Classify attributes					
Influence on project					
Strategic management					
Power, urgency, legitimacy					
Clear project objectives					
Resolving conflicts					
Identifying conflicts & coalitions					
Throughout communication					
Monitor and Report engagement strategies					
Prioritized Risk management					
Positive relationships					
Social, economic responsibilities					
Affect of project decisions					
Defined management plan processes					
Prioritized risk management					
Prioritize needs and interests					
Two way communication					
Classify attributes					
Influence on project					
Strategic management					

Power, urgency, legitimacy
Clear project objectives
Resolving conflicts
Identifying conflicts & coalitions
Throughout communication
Monitor and Report engagement strategies
Prioritized Risk management
Positive relationships
Social, economic responsibilities
Affect of project decisions
Defined management plan processes
Prioritized risk management

How "Classify attributes" is influenced by the following contributing factors of stakeholder management. *

	Low	Medium	High	Direct	Indirect
Prioritize needs and interests					
Two way communication					
Identification and listing					
Influence on project					
Strategic management					
Power, urgency, legitimacy					
Clear project objectives					
Resolving conflicts					
Identifying conflicts & coalitions					
Throughout communication					
Monitor and Report engagement strategies					
Prioritized Risk management					
Positive relationships					
Social, economic responsibilities					
Affect of project decisions					
Defined management plan processes					
Prioritized risk management					
Prioritize needs and interests					
Two way communication					
Identification and listing					
Influence on project					
Strategic management					
Power, urgency, legitimacy					
Clear project objectives					
Resolving conflicts					
Identifying conflicts & coalitions					
Throughout communication					
Monitor and Report engagement strategies					
Prioritized Risk management					
Positive relationships					

Social, economic responsibilities
Affect of project decisions
Defined management plan processes
Prioritized risk management

How "Influence on project" is influenced by the following contributing factors of stakeholder management. *

	Low	Medium	High	Direct	Indirect
Prioritize needs and interests					
Two way communication					
Identification and listing					
Classify attributes					
Strategic management					
Power, urgency, legitimacy					
Clear project objectives					
Resolving conflicts					
Identifying conflicts & coalitions					
Throughout communication					
Monitor and Report engagement strategies					
Prioritized Risk management					
Positive relationships					
Social, economic responsibilities					
Affect of project decisions					
Defined management plan processes					
Prioritized risk management					
Prioritize needs and interests					
Two way communication					
Identification and listing					
Classify attributes					
Strategic management					
Power, urgency, legitimacy					
Clear project objectives					
Resolving conflicts					
Identifying conflicts & coalitions					
Throughout communication					
Monitor and Report engagement strategies					
Prioritized Risk management					
Positive relationships					
Social, economic responsibilities					
Affect of project decisions					
Defined management plan processes					
Prioritized risk management					

How "Strategic management" is influenced by the following contributing factors of stakeholder management. *

	Low	Medium	High	Direct	Indirect

Prioritize needs and interests
Two way communication
Identification and listing
Classify attributes
Influence on project
Power, urgency, legitimacy
Clear project objectives
Resolving conflicts
Identifying conflicts & coalitions
Throughout communication
Monitor and Report engagement strategies
Prioritized Risk management
Positive relationships
Social, economic responsibilities
Affect of project decisions
Defined management plan processes
Prioritized risk management
Prioritize needs and interests
Two way communication
Identification and listing
Classify attributes
Influence on project
Power, urgency, legitimacy
Clear project objectives
Resolving conflicts
Identifying conflicts & coalitions
Throughout communication
Monitor and Report engagement strategies
Prioritized Risk management
Positive relationships
Social, economic responsibilities
Affect of project decisions
Defined management plan processes
Prioritized risk management

How "Power, urgency, legitimacy" is influenced by the following contributing factors of stakeholder management. *

	Low	Medium	High	Direct	Indirect
Prioritize needs and interests					
Two way communication					
Identification and listing					
Classify attributes					
Influence on project					
Strategic management					
Clear project objectives					
Resolving conflicts					

Identifying conflicts & coalitions
Throughout communication
Monitor and Report engagement strategies
Prioritized Risk management
Positive relationships
Social, economic responsibilities
Affect of project decisions
Defined management plan processes
Prioritized risk management
Prioritize needs and interests
Two way communication
Identification and listing
Classify attributes
Influence on project
Strategic management
Clear project objectives
Resolving conflicts
Identifying conflicts & coalitions
Throughout communication
Monitor and Report engagement strategies
Prioritized Risk management
Positive relationships
Social, economic responsibilities
Affect of project decisions
Defined management plan processes
Prioritized risk management

How "Clear project objectives" is influenced by the following contributing factors of stakeholder management. *

	Low	Medium	High	Direct	Indirect
Prioritize needs and interests					
Two way communication					
Identification and listing					
Classify attributes					
Influence on project					
Strategic management					
Power, urgency, legitimacy					
Resolving conflicts					
Identifying conflicts & coalitions					
Throughout communication					
Monitor and Report engagement strategies					
Prioritized Risk management					
Positive relationships					
Social, economic responsibilities					
Affect of project decisions					
Defined management plan processes					

Prioritized risk management
Prioritize needs and interests
Two way communication
Identification and listing
Classify attributes
Influence on project
Strategic management
Power, urgency, legitimacy
Resolving conflicts
Identifying conflicts & coalitions
Throughout communication
Monitor and Report engagement strategies
Prioritized Risk management
Positive relationships
Social, economic responsibilities
Affect of project decisions
Defined management plan processes
Prioritized risk management

How "Resolving conflicts" is influenced by the following contributing factors of stakeholder management. *

	Low	Medium	High	Direct	Indirect
Prioritize needs and interests					
Two way communication					
Identification and listing					
Classify attributes					
Influence on project					
Strategic management					
Power, urgency, legitimacy					
Clear project objectives					
Identifying conflicts & coalitions					
Throughout communication					
Monitor and Report engagement strategies					
Prioritized Risk management					
Positive relationships					
Social, economic responsibilities					
Affect of project decisions					
Defined management plan processes					
Prioritized risk management					
Prioritize needs and interests					
Two way communication					
Identification and listing					
Classify attributes					
Influence on project					
Strategic management					
Power, urgency, legitimacy					

Clear project objectives
Identifying conflicts & coalitions
Throughout communication
Monitor and Report engagement strategies
Prioritized Risk management
Positive relationships
Social, economic responsibilities
Affect of project decisions
Defined management plan processes
Prioritized risk management

How "Identifying conflicts & coalitions" is influenced by the following contributing factors of stakeholder management. *

	Low	Medium	High	Direct	Indirect
Prioritize needs and interests					
Two way communication					
Identification and listing					
Classify attributes					
Influence on project					
Strategic management					
Power, urgency, legitimacy					
Clear project objectives					
Resolving conflicts					
Throughout communication					
Monitor and Report engagement strategies					
Prioritized Risk management					
Positive relationships					
Social, economic responsibilities					
Affect of project decisions					
Defined management plan processes					
Prioritized risk management					
Prioritize needs and interests					
Two way communication					
Identification and listing					
Classify attributes					
Influence on project					
Strategic management					
Power, urgency, legitimacy					
Clear project objectives					
Resolving conflicts					
Throughout communication					
Monitor and Report engagement strategies					
Prioritized Risk management					
Positive relationships					
Social, economic responsibilities					
Affect of project decisions					

Defined management plan processes
Prioritized risk management

How "Throughout communication" is influenced by the following contributing factors of stakeholder management. *

	Low	Medium	High	Direct	Indirect
Prioritize needs and interests					
Two way communication					
Identification and listing					
Classify attributes					
Influence on project					
Strategic management					
Power, urgency, legitimacy					
Clear project objectives					
Resolving conflicts					
Identifying conflicts & coalitions					
Monitor and Report engagement strategies					
Prioritized Risk management					
Positive relationships					
Social, economic responsibilities					
Affect of project decisions					
Defined management plan processes					
Prioritized risk management					
Prioritize needs and interests					
Two way communication					
Identification and listing					
Classify attributes					
Influence on project					
Strategic management					
Power, urgency, legitimacy					
Clear project objectives					
Resolving conflicts					
Identifying conflicts & coalitions					
Monitor and Report engagement strategies					
Prioritized Risk management					
Positive relationships					
Social, economic responsibilities					
Affect of project decisions					
Defined management plan processes					
Prioritized risk management					

How "Monitor and Report engagement strategies" is influenced by the following contributing factors of stakeholder management. *

	Low	Medium	High	Direct	Indirect
Prioritize needs and interests					
Two way communication					

Identification and listing
Classify attributes
Influence on project
Strategic management
Power, urgency, legitimacy
Clear project objectives
Resolving conflicts
Identifying conflicts & coalitions
Throughout communication
Prioritized Risk management
Positive relationships
Social, economic responsibilities
Affect of project decisions
Defined management plan processes
Prioritized risk management
Prioritize needs and interests
Two way communication
Identification and listing
Classify attributes
Influence on project
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Power, urgency, legitimacy
Clear project objectives
Resolving conflicts
Identifying conflicts & coalitions
Throughout communication
Prioritized Risk management
Positive relationships
Social, economic responsibilities
Affect of project decisions
Defined management plan processes
Prioritized risk management

How "Prioritized Risk management" is influenced by the following contributing factors of stakeholder management. *

	Low	Medium	High	Direct	Indirect
Prioritize needs and interests					
Two way communication					
Identification and listing					
Classify attributes					
Influence on project					
Strategic management					
Power, urgency, legitimacy					
Clear project objectives					
Resolving conflicts					
Identifying conflicts & coalitions					

Throughout communication
Monitor and Report engagement strategies
Positive relationships
Social, economic responsibilities
Affect of project decisions
Defined management plan processes
Prioritized risk management
Prioritize needs and interests
Two way communication
Identification and listing
Classify attributes
Influence on project
Strategic management
Power, urgency, legitimacy
Clear project objectives
Resolving conflicts
Identifying conflicts & coalitions
Throughout communication
Monitor and Report engagement strategies
Positive relationships
Social, economic responsibilities
Affect of project decisions
Defined management plan processes
Prioritized risk management

How "Positive relationships" is influenced by the following contributing factors of stakeholder management. *

	Low	Medium	High	Direct	Indirect
Prioritize needs and interests					
Two way communication					
Identification and listing					
Classify attributes					
Influence on project					
Strategic management					
Power, urgency, legitimacy					
Clear project objectives					
Resolving conflicts					
Identifying conflicts & coalitions					
Throughout communication					
Monitor and Report engagement strategies					
Prioritized Risk management					
Social, economic responsibilities					
Affect of project decisions					
Defined management plan processes					
Prioritized risk management					
Prioritize needs and interests					

Two way communication
Identification and listing
Classify attributes
Influence on project
Strategic management
Power, urgency, legitimacy
Clear project objectives
Resolving conflicts
Identifying conflicts & coalitions
Throughout communication
Monitor and Report engagement strategies
Prioritized Risk management
Social, economic responsibilities
Affect of project decisions
Defined management plan processes
Prioritized risk management

How "Social, economic responsibilities" is influenced by the following contributing factors of stakeholder management. *

	Low	Medium	High	Direct	Indirect
Prioritize needs and interests					
Two way communication					
Identification and listing					
Classify attributes					
Influence on project					
Strategic management					
Power, urgency, legitimacy					
Clear project objectives					
Resolving conflicts					
Identifying conflicts & coalitions					
Throughout communication					
Monitor and Report engagement strategies					
Prioritized Risk management					
Positive relationships					
Affect of project decisions					
Defined management plan processes					
Prioritized risk management					
Prioritize needs and interests					
Two way communication					
Identification and listing					
Classify attributes					
Influence on project					
Strategic management					
Power, urgency, legitimacy					
Clear project objectives					
Resolving conflicts					

Identifying conflicts & coalitions
Throughout communication
Monitor and Report engagement strategies
Prioritized Risk management
Positive relationships
Affect of project decisions
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Prioritized risk management

How "Affect of project decisions" is influenced by the following contributing factors of stakeholder management. *

	Low	Medium	High	Direct	Indirect
Prioritize needs and interests					
Two way communication					
Identification and listing					
Classify attributes					
Influence on project					
Strategic management					
Power, urgency, legitimacy					
Clear project objectives					
Resolving conflicts					
Identifying conflicts & coalitions					
Throughout communication					
Monitor and Report engagement strategies					
Prioritized Risk management					
Positive relationships					
Social, economic responsibilities					
Defined management plan processes					
Prioritized risk management					
Prioritize needs and interests					
Two way communication					
Identification and listing					
Classify attributes					
Influence on project					
Strategic management					
Power, urgency, legitimacy					
Clear project objectives					
Resolving conflicts					
Identifying conflicts & coalitions					
Throughout communication					
Monitor and Report engagement strategies					
Prioritized Risk management					
Positive relationships					
Social, economic responsibilities					
Defined management plan processes					
Prioritized risk management					

How "Defined management plan processes" is influenced by the following contributing factors of stakeholder management. *

	Low	Medium	High	Direct	Indirect
Prioritize needs and interests					
Two way communication					
Identification and listing					
Classify attributes					
Influence on project					
Strategic management					
Power, urgency, legitimacy					
Clear project objectives					
Resolving conflicts					
Identifying conflicts & coalitions					
Throughout communication					
Monitor and Report engagement strategies					
Prioritized Risk management					
Positive relationships					
Social, economic responsibilities					
Affect of project decisions					
Prioritized risk management					
Prioritize needs and interests					
Two way communication					
Identification and listing					
Classify attributes					
Influence on project					
Strategic management					
Power, urgency, legitimacy					
Clear project objectives					
Resolving conflicts					
Identifying conflicts & coalitions					
Throughout communication					
Monitor and Report engagement strategies					
Prioritized Risk management					
Positive relationships					
Social, economic responsibilities					
Affect of project decisions					
Prioritized risk management					

How "Prioritized risk management" is influenced by the following contributing factors of stakeholder management. *

	Low	Medium	High	Direct	Indirect
Prioritize needs and interests					
Two way communication					
Identification and listing					
Classify attributes					

Influence on project
Strategic management
Power, urgency, legitimacy
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Social, economic responsibilities
Affect of project decisions
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Classify attributes
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