

An Evaluation of the Determinants of Project Success in Public Works Department (PWD)

Dissertation submitted in partial fulfillment of the degree
Masters in Procurement and Supply Management (MPSM)

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DECLARATION

I hereby declare that the content of this thesis has never been submitted for fulfillment of another academic degree or certification to other academic institutions or universities-except this degree in Masters in Procurement and Supply Management (MPSM) at BRAC University, Bangladesh.

I also confirm that this dissertation work is an illustration of my own research work. Any research works of other writers in this paper have been distinctly recognized.

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CERTIFICATION

It is indeed a great pleasure to certify that the dissertation entitled “An Evaluation of the Determinants of Project Success in Public Works Department (PWD)”, completed under my guidance and supervision, is a unique work of Muhammad Adnan Rahman. So far I know, the dissertation is an individual achievement of the candidate’s own efforts and it is not a joint work. Also, I would like to acknowledge this dissertation acceptable for submission to BRAC Institute of Governance and Development (BIGD), BRAC University for partial fulfillment of the requirement for the degree of Masters in Procurement and Supply Management (MPSM).

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Abstract

Public construction sector is highly responsible for the infrastructural development of a nation which is the prerequisite to overall wellbeing of the people. Modern public construction projects involve multiple stakeholders with multidimensional expectations which present high risk and uncertainty in these projects. In this complex project environment identification of the success factors is considered the key for achieving success. In this study the significant factors for success in public construction project in Bangladesh is analyzed. At the same time reasons for the underperformance of projects are also examined. A questionnaire-based survey was undertaken among the stakeholders (Public Works Department, contractor's organization, Department of Architecture) to elicit views of construction and project management professionals on the criticality of these factors for the success of public construction projects specially in PWD. This study aimed at finding the significance of various factors in project performance in PWD. The respondents of the survey have given their views regarding each of the 21 factors responsible for project performance using a three point scale. Relative Importance Index (RII) is used here for making the ranking. It is found that top management supports, competence of project manager, activities of technical support team at head office are the prime factors for success. On the other hand, contractors' incompetence, lack of support from department of architecture, faulty project conceptualization has come out as the main drivers of project failure in PWD. Interestingly it is found in this study that, political commitment has least effect in both success and failure in projects of PWD. In this study it is established that, for the success of public construction project, human factors especially top management contributes significantly in Bangladesh.

List of Abbreviations

GoB- Government of Bangladesh

PWD- Public Works Department

PMP- Project Management Professional

RNPP- Rooppur Nuclear Power Plant

PM- Project Manager

RII- Relative Importance Index

DoA- Department of Architecture

1. Introduction

1.1 Overview

In the recent times, the phrases like “the next Asian tiger”, “the economic tiger”, “the next eleven”, “middle income country” etc. are very well used and reassuring terms for the people of Bangladesh. Bangladesh is enjoying one of the world’s happiest economic stories right at this moment. The country is steadily advancing towards a better future both in terms of economic parameters and human development indices. Both the government and the private sector are trying their level best to prolong this socio-economic boom in order to achieve sustainable development. But, in a developing country like Bangladesh, how is burdened with huge population, where resources are scarce and where the private sector is still in its very early stage of infancy, the government has to play the most significant role in development. When we think of infrastructural development for the purpose of reinforcing the backbone for overall improvement, government has to be the leading actor. Realizing this, in the recent days Bangladesh government have undertaken a huge number of infrastructural development projects which are supposed to be the lifeline for the future development of the country. But the bitter truth is that, like many other developing countries, in Bangladesh the project management practices are not yet well groomed and not at all attuned to the socio-cultural context of the country. As a result, either at the end of the project or at the long run, it is found that, these projects are becoming stories of failure in terms of time, money, scope and quality. Delayed implementation, cost overrun, lack of quality performance and unfulfillment of project scope are very common for the public infrastructural development projects in our country. For these reasons, the very objectives of the projects are destroyed and benefits of the projects cannot be enjoyed to the fullest.

PWD, the oldest organization responsible for public construction is not out of this allegation of project failure. Identifying the factors for success of successfully completed projects and taking care of these factors in all other project should be the main focus of public organizations like PWD. Same should be done for factors responsible for project failure. In the recent time PWD has constructed three twenty storied building in Rooppur Nuclear Power Plant project just in twelve months and within the estimated cost. That’s a great

success for PWD in the field of construction project management. Till now the users are satisfied with the quality of the project. Although the housing project in RNPP is not yet finished, it is heading towards a remarkable success. This project can be an imitable one for the project management professionals in public construction sector in Bangladesh. This study is a step towards analyzing the success and failure factors of a project based on the housing project (Green City) in RNPP.

1.2 Scope and Objectives

The followings are the objectives of this research work.

- To find out the drivers of success in public constructions projects specially in PWD.
- To find out the factors of failure in other projects in PWD.
- To find out the relative importance or impact of different factors on the performance of project in PWD

1.3 Justification of the Study

In the projects of PWD, time and cost overrun is very common. As a result, most of the projects of PWD (like other public organizations in Bangladesh) end as unsuccessful ones. There are various factors of failure of projects. But in the recent time, PWD has completed three twenty storied buildings in RNPP just in twelve months and within the estimated budget. That's a great success for this organization. This study aims at finding out the drivers of success of this project. These findings will be helpful for organizations like PWD to increase the efficiency of project management. This study will be helpful in achieving efficient performance in the management of public construction projects in Bangladesh.

2. Research Methodology

This research adopted field survey methodology to uncover the success factors encouraging project performance in the housing project in RNPP and the factors responsible for failure in other projects of PWD. Questionnaire survey was found effective because of its relative ease of obtaining standard data appropriate for achieving the objectives of this study. Kothari (2003) stipulates that the survey protocol of random sampling procedures allows a relatively small number of people to represent a much larger population. Based on the literature cited and conversation with some of the project participants of the selected project, ten factors were selected which were greatly influential throughout the project timeline for its success. Pilot studies were carried out to ensure the clarity and relevance of the drafted questionnaire. The drafted questionnaire was shown to five professionals in the research field to review. The two professionals were officers of PWD, two were from contractors/ renderers and the other was researcher in the related field. Slight changes were made on the drafted questionnaire based on suggestions of the reviewers. The questionnaire required the respondents to rank their answers using three-point scale. For frequency index, the values are represented as follows:

0 = Not affecting,

1 = Moderately affecting,

2 = Strongly affecting.

In order to empirically determine the factors accounting for the success of housing project at RNPP and to give an understanding as to the extent to which each factor contribute to this success, both by itself and in combination of the other factors, the Relative Importance Index (RII) was employed. Relative Importance Index or weight is a type of relative importance analyses. RII was used for the analysis because it best fits the purpose of this study. According to Johnson and Le Breton (2004), RII aids in finding the contribution of a particular variable makes to the prediction of a criterion variable both by itself and in combination with other predictor variables.

In the calculation of the Relative Importance Index (RII), the formula below was used:

$$RII = \frac{\sum W}{N * A}$$

where, W= Weighting given to each statement by the respondents and ranges from 1 to 2;

A=Higher response integer (2)

N=total number of respondents.

Though, the findings of the paper may be a true representation of Housing Project at Rooppur Nuclear Power Plant and may even be helpful to authorities concern, the researcher does not seek to generalize the findings. It is only limited to Housing Project in RNPP.

3. Literature Review

3.1 Defining Project & Project Management

With the development of human capability and modernization of technology, projects, now a days are being more complicated. The uniqueness of each project is presenting more complications in terms of time, cost and quality assurance. The complex nature of socio-economic dynamics and stakeholders expectations, make every project a new challenge for the project management team. So, gradually the importance of project management is escalating.

The discipline of originating, planning, implementing, monitoring, and finishing the work of a team to achieve definite goals and meet specific success criteria at the specified time is attributed as Project Management. A project is a temporary endeavor designed to produce a unique product, service or result with a defined beginning and end which is usually time-constrained and constrained by funding (Nokes, 2007). While the Project Management Institute (PMI) defines projects as specific activities that are implemented to achieve defined goals and objectives in order to add value and positive change, Cattani et al. (2011) thinks, managing such approach of distinguished nature requires unique technical skills and management strategies.

The necessity of effectively managing a project specially in the construction sector is of utmost importance. The concept and perception of project management has been derived from this very particular sector. Methodically applying the tools to efficiently manage projects in implementing intricate civil engineering projects can be traced back to 1950s. The dynamics of the projects of the mentioned kind dwells on various factors. Such factors can be the exclusiveness of the projects, socio-economic aspects, ever changing scientific progression, ownership variation, variance of stakeholders' expectation, unique purposes of the project etc. These widespread variety of factors makes the practice of project management diversified in different countries even in this era of globalization. It can be perceived that project management is almost entirely a society oriented discipline of knowledge. In

Bangladesh, the project management practice is yet to be developed in the context of her socio-cultural orientation.

The area of concentration of this research is the public construction sector of Bangladesh, specifically projects under coverage of Public Works Department (PWD). In this study the building construction mechanism of the said public entity has been reviewed with an emphasis on overall determinants related to public sector projects.

3.2 Evolution of the Project Constraint Model

Every day the notion changes about how we perceive whether a project has been successful or not. To evaluate fruitfulness or effectiveness, parameters can be set by which desired results can be measured to be accomplished within a set order. As such parameters, time, cost, and quality, known as the “iron triangle” or the “triple constraints”, have long been the benchmarks of project success (Chan and Chan, 2004). While according to Ashley et al. (1987), the success of a project is distinguished as having outcomes beyond the expectation, and is thought to be related to performance measures. Performance measurement is used as a business instrument to assess management performance and monitor a strategic plan. But because of the dynamic and complicated attributes of a project of the constructions sector, using the “iron triangle” as the sole reference for performance measurement seems lacking. Here is a graphical representation of iron triangle.



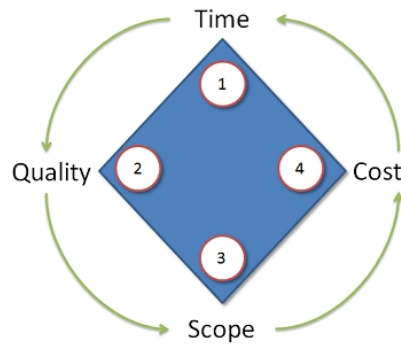
Figure 1: The Iron Triangle of a Project

Although this triangle is a logical representation of dynamics of factors that impact the project quality to a great extent, over time the measurement philosophy of a project's performance has evolved and taken a multidimensional turn.

With mainstream acceptance of the Triangle Model, "Cost" and "Time" appear to be represented consistently. "Scope" however is often used interchangeably given the context of the triangle's illustration or the perception of the respective project. Scope / Goal / Product / Deliverable / Quality are all relatively similar and generic variation examples of this, while the above suggestion of 'People Resources' offers a more specialized interpretation. The 'Project Diamond' model engenders this blurred focus through the inclusion of "Scope" and "Quality" separately as the 'third' constraint (Brown and Craig, 2009). While there is merit in the addition of "Quality" as a key constraining factor, acknowledging the increasing maturity of project management, this model still lacks clarity between output and process. The Diamond Model does not capture the analogy of the strong interrelation between points of the triangles however.

The Project Diamond

(Used to be the iron triangle)



These are our project priorities.

Everything is important, but use this diagram to help make day to day decisions on how and what you work on.

Figure 2: Project Diamond Model

PMBOK (Project Management Body of Knowledge) 4.0 offered an evolved model based on the triple constraint with 6 factors to be monitored and managed. This is illustrated as a 6 pointed Star that maintains the strength of the triangle analogy (two overlaid triangles), while at the same time represents the separation and relationship between project inputs/outputs factors on one triangle and the project processes factors on the other. The star variables are: scope, quality, schedule, budget, resources and risk. As per PMBOK 6.0, the project constraints include, but not limited to these six constraints.

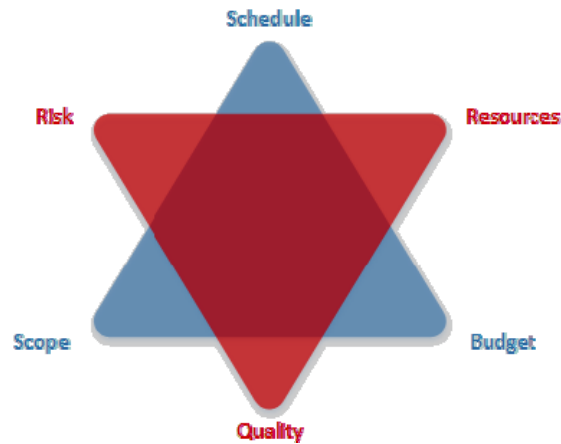


Figure 3: Project Management Star

Nonetheless, in this research, the housing project of Rooppur has been selected as a successful project based on the criteria of limited number of constraints. The construction completion of buildings under this project was timely and it did not surpass the budget previously estimated. As of now, the overall quality of the buildings under this project seems to be of high standard. Having said that, this very success of this project as per these limited constraints can be perceived also as a limitation of this research as the same project can be deemed as not so successful if measured against other constraints.

3.3 Project Environment

The overall project environment needs to properly understand prior determining the factors leading to the success of a public construction project. The specific part each factor has to play, their working synergy and particular control over specific part of the project environment should be analyzed to determine success factors of every individual project. Project environment is fundamental to the project success (PMI, 2004). A certain social, economic and environmental setting is maintained while planning and executing nearly all the projects. The distinctions of these settings can have both positive and negative influence on a project's outcome.

Gilbert (1983) portrays the project and its setting as a sequence of overlapping circles all of which are mostly, but not fully, limited in the direct environment, signifying the host community, government and its agencies. The outer solid –line circle represents the international economic and political environment within which the project exists. This circle is surrounded by the dotted line; labeled as ‘people’. This dotted line is a symbol that people are everywhere –within the project and in its environment. Thus, a special attention is essential from the project side to comprehend the cultural, social, environmental and political environment of the project (PMI, 2004). This is illustrated in the figure below:

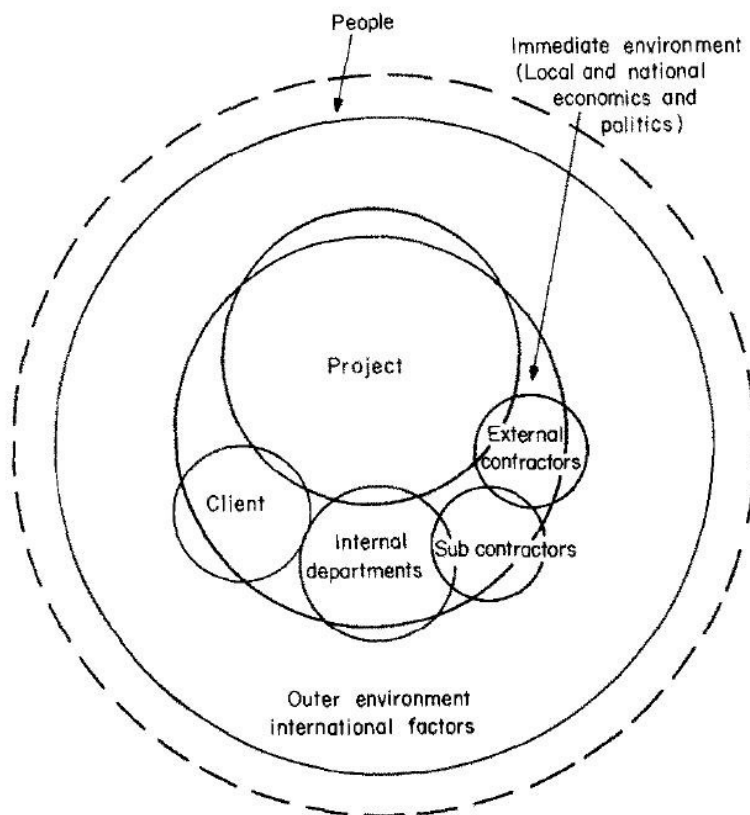


Figure 4: The Project and its environment (Gilbert, 1983)

3.4 Dynamics of Public Sector Organization

Recognizing the overall environment of the public sector and comprehending the project management modality of this sector is essential since this research concentrates on a public department and a project implemented by it. not differing from conventional wisdom,

organizations and administrations of public sector are designed as pyramids: where the top level entities formulate policies and take decisions, distribute responsibilities and tasks and allocate to the junior levels following a hierarchical chain of command. As Sotirakou and Zeppou (2005) depicted, power rests at the top of the hierarchy. Boyne (2002) showed, in terms of multifaceted administrative setting, objectives, organizational structure and executive values, the public sector widely differs from the private sector. The difference in these factors determine the execution and management modality variation in public and private sector. Spittler and McCracken (1996) observed that usually organizations of public sector pertain a divided and bureaucratic functionality. They added that this disunion into execution can be for a diversity of reasons. Maintaining specialization can be a prominent reason. Maintaining specialization is significant to isolate the phases of procurement and also to uphold the chain of command. Efficient distribution of responsibility and ensuring accountability is also considered closely regarding this. Furthermore, the method of theorizing, financing, designing, building and implementing a project encompasses functional division of the organization (ibid). This functional modality of public sector also brings about some challenges which derive from the people responsible to execute different functions as employees. others Brunetto and Farr-wharton (2003) attributes to the tendency of focusing on one's own proficiency being oblivious to how that affects the whole synergy of the workforce responsible for the task. Some such obstacles are:

1. Hindrance in flow of information
2. Unfitting decision making
3. Lack of foresight etc (Spittler and McCracken, 1996).

3.5 Dynamics of Public Sector Projects in Developing Countries

Youker (1992) states that positive or negative impact of many projects funded by The World Bank in less developing countries hinge on issues in the overall environment that are external to the immediate control of the project manager. Some of these problems listed in the study are as follows:

- Lack of government's own funding that was agreed as part of total financing of the project
- Instability in terms of challenges to retain competent staff
- The unsuccessful transmission of technology and trouble in ensuring organizational capacity
- Struggle in introducing something new to the policy structure
- Unsatisfactory accounting, financial management systems and auditing
- A shortage of resources due to overall economic problems

Environmental aspects such as risk factors, intricacy, distribution of authority and the accessibility of resources determine the nature of outcome of a project and scholars like Galbraith, (1973); Thompson, (1967); Hellsten and Larbi, (2006) have backed that premise. Bastani (1988) supplements that the external impacts such as traditions, norms, values, and procedures can also affect the project.

4. Determinants of Project Performance

From the literature review, where referring to leading journals and project management textbooks, an elementary level variety of parameters were assembled into a list that attributed positive and negative outcome as success and failure of a project. While the parameters designed were from the previous literature, that mostly accommodated the studies pertaining to developed countries, it was decided to take these parameters to selected Bangladeshi construction professionals mostly from PWD as part of a pilot survey to get the response on the selected attributes which helped to make proper adjustments to the previously mentioned list. Following which 10 factors as underlying influencer for success and 10 as affecting variables for failure has been developed in this improved list. A brief explanation of these factors the context of projects of PWD is provided below.

4.1 Success Factors of Public Projects

4.1.1 Project Manager's Competence

Features that are imminent in this factor emphasis largely on synchronizing the aptitude and rapport of the PM, the confidence levied in the project team by the assigning authority, the technical competence, constructive outlook and leadership. Project manager can be the most crucial personnel as he is responsible for resource allocation and field level decision making while keeping the policy principles set by the upper hierarchy intact. He is also influential in terms of encouraging staff and workers with his presence and guidance that can result in significant improved quality of work. A successful project manager ensures necessary resource availability by logically urging and convincing his higher authority while at the same time makes sure his vibrant involvement is noticed in control and monitoring of the site level of the construction. He also proves himself to be an efficient bridge in recruiting and training skilled human resources as per project's unique requirement while managing them to deliver the work ensuring conviction and dedication through effective leadership skills. All these traits can be thought of instigating from a Project Manager's competence, hence the name.

4.1.2 Top management support

Support from the top management support is vital for accomplishing favorable standards largely in case of four issues. Policy determination and justifiable resource allocation is set by the top management. While the top management organizes required training for the project staff they also have a significant part to play in selecting the suitable individual as the project manager. This crucial privilege which is at the same time a vital responsibility that is to regulate the key elements of the project, the top managements' concurrence is significantly anticipated for quality assurance and other objectives. Top management can improve the project by supporting the strategies and categorizing critical actions; supporting the project manager and the project team; recognizing operational complications associated with diverse matters, developing and sustaining a window of communication among project team, transmitting the message of optimistic outlook to the project team and delegating authority to project management.

4.1.3 Contractors' competence

Contractors' capability is one of the main factors of success of any project. Without a competent contractor, it would be very difficult for the project team to fulfill the success criteria of a project. Contractors' competence consists of many factors like adequately skilled manpower in all the required sectors, high professionalism in quality control and quality assurance mechanism, recruiting of qualified sub-contractors, monetary and technical capability, fully aware risk management system, smart communication mechanism with all other important participants of the project and many more. The contractor should be experienced enough based on the complexity and importance of the project. Reputation, integrity, flexibility and learning and listening skill are some characteristics of a good contractor. So it can be said that, a visionary, prompt, effective and efficient contractor is a must for any successful project.

4.1.4 Interaction among project participants

Fruitful interaction and communication among stakeholders of a project is very essential. Contractors can be identified as internal participants while subcontractors and vendors are external participants in this mechanism. When each participant rightfully understand and work accordingly the scope of work and needs of each other, the mechanism functions smoothly. Lack of proper communication among stakeholders jeopardizes the quality of the project. This condition becomes more intense if one project has various categories of work; for example, civil works; electrical works; mechanical works; HVAC (heating, ventilation, and air-conditioning); and building automation etc. these kinds of projects faces disorder created in quality of project activities due to want of interaction among project participants. The accommodating skill and constructive attitude of project participants are vital properties in such circumstances. Both formal meetings and informal communications among multidimensional stakeholders in addressing various issues faced in everyday project implementation have been proven very beneficial for a project's success.

4.1.5 Importance of the project

In Bangladesh, project success may vary depending upon the importance of the project. Importance of a project may depend on many factors. A project may be important based on the impact in overall development of the country. Importance depends on political will, magnitude of the project in terms of size and fund, complication of the project, stakeholders' response and the views of the implementing body. If most of the factors of importance come together for a project, it gets added emphasis. For example, if a project's jurisdiction is very large in terms of its land area and if the outcome of the project is enjoyed by a huge community, it is supposed to be a highly important one. Implementation of this type of projects may be beneficiary in terms of political and personal reputation.

4.1.6 Political Commitments

Based on political commitments, major stakeholders view towards a certain project varies. In a democratic political system, the parties are accountable towards people. For this reason political bodies are liable for the development and well being of a society. Sense of liability, accountability and political goodwill is a must for project implementation in any country. Selection of projects, prioritizing of selected project and responsiveness of project participants greatly depends on political commitments. For example, if a project is important for the government to fulfill its election manifesto, it must be of higher degree of importance. Administrative bodies related to this project will be more alert than that of other projects which experiences lesser political commitment.

4.1.7 Availability and management of fund

Budget is a great challenge and to some extent greatest constrain in project implementation here in Bangladesh. There are many problems regarding budget in this country. Inadequate funding, improper estimation of project cost, improper definition of scope of the project, price variation of project ingredients, cost overrun, monetary corruption, policy alteration by the government etc. imposes great challenge in successful project implementation. As Bangladesh lack in resource, availability of fund is a great problem here. The policy makers

face dilemma in prioritizing projects and allocate fund. For this reason, delay in fund disbursement, lesser amount of fund disbursement and even stoppage of fund disbursement is very common in Bangladesh. The performance of the project greatly depends on the source of fund as well. Over time it is experienced that donor funded projects run well than that of GoB funded ones. Because, in donor funded project contractors get part payments in appropriate time and that's why they enjoys liquidity all the time. Part payments encourage contractors to work with the schedule.

4.1.8 Use of technological advancement

In the modern time, use of technological advancement is a must for infrastructural development projects. Modern technology helps in quality assurance, time and cost management and in minimizing uncertainty. With the use of up to date technology with lesser human involvement, a project management team can extract the maximized efficiency. But use of modern technology requires efficient change management as the people are reluctant to change. People are afraid of change as it a may even cause termination of job. So introduction of modern technology needs closer look by the project management.

4.1.9 Monitoring and feedback mechanism of project management

It has been established from the experience of implementing projects in every sector and every type of setting that for a well-organized and improved performance of a project the presence of accurate mechanism of monitoring and constructive feedback in a specific interval is imperative. The acceptable quality of the outcome of a project can be achieved if several components and activities under them are monitored competently and any subpar work or misuse of resources are identified and then amended in a timely manner. Carrying out various components and activities under a project can be smooth when the stakeholders are devoted to deliver quality work as per approved and recognized technical standards. Since the implementation criteria and components of a project is multifaceted and multidimensional, the monitoring and evaluation mechanism should cover all those different angles to be effective. For the same reason this mechanism should involve all the

stakeholders from higher authority to team members and even contractors to incorporate all the relevant opinions and perspectives.

4.2 Failure Factors of Public Projects:

4.2.1 Lack of political commitment

In the context of Bangladesh, if there is no political commitment, it is very difficult to operate a construction project. As it is known that, infrastructural development imposes great impact in overall development process and visible development is a must for election oriented politics, the ruling political party has great interest in public construction projects. If the government does not feel that, the project has impact on its reputation and overall performance, the project may suffer in many perspectives. In these cases, there might be lots of problems like lack of support from local political units, lack of support from the administrative wings and police, delay in important decision making, delay in land acquisition, delay in fund disbursement, corruption and ignorance by high officials and so on.

4.2.2 Lack of support from Department of Architecture

This is a unique factor for the projects of PWD. Department of Architecture (DoA) plays an important role in the project development of PWD. Based on the works of DoA, PWD implements the project. DoA has great responsibility in fulfilling the need of the stakeholders. This organization has greater responsibility in preserving nature and heritage of a nation. Moreover, based on the drawings of DoA, PWD officials work in the field. So it can be said that, DoA is an integral part of the projects implemented by PWD. But due to many reasons, DoA cannot provide adequate support to the projects. Lack of manpower, limitation of resources, lack of proper communication mechanism between PWD and DoA, lack of ownership of project might be some probable causes of this problem.

4.2.3 Lack of support from Design divisions of PWD

This is another unique factor which determinate the performance of projects in PWD. Like DoA, the design wing of PWD plays a very important role in project development. Based on

the architectural drawings and detailing, design wings make structural drawings. Based on these drawings, the officials at field implement the project. This department has great responsibility in the success of project. In case of time, this department can be a cause of project delay. Because, if the project people do not get final structural drawings right in time, they cannot take important decisions timely. In terms of cost, design divisions have responsibility too. Structural engineers of this department are responsible for most optimized solution. They cannot suggest extravagant designs that may cause cost overrun in a project. They should always keep the estimated cost in mind while designing structures. Finally, in terms of quality, design divisions have the utmost responsibility. Design people are liable for safety of life and wealth at the long run. Under designed or undersigned structures can be cause of mass casualty and these cannot satisfy stakeholder needs.

Although design wing of PWD has great importance, it could easily be a bottleneck for projects. Delay in supplying structural drawings is considered as one of the main reasons for project delay in PDW. There are many reasons behind this allegation. Huge lacking in human resource, lack of modern facilities, improper office environment, limitation in research and training facilities, lack of motivation of officials, lack of recognition and encouragement might be some of the causes.

4.2.4 Conflict among project participants

It can be detected from Table 2, specially failure factor 1 and 6, the traits for failure mostly involves lack of agreeableness of key project participants or failing to retain consistency in some form. To achieve favorable quality level from the outcome of project both top level officials and workers at site level needs to be in an understanding synergy otherwise the conformity collapses. If the top management fails to take responsibility for their work and have a tendency to blame the lower level workers, proper teamwork gets hampered and it directly affects the project's results. Quality is ensured by proper coordination and effective teamwork and to achieve that it is the top management's duty to create a fitting workplace that represents those values and eradicate any adversity among team members.

4.2.5 Hostile socio-economic and climatic condition

As evident from project implementation experience from other industries, the analysis of this study also suggests that a hostile condition harms the construction sector projects as well. With an obvious negative impact to project quality, such environment reduces efficiency and production standards. Hostile environment also renders the workforce demotivated and drained that eventually results into unfavorable outcome in terms of quality. The 12.57% variance from Table 2 also supports this notion.

4.2.6 Project manager's ignorance and lack of knowledge

Absence of technical and operational know-how of the team members of the project leads to lower quality of work. As per this research his factor accounts for 11.66% of the variance. The top management should formulate mechanisms to enhance the knowledge gap of team members by arranging training at both need basis and refreshing that in a scheduled manner. Fair and appropriate recruitment procedure and proper training schedule can mitigate these issues.

4.2.7 Faulty project conceptualization

Features under this factor denote defective project conceptualization and conflict between PM and top management. But the title has been noted as faulty project conceptualization' since conflict among members has largely been analyzed in Failure Factor_1 and 6. When there is a non-negotiable delivery date of the project and that is set without incorporating proper inputs and planning ideas from all the relevant parties, the quality of the project takes a hit and work progress becomes chaotic and haphazard. From the owners' perspective, this rush results into a deteriorating quality specification, as they incline to disregard the aberration by the contractor from the approved technical specification. While the contractor tries to save time not following the set standards and the quality of the work end up to be poor eventually.

4.2.8 Uniqueness of some projects

The attributes under this factor varies from project to project. The inception of the attribute ‘Uniqueness of the project activities requiring high technical know-how’ in the failure category shows that if a project contains any exclusive element, that the project team do not possess the experience on, it affects the favorable outcome to achieved in an adverse way. In these cases, special learning and absorbing period is required for the team. In addition, while implementing a project with wide coverage and involving higher financial value, addressing it with the conventional approach and team size may result in poor performance and subpar quality.

4.2.9 Aggressive competition among renderers

Aggressive competition leads the bidders to submit lower than realistic prices to anyhow get the job and then if accepted in that criteria they eventually fail to provide quality material and meet the job standard. Driven by the principle of only to gain profit, they sometimes use lower quality raw materials and substandard technical applications that results into lower quality result of the project. The practice of bidding in this manner has become a regular phenomenon in government owned projects of Bangladesh. From the point of view of saving government funds, approving this kind of bidding may seem acceptable by the authorities, but in the long run the consequences prove to be damaging. Sometimes the lowest bidder selected through this process commissions the whole project to inexperienced subcontractors, leading to unacceptable quality.

4.2.10 Lack of capability of contractors

The limitation in the capability of contractors imposes huge pressure on the performance of a project. Contractors are key stakeholders of a project. Every single parameter of project success depends on the capability of contractors. Contractors may lack of technical expertise. This may be in terms lacking of knowledge of the particular project management, lacking of skilled manpower, lacking of technical knowhow etc. contractors may lack financial

capabilities. Due to lack of financial capability, there could be many problems. Lack of financial capability results delay in project time line.

4.2.11 Lack of use of technology

Due to lack of use of modern technology, the project may suffer in all three parameters of iron triangle, especially in terms of schedule. In the modern time, construction industry is highly dependent on updated technology. If the contractor cannot use modern technology along with skilled project management practice, the project may suffer in its performance. So before selecting contractor, its technological capability should be sensibly examined. Design departments of respected organizations should come forward in encouraging the use of modern technology. For example, use of hydraulic crane, construction lift, ready mix concrete, hydraulic hammer, digital survey could make formidable change in cost, time and quality of a construction project. So, now a days less use of technology is a great constrain in successful project completion.

5. Rooppur Nuclear Power Plan (A Giant Step Towards Development)

To achieve the status of a middle-income country by 2021 and subsequently a developed one by 2041, the Government of Bangladesh has been dedicated and very determined. The accessibility of electrical energy in a safe and reasonable means is the critical input parameters for accomplishing the country's Vision 2021 and the Vision 2041 through socioeconomic development of all social classes while ensuring better life standards for the citizens, planned and smart urbanization and responsible industrialization. To meet the complete demand while keeping the sustainability of the nature intact in the long run, the native resources of energy will become scarce as anticipated by experts. The continuous abundance of energy always requires intensive attention, particularly for ensuring readiness to tackle any future possible comprehensive energy crisis that can adversely affect the whole world and human civilization. Furthermore, the production cost of any form of energy needs to be realistic for confirming that all the classes of the population can have access. Bearing in mind the global understanding of energy policy infers that there should be proper balance between diversification, economics and environmental protection. Bangladesh has given the supreme importance on diversified fuel mix and new technologies incorporation to deliver safe, dependable, cost effective and value-for-money electricity for a longstanding period. It has also initiated to put together and implement nuclear power program to produce base load, secured, environmentally safe and affordable electricity and to diminish relying on imported energy excessively and to increase diverse sources to ensure energy security.

Rooppur Nuclear Power Plant is a giant step towards this vision of Bangladesh government. It is a 2,400 Mega Watt (MW) nuclear power plant. The nuclear power plant is under construction at Rooppur, in the Ishwardi Upazila of Pabna District, on the bank of the river Padma river, 140 km west of Dhaka. It will be the country's first nuclear power plant, and the first of two units is expected to go into operation in 2023. It is to be built by the Russian Rosatom State Atomic Energy Corporation. It should be stated that, the proposal of RNPP was made in 1961, but in 2nd November of 2011, the project got pace when the governments of Bangladesh and Russia came to an inter-governmental cooperation treaty.

The government of Bangladesh is going to build a green city at RNPP for the accommodation of project scientists and officials. This township, on 31.58 acres of land acquired by the government in Nutunhat area adjacent to the main plant area, would be the home to over 2,000 people. After completion of the project, Russian authority would hand over the city to Bangladesh authority. The estimated project cost of Green City is 3,200 crore taka. There are twenty two twenty storied buildings in this green city.

PWD are constructing the infrastructure of this township on the basis of MOU. Already construction of three buildings is completed. Among these three, two buildings are consist of apartments of 8,500 square feet and the other is consist of 1,250 square feet apartments. The scheduled time of this three building was twelve months and estimated cost was 222 crore taka. PWD completed this three buildings in estimated time and budget. Constructing twenty storied buildings in just one year is a huge success in construction project management in Bangladesh.

6. Analysis and Results

6.1 The Sample of Respondents

This chapter describes the sample of respondents to the quantitative survey. The first figure shows the age distribution of survey respondents. It can be seen that respondents mostly represent ‘middle years’ age bands (35 to 44 years) but that there was a representation across the age spectrum:

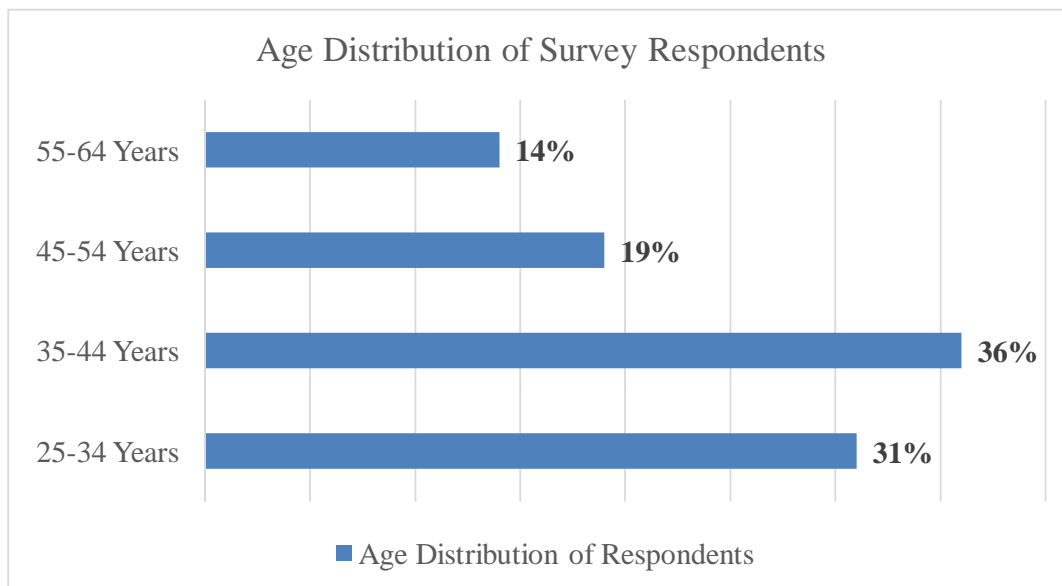


Figure 5: Age Distribution of Survey Respondents

Most of the respondents were from the project delivery team which represents officials from PWD, DoA and Project Management Unit. The second largest representation is from stakeholders who are contractors or resource/service providers of the project. Other representatives are from donor agencies, other departments/ministries of government etc.

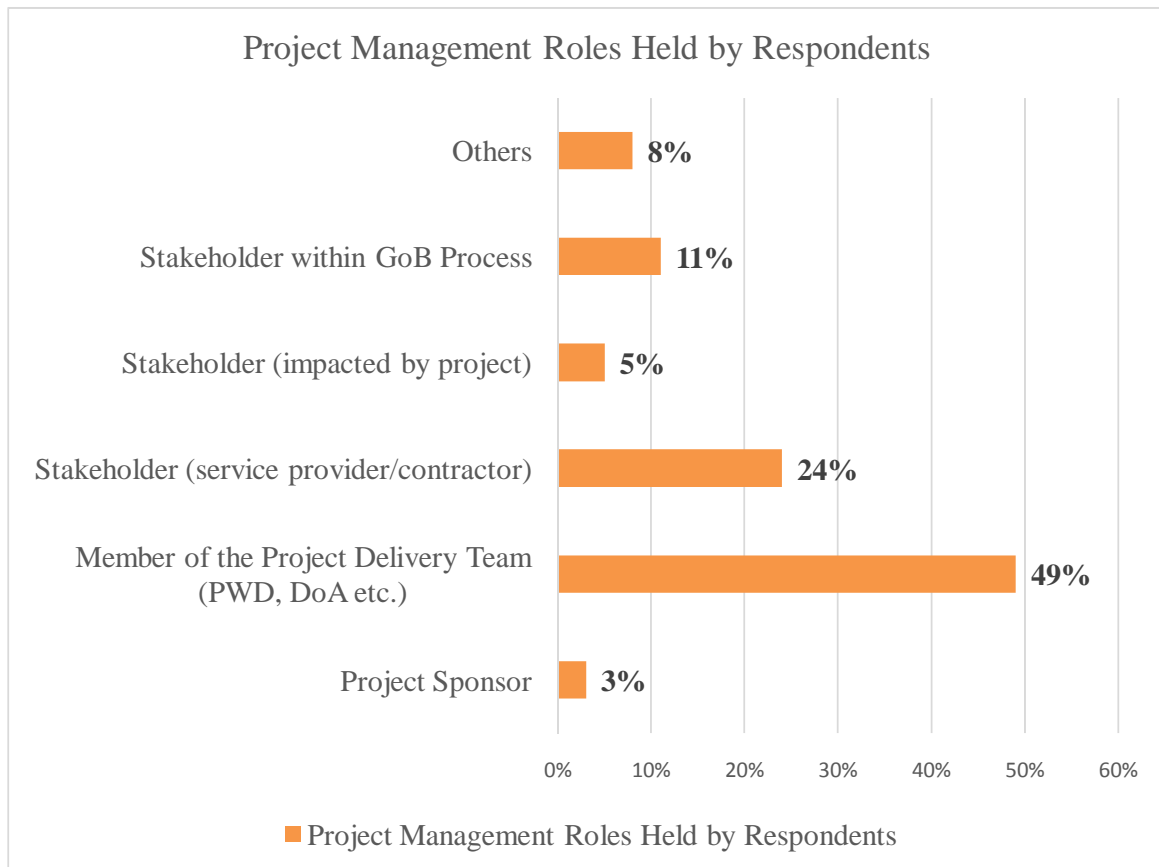


Figure 6: Project Management Roles Held by Respondents

Respondents' experience in the roles they identified was often significant. 86% of the respondents have more than 5 years of experience in project management at different capacities.

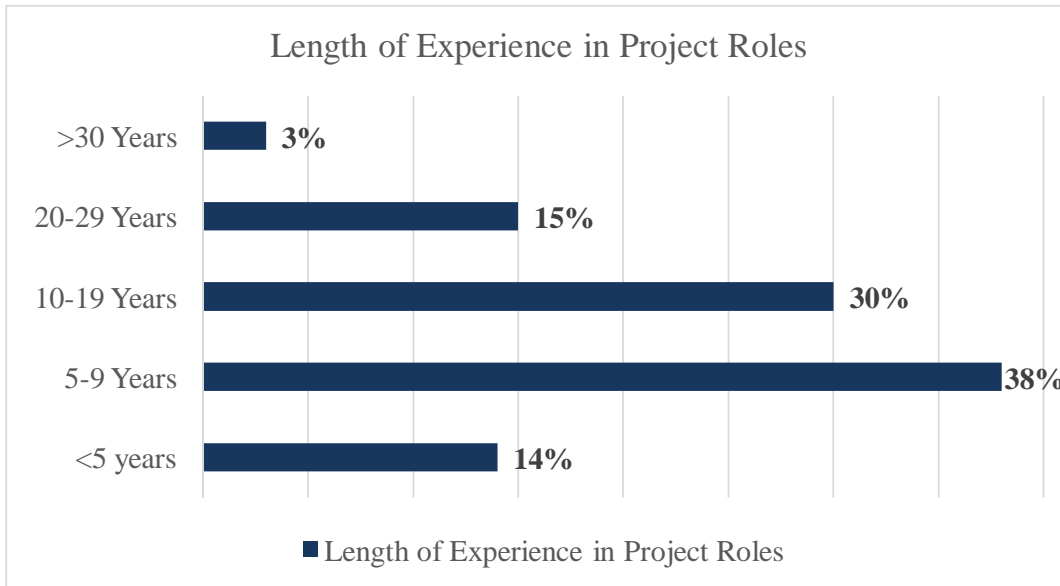


Figure 7: Length of Experience in Project Roles of Respondents

Duration and timely completion is one of the most significant measures of a project's success. The durations of respondents' most recent completed projects were often substantial with most of them lasting at least a year.

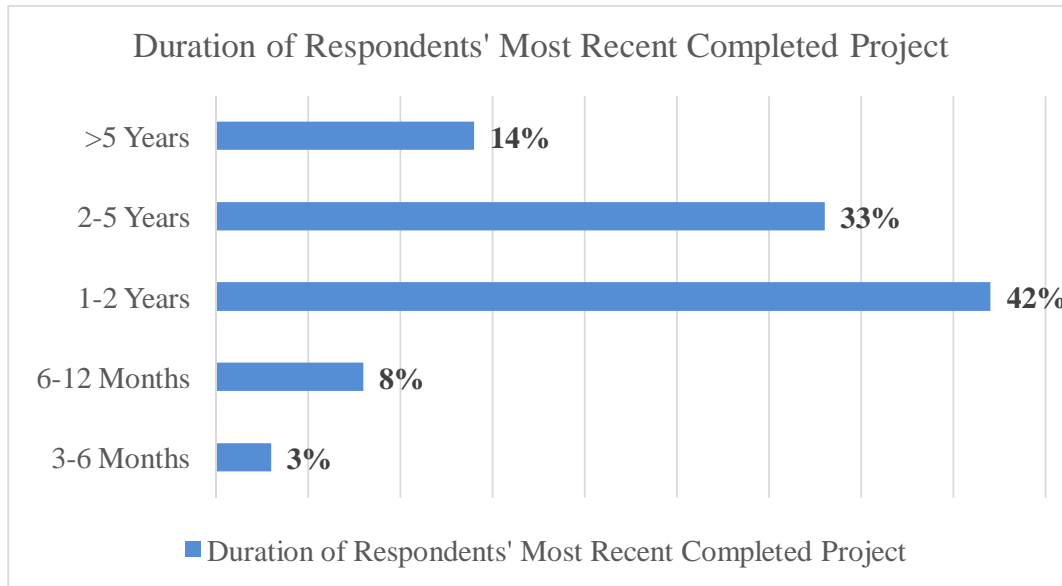


Figure 8: Duration of Respondents' Most Recent Projects

This parameter helps to perceive the respondents' experience in managing higher value construction projects (as these are more complex than lower value projects). Majority of construction projects are stand alone projects rather than wider programs and have lower values. Higher values, as would be expected, occur in the power sector and consisted of several construction aspects. The project chosen for this report (RNPP) is one of the exceptional projects of Bangladesh with an above average high value and that is the representation we see in the figure below:

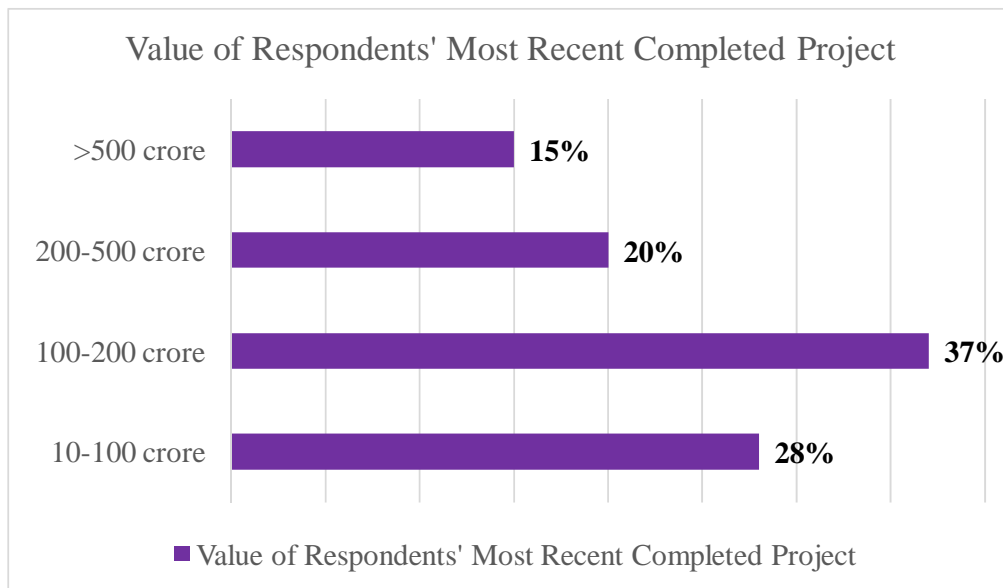


Figure 9: Value of Respondents' Most Recent Projects

In summary of the characteristics of respondents in the survey sample:

- Respondents were mainly mature individuals with substantial project management experience employed across a wide range of sectors in senior project management roles.
- In their most recent projects, they mainly had roles in substantial projects generally of significant duration and value.

6.2 Variation between Different Groups of Project Professionals

Overall, given the relatively high ratings given to all of the success and failure factors, it can reasonably be argued that these findings constitute professional endorsement of the framework as a whole. There were few significant differences between the ratings made by respondents according to their age, length of project experience, project role, or sector. Two tables below represent how some significantly higher average ratings were given to success and failure factors by different groups. It should be emphasized that these differences are marginal ones (for example, an average rating by one group of 8.9 can be significantly different from an average rating of 8.6 by another group). It can be seen that there is no strong consistency to these differences but there was some tendency for the public sectors and those in construction project roles to give somewhat higher ratings:

Table 1: Groups Giving Higher Rating to Success Factors

Factors of Failure of PWD Projects	Groups Giving Higher Rating
Lack of Political Commitment	-no significant difference
Lack of Support from Department of Architecture	-officials from PWD -respondents having 10-19 years of project management experience
Conflict among Project Participants	-respondents having 10-19 years of project management experience -contractors/service providers
Hostile Socio-Economic and Climatic Condition	-no significant difference
PM's Ignorance and Lack of Knowledge	-respondents aged more than 35 years
Faulty Project Conceptualization	-officials from PWD -other GoB officials -respondents having more than 10 years of project management experience
Uniqueness of Some Projects	-respondents aged 25-34 years
Lack of Support from Design Divisions of PWD	-no significant difference

Aggressive Competition during Tendering among Tenderer	-no significant difference
Lack of Capability of Contractors	-members of project management unit -officials of PWD and DoA -respondents having more than 10 years of project management experience
Lack of Use of Technology	-respondents aged 35-44 years -respondents having 5-9 years of project management experience

Table 2: Groups Giving Higher Rating to Success Factors

Factors of Failure of PWD Projects	Groups Giving Higher Rating
Lack of Political Commitment	-no significant difference
Lack of Support from Department of Architecture	-officials from PWD -respondents having 10-19 years of project management experience
Conflict among Project Participants	-respondents having 10-19 years of project management experience -contractors/service providers
Hostile Socio-Economic and Climatic Condition	-no significant difference
PM's Ignorance and Lack of Knowledge	-respondents aged more than 35 years
Faulty Project Conceptualization	-officials from PWD -other GoB officials -respondents having more than 10 years of project management experience
Uniqueness of Some Projects	-respondents aged 25-34 years
Lack of Support from Design Divisions of PWD	-no significant difference
Aggressive Competition during	-no significant difference

Tendering among Tenderer	
Lack of Capability of Contractors	<ul style="list-style-type: none"> -members of project management unit -officials of PWD and DoA -respondents having more than 10 years of project management experience
Lack of Use of Technology	<ul style="list-style-type: none"> -respondents aged 35-44 years -respondents having 5-9 years of project management experience

6.3 Ranking of Success and Failure factors

A total of 350 questionnaires were distributed to the stakeholders of the Housing Project of Rooppur Nuclear Power Plant. They are engineering professionals from both PWD and contractors' organizations and five architects from DoA. A total of 93 completed responses were received, giving a response rate of approximately 26%. Analysing the responses the following results are found.

Table 3: Determinants of Success of Housing Project at RNPP and Corresponding RII

Factors of Success in Housing Project at RNPP	RII	Ranking
Project Manager's Competence	0.892	2
Top Management Support	0.903	1
Contractor's Competence	0.844	5
Interaction among Project Participants	0.812	6
Importance of the Project (Based on Need for Community)	0.715	9
Political Commitment	0.710	10
Availability and Management of Fund	0.849	4
Use of Technological Advancement	0.801	7
Monitoring and Feedback Mechanism by Project Participants	0.785	8
Activities of Technical Support Team at Head Office of PWD	0.871	3

Table 4: Determinants of Failure of Projects in PWD and Corresponding RII

Factors of Failure of PWD Projects	RII	Ranking
Lack of Political Commitment	0.54301	9
Lack of Support from Department of Architecture	0.75269	2
Conflict among Project Participants	0.67204	5
Hostile Socio-Economic and Climatic Condition	0.55914	7
PM's Ignorance and Lack of Knowledge	0.55376	8
Faulty Project Conceptualization	0.70968	3
Uniqueness of Some Projects	0.4086	10
Lack of Support from Design Divisions of PWD	0.55376	8
Aggressive Competition during Tendering among Tenderer	0.56452	6
Lack of Capability of Contractors	0.76344	1
Lack of Use of Technology	0.67742	4

6.4 Discussion of Findings

From the questionnaire survey of this research, the relative importance of various factors responsible for project success and failure is determined. The respondents of the survey is stakeholders of RNPP from PWD, contractors' organization, and DoA. So it can be said that the result is based on the thinking of personnel related to project implementation.

In case of the determinants of success of Housing Project in RNPP, it is found that "top management's support" is the prime factor of success. In this project, the top managements from all the related organizations related to implementation were concerned from the beginning of the project. Honorable minister and secretary of ministry of housing and public works were well informed about the development of project. Honorable chief architect of DoA was concerned regarding the drawings and detailing of the project. Honorable chief engineer of PWD was highly concerned about the performance of the project throughout the project timeline. His strong leadership encouraged the project people in delivering quality work in defined timeline within allocated budget. But it should be stated that, "top management support" is an indirect factor for project success.

The second and third factors of success are project manager's competence and activities of technical support team at head office of PWD. This two is directly related to project progress. Project manager and focal point of technical advisory team are two key persons for project progress. Project manager's knowledge and capabilities are must for any projects success. His efficiency in decision making and managing people is key determinants of project performance. On the other hand, dedicated technical support team is a new concept in case of housing project in RNPP. This team is headed by the superintendent engineer of Design Circle-1 of PWD. He is responsible for all technical assistance and resolving any technical issues in shortest possible time. Apart from the project manager, he is another leader of this project. Based on the technical guidelines, this project is running well.

Factor regarding budget came out as the fourth important factor. This project is mostly dependent on Russian fund. As this is a foreign funded project, the fund management was

good. This is a deposit work for PWD. For this reason there was lesser bureaucratic problem. Contractors got timely part payments based on their project progress. For this reason they were highly motivated in work.

Contractor's competence was ranked five, which is very expected. Without competent contractors the previous factor cannot be fruitful. Most interestingly, political commitment is found last in rank among all the factors. The project RNPP is of high importance to the government. The top management effort (which is ranked first) was greatly driven by political commitment. RNPP is a high voltage project for the ruling party. So it can be said that, this is an important findings of this research that, stakeholders don't consider political commitment as an important factor for the success of a project.

In case of failure factors of other projects of PWD, lack of capability of contractors is ranked first. Based on all the factors which affect competence of contractors the ranking is well justified. Lack of support from DoA is ranked two as delay in preparation and supply of architectural drawing is one of the main causes of project delay. Limitation in manpower may be a cause of this problem. Faulty project conceptualization is the third point for failure. It means the project implementing body does not know the project itself in an extensive manner. Lack in proper guideline from the top, misconception in project formulation, lack of adequate technical and project management knowledge lack of interest might be the causes of faulty project conceptualization.

Lack of political commitment and uniqueness of some projects are least ranked factors for project failure. This is quite expected because political commitment was placed last for the success of project as well. On the other hand, uniqueness of project actually means nothing, because, when a work is unique in some of its dimensions, only then it becomes a project. So uniqueness does not impose any pressure for project performance.

There are some other interesting points regarding the outputs of this survey. If the RII values of the factors of success and failure are examined closely, it is found that, RII values are much higher in case of success factors than that of failure. This phenomenon needed to be

explained. It represents that in case of success factors, participants of the survey think in a similar manner. It means that, for this particular project of RNPP, people's perception is somehow similar in case of success. For this reason the response regarding success factor are similar to some degree. So the outcome regarding success is nearly unanimous in case of top ranked factors. On the other hand, response related to failure varies in a higher degree. Perception towards failure factors varies from person to person. Again it can be said that, success factors are for one particular project and failure factors are of general consideration. So response varies in case of failure.

7. Limitation

There are some limitations of this research. These are as follows.

- The respondents of this survey are from PWD, contractor's organization and DoA only. If there were respondents from other parties, the analysis could have been more representative.
- The housing project of RNPP is not yet completed. Three buildings are constructed and handed over. This project may not come out as a successful after completion. So, final performance of this project is still uncertain. But so far the project is running good.
- As the project is still underway and habitation is just started in the completed buildings, quality of construction at the long run cannot be ensured. So it can be said that, the quality issues of the housing project of RNPP is less considered here in this research.
- Factors considered for success and failure may be interdependent. This interdependence among the factors is not considered in the analysis. This correlation between independent variables could be addressed in future research. Factor analysis could be an effective tool for examining this type interdependence (Jha and Iyer, 2006)
- Success factors and their relative importance, found in this research are based on a particular project. This ranking may not be same in case of other projects which may vary in a number of dimensions.

8. Conclusion

A project with a successful completion in terms of cost, schedule and scope is the most cherished outcome for all the participants of the project. Compliance with all the quality specifications in scheduled time within allocated budget is the vision statement of any project. An unsuccessful project results in loss of resource, time and reputation. As Bangladesh is running fast in the development highway, the importance of completing projects fulfilling all the success parameters is even more required in the present socio-economic condition. In this regards, PWD has to play vital role as it is the oldest organization responsible for infrastructural development of the country. With modern project management practice, it is possible to achieve the most desirable outcome. Nurturing the success factors carefully and avoiding the factors of failure tactfully is a key to expected project performance. All the project managers and the top management of the organization should be aware of these factors which have impact on project performance. In this research, it is interestingly found that, although this is the era of automation and modern technology, efficient human resource have greater impact on project. Finally it can be concluded by saying that, human element rather than machinery is the key factor to project success.

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