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An Assessment of the Factors Leading to Projects Success/Failure in the Mauritian Building Construction Industry

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ABSTRACT: The Mauritian building construction sector is the 3rd largest employer in the economy with around 46,300 employees, thus absorbing a large percentage of the working population with minimum level of education. However, in the Mauritian construction industry, the concept of project success/failure still remains unclearly defined. The well-known success criteria like time, cost and quality do not provide any practical information of achieving project objectives in an efficient way. Thus, it is very important for local building construction companies to understand the factors which make a project successful or a failure, if they want to progress in the highly competitive environment. The main aim of this research is to identify the major success/failure factor (and their interrelationship) from the 26 factors which were identified from project management literature. The survey was carried out among the major stakeholders of the Mauritian building construction industry through emails and social-medias. 37 responses were successfully received. From the analysis, primary and support areas of success/failure factors were identified and a framework was worked out so as to illustrate the factors which can increase project success in building construction. The most important success/failure factors are proper planning/scheduling, purchasing, contractor competences and other project management skills. Moreover, a clear interrelationship has been identified between primary and support areas of success/failure factors. Hence, from the developed framework and the interrelation matrix of project success/failure factors, major building construction project stakeholders in Mauritius can focus more on the primary factors to increase chances of project success.

1. INTRODUCTION

1.1 Overview of Construction Industry and its segments

Construction is the process of constructing a building or an infrastructure and it starts with planning, design, and financing; and continues until the project is built and ready for use. Large-scale construction requires collaboration across multiple disciplines. An architect normally manages the job, and a construction manager, design engineer, construction engineer or project manager supervises it. Those involved with the design and execution must consider zoning requirements, environmental impact of the job, scheduling, budgeting, construction-site safety, availability and transportation of building materials, logistics, and inconvenience to the public caused by construction delays and bidding. There are three sectors of construction: Buildings, Infrastructure and Industrial.

Building construction is usually further divided into residential and non-residential (commercial/institutional). Infrastructure is often called heavy civil or heavy engineering that includes large public works, dams, bridges, highways, railways, water or wastewater and utility distribution. Industrial construction includes refineries, process chemical, power generation, mills and manufacturing plants. Fig. 1.1 gives an overview of the different segments of the construction industry in Mauritius.

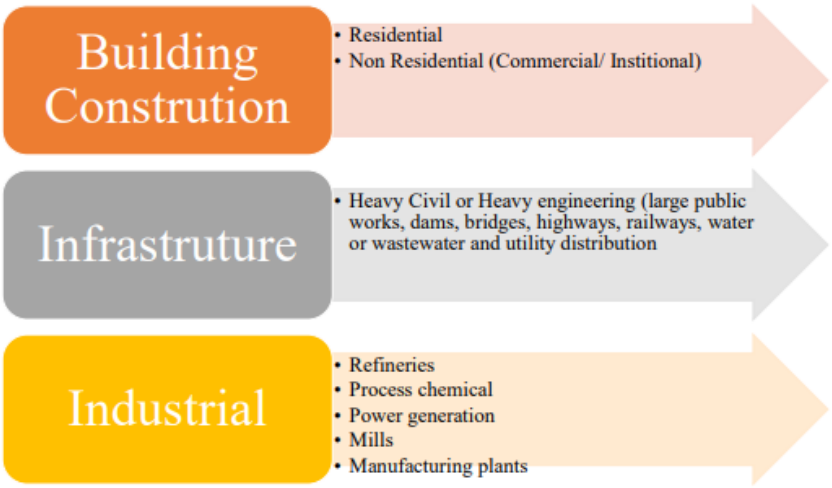


Fig.1.1: Segmentation of the Construction Industry in Mauritius

1.2 Overview of Construction Industry in Mauritius

Success or failure in the Mauritian construction projects is very ambiguous topic. There are numerous limitations (factors of failure) and drivers which can lead to successful delivery of a project (factors of success) at the same time. Around half of century researchers in project management field have been working on identification of project success/failure factors. However, this area of interest continues to motivate both academician and practitioners to investigate on factors which lead to project success regardless of the amount of studies that already have been done. In this study, we shall focus on the project success/failure factors for the Mauritian Construction industry.

The construction sector, a pillar of the Mauritian economy, is a macro-economic factor which brings development in the country. For the year 2017, according to information gathered from the Registrar of Companies, the local authorities, Construction Industry Development Board and contractors, the growth rate of the construction sector is expected to be higher than that of the past three years. Major projects in the construction sector, worth approximately MUR 25 billion, will be undertaken in the year 2017, according to the Minister of Public Infrastructure and Land Transport (GIS 2016).

The investment in the construction sector in Mauritius stood at MUR 47 billion in 2014 while direct employment was around 46,000 people. Recalling that the construction sector declined by 6.7% in 2014 after the contraction of 9.4% in 2013, it would recover with the upcoming various infrastructural projects, thus the necessity for implementation of good practices which will result in high quality of work, services and construction materials in Mauritius (GIS 2015).

1.3 Problem Statement

Nowadays, building construction companies have been struggling to improve their practices in order to keep in activity on the market. Nevertheless, there are projects that fail to attain their planned targets, making the total cost of the project to increase or not being able to reach their targets in terms of schedule and quality of the final product, which along with the difficult and competitive economic environment the country is facing, may lead business failure.

There are several examples of incomplete projects in Mauritius. One example is the Centerpoint shopping center at Trianon, this commercial project at a cost of nearly Rs. 100 million has ran out of fund (Business Mega, 2012). There are other examples; residential projects of 20 luxury apartments and 10 villas in the region of Bain Boeuf and also luxury apartments at Trianon have all been complete failures and are facing court litigation.

1.4 Aim & Objectives

The aim of the study is to seek the perceptions of construction professionals by revisiting some of these critical factors causing the success/failure of building construction projects in Mauritius. The study will inform the stakeholders of the reoccurring factors causing success/failure, and re-evaluate present strategies of overcoming these factors. It is also to anticipate that some of the recommendations proposed would enhance the current and future projects' success rates. The research gives an overview and status of building construction in Mauritius and it summarises and presents brief discussions on the critical factors causing the failure/success of construction projects and their interrelation. Below are the two-research question that shall be tackled:

I. Research question 1: Identification of main success/failure factors in the Mauritian building construction industry.
II. Research question 2: Identification of any possible interrelation between the success/failure factors in the Mauritian building construction industry.

2. LITERATURE REVIEW

PMI defines a "Project" as a temporary endeavour undertaken to create a unique project or service. In the Construction Extension of the PMBOK® Guide (PMI 2003, Pg. 4); a construction project is said to be unique because:

- Construction projects produce a facility that will make or house the means to make a product or provide service facilities such as dams, highways and parks.
- They deal with geographical differences and natural events in every case and may have significant effect on the environment.
- They involve a team of hired specialists in design and construction disciplines. • They involve many stakeholders particularly environmental and community groups.
- Construction projects often require large amounts of materials and physical tool to move or modify those materials.

According to PMI, progressive elaboration is a characteristic of projects that integrates the concepts of temporary and unique and it means developing in steps, and continuing in increments. Construction projects are prime examples of projects that require progressive elaboration. For example, the project scope will be broadly described early in the project, and made more explicit and detailed as the project team develops a better and more complete understanding of the objectives and deliverables.

Progressive elaboration of a project's specifications needs to be carefully coordinated with proper project scope definition, particularly if the project is performed under Contract. When properly defined, the scope of the project – the work to be done – should be controlled as the project and product characteristics are progressively elaborate. Below is an example of a progressive elaboration by referring to the development of a chemical process plant.

Example 1: Development of a chemical process plant begins with process engineering to define the characteristics of the process. These characteristics are used to design the major processing units. This information becomes the basis for engineering design, which defines both the detail plant layout and the mechanical characteristics of the process units and ancillary facilities. All of these result in design drawings that are elaborated to produce fabrication and construction drawings. During construction, interpretations and adaptations are made as needed and subject to proper approval. This further elaboration of the characteristics is captured by as-built drawings, and final operating adjustments are made during testing and turnover (Duprey 2010, Pg.26).

The debate about progressive elaboration is crucial, in construction projects, because the elaboration steps often carried out over an extended period of time (normal it takes years for big projects). One major challenge that project management has to face is to maintain the consistency of the project's scope throughout project execution and it continues through all the phases of the project life cycle.

The life cycle phases of a construction project, using an Engineering, Procurement, and Construction (EPC) Contract as an example, typically include the below four phases (Truman 2017a, Pg. 3):

- The Conceptual Phase, including the owner's development of the project's first goals, design concepts, initial design calculations, and order of magnitude cost estimates, identification of financing mechanisms, taking the pulse of the public and regulatory agencies on the concept, etc.
- The Preliminary Phase (sometimes called the basic design phase), including preliminary design calculations and preliminary plot plans and basic design drawings, development of permit packages and filing major permit applications, development of a contracting strategy, obtaining approval of major financing, ordering of long-lead-time equipment, and development of an EPC Contract and bid package.
- The Bid Phase (or Contracting Phase), including identification of qualified bidders, solicitation and analysis of bids, clarification of the bids, and negotiation and award the EPC Contract.
- The EPC (or Execution) phase, including all detailed engineering, procurement and construction activities, and Project Management activities identified as the contractor's responsibility, pre-commissioning and start-up activities, and possibly commissioning and initial operations activities.
- The Commissioning and Initial Operation phase, if not included above.
- The Warranty period.

Construction projects can be of different type (Anon 2017):

- Erecting a completely new facility from the ground (Design and build concept).
- Refurbishment of an existing building or expanding of existing facilities.
- And also, routine maintenance operation can be combined with construction project (Design, build and operate concept).

2.1 What constitutes project success or failure?

Most frequently a project is considered as a failure if it does not meet its targeted cost, time, or scope. Commonly a fourth criterion is also included, according to Stephen & Terry (2006), the benefits accruing to the organization as a result of the project. The triple constraint is at the root of project success. But while we can plan to control scope, time and cost, we still cannot guarantee success. That's because, during the project's life cycle, roadblocks will get in the way of delivering the value customers expect.

Fig. 2.1: The Triple Constraint in Project Management (Ten Six 2004)

2.2 Project Success

There is a number of variables which influences the success of a project implementation. According to a study carried out by Chan et al. (2002) suggests that success factors can be grouped under five main categories. These include human-related factors, project-related factors, project procedures, project management actions, and external environment.

2.2.1 Project-Related Factors & Procurement Related Factors

Project scope is a very important factor for the project success. Numerous researchers have attributed different measurement of this factor which are the type of the project, nature of the project, number of floors of the project, complexity of project and size of the project. In the other hand, a number of researchers identified the importance of procurement factors (Chan et al., 2002). There are two attributes which are used to measure this factor; they are procurement method (selection of the organization for the design and construction of the project) and tendering method (procedures adopted for the selection of the project team and in particular the main contractor).

2.2.2 Project Management Factors & Project Participants-related Factors

Project management action is a key for project success. According to Chan et al. (2002), the project managers shall be able to plan and execute their projects to maximize the project's chances of success through management tools. Then, the variables in project management include adequate communication, control mechanisms, and feedback capabilities, troubleshooting, coordination effectiveness, decision making effectiveness, monitoring, project organization structure, plan and schedule followed, and related previous management experience. A number of features will also affect this factor, including the communication system, control mechanism, feedback capabilities, planning effort, organization structure, safety and quality assurance program, control of subcontractors' works, and finally the overall managerial actions.

2.3 Project Failure

According to Truman (2017c, p. 5), reasons for project failure that are often cited during disputes include:

- The failure of the Project Management team to adequately plan the work, or, when a plan is developed, to properly execute that plan.
- The failure to provide adequate human resources, staff or direct labour, to the project.
- The failure to develop adequate project schedules, or to maintain those schedules throughout project execution.
- The failure to control costs and changes throughout the execution of the project.

All of the above can be attributed at some level to inadequately trained or under-resourced Project Management teams.

2.4 Environmental Impact Assessment and Social Impact Assessment

Development is an ever-growing process which impacts both environmental and human health. Hence, impact assessment should be done at a very early stage of the project, planning and design, so that potential problems are foreseen well in advance and same are mitigated. Environmental Impact Assessment (EIA) and Social Impact Assessment (SIA) are used to forecast the consequences of any development project. Therefore, Impact Assessment provides a lucid approach to sustainable development. EIA is a process having the ultimate objective of providing decision-makers with a sign of the likely impact of their actions. Environmental Assessment enables us in carrying out environmental cost-benefit analysis of projects at an initial stage. It is thus a pioneer to detailed analysis of environmental impacts, which are taken up only if a need for same is established. It gives a view of the actors involved in the development-environment linkages. This is important because community at large is always impacted in terms of deterioration of living environmental which accompanies any major projects. Based on Environmental Assessment, the regulatory measures can be acknowledged and the roles of concerned agencies defined for achieving more efficient environmental management. Social Impact Assessment (SIA) is carried out to ascertain the impacts, which would occur due to implementation of

the project. The exercise facilitates identifying types and extent of impacts and also identifying impacts that can be minimized by good engineering practices. Efforts are made to mitigate impacts, which cannot be minimized during the planning stage. The Impacts Assessment is thus a systematic process of identifying and mitigating impacts on individuals or society in consultation with the individuals or society affected (B.k. Dutta, 2010).

2.5 Factor Causing Project Failure

Projects that fail to complete on time, on budget, or in scope has an unexpected and unwanted cost implication. However, the impact of project failure goes far beyond extra costs for staff, equipment and other resources. There have been many studies on causes of project failure and where the different project failure factors were identified. According to a research carried out by Nyguyen & Chilesche (2013a, p.933), they tried to come up with a list of the major factors which could cause a construction project to fail or to be successful. Table 2.1 illustrates all the project success/failure factors identified through the research.

Table 2.1: Major Causes of Project Failures by Nyguyen & Chilesche (2013a, p.933)

No.	Project Failure Factors (PFFs)
1	Poor project management
2	Poor planning and scheduling
3	Inaccurate cost estimation
4	Unclear scope and goals
5	Project Failure Factors (PFFs)
6	Inefficient resources allocation
7	Poor design, Frequent design changes, Design errors
8	Poor communication
9	Lack of financial capacity
10	Bureaucracy and corruption
11	Leadership problems
12	Lack of experience and knowledge
13	Delays in payment
14	Lack of technical performance
15	Subcontractor failure
16	Poor contractor performance
17	Poor monitoring and tracking
18	Cultural Differences in global projects
19	Poor management of expectations
20	Weather and social environment

Table 2.2: Major Causes of Project Failures by Cousillas (2010)

No.	Project Failure Factors (PFFs)
1	Competitors (Project Team Members and Project Managers)
2	Continuous or dramatic changes to initial requirements
3	Customer’s requirements inaccurate, incomplete or not Members and Project Managers) defined (Project Team)
4	Disagreements or conflicts of interest among different departments
5	Inaccurate cost estimations
6	Inaccurate time estimations
7	Inadequate management of suppliers and procurement
8	Lack of Management support (Project Team Members and Project Managers)
9	Lack of previous identification of relevant rules and legislation
10	Not or badly defined specifications at the time the Project (Customers/ Final Users) Team starts to work
11	Political, social, economic or legal changes
12	Project Manager’s lack of commitment (Project Team Members and Customers/ Final Users)
13	Project Manager’s lack of communication skills (Project Team Members and Customers/ Final Users)
14	Project Manager’s lack of competence (Project Team Members and Customers/ Final Users)
15	Project Manager’s lack of vision (Project Team Members and Customers/ Final Users)
16	Project requirements inadequately documented (Project Team Members and Project Managers)
17	Project staff changes
18	Project Team's lack of competence (Project Team Members and Customers/ Final Users)
19	Project Team's misunderstandings related to Customer/User's wishes or needs (Customers/ Final Users)
20	Projects Team's lack of commitment (Project Team Members and Customers/ Final Users)
21	Public opinion opposition to project
22	Quality checks not or badly performed

23	Too much complex or new technology
24	Unexpected events with no effective response possible
25	Unrealistic customer's expectations (Project Team Members and Project Managers)
26	Wrong number of people assigned to the project

2.6 Lesson Drawn from Empirical Studies and Case Studies of Project Success/Failure Factors

According to a research made by Nguyen and Chileshe (2013b, p.937), major expected factors for projects failure could be as follows:

- Disregard of the significance of project planning process and poor project planning;
- Lack of experience in executing complicated projects;
- Poor design capacity and the frequent design changes;
- Lack of knowledge and ability in managing construction projects;
- And lack of financial capacity of owner. Furthermore, the issue of corruption and bribery.
- Poor risk assessment and management

Hence, their recommendation is that the various stakeholders of the project need to be included in a very thorough planning process, thereby maximizing the input from the various vested interests and broadening the understanding of the project manager and team members. If realistic goals and objectives are set in the beginning, increased costs, missed schedules, the assignment of inappropriate or substandard resources, and changes can be minimized or overcome, resulting in success rather than failure.

2.7 Literature Review Findings

In this section, the different success/failure discussed above are considered so as to come up with a framework.
Fig. 2.3 reflects success/failure factor extracted from different sources and which will be a base for answering research question for this study.

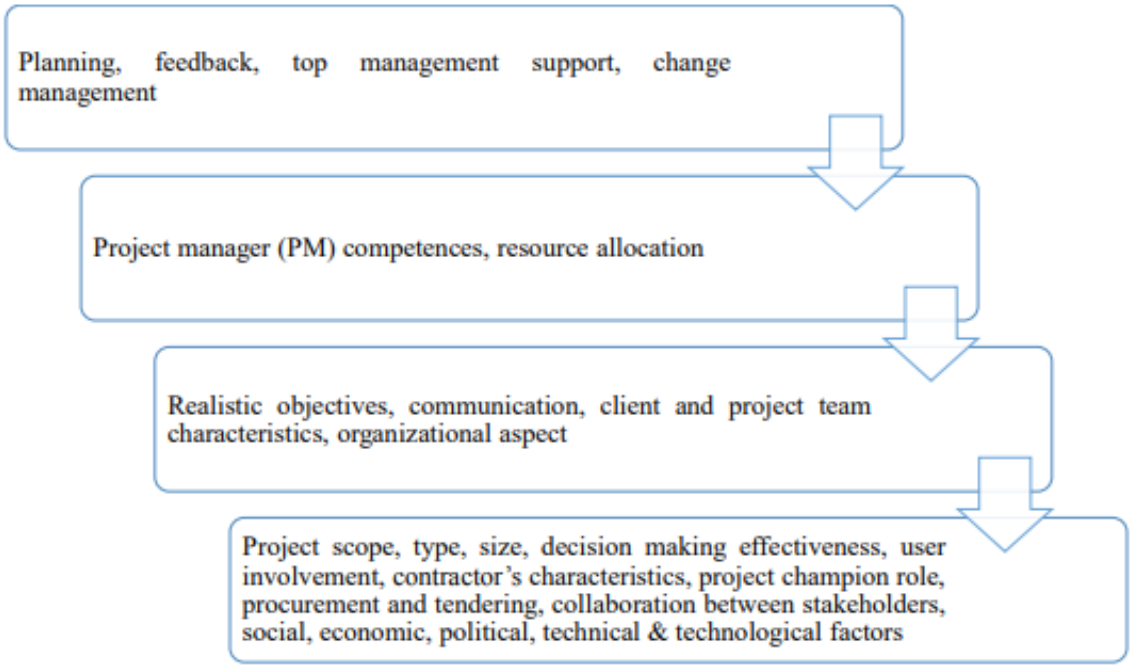


Fig. 2.3: Project Success/Failure Factors Framework

These success/failure factors are widely renowned and therefore are considered as a platform for questionnaire design.

3. METHODOLOGY

According to Cooper and Schindler (2003), the next step in the research process, after studying the literature, is deciding on the most suitable methodology approach. Hence, the main contribution of this chapter is the description of the general study approach followed by discussion and motivation of data collection method.
This section is divided into two major parts:
1. Identification of the fundamental philosophy of the study; which include research philosophy, research approach, research strategy, design of questionnaires, data collection etc...

2. Discussion of data collection techniques chosen for the research process; which include flow of research process, limitation of research, research ethics.

3.1 Research Philosophy

A research philosophy is a belief about the way in which data about a phenomenon should be gathered, analysed and used. The term epistemology (what is known to be true) as opposed to doxology (what is believed to be true) encompasses the various philosophies of research approach. The purpose of science, then, is the process of transforming things believed into things known: doxa to episteme. Two major research philosophies have been identified in the Western tradition of science, namely positivist and interpretivist (Anon, 2017).

Table 3.1 gives an overview and difference between positivism and interpretivism:

Table 3.1: Overview of Positivsm & Interpretivism Philosophy (Research Methodology, 2017)

	Positivism	Interpretivism
The observer	Must be independent	Is part of what is being observed
Human interests	Should be irrelevant	Are the main drivers of science
Explanations	Must demonstrate causality	Aim to increase general understanding of the situation
Research progresses through	Hypotheses and deductions	Gather rich data from which ideas are induced
Concepts	Need to be operationalised so that they can be measured	Should incorporate stakeholder perspectives
Sampling requires	Large numbers selected randomly	Small numbers of cases chosen for specific reasons
Units of analysis	Should be reduced to simplest terms	May include the complexity of 'whole' situations
Generalisation through	Statistical probability	Theoretical abstraction

For this specific study, positivism philosophy seems to be the most suitable approach. This is because the research is based on the building construction industry of Mauritius and statistical techniques will be more useful to gather facts and thus come up with trends in the industry and simultaneously uncovering facts.

3.2 Research Approach

There are two types of approach for a research (Anon, 2017):

• Deductive approach: A deductive approach is concerned with "developing a hypothesis (or hypotheses) based on existing theory, and then designing a research strategy to test the hypothesis). • Inductive approach: Inductive approach, also known in inductive reasoning, starts with the observations and theories are proposed towards the end of the research process as a result of observations. Hence for this research, deductive approach is more appropriate. This is because this particular approach helps to accumulate current knowledge about the area of interest, create hypothesis, do testing and analyse existing theory. The process begins with analysis of the current literature related to success/failure factors in project management area and building construction projects in particular.

3.3 Data Collection

Data collection is the process of gathering and measuring information on targeted variables in an established systematic fashion, which then enables one to answer relevant questions and evaluate outcomes. There are several ways to explore which success/failure factors dominate the Mauritian building construction industry. Here, we shall explore the different techniques that might be used to collect data so as to conduct a successful study.

Qualitative & Quantitative Method For the purpose of this research, both qualitative and quantitative approach shall be used to conduct the research. Quantitative methods might provide a more effective data collection by considering the scope of

research. However qualitative methods are more flexible and could be used to exploit in depth different areas of research question. These two approaches might complement each other and lead to a coherent.

Survey design the questionnaires is designed to gather the receivers' perceptions about success/failure causes and factors, having considered 3 different profiles.

The questionnaire is comprised of 5 parts, asking for:

- General information about what kind of projects have the receivers undertaken, with multiple choice, yes/no and open questions.
- Grade of fulfilment of Project targets regarding cost, time and quality requirements, considering the receivers' experience.
- Rate frequency for different Project failure causes, with multiple choice questions
- Grade of importance of different project success/failure factors. Respondents shall rate each one using a scale from 1 (not important) to 10 (Very important).
- Open-ended questions about their person views about the topics

3.4 Limitations of the Research Methodology

Limitations of research methodology designs are mainly related to the main elements chosen to conduct the research.

Research strategy: Since survey was chosen as the main strategy of this study a problem of question interpretation might be a limitation of the study. Different understanding of the questions might lead to a false conclusion or provide insufficient data for further analysis

Data collection technique: Questionnaire methodology also has some barriers and obstacles. Validity and accuracy of questionnaire data might be low considering the characteristics of respondents (Ticehurst and Veal, 1999). Two of the most serious concerns are possibility of low response rate to the questionnaire and inaccuracy in questionnaire design itself.

Sekaran (2003) suggest that 25-30 per cent response rate might be considered as acceptable. Therefore, the validity of this type of data collection technique might be questioned as the other 75-70 per cent's opinion is not counted (Ticehurst and Veal, 1999). The other problem closely connected to the low response rate is discussed in the literature as 'uninformed response' (Saunders, et al., 2007). This research will address this issue by targeting the questionnaire on the experienced project teams (including engineers, managers, senior managers and other members) within the organizations.

Data analysis: Quantitative approach in research strategy will not allow the researchers to explore the area at the same depth as qualitative research techniques (Saunders et al., 2007). Therefore, data analysis will not be able to answer curtain type of questions, for example those related to the reasons of one factor dominating the other.

4. RESULTS

Findings and discussion will be presented in order to realize the objectives of this study in the most efficient way which is being focused on the two research questions:

- Significance of success/failure factors in Mauritian building construction industry.
- Identifying possible interrelations between success/failure factors in the Mauritian building construction industry.

Hence, the first part begins with the analysis of the quality of the sample and confirms the reliability of the research. Then, we shall focus on the different groups and single factor which influences the building construction project success/failure in Mauritius. This includes detailed analysis from different perspective in order to understand why one factor is considered more crucial for project success/failure.

Then, the second research question will be tackled by correlation analysis which includes the calculation of the interrelationship between the different factors. Furthermore, the possible causes of the independent factor shall be discussed.

4.1 Sample/Respondents Descriptions

The questionnaire was created on Google forms and same was shared by e-mail and on social media to obtain responses. From data collection through questionnaires, a total of successful 37 responds were obtained. From Table 4.1, we can clearly see that 43.2% of our sample are engineers followed by managers (13.5%) and senior engineers (10.8%). Therefore, the samples represent professionals who are on sites and are used to the field issues.

Table 4.1: Job Title of Respondents

	Frequency	Percent	Valid Percent	Cumulative Percent
Director	1	2.7	2.7	2.7
Engineer	16	43.2	43.2	45.9
Manager	5	13.5	13.5	59.5
MEP Coordinator	1	2.7	2.7	62.2
Project Coordinator	3	8.1	8.1	70.3
Quantity Surveyor	2	5.4	5.4	75.7
Responsable de Projet	1	2.7	2.7	78.4
Senior Engineer	4	10.8	10.8	89.2
Senior Manager	2	5.4	5.4	94.6
Trainee Engineer	2	5.4	5.4	100.0
Total	37	100.0	100.0	

Additionally, experience of the respondents might be a good indicator of sample precision (Saunders, et al., 2007). Table 4.2 presents a summary of respondent's experience in building construction projects where the majority of the respondents (75.6%) have more than 2 years of work experience in the building construction industry. Therefore, responses obtained from such a sample might be characterized as mature and can be used for further analysis.

Table 4.2: Years of experience of sample

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	> 8 years	5	13.5	13.5	13.5
	2-4 years	15	40.5	40.5	54.1
	5-7 years	8	21.6	21.6	75.7
	less than 2 years	9	24.3	24.3	100.0
	Total	37	100.0	100.0	

The high quality of sample precision for answering the research questions is also supported to the fact that all of respondents are currently involved in building construction projects. Moreover, these respondents come from different type and size of company operating in different (not only in Mauritius but also in the Indian Oceans, Africa and even worldwide), as shown in Table 4.3, but still the majority (40%) operated only in Mauritius.

Table 4.3: Respondents' area of operation

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Africa	6	16.2	16.2	16.2
	Indian Ocean (Seychelles, Reunion etc…)	12	32.4	32.4	48.6
	Mauritius only	15	40.5	40.5	89.2
	Worldwide	4	10.8	10.8	100.0
	Total	37	100.0	100.0	

Though, 40% of the respondents come from big local company, the sample does represent different sizes of firms as shown in Table 4.4.

Table 4.4: Company size of respondents

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	>200	15	40.5	40.5	40.5
	100-200	6	16.2	16.2	56.8
	20-50	9	24.3	24.3	81.1
	50-100	5	13.5	13.5	94.6
	less than 20	2	5.4	5.4	100.0
	Total	37	100.0	100.0	

Hence, sample description provided above deals with several important issues closely connected with the purpose of the current research. It helps to support general validity and reliability of data collected to test the research hypothesizes. This is because the data contains responses from experienced stakeholders which work in companies of different size and operates at different level of the industry. Furthermore, all the respondents are in the Mauritian building construction projects. Thus, the sample obtained is able to provide relevant data in order to answer our research questions.

4.2 Groups of Factors Discussion In this section, we shall discuss the findings on groups of success/failure factors in the building construction industry in Mauritius.

4.2.1 Groups of Success/Failure Factors Figure 4.1 illustrates each group of project success/failure factor. From the diagram, it is obvious that there are four group factors which dominate a project success/failure in the Mauritians building construction industry; project management (19%), procurement (18%), human resource and general management & organization (both 17%)

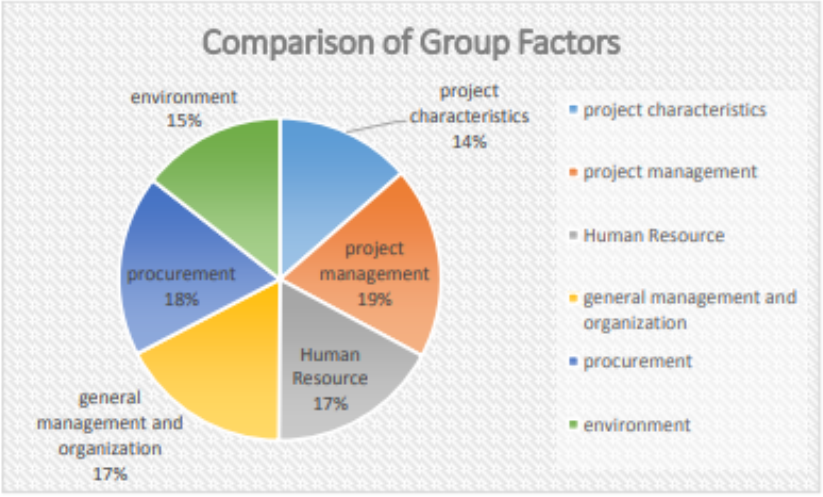


Fig 4.1: Comparisons of Group Factors

Project management group of factors was orientated on skills and techniques which are applied during the whole project life cycle: from its initiation phase to a project closure. It seems evident that this group deserves the highest attention from the site engineers and project managers and also mostly all of the respondents replied that the project success/failures lies in meeting scope, budget, time and quality.

Procurement is the second factor which shall determine the project success or failure. This is because; it includes purchasing and tendering and if these are not well addressed for the engineer, surely they will end up in big trouble to complete the project as per budget and time. Furthermore, as Mauritius is located far away from its importers of construction material (which are not produced locally), procurement lead time is very critical for a project success/failure.

Human resource factors take the third place together with general management and organization. Human resource factors is broken down into numerous detailed factors. Thus, a more precise analysis of each single factor is needed to measure the qualitative influences.

4.2.1.1 Average Group Factors and Years of Experience of Professionals Categories of success factors were analysed regarding project professionals' experience. Fig.4.3 demonstrates how average rank of groups of factors are changing with a variation in experience of respondents. Some trends could be noticed on this chart but it varies slightly.

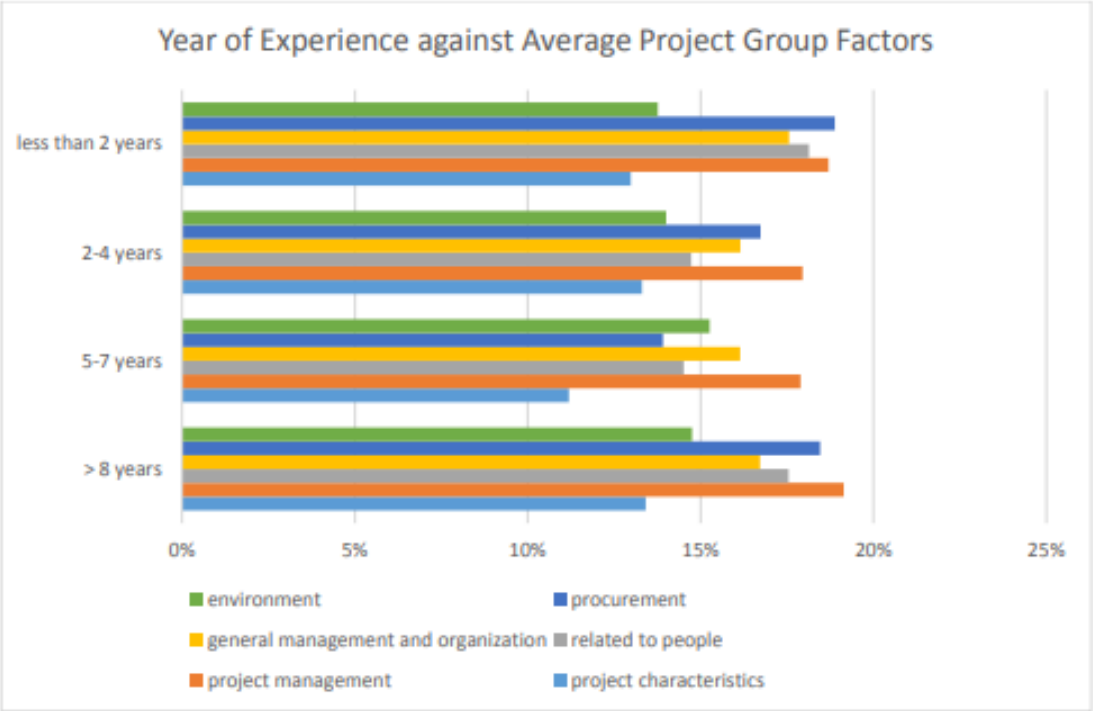


Fig 4.3: Years of Experience against Average Rank project Group factors

From fig 4.3, we can see that there is an increase importance in project management factors and also factors related to people as the experience of the project stakeholders increases as from 2 years and above. However, even if there is some trends, some of the groups' factors appear to remain unchanged or to change slightly with respect to the years of experience and the slight changes cannot be explained due to the unclear motions.

4.2.1.2. Average Group Factors against Profitability Here, analysis is done on how profitability depends on the success/failure group factors. From Fig 4.4, it is prominently demonstrated that respondents' projects which are highly profitable (rank 10), focus more on project management followed by procurement, human resource and general management. Therefore, projects which fails focuses more on the others remaining factors.

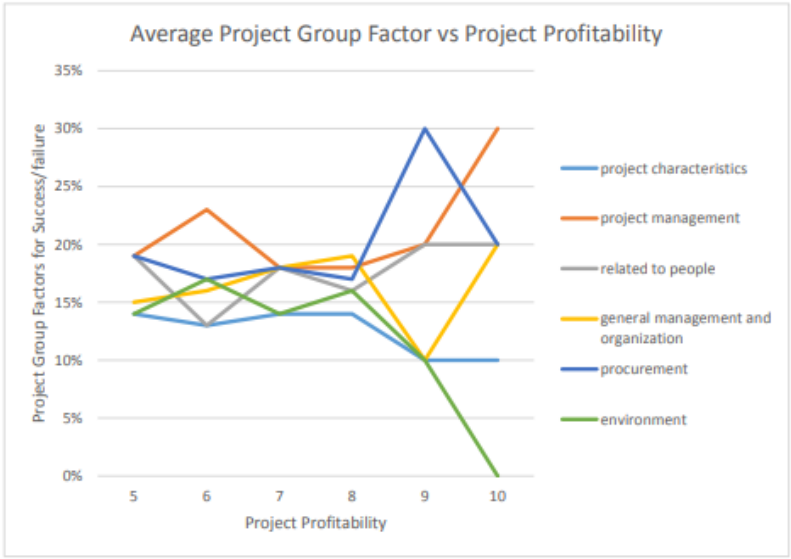
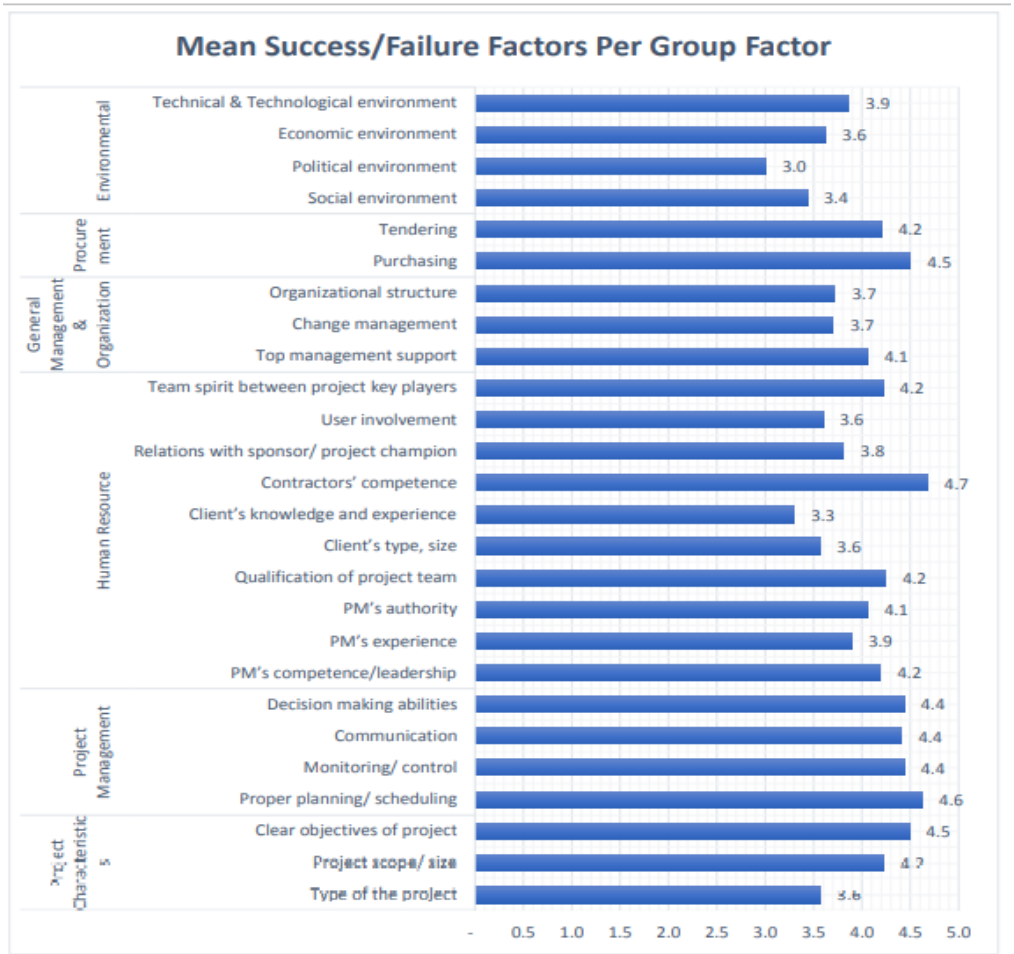


Fig 4.4: Average Project Group Factor vs. Project Profitability

According to the data in fig 4.4, projects which are highly profitable does not focus much on environmental factors. This can be explained as different environmental studies cost money and the implementation also. Furthermore, to move towards green materials and green energy require huge investment and this shall impact profitability.

4.3 Success/Failure Factors Analysis

In this section, the aim is to develop an analysis of the importance of each project success factors in the Mauritian building construction industry without the interrelationship. Fig. 4.5 reflects the list of success/failure factor relevant to the Mauritian construction industry for each individual group factor.



From the above chart, we can see clearly all the factor which shall bring the project to success/ failure.

Table 4.5 provides a summary of the different factors which are highly valued (between mean score 4 to 5) for project success or failure.

Table 4.5: Max Mean Score of Success/Failure Factors

Group Factor	List of success/failure factors	Mean Score
Project Characteristics	Project scope/ size	4.2
	Clear objectives of project	4.5
Project Management	Proper planning/ scheduling	4.6
	Monitoring/ control	4.4
	Communication	4.4
	Decision making abilities	4.4
Human Resource	PM's competence/leadership	4.2
	PM's authority	4.1
	Qualification of project team	4.2
	Contractors' competence	4.7
	Team spirit between project key players	4.2
General Management & Organization	Top management support	4.1
Procurement	Purchasing	4.5
	Tendering	4.2

Therefore, from table 4.5, it is clear that if the above factors are taken into consideration for our projects, the risk to failure decrease as these factors are the ones which are highly ranked. Furthermore, between the group factors, we can still analyse that project management and procurement are the key to either project success/failure as all the individual factors are identified in the highly ranked category. In project management group factor, proper planning/scheduling is given high priority followed by equal mean score for the other factors. Thus, for the stakeholders, a good planning in building construction surely shall contribute to a project success/failure. On the other hand, in procurement group factor, purchasing is a crucial factor as it was allocated the highest mean score. This is mostly because purchasing good quality material and a reasonable price shall maximize profit and at the same time contribute to the quality of work.

5. CONCLUSION

From the survey carried by e-mails and social media, data has been collected successful. The questionnaire was designed by using theoretical frameworks developed from exiting project management literature. Based on the 40 responses obtained, 37 was successful and both research question have been answered.

5.1.1 Research Question 1

The first research question was addressed by the questionnaire and an in-depth analysis has help to investigate the different perspectives of the question. Since building construction project success/failure factors are vast, the most widely spread characteristics of project success/failure were considered which are in term of project management (time, cost and quality) as well as stakeholder satisfaction, meeting project objectives and profitability). These parameters represent the most common characteristics (Cousilla, 2010; Myguyen and Chilesche, 2013; Chan et al, 2002).

From the data analysis, below are the main groups of factors which affect the project success/failure in the Mauritian building construction industry:

I. Primary project success/failure areas with a high priority groups of factors which are as follows:

a. Project management (19%)
b. Procurement (18%)
c. Human resources (17%)
d. General management of projects & organization (17%)

II. Supporting project success/failure areas with lower significance of groups of factor which are as follows:

a. Environmental factors
b. b. Project characteristics

Then, the most influential individual success/failure factors have been determined. Therefore, separate analysis of groups in the primary area helped to identify the most influential individual success factors. Contribution of these factors to overall project success seems to drive the importance of the groups these factors belong to as shown in Fig 5.1.

Primary Project Success/Failure Area

1. Project Management
   a. Proper Planning/Scheduling
   b. Monitor/ Control
   c. Communication
   d. Decision Making Abilities
2. Procurement
   a. Purchasing
   b. Tendering
3. Human Resources
   a. Contractor Competences
   b. PM's Competence/Leadership
   c. Qualification of Project Team
   d. Team Spirit between the Key Players

Fig 5.1: Primary Project Success/Failure Area

As a result, combination of the findings can be used in a general framework as shown in fig. 5.2 which complete the first research question and which can be used as a roadmap for project success/failure in the building construction industry in Mauritius.

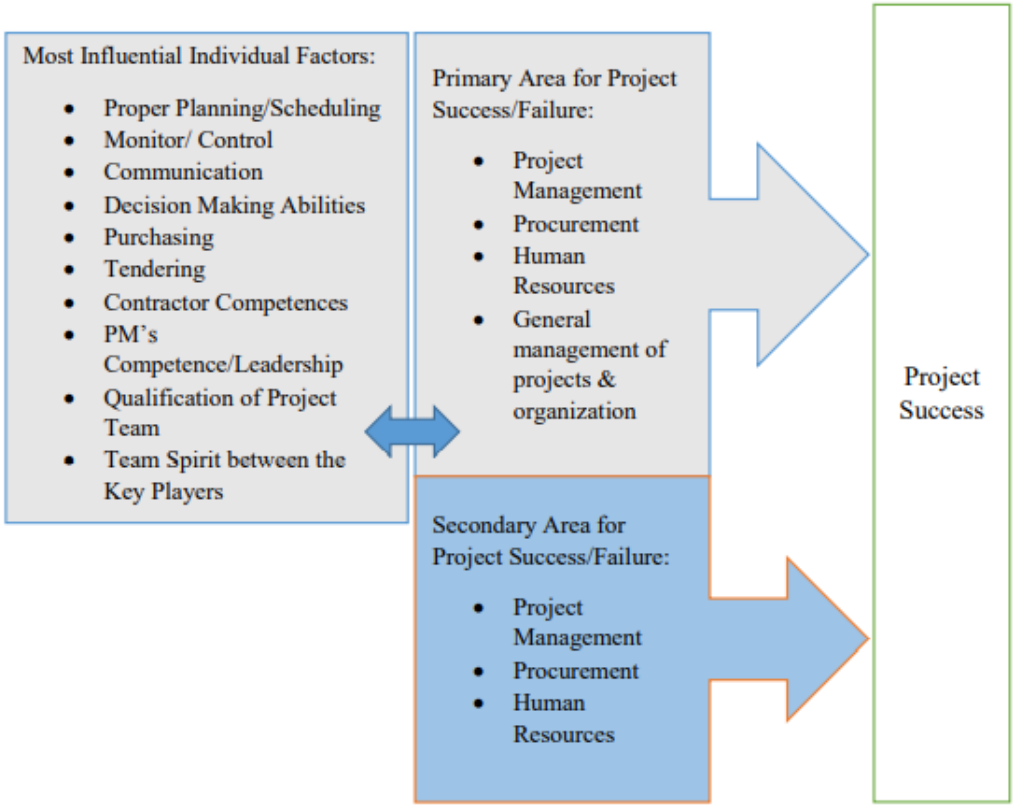


Fig 5.2: Framework of the major Success/failure factors

5.1.2 Research Question 2

The research approach was based on analysis of correlation between each of the individual success/failure factors. Findings clearly show the interrelationship between the different group factors.

The factors below show the highest strength of association:

I. Client's Type & Size and Client's knowledge and experience

II. Top management support and type of the project

III. Tendering and procurement

Though, there is a high correlation among primary project success/failure factors (Project management & Human resource), secondary project success/failure factors (group factor related to environment) do also influence largely the primary factors. Therefore, it is clear that secondary factors should also be considered as same can impact the primary factors. Hence, the second research question has been answered.

6. RECOMMENDATIONS

These findings support the current trend in world economy of human recourses' knowledge and expertise becoming main intangible assets of majority of organization. This trend seems likely to appear in the building construction industry in Mauritius. Among all the listed factors the impact of planning and monitoring abilities of project manager and other team members are the highest for future project performance, that is, both from time, cost and quality perspectives and stakeholders' satisfaction. Local companies which want to increase their chances of no failure or project success should allocate part of their limited resources for personnel training and development in project management. Simultaneously, these training of staffs in these areas might significantly improve the overall quality of project execution. Furthermore, procurement also is a major factor for project success. Companies that want to increase project success should keep a minimum stock of material (to reduce risk of project delays) and also try to buy in bulk to gain in economy of scale. Besides, during tender stage, everything should be well checked to prevent project cost overrun or unbilled items resulting in variation cost. Moreover, contractor employed for a specific building project should have the required skills and resources. All these should be checked at tender stage. Proper bank documents and bank guarantee should be request to mitigate the risk that the main contractor goes bankrupt or does not deliver as requested. Finally, conclusion can be made that improvement of some skills of project managers or project team are very likely to influence some other success/failure factors. Hence, this research helps to identify those factors which have a major relationship with other factors which requires bigger attention from the project manager and the other main project stakeholders. Using this study as a guide might indicate which factors will be affected while improving some of the key parameters. In addition, it can reduce the overall cost of the improvement process by serving as a roadmap.

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