

Assessment of Causes and Effects of Variation on Construction Project Performance in South West Nigeria

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ABSTRACT

The construction industry in Nigeria faces many problems, including the delay due to variations in project execution. This delay has been studied as a major setback in the Nigerian construction industry. In Nigeria, the construction industry's performance in terms of time has been observed to be poor. The objective of this study is to examine the variation of the construction project in order to determine the effect on the delivery of the project. The maximum performance of the project would be reached if the work always goes efficiently on time with the budget. The result of the variation is delay, cost overruns, quality defects and other negative impacts. The causes of variation were identified by a questionnaire survey for two higher education institutions. The results of the study identified the five main factors, including change of plan or scope, defective labour, customers' financial problems, unavailability of skills and desired profitability of the entrepreneur. In general, the study shows agreement among clients, consultants and contractors regarding the classification of the 20 factors that cause the variation. The results also reveal that factors related to clients are the main causes of variation, followed by factors related to contractors. An understanding of the causes and effects of the variation would be helpful in training professionals to assess the variation. In addition, the study would also help professionals take proactive measures to reduce the gaps on construction projects.

Keywords : Variation, Project Delivery, Contractors, Construction Projects.

I. INTRODUCTION

Variation is one of the critical issues in the building construction industry, these issues has been given a negative perspective to the respective profession involved in the construction industry such as architects, builders, engineers and quantity surveyors. Variation should be avoided or reduced, in order to ensure that the performance of the project remains as specified in the contract since it will have an impact mainly on the cost and time of the project. In the building construction industry variation has become a

phenomenon in which the negative impact linked to these problems is the deterioration in quality of work and low productivity among the staffs [1].

According to [2] in their study variation is any modification of the contractual orientation provided to the client by the contractor or his representative. Successful variation management results in uninterrupted project duration and agreed project costs of the construction operations [3]. But this cannot always be done in a practical way, because the variation must be carefully managed; otherwise,

disputes may arise between a client and an entrepreneur regarding costs and working time [3]. Variation implies additional costs and an interruption of work already in progress, leading to cost and time overruns [4]. Projects that experienced variations experienced delays and cost increases of more than 58% compared to those without variation [5]. The study carried out by [3] on the variation of construction projects revealed that the escalation of average costs was 7% of the initial cost of the project with an average extension of 30% more than the initial duration of the project. It has been shown in a study that a substantial reduction in the increase in cost and time due to the completion of design before the start of on-site work, resulting in the prevention of variations [5]. Therefore, the construction project management techniques such as planning, communication, scheduling, monitoring, etc. must be adequately applied in order to guarantee the completion of each project. There must be a clear contact and collaboration mechanism between project team members, and all interested parties must be at the highest level of project management and selected from the professional staff to ensure that the tender for documentation is well prepared for the procurement process. Effective communication between those participants reduces the risk of project failure and other performance related issues. Construction delay, cost overruns, faulty design, change of schedule are issues faced by contractors in the construction industry. Most projects face long delays and often surpass original expectations of time and costs.

[6] found that seven out of ten projects surveyed in Nigeria experienced delays in their execution, ultimately the period of completion would have to change due to differences in contract terms. From the developed countries of the world, such as Florida, the USA and the United Kingdom, researchers such as [7]; Nigeria [8], respectively, highlighted factors that cause variations in the project of building. These factors are biased towards the client, the contractor and the external factor. None of these academics

looked at a micro level within an educational setting to find out if there were delays in the construction of their buildings due to variations. All the experiences obtained from these academics are relatively similar, having identified similar factors, but with a different classification in terms of their most contributing factors to delay the construction of buildings. Due to the complex nature of the construction project, delay may occur and the study is necessary to know the root causes of the variations and to know how to overcome delay problems. The construction industry is an important actor in the economy, generating both employment and wealth. This study will provide insight into the causes of variation and examine methods of overcoming such variations. Most studies did not cover an educational institution, which is the focus of this study.

Prevalence of variation in construction projects

The variations indicate the quality, quantity, and schedule of work omissions, additions, modifications and replacements. The terms of the contract cannot be changed after the parties have agreed to a contract, so that the conditions for variation are included in the contract, and the variation allowed is the terms of the contract. Any minor modifications that the client or the architect would like to make will invalidate the contract and the drafting of the new contract.

According to [9] in his studies it demonstrates that the contractor is not obligated to perform additional work or to carry out repairs or modifications as the clause authorizing the variation of the work is an important feature of any construction contract. However, the contractor cannot fail to fulfil different obligations, the only solution being the price change payable for the results and, where applicable, the extension of the service time limit.

Pervasiveness of Variation on building projects

[10] believed that the use of variance clauses in contracts is the same as recognizing that no project

can be done without modifications and money available for each project's preparation and uniqueness. Several scholars suggested that the complex nature of the building activities allows variations common to all types of projects, adding that it is almost impossible to complete a construction project without altering the plans or the construction process itself. The variation exists for a variety of reasons ranging from flawed design, poor workmanship, poor feasibility analysis, financing, architectural enhancement, land topography, environmental conditions, legal adjustments and inconsistencies between the contract documents. Therefore, the contracting parties' human behaviour is not consistent, and variations can result from changes of mind of the parties to the contract which may be initiated by clients or contractors.

[11] indicated that contracts should nowadays take measures for possible variations taking into account the nature of the construction of the buildings. A certain degree of change must be expected, because it is very difficult for consumers to envision the final product, they receive at the initial design level, unexpected problems will occur and the steps not provided for in the contract will be necessary.

Origin and causes of construction project variation

While variations in construction projects are popular, it would take a better understanding to classify them into their agents and causes or origins. The source agent of information consists of defining the initiator of the order of variation. A research focussing on the developer's point of view on potential causes of variability indicated four significant causes of origin variability. These included "client", "consultant", "contractor" and "others". There is a relation between the originating agent and the variation causes.

Origin agents

Client

From the beginning to the end of the construction project, the client plays a significant role in the

project, as he is the project designer. The company determines the probability of a deviation. Clients anticipate project needs and determine the scope and purpose of the work, as well as the quality standards required. For various reasons clients initiate variations, particularly during the construction process. Client variance is caused by the failure to execute their original design due to client financial problems or other factors such as aesthetics.

[12] noted that the client's main reason for initiating the change was a change in requirements, such as a change in building use or the incorporation of new elements into the building. Clients are primarily divided into two categories: clients with construction industry expertise and experience, and clients with or without little building experience. During the design process, seasoned clients take part by offering technical advice to the design team. This client involvement in the design process will allow designers to prevent constant changes during the build phase. The technical contribution of clients to the design prevents them from completely trusting the designer and minimizes the chance to change their minds during the construction process. Clients with little to no design experience usually follow the contractor's orders without having a good understanding whether they have met their specifications.

[13] found that the exact needs of the company can often be very difficult to assess. For some reasons, clients tend to change their minds along the way, such as financial reasons when the project objectives are not properly defined. These changes include exchange of materials, modifications in design and the scope of the work plan. Such adjustments can result in a decrease in product quality and high cost of maintenance.

Consultant

Clients have historically relied on the architect's expertise in implementing the design and overseeing construction on the site. The introduction of emerging technology and the difficulty of modern

projects now involve a great deal of experience from consultants and not from an organization representing clients. Architects, designers, building owners, engineers, site managers and survey engineers make up the consulting team. Members of the consulting team are permitted to adjust the length of the project after being contacted by or on behalf of the client. It is the consultant's responsibility to provide the corrective measure in the event of errors, omissions, or inconsistencies in the design or detection of conflicts between contractual documents. Contractors experiencing difficulties in understanding vague design information and inaccurate job requirements should contact interested consultants as soon as possible. Delay in reviewing the exemption decision can result in job loss and inactivity before a decision is made by the attorney.

[14] proposed that advisors would attempt to consider the project's general scope and priorities, ensure that they understand the findings and make clear recommendations where necessary. This has to be completed fairly fast, without any effect on productivity. Sadly, the consultant's sense of superiority over the contractor will make it impossible for the consultant to satisfy the requirements of the contractor who has accused the consultants of defending their own interests at the expense of the client's and the contractor's interests.

The consultant's job is essentially to advise the company on legal, technical and financial matters. If this is deemed necessary, the consultant will frequently make a request for change to improve the project. Clients clarify their specifications during the design process and these form the basis for the formulation of contractual documents. The specification is sadly different from the perceived assumption that the contractor is not reading the specifications. As a result, change orders are put to ensure consumer expectations are met, resulting in more delay. Technological change may cause a consultant to deviate.

[15] found that all the new technologies and goods that are continuously on the market were not

identified. The designer should disregard alternative, cheaper finishing materials. It can lead to deviations in design if full information on content is not available. [14] suggested that if trained workers are eligible to turn the technology into actual construction work and using emerging technologies at the same time, it should be checked. Otherwise misuse of technology can lead to loss of money or quality.

Contractor

It's a significant fact that the contractor still produces variations. [16] indicated that the participants would be aware of the problems the contractor could cause during the construction process in a project. The information which the consultant provides to the customer is not always correct and must be known to all contracting parties. If a technical problem is found, it is the contractor's duty to contact the consultant to issue a change order. [17] noted that general contractors or their subcontractors could discover an obvious discrepancy, omission, error or conflict in the contract document and ask the architect to investigate this issue, discuss additional costs to rectify the situation, agree on a price and authorize the request for change. A contractor may propose alternative methods of construction, where experience shows that the proposed technology does not affect a design's desired form and function.

Situations Beyond the Control of The Contracting Parties

Situations outside the control of the parties and contributing to demands for reform include changes in government laws and policies, weak economic conditions, environment, health and safety problems, socio-cultural factors and unexpected issues.

Factors influencing the Occurrence of construction variations

Regrettably variations on all building projects are to be predicted. The rate at which variation occurs, though, depends on several factors that vary from project to project. Factors affecting the presence of differences in construction are the form of job, the size of the project and the method of acquisition.

Nature and type of works.

Construction work involves architectural, civil and technical work, such as construction of offices, residential buildings, and commercial premises. Variations are likely to be triggered by building projects requiring major unpredictable factors. For example, civil engineering work involving bulk-land excavations and construction work involving specialized work beyond the experience of the designer cannot be determined precisely before construction begins on site. The sketches and descriptions do not always reflect the actual conditions of the site or the preliminary surveys according to [13]. Despite this situation, it is normal for projects to begin on site, although some construction products have yet to be completely planned and documented. The contracts also include conditional sums and quantities which will be subject to further modification in future. The inclusion of conditional quantities or percentages in a contract is a direct indicator of a change in a project likely to occur. In a project which includes: [18] defined four possible causes of uncertainty:

- ✓ Lack of complete detail of the tasks to be performed
- ✓ Environmental unpredictability, such as the impact of the bad weather.
- ✓ Lack of uniformity, for example when the material to be worked varies by place and time, or when the teams working together vary by place and time.
- ✓ Insufficient experience with the project environment.

Complexity of the Project

The project's complexity is the result of ongoing demands on building speed, health and safety at work, conflict prevention, cost control and quality as well as technological progress, economic liberalization and globalization as well as the fragmentation of the construction sector.[19] found that complexity implies an element containing two variables or more. There are two types of complexity of the project, namely technological complexity, and complexity of the management or organization. A construction project includes, over a period of time, an administrative structure for different organisations, including contractors and consultants. Management complexity is linked to the project's contractual dimensions, the contract components and their relationships in terms of coordination, accountability, decision-making and task allocation.

Technological complexity refers to the complexity and difficulty of the transformation process, including the tools, materials, skills, and techniques required to complete a construction project. According to [18], the complexity of the project requires many specifics in order to implement the project, since it requires effective coordination, monitoring and control from the beginning of the project until its completion. And as a project that makes sense based on a series of surveys during construction and without interrelations between operations, making it impossible to upgrade the system effectively in the most effective way possible. The project's degree of complexity is broken down into low, medium, and high complexity. The more complicated the idea, the more likely it is to deviate. A change order that is performed because of the complexity of the design may take some time for the design team to recognize the adjustments and modifications that are needed while the on-site work is disrupted.

II. Acquisition method

The main actor in a construction project is a cross-organizational body composed of customers, architects, consultants, contractors, and site managers. The implementation process for a project varies from project to project. In general, it is a method of purchase which provides for the form of a contractual agreement between the participants or the contracting parties. [20] stressed that non-traditional recording methods are more likely than traditional recording methods to be subject to errors and omissions.

Effect of Variations on Project Performance

With a well-structured work plan, the project would reach optimum efficiency if the work went smoothly on schedule and within budget constraints. [21] indicated that uncertainty affects project performance in general, and concluded that variance orders influence project performance by adversely affecting project efficiency and expense. Additionally, [22] found that when a project involves many variants, the contractor achieves lower productivity than expected. The variance has a negative effect on project efficiency in terms of cost overruns, extra time, decreased quality and issues with professional relationships.

Cost Overruns

Construction projects include two main stages, both pre-construction and construction. Cost planning is based on the construction process, as more resources are required. Customers often want to learn ahead of time the overall cost of their finished building projects. Clients demand that the final construction costs meet the initial tender amount. Unfortunately, many building projects result in cost overruns. Almost all change orders, however, increase construction costs; in most cases, additions increase costs, while omissions minimize costs. Various studies

have shown that these cost overruns are caused by orders of variance. A study of the effect of change orders on institutional building projects found that the variance greatly added to the cost increases for building projects.

The larger the number of variations, the more likely they would impact the total cost of delivering the building. The variation actually has a direct and indirect impact on the costs. The direct costs are the additional costs incurred in carrying out the current variant 's activities. Though it is easy to calculate the direct costs associated with design variation, it is more difficult to quantify indirect costs. Indirect costs are costs resulting from demands for reform, regardless of whether they are related or not. Including:

- i) Loss of efficiency because of an interruption in which the gang needs to become acquainted with the new working conditions, equipment and consumables.
- ii) Cost of administration of the order of variation.
- iii) change in cash flow due to inflationary impacts and financial pressures.

Excessive Time

Clients expect to complete their building projects in the shortest time possible. Projects undertaken at the earliest possible moment would result in financial savings. Contractors shall be seriously disciplined if they surpass the initial date of completion of the project. The penalty levied is meant to account for the harm the consumer has sustained due to the long delivery time. A number of scholars believe that demands for changes are given as one of the reasons for the project's excessive length. Change orders made in various phases of construction projects have been found to affect both the time frame and the cost of the project. [23] graded the delays as "excusable" and "non-excusable," with the first classification exempting the contractor from damage liability and the second category due to the contractor's culpable error.

Quality reduction

[24] stated that since contracts pose a significant risk to unknown variables such as lump sums, contractors can reduce both quantity and quality to maximize profit. If requests for change are common, they may potentially affect the quality of the work. If contractors try to compensate for losses that aren't optimistic about recovery, quality can be affected.

Health and safety

The occurrence of deviations will lead to health and safety issues being investigated. Section 5.3(e) of OSH [25] states that the contractor must receive sufficient health and safety information and adequate resources to be able to carry out the work safely in the event of any changes. Changes in design, materials, and facilities that also require additional measures for health and safety. Furthermore, Section 5.14 on Health and Safety at Work [25] allows the contractor to give any details to the prime contractor that may contribute to the health and safety of a individual doing construction work or that an individual affected by the work may do construction work.

Professional Relations

A construction project is not just about bricks and mortar. Rather, it creates professional relationship between the parties to the contract. Every successful project improve experience of the participants and their credibility is built up. Disputes between contracting parties can arise, however, as a result of changes in orders. Misunderstandings can occur when contractors are unhappy with the decision to review change orders made by the client advisor. Contracting parties should analyze the costs, time-effects and a change order's compensation. Maybe since contractors don't trust the result of these agreements, they usually demand higher prices for anomalies over the project period than the actual costs incurred. [26] therefore argues that tension exists between the

parties because the contractor constantly asks the customer to pay the claims for an additional fee and still believes that the reimbursement was insufficient. It can have a very detrimental impact on interactions between all party members. [27] cautioned that evaluating differences in the form of demands for reform would remain at the center of litigation and lawsuits and eventually lead to arbitration if the parties do not agree on a mutually satisfactory solution.

[9] found that a substantial part of the ongoing arbitration process required extra time and cost. Due to design mistakes or omissions the excessive presence of deviations may affect the designer 's professionalism. Workers are demoralized because they have to reverse any of the work that has already been completed.

III. METHODOLOGY

The data collected using a questionnaire and an analysis of the field work were implemented in this study. A field study was carried out to determine the adequacy of the final questionnaire. The questionnaire was divided into six sections and included a total of 38 open and closed questions. Fifty questionnaires were distributed and completed by professionals: Quantity Survey, Project Manager, Engineer, Builder, Architect, and unskilled; Foreman, bricklayer, iron bender, painter, plumber, electrician at Awolowo University of Obafemi and Ibadan University, and only thirty-eight copies were retrieved for analysis, which is about 76% of the questionnaire.

IV. RESULTS AND DISCUSSION

All Out of 50 respondents selected, 38 (76%) returned the questionnaire. As shown in Figure 4.1, participating companies included contractors (44%), consultants (31%), architects (4%), project manager (4%) and others (17%).

Classification of Firm

From the table 4.1 it was observed that large firm has highest number of percentages with 78.9% respondent.

TABLE 4.1 ANALYSIS OF RESPONDENT ACCORDING TO THE CLASSIFICATION OF FIRM

			Percent	Valid percent	Cumulative percent
Valid	Large	30	78.9	78.9	78.9
	Medium	8	21.1	21.1	100.0
	Small	0	0	0	100.0
	Total	38	100.0	100.0	

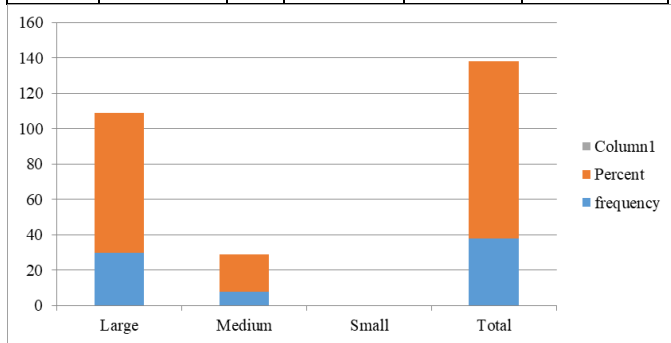


FIG 4.2

Source : Field survey, 2019

Causes of Variation

From Table 4.3 it was discovered that the clients concede to a variation due to a change of plans or scope (89.0%), inadequate project objectives (57.8%), financial problems of the client (81.6%), variation of the cause of the consultant due to a change in specifications (41.2%), Design error and omissions (60.6%), Inadequate scope of work for the contractor (58.0%), Conflicts between contract documents (63.2%), Variation initiated by the Contractor due to a change in schedule (34.2%), Lack of participation of the contractor in the design (44.7%), poor coordination (53.0%), Lack of availability of skills (81.6%), Desired profitability of the contractor (78.9%), Defective labor (84.1%), Different site conditions (55.2%), Health and safety considerations (47.4%) and other factors such as the change in government regulations (52.6%), variation initiated by God's act due to conditions of whether (68.4%), technological change (39.5%), Unforeseen problems (73.6%) and the change in economic conditions (57.8%)

Table 4.3 Analysis of respondent according to causes of variation

Causes of variation	1(RII)	%	2(RII)	%	3(RII)	%	4(RII)	%	Ranking order
Change of plan or scope	0.89	89.0	0.08	8.4	0.03	2.6	0	0	1 st
Change of schedule	0.29	28.9	0.32	31.6	0.34	34.2	0.05	5.3	20 th
Inadequate project objective	0.58	57.8	0.21	21.1	0.21	21.1	0	0	12 th
Client's financial problems	0.82	81.6	0.03	2.6	0.11	10.5	0.05	5.3	3 rd
Change in specifications	0.23	23.7	0.42	42.1	0.32	31.6	0.03	2.6	18 th
Error and omission in design	0.10	10.5	0.61	60.6	0.29	28.9	0	0	9 th
Conflicts between contract document	0.08	7.9	0.63	63.2	0.26	26.3	0.03	2.6	8 th

Inadequate scope of work for contractor	0.16	15.8	0.58	58.0	0.18	18.3	0.08	7.9	10 th
Technology change	0	0	0.34	34.2	0.26	26.3	0.40	39.5	19 th
Lack of coordination	0.05	5.0	0.53	53.0	0.42	42.0	0	0	14 th
Lack of contractors involvement in design	0.16	15.8	0.40	39.5	0.44	44.7	0	0	17 th
Unavailability of skills	0.05	5.3	0.10	10.5	0.82	81.6	0.03	2.6	4 th
Contractor's desired profit	0.10	10.5	0.03	2.6	0.79	78.9	0.08	8.0	5 th
Defective workmanship	0.05	5.3	0.05	5.3	0.84	84.1	0.05	5.3	2 nd
Differing site conditions	0.08	7.9	0.05	5.3	0.55	55.2	0.32	31.6	13 th
Weather conditions	0.03	2.6	0.11	10.6	0.18	18.4	0.68	68.4	7 th
Health and safety considerations	0.11	10.5	0.13	13.2	0.47	47.4	0.29	28.9	16 th
Change in government regulations	0.05	5.3	0.08	7.9	0.34	34.2	0.53	52.6	15 th
Change in economic conditions	0.05	5.3	0.16	15.8	0.21	21.1	0.58	57.8	11 th
Unforeseen problems	0	0	0.13	13.2	0.13	13.2	0.74	73.6	6 th

KEY: 1= Client, 2= Consultant, 3= Contractor, 4= Others which are unforeseen weather conditions, government regulation

Source: Field survey, 2019

Impact of Variation on Overall Project Performance

Table 4.4 shows the classification of the response means of relative importance in the variation and the percentage that the cost overruns contribute with a very important impact in the performance of construction projects with (87.0%). Excesses of time contribute with a very important impact on the performance of construction projects with (89.5%), the degradation of quality contributes with a very important impact on the performance of construction projects with (86.9%), the The health and safety of workers contribute a very important impact on the performance of construction projects with (68.4%), and the relationship between the project team also contributes a very important impact on the performance of construction projects with (60.5 %).

Table 4.4 Analysis of respondents on effect of variation on project performance

IMPACT OF VARIATION	1	RI	%	2	RI	%	3	RI	%	Ranking order
Cost overruns	0	0	0	5	0.13	13.0	3	0.87	87.0	2 nd
Time overruns	0	0	0	4	0.115	10.5	3	0.894	89.5	1 st
Quality degradation	1	0.036	2.6	4	0.105	10.5	3	0.873	86.9	3 rd
Health and safety	5	0.132	13.2	7	0.184	18.4	2	0.686	68.4	4 th
Relationship between the project team	1	0.036	2.6	1	0.037	3.7	2	0.603	60.5	5 th

KEY: 1= Not important, 2= Low important, 3= Very important

Source: Field survey, 2019

Factors Influencing the Occurrence of Variation

From table 4.5 it was found that the lack of comprehensive description for the activities to be carried out influences the occurrence of variation with an average effect of (31.6%), the lack of familiarity with the inputs and the environment due to the variation of influence of the administration

with an average effect of (34.2%) on project performance, lack of uniformity, such as when the material to work varies with the place and time or the teams working together influence the variation with an average effect of (39.5%) in the performance of the construction project, the design error influences the variation in the performance of the construction project with a high effect of (44.7%), and under the estimate of the costs of the variation of the project influence with a high effect on the performance of the construction project with (57.9%).

Table 4.5 Analysis of respondents on factors influencing the occurrence of variation

Factors influencing the occurrence of variation	1	RII	%	2	RII	%	3	RII	%	Ranking order
Un specified specification of the activities to be carried out	7	0.18	18.4	19	0.5	50	12	0.32	31.6	2 nd
Management's lack of knowledge of inputs and the environment	8	0.21	21.1	17	0.45	44.7	13	0.34	34.2	4 th
Lack of uniformity	7	0.18	18.4	16	0.42	42.1	15	0.39	39.5	5 th
Design mistake	6	0.16	15.8	15	0.39	39.5	17	0.45	44.7	3 rd
Under estimation of costs of projects	2	0.05	5.3	14	0.37	36.8	22	0.58	57.9	1 st

KEY: 1= Low, 2= Medium, 3= High

Source: Field survey, 2019

V. SUMMARY OF FINDINGS

The aim of the study was to identify the causes of the variation and to examine the effects of the variation on project performance. A questionnaire was therefore used to conduct this study in the state of Osun and Oyo in Nigeria. The causes of variations were classified in ascending order and the most common source agent listed in Table 4.3. It is obvious that the most common causes of changes were the change in plan and scope, faulty work, the customer's financial problem and the absence. Skills, sought profitability from consultants all of this came mainly from the consultants and the clients.

Although variations initiated by the contractor are claimed to have included those of the clients, mostly the primary cause of variation by the client is due to change of scope of work and that of the plans, this cover most of the changes made by the client from the contractor. Defective manufacturing and lack of experience and skill were opposing causes, resulting in variations, both attributable to the contractor. On the other hand, the experienced contractor might suggest exchanging materials or construction methods. Furthermore, lack of the technical know-how of the contractor can also contribute to variations in a project, which also affected the value of the project. Respondents suggested spending enough time

designing and sharing information between contracting parties.

the effects of the variation all have a negative impact on the performance of the project.

VI. CONCLUSION

It was observed in the case study that the client and the contractor together showed a variation of more than 60%. The investigation showed that the client is responsible for the major source of variation in the contract. Others apart from the client that are responsible for the causes of variation in the contracts are the contractor. Other unspecified events and the consultant had less impact on variation and its occurrence in a project.

It has been observed in the study that the variation had a negative impact on the overall performance of the project. According to the case study, the projects experienced excessive delays and costs due to the change in plan and scope. As a result, the contractor was fined for delays of 3% of the contract amount. The project surveyor and architect found that design variations and excessive on-site instructions and late instructions had disrupted the work schedule. They indicated that the change had a negative impact on the costs and activities affected on the critical path and had led to rescheduling. Respondents indicated that deviations were the main reason for the delay in delivery of construction projects. Variations management proved to be problematic in determining costs and time and was associated with delay in approval processes. This resulted to situation in which the certified amount given to the contractor is more likely to be lesser than what they claimed. You could say that these differences are due to the lack of a standard way of recording and managing variations. In summary, the main negative impact of the change was excessive time and cost. The deterioration in quality and the main factor influencing the occurrence of the change were below the estimated project costs, the lack of a full specification of the activities to be carried out, and the design errors and

VII. RECOMENDATION

The aim of the study was to determine the impact of variation on project performance in order to take proactive measures to reduce them. The results showed that due to the lack of clear information about the scope of work, the client was the most widely used agent for source of variation. It was found that the client's needs were not properly defined before the commencement of the projects. Hence, this study shows various ways by which clients can properly defined their needs.

The designers need to guarantee experienced human resources and enough time to deliver a solid design on time in order to reduce design errors and omissions. Among other things, recommendations for reducing the frequency of variation were expressed as follows:

- i) All those involved must carry out appropriate advance planning before starting work on the construction site.
- ii) The consultant responsible for the final draft must ensure completion in the tendering phase.
- iii) Sufficient time should be spent on the planning phase before the offer.
- iv) Clients must provide a clear summary of the work schedule.
- v) An overview of unforeseen circumstances should be provided by all parties involved in the contract.
- vi) At the design phase there is need for closer coordination of the consultant.
- vii) The participation of all parties during the contract period is required.

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