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Causes and Effects of Scope Creep on Large-Scale Public Sector Construction Projects

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***Abstract*— The study identifies, explores and models the causes and effects of scope creep of large scale public sector construction projects (LSPSCP) in the South East Geopolitical Zone of Nigeria (SEGPZN).Scope creep is a lethal disease that can result to project failure and abandonment. A survey and explorative research designs were adopted. Primary data was obtained from the technical experts involved in the management of LSPSCP in the SEGPZN with the sampled projects adduced to have suffered from scope creep. The opinion of the experts were quantified using five point Likert scale and subjected to the analysis and schematic modeling using Relative Severity Index (RSI) and cause and effect fishbone diagram respectively. The result of the analysis indicates that lack of knowledge and poor understanding of products versatility, and complexity as the most significant cause of scope creep of LSPSCP with resultant adverse effects on both the LSPSCP and the managers. The ordered ranking of the causative factors of scope of LSPSCP was presented. The cause and effect fishbone diagrams were development to serve as a warning signal and caution guide for the management of LSPSCP in order to minimize the incidence of scope creep. Technical experts with dexterity in the areas of complex project design and risks forecasting are inevitable in the management of such projects.**

***Index Terms*— Fishbone or Ishikawa diagram, Large scale public sector construction projects, Product versatility and complex, Relative severity index, Scope creep**.

I. INTRODUCTION

Scope Creep of Large-Scale Public Sector Construction Projects (LSPSCP) is rampant in the developing countries like Nigeria. Scope creep is a lethal project diseases, which has continuously plagued and threatened the success of many LSPSCP irrespective of all efforts put in place either to ameliorate or mitigate it to the barest minimum. Even when the project scope is fairly well defined, many LSPSCP suffer from scope creep – the tendency for project scope to grow bigger and bigger or extending beyond its initial boundaries. It is generally considered harmful and more vulnerable to LSPSCP due to cutting corners syndrome, compromises in technological and resources inputs, lack of comprehensive feasibility analysis, bureaucratic bottleneck and carefree attitude etc. Nigeria, being a developing nation, has a dearth in observing best practices in construction activities, especially the LSPSCP, as scope creep has accounted for abandonment and failures of projects which are littering all over the country. Therefore, the technique of project management is expected to proffer solutions to the issue of scope creep, but have not achieved the level of desired results, due to inability to establish the salient causative factors of the creep.

Causes and effects of scope creep of LSPSCP have not been thoroughly investigated as new areas keep on emerging from time to time. There are need to provide insights as to why project scope creep occurs and the very serious effects on the overall performance of a project in order to restore the balance among the three constraints that are key elements of project management vis-a-vis time-when it is due? budget-how much can you spend? and performance – what results must be achieved? By identifying the causative factors and effects of scope creep of LSPSCP, one would adduce reasons and fashion out robust strategies and decision support system for their management and containment of cost and time overruns. The roots causes and effects of scope creep of LSPSCP have not be fully identified and examined in abinitio before making efforts towards mitigations and management. Additional features and functionalities are usually added to the project tasks beyond those defined in project scope without addressing the effects on resources, costs and time; and therefore the case of dealing with project scope creep.

New cases, causes and effects of scope creep of LSPSCP in the South East Geopolitical Zone of Nigeria (SEGPZN) continually evolve unabated without decisive measures to identify and pin down the salient factors so as to provide avenue for the management. SEGPZN is characterized by high rainfall, thick forest with rugged geographical terrain, devastating erosion menace, high population and traffic densities. LSPSCP in this zone usually suffer from uncertainties in terms of scope creep, technological complexities, project failure and abandonment due to vulnerability to unexpected and unplanned changes in the work scope. If the most salient and significant causes and effects of scope creep of LSPSCP are not identified and decisively contained, it could lead to multiplier adverse effects. The causes and effects of scope creep on a small scale construction projects may not be significant for evaluation because of small resources expended on them. However, the effects on LSPSCP could be worrisome to the stakeholders due to its colossal economic waste and social implications. Identification of the causes of scope creep prior to the exploring the effects on LSPSCP is apt so as to address and provide early trouble shooting and warning signals because prevention is better than remedial actions.

However, it seems fair to say that LSPSCP in the SEGPZN rarely, if ever stay within their original specifications and meet their forecast targets of time and cost. In fact, many of such programs or projects that are complex in nature, covered on extended period of time, required a significant monetary investment, and have multiple components needing to manage simultaneously. They are vulnerable to scope creep despite heroic traditional project management efforts. The larger the project, the more people, departments, and agencies involved, the more complex the governance becomes.

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There is lack of awareness that LSPSCP in the SEGPZN could be said to belong to complex dynamic systems that are; highly complex, consisting multiple feedback processes, involve nonlinear relationships and involve both hard and soft data. These characteristics alongside with environment and geological terrain render LSPSCP in the SEGPZN vulnerable to scope creep with attendant poor business results and risk in managing them.

The aim of this study is to examine the causes and effects of LSPSCP scope creep so as to work out and explore avenues for better management. The specific objectives are;

(i) To identify the causative factors of LSPSCP scope creep and evaluate their severity in ranking order so as to isolate the most severed and salient causative factors for managerial decision making towards preventive measures.
(ii) To display on a visual aid and develop a cause and effect diagram of LSPSCP scope creep so as to form a good reporting medium for top management because of its visual clarity.
(iii) To identify and describe how scope creep begins and what causes it to build on itself overtime leading to costly overruns and delays.

The following research questions were answered in the course of the study.
(i) What are the most severed and salient factors responsible for scope creep of **LSPSCP**?
(ii) To what extent can the causes and effects of scope creep be displayed on a visual aid?
(iii) How does scope creep of **LSPSCP** begin and build on itself overtime leading to costly overruns and delays?

II. CONCEPTUAL AND THEORETICAL FRAMEWORK

Many projects suffer from scope creep – the tendency for project scope to grow bigger and bigger, even if the project scope is fairly well defined [1]. Project changes must be managed to ensure that only those enabling project benefits to be realized are accepted and to avoid the dangers of scope creep. According to [2], poor project scope management is one of the main reasons for project failures. Failure to clearly define project boundaries and failure to properly document changes to these boundaries result in possible "out of control" situations, [3] avers that large changes in scope are easily identified, and it is the "minor refinements" that eventually build to be major scope changes that can cause problems. These small refinements are known as scope creep. [4] state that without a scope definition "firewall" in place, projects will be in the unenviable position of constantly accepting additional work, referred to as, "scope creep" throughout the life of their existence.

Mere managing scope creep of LSPSCP without identifying and examining the causes and effects is synonymous with providing intensive medical treatment for a patient with a very serious unknown sickness without diagnosis to unveil the name, causes and effects of the ailment, thus exercise in futility. LSPSCP are usually characterized by high risk and high capital intensive which will need very detailed and careful analysis before financial approval is given [5]. In the case of the public sector, someone will have to identify a benefit to be achieved within resource and time frame, and without unexpected increase in scope. Also most projects in the public sector are triggered by an expression of public need whether this is initiated by a committee of elected representatives or officers of the public body undertaking their responsibilities. Irrespective of sectorial affiliation, many projects suffer from scope creep, which is the tendency for the project scope to expand over time usually by changing the requirements specifications and priorities. Scope creep usually means added cost, and possible project delays. Also changes in requirements, specifications and priorities frequently result in cost overruns and delays.

III. EMPIRICAL REVIEW

In a study carried out by [6] on the successful completion of an underpass (tunnel and a cross-over bridge) on the Mall road in Lahore, Pakistan, special attention was paid to the definition and management of the project scope. The Secretary, communication and work clearly understood the implication of scope creep on the triple constraint: performance, cost and time. Therefore, he made sure that scope was clearly defined and there was no scope creep during the execution of the project. In a similar case, a study conducted by [7] on a large petroleum refinery plant project, they found that poor scope definition for major segments of the project had the greatest negative impacts on cost and schedule. It is therefore noteworthy that poor scope definition and management result to scope creep and for project to be successful, inherent probable causes of scope creep should be identified, evaluation and mitigated so as to provide avenue for clear scope and work definitions. [8] found that a clear mission or scope statement is a predictor of more than 50 percent of project success in the concept, planning and execution stages of projects. Similarly, [9] found that outstanding successful projects exhibited clears scope and work definitions. However, in case some additional features and functionalities are added to the project beyond those defined in project scope and without addressing the effects on resources, costs and time; it will mean dealing with scope creep. Scope creep affects project quality and impacts the proportion of high severity defects, which results in product quality deterioration.

The study conducted by [10], quotes Northcote Parkinson's now famous adage, "Work expands so as to fill the time available for its completion" may be overly optimistic. Unfortunately, work tends to expand far beyond both the time and the money budgeted for its completion, particularly for complex projects. A similar study by Coopers & Lybrand in the United Kingdom indicates that 85 percent of Information Technology (IT) projects are over budget, fail to meet their schedule, or customer expectations due to scope creep.

Although IT and software development projects may be the most visible areas in which work extends beyond its original parameters, process reengineering efforts, wide-range organizational change initiative, and large-scale construction projects certainly are not exempted. According to [10], a small town in North Carolina that is building a reservoir for its municipal water supply indicates that the original estimate for the project five years ago was $5.4 million, with a two-year window for construction, and today, the estimate has increased to $8 million. Construction has barely begun and is now projected to take three years.

Given these troubling statistics, it seems fair to say that large projects rarely, if ever, stay within their original specifications

and meet their forecast targets of time and cost. In fact, any program or project that is large-scale and complex in nature, covers an extended period of time, requires a significant monetary investment, and has multiple components needing to be managed simultaneously is vulnerable to scope creep despite heroic traditional project management efforts. The tendency of such projects to expand beyond their initial boundaries and thereby to extend far beyond their forecast is often induced by "scope creep. By understanding scope creep in this context, it is imperative to identify how and why it occurs. Equipped with this knowledge, empowered people, teams and organizations can more effectively plan for and mitigate the effects of scope creep by taking a more realistic and dynamic perspective on the project management process. When the governance of LSPSCP is complex, managers find it difficult to make decisions in a timely manner and to attend to the long-term consequences of each decision. These difficulties threaten the accuracy of schedule estimates. As deadlines draw closer and time pressure rises, people tend to "cut corners" to keep the project on track. Cutting corners in a construction project could means accepting the lowest bid without qualifying the vendor, not allowing enough time to coordinate the work of the various subcontractors, or even neglecting to let cement cure properly. In the short term, cutting corners can appear to alleviate schedule pressure. Rework also increases cost and as the cost of a project goes up, project managers need to justify the additional expenditures to upper management or to their constituents. To do so, they often find themselves promising new and enhanced features to make the additional expenses more palatable. As the project's scope increases, the web of interactions and dependencies among tasks, subprojects, departments, and agencies grow even more intricate. This rising complexity can lead to delays. Delays create even more deadline pressure and reinforce the "scope creep" dynamic. Such interactions and dependencies also make it difficult to accurately estimate costs. Delays can further compound the problem, making cost estimates even less accurate. If actual cost are much higher than the original estimates, the pressure on officials and managers to justify costs increase, which can further influence the expectations from the project and cause even more scope creep [10]. The complexity of the governance affects more than the timeliness of decisions. It also affects the ability of decision makers to see the effects of their decisions-both on other aspects of the projects and later in time. The quality of decisions therefore can go down-increasing the likelihood of additional rework and creating additional complexity. According to [10], the tendency of large projects to increase in scope finds its root in two underlying assumptions. The first is that we can manage a project by simply managing it parts. This practice leads us to ignore the system wide impact of apparently small, local decision, which in turn can undermine initial time and cost estimates and increase the project's complexity and scope. The second is that we assume that we can estimate schedules and costs accurately in advance of initiating work. But often, when a project cost more or takes longer than expected, we respond either by assuming that it must include additional features or by deliberately adding more to justify the increased cost or time, thus compounding the scope creep. To date, most explanation of scope creep stem from a linear, sequential view of projects and how they are managed. For example, the Project Management Institute defines project management phases as initiating, planning, executing, controlling, and closing (www.pmi.org/standards/pmbok.htm). This model assume that one phase is completed before the next one begins, and that we should return to previous phases only when problem occur.

Using this sequential framework, several authors such as [1], [10] and [4], have written that scope creep occurs when the planning phase is incomplete. For example, some suggest that if objectives and project "deliverables" are not fully defined up front or if work breakdown are unclear, then the project will exceed its original cost and schedule projections. Others attribute scope creep to ill-defined resource requirements or insufficient funding. Another set of explanations focuses on the problems that occur during the controlling phase; for instance, poorly documented changes to the project specifications. All of these explanations are probably correct to some degree. However, even if a team rigidly adheres to this project management framework and completes each step with near perfection, scope creep can still occur, especially in large, complex projects. Good, linear project management is necessary. However, as the frequency of scope creep shows, it is insufficient to prevent the problem. Equally, important, as the interdependencies among the different modules come to light, the scope of the project changes, even if the project plan does not, because of project complexity as the people involved get new ideas about what the product should offer. [10] identify two kinds of complexity in projects: combinatorial and dynamic. *Combinatorial complexity* is created by the parallel and sequential activities that take place in a large, complex project—for example, in a permit needed before breaking ground. Traditional project management tools, such as PERT, CPM, and Gantt charts, are intended to help people handle these details. On the other hand, *dynamic complexity* is created by the multiple feedback processes, time delays, and nonlinear causal relationships that exist in any large project. Because the interactions among multiple variables over time drive this kind of complexity, it can grow geometrically or even exponentially as additional elements enter the system. Dynamic complexity therefore contributes significantly to the phenomenon of scope creep and cannot be adequately addressed using standard, linear approaches.

Many authors and researchers from the literature and empirical reviews as shown in table 1 identified the following as the causative factors of project scope creep.

Table 1: Causative factors of scope creep in LSPSCP

Code	Causative Factors of Scope Creep
S_1	Lack of defined and disciplined procedure for project management [11]
S_2	Lack formal communication plan [12]
S_3	Unavailability of formal risk analysis and planning process [12]
S_4	Inability to manage stakeholders, particularly the clients [13]
S_5	Incompetent project manager/team management [12]
S_6	Lack of knowledge and poor understanding of product versatility/technical complexity [12]

S_7	Customers' requirements changes/Lack of change control contingency plan [12]
S_8	Environmental changes/force majeure [14]
S_9	Platform changes [2]
S_{10}	Poor understanding of customers' requirements prior to project scope definition and contract signing [12]
S_{11}	Internal changes by development team [14]
S_{12}	Poor quality of design/work breakdown structure [4]
S_{13}	Goldpating [12]
S_{14}	Poor requirements specifications that lacks in details or contain conflicting need that were not identified before the specification were issued [14]
S_{15}	New ideas or market needs [14]
S_{16}	Managing projects by its parts devoid of system thinking [10]
S_{17}	Advance estimates of schedules and resources [10]
S_{18}	Complexity of the governance [10]
S_{19}	Cutting corners and politically induced contract scam [10]
S_{20}	Delay over the project life time [10]

IV. METHODOLOGY

The study adopts a combination of exploratory and descriptive survey methods, involving a two-stage data gathering and creative approaches. The purpose of exploratory approach is to better understand events and phenomena on the causes and effects of scope creep of LSPSCP and how they could be displayed on a visual aid for clarity and as cautious reference signal. The exploratory method was used to identify the relevant causes of project scope creep. Constructs generated at the exploratory stage were used in designing questionnaires, which were pre-tested and distributed to skilled and expertise technical staff involved in the management of five LSPSCP, one from each of the five states of the SEGPZN. The professional skills of the staff and respondents involved were civil/structural engineers, architects, quantity surveyors and project/construction managers. The selected ongoing LSPSCP suffered from scope creep and are in the process of finding a way of ameliorating the problems. It was on these reasons that they were selected for the study. Using a five-point rating scale, the respondents were asked to rate the level of severity of each identified causative factors of scope creep. The five-point rate scale for the levels of severity range from 1= very low to 5 = very high. The sample size (n) of the respondents, which is 98 was obtained from the population size (N) using the Yaro Yamane formula

$$n = \frac{N}{1 + Ne^2} \quad \ldots(1)$$

where e = error margin, usually 0.5 The method of analysis adopted is Relative Severity index; (RSI) which indicate the level of severity of each identified causative factor of scope creep of LSPSCP in the SEGPZN. In each computation, the total number of respondents rating on each causative factor is obtained and used to calculate the percentage of the RSI with the aid statistical package for Social Science (SPSS) 17.0 packages and Microsoft excel.

Relative Severity Index (RSI) =

$$\sum_{i=1}^{n} \frac{Wifi}{AN} \frac{100}{1} x \ (\%) \quad - \quad - \quad - \quad - \quad (2)$$

where; w_i = weight of each factor on five-point scale, f_i = frequency, A = the highest weight and n = the total number of respondents = 98.

The causes and effects of LSPSCP scope creep were displayed on a visual aid called fishbone diagram or Ishikawa diagram for visual clarity and as a warning signal for impending scope creep so as to provide avenues for prevention or mitigation. API, an online publication provided overview on how to use fishbone tool for root cause analysis; a structured team process that assists in identifying underlying factors or root causes of an adverse event or near-miss. Understanding the contributing factors or causes of a system failure (scope creep) can help develop actions that sustain the correction.

A causes and effect diagram, often called a "fishbone" diagram, can help in brainstorming to identify possible causes of a problem and in sorting ideas into useful categories. A fishbone diagram is a visual way to look at cause and effect. It is a more structured approach than some other tools available for brainstorming causes of a problem. The problem or effect is displayed at the head or mouth of the fish. Possible contributing causes are listed on the smaller "bones" under various cause categories. A fishbone diagram can be helpful in identifying possible causes for a problem that might not otherwise be considered by directing the team to look at the categories and think of alternative causes. Included are project team members who have personal knowledge of the processes and system involved in the problem or event to be investigated. The following steps listed below were carried out in using the fishbone diagram.

- Agree on the problem statement (also referred to as the effect). This is written at the mouth of the "fish". Be as clear and specific as you can about the problem. Beware of defining the problem in terms of a solution (e.g, we need more of something).
- Agree on the major categories of causes of the problem (written as branches from the main arrow). Major categories often include: equipment or supply factors, environmental factors, rules/policy/procedure factors, and people/staff factors. (API online)
- Brainstorm all the possible causes of the problem. Ask "why does this happen?" As each idea is given, the facilitator writes the causal factors as a branch from the appropriate category on the fishbone diagram). Causes can be written in several places if they relate to several categories.
- Again asks "why does this happen?" about each cause. Write sub-causes branching off the cause branches.

Continues to ask "why" and generate levels of causes and continue organizing them under related causes or categories. This will help to identify and then address root causes to prevent future problems.

Table 2: Questionnaire distributors and returns based on LSPSCP and budgeted cost

Project Code	SEGPZN State	Title of the project	Budget Cost (N)	Distributed	Returned	% Returned
AB	Abia	Erosion project	598,312,218	15	12	80
EB	Ebonyi	Road project	1,917,228,668.17	22	18	82
EN	Enugu	Road Project	5,199,918,515.51	30	26	87
IM	Imo	Road dualization project	2,599,419,124.96	25	25	100
AN	Anambra	International hotel and conference centre	1,896,611,181.17	20	17	85
		Total		112	98	88

Source: Field Survey (2016)

Table 3: Questionnaire administration and returns based on technical skills

Respondents	Project and Questionnaire Distribution							
	AB	EB	EN	IM	AN	Total	Returned	% Returned
Civil/Structural engineers	5	7	11	8	6	37	31	84
Architects	2	3	6	4	5	20	17	85
Quantity Surveyors	2	3	3	4	3	15	13	87
Project/Construction managers	6	9	10	9	6	40	37	93
	15	**22**	**30**	**25**	**20**	**112**	**98**	**86**

The results of data analysis and the development of cause and effect tools for root cause analysis are shown below:

Table 4: Ordered significant ranking of computed relative severity index of causative factor of scope creep of LSPSCP

		Scale and Frequency of Respondents					No. of Respondent	Sum	RSI (%)	Rank
		1	2	3	4	5				
S_6	Lack of knowledge and poor understanding of product versatility/complexity	2	4	11	20	61	98	428	87.35	1
S_{10}	Poor understanding of customer requirements prior to project scope definition and contract signing	4	3	13	23	55	98	403	82.24	2
S_{12}	Poor quality of design and work breakdown structure	6	8	10	24	50	98	398	81.24	3
S_1	Lack of define and discipline procedure for project management	13	12	9	22	42	98	362	73.88	4
S_7	Customers requirements changes and lack of change control contingency plan	8	10	25	20	35	98	358	73.06	5
S_{16}	Managing project by parts devoid of system thinking	10	9	27	22	30	98	347	70.08	6
S_{14}	Poor requirements specifications that lacks in details with conflicting needs not identified prior to implementation	11	13	29	18	27	98	331	67.55	7
S_3	Unavailability of formal risk analysis and planning process	13	17	20	28	20	98	292	59.60	8
S_2	Incompetent project manager/poor team management	20	23	23	14	18	98	281	57.35	9
S_8	Environmental changes/force majaure	23	24	22	16	13	98	266	54.29	10
S_{17}	Advance estimates of schedule and resources	31	21	24	12	10	98	243	49.59	11
S_9	Platform changes	38	24	18	8	10	98	222	45.31	12
S_2	Lack of formal communication plan	38	22	23	11	4	98	215	43.88	13
S_{11}	Internal change by development team	41	25	21	8	3	98	201	41.02	14
S_{15}	New ideas or market needs	44	27	19	7	1	98	188	38.37	15
S_{19}	Cutting corners and political induced contract scam	46	30	14	7	1	98	181	36.94	16
S_{18}	Complexity of governance	44	32	15	6	0	98	171	34.90	17
S_4	Inability to manage stakeholders clients	50	53	10	5	0	98	166	33.88	18
S_{20}	Delays over the project life time	49	38	8	3	0	98	161	32.86	19
S_{13}	Gold plating	52	40	4	2	0	98	152	31.02	20

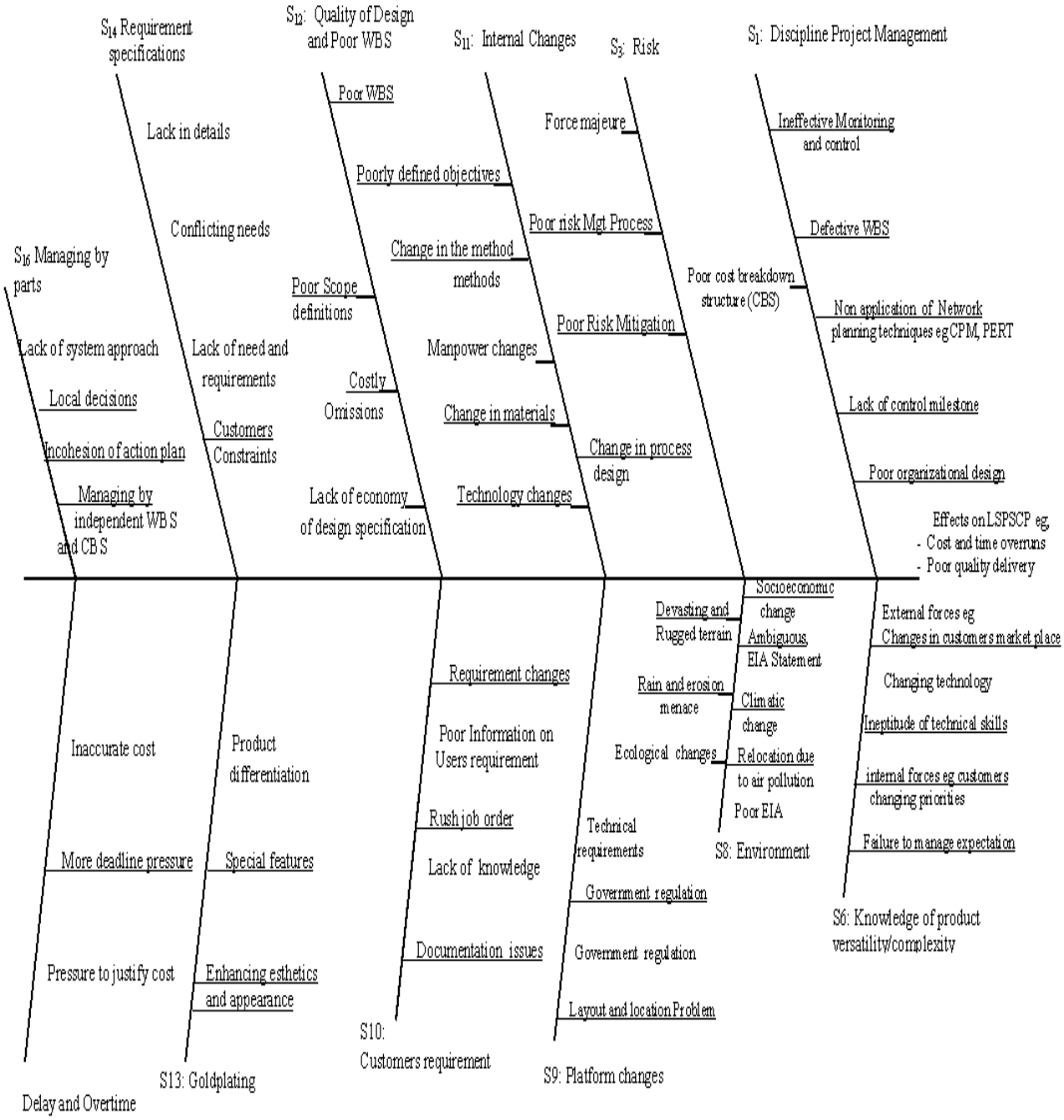
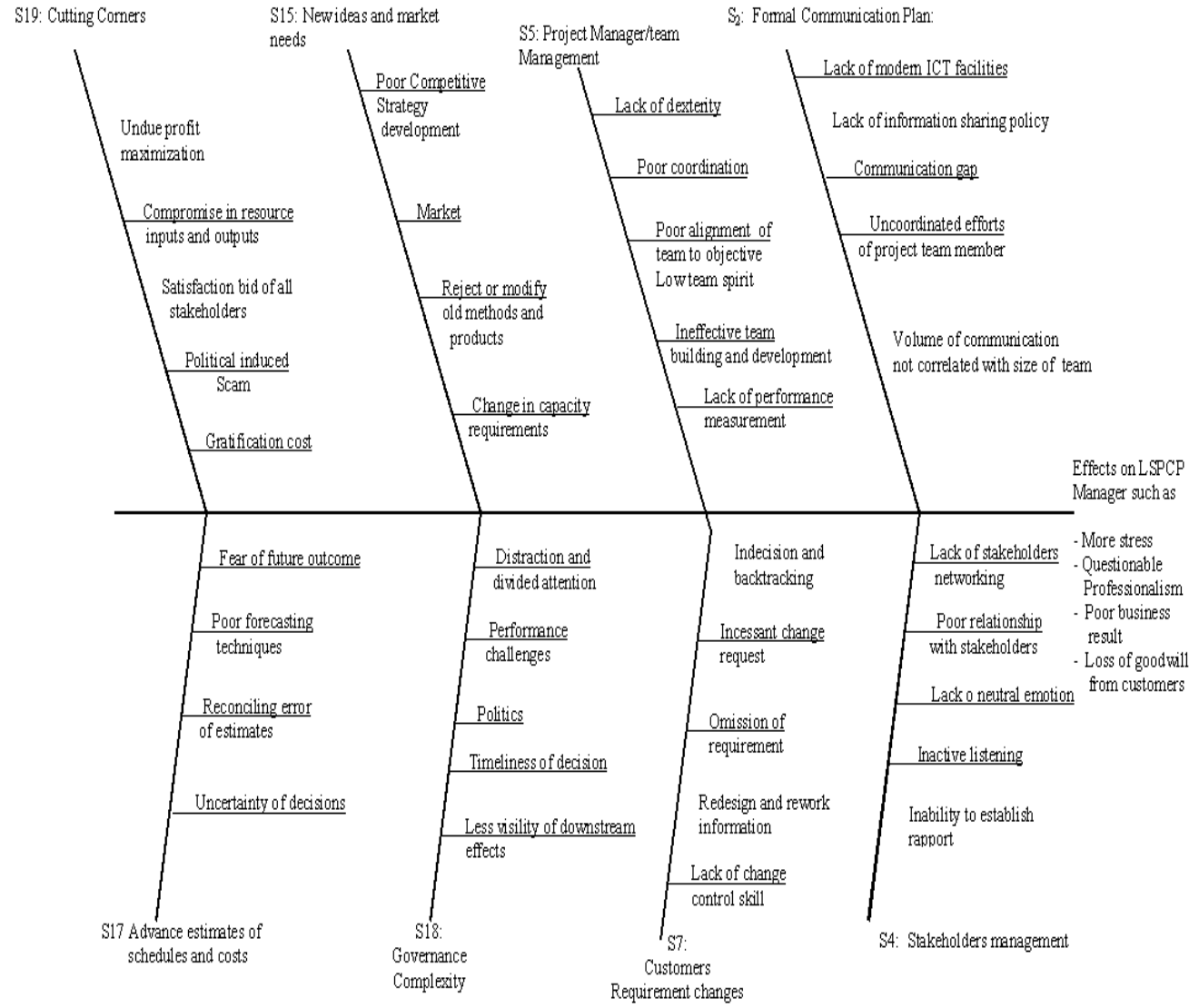


Figure 1: Fishbone diagram of Scope Creep on LSPSCP



V. RESULTS AND DISCUSSIONS

From the analysis of result based on the twenty identified causative factors of scope creep of LSPSCP and the development of cause and effect tools, the following inference and deductions were made. The are many causative factors of scope creep of LSPSCP in the SEGZN. The ranking of these factors using relative severity index indicates that lack of knowledge and poor understanding of product versatility and complexity S_6 ranked first. Complexity factor takes into account the type of technical issues likely to be associated with the project. LSPSCP are usually characterized by ambiguity and versatility in requirement with RSI of 87.35% specifications as well as complexity in design and implementation. It could be on these premises that [10] describe large scale projects as complex systems. Complex project involves more than a series of tasks to be accomplished. It involves people in an organizational structure doing work, which includes decision-making, governance, and time and cost forecasts. According to [10] each of these aspects of the project has an impact on the other, adding dynamic complexity to the process and affecting people's expectations. Similarly S_{10}, which is; poor understanding of customers' requirements prior to project scope definition and contract signing rank second in the significant order with RSI of 82.24%. The increase in scope will evolve as a surprise during the implementation stage if the customer's requirements are not completely captured in the course of requirements specifications and design. Also poor quality of design/Work Breakdown Structure (WBS) coded S_{12} ranked third then followed by S_1, S_7, S_{16}, S_4, S_3, etc as shown on table 4 while the least ranked is gold plating S13 with RSI of 31.02%. Quality of design is refers to the intention of designers to include or exclude certain features in a product or service [15]. A poor scope definition in project design could result to costly omissions and difficulties in project implementation and resulting to expanded scope later in the project implementation stage. For example, suitable materials may be difficult to obtain, specifications difficult to meet and procedures difficult to follow. It could be on this premise that [3] and; [4] aver that without a scope definition in place, project will be in unenviable position of constantly addition work referred to as scope creep throughout the life of their existence. The WBS acts as a vehicle for breaking the work down into smaller elements, thus providing a greater probability that every major and minor activity will be accounted for [3], [4. It could be opined that these causative factors of LSPSCP scope creep are interrelated, could interact and make aggregate impacts resulting to scope creep.

The fishbone or Ishikawa diagram was developed in the study. The value of using fishbone diagram is to dig deeper, to

go beyond initial incident report to better understand what in the LSPSCP systems and processes that are causing the scope creep so that they can be addressed. The root causes of scope creep are the underlying process and system problems that allow the contributing factors to culminate into a harmful effect. Once the root causes and contributing factors are identified, then the need to address each roots cause and contributing factors as appropriate. The effects of these causative factors of scope creep are divided into two; viz on the project performance and on the project manager as shown in the fishbone diagrams. Both of them result to scope creep of LSPSCP. To the LSPSCP, the causative factors of scope creep result to cost and time overruns, poor quality of projects, project failure and abandonment etc, while to the managers of LSPSCP, the factors cause more stress, questionable professionalism, poor business results, loss of goodwill from customers and dwindling capacity to face competition. Large changes in scope are usually easily identified. It is the minor refinements scope creep that eventually builds to the major scope changes that can cause the problem of scope creep. The most severed cause of scope creep was identified to be S6, which is lack of knowledge, and poor understanding of product versatility and complexity. The fishbone or Ishiakwa diagram should serve as a tool for display of caution signs and warning signals to the project team against impending risks and danger of scope creep in the management of LSPSCP. Because of their visual clarity, they could be effective reporting medium for top management and project team on the causes and effects of scope creep so as to track them and explore measures for their containment and mitigation.

VI. CONCLUSIONS

The study has identified the causative factors of scope creep of LSPCP, ranked them in the order of relative severity index and developed a fishbone/Ishikawa diagram as a visual aid, which will help to address the problems. Table 4 indicated the severity ranking of all the identified causes of scope creep when applied to LSPSCP in the SEGPZN. The employment of skill technical manpower with dexterity and in-depth knowledge in project system analysis and design will address the complexity and versatility of projects prior to implementation. Also, effective project design will capture all the details of project specifications and develop a compressive WBS of the projects prior to implementation. The WBS diagram provides an excellent device for not only defining the work to be done, but also to assign the defined work to a specific individual and organization for performance.

The fishbone/Ishikawa diagram will display causes and effects of scope creep as a warning signal and pointer to impending dangers in the course of managing LSPSCP so as to minimize the incidence of scope creep. This study diagnosed the scope creep and therefore will form the basis for exploring avenues for management of scope creep in the subsequent studies. Project scope creep is a harmful disease of projects that requires discipline project management approach to address it. However, prevention of scope creep is better than the remedial actions of managing them.

REFERENCES

[1] Schwalbe K. "*Introduction to Project Management*. Thomson Course Technology". 2006, pp. 34-37.

[2] Glasson R.L. "Evolving a New Theory of Project Success. (Communication of the ACM, 42 II *Business Source Complete"1999*.

[3] Fleming Q.W. "*Project Procurement Management Contracting Subcontracting, Teaming".* California, USA, FMC Press, 2003, pp. 45-49

[4] Ubani E.C, Echeme I.I. and Ukwuoma B.A. (2015, March) Development of Strategies for Effective Project Scope Management. A Study of National Integrated Power Projects. *European Journals of Academic Essays,2(2),* pp. 11-20. www.euroessays.org

[5] Snowdown L.E. "*Management of Engineering Projects*" Newness Butterworth's, London, Boston, 1977, pp.70

[6] Sheikh R.A. and Khan K.A. "How to Manage Public Sector Construction Projects Successfully in South Asia" *PMI Global Congress Proceedings* Singapore, 2005.

[7] Smith A. and Tucker R.L. (1984) Early Project Problem – Assessment of Impact and Cause. *1984 Proceedings Newton Square. Project Management Institute* (PMI)

[8] Pinto J.K. and Slevin D.P. (1988) Critical Success Factors Across the Project Life Cycle. *Project Management Journal* 19 (3).

[9] Ashely D.B., Lurice C.S., and Jaselskis EJ. (1987) Determinants of Project Success. *Project Management Journal* 18 (2)

[10] Shapiro A. and Lorenz C. (2000). Large –Scale Projects as Complex Systems. Managing Scope "Scope Creep. System Thinking Pegasus *Communications*. Volume II, Number 1. editorial@pegasus.com

[11] Kerzner H. (2012) Project Management: A System Approach to Planning, *Scheduling and Controlling*. 10th Edition. John Wiley & Sons New Jersey.

[12] Moneke U.U. (2015) Management of Scope Creep for Delivery of Public Section Construction Projects in Nigeria. *Unpublished Ph.D Thesis. Federal University of Technology, Owerri, Nigeria.*

[13] Tharkuta R. (2013) Impact of Scope Creep on Software Project Quality; Wilakshan: *The XIMB Journal of Management. 01, 1*. Business Source Complete.

[14] Turk W. (2010) Scope Creep Horror, Defence AT & L 39, 2, Business Source Complete.

[15] Stevenson W.J. (2007) *Operation Management*, Instructors Edition. Mc Graw Hill Irwin.

www.pmi.org/standards/pmbok.htm,
API online publications.

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