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Assessment of Indices of Building Project Quality Control Checklist in the South-Eastern States of Nigeria.

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ABSTRACT: *Production of a good quality building depends among other variables the construction methodologies, project quality management plan and project health and safety plan. Achievement of the quality management plan depends largely on a checklist document to guide on the workmanship, construction material, inspection, material sampling and testing. 62 variables were considered as important parameters that constitute the checklist document. The 62 variables were grouped under 8 sub-headings namely subsurface, timber, formwork, concretework, steel reinforcement, blockwork, rendering and roofing. Assessment was done a Likert 5 point scale and was analysed using weighted average mean index (I_{imp}) which ranged from -2 to 2. The subsurface sub-sector ranked first with a mean score of 1.5752 followed by the roofing sub-sector. The least is blockwork with a mean score of 1.3297 followed by the rendering sub-sector with a mean score of 1.3492. Out of the 900 copies of structured questionnaires administered, 730 responded which is a return rate of 81.1 percent. The building professional bodies and all levels of the government regulatory agencies to provide quality control checklist and approved system for building project monitoring.*

KEYWORDS*: Checklist, quality control, mean score, building, inspection, quality planning*

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I. INTRODUCTION

Complexity of building design, modern construction materials/ components, construction methodologies have called for specialization in building production. It is the need for specialization and its accured benefits, among other things that brought about the building profession worldwide. The direct benefits to clients and developers in engaging specialist include adoption of appropriate construction methodology for optimal cost, optimum production time and achieving the specified quality standards at first attempt.

The construction manager prepares the production management documents like construction methodology, construction programme, project quality management plan, project health and safety plan, information requirement schedule. It is the construction methodology that dictates the details of project quality management plan which would be used to achieve the specified quality standards.

Hackett et al (2006) stated that routine site visits are made for main reasons;

i) Checking that quality of completed work conforms to agreed quality standard,
ii) Checking that the contractor's process conforms to the programme,
iii) Checking that designs are being completed according to plan.

The checklist documents include the following items:

i) Drawings and schedules,
ii) Specifications,
iii) Bill of quantities,
iv) Quality manual for construction method,
v) Quality manuals for construction materials,
vi) Products suppliers details,
vii) Sub-contractors details.

It is unbelievable that since 1960 when Nigeria gained political independence, the national standards and codes with respect to construction practice are yet to improve indigenous practice. Most Nigerian building professionals do not talk of Nigerian Industrial Standards (NIS). The standards in use do not reflect the prevailing local climate conditions which are critical to the properties of materials. The quality of these construction materials can only be guaranteed through adequate quality control inspection, material sampling and testing and by ensuring adequate storage. According to Ali and Rahmat, (2002), in the construction industry the emphasis of quality is on the ability to conform to established requirements. They identified the important criteria for measuring quality performance to include compliance with the use of specified quality of workmanship; standardized production processes to ensure quality; magnitude of quality degradation of output and above all client/customr satisfaction.
Dimeji (2001) is of the opinion that a checklist is a structured tool, usually item specific, used to verify that a set of required steps has been performed. Checklist may be simple or complex and many organizations have standardized checklist available to ensure consistency in frequently performed task. In some application areas, checklists are also available from professional associations or commercial providers.

The high incidence of building collapse in Nigeria and the non compliant to quality management standard in the building industry is the yawning need of this research in South-eastern states of Nigeria. The objective of this work will be by ascertaining the level of compliance with existing quality management standards in public building projects in the South-eastern states of Nigeria in accordance with NIOB/NBC quality checklist. It will also identify and rank in order of preponderance of the constituents of quality management checklist in the South-eastern states of Nigerian.

II. METHODOLOGY

62 variables were considered to be important parameters and constitute the checklist document extracted from the Shell Petroleum Development Company Ltd building project document. The 62 variables were listed under eight subheadings. They subheadings include subsurface, timber, formwork, concretework, steel reinforcement, blockwork, rendering and roofing.

The Likert 5-point scaled questions were used in the assessment of indices of preponderance and implementation of building project quality control checklist obtained from Shell Petroleum Development Nigeria Limited, Civil/Building quality control/assurance checklist.

The questionnaire for this study was designed with due regard for the suggestions on question sequence and question formulation and wordings. The research adopted the structured questionnaire method. The Likert 5 point weighting were as follows: very high as 2, high as 1, undecided as 0, low as -1 and very low as -2. Respondents were required to rank the degree of preponderance on a Likert scale of 5 on the 62 variables grouped into 8 sub-headings.

A survey research design was adopted in this research work. the data were obtained from research participants through a structural questionnaire, personal interviews and observations.

The major actors in the population include architects, engineers, builders, quantity surveyors, contractors, clients and financiers of public buildings projects. 900 copies of the questionnaires were distributed in the South-eastern states of Nigeria namely; Abia, Anambra, Ebonyi, Enugu and Imo state. Research assistants were used in the distribution of the questionnaire across the states.

Percentages were used to simplify numbers, reducing all of them to a 0 to 100 range. In the comparison of factors, the higher the percentage rating, the higher on the comparatively more significant the importance attached to the factor.

Mean Score. Scores or numerical values were assigned to each of the statement that describes a situation being investigated in order to measure the intensity of agreement by the respondent to the statement. The mean score for each item was then determined from the scores and the frequency of responses for each score. The Mean Score (M.S) is mathematically represented as

$$\text{Mean Score (M.S)} = \frac{\sum aixi \ (-2 \leq MS \leq 2)}{N}$$

M.S is the mean score
a = the respective weighting of the factors ($-2 \leq MS \leq 2$)
x = the number of respondent for each weighting
N = the total number of respondents.
$\sum$ = Capital Greek sigma which means summation i.e. the sum of

The weighted average formula was used in assessing respondents ranking of importance. The weighted average for each of the variables was obtained from the sum of the product of the proportion of the responses received from each group compared to the total number of receipts ($^{n}/_{N}$) and the corresponding mean score of that group in respect of individual variable. The weighted average is given as: $WA = \sum (^{n}/_{N}) \times MS$ $(-2 \leq WA \leq 2)s$

III. RESULT AND DISCUSSIONS

Nine hundred copies of the questionnaires were distributed to the building project professionals in the South-eastern states of Nigeria. Seven hundred and thirty responded to the questionnaires representing 81.1 percent of the respondents.

Table 1: Categorization of Respondents

Organisation	Number	Percentage
Client	125	17.4
Consultant	275	37.7
Contractor	273	37.4
Others	57	7.8
Total	730	100

Source: Author's fieldwork

The data in Table 1 shows that 75.1 percent of the respondents were either in the consultancy or contracting organisations of the building sub-sector and therefore the background information supplied to them was deemed adequate and reliable.

Table 2: Summary Of Building Project Quality Management Checklist Indices

	Variables	n=134 ABIA		n=147 ANAMBRA		n=98 EBONYI		n=177 ENUGU		n=174 IMO		n = 730 Weighted Mean Index	
S/N	A. SUBSURFACE	INDEX	RANK	INDEX	RANK	INDEX	RANK	INDEX	RANK	INDEX	RANK	INDEX	RANK
C1	Subsoil investigation carried out on proposed site	1.582	2	1.66	1	1.796	1	1.638	2	1.661	1	1.6674	1
C2	Materials for damp proof courses adequate	1.552	3	1.619	3	1.612	3	1.621	3	1.563	4	1.5936	3
C3	Hard-core material inspected and approved	1.552	4	1.626	2	1.592	4	1.695	1	1.603	3	1.6137	2
C4	Sample loads of approved hard-core kept for future references	1.313	5	1.401	5	1.531	5	1.452	5	1.425	5	1.4245	5
C5	Surface to receive DPC properly flushed	1.604	1	1.463	4	1.643	2	1.565	4	1.609	2	1.5768	4
	B. TIMBER												
C6	Timber without defects	1.619	3	1.639	3	1.684	1	1.571	4	1.592	3	1.621	3
C7	Timber properly seasoned and treated	1.664	2	1.728	1	1.602	2	1.695	2	1.626	2	1.6631	1
C8	Timber stored above ground and under cover	1.388	9	1.456	7	1.449	6	1.373	7	1.42	9	1.417	8
C9	Setting out of joinery works as per detailed drawings	1.57	4	1.537	5	1.48	5	1.78	1	1.575	5	1.5883	4

SUMMARY OF BUILDING PROJECT QUALITY MANAGEMENT CHECKLIST INDICES

S/N	Variables	n=134 ABIA		n=147 ANAMBRA		n=98 EBONYI		n=177 ENUGU		n=174 IMO		n = 730 Weighted Mean Index	
		INDEX	RANK	INDEX	RANK	INDEX	RANK	INDEX	RANK	INDEX	RANK	INDEX	RANK
C10	Iron mongery checked and found adequate	1.396	8	1.388	10	1.245	9	1.25	9	1.431	7	1.3418	10
C11	Nails new and of adequate length	1.216	10	1.442	8	1.408	7	1.345	8	1.345	10	1.3512	9
C12	Timber bearers (sleepers) properly bedded	1.545	5	1.558	4	1.571	3	1.486	6	1.58	4	1.5481	5
C13	Timber runner properly lapped and nailed	1.537	6	1.435	9	1.531	4	1.508	5	1.466	6	1.4955	6
C14	Framing and glued joints checked	1.478	7	1.497	6	1.35	8	1.485	10	1.428	8	1.4474	7
C15	Timber planks within specified dimensions and tolerance	1.687	1	1.721	2	1.63	10	1.599	3	1.631	1	1.6536	2
	C. FORMWORK												
C16	Formwork material resistant to action of cement and water	1.567	4	1.612	2	1.643	2	1.661	2	1.649	2	1.6265	1
C17	Formwork material surface free of defects	1.515	5	1.456	5	1.52	5	1.537	6	1.477	8	1.501	7
C18	Joints sufficiently tight to prevent leakage of grout and avoid formation of fines or other blemishes	1.701	1	1.646	1	1.653	1	1.678	1	1.684	1	1.6725	2
C19	Formation faces to be in contact with fresh concrete treated with approved non-stick compound	1.455	7	1.442	6	1.531	4	1.565	5	1.598	5	1.5181	5

SUMMARY OF BUILDING PROJECT QUALITY MANAGEMENT CHECKLIST INDICES

S/N	Variables	n=134 ABIA		n=147 ANAMBRA		n=98 EBONYI		n=177 ENUGU		n=174 IMO		n = 730 Weighted Mean Index	
		INDEX	RANK	INDEX	RANK	INDEX	RANK	INDEX	RANK	INDEX	RANK	INDEX	RANK
C20	Formation thoroughly cleaned prior to concrete placement	1.54	6	1.408	7	1.541	3	1.531	7	1.5	7	1.504	6
C21	Striking of formwork carried out after specified time elapse	1.396	8	1.347	8	1.439	7	1.514	8	1.552	6	1.4494	8
C22	Formwork braced and strutted to prevent deformation	1.634	3	1.517	3	1.408	8	1.621	3	1.632	3	1.5626	4
C23	Formwork propped sufficiently to prevent deflection	1.642	2	1.531	4	1.469	6	1.588	4	1.615	4	1.5689	3
	D. CONCRETE WORK												
C24	Method of measuring materials established and approved	1.567	5	1.537	4	1.735	1	1.559	3	1.494	5	1.5786	3
C25	Mix design carried out and approved for designed mixes	1.582	3	1.612	2	1.51	4	1.701	1	1.569	2	1.5948	1
C26	Method of transporting mixed concrete established and approved	1.351	8	1.388	8	1.378	8	1.379	8	1.397	8	1.3782	8

SUMMARY OF BUILDING PROJECT QUALITY MANAGEMENT CHECKLIST INDICES

	Variables	n=134 ABIA		n=147 ANAMBRA		n=98 EBONYI		n=177 ENUGU		n=174 IMO		n = 730 Weighted Mean Index	
S/N		INDEX	RANK	INDEX	RANK	INDEX	RANK	INDEX	RANK	INDEX	RANK	INDEX	RANK
C27	Method of placing and compacting concrete established and approved	1.403	7	1.415	7	1.388	7	1.424	7	1.437	7	1.4132	7
C28	Excavations and framework made dry prior to placing concrete	1.552	2	1.449	6	1.49	5	1.492	5	1.529	3	1.5023	5
C29	Mixed concrete tested for workability (slump test)	1.56	4	1.653	1	1.52	3	1.627	2	1.603	1	1.5927	2
C30	Concrete cube test carried out regularly as specified	1.604	1	1.612	3	1.531	2	1.554	4	1.546	4	1.5694	4
C31	All failed concrete work demolished and carted away	1.41	6	1.469	5	1.418	6	1.446	6	1.448	6	1.4386	6
	E. STEEL REIN-FORCEMENT												
C32	Bar bending schedule available and adequate	1.59	1	1.612	2	1.878	1	1.638	2	1.603	2	1.6642	2
C33	Reinforcement tested for strength and size	1.582	2	1.667	1	1.816	2	1.667	1	1.672	1	1.6808	1
C34	Reinforcement arrangement certified by engineers	1.478	3	1.456	3	1.694	6	1.48	3	1.477	4	1.5169	3
C35	Concrete cover to reinforcement provided as specified	1.261	7	1.442	4	1.071	7	1.395	6	1.351	6	1.3042	7

SUMMARY OF BUILDING PROJECT QUALITY MANAGEMENT CHECKLIST INDICES

	Variables	n=134 ABIA		n=147 ANAMBRA		n=98 EBONYI		n=177 ENUGU		n=174 IMO		n = 730 Weighted Mean Index	
S/N		INDEX	RANK	INDEX	RANK	INDEX	RANK	INDEX	RANK	INDEX	RANK	INDEX	RANK
C36	Spacing of reinforcement in line with the approved drawings and schedules	1.4	4	1.293	6	1.714	5	1.48	4	1.351	7	1.4475	5
C37	Reinforcement steel free from deleterious matter	1.358	5	1.381	5	1.755	3	1.424	5	1.489	3	1.4813	4
C38	Steel reinforcement cut and bent cold	1.284	6	1.259	7	1.724	4	1.282	7	1.448	5	1.3995	6
	F. BLOCK WORK												
C39	Sandcrete samples taken and cast into cubes	1.403	5	1.401	5	1.388	4	1.407	4	1.414	4	1.4025	4
C40	Setting out of Blockwork	1.619	1	1.619	1	1.612	1	1.621	1	1.626	1	1.6197	1
C41	Quality of mortar	1.06	9	1.075	8	1.051	8	1.068	8	1.103	8	1.0714	9
C42	Blockwork properly tied to structural frames	1.522	2	1.068	9	1.531	2	1.531	2	1.552	2	1.4408	3
C43	Blockwork adequately filled where required by specifications	1.082	7	1.51	3	1.143	7	1.147	7	1.132	7	1.2028	7
C44	Blockwork adequately wetted with fresh water before laying	1.216	6	1.279	7	1.214	6	1.226	6	1.23	6	1.2331	6
C45	Metal ties for Blockwork alright	1.067	8	1.585	2	1.041	9	1.034	9	1.063	9	1.158	8
C46	Blockwall properly aligned vertically and horizontally	1.455	4	1.45	4	1.429	3	1.446	3	1.46	3	1.448	2
C47	Bonding of blocks adequate	1.478	3	1.392	6	1.347	5	1.401	5	1.339	5	1.3914	5

SUMMARY OF BUILDING PROJECT QUALITY MANAGEMENT CHECKLIST INDICES

	Variables	n=134 ABIA		n=147 ANAMBRA		n=98 EBONYI		n=177 ENUGU		n=174 IMO		n = 730 Weighted Mean Index	
S/N		INDEX	RANK	INDEX	RANK	INDEX	RANK	INDEX	RANK	INDEX	RANK	INDEX	RANK
	G. RENDERING												
C48	Surface properly cleaned and the joints raked out	1.664	1	1.66	1	1.704	1	1.678	1	1.684	1	1.678	1
C49	Finished thickness of rendering adequate	1.522	3	1.306	4	1.367	4	0.853	8	1.368	6	1.2834	5
C50	Rendering properly cured	1.172	6	0.946	7	1.204	6	1.305	5	1.247	7	1.1747	7
C51	Finished surface fair and smooth without trowel marks	1.112	8	0.823	8	1.122	7	0.983	7	1.086	8	1.0254	8
C52	All openings straight and true	1.157	7	1.19	5	1.082	8	1.158	6	1.557	3	1.2289	6
C53	Water applied on walls before rendering	1.478	4	1.442	3	1.541	3	1.599	2	1.534	4	1.5188	3
C54	Rendered walls free of shrinkage cracks	1.328	5	1.075	6	1.327	5	1.362	4	1.448	5	1.3079	4
C55	All fittings on wall for doors, windows, AC units, plumbing and electrical wiring complex and approved	1.582	2	1.51	2	1.571	2	1.565	3	1.655	2	1.5768	2
	H. ROOFING												
C56	Rafters and purline adequately maintain roof profiles	1.597	4	1.68	3	1.7	1	1.678	3	1.672	4	1.6655	1

SUMMARY OF BUILDING PROJECT QUALITY MANAGEMENT CHECKLIST INDICES

	Variables	n=134 ABIA		n=147 ANAMBRA		n=98 EBONYI		n=177 ENUGU		n=174 IMO		n = 730 Weighted Mean Index	
S/N		INDEX	RANK	INDEX	RANK	INDEX	RANK	INDEX	RANK	INDEX	RANK	INDEX	RANK
C57	Slopes and falls of roof frame of designed angle/profile	1.791	1	1.633	4	1.37	3	1.729	1	1.695	3	1.6436	2
C58	Roof paneling sequence plan and installation details approved	1.582	5	1.565	7	1.2	4	1.667	4	1.713	2	1.5452	5
C59	Roof frame approved for covering	1.642	2	1.694	1	1.12	5	1.706	2	1.724	1	1.5772	4
C60	Roofing sheets of specified make and brand	1.575	6	1.585	6	1.09	7	1.61	6	1.506	6	1.4731	6
C61	Roofing sheets of specified thickness	1.627	3	1.694	2	1.54	2	1.621	5	1.534	5	1.6033	3
C62	Roofing sheets firmly secured to the roof frame	1.493	7	1.612	5	1.112	6	1.605	7	1.483	7	1.4608	7

the data in Table 2 shows the 62 variables grouped under the eight sub-headings. The information in Table 2 were analysed using percentages to reduce the number of respondent from 0 to 100 in each of the variables. The mean score for each variable was calculated for each of the states; namely Abia, Anambra, Ebonyi, Enugu and Imo state. The data in Table 2 were further analysed to establish the level of awareness to quality control checklist. Table 3 is a summary of Table 2 showing the composition of the checklist sub-sector and their ranking. The information shows the eight sub-sectors, the weighted mean score and the ranking.

Table 3: Order of Ranking of Checklist Sub-sectors

RANK ORDER	SECTOR	MEAN INDEX
1	Subsurface	1.5752
2	Roofing Sector	1.5672
3	Formwork	1.5498
4	Concrete Work sector	1.5085
5	Timber sector	1.5034
6	Steel reinforcement	1.4992
7	Rendering sector	1.3492
8	Blockwork	1.3297

Source: Author's Fieldwork

It may be surprising to non-professionals that the importance of blockwork in building project quality management checklist parameters ranked last among the eight sectors examined. To them, it is the blockwork that strikes them as the most important sector. However, professionals may not be surprise that the subsurface sector ranked first. This is because they know that for the stability and durability of any building, it is paramount that the sub-surface sector is solidly fortified. While the non-professionals are interested in aesthetics of the building, the professionals are interested in the functionality of the building. The foundation remains below the ground level, the signs of failure of foundation are not noticeable till it has already affected the building. Therefore, a foundation should be sufficiently strong to prevent excessive settlement as well as unequal settlement. Unequal settlement or differential settlement may be caused by:

(i) weak sub-soils such as made up ground;
(ii) shrinkable and expensive soils (such as clay);
(iii) movement of ground water and uplift pressure; and
(iv) excessive vibrations, due to traffic, machinery, etc.

According to Punmia and Jain (2008) when designing the foundation the factors listed above must be taken into account.

It is not surprising that the roofing sub-sector ranked second with a mean score of 1.5672. The roof is the uppermost part of the building, provided as a structural covering to protect the building from weather (rain, sun and wind). The roof type depends upon the shape or plan of the building and the type of constructional materials. Its second position in ranking could be attributed to its value to the aesthetic nature of the building and the ability of the roof structure which support the roof covering materials to have adequate strength and stability. In this roofing subsector, rafters and purlins adequately maintain roof profiles ranked first followed by slopes and falls of roof frame of designed angle/profile. This could be attributed to the inclined members running from the ridge to the eaves. It is expressed either in terms of degrees (angle) or as a ratio of rise to span.

The formwork assemblage sub-sector ranked third with a mean score of 1.5498. When the concrete has reached a certain required strength, the shutter is no longer needed and is removed. The operation of removing the formwork is commonly known as stripping. When the striking or stripping takes place, the components of formwork are removed and then re-used for other elements of the building structure. The re-use nature of the formwork material might be the reason for respondents ranking material resistant to action of cement and water as first, followed by joint being sufficiently tight to prevent leakage of grout and the formation of honeycombs or other defects. The least in the formwork sub-sector ranking is striking of formwork carried out after the specified time has elapsed which ranges from 24 hours to 21 days depending on the span and nature of the structural element and the location of the formwork in the building.

The fourth in the ranking order is the concrete work sub-sector with a mean score of 1.5085. The concrete is a product obtained artificially by hardening of the mixture of cement, fine aggregate, coarse aggregates and water in predetermined proportions. Concrete has enough strength in compression, but has little strength in tension. The predetermined proportion called mix design was ranked first in the concrete sector with a mean score of 1.5948,

while the workability of the concrete (slump test) was ranked second with mean score of 1.5927. In its simplest form, the term workability may be defined as the ease with which concrete may be mixed, handled, transported, placed in position and compacted. The third in terms of ranking of the concrete sub-sector is method of measuring out (batching) materials as specified with a weighted average mean score of 1.5786. It is preferable to measure cement in terms of its weight and not in terms of volume. The volume of cement changes with the conditions of measurement. In Nigeria, cement is supplied in bags, each bag weighing 50kg. Under normal conditions, the volume of cement in the bag is considered equivalent to $0.035m^3$. Fine aggregates (sand) may be measured by weight for accurate works and by volume for ordinary works. However, when dry sand absorbs water from atmosphere, or when water is mixed to it artificially, its volume increases. There is no problem of bulking in coarse aggregate and hence it may be measured either by volume or by weight.

The timber sector ranked fifth with a mean score of 1.5034. The top in the indices of timber is timber properly seasoned and treated with mean score of 1.6631, followed by timber planks within specified dimensions and tolerance and the third, timber without defects with mean scores of 1.6354 and 1.621 respectively. Defects affect the quality, reduce the quantity of useful timber, reduce the strength, spoil the appearance and contributes to its decay. With scientific development, timber may be seasoned and treated before using it in construction work. It is easily convertible to any size and shape. Its different components may be easily jointed together to build a composite part of the structure. Its life span may be increased by proper seasoning and treatment of their surface.

Steel reinforcement sector has a mean score of 1.4992 to rank sixth. Building failure is the resultant negative difference between achieved result in building structure and the expected performance. In the checklist for steel reinforcement, concrete cover to reinforcement as specified was the least with a mean score of 1.304. Coming behind steel reinforcement is cut and bent cold with a mean score of 1.399. The roles of the building professionals with respect to the use of reinforcement in concrete are complementary and awareness level in this regard should be improved because the structural engineers incorporate all these elements including concrete cover to reinforcement in his structural analysis and design.

The seventh item in the ranking is rendering sector with a mean score of 1.3492. The data in Table 3 show how the professionals in the building industry perceive the procedure for the rendering operation. Apart from the decorative effect, rendering conceal inferior materials or defective workmanship and protect surfaces against termite. It can be applied to walls, columns, ceilings and other building components with this coat of plastic mortars to form a smooth durable surface.

Blockwork had a mean score of 1.3297 to rank 8 in the items considered in this study. Among the items involved in the blockwork, setting out of blockwork ranked first, followed by blockwork properly aligned vertically and horizontally with a mean score of 1.3913. To non-professionals, the two items ranked 1st and 2nd are the most critical aspects of the blockwork without taking other elements and activities into consideration as outlined in the blockwork. While these other elements add to the structural stability of the building, blockwork is normally used for the construction of foundations, walls, columns and other similar structural components of buildings. The areas of low awareness on blockwork include metal ties for blockwork, blockwork properly tied to structural frames, quality of mortar, blockwork adequately wetted with fresh water before laying, bonding of blocks and sandcrete samples taken and cast into cubes.

IV. RECOMMENDATION

1. Preparation of a quality control checklist and approval system for monitoring quality control indices of building project is a necessity.
2. Town planning and development control authorities and other quality regulatory bodies in the building construction industry should be more proactive in quality control programmes.
3. Efforts should be made by the Nigerian Standard Organisation (SON) and the built environment professional bodies to establish authentic standards relevant and appropriate to local conditions in all aspects of building production.
4. The building professional bodies NIA, NIQS, NSE, NIOB, etc and all levels of the government regulatory agencies to provide quality control checklist and approval system for building project monitoring using the developed quality management framework.

V. CONCLUSION

This research has shown that quality assurance in building project can be achieved by strict adherence to building project quality control checklist indices. The research indicated that even with drawings provided and

material specifications given, quality control checklist and its usage were low among the built environment professionals. Building professional bodies to provide quality control checklist and approval system for building project monitoring using the developed quality management framework.

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