Influence of Architectural Design on Workability in the Kitchen Among Staff of Higher Institutions of Mainland Local Government Area, Lagos State

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Abstract
The ability to achieve effective and efficient performance of chores in the kitchen lies in the architectural design adopted in constructing it. Architectural and structural designs influence workability positively or negatively. Kitchen is the centre of attraction in a home where all good smells and thoughts originate. It appears that there is something so comforting about the way the kitchen appeals to all the senses. This could be traced to the ability to perform chores with ease in the kitchen, and to achieve effective and efficient performance. The aim of the study was to determine the influence of architectural design on effective and efficient workability in the kitchen among female staff of University of Lagos, Yaba College of Technology and Federal College of Education (Technical) Akoka, Lagos. The study is a cross-sectional survey with a sample size of 302 female adults (21 years and above) sampled based on their willingness to participate. A validated, structured and pre-tested questionnaire was used in data collection: on the demographic characteristics of the respondents and influence of architectural design on effective workability in the kitchen. Data were presented using descriptive statistics - percentage, mean and inferential statistic - ANOVA. The result showed that 78%, 84% and 73% of the respondents from UNILAG, YABATECH and FCE(T) Akoka respectively affirmed that architectural designs have influence on effective and efficient workability in the kitchen. The study concluded that architectural designs have influence on effective and efficient carrying out of chores in the kitchen and also enhance productivity.

Keywords: Architectural Design, Effective and Efficient kitchen, Kitchen Workability

Introduction

The kitchen is the centre of attraction in a home where all good smells and thoughts originate. It is one of the most important sections in the home, without it members of the family might be uncomfortable and wonder how life continues without one of the basic needs (food). The kitchen is a place for preparing food and performing some other household chores. The kitchen is a popular gathering

spot in most homes. A lot of entertaining is done in this room as family and friends gather in an area close to where meals and appetizers are being prepared. It appears that there is something so comforting about the way the kitchen appeals to all the senses at once. This could be traceable to the ability to perform chores in the kitchen with ease and achieving effective and efficient performance (Parr, 2002).

Bullock (1988) explained that the new dwelling sets for its occupants the task of rethinking everything afresh, of organizing a new lifestyle, and of winning freedom from the irrelevant clutter of outmoded habits of thought and old-fashioned equipment. Like anything that first appears unattainable, but then becomes indispensable, the New Housekeeping, organized in keeping with the spirit of our age, is destined to become a natural part of our everyday life and as such architectural design become important.

Architectural design (AD) is a major key in the design of a building. It focuses on the components or elements of a structure or system and unifies them into a coherent and functional whole, under constraints or limitations. Before and after the beginning of the 20th century, kitchens were frequently not equipped with built-in cabinetry, and the lack of storage space in the kitchen became a real problem. This indicates that a kitchen then appears to be like an empty space where cooking could be done, with this there could be some difficulties in carrying out the chores. This description is sometimes referred to as traditional or open space kitchen. It is imperative to know that the construction of the kitchen is clearly too important to be left to architects alone. The histories are diverging and mutually informing. The relationships among design, technology, and work in the kitchen are multiple. Home economists, by measurement and movement studies, stabilized the body at work in the kitchen as female and northern European. Functionalist architects established a small, single-purpose room, which borrowed design influences from the railway car galley and the laboratory, as the prototype for the modern kitchen. Hence, it appears that there is need for a synergy between the homemaker, the users of the structure (kitchen) designed by the architect in order to enhance effective and efficient working conditions in the kitchen.

Space in the Kitchen

Space is very important in the kitchen as it involves maximum utilization of all available surfaces in an efficient and effective manner in relation to special needs and requirements. Space planning is the core of any design; it is usually the allocation and division of interior space to meet the requests and needs of

individuals/homemakers whether they are looking to plan a modern or a functional kitchen. An ideal space planning makes a huge difference on how chores are done, and tools, utensils and equipment are arranged for effective and efficient working in the kitchen. When talking about space planning for the kitchen, moving around freely and thought to fight claustrophobia as well as designing to meet the custom needs and requirements should be considered (Parr, 2002).

A modern residential kitchen is typically equipped with a stove, a sink with hot and cold running water, a refrigerator, and it also has counters and kitchen cabinets arranged according to a modular design. Many households have a microwave oven, a dishwasher and other electric appliances. The main function of a kitchen is serving as a location for storing, cooking and preparing food (and doing related tasks such as dishwashing), also used for dining, entertaining and laundry. All these equipment and facilities are to help the homemaker and the users of the kitchen to be comfortable and work with less difficulty which may transcend to the ultimate goal of Home Economics; to live a satisfactory life. The attainment of the aims of the kitchen user leads to the achievement of an architect (Verhoef, 2012). This space planning has become known as the 'work triangle' which is based on many tasks carried out in a kitchen involving the fridge, cooker and sinks. This work triangle is important to consider when planning out the design of kitchen and construction of a house.

Natural Lights

Natural lights are referred to as daylight. They are lights that reflect and enhance vision, movement and other activities in the home most especially in the kitchen. In Nigerian situation where generation and distribution of electricity is a challenge, natural light becomes beneficial either during the day or night time. Malone and Thibaud (2012) reported that about 10% of the average household's electricity usage comes from lighting, so utilizing as much natural light as possible is cost effective. Without having to turn on electric lights during the day you will cut energy consumption from lighting anywhere from 50% to 80%.

The structural system has to be integrated with the overall lighting design if the space has to be perceived as visually comfortable. The conflict between the space and light could lead to overloading of the visual stimuli without any meaningful information being conveyed. The use of uneven illumination should have a definite purpose like an emphasis on one of the design elements that creates a point of interest against a restrained background. Lighting in a kitchen is often

overlooked, or an afterthought. However, good lighting is essential in a kitchen and must be considered alongside the basic layout.

Kitchen Design and Layouts

The key to a well-structured kitchen is planning the space and the location of the most important appliances to enable frequent tasks to be completed easily and efficiently. Space planning is known as the 'work triangle' which is based on many tasks carried out in a kitchen involving the fridge, cooker and sink. This work triangle is important to consider when planning out the design of your kitchen. No major traffic routes should cross the triangle. Linear kitchen is becoming more fashionable in order to create a large open plan family space. Linear kitchen allows for arranging zones within a line, an area for cooking, an area for food preparation, an area for serving and washing up. This will allow the appropriate equipment to be stored close to the particular zone, with sufficient workspace to carry out the task (Dempsey, 2018).

Kitchen Ventilation

Ventilation in the kitchen involves the treatment of air in kitchens. It deals with the problems of grease, smoke and odours not usually found in other places. There is need to have adequate outlets (windows) to care for these problems because inadequate ventilation can cause stress, contribute to unsafe systems of work and limit productivity. An adequate kitchen ventilation system should achieve removal of cooking fumes, removal of excess hot air and introduce incoming cool clean air to give comfortable environment; ensure that the air movement in the kitchen does not cause discomfort; provide sufficient air for complete combustion at fired appliances, and prevent the risk of carbon monoxide accumulation (Gids & Jicha, 2010).

Statement of the Problem

Working in the kitchen entails some skill and knowledge, to demonstrate these skills and knowledge into appreciable tasks there are lots of things to be put in place to enhance productivity. It has been observed that many prefer to visit fast food outlets and eateries to meet their nutritional requirements, which to an extent looks awkward because it is believed that a family meal time is a period to show love and relate to one another and that meals prepared at home are more enjoyed. It becomes needful to discourage this trait among the homemakers (major users of the kitchen) for the promotion of family food tradition, companionship among others. This study sought to find out the influence of kitchen design on the effective and efficient workability of the kitchen.

Purpose of the Study

The purpose of the study was to find out the influence of architectural design on effective and efficient workability in the kitchen. Specifically, the paper sought to:

- ascertain the relevance of space in the kitchen
- determine how effective natural lightening can enhance work in the kitchen
- find out how often does minor accidents occur while working in the kitchen
- determine which kitchen design is more acceptable

Research Questions

The following research questions were raised to guide the study;

- Is there a difference in the relevance of space in effective workability in the kitchen among staff by institutions?
- Is there a difference on important of natural lighting in enhancing workability in the kitchen among staff by institutions?
- Is there a difference in frequency of minor accident occurrence in the kitchen among staff by institutions?
- What kitchen layout is more accepted and common?

Methodology

The paper employed cross-sectional survey research design. The population entails all academic homemakers in three tertiary institutions in Lagos State, University of Lagos, Yaba College of Technology and Federal College of Education all in Mainland Local Government Area totalling 724. With a sample size of 155, 104, and 43 (total 302), conveniently sampled based on their willingness to participate respectively from the institutions. A validated structured and pre-tested questionnaire named Architectural Design and Workability in the Kitchen (ADWK) was used in data collection: on the demographic characteristics of the respondents and influence of architectural design on effective workability in the kitchen. Data were presented using tables and descriptive statistics - simple percentage, frequency, mean standard deviation and inferential statistic – ANOVA were used to analyse the data.

Results

Table 1: Age Distributions of the Respondents

Item	Frequency	Percentage (%)
Status: Academic	302	100.0
25-30 years	53	17.5
31-35	35	11.6
36-40	49	16.2
41-45	86	28.5
46 years and above	79	26.2
Female	302	100.0

Field Work, (2018)

Table 1 presents the age distributions of the respondents of 25-30. 31-35, 36-40 and 46years and above with their frequencies and percentages of 53(17.5%), 35(11.6%), 49(16.2%), 86(22.8%) and 79(26.2%) respectively. The Table also revealed that the entire respondents for the study were all female 302(100%).

Table 2: Descriptive Statistic on the Relevance of Space in the Kitchen among Staff by Institution

Variable	Institution	Mean	N	Std. Deviation	Std. Mean
Relevance of Space	Unilag	27.81	155	4.640	25.00
	Yabatech	28.70	104	2.662	
	FCE(T)	29.33	43	2.124	
	Total	28.33	302	3.795	

Table 2 shows the means of 28.33 with a standard deviation of 3.795 and standard mean 25.00, since the mean is greater than the SD of 25.00; it implies that there is relevance of space in the kitchen among staff by institution.

Research Question 1: Is there a significant difference in the relevance of space in workability in the kitchen among staff by institutions?

Table 3: One way ANOVA on the Relevance of Space in the Kitchen among Staff by Institution

Items	Sum of Squares		df	Mean Square	F	Sig.
Kitchen should be spacious	Between Groups	64.840	43	1.508	5.864	.000
	Within Groups	66.339	258	.257		
	Total	131.179	301			
Working surface improves performance	Between Groups	56.776	43	1.320	3.136	.000
	Within Groups	108.641	258	.421		
	Total	165.417	301			
Painting is necessary	Between Groups	64.185	43	1.493	2.960	.000
	Within Groups	130.123	258	.504		
	Total	194.308	301			
Drawers for utensils are necessary	Between Groups	69.784	43	1.623	5.128	.000
	Within Groups	81.647	258	.316		
	Total	151.430	301			
Cupboards for convenient foods are necessary	Between Groups	57.777	43	1.344	7.083	.000
	Within Groups	48.942	258	.190		
	Total	106.719	301			
Shelves for raw food are necessary	Between Groups	64.364	43	1.497	4.164	.000
	Within Groups	92.735	258	.359		
	Total	157.099	301			
There should be free flow of movement	Between Groups	71.428	43	1.661	6.745	.000
	Within Groups	63.539	258	.246		
	Total	134.967	301			
A spacious kitchen is easily cleaned	Between Groups	63.726	43	1.482	4.487	.000
	Within Groups	85.215	258	.330		
	Total	148.940	301			

Table 3 presents the one way ANOVA on the opinions of the respondents reflecting the various degrees of freedom, mean squares, F-values and P-value at 0.05 alpha level of significance respectively on the relevance of space in the

kitchen. The p value (.000) is less than the alpha level (0.05) implying that there is significant difference in the relevance of space in workability in the kitchen among staff by institutions.

Table 4: Descriptive Statistic on the effect of natural lights in enhancing work in the Kitchen

Variable					Std. Mean
	Institution	**Mean**	**N**	**Std. Deviation**	
Natural Lights	Unilag	24.70	155	5.618	25.00
	Yabatech	27.09	104	6.404	
	FCE(T)	26.79	43	2.550	
	Total	25.82	302	5.695	

Table 4 shows the mean of 25.82 with the SD of 5.695 and standard mean of 25.00. The mean is greater than the Standard mean which implies that natural lighting has an effect on enhancing work in the Kitchen.

Research Question 2: Is there a significant difference in natural lighting for enhancing workability in the kitchen among staff by institution?

Table 5: One way ANOVA of effect of natural lighting in enhancing work in the Kitchen

Items	Sum of Squares		df	Mean Square	F	Sig.
Natural light enhances workability	Between Groups	1809.533	43	42.082	108.669	.000
	Within Groups	99.911	258	.387		
	Total	1909.444	301			
Electric light should be made available always	Between Groups	72.361	43	1.683	4.789	.000
	Within Groups	90.662	258	.351		
	Total	163.023	301			
Lighting does not impact workability	Between Groups	1701.880	43	39.579	49.722	.000
	Within Groups	205.368	258	.796		
	Total	1907.248	301			
With natural lights tools/utensils can be easily reached	Between Groups	102.238	43	2.378	4.103	.000
	Within Groups	149.523	258	.580		
	Total	251.762	301			

Work can be done without electric light effectively	Between Groups	82.266	43	1.913	2.227	.000
	Within Groups	221.631	258	.859		
	Total	303.897	301			
Well-lit kitchen makes it possible to detect problems	Between Groups	89.473	43	2.081	3.927	.000
	Within Groups	136.713	258	.530		
	Total	226.185	301			
Good lighting makes food preparation easier and faster	Between Groups	103.986	43	2.418	4.891	.000
	Within Groups	127.564	258	.494		
	Total	231.550	301			
Good lighting ensures safety from common accidents	Between Groups	2567.248	43	59.703	72.814	.000
	Within Groups	211.547	258	.820		
	Total	2778.795	301			

Field Work, (2018)

Table 5 presents the one way ANOVA on the opinions of the respondents reflecting the various degrees of freedom, mean squares, F-values and P-values at 0.05 alpha level of significance respectively on the effect of natural lighting in enhancing work in the Kitchen. The p value .000 is less than the significance value of 0.05 indicating that there is significant difference in natural lightening for enhancing workability in the kitchen among staff by institutions.

Table 6: Descriptive Statistic on Frequency of Minor Accident Occurrence in the Kitchen among Staff by Institution

Variable	Institution	Mean	N	Std. Deviation	Std. Mean
Minor Accidents	Unilag	16.59	155	3.736	25.00
	Yabatech	19.62	104	4.466	
	FCE(T)	19.60	43	3.451	
	Total	18.06	302	4.235	

Table 6 shows the mean of 18.02 with the SD of 4.235 and standard mean of 25.00. The mean is less than the Standard mean which implies that the rate at which minor accidents occur in the kitchen among the respondent differs.

Research Question 3: Is there a significant difference in frequency of minor accident occurrence in the kitchen among staff by institutions?

Table 7: One way ANOVA on Occurrence of Minor Accidents in the Kitchen

Items	Sum of Squares		df	Mean Square	F	Sig.
Cuts occurs commonly in the kitchen	Between Groups	137.662	43	3.201	3.559	.000
	Within Groups	232.100	258	.900		
	Total	369.762	301			
Good lighting makes food preparation easier and faster	Between Groups	103.986	43	2.418	4.891	.000
	Within Groups	127.564	258	.494		
	Total	231.550	301			
Burns happen commonly in the kitchen	Between Groups	103.104	43	2.398	5.283	.000
	Within Groups	117.094	258	.454		
	Total	220.199	301			
Slipping over happens commonly	Between Groups	127.845	43	2.973	6.535	.000
	Within Groups	117.387	258	.455		
	Total	245.232	301			
Burns from liquids happen commonly	Between Groups	109.464	43	2.546	4.735	.000
	Within Groups	138.722	258	.538		
	Total	248.185	301			
Range tip overs happen commonly	Between Groups	123.822	43	2.880	3.815	.000
	Within Groups	194.721	258	.755		
	Total	318.543	301			

Table 7 presents the one-way ANOVA on the occurrence of accidents in the kitchen with the degrees of freedom, various mean squares, F-values and P-values at 0.05 alpha level of significance respectively on the effect of natural lighting in enhancing work in the Kitchen. The p value .000 is less than the significance value 0.05 indicating that there is a significant difference in frequency of minor accident occurrence in the kitchen among staff by institutions.

Table 8: Distributions of Respondents on Kitchen Design Preference

Kitchen Design	Frequency	Percentage (%)
One wall	60	19.9
U-shape	114	37.7
L-shape	96	31.8
Functional	32	10.6
Total	302	100.0

Field Work, (2018)

Table 8 presents the respondents respective kitchen design preference with frequencies and percentages as follows 60(19.9%) for one wall kitchen design, 114(37.7%) for U-shape, 96(31.8%) for L-shape and 32(10-6%) for functional kitchen design respectively.

Table 9: Frequency Distribution on the Number of Windows in the Kitchen of Respondents

Item (Number of Window)	Frequency	Percentage (%)
None	21	7.0
One	145	48.0
Two	78	25.8
More than two	58	19.2
Total	302	100.0

Table 9 presents the frequency distribution of numbers of window by respondents. 21(7%) do not have windows at all, 145(48%) has one window in their kitchens, 78(25.8%) has two windows and 58(19.2%) has more than two windows in their kitchens.

Findings

The findings from the study revealed that space is relevant in the kitchen to carry out the kitchen chores effectively and efficiently. The finding is supported by the submission of Rock, Torre and Wright (1980) in Peatross and Hasell (2018) that spacious kitchen enhances high visibility and accessibility of all the tools, as well as the means for shopping, planning, preparing, eating, cleaning up, and storing after meals promotes participation in these tasks by all members of the household. When the space in the kitchen is not adequate, members of the family will withdraw from the chores in the kitchen.

The study found out that natural light plays very important roles in working effectively and efficiently in the kitchen. Literature supports this finding that

natural lights are beneficial, and enhance vision, movement and other activities in the home most especially in the kitchen. The submission of Malone and Thibaud (2012) agrees with the finding of the study that most of the times there is power failure, natural light becomes beneficial either during the day or night time and that about 10% of the average household's electricity usage comes from lighting, so utilizing as much natural light as possible will save money.

It was also found that the rates at which kitchen accident occur among the respondents varies. This might be as a result the availability of natural light and lightings, circulation space, technical know-how and the manipulative skills of the respondents. The finding is supported by Kim, (2012) that explained that the kitchens are full of potential accidents that are just waiting to happen- from cutting on knives, to slipping over on spilt liquid and that the kitchen is a minefield of accidents waiting to happen. It is expedient to ensure adequate space and lighting in the construction and designing of the kitchen to limit occurrences of accidents resulting from the kitchen; based on the further reports of Kim (2012) that, in 2010-2014, U.S. fire departments responded to an average of 166,100 home structure fires that involved cooking equipment per year. These fires caused an average of 480 civilian fire deaths, 5,540 civilian fire injuries, and $1.1 billion in direct property damage.

The study found out that preference for U-shaped kitchen is highest among the respondents. This particular kitchen layout is being opposed by Dempsey, (2018), because it make users of the kitchen to move about, (working triangle) causes cramp, stress, inconveniencies and collision that can result to accidents. Dempsey suggested that the linear/one wall kitchen layout should be adopted and that is becoming more fashionable, stress-free and creates large open plan family space. It allows for arranging zones within a line, an area for cooking, an area for food preparation, an area for serving and washing up, appropriate equipment to be stored close to the particular zone, with sufficient workspace to carry out the task.

Figure 1: U shape Kitchen
Source: *Ideal Home. https://www.idealhome.co.uk/kitchen/u-shaped-kitchen-ideas-182494*

Figure 2: L shape Kitchen
Source: https://www.pinterest.co.uk/pin/109916047139086836/

Figure 3: Single Wall Kitchen
Source: *http://michaelgrahamphoto.com/wp-content/uploads/2018/04/kitchen-single-wall-kitchen-layout-ahscgs-single-wall-kitchen.jpg*

Lastly, the study found out that majority of the respondents has just one window in their kitchen. This appears not appropriate as cited by de Gids and Jicha (2010) that there is need to have adequate outlets (windows) to care for problems such as grease, smoke and odours because inadequate ventilation can cause stress, contribute to unsafe systems of work and limit productivity. There should be free follow of clean fresh air to keep both the user and the kitchen environment conducive and comfortable; architects should bear this in mind.

Conclusion and Recommendations

Based on the findings of this study, the researchers concludes that architectural design has a great influence on the kitchen layout and consequentially impact on the effective and efficient working condition of both the user of the kitchen and the kitchen itself.

It also recommends that, Architects and homemakers should come together in planning the construction of houses, most especially the kitchen. This will help to incorporate adequate space in the designs. They should also ensure that adequate sources of natural light is considered to allow for appropriate illumination and help reduce utility bills such as electricity

Kitchen accidents would be curbed or reduced to a barest minimum when the Architects and homemakers plan the kitchen layout together and put into consideration the type of kitchen, purpose of use, size of the family, status/class, and ventilation among others.

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