AFRICAN JOURNAL OF

EDUCATIONAL MANAGEMENT

ISSN 0795 – 0063 Volume 23, No. 1 June, 2022

A JOURNAL OF THE DEPARTMENT OF EDUCATIONAL MANAGEMENT, UNIVERSITY OF IBADAN

KITCHEN LAYOUT AND SPACE AS DETERMINANTS OF COOKS' PRODUCTIVITY IN HOTELS IN MACHAKOS COUNTY – KENYA

[1] Wavinya, Mutunga Florence, [2] Macharia, Juliet & [3] Ngugi, Louise

[1]Masters student,
Department of Tourism and Hospitality
School of Business
Karatina University, Kenya
Email: mutunga_f@yahoo.com

[2]Associate Professor, Communication Studies
Department of Human Resource Development
Karatina University
School of Business
P.O Box 1957- 10101
Karatina, Kenya.
Email: jmacharia@karu.ac.ke

[3]School of Agriculture & Biotechnology
Karatina University
P.O Box 1957 -10101
Karatina, Kenya
Email: lngugi@karu.ac.ke

Abstract

The purpose of the study was to establish the extent to which kitchen layout and kitchen space as aspects of ergonomics affected cooks' productivity. It focused on selected hospitality facilities in Machakos County in Kenya. The objectives of the study were: to investigate the relationship between the kitchen layout and cooks' productivity in the selected hospitality establishments in Machakos County, and to examine the relationship between kitchen space and cooks' productivity in selected hospitality establishments in Machakos County. Cross-sectional design and mixed research approaches were employed. A survey was carried out by use of a questionnaire and observation

checklist among cooks and managers of selected Classes B, C and D hospitality facilities in Machakos County. Research questionnaires were developed and distributed to a sample of 210 hotel workers consisting of managers and cooks. Quantitative and qualitative data were collected from the respondents and by physical observation respectively. Data were analyzed by descriptive statistics of determination of frequencies, percentages, means and by inferential statistics of correlation analysis and multiple regression at .05 confidence level. The findings showed that kitchen layout and kitchen space satisfactorily explained kitchen ergonomics from the perspective of the kitchen employees. It was further established that kitchen layout and kitchen space had a significant positive correlation with cooks' productivity. The study recommended to the management of hospitality facilities of the need to formulate policies that focus on improving kitchen workplace environment to attract, retain, and boost the performance of cooks.

Keywords: *Cooks Productivity, hospitality facilities, kitchen Ergonomics, kitchen layout, kitchen space, Machakos county*

Introduction

Over twenty million people experience various work-related musculoskeletal disorders (WRMSD) around the world (Vinod and Arun, 2015). These are groups of painful disorders of muscles, tendons, and nerves, which occurs as a result of frequent or repetitive activities with awkward postures. The food service industry ranks number one in terms of work-related injuries and illnesses among various occupations in the USA. Foodservice workers are particularly susceptible to various ergonomic or musculoskeletal injuries such as repetitive stress damage, lacerations and "slips, trips, or falls" (Atkinson, 2007). In Malaysia, in 2013, out of 2630 cases of occupational diseases, 694 were ergonomic-related cases associated with prolonged standing among manufacturing workers (Aziz, 2015). The National Academy of Sciences (NAS) (2019) notes that estimates of costs associated with reported musculoskeletal disorders directly affect a firms' profitability in terms of workers' compensation and similar associated costs. It is reported that after employees at the Black Angus Restaurants participated in an ergonomics-training programme, strains and sprains decreased by 30%, saving the firm an estimated $100,000 annually (Atkinson, 2007).

In Hong Kong, the catering industry is one of the most important service sectors, employing more than 200,000 workers. Yet catering is also a costly service in terms of Work-related Musculoskeletal Disorders (WMSDs). Comparing different industries, 22.1% of accidents occurred in the catering industry, which ranked first in Hong Kong. Cuts, burns, scalds, slips and falls were the most common musculoskeletal injuries, followed by injuries from lifting heavy objects (which accounted for 21.1%). Evidence from prior studies conducted by the US Department of Labour showed that WMSDs were largely caused by over-exertion and pain suffered at work, which are usually caused by physical loading as required by the job (Colombini and Occhipinti, 2006). Effective ergonomic design creates a work environment that is healthy, and it reorganizes the work process to control or eliminate hazards (Driessen, et al., 2010). Yankson (2012) indicated that accidents at the workplace kept on increasing, despite the fact that management and employees are making efforts to ensure safety in the workplace. As observed by Akinyele (2010), a conducive work environment ensures the well-being of employees which invariably will enable them exert themselves to their roles with all vigor that may translate to higher productivity.

The Kenyan Laws chapter, 514 popularly referred to as OSHA 2007 spells out the responsibility of both the manager and the worker in ensuring a safe working environment and safe operational practices (SOP) for the welfare of the entire work force (GOK, 2007). This is based on the fact that while every person has responsibility of his or her personal well-being, the primary responsibility for providing a safe and healthy working environment rests with line management (GOK, 2007). Working in labour-intensive environment such as busy hospitality facilities have risks and dangers associated with it which could adversely affect productivity. As has been observed earlier, ergonomics is the most relevant factor in kitchen environment (Baden-Powell, 2005).

Problem Statement

The tourism industry ranks high among major contributors of GDP in Kenya, earning the country Kenya Shillings (KES) 157.4 billion in revenue in the year 2018 (MoT, 2019) and hence having a high number of employees. The hospitality sub-sector of the industry made a significant contribution to this with 3.98 million domestic bed-nights

recorded. In recent years before Covid-19 pandemic, Kenya has witnessed an increase in the number of hospitality facilities and an expansion in their operations. Amidst the growth in the hospitality sector, there are undocumented cases of injuries, musculoskeletal disorders and other work-related discomforts, which could result in absenteeism and general low productivity in the sector in the short-term or long-term. These issues associated with workplace conditions in hospitality facilities, especially in the kitchen section, could compromise a healthy workforce, optimum productivity, and sustained financial well-being of hospitality enterprises. Therefore, the purpose of this study was to investigate the influence of work place environment on cooks' productivity in selected Class B, C and D hospitality establishments in Machakos County.

Specific objectives of the Study were:

1. To investigate the relationship between the kitchen layout and cooks' productivity in the selected hospitality establishments in Machakos County.
2. To examine the relationship between kitchen space and cooks' productivity in selected hospitality establishments in Machakos County.

Literature review

Concept of ergonomics

There were various definitions of the word "ergonomic". Strangeland (2011) traced the origin of the word "Ergonomic" from two Greek words "Ergon", meaning work, and "Nomes" meaning "laws". He observed that today, the word is used to describe the science of designing the environment to fit the person, not forcing the person to fit the environment. Pheasant, (2005) defined it as "the science of work, of the people who do it and the ways it is done, the tools and equipment they use, the places they work in, and the psycho social aspects of the working situation". Occupational Safety and Health Administration [OSHA] (2000) in USA defined the term as, any attempts to prevent occupational disorders and to reduce the potential for fatigue, errors or unsafe acts through the evaluation and design of facilities, environments, jobs, tasks, tools, equipment, processes and training methods. In this respect, ergonomics was understood as the

science of designing the job to fit the needs of the worker, instead of having the worker fit the needs of the job. Abarqhouei and Nasab, (2011) observed that, employees in service industry such as hospitality were prone to experience musculoskeletal disorders due to poor ergonomics. According to Samson (2014) the physical environment included components of the tangible workplace environment that comprised spatial layout and functionality of the surroundings. The spatial layout of furniture influenced the amount and nature of conversation between individuals (Nzewi, 2018). How performance is achieved was affected by how well people fit with their physical workspace and physical work environment (Srivastava, 2008).

Ergonomics and the hospitality industry

Some studies have examined the impact of work environmental factors such as the height and thickness of workstation partitions, furniture measurements and the amount and availability of file and work storage on individual and team performance (Visher, 2008). Leblebici (2012) considered 50 employees of a bank in Turkey to analyse the impact of workplace quality on employee productivity. The author evaluated the satisfaction of the employees towards the physical and behavioral environmental factors of the bank and found that employees were not satisfied with the physical factors which the bank had provided for them. Studies in the context of the hospitality sector have shown that working conditions in the hotel sector are poor (Jayaweera, 2018). In a cross-sectional study, Jayaweera (2015) assessed the relationship between work environmental factors and job performance with work motivation using 254 hotel workers in twenty-five chain hotels in England. The study also investigated the degree to which the relationship between elements of work environment and job performance. It was found that there is a significant relationship between work environmental factors and job performance, and also noted that work motivation facilitates the association between working conditions and job performance. A kitchen layout of acceptable ergonomics must put physical, cognitive and organizational ergonomics into consideration, defined by the 'kitchen work triangle' and must also remember the ergonomics of good lighting, (Colin, 2011). Sultana and Prakash (2014) observed that ergonomic kitchen spaces are great ways to save time and energy. He pointed out that kitchen requires a lot of

body mechanics to complete the activities. Accordingly, an efficient ergonomic kitchen space requires to ease the stress in looking out for utensils and ingredients in the kitchen.

Hypothesis development

In all the studies above, varying degrees of relationships were established between workplace quality and employee productivity. Generally, workspace design, and space affected the performance of employees by varying percentages. This study investigated the influence of kitchen workplace factors on cooks' productivity within the context of the hospitality sector in Machakos County, Kenya. In light of the foregoing discussion, this study sought to test the following four hypotheses:

$H_0$1: There is no significant relationship between kitchen layout and cooks' productivity in hospitality facilities in Machakos County.

$H_0$2: There is no significant relationship between kitchen space and cooks' productivity in hospitality facilities in Machakos County.

Kitchen workplace environment Productivity

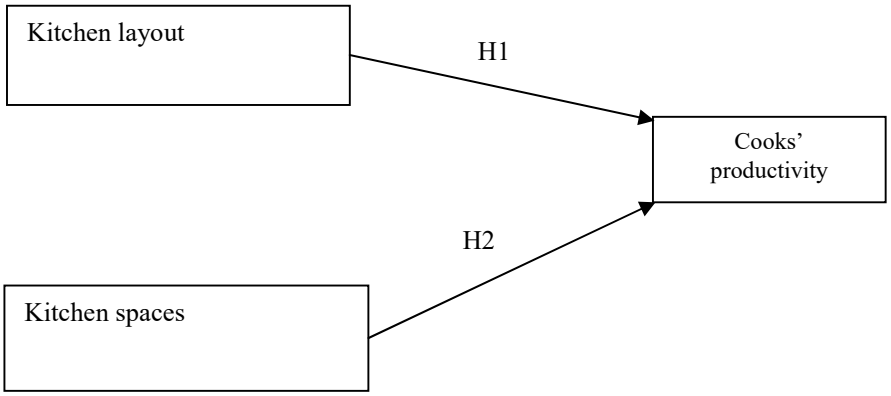

Figure 1. Research model

Source: Researchers own findings (2022)

Methodology

The study employed a mixed method design whereby both quantitative and qualitative data were generated and analyzed. This study was carried out in selected class B, C and D hospitality facilities found in Machakos County in Kenya. Machakos County is an administrative and political region comprising the former Machakos District. There is a total of ninety-one (91) hotels in the category of B, C and D Class operating in this County from which stratified sampling process gave 36 facilities and the 36 selected class B, C and D hospitality facilities gave a total of 180 cooks as respondents, five for each facility. Class B/C hotels comprised small to medium size lodgings /hotels of basic standard rooms, between 5 and 40 rooms, and with restaurant and/or bar in the premises, while Class D comprised medium to large size lodging houses/hotels of high standard rooms, over 40 rooms (GoK, 2004). The cooks were selected using simple random sampling (Kombo and Tromp, 2006) while managers were purposively sampled. The respondents were given self-administered questionnaires, which were to fill at their convenient time then submitted to the researchers or their assistants. Data collection was conducted in the month of February and March 2022. Data was analyzed by descriptive and inferential statistics using Statistical Product and Service Solutions (SPSS software). Descriptive statistics involved determination of frequencies, percentages, and mean while inferential statistics involved correlation analysis and multiple regression.

Measurement scale Response rate

First, the respondents were asked to give their assessment of the ergonomics situations in their respective kitchens by agreeing or disagreeing as gauged on a 7-point Likert Scale. The scale was such that 1 = strongly disagree, 2 = disagree, 3 = somewhat disagree, 4 = neutral, 5 = somewhat agree, 6 = agree and 7 = strongly agree. A total of 216 questionnaires were administered to the cooks, and hospitality facility managers in the sampled hotels. Out of these, 210 were appropriately filled and returned. This represented a successful response rate of 97%. 178 were from cooks while 32 were from managers. Concerning the filling of the observation checklist, 21 out of the targeted 36 kitchens were assessed. This represented 55%. On the basis of the assertions by well-known scholars such as Fincham (2008) and Gordon et al. (2002)

that a response rate of 50% was adequate for a descriptive study, 60% was good and 70% was very good, the response rate of 97% was considered to be very adequate for this study.

Demographic information of the respondents

The results in table 1 showed that 52.4% of the respondents were female while 47.6% of the respondents were male. The findings showed that there were more female employees working in the hotel kitchens compared to male employees, majority of the respondents (53%) were aged 20-29 years, then 32% who were aged 30-39 years, while 11% of the respondents were aged 40-49 years. (3%) were above 50 years and of the respondents was aged below 20 years. This result indicated that on average, a large number of hotels employees were middle-aged, which could be a fairly youthful, and highly productive age in the hospitality industry.

Table 1: Demographic Characteristics of the Respondents

Characteristic		Frequency	Percent
Gender	Female	110	52.4
	Male	100	47.6
Age	50 and above	6	3
	40 – 49	23	11
	30 – 39	69	32
	20 – 29	112	53
	Below 20	0	0
Length of time served	over 10 years	23	11.0
	8 to 10	35	16.7
	5 to 7	59	28.1
	2 to 4	66	31.4
	0 to 1	27	12.9
Highest education attained	Post graduate	26	12.4
	College/first degree	172	81.9
	Secondary	11	5.2
	Primary	1	.5

Source: Researchers own findings (2022)

There were slightly more female employees working in the hotels than their male counterparts. This is consistent with the observation of Kumara (2018) which observed that in countries like China, career choice of women in the hospitality industry is remarkably high, and around 60% of the total tourism employees are women. However, in countries like Sri Lanka, this is remarkably low. These female employees are mainly occupied with operational level employment (including cooking), and very few represent the middle and upper management positions. For this study, majority of the respondents were youths (20-29 years old), had attained an above college-level of education, and had worked in the hotel for a relatively shorter time of between 2 and 4 years.

Findings of the Study

Ergonomics and productivity of cooks

The findings showed that the respondents agreed with all the 20 statements on ergonomics and productivity (table 2). The mean scores of the statements on aspects of ergonomics and productivity factors were analyzed to identify the factors that were perceived more important among respondents. A comparison of the mean scores of the level of agreeableness with the statements indicated that the statement "I am confident that my work output is the best ever I can produce" had the highest mean score of 5.78 which translated to "agree" on the 7-point Likert scale. This was closely followed by the statement "Space in the kitchen in my hospitality facility allows for comfortable standing and bending when working" with a mean score of 5.68.

Table 2: Mean score of the individual statements on aspects of ergonomics and productivity

Statement	Mean	Std. Error of Mean	Mode	Std. Deviation
I am confident that my work output is the best ever I can produce	5.78	0.101	7	1.462
Space in the kitchen in my hospitality facility allows for comfortable standing and bending when working	5.68	0.087	6	1.26
Working surfaces in the kitchen I work in are comfortable	5.65	0.084	6	1.214
Working surfaces in the kitchen I work in are of convenient texture	5.54	0.083	6	1.202
The arrangement of the kitchen equipment and components is pleasant	5.53	0.085	6	1.23
Space in the kitchen in my hospitality facility allows for flexibility and flow in work sequence	5.51	0.091	6	1.313
The arrangement of the kitchen main parts and components is convenient	5.5	0.077	6	1.116
Space in the kitchen in my hospitality facility is sufficient for routine working movements	5.5	0.089	6	1.284
In this kitchen environment I always complete my tasks within the given time duration	5.4	0.096	6	1.398
I meet my daily kitchen assigned work targets without overstraining	5.31	0.099	6	1.439
I don't sustain work-related injuries when working in this kitchen	5.31	0.1	6	1.446
The floor of the kitchen is safe for working on	5.3	0.11	7	1.596
I have never been absent from work due to injuries/illnesses induced by kitchen work	5.3	0.121	7	1.749
The décor (furnishing and decoration) in the kitchen motivates me to work	5.28	0.085	6	1.23

Source: Researcher's own study (2022)

On the other hand, the statement with the lowest mean score was "The décor (furnishing and decoration) in the kitchen motivated me to work" with a mean score of 5.28. This showed an almost neutral opinion about this aspect of kitchen environment. The second lowest mean score of the statement "I have never been absent from work due to injuries/illnesses induced by kitchen work" was 5.30, similar to the third lowest mean score was 5.30 which applied to the statement "The floor of the kitchen is safe for working on". The above findings point to a favorable assessment of the kitchen's ergonomic status by the respondents.

Exploratory Factor Analysis for study variable analysis

To assess the dimensionality of the 20 items in the questionnaire, Exploratory Factor Analysis (EFA) was conducted. Out of 216 questionnaires, 210 were filled in and returned. The final sample size remained 210 after data cleaning. To reduce the number of items, the factor loading values that indicate the correlation between items and factors were identified whether the group of variables can be presented by the factor or not. The eigen value one was determined and items with factor loadings greater than 0.5 were taken for each factor grouping. Cronbach's α was applied to test reliability of factor groupings. The factors with Cronbach α greater than 0.8 were taken to the analysis.

Cronbach's alpha coefficient was calculated to evaluate the internal consistency of the variables: kitchen layout, space, height, ambience and productivity. First, the suitability of the data was assessed through an exploratory factor analysis on the 14 statements related to kitchen ergonomics and productivity. KMO Bartlett's test was conducted to verify the normality and significance of the conducted analyses and it was found to be highly significant (approximate X^2 = 1844.123, df = 91, p < 0.001). Bartlett's Test of Sphericity (X^2 = 1844.123) and the Kaiser-Meyer-Olkin's (KMO) overall measure of sampling (0.882), indicate that the data were suitable for using factor analysis (Tabachnick and Fidell, 2001).

Factor analysis with a Principal Component approach and Varimax Rotation was conducted using the 14 statements addressing the aspects of ergonomics and cooks' productivity. A total of three factors were identified. The three factors accounted for 69% of total

variance, that is, 48.744%, 10.824%, and 9.465% for layout, space, and productivity respectively. The Cronbach's alpha coefficient results obtained were .871, .881, and .882 for the three variables. Accordingly, all the collected data, except one item, were acceptable which indicates that all the items are internally consistent (Gliem and Gliem, 2003).

Table 3: EFA and reliability test results of aspects of ergonomics

Factor and items	Eigenvalue	Cronbach alpha	Factor Loading
Kitchen Layout	**6.824**	**.871**	
The arrangement of the kitchen equipment and components is pleasant			.572
The arrangement of the kitchen main parts and components is convenient			.703
The décor (furnishing and decoration) in the kitchen motivates me to work			.741
Working surfaces in the kitchen I work in are comfortable			.761
Working surfaces in the kitchen I work in are of convenient texture			.790
The floor of the kitchen is safe for working on			.663
Space	**1.325**	**.881**	
Space in the kitchen in my hospitality facility is sufficient for routine working movements			.867
Space in the kitchen in my hospitality facility allows for flexibility and flow in work sequence			.868
Space in the kitchen in my hospitality facility allows for comfortable standing and bending when working			.750
Productivity	**1.515**	**.882**	
I always complete my tasks within the given time duration			.834
I meet my daily kitchen assigned work targets			.857
I don't sustain work-related injuries when working			.686
I have never been absent due to			.731

injuries/illnesses	
My work output is the best ever I can produce	.694

The Eigenvalues greater than 1, item factor loading of above .5, and variables' Cronbach's alpha coefficients of above .7 qualified the variables and their measurements for further analyses, having exhibited internally consistency.

Perception of respondents on the impact of ergonomics on productivity

The two aspects of ergonomics had positive ratings (beyond the neutral value of 4 on the 7-point Likert scale). Space had the highest means score (5.56). It represented the highest degree of agreement by the respondents concerning the suitability of the kitchen environment for effective work and productivity in the kitchen. Then kitchen layout followed with a mean score of 5.50 (table 4).

Table 4: Descriptive statistics of the aspects of ergonomics, and productivity (N=210)

	Mean		Std. Deviation	Skewness		Kurtosis	
	Statistic	Std. Error	Statistic	Statistic	Std. Error	Statistic	Std. Error
Space	5.5635	0.07979	1.15628	-1.079	0.168	1.299	0.334
Layout	5.499	0.06699	0.97082	-0.76	0.168	0.32	0.334
Productivity	5.3024	0.10271	1.48847	-0.926	0.168	0.024	0.334

The dependent variable, (Productivity) had a mean score of 5.30, indicating a "somewhat agree" rating of this variable by respondents on the Likert scale. Descriptive statistics showed a favourable assessment of the kitchen's aspect of ergonomics by the respondents. It showed that cooks and managers perceive the kitchen situation in the positive light. Similarly, the dependent variable (productivity) had a mean of *M* = 5.3024, *SD* = 1.48847 which was an impressive positive rating. The statistics for skewness and kurtosis, being between ±2 is a clear indication that the data comprising these variables were normally distributed. Hence, suitable for parametric inferential analysis.

The Correlation between ergonomics and productivity

Pearson Correlation analysis showed that all the variables in this study were positively and significantly correlated at .01 significance level as presented in table 5. In all the cases, the *p* -value was less than 0.01

Table 5: Correlation Analysis results

	Space	Layout
Space	-	
Layout	.579**	-
Productivity	.426**	.534**

**. Correlation is significant at the 0.01 level (2-tailed).
N=210

Notably, the two variables for kitchen ergonomics aspects (layout, space) were positively and significantly correlated with each other and with cooks' productivity. The correlation analysis revealed a strong and positive relationship between kitchen layout and cooks' productivity (r = .534, *p* <. 000) (Table 5). In between kitchen space and cooks' productivity, the correlation analysis revealed a moderate and positive relationship (r = .426, *p* < .000). In between kitchen layout and space, the correlation analysis revealed a moderate and positive relationship (r = .579, *p* < .000). This clearly showed that there was a positive and significant relationship between kitchen workplace environment and cooks' productivity in hospitality facilities in Machakos County. There was therefore need for further inferential analysis by regression to ascertain the magnitude of the effect of each of these relationships.

Multiple regression analysis explaining the relationship between ergonomics and productivity

A multiple regression analysis was carried out to quantify the influence of the two aspects of kitchen ergonomics on cooks' productivity. The regression results in table 6 indicated that collectively, the two aspects of kitchen ergonomics explained a significant proportion of variance in cooks' productivity in the kitchen (R^2 = .305). This finding implied that 31% of the change in the productivity of cooks working in class B, C and D hospitality facility kitchens in Machakos county was explained by the two aspects of kitchen ergonomics (kitchen layout, and space) in

different proportions. Conversely, the above finding implied that 69% of variance in cooks' productivity could be attributed by other factors not included in this model.

Table 6: Regression model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.553[a]	.305	.299	1.24646

a. Predictors: (Constant), Space, Layout
b. Dependent Variable: Productivity

With 31% of variance in cooks' productivity explained, this result qualified the model comprising of the variables (layout, and space) as having a good fit for estimating kitchen productivity with respect to kitchen work environment.

Table 7: Regression Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.401	.522		.769	.442
	LAYOUT	.662	.109	.432	6.080	<.001
	SPACE	.226	.091	.176	2.473	.014

Regression equation: Cooks productivity = 0.662(layout) + 0.226(space) + 0.401

A multiple regression analysis was carried out to quantify the effect of kitchen layout on cooks' productivity (Table 7). The model summary, analysis of variance, and regression coefficient showed that kitchen layout has a significant positive influence on cooks' productivity (β = .432, p < .001) as presented in table 7. Equally, the relationship between kitchen space and cooks' productivity was significant (β = .176, p < .05). These two relationships were positive and of moderate level.

A significant regression equation was found (F2,207 = 45.519, p < .001), with an R^2 of .305. The results indicated that both the two predictors in the model predicted cooks' productivity, R^2 = .305. One of the predictor variables (kitchen space) failed to significantly predict cooks'

productivity. The overall predictive power of the model as displayed by the R-square of .305 revealed that the predictive power of the model was moderate (31%). The whole model was statistically significant, (F2,207 = 45.519, p < .001).

Study results on objectives and hypotheses testing

The first objective of this study was to establish the relationship between kitchen layout and cooks' productivity. A multiple regression analysis was carried out to quantify the effect of kitchen layout on cooks' productivity (Table 6). The model summary, Analysis of variance and regression coefficient show that kitchen layout had a significant positive influence on cooks' productivity (β = .432, p < .001) as presented in Table 7. The second objective of this study was to establish the relationship between kitchen space and cooks' productivity and space had a significant positive influence on cooks' productivity (β = .176, p < .05).

Table 8: Summary results of hypotheses involving ergonomics aspects and cooks' productivity

Relationship	Remarks	Hypothesis	Decision	R^2
Kitchen layout and productivity	Supported	Null	Rejected	.305
Kitchen space and productivity	Supported	Null	Rejected	

Source: Researchers own findings (2022)

Hence, the following hypotheses were tested:

$H1_0$: There is no significant relationship between kitchen layout and cooks' productivity in hospitality facilities in Machakos County. (REJECTED)

$H1_A$: There is significant relationship between kitchen layout and cooks' productivity in hospitality facilities in Machakos County. (NOT REJECTED)

$H2_0$: There is no significant relationship between kitchen space and cooks' productivity in hospitality facilities in Machakos County. (REJECTED)

$H2_A$: There is significant relationship between kitchen space and cooks' productivity in hospitality facilities in Machakos County. (NOT REJECTED)

Correspondingly, the beta value coefficients in the regression analysis associated with the two aspects were: layout = .432, and space = .176. Noticeably, the change in cooks' productivity associated with space is relatively smaller than that of layout, but statistically significant ($p < .05$). This implies that a unit improvement in kitchen layout would result in 0.432 increase in cooks' productivity, while a unit improvement in kitchen space would result in 0.176 increase in cooks' productivity. The probability of attaining these changes was significant (predictable). It was therefore imperative that the two factors that determined cooks' productivity in kitchens in Machakos county were significant. These were the factors worth of consideration if productivity in the kitchen is to be maintained or improved. The overall measurement showed that kitchen ergonomics (with respect to these two aspects) influenced cooks' productivity. Hence, the null hypotheses ($H1_0$ and $H2_0$) were rejected, while the alternative hypotheses ($H1_A$ and $H2_A$) were not rejected.

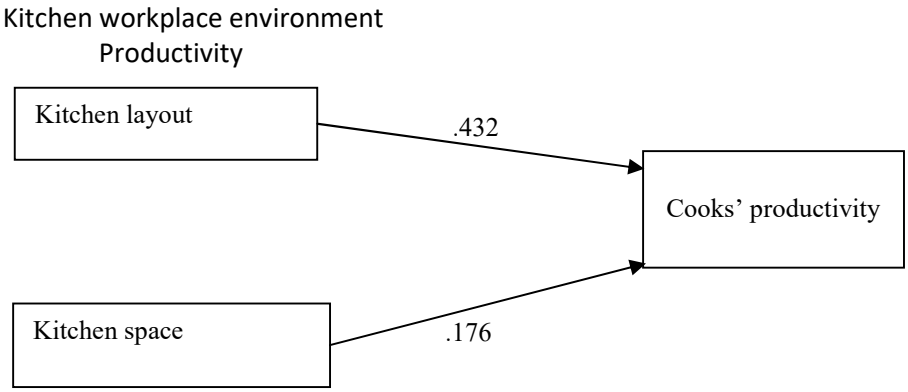

Figure 2: Research model output
Source: Researchers own findings (2022)

Particularly, the figure above shows that a unit improvement in kitchen layout would result in an increase in cooks' productivity by 0.432 units. Similarly, a unit improvement in kitchen space would result in an increase in cooks' productivity by 0.176 units.

Discussion of findings

Kitchen layout and cooks' productivity

The layout of a kitchen may be described as "the best practical arrangement of furniture, equipment and persons within the available floor space in order to achieve the maximum output of work" (Haga et al., 2017). Their study found out that a poor kitchen layout affects performance of employees. This is similar to the current study which established that on average, the respondents rated the layout in their kitchens as above average (5.499). However, the highest rated aspect of ergonomics in this study was the kitchen space. The most prevalent type of kitchen layout was U-type.

There was a positive and significant relationship between kitchen layout and cooks' productivity. This agreed with the findings of Haga et al. (2017) who assessed the effect of kitchen layout on employee's productivity and established that layout had a positive and significant bearing on productivity. Salama (2016) collaborated the same. According to Leblebici (2012) the physical environment is a tool that can be leveraged both to improve business results, and employee well-

being. It is therefore imperative that the better the layout in kitchens, the higher the productivity of cooks. He asserts that apart from providing a healthy level of communication and personal motivation in the workplace, the actual physical layout of the kitchen is crucial when it comes to maximizing productivity.

This study established that kitchen space also had significant bearing on cooks' productivity. These results agree with the findings of Salama (2016) who found out that enough space to operate in allowed workers to have easy movement from one station to another and improved their working speed to accomplish their tasks quickly. In a kitchen set-up, good space eases the stress in looking out for utensils and ingredients as well as saving time. However, it should not be so large that employees spend lots of time walking from place to place (Hagan et al., 2017).

Analysis of observable data

The researcher made physical observation of the status of kitchens on the various aspects of ergonomics and filled in an observation checklist A total of eleven observations were made. The result of which are as summarized in table 9.

Observations on kitchen layout

Majority of the kitchens that were assessed (38%) had adopted the U-shaped layout. This was followed by L-layout (33%), then Island (14%), one-wall (10%), and finally Double-L or G (5%). None of the sampled kitchens had Corridor/Galley-type and Peninsular-type of layout. Concerning compliance with the recommended shelf-type, majority of the kitchens had complied, with respondents answering "Yes" to the question as to if the "high-shelves placed above the eyes had openable doors" (60%) and if the lower ones "below the waist were pullout types" (75%). The average height of the highest shelves in the kitchen was 1.85 metres and the average height of the lowest shelves was 0.87 metres. The working height for kitchen surfaces has been prescribed at 34 inches (0.86M) according to Birchfield (2007). However, he pointed out that it was not clear whether this recommended height was ergonomically sound for routine commercial kitchen tasks.

Table 9: The distribution of kitchen layout types and space in hospitality facilities (N=21)

Type of kitchen design layout	**Type**	**Number**	**Percentage**
	U-type	8	38
	L-type	7	33
	Island-type	3	14
	One-wall	2	10
	Double-L(G)	1	5
	Galley	0	0
	Peninsular	0	0
Distance/space	**Shortest (M)**	**Longest (M)**	**Average (M)**
Distance to the shelves	0.7	2.25	1.64
Distance to sink	0.5	1.46	1.708
Distance to food preparation area	0.8	2.32	1.53
Distance to fridge	0.6	3.5	2.27

Source: Researchers own findings (2022)

Observations on kitchen space

Spaces from the kitchen's main stove/cooker to the various sections was measured in metres to determine how suitable they were for kitchen operations (Table 9). On average, the distance to the storage shelves was 1.64 metres, to the sink area was 1.71 metres, to the food preparation area was 1.53 metres, and finally to the fridges was 2.27 metres. Without specifying space dimensions, Grundig (2019) recommended that sufficient space for the use of material handling equipment use should be considered. According to Civilsir (2022), focus with respect to kitchen space should be on primary kitchen needs and mapping out the area for the cooker, the sink, and the food preparation especially for a small kitchen room. He proposed the establishment of the minimum dimensions to work within, without feeling cramped, and then arranging other appliances and storage around this core.

Summary

This study established the influence of kitchen workplace environment on productivity among cooks in selected class B, C and D hospitality facilities in Machakos county. The study was guided by two specific objectives. Kitchen layout and space were found to significantly affect

cooks' productivity. Furthermore, U-type of kitchen layout was found to be pre-dominant. Overall, the study found that the physical work environment influenced the productivity of cooks. From the aforementioned outcome, the proposed null hypotheses were rejected, while the alternative hypotheses were not rejected. It was therefore established that the model involving kitchen layout, and kitchen space significantly accounted for variance in cooks' productivity by 31%. Hence, the objectives of this study were achieved.

These findings provided vital information to hospitality experts by enlightening them on the ergonomics-related challenges faced in kitchens for them to provide solutions to enhance productivity. The findings also added to the existing body of knowledge on kitchen ergonomics and employee performance in the academic field. Additionally, the findings assisted future researchers interested in identifying the research gaps in the field of kitchens ergonomics and productivity. The study's findings therefore inform policy and decision makers on the need to focus their policies and decisions on enhancing the kitchen work environment for increased productivity and organizational performance.

Conclusion

In conclusion, the significant findings of this study are highlighted as follows: First. kitchen environmental conditions significantly affected cooks' productivity. It clearly showed that hotel managers and kitchen supervisors must consider improving the physical work environment to promote productivity of their staff. Secondly, different aspects of ergonomics did influence cooks' productivity in varying degrees. Of the two ergonomics factors considered in this study, kitchen layout had the highest significant effect on cooks' productivity. Space had a lesser effect on cooks' productivity. This meant that the hotel management must take initiatives to promote ergonomics in the kitchen.

Recommendations for management and practice

1. The present findings show that working conditions can predict cooks' productivity. Considering the positive impact of ergonomically sound work place environmental characteristics on productivity, it is suggested that the managers of hospitality

facilities should take initiatives to improve the general employees' work environments.

2. Quantitative and qualitative findings of this study indicated that the space and working surfaces in the kitchens in Machakos County were ergonomically compliant, but there is need for further improvement. Therefore, it is recommended that necessary adjustments are made with regard to kitchen spaces and working surfaces.

Recommendations for further research

Since this study only focused specifically on the productivity of cooks, it is recommended that future studies examine the relationship between working environment and productivity across different staff categories in hotels. Further research is recommended to collect data over a wider range like the employees of the different departments of the hotel sector overall in Kenya to establish if the findings of this study can be generalized.

References

Abarqhouei, N. S. & Nasab, H. H. (2011). Total ergonomics and its impact in musculoskeletal disorders and quality of work life and productivity. *Open Journal of Safety Science and Technology*, *1*(03), 79.

Akinyele, S. T. (2010). A critical assessment of environmental impact on workers' productivity in Nigeria. *Research Journal of Business Management*, *4*(1), 61-72.

Ali, Alfatmafathallasalama & Salama, A.l. Fatema (2016). The role of kitchen design effectiveness in improving hotel employees' performance: Case of Minia city. *International Journal of Hospitality Management*, *1*(2), 33-57.

Appiah, S.O. (Undated). Management's role in ensuring workplace safety: The situation in a Ghanaian factory. Accessed on 22nd April, 2021 from https://www.academia.edu/8098521/Managements_Role_in_Ensuring_Workplace_safety_The_situation_in_a_Ghanaian_Factor

Asante, K. (2012). *The impact of office ergonomics on employee performance; A case study of the Ghana National Petroleum Corporation* (GNPC). Unpublished Master's Thesis, Institute of

Distance Learning, Kwame Nkrumah University of Science and Technology, Kumasi.

Atkinson, W. (2002). Decreasing industry injury rates. *Restaurants & Institutions*, *112*(22), 80-81.

Aziz, R. A., Adeyemi, A. J., Kadir, A. Z. A., Rohani, J. M. & Rani, M. R. A. (2015). Effect of working posture on back pain occurrence among electronic workers in Malaysia. *Procedia Manufacturing*, *2*, 296-300.

Baden-Powell, C. (2005). Architect's pocket book of kitchen design. Oxford, UK: Elsevie.

Birchfield, J. C. (2007). Space analysis. In J. C. Birchfield, *Design and layout of food service Facilities* (94-119). New Jersey: John Wiley and Sons, Inc.

Civilsir, (2022). *What is the standard size of kitchen room in India*. Accessed on 15.6.2022 at https://civilsir.com/what-is-the-standard-size-of-kitchen-room-in-india/

Colin, E. (2011). *Ergonomics kitchen design*. Retrieved Aug. 21, 2020, from Ergonomics-Info.com: http://www.ergonomics-info.com/ergonomics-kitchen.html

Colombini, D. & Occhipinti, E. (2006). Preventing upper limb work-related musculoskeletal disorders (UL-WMSDS): New approaches in job (re) design and current trends in standardization. *Applied ergonomics*, *37*(4), 441-450.DeCarlo, L. (1997). On the meaning and use of kurtosis. Psychological Methods, 2 (3), 292-307.

Driessen, M. T., Proper, K. I., Anema, J. R., Bongers, P. M., & van der Beek, A. J. (2010). Process evaluation of a participatory ergonomics programme to prevent low back pain and neck pain among workers. *Implementation Science*, *5*(1), 1-11.

Fincham, J. E. (2008). Response rates and responsiveness for surveys, standards and the Journal. *American Journal of Pharmaceutical Education*, *72*(2) 43; DOI: https://doi.org/10.5688/aj720243

Gliem, J. A., & Gliem, R. R. (2003). *Calculating, interpreting and reporting Cronbach's alpha reliability coefficient for Likert-type scales*. Midwest Research-to-Practice Conference in Adult, Continuing, and Community Education, October 8-10, 2003.

GoK. (2004). *Kenya Gazette Notice of July*. Nairobi: Government Printers.

GoK. (2007). *Occupation Health and Safety Act*. Nairobi: Government Printers.

Gordon, N., Davidoff, F., Tarnow, E., Reidenberg, M. M., & Endriss, K. (2002). A question of response rate. *Science*, *25*(1), 25.

Grundig. (2019). *A complete guide to kitchen layouts.* https://www.grundig.com/ktchnmag/blog/the-complete-guide-to-kitchen-layouts/

Hagan, J. A., Spio-Kwofie, A., & Baissie, F. (2017). Assessing the effect of kitchen layout on employee's productivity. *IJRDO - Journal of Applied Management Science.* 3(1), 4

Hameed, A. & Amjad, S. (2009). Impact of office design on employee productivity: A case study of banking organizations of Abbottabad, Pakistan. *Journal of Public Affairs Administration and Management,* 3(1), 1-13.

International Ergonomics Association (IEA). (2000). *In the discipline of ergonomics*. Retrieved on 14th February, 2019 from http://www.iea.cc.

International Ergonomics Association. (IEA). (2000). Congress, human factors, & ergonomics society. Meeting. *Ergonomics for the New Millennium: Proceedings of the XIVth Triennial Congress of the International Ergonomics Association and the 44th Annual Meeting of the Human Factors and Ergonomics Society, July 29 Through August 4, 2000, San Diego, California, USA* (Vol. 1). Human Factors and Ergonomics Society.

Jayaweera, T. (2015). Impact of work environmental factors on job performance, mediating role of work motivation: A study of hotel sector in England. *International Journal of Business and Management, 10,* 271-278. https://doi.org/10.5539/ijbm.v10n3p271

Kahya, E. (2007). The effects of job characteristics and working conditions on job performance. *International Journal of Industrial Ergonomics,* 37, 515-523. http://dx.doi.org/10.1016/j.ergon.2007.02.006.

Kombo, D. K., & Tromp, D. L. (2006). Proposal and thesis writing: An introduction. *Nairobi: Paulines Publications Africa*, *5*(1), 814-30.

Kumara, Y.A. D. R. R. (2018). Career development of women in the hotel industry: An overview. *Journal of Applied and Natural Science, 10*(1), 330 - 338.

Leblebici, D. (2012). Impact of workplace quality on employee productivity: Case study of a bank in Turkey. *Journal of Business Economics and Finance, 1*(1), 38-49.

Ministry of Tourism and Wildlife (MoT, Kenya). (2019). 2008 Tourism Sector Performance Report. Retrieved from www.tourism.go.ke on 15th March 2019.

National Academy of Sciences (NAS). (2019). *Musculoskeletal disorders and the workplace: lower back and upper extremities*. Washington, DC: National Academy Press.

Nzewi, H. N., Augustine, A., Mohammed, I., & Godson, O. (2018). Physical work environment and employee performance in selected brewing firms in Anambra State, Nigeria. *Journal of Good Governance and Sustainable Development in Africa*, *4*(2), 131-145.

Pheasant, S. (2005). Ergonomics in the home. In S. Pheasant, *Body space: Anthropometry, Ergonomics and the Design of Work* (pp. 105-109). London: CRC Press.

Saleem, A., Shah, A., Zaman, K., Arif, M., Shehzad, K. & Ullah, I. (2012). The impact of interior physical environment on academicians' productivity in Pakistan higher education institutes perspectives. *Iranian Journal of Management Studies* (IJMS*), 5*(1), 25-46.

Samson, G. N. (2014). *Effect of workplace environment on the performance of commercial banks employees in Nakuru town*. Accessed on 26th June, 2022, from http://ir.kabarak.ac.ke/handle/123456789/1093.

Srivastava, A. K. (2008). Effect of perceived work environment on employees' job behaviour and organizational effectiveness. *Journal of the Indian Academy of Applied Psychology, 34*(1), 47–55.

Strangeland, T. (2011). Body friendly design: Kitchen ergonomics. Retrieved May 09, 2020, from *Star Craft Custom Builders* Lincoln, Nebraska: http://starcraftcustombuilders.com/kitchen.ergonomic.htm

Sultana, S. & Prakash, C. (2014). The ergonomic perspective of the home makers in using kitchens. *Asian Journal of Home Science, 9*(1), 25-28.

Uncaged ergonomics. (2017). *Principles of ergonomics in the workplace*. Accessed on 15.3.2022, at https://uncagedergonomics.com/

Vinod, S., & Arun, B. (2015). Prevalence of various work-related musculoskeletal disorders in software professionals. *Indian Journal of Medical & Health Sciences*, *2*(1), 9-13.

Yankson, E. (2012). The effect of health and safety standards on productivity in Ghana rubber estates limited. *Unpublished Master's Thesis, Institute of Distance Learning, Kwame Nkrumah University of Science and Technology, Kumasi*.