

Organisational Ergonomics and Academic Staff Performance in Lagos State University.

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Abstract: The study examined the relationship between Organisational Ergonomics (OE) and academic staff performance at Lagos State University. The study is a shift from the conventional examination of organizational ergonomics as a direct variable within the production/manufacturing or construction system that has been the focus of past researchers to the use of indicators of OE within an academic environment. The study population is five hundred and fifty-seven (557) academic staff of Lagos State University, Ojo campus. While a sample size of two hundred and thirty-four (234) was drawn from the population. The reliability of the research instrument was assessed using Cronbach's Alpha coefficient (with 0.884 reliability statistics) while the validity was assessed using content and face validities. The study found that; in the two hypotheses tested there were moderate positive relationships between the two indicators of OE (teamwork and participatory design) and the indicators of performance (level of innovativeness and flow of work with $R = 0.540$ and 0.535 respectively) based on the academic environment tested. This implies that there is a relationship between organisational ergonomics and the performance of the academic staff of LASU. The study concluded that; the use of such indicators as teamwork, participatory design, and level of innovativeness, the flow of work to study the relationship, especially within academic work environments give a new insight into how these factors can also improve the success of an organisation effectively and employee performance. The study recommends among others that; management in an academic system would need to develop a policy that enhances participatory design in workplace to improve the teamwork of the system, and invariably the level of innovativeness in a knowledge-based environment.

I. INTRODUCTION

Sharad and Irfan (2020), believe that an improvement in the physical ergonomics design of workplace in organisation is essential. But it was not enough for ergonomics to improve employees' well-being. This may be connected to its focus on micro ergonomics design; the immediate workstations. To make a real difference, Sharad and Irfan (2020) think that, "the discipline must consider the context of that change and forces which facilitate and inhibit ergonomic improvements". This is done with consideration from the OE domain of ergonomics which addresses more subjective aspects of the workplace (Kramer, 2009). He further identifies some elements of the OE domain such as Communication, Crew Resources and Management, Work Schedule Design, Teamwork, Participatory Design, Cooperative Work, New Work Paradigms, Quality Management, Virtual Organisations, and Community Ergonomics. But most literature on OE had failed to examine most of the elements of this domain as indicators to

measure the level of OEs adoption in organisations. Thus, Sharad and Irfan (2020) revealed that most literature on OE failed to respect the critical ergonomics domain in their studies. This is a gap that this study shall fill by examining how two elements of OE-Teamwork and Participatory design affect a system in terms of the level of innovativeness and flow of work within the system

The choice of the two indicators-Teamwork and Participatory Design though discretionary, but it is connected to the fact that, most researchers that have examined them in their studies used production/manufacturing or construction system as areas of focus as seen in the works of researchers like; Panatika (2012) and Passicot and Murphy (2013) among others. Thus, this study is a shift from the conventional production/manufacturing or construction system that has been the focus of past researchers as established by Sharad and Irfan (2020). The scope of this study encompasses the academic system and focuses on the academic staff performance in Lagos State University.

1.1. Objectives of the Study

The study's specific objectives are:

1. Investigate the relationship between teamwork and the level of innovativeness among Lagos State University academic staff (LASU).
2. Examine the relationship between participatory design and the flow of work within the academic system of Lagos State University (LASU).

1.2. Research Questions

1. How significant is the relationship between teamwork and the level of innovativeness among Lagos State University academic staff (LASU)?
2. Is there a significant relationship between participatory design and the flow of work within the academic system of Lagos State University (LASU)?

1.3. Research Hypotheses

1. There is no significant relationship between teamwork and the level of innovativeness among the academic staff of Lagos State University (LASU).
2. There is no significant relationship between participatory design and the flow of work within the academic system of Lagos State University (LASU).

1.4. Relevance of the Study

This study assesses the study variables: work schedule design, teamwork, and participatory design as indicators for OE with the level of stress and strain, level of innovativeness, and flow of work as indicators for performance. These are specific indicators that give better insight to examine indirectly the performance element of management of organisations, especially in academic environment.

II. LITERATURE REVIEW

This section will capture a review of the conceptual and theoretical works that are relevant to this research. Thus, relevant study variables and indicators such as teamwork and participatory design as indicators for the independent variable OE while the level of innovativeness and flow of work as indicators for the dependent variable-performance in an academic environment.

2.1. Ergonomics

The concept of ergonomics is seen as a human factor engineering discipline focused on gaining an insight into the relationship and association that exist among employee(s) and another component(s) of an organisation, and the identification of applicable theory, principle(s), data and method(s) to the designing of a system that can optimise employee(s) health, comfort and invariably the overall organisation's performance (Ismaila, 2010). A critical observation of the above concept of ergonomics shows that; it's design and implemented to enhance employee performance.

Other stakeholders like International Ergonomics Association (2017) conceptualised ergonomics a discipline that gives attention to relevant factors such as the physical, cognitive, organisational, environmental, etc. for the designing and evaluating of tasks, jobs, products, environments, and systems to make the job/work of fit the needs, abilities, and limitations of the employees. This shows that concept the isn't limited to improving the performance of each employee but also enhancing that of the overall organisation. It's also broader and all-encompassing as the construct identifies the possible domains of ergonomics-physical ergonomics, cognitive ergonomics and organisational ergonomics (Asante, 2012; IEA 2017). Asante (2012) claims that the domains identified have different school of thought. Examples are office ergonomics and engineering psychology-physical ergonomics with cognitive ergonomics which are both micro ergonomics, while organisational is also known as macro ergonomics.

Glander-Dolo (2017) who also studied human factor engineering believes that; each of the domains of ergonomics doesn't function in isolation. Thus, there is an interaction among organizational, physical, and cognitive ergonomics. However, the most recent of the three domains of ergonomics is OE (Glander-Dolo, 2017). Glander-Dolo (2017, p. 1) like few other researchers conceptualised Ergonomics as stated by the IEA (2016) and thus defined it as

“the scientific discipline concerned with the understanding of the interactions among humans and other elements of a system, and the profession that applies theoretical principles, data, and methods to design to optimize human well-being and overall system performance.”

2.1.1. Organisational Ergonomics

In 2017, the IEA defined Organisational Ergonomics

“as a scientific discipline concerned with the optimization of sociotechnical systems, including their organisational structures, policies, and processes.”

IEA (2017) believed that; culture, habits, human capability, human-machine interfaces, production streamlining, reliability, etc. are abstract components not included in the concept of a sociotechnical system identified for optimisation. Thus, this study believed that OE critically examined the elements of a sociotechnical system, the organisational structure, policies, and processes that are governing the organisation.

According to Gomathi and Rajini, (2019) OE aims to absolutely and consistently improve workplace directly from quality management and cooperation, which includes supervising every process in the system for improvement

Like other studies, Mackenzie Glander (2017) believes that; OE is concerned with the socio –technical system optimisation including their organisation structure, policies, processes, risk management, work system design, etc. This study as mentioned earlier is limited to three of the above domains of OE namely; work schedule design, teamwork, and participatory design.

2.1.2. Teamwork

Kroupa (2007) believes that the system under observation influences researchers and stakeholders variant views of the concept of teamwork, hence the inability to have a common definition for teamwork. Kroupa further opines that the conceptualisation of the word by any researcher is more dependent on the specific area of study. Kroupa (2007, p. 2-3) then adopted two definitions for his work based on his area of study as follows;

‘Groups of employees who have at least some collective tasks and where the team members are authorised to regulate mutually the execution of these collective tasks’ (Delarue, 2003)’.

‘A Group work defined by a common task requiring interdependent work and successive or integrative action’ (Hacker, 1998)’.

Andreas and Emma (2007, p. 239) examined the concept with their focus on the health system, and define teamwork as;

a dynamic process involving two or more healthcare professionals with complementary backgrounds and skills, sharing common health goals and exercising concerted physical and mental effort in assessing, planning; or evaluating patient care.

While Eclipse Research Consultants (2003, p. 5) in conjunction with the Department of Architecture at the University of Cambridge with a focus on engineering construction projects, sees the concept as;

'groups of people with complementary skills who are committed to a common purpose and hold themselves mutually accountable for its achievement, Ideally, they develop a distinct identity and work together in a coordinated and mutually supportive way to fulfill their goal or purpose.'

But because this study is based on the academic environment, the definition of the concept by Andreas and Emma (2007) was modified and adapted. This was because the original definition focuses on health as identified above. Thus, the adapted concept defines teamwork as a process that required the interdependent collaboration of more than one professional with complementary backgrounds and skills to achieve common goals and generates value-added outcomes through open communication and shared decision-making.

Though, some researchers like; Fay, Shipton, West, and Patterson (2015); Pérez and Molina (2017). their work had shown that teamwork has a good impact on the level of innovation but few other researchers like Kroupa (2007) also acknowledged its possible negative impacts such as; higher work intensity and work overload. Work overload according to Dirk and Imanol (2018) affects negatively workers' creative behaviours or indirectly the level of innovativeness of the team and invariably the organisation. This study examined if this outcome will be in convergence or divergence in an academic environment like LASU.

2.1.3. Participatory Design

Participatory Design (PD) was traditionally called cooperative design but known as co-design in the modern period. PD is a decision-making design method that aims to solicit input from all stakeholders such as; employees, vendors, etc., and most especially end users in the design process to ensure the outcome/output meets the necessary expectation (Nichols, 2009). Nichols further stressed that PD as a method focused not on a design style but on the processes and procedures of design. To Velden and Mörtberg (2014) PD is seen as;

'collection of design practices for involving the future users of the design as co-designers in the design process.'

Velden and Mörtberg believed this process hinged on the ability to manage the capability of co-designers and the ability to incorporate their shared inputs in the design process for outputs that are mostly in line with a model developed into product/service, a new method of organising work practice or a new model in designing a workplace.

The above view of PD as a new method of organising work practice or a new model in designing the workplace shows its importance to OE. But its' possible effect on the flow of work as a domain of OE within academics' system/organisation has rarely been examined. This is because the focus of most

researchers has been on computer or construction base organisation as shown in some of the reviewed literature by Mihyun, Phil, and Craig (2015). Unlike the above focus areas, this study will change the focus to an academic system as identified in the statement of the problem and examine how PD affects a domain of OE in term of the flow of work.

2.1.4. Employee Performance

As noted by many researchers, there is no generally accepted definition of the term performance as researchers faced many difficulties in finding a single definition as multiple definitions are developed. Few researchers like Âta, Chafik, Razane, and Elalami (2016) thus opine that; the terms used in a particular field could be modified and adapted as they suit the specific area of study. But this study thinks that irrespective of the perception of how the term performance is used in the context of research, it will still gear towards defining the value of set(s) of the result.

Thao and Hwang (2011) express employee performance as the successful completion of tasks by an individual, as set and measured by the system, to pre-defined acceptable standards of efficiently and effectively utilizing available resources within a changing environment.

2.1.5. Level of Innovativeness

According to Nasierowski and Arcelus (2012), the level of innovativeness is considered to be a complex issue, it shows the intensity of a system's involvement in new activities or implementation of new solutions in achieving the goal(s), for which these have not been used earlier.

Though some researchers like Fay, Shipton, West, and Patterson (2015); Pérez and Molina (2017), etc. in their work had shown that teamwork has a good impact on the level of innovation but few other researchers like Kroupa (2007) also acknowledged its' possible negative impacts such as higher work intensity and work overload. This indirectly also affects negatively the level of innovativeness of the team and invariably the organisation.

2.1.6. Flow of Work

Joshbersin (2018) believes Flow of work is the sequence of connected steps that make up a work process or is concerned with the way work moves along from one operation to another. The flow of work aims at greater efficiency in every office activity, so that costs mostly in term of time, finances, and human effort are cut down to eliminate delays.

Work flow is also seen as the mental state where a worker(s) performing operations is/are totally engaged in an energised state and being focused, fully involved, and enjoying the process of the operations. This means the flow is characterised by being totally absorbed in one's activity(ies), with a resultant transformation in one's sense of time.

2.2. Theoretical Framework

The two hypotheses were based on the theory of instruction since both indicators of OE-teamwork and participatory design-

exhibited a sort of collaborative effort of learning. The theory of instruction is of three types namely: behaviorist, cognitive and constructivist. Behaviorist reflects human behavioral change occur in response to several stimuli. Cognitive examines the psychological approach to learning that may rely on rehearsal or mnemonics. While Constructivists reflect how individuals draw knowledge from their environment either through previous experience or from system efforts. Thus, Sharad and Irfan (2020) observe constructivism as a constructivist learning theory and It states that building knowledge occurs best through building systems that are shareable. In this study, the system that is sharable is the system of knowledge since the theory of instruction is about the acquisition of knowledge and its benefits. These benefits could probably be an improvement in the level of innovativeness, the flow of work, etc. the findings of this study will reflect the relationship that existed in the two hypotheses.

III. RESEARCH METHODS

This study adopted a descriptive research design. The study population is five hundred and fifty-seven (557) academic staff of LASU, Ojo campus. While using Yamane formula a sample size of two hundred and thirty-four (234) was drawn. The sample was stratified as shown in table 1, so all the faculties and schools were represented. As identified earlier in the study, scope and limitation, a convenience sampling technique was used to choose LASU because of accessibility and proximity and accessibility. While purposive sampling technique was used in each stratum because, experience from the research field has shown that not all academic staff are willing to fill questionnaires and return it within an acceptable time.

A five-point Likert Scale questionnaire was designed for data collection to assess how the level of stress and strain on the academic staff of LASU' is affected by the work schedule design. Copies of the questionnaire were taken to the offices and distributed to the staff with minimal persuasion within two weeks.

Inferential statistics (linear regression and correlation analysis) with the aid of a statistical software called IBM SPSS (Statistical Product and Service Solution) was used to analyse the data collected

Yamane-Formula.

$$n = N / (1 + N(e)^2)$$

Where,

n = sample size;

N = population size = 557;

e = level of precision; which is 5% for the study

Thus, $n = 557 / (1 + 557 (.05)^2)$.

$$n = 232.81 = 233.$$

Each faculty/school sample size = n' . This is the fractional contribution of each faculty/school to the population ($N_t = 557$) multiplied by the sample size. Thus; $n' = (N_t/N_t) * n$

where n' = sample size per stratum

N_f = population per stratum

N_t = study population

n = study sample size

The result is approximated to the nearest whole number. For example, in Faculty of Art the sample will be $(83/557) * 233 = 34.72$

this is approximate to 35 as shown in table 3.1.

The final summation of the sample size column resulted in 234. Since this figure is higher than the 233 from the Yamane formula it can represent the system adequately.

Table 1: Samples Distribution

S/N	Faculty/School	Population	Sample
		N_f	n'
1	Art.	83	35
2	Management-Sciences.	77	32
3	Social-Sciences.	71	30
4	School of Communication.	38	16
5	School of Transport.	09	04
6	Law.	68	28
7	Education.	109	46
8	Sciences.	102	43
	TOTAL (N)	557	234

Source: Registry office, (2021).

IV. DATA ANALYSIS AND DISCUSSION OF FINDINGS

Analysis of Hypothesis One

(H_{10}): There is no significant relationship between teamwork and the level of innovativeness among the academic staff of LASU.

To test the hypothesis, linear regression analysis was used as specified in the regression model. teamwork (T) formed the independent variable while the level of innovativeness among the academic staff of LASU (LOL) formed the dependent variable. The regression test results are presented in Table 2.

Table 2: Model summary of teamwork and level of innovativeness among academic staff of LASU

	R	R Square	Adjusted R Square	Std. Error of the Estimate
1.	.540 ^a	.292	.289	.45117

a. Predictors: (Constant), TEAMWORK

Coefficients ^a						
Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.924	.269		7.165	.000
	TEAMWORK	.553	.060	.540	9.196	.000

a. Dependent Variable: LEVEL OF INNOVATIVENESS

Source: Researcher's Computation (2021)

The model summary table 2 that there is a moderate positive relationship between teamwork and the level of innovativeness among academic staff in LASU ($R = 0.540$). The model further indicates the extent to which teamwork accounts for the changes in the level of innovativeness among academic staff at LASU. The coefficient of determination ($R^2 = 0.292$) suggests that teamwork accounts for 29.2% of the changes in the level of innovativeness among academic staff at LASU. This result is statistically significant because the p-value of the result (0.000) is less than the $p < 0.01$ level of significance used for the study. Therefore, research hypothesis two is rejected. This implies that there is a significant relationship between teamwork and the level of innovativeness among the academic staff of LASU.

It is also observed from the table above that an evaluation of the unstandardised coefficient of teamwork in the coefficient table, and its associated p-value shows that teamwork ($\beta_T = 0.553$, $p < 0.01$) is statistically significant but it can be predicting the level of innovativeness among academic staff in LASU. This, therefore, further strengthens the rejection of research hypothesis two, which implies that there is a significant relationship between teamwork and the level of innovativeness among the academic staff of LASU.

Analysis of Hypothesis Two

(H_2): There is no significant relationship between participatory design and the flow of work within the academic system of LASU.

To test the hypothesis, linear regression analysis was used as specified in the regression model. participatory design (PD) formed the independent variable while the flow of work within the academic system of LASU (FOW) formed the dependent variable. The regression test results are presented in Table 3

Table 3: Model Summary of participatory design and the flow of work within academic system of LASU.

	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.535 ^a	.286	.282	.46832
a. Predictors: (Constant), PARTICIPATORY DESIGN				

Coefficients ^a						
Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.915	.263		7.279	.000
	PD	.541	.060	.535	9.055	.000
a. Dependent Variable: FLOW OF WORK						

Source: Researcher’s Computation (2021)

The model summary table 3 shows a moderate positive relationship between participatory design and the flow of work w within the academic system in LASU ($R = 0.535$). The model further indicates the extent to which the participatory design explains the changes in the flow of work within the academic system at LASU. The coefficient of determination ($R^2 = 0.286$)

suggests that participatory design explains 28.6% of the changes in the flow of work within the academic system at LASU. This result is statistically significant because the p-value of the result (0.000) is less than $P < 0.01$ level of significance used for the study. There, research hypothesis three was rejected. This implies that there is a relationship between participatory design and the flow of work within the academic system at LASU.

It is also observed from the table above that an evaluation of the unstandardised coefficient of participatory design in the coefficient table, and its associated p-value shows that participatory design ($\beta_{PD} = 0.541$, $p < 0.01$) is statistically significant and can be used in predicting the flow of work within the academic system in LASU. This, therefore, further strengthens the rejection of research hypothesis two, which implies that there is a relationship between participatory design and flow work within the academic system at LASU.

Discussion of Findings

In hypothesis one, the result of the correlation shows that teamwork is an important factor that influences the level of innovativeness among the academic staff of LASU. These findings can be found to have existed in the works of Pérez and Molina (2017), who illustrates that the more widespread the use of teamwork in organizations, the higher the level of organizational innovation. This is because organizations are increasingly required to initiate and sustain innovation to survive in a turbulent external environment. The results from testing hypothesis two shows that there is a moderate positive relationship between participatory design and flow of work within the academic system of Lagos state university. This implies that participatory design has a significant effect on the flow of work in Lagos State University. This result is in tandem with the result of the study of Hansen et al. (2019) and Sood and Nasu (2015), which illustrate that participatory design plays an essential role in the improvement process of any organization as they are involved in most stages of a change process and add a new realistic vision when employees are totally committed.

V. CONCLUSION AND RECOMMENDATION

This study has assessed the effect of organisational ergonomics on academic staff performance in Lagos State University. The results from the study reveal a correlation between organisational ergonomics and performance of LASU academic staff. It also shows that the use of such indicators as teamwork, participatory design and level of innovativeness, flow of work to study the relationship especially within academic work environments give a new insight to how these factors can also improve the success of an organisation and employee performance effectively.

Thus, management in an academic system would need to develop a policy that enhance participatory design in workplace that can improve the teamwork of the system and the level of innovativeness in a knowledge- based environment like LASU.

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