

## GLOBAL JOURNAL OF ENGINEERING SCIENCE AND RESEARCHES CONSTRUCTION AND ERGONOMICS EVALUATION OF AN OFFICE CABINET

Ogunlade, C. A.<sup>\*1</sup>, Babajide, N. A.<sup>2</sup>, Aremu, D. O.<sup>3</sup>, Kadiri, A. O.<sup>4</sup> and Oyeniran, S. T.<sup>5</sup>

<sup>\*1</sup>Department of Agric and Environmental Engineering, University of Ibadan, Ibadan, Nigeria.

<sup>2</sup>National Rice/Maize Center, c/o Federal Dept. of Agric., Moor Plantation, Ibadan.

<sup>3</sup>Dept. of Agricultural Engineering, Federal College of Agriculture, Ibadan, Nigeria

<sup>4</sup>Department of Agric and Environmental Engineering, University of Ibadan, Ibadan, Nigeria.

<sup>5</sup>Department of Agric and Environmental Engineering, Obafemi Awolowo University, Ile Ife,, Nigeria.

### ABSTRACT

Wood is a natural endowment; an engineering material that is durable and aesthetic. An office cabinet was constructed using wood and the ergonomics evaluation was carried out. A total of 50 subjects were used for the ergonomics evaluation, the anthropometrics data of the subjects shows an average height of 165.06cm, overall weight of 62.5kg, overall arm stretch of 217.36cm, shoulder to hand of 59.2cm, elbow to finger of 49.5cm, average waist diameter of 80.32cm, waist to knee length of 53.5cm, knee to leg length of 50.38cm and average shoulder length of 38.34cm. A total of 92% of the subjects recommended the cabinet has been of good quality and finishing and found it comfortable for use for hours while 8% found it fair in usage.

*Keywords- Office Cabinet, Ergonomics Evaluation, Anthropometrics Data.*

### I. INTRODUCTION

A cabinet is a box-shaped piece of furniture with doors or drawers for storing miscellaneous items. Cabinets are typically made of wood or synthetic materials (Bruce, 2002). Many cabinets have doors and drawers or sometimes only drawers. Short cabinets often have a finished surface on top that can be used for display, or as a working surface such as the countertops found in kitchens (Hickey, 2001). A filing cabinet is a piece of office furniture used to store paper documents in file folders. Filing cabinets are typically available in two types: lateral and vertical files. Cabinet making is the practice of using various woodworking skills to create cabinets, shelving and furniture. Filing cabinets can feature any of a number of amenities to help make work-life easier. Filing cabinets with an anti-tip mechanism prevent the unit from tipping over by allowing only one drawer to open at a time (Melvin, 2008), they are usually made from wood but may be made from metal when used in industrial or public areas (Mclikian, 2012).

Office cabinets are typically made of sheet metal or wood. Wood is one of the most available materials in all parts of the world; it is easy and cheap to procure, resistant to vibratory load and heat conductivity (Claude, 2001). Its availability has made it to be a good material for the construction of office cabinets.

Wood material is needed to construct an Office Cabinet; those cabinets imported from foreign countries are very expensive and may not be affordable for an average Nigerian (Oladejo, 2009). The material used for the construction works were gotten in the country and cost of producing such cabinet is cheap compared to the imported ones. However, the ergonomics evaluation of any equipment is important because it studies the comfort-ability and levels of injury caused on end-users as a result of equipment usage (Jekayinfa, 2007) hence, it is referred to as human factors engineering, the objective of this study therefore is to construct an office cabinet and analyze its ergonomics evaluation.

### II. MATERIALS AND METHODS

#### A) Materials

Hard wood (*Arboreal gmelina*) was considered as the material of construction based on its characteristics, properties and design and other factors like strength, durability, workability and availability. The wood was sundried in order to remove its moisture content to avoid warping. Other materials used for construction of the cabinet include the following: nails, polish, polyguard, sand sealer glue, sandpaper, plywood, handle, tyre, top band. Other stationary tools such as: Vice, chisel, Saw, Try Square, Card Scraper, Plane, Hammer, Smooth and Circular machines were used.

#### B) Methods

Ergonomic data was obtained using 50 different subjects (age range 15-65 years) all around Federal College of Agriculture Ibadan school campus, Odo-Ona, Ibadan, Nigeria. Measuring tape, spring eluded weighing balance and writing materials such as exercise book, pencil and pen were used for measurement anthropometrics data of the subjects including overall height, overall arm stretch, shoulder to elbow, elbow to finger, shoulder to finger, waste, waste to knee, and knee to leg. The weight was taken using spring-eluded weighing balance. The office cabinet measures 85cm in height, 112cm in length, and 43cm in width. Plate 1 shows the constructed office cabinet and Figure 1 shows the isometric view while Table 1 shows the list of construction materials, specification, unit, unit price and amount.



Plate 1: The Constructed Office cabinet.

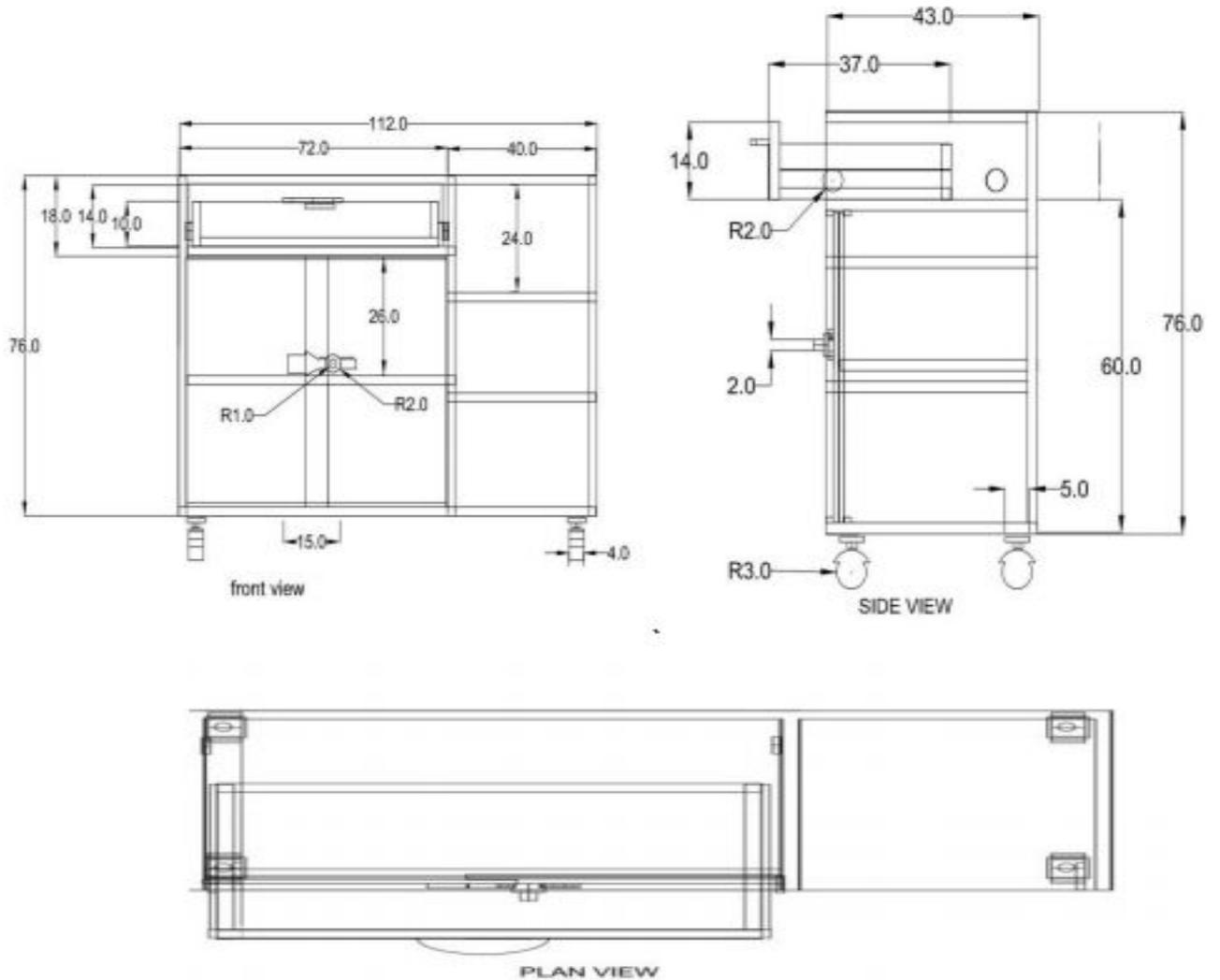


Figure 1: Isometric View of the Office Cabinet

**Table 1: Construction Materials, Specification, Unit, Unit Price and Amount**

S/N	ITEM	SPECIFICATION	UNIT	UNIT PRICE (₦)	AMOUNT (₦)
1	Melina wood	4ft by 4ft	5	1,000	5000
2	Assorted (Sand paper)	Dull & sharp	2	500	1000
3	Roland Castrol	1 pair	1	500	500
4	Door Hangs	2 pair	2	750	1500
5	Glue	1 tin	1	500	500
6	Sheet of plywood	4ft by 4ft	1	800	1600
7	Sand sealer	1 gallon	1	1300	1300
8	Thinner	½ gallon	½	1200	600
9	Glossy	½ gallon	½	1500	750
10	Glass (Door)	16½ by 26 by (5mm)	2	1200	2400
11	Door cabinet key	1 pair	1	200	200
12	Handle	2 pairs	2	150	300
13	Transportation				1250
14	Drawer runner	1	1	350	350
15	Drawer handle	1	1	200	200
16	Workmanship				3000
<b>Total</b>					<b>20,450</b>

### III. RESULT AND DISCUSSION

The ergonomic evaluation of an office cabinet was carried out to determine the effect of the wood on the end-users and also for further design, investigation and precisioning. The result obtained from the ergonomics evaluation is presented in Table 2:

**Table 2: Ergonomics Evaluation of the office Cabinet**

S/N	VALUE	Overall height (cm)	Overall weight (kg)	Overall arm stretch (cm)	Shoulder to hand (cm)	Elbow to finger (cm)	Waist (cm)	Waist to knee (cm)	Knee to leg (cm)	Shoulder to elbow (cm)
1.	Mean	165.06	62.52	217.36	59.2	49.5	80.34	53.5	50.38	38.34
2.	Standard Deviation	6.8106	9.1879	10.956	3.5399	3.0523	8.0773	2.2338	2.6704	4.2359
3.	Minimum Value	151	33	50	50	42	52	49	45	32
4.	Maximum Value	178	82	67	56	56	97	58	55	49

#### Discussion

The office cabinet constructed has good quality and finishing. Visual assessment of the wood cabinet was carried out to assess the quality and finishing by 50 people, 92% of whom gave good recommendation and 8% fair recommendation for the usage of the office cabinet. The office cabinet is therefore recommended that wood has good quality and finishing.

#### IV. CONCLUSION

Ergonomic data of an office cabinet carried out shows that, the average Height of a man is 165.06, the overall weight is 62.52, the overall arm stretch is 217.36, the shoulder to hand is 59.2, the elbow to finger is 49.5, the waist is 80.34, the waist to knee is 53.5, the knee to leg is 50.38, the shoulder to elbow is 38.34.

The wooden office cabinet constructed. Hardwood (Melina) was used due to his many advantages of it's over stiffness, strength durability and easy to work with, also its advantages over cost of its cheapness.

The wood cabinet has a breadth of 43cm, height of 85cm and length of 112cm. Visual assessment carried out shows that 92% of people (46) recommended the cabinet as that of a good quality and good finishing while 8% (4) people said the cabinet was of a fair quality.

#### REFERENCES

1. Bruce Hoadly. (2002): *Understanding wood, a craftsmanship guide to wood technology*, tauton press. 4<sup>th</sup> edition. Pp.15-20. ISBN 0-4327683-1-4.
2. Claude, R.S. (2001): *The use of wood in design and construction of commercial sized gate and study on application*, Clarenson press, Pp 51-53. ISBN 978-1-4259-6658-4.
3. Hickey Nick, (2001): *Wood structure*. Pronsbin London Publisher. 2nd Edition ISBN pp. 20-28. ISBN 978-0-93470-48-8.
4. Jekayinfa, S. O. (2007). *Ergonomics evaluation and energy requirements of bread-baking operations in South-Western Nigeria*. *Agricultural Engineering International: the CIGR Ejournal*, Manuscript EE 07 002 Vol. IX. Pp 1-12
5. Melvin, H.L. (2012): *A new tree biology dictionary*. [www.Melvinandtreeassociates.com](http://www.Melvinandtreeassociates.com). assessed 22 August, 2014. pp 13-14.
6. Mclikan S.E. (2012): *Cabinet making team that dazzled the elite "New York team"*, *Journal of wood importance to humanity Company*, ISBN 2541-5326. 8: 77-84.
7. Oladejo, R. (2009): *Construction of an Office Cabinet with desktop stand*. *Journal of Nigerian Wood Products*. Vol. 12, pp 32. ISSN 1674-8642.
8. Parker Boerjan, (2002): *Ligin Biosynthesis and Structure*. *Journal of Annu Revolution*, vol 2. Pp. 15-30.
9. Ryan O.D. and Kloot, B.S. (2004): *A non linear strain and moisture content, model 9 variable hardwood using schedule*, *Journal of International wood Product Organization*, volume 4, pp 35-40.
10. Witmann. P.D. (2005): *Managing wood for construction purposes. A critical appraisal*. *Journal of Wood Construction Institute*. vol 3, pp 81-89.