



Investigating the Impact of Gender Centred Approach on the Conventional Generator Used by Artisans in Nigeria

D. J. Idiata¹, O. K. Asikhia², E. E. Oriarewo³, S. O. Omoruyi⁴, S. A. Oimage⁵, L. O. Obonor³

¹Department of Civil Engineering, Edo State Polytechnic, Usen, Nigeria

²Department of Mechanical Engineering, Edo State Polytechnic, Usen, Nigeria

³Centre for Gender and Development Studies, Edo State Polytechnic, Usen, Nigeria

⁴Department of Electrical Electronic Engineering, Edo State Polytechnic, Usen, Nigeria

⁵Department of Adult and Non-Formal Education, University of Benin, Benin City, Nigeria

Email: djidiata@gmail.com

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Abstract

Gender concerns and experiences, as well as those of policymakers and programme implementers, should be considered when formulating policies and programmes in all areas of public life, politics, business, and society. This ensures that women and men benefit from policies and programmes in the same way, while preventing inequalities from being perpetuated. This should also be integrated in the designing of machines used in homes too. This research seeks to investigate the impact of gender centered approach on the conventional generator used by artisans in Nigeria. To guide the study, two (2) research questions, comprising three (3) research items each were raised. This paper specifically considers responses that focus on gender perspectives and operational and control requirement limitations of the use of the conventional generator, particularly in Nigeria. The result reveals significant differences exist in the three (3) items in research question one (1) for the male and female responses in the use of the product, while there are significant differences in two (2) out of the three (3) items in research question two (2) of the male and female responses in the use of the product. The results justify the re-design of the generator in terms of the impact of gender centred approach based on the research questions raised in the study.

Subject Areas

Sustainable & Renewable Energy

Keywords

Gender, Fuel-Less Generator, Artisans, Population

1. Introduction

Currently, only 45% of Nigeria's population is connected to the energy grid whilst power supply difficulties are experienced around 85% of the time and almost nonexistent in certain regions. At best, average daily power supply is estimated at four hours, although several days can go by without any power at all [1]. According to World Bank [2], 85 million Nigerians do not have access to grid electricity. This represents 43% percent of the country's population and makes Nigeria the country with the largest energy access deficit in the world. The lack of reliable power is a significant constraint for citizens and businesses, resulting in annual economic losses estimated at \$26.2 billion (₦10.1 trillion) which is equivalent to about 2 percent of GDP of the country. This negative deficit of power supply has necessitated the ubiquitous application of varieties of power generator products as the alternative source of power by the average household in Nigeria.

In today's world, technical products have penetrated all aspects of our life. There are varieties of products with ever-more sophisticated features and functionality that appears every day. This trend has a negative impact on users, as unfamiliar interfaces increase the cognitive effort required during interaction with products. The problem is made worse for the female users of these products, as no serious design thinking is considered during the conceptualization to the product life cycle phase of the product, resulting in unsuitable use of these products from gender perspective.

With respect to technical/challenging products, the female gender is at the receiving end in terms of usage. For example, the Power generator, a piece of technical product, mostly available for low income artisans in Nigeria is challenging to use by the female gender. Even though power generator design and development appear to be male biased based on its use; the epileptic power supply in the country has necessitated the product to be widely used by both male and female gender in private households and companies. Till date, the female values and preferences are not given serious consideration in the current generators design available in the market in Nigeria. This can be attributed to lack of accurate and regular gender centred data that encourages proliferation of designs that are not inclusive in nature.

The gender perspective focuses particularly on gender-based differences in status and power, and considers how such discrimination shapes the immediate needs, as well as the long-term interests, of women and men. In a policy context, taking a gender perspective is a strategy for making women's as well as men's concerns and experiences an integral dimension of the design, implementation, monitoring and evaluation of policies and programmes in all political, economic and societal spheres, so that women and men benefit equally and inequality is not perpetuated [3].

In this case, this research seeks to investigate the impact of gender-centred approach on the conventional generator used by artisans in Nigeria.

1.1. Problem Statement/Justification

Access to quality, adequate, reliable and affordable power is a necessity to enhance the standard of living in Nigeria, especially in the rural areas. Inadequate and epileptic power supply retards economic development and this has plagued the economic development of Nigeria for decades [4]. The fossil fuel, which is the main source of electricity generation in the country is under criticism and scrutiny due to the hazardous environmental threats emanating from its usage.

Incessant electric power failures have forced Nigerians, especially the artisans into extensive use of alternative sources of power generation to support small, medium and large scale businesses to boost their productivity. Over the years, the emphasis on the alternative sources of energy for powering their businesses has been on the fossil fuel supported power generators. This implicates a host of environmental livability glitches [5]. The females are particularly affected in the sense that the conventional generating sets are too bulky and heavy to carry, as a result are tempted to use these generators indoors creating serious air pollution inside the house or building which may result to death by inhaling carbon monoxide. Another challenge is the fact that the technicality of operation may also be another disadvantage.

Gender parity is important because true progress cannot happen without a diversity of perspective roles. Any other model assures the perpetuation of the status quo with only inconsequential modification. Therefore, harnessing the almost 50 percent of the Nigerian population is key to our economic development.

1.2. Objectives of the Study

The overall aim of this project is to investigate the impact of gender-centred approach on the conventional generator used by artisans in Nigeria. The objectives of this study are:

- 1) To identify challenges that the conventional generator poses to the end users.
- 2) To identify whether there is gender perspective associated with the use of the conventional generator.
- 3) To identify and evaluate the operational and control requirement limitation of the conventional

2. Literature Review

Historically, product design thinking has always centred on product based innovation with less emphasis on the needs of the persons that will use the product. Since the concept of user-centred design has taken centre stage, attention has shifted from the product-based to human-centred aspect of design. Gender centred design is a specific user-centred design that consider the analysis of objects and the relationship between subject and object with regard to their gender.

Prior to this time, most countries, including Nigeria, believed in gender neu-

trality and thus, a lot of product design do not consider the peculiarity of the womenfolk in their usage and operation as their biological makeup is not taken into consideration. Now that the society has gradually evolved from gender neutrality to gender mainstreaming, it has become imperative to have designs that is suitable for both sexes. Gender mainstreaming tends to include female participation in social economic development of the society.

Real equality in the workplace, home and in every other area will make all of us better off. When we use the full talents of the population, our countries and companies are more productive. When men are 50/50 partners at home, marriages are stronger. When men are active fathers, their children are healthier, happier, and more successful [6].

In 2020, according to [7] [8], Nigeria's female population amounted to approximately 101.67 million, while the male population amounted to approximately 104.47 million inhabitants. The trend has remained the same since 1991 census; the population for males are usually slightly higher than the females. The approximation is almost 50 percent males and 50 percent females. In today's world, access to quality education has increased the chances of women getting well paid job, thus increasing their personal buying power. It is estimated from leading business analyst that 80% of buying decisions in private households are heavily influenced by women [9]. This interesting statistics justify the serious consideration of women values and interest in product design thinking.

There is a fundamental need to raise awareness about the issues related to gender, as well as other social categories which are intersectional, and energy poverty. In order for gender issues to be more visible, it is important to recognize that households are not a holistic entity [10].

Women are the pioneers of nation. Cultures globally attach great importance to women, comprising half of world's population. According to a report of secretary general of United Nations, women constitute 50% of human resources, the greatest human resource next only to man having great potentiality. Women are the key to sustainable development and quality of life in the family. The varieties of role the women assume in the family are those of wife, leader, administrator, manager of family income and last but not the least important the mother. Women are the key to sustainable development and quality of life. So they should be members of community centre or club to disseminate knowledge about handicraft, cottage industries, food preservation and low cost nutritious diet to people belonging to low socio economic status for their economic upliftment [11].

Designers have only recently become aware of gender as an issue that influences not only the form and practice of design, but also the effects on the application, use, and purchase of design by women and men. Gender design is dedicated to the analysis of objects (object here being the general term for all designed products, signs, concepts, and processes) and the relationship between subject and object with regard to their genderization [12].

Gender is an important part of our identity, so it concerns all of us—whether we are actively conscious of it or not. Gender-inclusive design is one important dimension of inclusive design because our design decisions in this area directly impact our users. Inclusive design is gaining attention across the industry as an approach that result in products that are more useful to even more people, and that reduces or eliminates the number of obstacles users encounter on their way to having a productive, easy, and even delightful experience. It's good for people, it's good for culture, and it is good for business [13].

Gender-Inclusive designing can be overwhelming, imagine designing a product or experience that is fully inclusive. We all have gaps in our personal knowledge or experience that leave us insensitive to the kinds of exclusion other people face on a daily basis. To overcome this will involve interfacing with the female artisans in order to boost the design and construction of a sustainable and alternative source of power generator.

3. Study Design and Method

This study was designed to explore Gender centre design using female artisans in Nigeria as participants. The conducted studies aim to identify gender problems experienced by the recruited participants in the use of conventional generators available in the country.

3.1. Participants

The participants were directly recruited at their shop across the four chosen location in Edo State. The time and date for the study (completion of the questionnaires and interview) was decided by the data collector and the participants. Four hundred and nineteen (421) participants were recruited—mainly from Benin City, Ekpoma, Auchi and Usen for the study. The breakdown shows 309 females and 112 males

3.2. Task/Data Collection Procedure

The questionnaire was titled “Gender Perspective to Design of Alternative Source of Electricity Generation Questionnaire” It comprised sections A and B. Section A focused on the socio-demographic data of the respondents such as location, occupation, educational background, marital status, age and religion while section B was made up of items specifically designed to address all the variables of the study and to elicit responses to the research question raised.

The study took place in the shop of the recruited participants in Benin, Auchi, Ekpoma and Usen. The questionnaire and interview question were administered to the participants after the ethical forms were completed before participating in the study.

The participants were given a questionnaire with three items each in the research questions as shown below. For this particular study, the research question covers two out of the five research questions formulated from the study. These

are:

- 1) Are there gender perspectives to the challenges posed by the use of the conventional generators?
- 2) What are the operational and control requirement limitations of the conventional generator?

3.3. Data Analysis

Data gathered for the study were analyzed using Independent T test, Mean and Standard Deviation. The Independent T-test was used to answer the research questions raised in the study [14] [15].

The data analysis phase involves analyzing the 2 research questions associated with the study. The questionnaire containing five-point liker scale was analysed using SPSS 25.0.

4. Results

Research Question 1: Are there gender perspectives to the challenges posed by the use of the conventional generators? (**Table 1**)

The hypothesis tested

The hypothesis tested for the three items for research question 1 includes:

- 1) No significant difference exists in the responses of the male and female participants with respect to the effect of weight of the conventional generator.
- 2) No significant difference exists in the responses of the male and female participants with respect to the effect of usability of the conventional generator.
- 3) No significant difference exists in the responses of the male and female participants with respect to the difficulties experienced in the operation of the conventional generator.

To test this hypothesis, participants that completed the questionnaire were grouped based on their gender (Male and Female) in the study. For a gender centred design perspective, It is expected that that there will not be significant differences in the responses in terms of the effect of the weight, usability and difficulties for the male and female users of the conventional generator.

Statistical analysis was then conducted in order to examine how the aforementioned issues affect the male and female participants in the study using SPSS 25.0.

Dependent variable

The mean and standard deviation of the responses on the effect of weight of the generator, usability of the product and the difficulties in operating the conventional generator for the male and female were computed, as shown in **Table 2**.

An independent t-test was run to determine if there were significant differences in responses with respect to the effect of the weight, usability and operational difficulties of the conventional generator in the two groups (male and female).

Table 1. Gender perspectives to the challenges posed by the use of the conventional generators.

S/N	Item
1	The weight of the conventional generator is too heavy for me.
2	The use of the conventional generator has an effect on me as a person.
3	The operation of the conventional generator is difficult for me.

Table 2. Gender perspectives to the challenges posed by the use of the conventional generators.

Variable	No	Male		No	Female	
		Mean	SD		Mean	SD
The weight of the conventional generator is too heavy for me.	112	3.78	1.18	309	4.22	0.91
The use of the conventional generator has any effect on you as a person.	107	2.85	1.56	309	3.28	1.50
The operation of the conventional generator is difficult for me.	112	3.11	1.20	309	3.85	1.00

A Shapiro-Wilks test (0.00) shows that normality test was violated in the responses of the participants with respect to the effect of the weight on the male and female users of the product, hence a non-parametric test, Mann-Whitney U test, was conducted on the variables. For the variable, responses of the effect of the weight of the generator on the male and female groups, the results revealed that a statistical difference exists between the responses concerning the effect of the weight of the generator in the two groups (male and female): $U = 13,839$, $p < 0.05$.

Similarly, for the usability, normality test was violated (0.00), hence the non-parametric test, Mann-Whitney U was used for the analysis. For the variable, responses of the effect of the usability of the generator on the male and female groups, the results revealed that a statistical difference exists between the responses concerning the effect of the usability of the generator in the two groups (male and female): $U = 14,078$, $p < 0.05$.

Similarly, for the operational difficulty, normality test was violated (0.00), hence the non-parametric test, Mann-Whitney U test was used for the analysis. For the variable, responses of the operational difficulties of the generator on the male and female groups, the results revealed that a statistical difference exists between the responses concerning the effect of the operational difficulties of the generator in the two groups (male and female): $U = 11,441$, $p < 0.05$.

Research Question 2: What are the operational and control requirement limitations of the conventional generator? (**Table 3**)

Table 3. Operational and control requirement limitations of the conventional generator.

S/N	Item
1	There are no operational and control issues with the conventional generator.
2	The method of switching on the generator is a major issue.
3	Making changes to these operational issues will improve my use of the generating set.

The hypothesis tested

The hypothesis tested for the three items for research question 1 includes:

1) No significant difference exists in the responses of the male and female participants with respect to the operational and control issue of the conventional generator.

2) No significant difference exists in the responses of the male and female participants with respect to the effect of switching-on of the conventional generator.

3) No significant difference exists in the responses of the male and female participants with respect to making operational changes of the conventional generator will improve the usability.

To test this hypothesis, participants that completed the questionnaire were grouped based on their gender (Male and Female) in the study. For a gender centred design perspective, It is expected that that there will not be significant differences in the responses in terms of the operational and control issue, effect of switching-on and making changes of the conventional generator will improve usability for the male and female users of the conventional generator.

Statistical analysis was then conducted in order to examine how the aforementioned issues affect the male and female participants in the study using SPSS 25.0.

Dependent variable

The mean and standard deviation of the responses on the effect of no operational and control issues with the conventional generator, method of switching on the generator is a major issue and making changes to these operational issues will improve my use of the generating set for the male and female were computed, as shown in **Table 4**.

An independent t-test was run to determine if there were significant differences in responses with respect to the effect of no operational and control issues with the conventional generator, method of switching-on of the generator is a major issue and making changes to these operational issues will improve my use of the generating set in the two groups (male and female).

Shapiro-Wilks test (0.00) shows that normality test was violated in the responses of the participants with respect to the effect of no operational and control issues with the conventional generator, hence a non-parametric test, Mann-Whitney U was used for the analysis. For the variable, responses of no operational and control issues with the conventional generator on the male and female groups, the results revealed that no statistical difference exists between the responses concerning the effect of no operational and control issues with the conventional generator in the two groups (male and female): $U = 16,281, p > 0.05$.

Table 4. Operational and control requirement limitations of the conventional generator.

Variable	No	Male		No	Female	
		Mean	SD		Mean	SD
There is no operational and control issues with the conventional generator.	112	3.00	1.21	309	2.87	1.22
The method of switching on the generator is a major issue.	112	3.37	1.22	309	3.86	1.01
Making changes to the operational issues will improve my use of the generating set.	112	4.13	0.80	309	4.30	0.72

Similarly, for the method of switching on the generator is a major issue, normality test was violated (0.00), hence the non-parametric test, Mann-Whitney U test was used for the analysis. For the variable, method of switching on the generator is a major issue on the male and female groups, the results revealed that a statistical difference exists between the responses concerning the effect of method of switching on the generator is a major issue in the two groups (male and female): $U = 13,417$, $p < 0.05$.

Similarly, for the making changes to these operational issues will improve my use of the generating set, normality test was violated (0.00), hence the non-parametric test, Mann-Whitney U test was used for the analysis. For the variable, responses of the making changes to these operational issues will improve my use of the generating set on the male and female groups, the results revealed that a statistical difference exists between the responses concerning the effect of making changes to these operational issues will improve my use of the generating set in the two groups (male and female): $U = 15,360$, $p < 0.05$. After the text edit has been completed, the paper is ready for the template. Duplicate the template file by using the Save As command, and use the naming convention prescribed by your journal for the name of your paper. In this newly created file, highlight all of the contents and import your prepared text file. You are now ready to style your paper.

5. Discussion

The results from the statistical analysis conducted on the two research questions comprising three items each revealed a significant statistical difference exists between male and female responses in all the items in research question 1 while there exists a significant difference in 2 (two) out of the 3 (three) items in research question 2.

Specifically, significant differences exist in terms of the responses of the male and female based on the effect of weight of the conventional generator. This clearly demonstrates that, even though the male and female responses were above the cluster mean value of 3, the female responses were significantly higher

in terms of the effect of weight of the generator compare to the male. That shows that the weight of the generator is actually a problem to both genders, but significantly affects the female more than the male. Consequently, there is a strong need to consider the redesign of the current generator to accommodate changes in the weight of the generator.

Similarly, the same relationship exist for the other two items (usability and difficulties) in research question 1, resulting in a strong need to redesign the conventional generator to make it more usable and less difficult for the female users of the product.

For the second research question, 3 (three) items were examined. The result clearly shows there are no significant differences in the responses of the male and female in terms of the operational and control issues of the conventional generator, while there are significant differences in the method of switching on and making changes to the conventional generator will improve its use. The result of the first item in research question 1 reveals that the male and female users of the generator are very comfortable in terms of the operation and control mechanism of the generator. The results for the items 2 and 3 of research question 2 clearly shows that, even though the male and female responses were above the cluster mean value of 3, the female responses were significantly higher in terms of the effect of the afore-mentioned issues compare to the male. These shows that these identified issues of the generator is actually a problem to both genders, but significantly affects the female more than the male. Consequently, there is a strong need to consider the redesign of the current generator to accommodate changes in terms of the gender related issues identified in the study.

6. Conclusion and Future Work

In particular, the gender perspective looks at inequalities in status and power that exist between men and women, as well as how much discrimination affects both the immediate needs of women and the long-term interests of men and women. Discriminating against the female gender in terms of product designs will have a negative impact on the overall performance of the society and nation's development considering that the population ratio is almost 50-50. Harnessing the also 50 percent of the Nigerian population is crucial to our economic development and hence the need to develop a fuel-less generator that will be gender inclusive to provide the needed essential power and electricity for small business holdings comprising of females (artisans) to contribute their quota to the development of the economy.

The research team intends to do a follow-up study on the design and construction of a fuel-less generator to accommodate the solution to the aforementioned issues in the current study.

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Conflicts of Interest

The authors declare no conflicts of interest.

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