ROLES OF WOMEN IN TECHNOLOGICAL CHANGE, RESEARCH AND DEVELOPMENT

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ABSTRACT

Technological change, research and development are the three major things that build or develop a nation or society. This study aims at revealing the roles of women as related to the above subject matter. They play a major role in the society by combining their career with their domestic chores as wives and mothers, thereby neglecting their contribution to the development of the society or nation. Globally, the population of women is larger than that of men, thus, its impact cannot be overemphasized. This paper looks into the gender gap, its constraints and how to overcome them. Also, the effective roles of women in societal development were outlined and solutions and suggestions on how they can be fully involved in the ongoing technological change and societal development were presented. Thus, enhancing women interest in science and engineering could improve innovation and problem solving skills.

KEYWORDS*: development, nation, society, technology, women*

1   INTRODUCTION

Women play a major role in the society by combining their career with domestic chores as wives and mothers, thereby neglecting their contribution to the development of the society or nation. In some organizations, women find it difficult to gain employment due to several factors. Enhancing women's interest in technology and research could bring about the development and innovation we all desire.

There are few women who study STEM (Science, Technology, Engineering and Mathematics) courses. However, employed women are few in the field of engineering and some employers do not even wants to employ female. Recently, other nations are advancing in technological innovations and we on the other hand, are low on the global innovation index. According to a research, women make up 22% averagely of the total number of engineering and technology graduates yearly. Also, if care is not taken, most of the jobs in the decade will require good knowledge and technological skill. If women are not carried along, as technology developers and users, we might be lagging behind in future. (Women's Technology Empowerment Center, 2016)

If Nigeria needs to attain a long lasting development, role of women in technological change, research and development should be a major concern by government for companies and civil society. Research shows that any nation or society that fails to harness the energy and creativity of its women is lagging behind in the modern day. Problems of low involvement seem to be developed from the lack of exposure of women to prospective careers in Technology, Engineering, Mathematics and other science related courses. Therefore, women should be encouraged to take part in STEM courses as soon as they get of age and thus ensure equal participation of both female and male students so as to promote career discovery right from a young age. (Women's Technology Empowerment Center, 2016)

The profession of engineering is changing with less emphasis placed on the older heavy types of engineering. In its place are computers and chips, printed circuit boards, programming, design and electronics. Women in engineering are not dramatically different from women in the more traditionally feminine fields, or from their male engineer counter parts. Based on research, women did not seek or find career success for several factors. One was that the women learnt that high achievement might be a loss of their traditional feminity which was preferred, was thus preserved while achievement was sacrificed. There are no serious sex-related individual differences between women and men's behavior at work. Lack of the opportunity to succeed and not a personality style shuns success; thus,

separates the women from men. This study is aimed at revealing the relevance of women in Technology, Research and Development.

2   LITERATURE REVIEW

2.1   Gender Gap in Engineering

Women should be able to contribute to policies and decisions on issues that affect them. That seeks to address women's challenges in contribution to policies and decisions but fail to do so effectively because they were designed by men. Women, who chose engineering career, should be encouraged to get involved in the design of technological innovations that are primarily meant for women including in the field of health sciences and medical innovations. (Nakafeero, Okello, Kazanka, Mandlate, Bantebva, 2013)

In the northern part of Nigeria, though they have a large number of females schooling; there is little participation of the females in the field of engineering, which gives a huge gap from the males participating in the engineering field. A research shows that there is more gender disparity in northern Nigeria, the global ratio of women studying and pursuing carriers in Engineering to men to be around 1:4 and due to a lot of issues concerning delivery mechanism, home condition, community and environmental influences which combine to create a lot of barriers for girls to study and pursue carriers in Engineering. (Nakafeero *et al.*, 2013)

In Nigeria, according to the National Bureau of Statistics, women make up on average just 22% of the total number of Engineering and Technology university graduates each year. Research has shown that better and more useful tools are created when the developers fully represent the diversity of the societies we live in. Also, if care is not taken 90% of the jobs in the next 10years will require technology skills and knowledge. If women are not well represented as technology users and developers, we will be left behind in tomorrow's world. National Bureau of Statistics has it that women make-up roughly a fifth of the total number of people working in information and communication technology sector. (Women's Technology Empowerment Center, 2016)

In some Nigerian culture men control the fertility of their women; which means that childbirth may limit their ability to engage in productive activities. Even after the provision of reproductive health services, this is not enough to ensure women's ability to access them. Men in some cultures may see the decision over when and when not to have children to be their decision and large numbers of children may be read as a sign of male fertility and power, which becomes more important when masculinity is threatened. (Bradshaw, Castellino, Diop, 2013)

In the majority of cultures there is unequal gender and generational relations exist within most of the households where the 'head' of the family is said to be males. In some, women going to work may be interpreted as the man's inability to make provision for the family and cater for their needs. This makes some men reluctant in allowing their wives to be working class personality and thus reducing women's working class population. Often when women get involved in jobs or are working class personalities, it can improve their ability to take decisions in the households. Though it may lead to dispute between couples especially when the wife earns more than the husband, or if the woman is employed and the man is unemployed. (Bradshaw *et al.*, 2013)

(Soto, 2017).Women choosing these educational paths and careers face many obstacles, starting with the stereotypes affecting girls and including the prejudice women face when they choose a field of study and the difficulty of combining their career with family responsibilities. Being a mother, may limit women from participating in science, and the circumstance is inevitable. Some women find it difficult to combine taking care of children and pursuing their career, raise funds, and so on. However, none of this is taken into consideration by some employers; where mothers might not be fully chanced unlike single persons who have much greater availability and flexibility. But motherhood should not be an obstacle to a woman's career development. There should be a positive change in the participation of mothers and women in general, to increase the percentage of women scientists at higher levels, and make sure that women can manage both their motherhood and career wisely. (Soto, 2017)

2.2 The Effective Role of Women in Societal Development

Most societies that have gender disparity tend to have less rapid economic growth and poverty reduction than societies that have gender equality, and that social gender disparities produce outcomes that are not economically efficient. (World Bank 2001a) as cited in (Bradshaw *et al.*, 2013)

Historically, the central role of women in society has ensured the continual stability, achievements and lasting innovative advancements of several nations. Women especially mothers, play a larger role in decision-making about family meal planning and diet. Also, women have good initiatives in child care and nutrition of the children. (Gran, 2019)

2.2.1 Role of Women in Technology

(Ash, Gann, Dodgson, 2017) Women may hold up half the sky, according to a Chinese proverb, and make up half of the total users of technology, but they are not well involved in the present day technology and entrepreneurship. This is not convincing and should be of major concern in our society. It is dangerous to technological development, making the society to be lagging behind in economic progress. When airbags began to be introduced into vehicles, the past experience revealed that women and children were injured due to the fact that they were designed by and tested on men.

Technology companies managed by women, gets greater return on investment than technology companies managed by men. According to Forbes, it is found that technology entrepreneurs that are women, despite having a low venture capital funding, produce more revenues than their male technology entrepreneurs. (Ash *et al.*, 2017)

(Afolayan, 2017) The role of women can never be over emphasize in the present day growth, because the world becoming a much better place with advance in technology and the role of women, women have a vital role to play in Information technology sector, but the women are less involved in the sector than men. Therefore, women need to set their priorities right craving to achieve more in this sector. Women are needed to get involved in this sector. There is a great desire for women who can improve our present day technology. Women should emulate the likes of Mark Zukerberg, Bill Gates and make their marks even more than these men. Women need to show that there is no sector they can't work with. Women generally should be encouraged to get involved in Information Technology sector.

2.2.2 Role of Women in Research

Huyer (2015) as cited in Kenny and O'Donnell (2017). There are fewer Women researchers in the present day compared to the researchers which are men. In the United Kingdom, women have few women researcher positions, who have low number of publications and patents. Also, Germany has a very low figure of publications and patents from women researchers (Schiebinger, 2010) as cited in Kenny and O'Donnell (2017). Women are less involved at each level of the research hierarchy in the United State; there are a larger number of women that assistant professors to full professors (Schiebinger, 2010) as cited in Kenny and O'Donnell (2017). The situation is worse in the private sector: in engineering, women have lesser number of paper authorship in universities and governmental institutes, also a very low figure in industry (Ghiasi et al., 2015) as cited in Kenny and O'Donnell (2017).

Kenny and O'Donnell (2017) A significant increase in positive change and effects can be gotten from the increase in women's involvement in research. The current imbalance in research and innovation is driven by both implicit and explicit bias that leaves the field with a lower quality human capital stock than would exist absent such discrimination (Moss-Racusin et al., 2012) as cited in Kenny and O'Donnell (2017). In addition, male and female engineers that collaborate with both genders are about twice as productive (producing more articles that are more cited) than those who only collaborate with one gender (Ghiasi *et al.*, 2015) as cited in Kenny and O'Donnell (2017).

2.2.3 Role of Women in Development

For any society to be developed there has to be contribution of every citizen of that society. Women are part of this numbers and research has it that women are the larger part of the world's population. A society where, most citizens do not participate or get involved in its development, they would yield a low outcome. Here are some of the women who contributed to the development of their nation;

(SudyMoose, 2016) talks about Olufunmilayo Ransome Kuti, the wife of the renowned reverend Israel Ransome Kuti, who organized a lot of campaigns against colonial rule. Ellen Johnson-Sirleaf of Liberia who became Africa's first female head of state, helped Liberia nation in advancement over the last decade. These women were able to rise above the limiting factor of their gender to contribute greatly to nation building in their time.

Women involvement in societal market, develops the nations' economy rapidly, Women's economic participation decreases the dependency ratio and increases the proportion of wage earners to dependents. Women are also more likely than men to reinvest their earnings to benefit the family. (Cheryl *et al*., 2008)

Research showed that campaigns led by women across the globe are more successful than the campaigns led by men across a wide range of sectors, geography and cultures. Gender disparity should not be encouraged at any level. (Ash *et al*., 2017)

3. SOLUTIONS OR SUGGESTIONS ON HOW WOMEN CAN BE FULLY INVOLVED IN THE ONGOING TECHNOLOGICAL CHANGE AND SOCIETAL DEVELOPMENT

Having considered all these, the following solutions can help bring up the high involvement of women in technology, research and development. In summary, it is high time our society feel the effectiveness of the role women play in nation building though their involvement in technological change, research and development. Also, women should not allow the act of motherhood to affect our impact to our society. Young girls must be encouraged to develop interest in STEM subjects from an early stage because these girls are the women of tomorrow. To achieve this, women should be actively engaged in every field and organization. Teachers taking STEM subjects at the primary and secondary level should make the subjects interesting to the young ones so as that they can key in into the goal and not scare them. Government and private employers in the field of tech should give more room for female folks to be employed and also be allowed to occupy leadership positions.

There is a need to have a well structured and long lasting plan for the women and productive efforts, from schools, to universities and workplaces, to encourage women into technology careers. Research by PwC into over 2,000 school and university students shows the gender gap in technology starts early in their education and carries on through every stage of women's lives. Girls are less likely to study STEM subjects at school, and this gap continues through to tertiary institutions. Over a quarter of women students say that they lack interest in pursuing a career in technology because they view it as too male dominated. We urgently need talented women role models in tech to challenge this perception. (Ash *et al*., 2017)

4. CONCLUSION AND RECOMMENDATION

4.1 Conclusion
Nigeria has the potential to be a global power, if we embrace and invest heavily in technology and innovation. Women's voices are essential to the problem solving and innovation that is at the heart of Engineering. Enhancing girls' interest in engineering could improve innovation and problem solving skills.

4.2 Recommendation

We need to do more, as both a society and an industry, to encourage girls to engage in STEM subjects in Schools. Support should be given to women pursuing engineering degrees in tertiary institutions and provide them with opportunities to thrive in their workplaces. Organizing several initiatives and going to Secondary Schools to organize career talks and` encouraging girls to study Science, Technology, Engineering, and Mathematics subjects.

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