THEMATIC ANALYSIS OF FEMALE SOFTWARE DEVELOPERS' WORKPLACE EXPERIENCE IN NIGERIAN COMPANIES

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Abstract

The low representation of women working as software developers around the globe has been a significant issue over the years especially in a developing country like Nigeria. This inadequate representation leads to software applications and programs being partial to end-users along with preventing women from benefiting from one of the current most lucrative career opportunities. Some software development start-ups in Nigeria have received about $1.8 billion in funding in the year 2021 and just 27% of the start-ups that received the money have at least one woman as a founding member. Different barriers have been in existence to discourage women from pursuing a career in the field worldwide like a glass ceiling, and significant pay gap against the male counterparts. These barriers are now being lifted at a slow rate with the help of different Non-Governmental Organisations (NGOs). The aim of this study was to interpret and understand the different experiences some of the few female programmers have had around the workplace while working for Nigerian companies. A pilot study was conducted among 6 female programmers in order to improve the questionnaire. The final questionnaire was sent out via LinkedIn, WhatsApp and Twitter to some female programmers but only 6 responded. A thematic analysis was conducted from the information the various participants submitted to locate and understand the recurring themes amongst their experiences. The thematic analysis revealed 4 key themes which includes: Career transition; Financial stability; fulfilment; work life balance; Professional Culture & Gender stereotype and Fulfilment. Most women stated they transitioned into the programming space after coming across the information from friends and family. The major influence was the financial stability and the fulfilment of solving problems the field provide. Their experience has been negatively influenced by the poor work life the field provided. Gender stereotype was also highlighted as a core reason as why other women do not venture into the space.

Keywords: Female developers, workplace experience, female workplace experience, Nigerian developers.

1 INTRODUCTION

Software developers also referred to as programmers, coders or even software engineers in developing countries especially Nigeria are greatly underrepresented by females (Machando et al, 2021). The occupation of developing software does not fully represent those who make use it and gender is the most applied category of diversity dimension within software development (Albusays et al., 2021). According to a report published by Statista (2021), just about 5% of the profession is being occupied by women globally although women occupy about 46% of the world's total working population (The World Bank, 2022).

Over the years, the software industry has been considered as one designed just for males to occupy (Izquierdo et al., 2019). Programming used to be seen as an average woman's job before the 1980s, after which it was then rebranded as a task that required the perception of men (Ensmenger, 2015). This implies that women are at a great disadvantage in benefiting from one of today's most lucrative career opportunities (Davies et al., 2002). Research conducted in this area, such as the work of (Organisation for Economic Cooperation and Development, 2017) highlighted that one of the major reasons why there is insufficient representation of women in the software industry is due to the choice of professions they set out to pursue at a younger age (Malik and Al-Emran, 2018). This path which has been greatly influenced by teachers, friends, family members and the other non-attractive ways in which programming has been sold to them (i.e., long hours, male-only space) leads them toward non-Science, Technology, Engineering and Mathematics (STEM) and traditional gender occupations like Secretaries, Hairstylist and Human Resource Managers directly from the junior school (Vitores and Gil-Juarez, 2016; Solberg et al., 2012). This absence of women software developers has been known for quite some time and even around December 2020, a top researcher was laid off for condemning the lack of

representation of women in Google and postulating that the underrepresentation will lead to Artificial Intelligence (AI) systems being biased (Klinger and Svensson, 2021).

Nigeria has about 202 million citizens in total and about 49.3% of the population are women (The World Bank, 2019). These women also account for approximately 48% of the total labour force in the country (The World Bank, 2022). However, this does not reflect in the statistics of the software development industry. The situation in Nigeria compared to other countries of the world is no different as women in the country are also a minority in the programming world (Abdulazeez, 2019). The country presently has approximately 85,000 software developers working and just about 18% of them are women (Nairametrics, 2021).

Even though the country is underdeveloped, some software start-up companies still managed to attract about $1.8 billion in funding from Venture Capitalists (VC) in the year of 2021 (Partech, 2021). Partech (2021)'s report showed that just 36 out of the 185 equity deals included a female as a member of the founders. This implies that just a few women will be benefiting from and contributing to the growth of the software economy space in the country. Several Non-Governmental Organisations (NGOs) in the country have taken it upon themselves to support and encourage women to get into the coding space like Code IT, Inspire IT, Pearls Africa Foundation and so much more (Abdulazeez, 2019). This is also to leverage a major advantage the field has recently developed, as it does not necessarily require a higher education certificate before one can venture into it and permits belated entry through self-study and boot camps (Pruitt, 2019). Women getting involved in software development roles will not only increase productivity in the sector but also influence the design of products and hence incite economic growth (Powell and Chang, 2016).

The underrepresentation of women as software developers is a popular knowledge and as a result, quite a few studies have been done around why they are still a minority in the field like (Chaudhry et. al, 2019; Srivastava, 2019), especially in the western world. Patel and Parmentler (2005), predicted that the inclusion of women in the IT sector could change their socio-economic status in the world since the industry is seen as the "gender equaliser". For this reason, it was now evident to conduct a study on the workplace experiences of some of the few women that are currently software programmers in the country.

This paper intends to interpret and understand the experiences of the current female developers in Nigeria companies. The factors or themes discovered in the study can then be further explored on by other researchers. Interpretivism paradigm was used in this research. This approach was more concerned with the in-depth factors and influences related to the experiences and actions the female software developers took (Alharahsheh and Pius, 2020). A primary qualitative approach was taken in other to acquire their responses which was then analysed.

2   AIM AND RESEARCH QUESTIONS

This research aims to assess the experiences of the current female programmers around their working environment at Nigerian Companies.

In other to explore the experience of female software developers in their working environment in Nigerian companies, a few questions stand out:

1   What are the reasons females decide to pursue a career in software development?

2   What are some of the challenges they face in the work environment as female software developers?

3   What were some of the barriers they encountered on their journey to be software developers and how did they overcome them?

4   How can they be better supported as female software developers to encourage more females in the field?

3   RELATTED WORK

Encouraging gender inclusivity amongst a team of programmers is a major advantage for companies and organisations, from how platforms are designed and maintained to how they impact the way end users communicate effectively (Smith and Swamy, 2016; Klinger and Svensson, 2021). A study conducted by Malik and Al-Emran, (2018) at the Buraimi University College in Oman found out that women are very much interested in being software developers which contradicted studies made in

western regions where the dominant perception is that females are not interested in the software development department.

According to Nguyen (2018), women in the coding sector are encouraged to have at least one mentoring relationship for different environments and a minimum of one encouraging relationship around them. These relationships can assist them in achieving more personal accomplishments as they develop in the field. This research also supports one of the results Klinger and Svensson (2021) found in the study they conducted on the aspects of why women are less likely to come into the software industry in some countries outside Africa. Some other aspects the study found include the lack of role models for women, the culture of the profession which does not enable them to have time for other aspects of their life and the existence of stereotypes like men being more technical than women.

Even though some women are entering the software development atmosphere, the training they receive, the contracts they sign, and even wages are not as good when compared to their counterparts (Alegria, 2019). Female programmers were found to earn about 24.36% less than their fellow male counterparts in India (Rahul and Srivastava, 2022). The study also found women to be highly represented at lower to intermediate levels in the field and are not well represented at higher positions which exhibits the presence of glass-ceiling. Algeria's (2019) study also shows women are also more likely to be promoted into managerial roles which contradicts the opinion that the programming world is seen as a field that does not discriminate regarding gender. When compared to other industries in developed countries like financial institutions, the rate at which women move into programming is less and thus, the field is far from breaking the gender bias in India (Patel and Parmentler, 2005). Wandari et al., (2021)'s study on how the work environment influences productivity concluded that having positive working environment will have a positive significant effect on the productivity of any employee in general. If the employees are productive, it will influence the organsations growth and in consequence economic growth.

Mochetti, (2019) conducted a study to shed lighter on women who have been significant to the software development world. The research also appealed for the inclusion of women in the histography of the field. Davies et al., (2002)'s research looked at reasons for the occurrence of low representation by women pursuing programming because the gender disparity is present which is a concern for the future of human beings. The research reviewed principal factors that discouraged women from the field, which also corresponded with the study of Malik and Al-Emran (2018). Some solutions were suggested like the launch of The Virtual Family project that was introduced in Canada to get young females to give programming a try (Davies et al., 2002).

Women have also been proved to have their pull requests being more accepted in an Open-Source community such as Stack Overflow and GitHub across different programming languages like JavaScript, Python, Java and Ruby amongst others than men especially as they gain more experience (Terrel et al., 2016). The changes they make are also larger compared to men which also implies they take more risks and are more competent. Digital literacy programs and awareness in Indonesia have been targeted towards women (Suwana, 2017). This is because the women are the ones who mostly monitor the children and they will be able to influence them especially the females to become competent developers.

Unlike similar previous studies conducted in developed regions of the world, this paper explored the experiences of the female programmers via a qualitative approach and analysed the responses using thematic analysis. This paper fills the gap of the absence of variable around their experience in the country. The findings of this research will be used to promote further research in the field.

4 METHODOLOGY

4.1 Research Paradigm

The Interpretivism paradigm was selected for the research method of this study. This approach maintains that there is no unbiased reality but multiple views of social reality and to make meaning from the individuals in this research (Bonache and Festing, 2020). This study attempts to understand and analyse some of the experience's women have had in the workplace environment at Nigerian companies as software developers.

4.2 Methodology Rationale

The Interpretivism paradigm is usually supported with a qualitative method in other to gain full in-depth knowledge and understanding with respect to the circumstance participants might be in (Thanh and

Thanh, 2015). A primary qualitative approach will be used in conducting this research to gain an understanding, interpret and later describe the different perspectives of the female software engineers working for some companies in Nigeria. This method will be the most suitable for this research because their experiences in this part of the world are yet to be known. Hence, the variables around their different circumstances have not been determined.

The questionnaire design that will be distributed is going to be in an unstructured format, so as not to influence or limit the opinions the participants might have, and additionally get narrative feedback of their experience (Johnson and Christensen, 2014, p.103).

4.3 Research Methodology

This study focused on observing and interpreting the different emotions and perceptions of the participants of this research in an effort at getting a real stance on their experience. The subjects of the research are women who have been coding for at least 3 months and working for a company in Nigeria. Recurring themes and patterns will also be identified and interpreted across all participants.

Their various perceptions of the research questions will be collected via Google forms sent from different social media and communication platforms like WhatsApp, Twitter, Email, LinkedIn, and Instagram.

4.4 Pilot Study

A pilot study which was a small important study to test the research questions and instrument was conducted in preparation for the final study was conducted (Hassan et al., 2006). This study was carried out on a sample 6 software developers who have been in the field for at least 3 months. Unstructured questionnaires were sent to them in other to their experience in the field so far. The responses generated from the participants was used in modifying the questionnaire to meet the aims of the research question of this study.

4.5 Thematic Analysis

This was the process of picking out, interpreting, and making sense of the important patterns and/or themes amongst the data collected from the various participants (Maguire and Delahunt, 2017). The goal of this analysis was to identify themes of the data collected from participants and hence make sense of them.

The steps that were taken to analyse the various results from the participants was derived from Braun and Clarke's (2006) framework and they include (McWalters, 2020):

- Becoming familiar with the data collected:

  This first step will be the foundation of the analysis. It entails actively reading the data collected from the different participants to understand their different perspectives.

- Generating initial codes:

  This phase required the data to be sorted out into a meaningful and systematic way. This way, lots of data was narrowed down into meaningful small bits. Qualitative data analysis software like Microsoft word and NVivo was also used to assist with this process.

- Searching for themes: The codes generated will be organized and then identified into preliminary themes. The themes are patterns that represent significant information from the data collected.

- Reviewing the themes: At this phase, the themes identified earlier was evaluated, improved and then developed with respect to the research questions to ensure they are significant to the study.

- Defining and themes: This stage was where the themes will be filtered with the purpose of identifying what each theme is about.

- Drafting the report: This was the final phase of thematic analysis. The research paper will be generated from all the themes generated from the data the participants submitted.

5 RESULTS

The generated themes from the responses the participants provided will be discussed. The themes are procured through an inductive thematic analysis of the narratives derived from the unstructured

qualitative interviews. The data was analysed to answer the aims of the study. Irrespective of the fact that the field was not the primary career path for most of these women, it has offered them prospects for financial stability and sense of fulfillment by solving people's problems. They are still not certain if they will stick to coding in the long run due to the poor work-life balance they are experiencing and other feminine stereotypical roles.

5.1 Theme 1: Transition

Many participants explained that software development was not their first-choice career and they just transitioned into the field recently. For example, a participant mentioned she picked it up recently when asked if it was something she always wanted to do:

No, I picked up interest in it during the lockdown. [P1]

Some parents of the participants tried to get them to study non-STEM course while in secondary school and most did not even study the software development or any computer related study while at the university. They eventually got to know about programming from friends and internet. The necessary skills needed were developed by taking up courses on online educational platforms like Coursera, Udemy and EdX. This method is being encouraged due to the nature of the industry being accessible without the need of a university degree and belated entry through self-study and bootcamps. A participant highlighted how easily accessible the information to aid her transition to the industry was:

It is really accessible online…Go to Google, tech platforms like Udemy, etc. [P6]

Another participant highlighted experiencing inconvenience while trying to get access to some of the necessary materials and information needed to transition into the field. Despite the difficulties, male counterparts assisted in easing the process.

Well, it was not really accessible because I didn't get a lot of information as I should have. I noticed my male counterparts learnt faster and got better than I did. I didn't let that discourage me though. I approached them whenever I thought they had information I needed, and they helped in ways they could. [P2]

5.2 Theme 2: Finance

In this body of work the financial benefit and hinderance of being a software developer was constantly reoccurring. Acquiring Laptops, subscribing for data, fueling when there is no electricity supply and paying for online courses are not cheap especially with the current economic situation in Nigeria. This is amongst the factors that does not make it easy for women to go into programming.

Money to start - I got help from people via God [P6]

This was frequently expressed as one of the major reasons that influenced their decision to transition into the field especially during the COVID-19 lockdown where they were able to work remotely.

No. Programming for me is not passion but a means of survival [P3]

Solving problems using programming skills helps me to improve on my learning daily. I also get to work with intelligent people and learn from them. I have the opportunity to make life better for people by solving real life problems with my skills. I also have the opportunity of being paid well to take care of myself and my family. [P2]

Even though the entry barrier on entering into the field is low, money was still needed to get equipment like laptop, pay for online courses, internet plan and back up electricity especially in a country like Nigeria with poor infrastructures. Some of the participants found it difficult to get the necessary equipment and resourced

Money to start - I got help from people via God [P6]

Despite the monetary problem, women have mentioned the financial stability the career provides is one of the reasons they are transitioning into the field:

Finance, well I'm still struggling but I mostly take up jobs outside tech.[P1]

On getting into the field the monetary incentive seemed to be the biggest motivation for continue in the field

… I also have the opportunity of being paid well to take care of myself and my family. [P2]

… Asides the high income, it is a way of me proffering solutions to people's problems using tech [P6]

5.3   Theme 3: Work-life balance

Poor work-life balance was frequently discussed by most of the participants. They pointed out that the poor work-life balance has enforced them to change their lifestyle:

A whole lot, I have tended more towards low cut hair styles or wigs because I devote most times to learning and completing tasks. I am rarely seen outside [P3]

This poor balance has also negatively influenced the way they envision their future in the field as they feel this lifestyle is not healthy enough for them:

To be honest, I don't know. I do know I don't intend doing this for the rest of my life. I am looking forward to being able to rest well and live better generally and having a more healthy work life balance. I am looking forward to having enough financially and able to interact more with people than with computers in the long run [P2]

It has been hard getting a healthy work life balance. I work at a start-up so there are high expectations and I tend to overwork to meet those expectations [P3]

5.4   Theme 4: Professional culture & pervasive stereotype

Pervasive stereotype of the programming world was identified in the responses the participants provided. This was frequent when asked about the reasons why women tend to not to migrate into the programming space. One of the participants highlighted it was because women do not task their brain enough

Women can be lazy when it comes to brain work [P4]

In addition to that, some others highlighted it was the way the industry has been portrayed to the public, the harassment and the unequal opportunity provided to them

They believe it is too difficult…They believe it is for guys only…Some even have tech apathy while others believe that it is not just for them [P6]

The stress involved, the inconsiderate behaviour of several organisations, sexual harassment, being looked down on by colleagues, managers and junior developers, not giving the same opportunities offered to the men, to the women and a lot more. [P2]

… A woman that cares about beauty and lifestyle might have a tough time coding [P3]

5.5   Theme 5: Fulfilment

In addition to the monetary benefits that motivates the female programmers in the field, the satisfaction of solving other people's problems was frequently mentioned. This

Networking with great minds and it's amazing when you realize the number of things you can build with technology. [P1]

… I have the opportunity to make life better for people by solving real life problems with my skills. [P2]

I've been to able to put my ideas into fulfillment [P5]

Asides the high income, it is a way of me proffering solutions to people's problems using tech [P6]

In addition to the themes generated from the responses, a word cloud as shown in Figure 1. below was also generated from their responses so show the frequent words that appeared in the data:

Figure 1: Word cloud of responses from the participants.

6   DISCUSSION

The first theme clearly demonstrated women did not see software development as their first choice of career. This could be due to the lack of female role models in the field, perceived professional culture and the poor work life balance they might experience once in the field. Seibel and Veilleux (2019) research findings is similar to this theme. Their study also discovered that women entered the software development field via knowledge gained from bootcamps after understanding what the industry entails. This decision to transition into the field was also influenced by having support from friends and family.

Being one of the most lucrative jobs currently in the world is a big driving force for women to transition into the field (Lyon and Green, 2021). Theme 2 was also similar to the observation Schnell (2019) made, where it was highlighted that most women observed a significant increase in salary when they became software developers which they found "liberating".

Schnell's (2019) study found shocking result that women ventured into programming world because of the good work life balance it provides. This result contradicted the theme 3 of this study where the work life balance was indicated as the major influence women might not stay in the space for long. The unhealthy work life balance has negatively influenced the experience the participants have as being a software developer. They mentioned they barely interact with people outside the screens of their computer and they have resulted in stopping to care about their beauty and lifestyle. Some do not see themselves working in the field due to this reason. Manasa and Showry's (2018) study however corresponded with this theme, as it was highlighted that 48% of Indian women left their jobs in the sector due to poor work life balance compared to 25% of men that quit for the reason.

Theme 4's "Professional Culture" is similar to the theme discovered in Klinger and Svenssson (2021) study on why women leave the software development at a higher rate than men. The professional culture of the field does not seem to be conducive for women especially in Nigeria where the gender roles are still very much effective. This could be as a result of women still being are severely underrepresented in the software development space in Nigeria. Hence, enough awareness and development has not taken place in other to change the narrative. Some NGOs like Afro-Tech and WITIN (Women In Technology In Nigeria) have taken it upon themselves to and encourage and educate more women into the programing world. However, there is significant lack of study of experiences the current female programmers experience. Bridging this gap will give more insight into how their experience can be made better and other research can be built on it.

Lyon et al., (2018)'s study contradicted the opinion that women do not like brain work. Tinkering which involves critically examining codes is one of the activities involved while learning and developing programs. This act was found more effective when performed by women.

In addition to the monetary incentives the field has to offer, the fulfillment of solving people's problems using codes is also one of the major benefits to them being in the field. This implies that if more women are exposed to what programming can be used for, the assumption most women have about the field might change. This can therefore lead to their socio-economic status being changed in the society as Patel and Parmentler (2005) predicted.

7   RECOMMENDATIONS AND FURTHER STUDY

In addition to the results obtained from this study, some of the recommendations to make women's experience a better one includes:

- Educating females on how coding can be used to solve problems around them.
- Providing equal opportunities to them as their male counterparts.
- Provide female mentors and role models to them so they can see practical examples of how women are excelling in the area.
- Providing and/or subsidising cost laptops, data bundles and courses for them.

Organisations should create and promote health work life balance amongst their employees.

8   CONCLUSIONS

Women are gradually migrating into the software development field but at a much slower rate compared to the rate at which they are entering other male dominated fields. This means that their contribution to end user products is limited and will also be left from benefitting from one of the world's most lucrative profession. This research explored the experiences of a few female software developers currently working in Nigerian companies via thematic analysis. The analysis was used in order to generate common themes and factors that influenced the subjective experiences they have. The research highlighted most women did not initially have an interest in software development and recently transitioned into the field after getting to know the advantages being in the field. The financial incentive in the area was a major catalyst for the transition, irrespective of that, they do not see themselves working as programmers for long due to the poor work-life balance they are experiencing.

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