

Nigeria Software Industry: Challenges and Potentials for Sustainable Growth

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ABSTRACT

The challenges of the Nigeria software industry and its potentials for sustainable growth were investigated in this research. Findings revealed three major challenges of the software industry as low patronage of locally developed software by government and private organizations; poor government policies to encourage sustainable growth of the industry and low innovative index of locally developed software as affirmed respectively by 79%, 78% and 81% of respondents via questionnaire. Research findings also revealed that developers' skillsets have greatly improved over the years through trainings and international certification programs which have impacted positively on the quality of developed software following increased adoption of quality assurance practices by most developers. However, 81% of the respondents reported that most locally developed software are not innovative – that is, lacking novelty values and not developed to address modern ecosystem challenges rather they have functions similar to software already deployed in public and private sectors, hence not patronized. It's important that developers focus more on international certification and development of qualitative and innovative software like the well celebrated Remita, eGOS and others to enhance sustainable growth. Furthermore, national strategy and government policies are urgently needed to encourage patronage of qualitative and innovative software.

General Terms

Software Development and Industry Growth

Keywords

Nigeria software industry, locally developed software, innovative Software products, Mentorship and Advisory services

1. INTRODUCTION

In the contemporary society, technology and innovation are key indicators for growth and sustainable development. Nigeria's consciousness of this is demonstrated in various technology and innovation exposition programmes by government, particularly for software products. Unfortunately, till date, less than 20% of software products deployed in key sectors of Nigerian economy are locally developed whereas an average of \$1 billion dollars is spent on software importation and license renewal annually [1].

Most of these long standing imported software have become legacy applications with huge maintenance burden and annual license renewal costs which are clear indications of the need for modernization or replacement with innovative software [2], yet end-users in MDAs (Ministries, Departments and Agencies) prefer to keep them claiming there are no local match for them. In 2014, the Federal Government revealed a plan to produce 250 indigenous and sustainable software companies by 2017 to meet software needs of the country. Sadly, till date, the plan is not accomplished and stakeholders increased complaints on low

skillsets and competence of developers and substandard products abound. National Office for Technology Acquisition and Promotion (NOTAP), government agency responsibility for registering technology transfer agreements, had observed that 90 per cent of technologies powering the Nigerian economy, including software technologies were foreign [3].

Despite these, few innovative products developed locally like Remita by Systemspecs Limited for Treasury Single Account (TSA) management used by MDAs stands out as a success story. Others like e-Government Operation Solution (eGOS) by Connect Technologies Limited, and iX-Trac by Infosoft Nigeria Limited are also worthy of note. Meanwhile, local developers claim, "there are more but lacked patronage", end-users raise doubts on products quality and innovativeness. Overdependence on foreign software also contributes to the low global innovation index (GII) of the country, ranked 115th in 2019 [4].

From the foregoing, this research was designed to investigate the challenges of the Nigeria software industry and its potentials for sustainable growth.

2. REVIEW OF RELATED RESEARCH WORKS

A review of relevant research works was undertaken and presented thus. In [5], a comprehensive study of the Nigeria software industry was undertaken leading to the profiling of the industry in terms of existing software corporations, ownership, developed products and services rendered. Also, [6] presented research findings concerning the state of the Nigeria software industry and highlighted process compromise, resistance to measurements and poor training of students at the higher education institutions as some of the problems befalling the industry.

Also, in [7] research findings on the perceptions of software inspection as a quality assurance activity by software professionals in Nigeria is presented, with an observation that software inspection was highly neglected in software projects by most organizations as they considered it, a waste of time. In reference [8], findings from a research on the state of software engineering ethics in Nigeria is presented revealing nonchalance, dispassion and mass negligence of software engineering ethics by developers. Based on a case study, the research further revealed that application of ACM/IEEE software engineering code of ethics in software development projects could resolve ethical issues in software projects and recommends it for software projects.

In reference [9], wide skills gap in modern tools is identified as the major challenge of developers in Nigeria and recommends regular trainings on modern tools as well as mentorship and business advisory to raise young innovative developers. In [10], components reusability technique is presented as a veritable tool for enhancing developers' skills in rapid

development of innovative software products to meet the growing needs of end-users.

In reference [11] findings from a research aimed at increasing patronage of locally developed software and reducing software importation into Nigeria is presented. It reveals neglect of international standards by most developers and lack of innovative developers as major causes of low quality products and poor patronage. It further recommended international accreditation and certification of Nigerian developers to expose them to international standards adopted by foreign developers in creating quality and innovative software products.

In [12], the roles needed to be played by government to support the growth of indigenous software developers and companies were examined and concluded that government's support by way of patronage was key to achieving such goal. Also, [13] presents research findings that state that the market potential of the Nigerian software industry is very high having over twenty thousand MDAs across all three tiers of government that require software solutions to drive their operations. Unfortunately, it further reveals that, the local software firms came into the space rather too late when most of the MDAs have already been dominated by foreign counterparts, hence their products lowly priced.

Lastly, in [14], the recommendation of National Software Think Tank (NSOFT) is presented following an investigation that was conducted; and urging the federal government to endorse and approve the proposed 5-Year National Software Strategic Plan to accelerate the adoption and patronage of locally developed software to enable developers maximize opportunities and benefits.

3. FINDINGS FROM THE REVIEW

From the review conducted, it is clear that most of the research works focused on quality assurance issues vis-à-vis product patronage in the Nigeria software industry which is quite important for a struggling software industry like that of Nigeria. However, in contemporary software development practices, innovativeness is key in ensuring that developed software products possess the novelty value needed to address ecosystem challenges; its then, can huge patronage be envisaged.

In this research, the challenges of the Nigeria software industry are examined in terms of software quality and innovativeness to determine the impact of software novelty value in addressing the challenges of the software industry. As predicted by Gartner research findings, in 2021 the market demand for software products will grow at least 5 times faster than IT capacity could deliver [15]. It's important that, challenges of the local software industry are identified and addressed to enable its developers join the league of global developers in creating software products that will meet the predicted global market demand for software.

4. RESEARCH METHODOLOGY

The research was designed as a Descriptive Survey Research as follows:

- i) **Literature Review**, undertaken to gain more understanding of the subject matter being investigated.
- ii) **Research Design**, specifying research objectives, research questions and methodology.
- iii) **Design of Research Instrument**, a closed-ended questionnaire with relevant questions and

predefined options was designed.

- iv) **Review and Validation of Questionnaire**, undertaken by experts - software developers and statisticians to ascertain instrument's suitability for the research.
- v) **Distribution of questionnaires to respondents via online platforms** like email and WhatsApp. Respondents were sourced through Snowball sampling technique.
- vi) **Data Analysis**, conducted using statistical package like MS Excel.
- vii) **Interpretation of Results** and appropriate recommendations.

5. DATA COLLECTION

Questionnaires were sent to one hundred and thirty seven respondents from which one hundred and eighteen valid responses were received and analysed to test the positivistic proposition that sustainable growth of the Nigeria software industry is achievable where there is increased patronage of locally developed quality and innovative software products. The snowball sampling method was used to identify the respondents for the research which were drawn from three groups in the Nigeria software industry namely, software developers, heads of IT units in MDAs and private organizations and Software development Mentees. The characteristics of the respondents are given in table 1.

Table 1: Characteristics of Respondents

A) Roles in the Industry		
S/n	Role	No. of respondents
1	Software Developers	58
2	Heads of IT Units in MDAs and private organization	46
3	Software Development Mentees	14
Total		118
B) Years of experience in the industry		
S/n	Years	No. of respondents
1	not above 5	26
2	between 6 – 10	52
3	above 10	40
Total		118

Each respondent was briefly interviewed to confirm their awareness of the subject matter. They were then invited to respond to twenty six (26) multiple choice positivistic statements that were focused on whether low patronage of locally developed quality and innovative software products were impacting on the sustainable growth of the Nigeria software industry.

Respondents were required to indicate whether they: i) strongly agreed (SA), ii) agreed (A), iii) undecided (UD), iv) dis-agreed (D), or v) strongly dis-agreed (SD) with each statement. A summary of the respondents' feedback through questionnaire to the twenty six positivistic statements organized into four categories are shown in tables 2 to 6.

Table 2: Software Quality-related Challenges

Statement	SA	A	UD	D	SD	Total
Certified standardization processes and procedures are adopted in software products development	13	48	6	43	8	118
Locally developed software meets international standards and certification	11	53	7	36	11	118
Locally developed software are higher in quality than Imported Software	8	32	5	55	18	118
Locally developed software are easily distinguished between standard and substandard software	9	25	12	61	11	118
Quality assurance practices are usually adopted in software projects	13	60	6	28	11	118
Locally developed software are highly innovative to address ecosystem challenges	8	12	3	64	31	118
Quality development cost is lower than cost of software importation	41	39	8	16	14	118

Table 3: Developers' Skillsets-related Challenges

Statement	SA	A	UD	D	SD	Total
Software developers in Nigeria are well-trained to develop quality Software products	25	39	9	24	21	118
Software developers in Nigeria are skillful in using modern technologies to develop software products	29	31	11	27	20	118
Software developers in Nigeria are innovative creators of software products	9	20	18	41	30	118
Software developers in Nigeria are certified both locally and internationally to practice the profession	10	21	15	38	34	118
Young developers are raised through Mentorship and business advisory	14	37	12	30	25	118

Table 4: Patronage-related Challenges

Statement	SA	A	UD	D	SD	Total
Locally developed software with great innovations are not patronized	11	17	5	16	69	118
Patronage of locally developed software by Nigerian end-users is generally high	8	29	0	13	68	118
Patronage of locally developed software by MDAs is higher than foreign software	10	14	0	21	73	118
Patronage of locally developed software by private companies and multinationals is higher than foreign software	14	27	0	16	61	118
Locally developed software are priced higher than foreign software	7	21	0	14	76	118
Efforts by government to increase patronage of locally developed software is highly encouraging	11	24	8	11	64	118

Table 5: Government Policies-related Challenges

Statement	SA	A	UD	D	SD	Total
Software industry policies are well formulated for sustainable growth	11	28	6	55	18	118
software industry policies are adequately implemented	9	19	10	57	23	118
Stakeholders involvement in software policy formulation and implementation for sustainable growth are adequate	14	23	9	54	18	118
Activities of software regulatory agencies towards sustainable growth of the industry are adequate	11	21	8	56	22	118

Table 6: Sustainable Growth-related Challenges

Statement	SA	A	UD	D	SD	Total
Low growth rate of the Nigeria Software industry is due to poor quality of locally developed software	11	32	4	55	16	118
Low growth rate of the Nigeria Software industry is due to low patronage of locally developed software	79	14	5	12	8	118
Low growth rate of the Nigeria Software industry is due to low skillsets of Nigeria developers	16	21	11	55	15	118
Low growth rate of the Nigeria Software industry is due to poor policy formulation and implementation by government	81	11	3	14	9	118

6. DATA ANALYSIS

which yielded the following figures 1 to 5.

The data were analyzed using spreadsheet package (MS Excel)

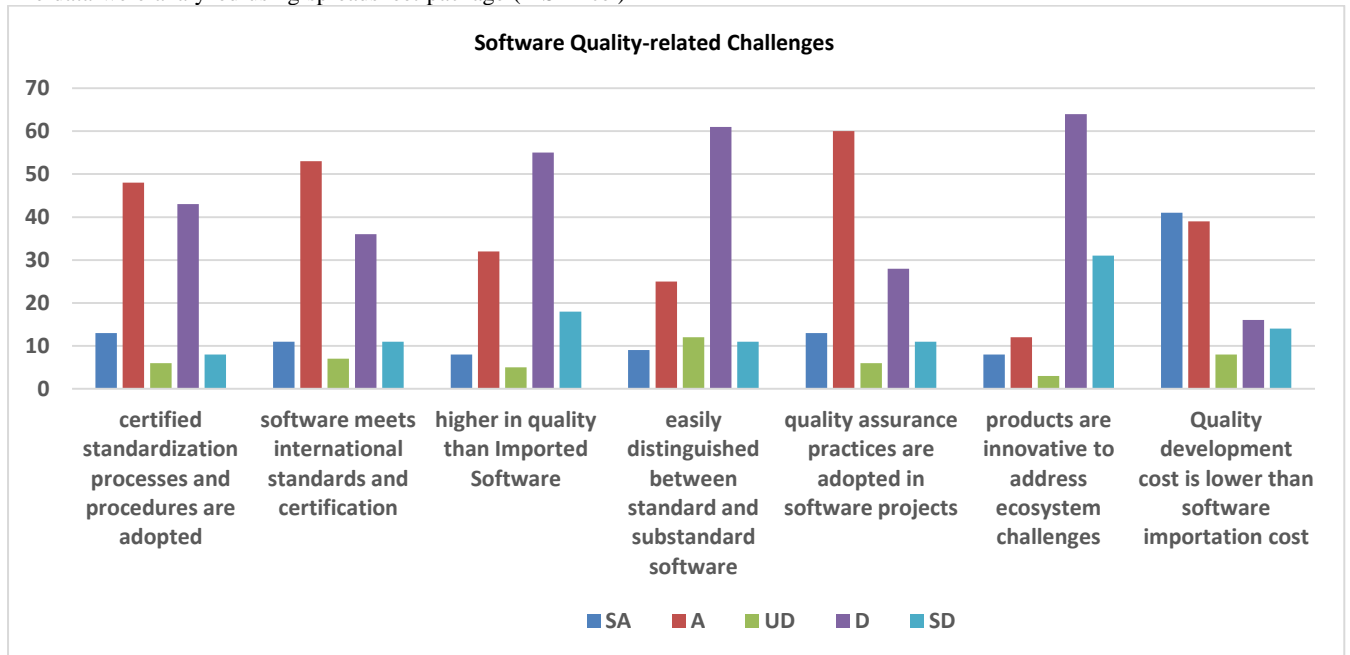


Figure 1: Software Quality-related Challenges

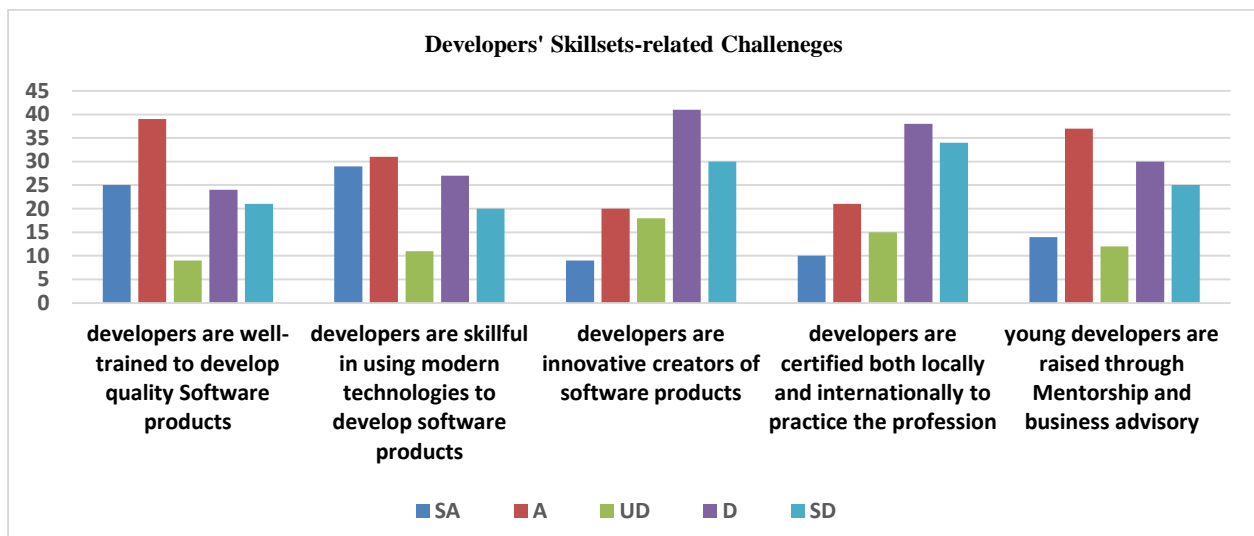


Figure 2: Developers' Skillsets-related Challenges

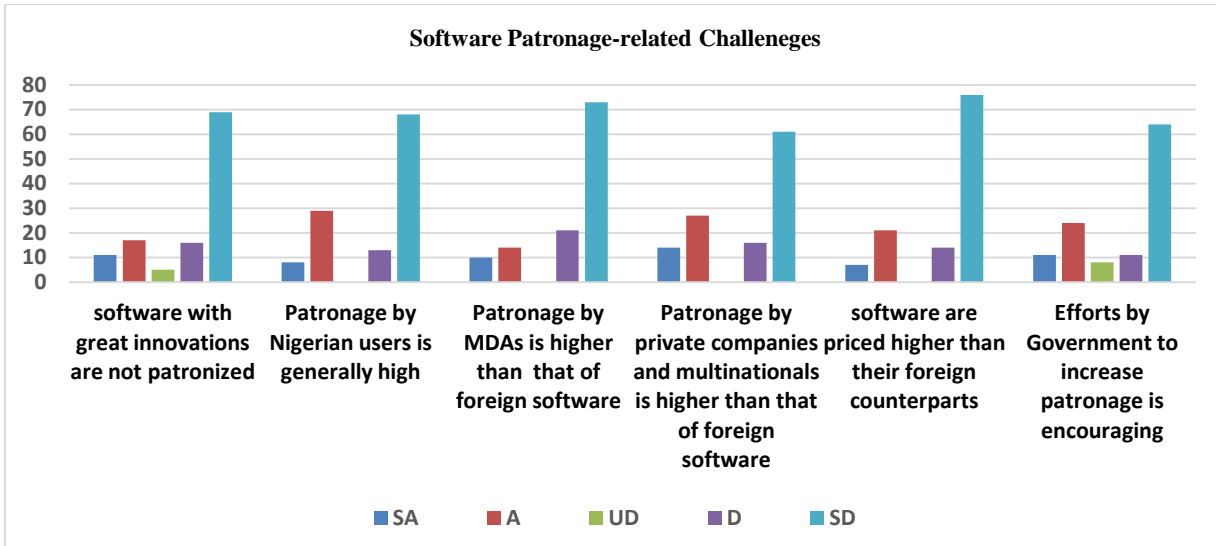


Figure 3: Software Patronage Challenges

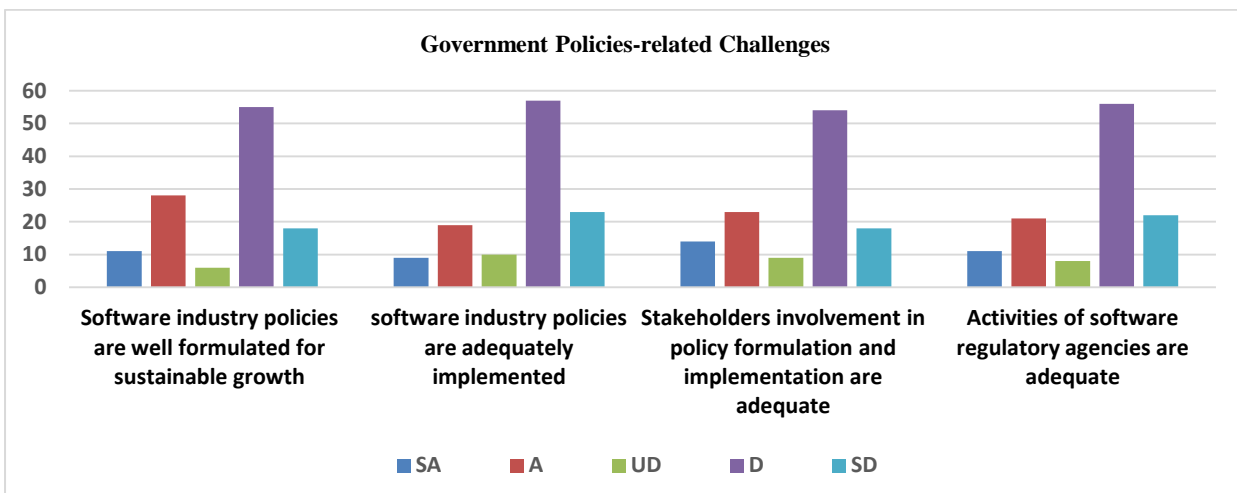


Figure 4: Government Policies Challenges

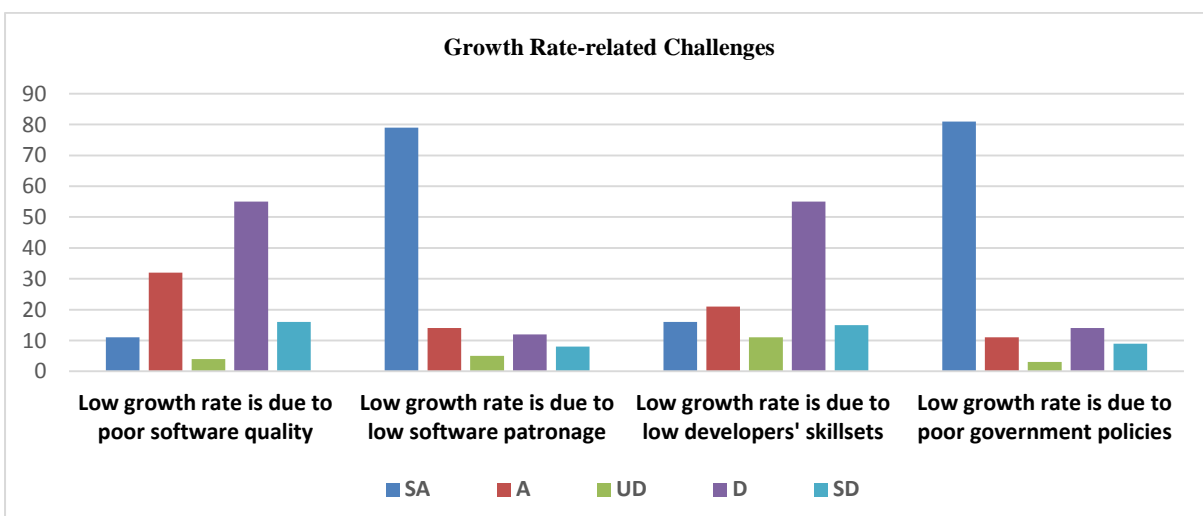


Figure 5: Growth Rate-related Challenges

7. RESULTS AND DISCUSSION

Results of the analysis reveal the following with respect to indicators examined:

7.1 Quality-related Challenges

For 36% of the respondents, poor software quality is the reason for low growth rate of the software industry whereas 64% think otherwise. Summary of quality indicators in terms of percentages of respondents in affirmation of the positivistic statements are presented thus:

- i. Certified standardization processes and procedures are adopted (52%)
- ii. Software meets international standards and certification (54%)
- iii. Higher in quality than Imported Software (33%)
- iv. Easily distinguished between standard and substandard software (29%)
- v. Quality assurance practices are adopted in software projects (62%)
- vi. Products are innovative to address ecosystem challenges (19%)
- vii. Quality development cost is lower than software importation cost (70%)

The above results indicate that there is improvement over the years in the quality of locally developed software, which according to 64% of the respondents, poor quality is not the reason for low patronage. In fact, locally developed software like Remita by Systemspecs Limited, e-Government Operation Solution (eGOS) by Connect Technologies Limited, iX-Trac by Infsoft Nigeria Limited, and Eyowo by Softcom have proved this point. However, much is still required to ensure that a greater percentage of locally developed software are of international standards, particularly in terms of adoption of quality assurance practices in software projects, creation of innovative software and international certification of developers. Also, where the regulators could evolve acceptable measures to guide end-users in differentiating between standard and substandard software before patronage, developers will intensify efforts in enhancing the quality of their software to gain patronage.

7.2 Developers' Skillsets-related Challenges

In terms of skillsets-related challenges, 41% of the respondents opined that low developers' skillsets is one of the reasons for low growth rate of the software industry whereas 59% think otherwise. Summary of developers' skillsets indicators in terms of percentages of affirmation of the positivistic statements by respondents are presented thus:

- i. Developers are well-trained to develop quality software products (54%)
- ii. Developers are skilful in using modern technologies to develop software product (51%)
- iii. Developers are innovative creators of software products (25%)
- iv. Developers are certified both locally and internationally to practice the profession (26%)
- v. Young developers are raised through Mentorship and business advisory (43%)

This result indicate some sort of improvement in developers' skillset though not very encouraging as only two indicators were up to 50% success mark. Similarly, more is has to be done to further enhance developers' skillsets particularly in terms of local and international certifications of developers, training and retraining of developers on modern software

development tools, as well as international linkage and partnership programs with renown foreign software corporations. Amongst others, acquisition of skills in using components reusability tools will be highly useful in developing quality and innovative software products from existing software using reusable components [16].

7.3 Patronage-related Challenges

For 79% of the respondents, low patronage of locally developed software is one of the major reasons for low growth rate of the software industry although 21% of the respondents are of the contrary view. Summary of patronage indicators with respect to percentages of respondents in affirmation of the positivistic statements are presented thus:

- i. Software with great innovations are not patronized (24%)
- ii. Patronage by Nigerian users is generally high (31%)
- iii. Patronage of locally developed software by MDAs is higher than that of foreign software (20%)
- iv. Patronage of locally developed software by private companies and multinationals is higher than that of foreign software (35%)
- v. Software are priced higher than their foreign counterparts (24%)
- vi. Efforts by Government to increase patronage is encouraging (30%)

As indicated above, none of the above patronage indicators is favorable to the industry as they are far below 50% success mark. This is further confirmed by the fact that less than 20 percent of software used by government agencies are locally developed and those that are in use are even priced at ridiculously low rates [3]. Success in software business requires patronage and encouragements from domestic government just as enjoyed by foreign corporations likes of SAP, Microsoft and Oracle that have now become global software giants. Same is expected from the Nigerian government even as developers continue to improve on the quality and novelty value of their software products.

When locally developed software are patronized, the software companies will be encouraged to invest their earnings in research and development (R & D) projects that could result in creation of innovative software products to add value to the industry and address ecosystem challenges. As it stands, most indigenous software companies are willing to engage in R & D projects but lacked the financial muscles for such investments.

7.4 Government Policies-related Challenges

In terms of government policies, 78% of the respondents reported that poor government policies is a key challenge for the growth of the software industry whereas 22% think otherwise. In terms of government policies indicators, percentages of respondents in affirmation is as presented thus:

- i. Software industry policies are well formulated for sustainable growth (33%)
- ii. Software industry policies are adequately implemented (24%)
- iii. Stakeholders' involvement in policy formulation

and implementation are adequate (31%)

- iv. Activities of software regulatory agencies are adequate (27%)

Just as with patronage, none these indicators is favorable to the software industry. As can be easily confirmed, the Federal Government plan revealed in 2014 to produce 250 indigenous and sustainable software companies by 2017 to meet software needs of the country is yet to be achieved, as such plan was yet to be backed by adequate policies to drive it.

Most times, policies are made by government without input from the stakeholders who could help to shape it. Where policies are forced through like the local content policy, poor implementation and ineffective monitoring by the regulatory agencies like National Office for Technology Acquisition and Promotion (NOTAP) and National Information Technology Development Agency (NITDA) will just render it ineffective. Nigerian software regulators have enormous roles to play in enhancing the growth of the industry by implementing the local content policy to the later. Also, there is a need for national strategy and policies conscientiously drafted with stakeholders' involvement towards achieving sustainable growth of the software industry.

8. CONCLUSION

This research was borne out of the need to investigate the challenges facing the Nigeria software industry and its potentials for sustainable growth. It is clear from the research findings that the Nigeria software industry is yet to grow at an appreciable rate due to the fact that the needed opportunities for its sustainable growth were being hindered by low patronage of locally developed software, poor government policies and low innovative index of most locally developed software. The research further revealed that although there are some locally developed software that are standard and innovative enjoying high patronage, the need to further enhance the skillsets of developers to develop software products that are both qualitative and innovative was critical to the sustainable growth of the industry. In the abundance of locally developed quality and innovative software products, backed by favourable government policies, patronage will happen naturally.

There is no doubt the fact that, careful implementation of the outlined recommendations will enhance the growth of the local software industry and brings about positive impact on the global innovative index of the country.

9. RECOMMENDATIONS

Based on the research findings, the following recommendations are necessary to enhance sustainable growth of the Nigeria software industry.

- a) Government should create the enabling environment through national strategy and policies needed to encourage well-trained professional developers of Nigeria extraction in diaspora to bring in their expertise and resources to invest and develop the local software industry.
- b) Government should formulate policies and national strategies that will deliberately encourage end-users to patronage locally developed software products that are qualitative and innovative.
- c) Developers in Nigeria should focus more on international certification and development of quality and innovative software products capable of addressing ecosystem challenges rather than

developing products with similar functions as those of foreign counterparts already deployed in MDAs, banks and multinationals with intension of replacing them.

- d) Regulators in the Education sector like National University Commission (NUC) and National Board for Technical Education (NBTE) should ensure that Innovation and Technology Management courses are introduced into the curriculum of Computer Science and related courses to expose students to innovative creation and management of software.
- e) Software organizations should adopt measures aimed at continuous enhancement of their products quality and standard by ensuring that quality assurance practices are enforced in their software products.
- f) Mentorship and business advisory should be encouraged through additional software Hubs to mentor and equip young developers with knowledge and skills needed to develop standard and innovative software.

10. FURTHER STUDY

Empirical study is required to find out innovation-driven software solutions that are in dire need by the MDAs and the private sector. With such research findings, developers will be well guided to redirect their focus on developing solutions to meet such needs instead of wasting efforts and resources in developing products with similar functions as those of foreign counterparts already deployed in MDAs and private sectors with intension of prevailing on the end-users to replace them, which might be difficult to achieve. When innovative products with huge benefits to potential end users are developed, such products will enjoy high patronage and high product pricing thereby encouraging the growth of the industry.

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