Available online at www.koozakar.com/journal/jbietm

JOURNAL OF BUSINESS INNOVATION, ENTREPRENEURSHIP, & TECHNOLOGY MANAGEMENT

Innovation Capability of Software Firms in Nigeria: Users' perception

Festa Ndutimi Okrigwe
National Center for Technology Management (NACETEM), Ile-Ife, Nigeria

Corresponding Author
Email: fndutimi@gmail.com

Article Information

https://doi.org/10.69798/95849842

Published by: Koozakar LLC. Norcross GA 30071, United States.

Edited by:
Mirabel Omoruyi, PhD
Michael Olomu, PhD

Abstract

This study explores the users 'perceptions of the innovation capability of software firms in Nigeria. In Nigeria, software users especially organization believe that software firms are not capable to develop innovative customized software products like the once developed by foreign firms. Hence, the study explored users' perception of the quality of indigenous Customized Software Product (CSP) developed in Nigeria by Nigerian software firms. The innovation capability maturity model (ICM) was used to determine the ICM level of indigenous software firms according to the users' perceptive. A quantitative analysis was conducted from 600 respondent across three geopolitical regions of Nigeria and one states within the region. The results were obtained using descriptive analysis (frequencies and mean values) as well as one-way ANOVA test to determine the users' perceptive of the ICM level of indigenous software firms (ISF) categorized on a 5-point Likert scale. The findings reveal that the ICM level of ISFs to develop quality of CSP is at the supported innovation level on the ICM where the ANOVA test the users' perception of the quality of CSP showed at $p<0.05$, and (μ=3.3). This is an indication that ISF are capable to a great extent to develop CSP that are Functional (μ=3.6) and Reliable (μ=3.6) whereas, to a moderate extent the ISFs are capable of developing CSPs that are durable (μ=3.3), good capacity (μ=3.0), cost effective (μ=3.4) and focused on users' experience (μ=3.2).

Keywords: Users perception, Software firms, Software product, Software quality, Nigeria

INTRODUCTION

The software industry is rapidly taking over large swathes of the economy (Andreessen, 2011) as the demands for software is increasing in almost every other industry (Mohammed & Ephraim, 2018). It has become a linchpin to governments, companies, and individuals at all levels (Information Economy Report, 2012). Globally, the software industry is estimated at about $1.1 trillion US Dollars (McManus, 2007), and Nigeria has contributed about 0.05% of software products to the global software market (Sa'ad & Jakwa, 2022). With this increasing demand, it is assumed that the software industry can support the United Nations (UN) to meet 4 of its 17 Sustainable Development Goals before 2030. For instance, the high employment opportunities for software developers can empower youth, reduce poverty by providing income for self-sufficiency, this aligns with SDG Goal 1 (Brandli, Mazutti, Salvia, Pretorius, Nicolau, Shulla, Mora Motta, & Pohlmann, 2023). Also, access to quality education avails software developers to secure decent work that fosters economic growth, corresponding to SDG Goals 4 and 8 (Ncanywa, Dyantyi, & Asaleye, 2025). Furthermore, the use of the SPs can further integrate the SDG goals 12 for responsible consumption and production with a consensus between the software developers in the firms and the software users to produce (develop) and consume responsibly through fair cooperation, collaboration and coordination (Arora & Mishra, 2023).

More so, Kamel (2019), believes the software industry is the best entry platform for developing countries into global ICT production. Innovations in the software industry have given developed and some developing countries a competitive edge in their economic growth. For instance, countries in the United States and Europe that are leveraging on the software industry have transformed and sustained their economies (Chien, 2017). McManus, (2007) argued that about 90% of the world's software products are developed and exported from these countries. Also, some low-income countries (LICs) like Brazil, Russia, India, and China have catapulted their economic positions via the innovativeness of the software industry (Vijayabaskar & Babu, 2014). The same can be realized in Nigeria through the software industry, hence the need to measure software innovations practices software firms' uptake in Nigeria.

LITERATURE REVIEW

Software development is the production or creation of software product that can be used for different purposes in business enterprises, government agencies and ministries or for personal use (Binuyo *et al.*, 2014). However, the cost of developing the software product is significantly decreasing due to open sources and competition is increasing to lower entry barriers thereby bringing users closer to the developers in the firms is important (Alvertis, Koussouris, Papaspyros, Arvanitakis, Mouzakitis, Franken, & Prinz, 2016). In essence, software development requires the building up of acceptable SP (Binuyo *et al.*, 2017), using the methodologies or framework appropriate to plan, manage, and control the software development process (Dora & Dubey, 2013), following through the Software Development Life Cycle (SDLC), that are divided into five (5) phases such as the requirement phase, analysis phase, design, coding, testing, installation and maintenance phases (Dora & Dubey, 2013).

Initially, in Nigeria, the software industry only imported and installed foreign software products for users. However, the industry have grown with its capacity to innovate and develop Customized Software Products (CSPs). An example is the Remita software used for electronic funds management for the government (ITA, 2021). According to Luo (2024), adopting software technologies is now a necessity in every organization across the globe. Hence, the ability for the organizations to be able to use these technologies easily to perform their tasks and be productive is their ability to compete effectively. Nigerians are disfavoring the economy when they purchase more of foreign SPs (Ekanem & Peter, 2020). Isah & Aliyu (2017) also highlighted that lack of patronage of locally-developed goods will be imposed negatively on the nations' economy. Unfortunately, this has not changed the perceptive of users in the country. Echebiri, Phillips, Igbinosa, Raphael & Ugoh (2022) opined that it could be as a result of the lifestyle of the elite or/and the economic factors (quality, cost and availability) of indigenous product. Binuyo *et al.* (2014) added that software users pointed out that indigenous SPs are of low standards, unable to meet organizational

needs, crash too often, too expensive for deployment, unable to meet clients' needs, and unease to acquire. This influences the users' perception about the quality of the indigenous SPs and the capability for the firms to develop user-friendly SPs. Aguboshim (2018), added that users may also decline from using a SP if they perceive that it too complex and difficulty to use.

Nevertheless, indigenous software firms are to strengthen the software market and re-strategize on how to develop SP that are user-friendly products (Aguboshim, 2018). To develop a user-friendly SP, the authors affirmed that software firms are to gather adequate knowledge about the software users' abilities and limitations. SP are successful when they are able to meets the needs of the end-users, the users can use it over a very long period, it is easy to modify and easy to use. (Pressman, 2001; Oyovwe-Tinuoye & Omosekejimi, 2022). The ability to use the SP is the key for the adoption of the product.

Furthermore, usability is defined by Park & Song, (2015) as cited in Aguboshim (2018), as the extent to which a SP is easy for users to use and perform predefined tasks. According to Oyovwe-Tinuoye & Omosekejimi (2022) user-organizations are to choose SP with clear decision based on the product performance, efficiency and flexibility to meet future demands and desires from users.
In addition, adopting appropriate methodologies that could be either waterfall (traditional) method or/and agile methodology is crucial to develop a user-friendly product (Bolanle & Dimple, 2014). However, involving the users across the software development life cycle is key to developing user-friendly product (Ogunyemi, Lamas, Adagunodo, & Da Rosa, 2015).

The Innovation Capability Maturity Model (ICMM)

Innovation Capability Maturity models have been proposed to assess the innovation capability of organizations irrespective of their size, or the sector (Knoke, 2013). The study of Arends & Advisory (2018) presented the innovation capability maturity model (ICMM) that serves as a practical tool for organizations to examine their innovation capability and determine the direction and areas for improvement. Tarhan, Turetken & Reijers (2016) state that the maturity models are described as the conceptualization of a set of capabilities of an organization, describing it as an anticipated desired or evolutionary path. Given a typical example, the authors added that the capability maturity model integration (CMMI) was developed by the CMMI product team in the mid-90s to assess the innovation capabilities of organizations. This framework was first applied in the software engineering domain where the software development processes improvement were measured. This model is an outcome from a research activity conducted by the Software Engineering Institute (SEI), funded by the U.S. Department of Defense (DoD) and developed by Watts Humphrey and his colleagues at IBM in the early 1980s (Essmann, 2009; Knoke, 2013). The first version was published in 1991, with the goal of expanding the application and improving the integrated system model. It was further enhanced to the second version which was developed in 2002 (Knoke, 2013).

Following a highly structural approach, Arends and Advisory (2018) provided a high-level structure and scope of the ICMM depicting six (6) main elements such as vision & strategy, value network, process & governance, feedback & results, resources, and culture. Showing the loop for continuous improvement of an organization in developing its innovation capability. However, in this study, 2 elements are adopted to measure the innovation capability of the selected software firms in Nigeria, based on the users' perception, they are: the quality of the CSP and software firms responsiveness,
Narcizo, Canen and Tammela (2017) emphasized that a detailed assessment of the model is important to determine the maturity level of an organization's maturity level. The 'Innovation Capability Maturity Models' (ICMM), was developed by Essmann in 2009, as cited in Knoke (2013). The model is used as a framework for the management of innovations and is structured into five (5) maturity levels.

The first level, Ad-hoc innovation is describes the maturity of an organization to be basically on day-to-day operations, outputs are inconsistent and unpredictable. The second level, Defined innovation, identifies the need to innovate, however, while the outputs maybe traceable, they are inconsistent. Meanwhile, at the Supported

innovation level, the organizations implement consistent practices, procedures and tools and their outputs maintains a stable market share. The fourth level, Aligned innovation, involves the integration and alignment of the organizations' activities and resources such that the outputs sources are of a consistent differentiation and the final level, Synergized innovation is the level where the organizations' activities are synchronized with their resources; the outputs provided is a sustained competitive advantage.

Therefore, the ICMM was adopted for this study to determine the ICMM levels of the software firms based on the users perception for each of the six elements separately and cumulatively. The cumulative ICMM level determines the extent to which users perceived the software firms to have developed their innovative capability to develop customized software products.

Software Quality Models

Several models have been developed to assess the quality of software products based on software firms' perspective. In the past, many studies assessed the quality of software from the perspective of the managers and developers, unfortunately the users' perspectives have been ignored. However, according to Singh and Kassie, (2018) the International Organization for Standardization (ISO) 9126-1 Quality Standard is the most suitable: This model evaluates software quality based on functionality, reliability, usability, efficiency, maintainability, and portability. It encompassing six key categories and their sub-divisions accordingly:

i. Functionality: suitability, accuracy, interoperability
ii. Reliability: maturity, fault tolerance, recoverability, reliance compliance
iii. Usability: learnability, understandability, operability, attractiveness, usability compliance
iv. Efficiency: time behavior, resource utilization, efficiency compliance
v. Maintainability: analyzability, changeability, stability, testability, maintainability compliance
vi. vi. Portability: adaptability, stability, co-existence, replaceability, portability compliance (Singh & Kassie, 2018).

Therefore, in this study, the functionality, reliability, durability, capacity and cost factors are considered to ascertain users' perception of the quality of the application software in this context discussed below,

a) Functionality is described as the excellent performance of the software product that is suitable to meet users' specified needs, appropriate for specified task it was primarily developed for, with accurate software output.
b) Reliability is described as the software compliance with global standards, minimizing downtime, where specific goals are achieved efficiently and users satisfied with their software specified are met (Rusu *et al.*, 2015).
c) Usability: is described as the development process that follows full compliance with global standards, where remote or in-person usability test is organized, for easy discovery and navigation through the contents, incorporating stakeholders' requirements and review expert's documents to ensure due adherence. Mostly, prototypes are developed early and continuously through the software development phases, for quality of the software products, and to ensure the achievement of users' requirements and documentations to develop parallel features for a robust software product.
d) Durability is described as restrictive measures developed against unauthorized users of the software product. The software is readily available for use, always accessible to authorized users, the size of the application is robust to meet future users' demands, style guide documentation is available for users to learn and understand the operability of the software, and software security is enhanced to meet changing requirements for the future (Kumar, Zarour, Alenezi, Agrawal and Khan, 2019)
e) Capability of the software is described as the application performance rate to sustain the number of users per time, flexible software that can be used on any computing device, data backup and recovery provisions are available
f) Cost is described as the cost of acquiring the software, deploying (which includes cost of installation and training) and frequent management and maintenance of the software.

METHODOLOGY

This study employs a quantitative analysis to evaluate users' perceptions of the capabilities of indigenous software firms in developing customized software products (CSPs) suitable for use in different business enterprises and for different purposes (Binuyo *et al.*, 2014). The Innovation Capability Maturity Model (ICMM) was used to assess the users' perception of the level of maturity indigenous software have attained to develop quality CSPs.

The study focuses on three regions in Nigeria where software firms are densely clustered such as: North-Central (Abuja), Southwest (Lagos), and South-South (Rivers State). Data was gathered from software users across five sectors, both in public and private organizations that are considered to use software products more in their operation. According to Bassey (2019) organizations in the following sectors uses CSPs most in Nigeria, which are education, health, manufacturing, and service-providing companies, as well as government ministries, agencies, and departments.

To select respondents, a multi-stage sampling technique was employed. Given that the population of software users is large above 50,000 across the five sectors in the study area, the population is considered as infinite. Hence, a purposive and convenience sampling methods was employed to select participants from the population that are easily accessible (Golzar, Noor & Tajik, 2022) and with the intention to select participating organizations that are using CSPs (Tajik, Golzar & Noor, 2024). Consequently, 40 questionnaires were distributed to the five (5) sector across the three (3) states. As a result, 200 questionnaires were distributed in one study area, and 600 questionnaires were distributed to the software in all three locations.

A structured questionnaire was used to collect data from software users. Respondents were assured that all information gathered would be kept completely confidential and used exclusively for academic purposes. According to Ekanem & Peter (2020), the use of structured questionnaires is consistent with best practices in quantitative research, enabling methodical data collection and analysis.

Using a 5-point Likert scale, the data analysis process examined the responses users' perceptive regarding the quality of software developed by indigenous software firms. The following categories were used to group the maturity levels: Ad hoc innovations (Level 1) had a mean score of 0.1 to 1.4, defined innovations (Level 2) had a mean score of 1.5 to 2.4, supported innovations (Level 3) had a mean score of 2.5 to 3.4, aligned innovations (Level 4) had a mean score of 3.5 to 4.4, and synergized innovations (Level 5) had a mean score of 4.5 to 5.0, indicating a "Very Great Extent." This categorization is essential for comprehending how users view software firms' innovation capability.

The variables used to measure software users' perceptions were grouped into six themes: perceived quality based on functionality, reliability, usability, durability, capacity, and cost of the CSPs developed by the software firms. The ICMM framework was structured according to these levels, as illustrated in Table 1 and graphically represented in Figure 1. This model reflects the extent of the ICMM of the software firms, the quality variable with the highest mean indicates the ICMM level of the indigenous software firms from the users' perspective. This approach is supported by the findings of Narcizo *et al.* (2017), who emphasize the importance of innovation capability in enhancing competitive advantage in the software industry.

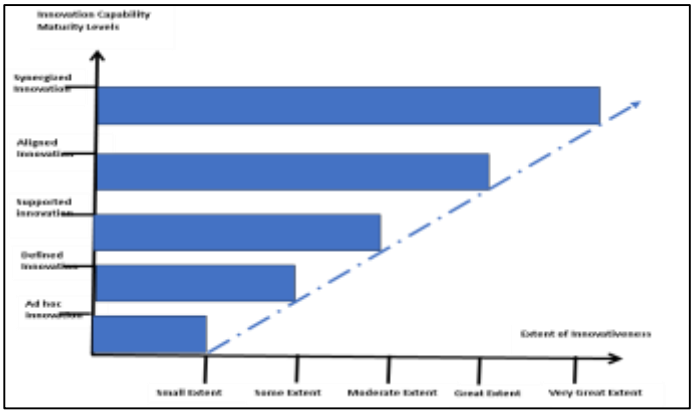


Figure 1: Innovation Capability Maturity Levels
Source: Knoke (2013)

FINDINGS AND DISCUSSION

Software users' general enterprise information

The general enterprise information of software users examined is shown in Table 2. The software users in this study are referred to as organizations both in private and public sectors that use customized software product to perform organizational task.

Table 1: Determination of the Innovation Capability Maturity Levels

Element	Definition	**Level 1: Ad hoc Innovations** *Small extent* *(μ= 0.1-1.4)*	**Level 2: Defined Innovations** *Some extent* *(μ= 1.5-2.4)*	**Level 3: Supported Innovations** *Moderate extent* *(μ=2.5-3.4)*	**Level 4: Aligned Innovations** *Great extent* *(μ= 3.5-4.4)*	**Level 5: Synergized Innovations** *Very great extent* *(μ= 4.5-5.0)*
Software Users Perception (SUP)	The extent to which users of customized software products (CSP) perceive the quality, user experience and the software firms' responsiveness to the users	The extent of CSP users' perception is to a small extent as perceived to yield the inconsistent and unpredictable CSP quality, users experience and responsiveness of the software firms	The extent of CSP users' perception is to some extent perceived to produce identified quality in CSP, the users experience and responsiveness of the software firms	The extent of CSP users' perception is to a moderate extent perceived to have implemented practices that produced quality CSP, user experience and good response of the software firms	The extent of CSP users' perception is to a great extent perceived as being aligned with the right activities and resources that yielded quality CSP, good user experience and acceptable response from the software firms	The extent to which users perceive the CSP is to a very great extent where users perceived that the quality, experience and responsiveness of software firms has given them a competitive advantage

Source: Arends and Advisory (2018)

Analysis results on the sectors both in the private and public domains of the software users examined showed 114 (22.4%) are in educational sector, 107(21.0%) are in the health sector, 117(23.0%) are in the service sector, 111(21.8%) are in the manufacturing sector, and 60(11.8%) are in government agencies. This result implies that the majority (23.0%) of organizations in the service sector use customized software products (CSP) especially with the growing trends of e-commerce after the advent of the internet and smart phones (Statista, 2023). Analysis of the geographical location of the organizations revealed that 134 (26.3%) of the organizations are in Abuja, 196(38.5%) in Lagos, and 179(35.2%) in Rivers State. Lagos, being the most populous city and the commercial hub of Nigeria, contributes significantly to the surveyed organizations (Proshare, 2021).

On the use of customized software products (CSPs), 472(92.7%) of the organizations use CSPs for their business operations, implying that software products are ubiquitous, present in almost every sector of the economy (Mohammed & Ephraim, 2018). Analysis of the result in Table 2 revealed the origin of the CSPs 284(55.8%) were developed in Nigeria, indicating a rising trend of organizations choosing locally developed applications, contrary to the findings from Ekanem & Peter (2020) that the Nigeria software market is flooded by foreign software. On the age of the organization surveyed, 27(5.3%) were established in 1980-1990, 108(21.2%) between 1991-2000, 238(46.8%) from 2001-2010 and 136(26.7%) from 2011-2023.

Furthermore, majority (73.5%) of the organizations were established about 20 years ago. This result denotes that the number of organizations using CSPs are on the rise which is unconnected to the accessibility of internet connectivity (Statista, 2023).

From Table 2 analysis of the result revealed that the category of organizations most heavily represented in the study: 295(50.9%) have 11-49 staff and 250(49.1%) have 50 and above staff. This denotes that all of the organizations surveyed have the minimum required number of staff to qualify as an enterprise and falls within the categorization stated under the study's methodology.

Software Users' Respondent Profile

The demographic profile of respondents to the software users' research instrument is shown in Table 3. Analysis result on the position of respondent in the organization of software users examined revealed that 55 (10.4%) are Chief Executive Officer, 86 (16.9%) are Operation Officer, 53 (10.4%) Finance Officer, 222 (43.6%) Human Resource personnel, and 93 (18.3%) Procurement Officer. Majority (43.0%) of the respondents were of the Human Resource cadre due to their overseeing duty of ensuring a good working condition for the staff in their organizations. Analysis of the gender of respondents showed that 427(83.9%) are male and 82(16.1%) were females. This result implies that the majority (83.9%) of the respondents were male who are at the top management cadre in the surveyed organizations as compared to their female counter-parts, revealing a gender imbalance in occupying top management positions in most organizations in Nigeria.

Table 2: Software Users' General Enterprise Information

Software users' general enterprise information		**Frequency**	**Percentage**
Organizational sectors	Educational	114	22.4
	Health	107	21.0
	Servicing	117	23.0
	Manufacturing	111	21.8
	Government	60	11.8
Location	Abuja (FCT)	134	26.3
	Lagos State	196	38.5
	Rivers State	179	35.2
Used CSPs	Yes	472	92.7
	No	37	7.3
Origin of software	Developed in Nigeria	284	55.8
	Developed outside Nigeria	188	36.9
Year of establishment	1980-1990	27	5.3
	1991-2000	108	21.2
	2001-2010	238	46.8
	2011-2023	136	26.7
Firm size	11-49	295	50.9
	50 & above	250	49.1

Furthermore, from Table 3, analysis of the results revealed that the educational qualification of the top managers in the organizations examined 35(6.9%) post-secondary Diploma, 291 (57.2%) Bachelor/HND, 129 (25.3%) Masters and 54 (10.6%) PhD. The result indicated that majority (57.2%) of top managers in the organizations have a minimum of a first degree or its equivalent with a considerable level of education that enables them apply and understand the use of certain digital applications. On the age, respondents of the surveyed organizations revealed that 52(10.2%) are under 25years; 79 (15.5%) are between the ages of 26-30years; 214 (42.0%) are 31-35 years old, 108 (21.2%) are 36-40 years and 56 (11.0%) are 40 years and above. This result denotes that the majority (42.0%) of the top managers in the organizations examined are between the ages of 31 to 35 years old. Indicating a breed of young, vibrant manager with foresight of the fourth industrial revolution (4IR) (Marr, 2025).

Table 3: Software Users' Respondent Profile

	Variables	**Frequency**	**Percent age**
Position in the organization	Chief Executive Officer	67	11.2
	Chief Operation Officer	103	17.2
	Chief Finance Officer	69	11.5
	Head of Human Resource	258	43.0
	Chief Procurement Officer	103	17.2
Gender	Male	501	83.5
	Female	99	16.5
Educational Qualification	Post-secondary Diploma	49	8.2
	Bachelor/HND	327	54.5
	Masters	154	25.7
	PhD	70	11.7
Age of Respondent	Under 25years	52	10.2
	26-30	79	15.5
	31-35	214	42.0
	36-40	108	21.2
	41&above	56	11.2

Software Users' Perception

Software users that responded to the use of Customized Software Product (CSPs) revealed their perception about the quality of the applications. Table 4 presents the perception of software users about the quality of Customized Software Products (CSPs). From the results, the software users perceived that the CSPs functions (μ=3.7187) to a great extent, in that 'the software application performs excellently' (μ=3.62), 'it was suitable to meet specified official needs' (μ=3.45), 'the software was appropriate for the specified task it was primarily developed for' (μ=4.05), and 'the output of the software was accuracy' (μ=3.72).

Similarly, users perceived the CSP reliable (μ=3.5937) to a great extent indicating that 'the software is compliant with global standards' (μ=2.77), 'the software downtime was minimized' (μ=3.91), 'specified goals were achieved efficiently' (μ=3.80), and 'the software satisfied the specified need' (μ=3.90).

Also, users indicated that the Usability (user experience) of the CSP (μ=3.3596) is to a moderate extent such that 'the software is easy to operate and control' (μ=3.58), 'it was easy to learn and understand how to use the software' (μ=3.08), 'the software interface is attractive' (μ=3.17), 'the application functioned effectively' (μ=4.28), 'it's fun using the application' (μ=2.70), 'navigating through the interface is easy' (μ=2.11), and 'the application is suitable for the task' (μ=4.50).

Analysis reveals that the durability (μ=3.5937) of the CPS was perceived by users to a very great extent such that the 'there are restrictive measures against unauthorized users of the software' (μ=3.29), 'the software is readily available for use' (μ=3.67), 'the software is always accessible to authorized users' (μ=3.91), 'the size of the application is robust to meet future users' demands (μ=2.91), 'style guide documentation is available for future users to learn and understand the operability of the software' (μ=2.11), and 'the software security is enhanced to meet changing requirements for the future' (μ=3.63).

About the capacity, users perceived the CSP capacity (μ=3.2797) to be at a moderate extent, where 'the application performance rate is sustained irrespective of the number of users per time' (μ=2.81), 'the software is flexible, and can be use on any computing device (μ=2.57), and 'data backup and recovery provisions are available' (μ=4.46).

Finally, from Table 4, analysis of the perception of users about the cost of the CSPs, reveals that the 'cost of acquiring the software is affordable' (μ=4.07), 'cost of installation of the software was minimal' (μ=4.06), 'cost of training users was quite expensive' (μ=3.07), and 'cost of managing and maintaining the application is acceptable' (μ=4.24) cumulatively is to a 'Great Extent' as users perceived the cost (μ= 3.8586) of CSPs to be at the ICMM level 4 which is the aligned innovations level.

Comparative Analysis of the Variables of the Origin of the CSPS Based on Software User's Perception of the Quality of CSPS and the Response Rate of the Firms

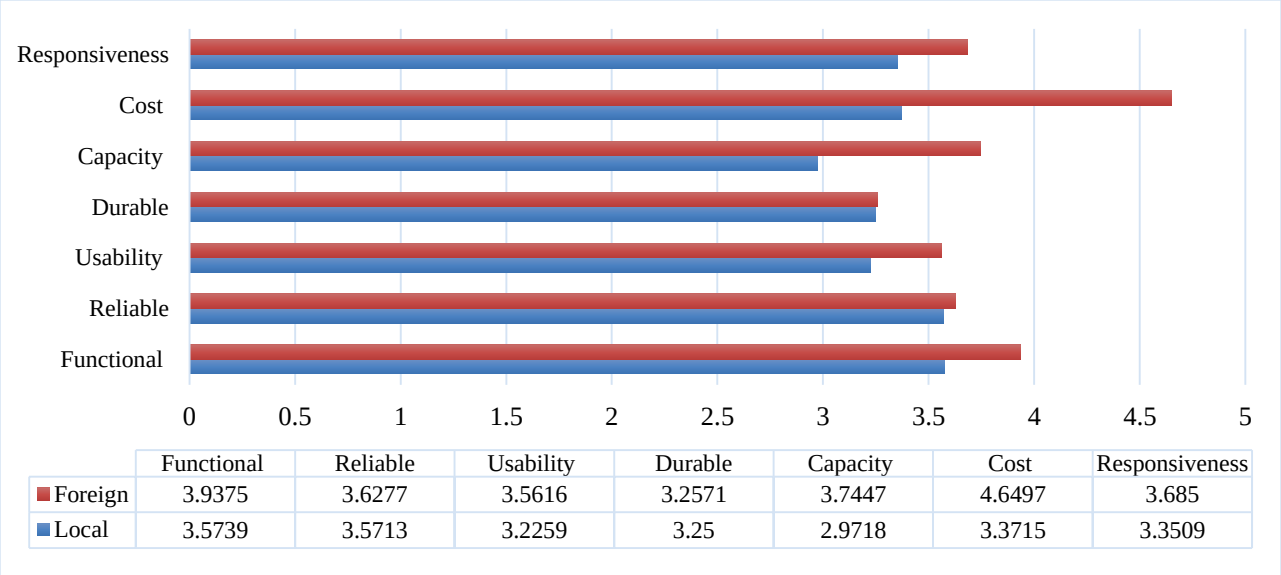
A comparative analysis reveals the perception of users of the origin of the CSPs they use based on the quality attributes (functionality, reliability, usability, durability, capacity, and cost) and the responsiveness of the software firms that developed the CSPs for them. The results in Figure 2 shows that to a great extent the foreign (μ=3.9375) and local (μ=3.5739) CSPs are functional, and foreign (μ=3.6277) and local (μ=3.5713) CSPs are reliable. However, the usability-user experience of foreign (μ=3.5616) CSPs is to a great extent compare to local (μ=3.2259) CSP of a moderate extent. The durability of foreign (μ=3.2571) and local (μ=3.2500) are of moderate extent, the capacity of foreign (μ=3.7447) CSPs is to a great extent while local (μ=2.9718) CSPs is of a moderate extent, and the cost of foreign (μ=4.6497) is to a very great extent, and that of local (μ=3.3715) is to a moderate extent, this reflects the perception of software users based on the origin of the products.

Bivariate Association between Origin of Customized Software Product and Socio-Economic Characteristics of Software User-Organizations

The result in Table 5 shows the bivariate relationship between origin of customized software product and socio-economic characteristics of software user-organizations. According to the results in the table, all the socio-economic characteristics of the users were significantly associated with the origin of the CSPs.

Table 4: Software Users' Perception about the Quality of Customized Software Products

Quality of CSPs	Software Users' Perception	Mean
Functionality (μ=3.7187)	The software application performing excellently	3.62
	It suitable to meet our specified official needs	3.45
	The software was appropriate for the specified task it was primarily developed for	4.05
	The output of the software was accuracy	3.72
Reliability (μ=3.5937)	The software is compliant with global standards	2.77
	The software downtime was minimized	3.91
	Specified goals were achieved efficiently	3.80
	The software satisfied the specified need	3.90
Usability (μ=3.3596)	The software is easy to operate and control	3.58
	It was easy to learn and understand how to use the software	3.08
	The software interface is attractive	3.17
	The application functioned effectively	4.28
	It's fun using the application	2.70
	Navigating through the interface is easy	2.11
	The application is suitable for the task	4.50
Durability (μ=3.5937)	There are restrictive measures against unauthorized users of the software	3.29
	The software is readily available for use	3.67
	The software is always accessible to authorized users	3.91
	The size of the application is robust to meet future users demands	2.91
	Style guide documentation is available for future users to learn and understand the operability of the software,	2.11
	The software security is enhanced to meet changing requirements for the future	3.63
Capacity (μ=3.2797)	The application performance rate is sustained irrespective of the number of users per time,	2.81
	The software is flexible, and can be use on any computing device	2.57
	Data backup and recovery provisions are available	4.46
Cost (μ=3.8586)	Cost of acquiring the software is affordable	4.07
	Cost of installation of the software was minimal	4.06
	Cost of training users was quite expensive	3.07
	Cost of managing and maintaining the application is acceptable	4.24



	Functional	Reliable	Usability	Durable	Capacity	Cost	Responsiveness
Foreign	3.9375	3.6277	3.5616	3.2571	3.7447	4.6497	3.685
Local	3.5739	3.5713	3.2259	3.25	2.9718	3.3715	3.3509

Figure 2: Comparism of Origin of CSPS Based on Quality and Firms' Response Rate

The analysis is said to be significantly associated where $p < 0.05$, and the result revealed that majority 78.3% of user-organizations in the manufacturing sector used CSPs made in Nigeria, 73.3% of user-organizations in the public sector (government agencies) used CSPs made abroad, and 66.7% of user-organizations in servicing firms used CSPs made in Nigeria. The analysis further revealed that 64.2% of user-organizations in Rivers State and 62.8% of user-organizations in Lagos State use CSPs made in Nigeria. Whereas, 56.7% of user-organization in Abuja (FCT) use CSPs made abroad. Also, analysis from the table revealed that majority of 80.8%, 59.3% and 55.7% of user-organizations that used CSPs made in Nigeria had firms' sizes (number of employees) between 1-10, 31-40 and above 40 staff strength as well as 52.6% of user-organizations established between 1980-1990, 60.0% established between 1991-2000 and 54.7% established between 2011-2023 use made in Nigeria CSPs, 48.5% of the users-organizations established between 2001-2010 use foreign CSPs.

The analysis also revealed that the Pearson Chi-square test of significance was used to analyze the level of significance between the origin of the software developed locally or foreign with the different organizational sectors, location of the organization, year of establishment and the size of the organization. The result indicated that it was significant at p-value less than 0.005 for the organizational sectors, location of the organization and the size of the organization but insignificant at the year of establishment.

Table 5: Bivariate Association between Origin of Customized Software Product and Socioeconomic Characters of Software User-Organization

Variables	Origin of Customized Software Products		Chi-Square
	Locally Made	Foreign Made	(P< 0.005)
Users-Organizations Sectors			
Government	10(16.7)	44(73.3)	
Education	52(45.6)	47(41.2)	75.947**
Health	57(53.3)	43(40.2)	(P=0.000)
Manufacturing	87(78.3)	21(18.9)	
Servicing	78(66.7)	33(28.2)	
Location of the organization			
Abuja (FCT)	46(34.3)	76(56.7)	47.199**
Lagos State	123(62.8)	68(34.7)	(P=0.000)
Rivers State	115(64.2)	44(24.6)	
Firms' size (Number of employees)			
1-10	21(80.8)	5(19.2)	
11-20	71(50.4)	51(36.2)	17.883**
21-30	47(51.1)	34(37.0)	(P=0.007)
31-40	96(59.3)	64(39.5)	
40 & above	49(55.7)	34(38.6)	
Year of Establishment			
1980-1990	60(52.6)	45(39.5)	
1991-2000	135(60.0)	77(34.2)	5.167
2001-2010	14(42.4)	16(48.5)	(P=0.523)
2011-2023	75(54.7)	50(36.5)	

Comparative Analysis of the Variables of Local CSPS Based on Software User's Perception of the Quality of CSPs

Table 6 presents users' perception of the quality software developed in Nigeria by indigenous software firms. The respondents revealed that the CSPs developed by indigenous software firms are to a 'Great Extent' functional (μ=3.71), reliable (μ=3.60), and cost efficient (μ=3.86) indicating that the software firms are at ICM level 4 where their innovations are aligned and integrated with the organizations' activities and resources hence the final product outputs are of a consistent differentiation. Meanwhile, usability (μ=3.35), durability (μ=3.25), and capacity (μ=3.28), of indigenous CSPs are to a 'Moderate Extent'. This

indicates that the software firms according to users' perceptions are on ICM Level 3, the supported innovations level, where the software firms are said to implement consistent practices, procedures and tools and their outputs is maintains and have a stable market share and become competitive.

From the Table, the results reveals that the users' perceives that the software firms in Nigeria are at ICM level 3 (μ=3.3082). Indicating that the software firms have attained a supported innovation level where they are capable to develop quality software using consistent practices, procedures and tools and the software product outputs maintains a stable market share. This has enabled the CSPs developed in Nigeria to contribute 0.05% to the global software product (Sa'ad & Jakwa, 2022).

Hence, Table 7 reveals the results of an Analysis of Variance (ANOVA) test for the quality of software products. From the table, it shows that the significant F-statistic (5, 1698) = 20.427 with a p-value of .000, indicating that there is a significant difference in means among the groups.

Table 6: Comparative Analysis of the Quality of Local CSPS Used by the Organizations

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Mini	Maxi
					Lower Bound	Upper Bound		
Functionality	284	3.71	1.111	.066	3.58	3.84	1	5
Reliability	284	3.60	1.060	.063	3.47	3.72	1	5
Usability	284	3.35	.806	.048	3.25	3.44	1	5
Durability	284	3.25	.791	.047	3.16	3.35	1	5
Capacity	284	3.28	.953	.057	3.17	3.39	1	5
Cost	284	3.86	.863	.051	3.76	3.96	1	5
Total	**1704**	**3.51**	**.965**	**.023**	**3.46**	**3.55**	**1**	**5**

Table 7: Analysis of Variance (ANOVA) Test of Quality of CSPs

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	89.960	5	17.992	20.427	.000
Within Groups	1495.574	1698	.881		
Total	1585.535	1703			

CONCLUSION

Since the software industry is becoming more and more integrated into different areas of the economy and the demand for customized software products is rising in almost every industry, evaluating the innovation capacity of software companies has become crucial. Additionally, three to four of the Sustainable Development Goals (SDGs) of the United Nations (UN) can be greatly aided by these companies' capacity for innovation. The purpose of this study is to assess users' perceptions of software companies' capacity for innovation in creating specialized software products. The maturity level of the chosen software companies was evaluated using the Innovation Capability Maturity Model (ICMM) framework. Findings indicate that users perceive these firms to have achieved a moderate level of innovation capability, which corresponds to a supported innovation maturity level. This implies that software companies must that software firms have, to some extent, been able to develop customized software products (CSP) that adhere to established software development practices and procedures. The tools employed are consistent, and the final outputs maintain a sustainable market presence.

Therefore, the study recommends that Nigerian software firms prioritize User-Centric Design (UCD) by actively understanding and addressing user needs. Engaging in user research, conducting usability testing, and collecting feedback will be crucial for continuously enhancing the user experience. Additionally, incorporating interactive features, intuitive interfaces, and customization options will further improve user satisfaction.

REFERENCES

Aguboshim, F. C. (2018). User interface challenges of banking ATM systems in Nigeria. Walden University.

Alvertis, I., Koussouris, S., Papaspyros, D., Arvanitakis, E., Mouzakitis, S., Franken, S., & Prinz, W. (2016). User involvement in software development processes. Procedia Computer Science, 97, 73-83.

Andreessen, M. (2011). Why software is eating the world. From https://www.andreessenhorowitz.com Retrieved on July 4, 2025.

Arends, S. C., & Advisory, B. G. K. I. (2018). Development of a firm-level innovation capability maturity model and identification of innovation archetypes. Eindhoven University of Technology, Netherlands.

Arora, N. K., & Mishra, I. (2023). Responsible consumption and production: A roadmap to sustainable development. Environmental Sustainability, 6(1), 1-6.

Bassey, J. (2019). 10 most popular software companies in Lagos. Retrieved November 28, 2021, from https://infoguidenigeria.com

Binuyo, G. O., Oyebisi, T. O., & Alimi, M. O. (2017). Assessment of the approaches used in indigenous software products development in Nigeria. IOSR Journal of Computer Engineering (IOSR-JCE), 19(1), 42-52.

Binuyo, G. O., Oyebisi, T. O., Olayinkaka, A., & Afolabi, B. S. (2014). Effectiveness of software products development in Nigeria. International Journal of Scientific & Engineering Research, 5(2), 327-344.

Bolanle, O. F., & Dimple, O. T. (2014). Customized software development & testing in Nigeria: Challenges and way forward. The International Journal of Science and Technoledge, 2(7), 90.

Brandli, L., Mazutti, J., Salvia, A., Pretorius, R., Nicolau, M., Shulla, K., Mora Motta, A., & Pohlmann, J. (2023). Sustainable Development Goal 1 – No poverty: Teacher's manual. Output of the collaborative DAAD-funded project between HAW, UPF, and Unisa: Digital Introduction to the Sustainable Development Goals in higher education teaching – regional aspects in implementing the SDGs from Brazil and South Africa (DITTS). University of Passo Fundo, Passo Fundo.

Chien, C. V. (2017). The market for software innovation through the lens of patent licenses and sales. Berkeley Technology Law Journal, 31.

Davidson, B. J. (2017). The 6 key features of user-friendly software. Retrieved September 24, 2021, from https://percentotech.com/

Dora, S. K., & Dubey, P. (2013). Software development life cycle (SDLC) analytical comparison and survey on traditional and agile methodology. *National Monthly Refereed Journal of Research in Science & Technology, 2(8), 22-30.

Echebiri, U. V., Phillips, T. R., Igbinosa, E. S., Raphael, M. U., & Ugoh, C. I. Analytical methods on factors contributing to the poor patronage of made-in-Nigeria products: A case of Nigeria.

Ekanem, B. A., & Peter, E. A. (2020). Nigeria software industry: Challenges and potentials for sustainable growth. International Journal of Computer Applications, 175(17), 24-31.

Golzar, J., Noor, S., & Tajik, O. (2022). Convenience sampling. International Journal of Education & Language Studies, 1(2), 72-77.

Information Economy Report. (2012). The software industry and developing countries. United Nations Conference on Trade and Development (UNCTAD). Retrieved July 4, 2025, from https://unctad.org/

International Trade Administration (ITA). (2021). Country commercial guides. Nigeria information and communications technology. Retrieved November 8, 2021, from https://www.trade.gov

Isah, B., & Aliyu, M. (2017). Impact of low patronage of home-made goods on Nigeria's economic growth. International Journal of Novel Research in Marketing Management and Economics, 4(2), 65.

Kamel, S. H. (2018). The potential role of the software industry in supporting economic development. In Encyclopedia of Information Science and Technology (4th ed., pp. 7259-7269). IGI Global.

Knoke, B. (2013). A short paper on innovation capability maturity within collaborations. In NGEBIS Short Papers (pp. 7-11).

Kumar, R., Zarour, M., Alenezi, M., Agrawal, A., & Khan, R. A. (2019). Measuring security durability of software through fuzzy-based decision-making process. International Journal of Computational Intelligence Systems, 12(2), 627.

Luo, J., Ahmad, S. F., Alyaemeni, A., Ou, Y., Irshad, M., Alyafi-Alzahri, R., & Unnisa, S. T. (2024). Role of perceived ease of use, usefulness, and financial strength on the adoption of health information systems: The moderating role of hospital size. *Humanities and Social Sciences Communications, 11(1), 1-12.

Marr, B. (2025). 4 essential leadership skills for the 4th industrial revolution. Bernard Marr & Co. Retrieved September 6, 2023, from https://bernardmarr.com

McManus, J. (2007). The global software industry: Evaluating the software markets of the BRIC nations. Asia Pacific Business Review, 3(2), 1-9.

Mohammed, U. F., & Ephraim, C. O. (2018). Consumption of foreign software and its effects on the development of indigenous software in Nigeria. International Journal of Science and Research (IJSR), 7(296), 921-930.

Narcizo, R. B., Canen, A. G., & Tammela, I. (2017). A conceptual framework to represent the theoretical domain of 'innovation capability' in organizations. Journal of Entrepreneurship, Management and Innovation (JEMI), 13(1), 147-166.

Ncanywa, T., Dyantyi, N., & Asaleye, A. J. (2025). Empowerment through entrepreneurship: Mixed-methods analysis of social grants and economic sufficiency. Economies, 13(4), 107.

Octasylva, A. R. P., Yuliati, L. N., Hartoyo, H., & Soehadi, A. W. (2022). Innovativeness as the key to MSMEs' performances. Sustainability, 14(11), 6429.

Ogunyemi, A., Lamas, D., Adagunodo, E. R., & Da Rosa, I. B. (2015). HCI practices in the Nigerian software industry. In Human-Computer Interaction–INTERACT 2015: 15th IFIP TC 13 International Conference, Bamberg, Germany, September, 14-18, 2015, Proceedings, Part II (pp. 479-488). Springer International Publishing.

Organization for Economic Co-operation and Development (OECD). (2018). Oslo Manual 2018: Guidelines for collecting, reporting and using data on innovation. Directorate for Science, Technology and Innovation.

Oyovwe-Tinuoye, G. O., & Omosekejimi, A. F. (2022). User perception of the use of integrated library software for service delivery in federal university libraries in the Niger Delta, Nigeria. Library Philosophy & Practice.

Proshare. (2021). The impact of Lagos State on Nigeria's economy. Retrieved September 6, 2023, from https://www.proshareng.com

Rusu, C., Rusu, V., Roncagliolo, S., & González, C. (2015). Usability and user experience: What should we care about? International Journal of Information Technologies and Systems Approach (IJITSA), 8(2), 1-12.

Sa'ad, M., & Jakwa, G. (2022). Quality software design, development and implementation in Nigeria: A panacea to national crisis. International Journal of Innovative Scientific & Engineering Technologies Research, 10(3), 9-19.

Singh, J., & Kassie, N. B. (2018, March). User's perspective of software quality. In 2018 Second International Conference on Electronics, Communication and Aerospace Technology (ICECA) (pp. 1958-1963). IEEE.

Statista. (2023). Mobile internet user penetration in Nigeria from 2018 to 2027. Retrieved August 9, 2023, from https://www.statista.com

Tajik, O., Golzar, J., & Noor, S. (2024). Purposive sampling. International Journal of Education and Learning Studies, 2(2).

Tarhan, A., Turetken, O., & Reijers, H. A. (2016). Business process maturity models: A systematic literature review. Information and Software Technology, 75, 122–134.

Vijayabaskar, M., & Babu, M. S. (2014). Building capabilities in the software service industry in India: Skill formation and learning of domestic enterprises in value chains. In Transforming Economies: Making industrial policy work for growth, jobs and development. Geneva: International Labour Office/UNCTAD, 252. Singh, J., & Kassie, N. B. (2018, March). User's Perspective of Software Quality. In 2018 Second International Conference on Electronics, Communication and Aerospace Technology (ICECA) (pp. 1958-1963). IEEE.