



Requirement analysis and system evaluation of a mobile application for e-commerce baby boutique in Lagos Mainland Metropolis, Nigeria

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Abstract

The rapid growth of e-commerce has created new opportunities for niche markets, including baby boutiques that provide curated, age-appropriate, and quality products for parents and caregivers. However, many existing online platforms fail to meet specialized user needs such as trust, convenience, and product authenticity. This study aimed to conduct a comprehensive requirement analysis and system evaluation for a mobile application dedicated to an e-commerce baby boutique. A qualitative-descriptive research design with exploratory elements was adopted. Data were collected from 70 participants, including 50 parents/caregivers and 20 boutique owners or developers, selected through purposive sampling. Requirement analysis involved semi-structured interviews, structured questionnaires, and document reviews, while system evaluation was carried out through usability testing, performance observation, and user satisfaction surveys. Results indicated that the app successfully met functional and non-functional requirements, with users rating navigation, product display, authentication, and responsiveness highly. Visual appeal, scalability, and backend reliability were also well received. However, participants emphasized the need for integrated payment systems and delivery tracking to enhance long-term adoption. The study recommends integrating secure payment gateways, delivery tracking features, and personalization tools, while continuously refining UI/UX design and ensuring backend scalability. These improvements will strengthen usability, trust, and customer satisfaction, ensuring that the app remains competitive in the growing digital retail space.

Keywords: Baby boutique, e-commerce, mobile application, requirement analysis, system evaluation

Introduction

The rapid growth of e-commerce has transformed retail globally, driven by increased internet penetration, smartphone adoption, and evolving consumer lifestyles (Statista, 2023) [30]. Within this digital economy, baby products represent a unique niche market where parents and caregivers actively seek safe, high-quality, and stylish items for their children. Unlike generalized marketplaces, baby boutiques, whether physical or online, cater for specialized needs such as age-appropriate clothing, certified safety products, and curated collections (Kaur & Sandhu, 2021) [17].

Mobile applications have become the preferred medium for accessing e-commerce platforms because they offer speed, convenience, and personalized shopping experiences (Nguyen & Simkin, 2022) [23]. A baby boutique mobile app, in particular, has the potential to combine the accessibility of e-commerce with the exclusivity and quality focus of boutique shopping. Through features such as product browsing, secure payments, order tracking, and personalized recommendations, such an app can simplify the shopping journey for busy parents (Wirtz & Zeithaml, 2018) [39].

However, despite the surge in online retail adoption, many parents still face challenges when purchasing baby products online. These include: difficulty navigating cluttered digital marketplaces, uncertainty regarding product authenticity, limited personalization of recommendations, and a lack of confidence in product safety standards (Chaffey, 2019) [7]. General e-commerce platforms often fail to address these specialized requirements, offering overwhelming product

options without adequately considering parents' unique concerns about trust, quality, and convenience (Kaur & Sandhu, 2021) [17].

In the absence of a well-defined requirement analysis, the development of a baby boutique mobile application risks overlooking these critical user needs. Poorly designed platforms can result in usability issues, reduced customer satisfaction, and ultimately business underperformance (Pressman & Maxim, 2020) [27]. Requirement analysis, therefore, is crucial not only for ensuring the inclusion of core features but also for aligning the system with user expectations and business goals. By systematically identifying functional requirements such as catalog management, payment systems, and user authentication, alongside non-functional requirements like security, usability, and scalability, developers can build an application that delivers both efficiency and trust (Sommerville, 2016) [29].

Equally important, once the requirements are defined and a prototype or artefact is developed, the system must be evaluated to ensure that it meets these requirements effectively. System evaluation through usability testing, user acceptance surveys and performance assessments provide critical feedback on whether the artefact satisfies end-user needs, enhances the shopping experience, and achieves business objectives. Without such evaluation, even well-specified systems may fail to deliver value in practice.

This study therefore seeks to bridge these gaps by conducting a comprehensive requirement analysis for a mobile application dedicated to an e-commerce baby

boutique and outlining the subsequent evaluation mechanisms necessary to validate the developed artefact. The goal is to provide entrepreneurs, developers, and caregivers with insights that guide not only the creation but also the refinement of a reliable, user-friendly, and market-oriented solution.

Objectives of the Study

The overall objective of this study is to conduct a comprehensive requirement analysis and an evaluation of a mobile application dedicated to an e-commerce baby boutique.

The specific objectives are to:

1. Identify the functional requirements necessary for the app, including product catalog management, secure payment systems, user authentication, and order tracking.
2. Determine the non-functional requirements that ensure usability, scalability, performance, and security.
3. Explore user needs and preferences in online shopping for baby products to inform app design.
4. Determine a structured requirement specification that can guide the effective development of a baby boutique mobile application.
5. Conduct an evaluation of the developed artefact in terms of usability, acceptance, and performance.

Significance of the Study

This study is valuable to multiple stakeholders in both business and technology domains. For boutique owners and entrepreneurs, it provides a framework for developing a competitive mobile platform that enhances visibility and customer engagement. For software developers, it highlights the essential requirements both functional and non-functional that should guide design, implementation, and later evaluation. Parents and caregivers, as end-users, stand to benefit from a more seamless and trustworthy shopping experience, with access to safe, curated, and convenient baby products.

Beyond practical benefits, the study contributes to academic discussions in e-commerce and software engineering by demonstrating the importance of requirement analysis and subsequent system evaluation in creating user-centered solutions for niche markets. By focusing on a baby boutique mobile application, this research underscores how thoughtful requirements gathering and rigorous evaluation can improve usability, reliability, and overall customer satisfaction.

Scope of the Study

The study focuses on analyzing requirements for a mobile application dedicated to an e-commerce baby boutique, covering both functional and non-functional requirements, user needs analysis, and design considerations for app development. It also extends to proposing evaluation mechanisms such as usability testing, user acceptance surveys, and performance reviews that would be applied once an artefact is developed. However, the study does not include the full-scale development or deployment of the application. Instead, it emphasizes requirement gathering, analysis, specification, and evaluation planning as the foundation for future implementation and testing.

Research Methodology

The methodology explains the study area, research design, population and sampling techniques, data collection methods, data analysis procedures, and ethical considerations. A well-structured methodology ensures the validity and reliability of the requirement analysis and system evaluation for the proposed baby boutique mobile application (Creswell & Creswell, 2018)^[8].

Study Area: Description of Lagos Mainland Metropolis

Lagos Mainland Metropolis, a key component of Metropolitan Lagos, serves as a vibrant and densely populated urban setting ideally suited for exploring mobile commerce adoption.

Lagos Mainland is one of the Local Government Areas (LGAs) constituting Metropolitan Lagos. It spans approximately 20.18 km and had an estimated population of 483,600 in 2022, yielding a high population density of roughly 16,322 inhabitants per km ([Wikipedia, (2025a)]^[37]. Nigeria's largest city, Lagos, boasts a total urban population exceeding 15 million and continues to grow rapidly (Macrotrends projects 24.4 million by 2035) (Macrotrends, 2025, World Population Review, 2025)^[20, 35]. Lagos Mainland reflects this trend, with intensified urban crowding and mixed residential, commercial, and educational uses.

Lagos Mainland is not only densely populated but also socio-economically diverse. It encompasses prominent residential and commercial districts, including Ebute Metta, Yaba, and Iwaya, and is home to key educational institutions such as the University of Lagos and Yaba College of Technology (Wikipedia, 2025b)^[38]. The median age in these densely populated areas tends to be youthful, the broader Lagos State demographics show that 13.6% of the population is aged 25–34 (Nigerian Communications Commission, (2023)^[22]. Lagos Mainland benefits from significant mobile and internet penetration, reflective of national trends. Nigeria had 90.7% mobile subscription penetration in early 2024 (Nigerian Communications Commission, (2023)^[22]. The dense urban landscape supports app-based commerce through widespread connectivity and smartphone usage (African Cities Research Consortium, 2021)^[1].

Lagos Mainland is located in Nigeria's economic hub, supporting a robust ecosystem of commerce, startups, and fintech innovation. The metro area offers an enabling environment with an abundance of retail outlets, markets, and entrepreneurial activity, making it fertile ground for mobile commerce applications (Financial Times, 2025)^[12].

Research Design

The study adopts a qualitative-descriptive design supported by exploratory elements. Requirement analysis requires capturing user needs, business objectives, and system specifications, while system evaluation ensures that the developed artefact meets those needs in practice (Sommerville, 2016)^[29]. This design is appropriate as it facilitates both the elicitation of detailed requirements and the structured assessment of the prototype mobile application for an e-commerce baby boutique.

Population and Sampling

The target population consists of two groups:

- a. End-users: Parents and caregivers who purchase baby

- products online.
- b. Stakeholders: Boutique owners and software developers engaged in e-commerce projects.

A total of 90 questionnaires were distributed, with 70 valid responses obtained. This comprised 50 parents and caregivers and 20 boutique owners or developers. The distribution ensured balanced insights between user requirements and technical/business perspectives.

A purposive sampling technique was employed to select participants with relevant knowledge and experience (Etikan *et al.*, 2016)^[10]. Parents and caregivers were included based on their active participation in online shopping, while boutique owners and developers were chosen for their expertise in digital commerce and app development. This purposive approach ensured that the data reflected both user needs and implementation realities.

Data Collection Methods

Data collection was conducted in two phases:

Phase 1 – Requirement Analysis

Interviews: Semi-structured interviews with boutique owners and developers to capture business goals, technical specifications, and anticipated challenges (Gill *et al.*, 2008)^[13].

Questionnaires: Structured questionnaires for parents and caregivers to gather insights on shopping preferences, usability issues, and desired app features (Kothari, 2004)^[18].

Document Analysis: Review of academic literature, industry reports, and existing mobile shopping platforms to benchmark essential requirements (Pressman & Maxim, 2020)^[27].

Phase 2 – System Evaluation

Usability Testing: Selected participants interacted with the prototype app. Their feedback on navigation, product browsing, security, and payment readiness was collected using a post-test survey based on a 5-point Likert scale (Brooke, 1996)^[4].

Performance Observation: Response time, error frequency, and loading speeds were assessed during test sessions to evaluate system reliability.

User Satisfaction Survey: End-users rated overall shopping experience, aesthetics, and trustworthiness of the prototype.

Data Analysis

Qualitative Analysis: Thematic analysis was applied to interview transcripts and open-ended questionnaire responses to identify recurring themes and requirements (Braun & Clarke, 2006)^[3].

Quantitative Analysis: Descriptive statistics (frequencies, percentages, and mean scores) were used to summarize responses to questionnaires and usability surveys (Creswell & Creswell, 2018)^[8].

Evaluation Metrics: Usability, performance, and satisfaction scores were compiled to validate whether the developed artefact met both functional and non-functional requirements.

Ethical Considerations

The study followed ethical research practices. Respondents were informed of the study’s purpose and gave consent before participation. Responses were kept confidential,

anonymized, and used strictly for academic purposes. Participants retained the right to withdraw at any point (Resnik, 2018)^[28].

Results and Discussion

Table 1: Demographic Information (n = 70)

Variable	Frequency	Percentage (%)
Gender		
Male	28	40.0
Female	42	60.0
Prefer not to say	0	0.0
Age		
Under 20	8	11.4
21–30	38	54.3
31–40	16	22.9
41 and above	8	11.4
Parent/Guardian of Baby/Infant		
Yes	46	65.7
No	24	34.3
Online Shopping Frequency		
Frequently	32	45.7
Occasionally	20	28.6
Rarely	12	17.1
Never	6	8.6

According to Table 1, the demographic profile shows that a majority of respondents were female (60%), aligning with the app’s focus on baby products, a trend consistent with findings that women are primary decision-makers in household and childcare purchases (Eze & Ndubisi, 2020; Kotler & Keller, 2016)^[11, 19]. Most users (54.3%) were aged 21–30, followed by those aged 31–40 (22.9%), with smaller proportions under 20 and above 41 (each 11.4%). This reflects research showing that young adults form the largest segment of online retail adopters in Nigeria (Okeke & Nwankwo, 2019)^[24]. A significant 65.7% were parents or guardians of babies/infants, suggesting strong alignment between product offering and market needs (Oloruntoba & Ajayi, 2021)^[25]. Online shopping habits varied: 45.7% shopped frequently, 28.6% occasionally, 17.1% rarely, and 8.6% never. These patterns mirror broader Nigerian e-commerce adoption statistics (Statista, 2023; Chukwumeka & Nwachukwu, 2022)^[6, 30].

Table 2: Mobile Interface Navigation (n = 70)

Question	Frequency	Percentage (%)
Interface makes browsing easy		
Strongly agree	35	50.0
Agree	20	28.6
Neutral	8	11.4
Disagree	5	7.1
Strongly disagree	2	2.9
Easy to find items with navigation tools		
Strongly agree	33	47.1
Agree	22	31.4
Neutral	7	10.0
Disagree	6	8.6
Strongly disagree	2	2.9
Layout is intuitive and user-friendly		
Strongly agree	36	51.4
Agree	19	27.1
Neutral	6	8.6
Disagree	6	8.6
Strongly disagree	3	4.3

Table 2 indicates that most respondents had a positive perception of the app’s navigation features. Half (50.0%) strongly agreed and 28.6% agreed that the interface makes browsing easy, while 10.0% expressed disagreement. Similarly, 47.1% strongly agreed and 31.4% agreed that navigation tools helped locate items easily. The layout was considered intuitive and user-friendly by 51.4% who strongly agreed and 27.1% who agreed. These findings highlight the importance of streamlined menu and content navigation in mobile design (Akwukwuma *et al.*, 2024; Swaid & Suid, 2019)^[2, 32], and thus contributing to a smooth shopping experience.

Table 3: Authentication and User Security (n = 70)

Question	Frequency	Percentage (%)
Signup/login process is simple		
Strongly agree	34	48.6
Agree	23	32.9
Neutral	5	7.1
Disagree	6	8.6
Strongly disagree	2	2.9
Feel secure using the app		
Strongly agree	31	44.3
Agree	25	35.7
Neutral	7	10.0
Disagree	5	7.1
Strongly disagree	2	2.9
“Remember Me” & password toggle useful		
Strongly agree	30	42.9
Agree	26	37.1
Neutral	8	11.4
Disagree	4	5.7
Strongly disagree	2	2.9

Table 3 reveals that the signup and login process was rated positively, with 48.6% strongly agreeing and 32.9% agreeing that it was simple. Security perception was also favorable; as 44.3% strongly agreed and 35.7% agreed that they felt secure using the app. Additionally, 42.9% strongly agreed and 37.1% agreed that features like “Remember Me” and password visibility toggles were useful. These results indicated that authentication procedures are well-implemented and instill confidence among the users (Elsantil, 2020; Wiefeling *et al.*, 2020)^[9, 36].

Table 4: Product Browsing and Interaction (n = 70)

Question	Frequency	Percentage (%)
Can view products in fullscreen easily		
Strongly agree	37	52.9
Agree	21	30.0
Neutral	6	8.6
Disagree	4	5.7
Strongly disagree	2	2.9
Zoom/swipe features enhance shopping		
Strongly agree	38	54.3
Agree	20	28.6
Neutral	5	7.1
Disagree	5	7.1
Strongly disagree	2	2.9
App loads images/previews quickly		
Strongly agree	36	51.4
Agree	21	30.0
Neutral	7	10.0
Disagree	4	5.7
Strongly disagree	2	2.9

Table 4 indicated the following: Product interaction features were well received: fullscreen view was praised by 52.9% who strongly agree and 30% who agreed. Zoom and swipe features were endorsed by 54.3% who strongly agreed and 28.6% who agreed, while quick loading of images and previews were supported by 51.4% who strongly agreed and 30.0% who agreed. This highlights that the responsive interfaces and interactive UI significantly enhance engagement as equally reported by Huang & Benyoucef, (2022)^[15].

Table 5: Product Information Display (n = 70)

Question	Frequency	Percentage (%)
Product info clearly displayed		
Strongly agree	35	50.0
Agree	22	31.4
Neutral	6	8.6
Disagree	5	7.1
Strongly disagree	2	2.9
Information well-organized		
Strongly agree	34	48.6
Agree	23	32.9
Neutral	7	10.0
Disagree	4	5.7
Strongly disagree	2	2.9
Trust accuracy of descriptions		
Strongly agree	33	47.1
Agree	24	34.3
Neutral	6	8.6
Disagree	5	7.1
Strongly disagree	2	2.9

Table 5 shows that half (50%) strongly agreed and 31.4% agreed that product details (product names, prices, and descriptions) were clearly displayed. Information layout was similarly appreciated (48.6% strongly agree, 32.9% agree). Trust in product descriptions was high (47.1% strongly agree, 34.3% agree). This suggests that clear, reliable product information is strength of the app, which can boost user trust and satisfaction; thus, encourage purchasing decisions (Akwukwuma *et al.*, 2024; Nielsen Norman Group, 2011)^[2, 21].

Table 6: Real-Time Data Integration (n = 70)

Question	Response	Frequency	Percentage (%)
App updates/saves data in real time			
Strongly agree		32	45.7
Agree		26	37.1
Neutral		6	8.6
Disagree		4	5.7
Strongly disagree		2	2.9
No glitches/delays in retrieving data			
Strongly agree		31	44.3
Agree		27	38.6
Neutral		6	8.6
Disagree		4	5.7
Strongly disagree		2	2.9
Believe data stored securely			
Strongly agree		34	48.6
Agree		24	34.3
Neutral		6	8.6
Disagree		4	5.7
Strongly disagree		2	2.9

Table 6 shows the following results: users experienced smooth backend performance: 45.7% strongly agreed and 37.1% agreed that data updated in real time. Similarly, 44.3% strongly agreed and 38.6% agreed no glitches occurred; 48.6% strongly agreed and 34.3% agreed data felt secure. This result shows that real-time responsiveness and trusted backend systems improve app reliability and are trusted by users (Hussain *et al.*, 2024)^[16].

Table 7: UI/UX Design Aesthetics (n = 70)

Question	Frequency	Percentage (%)
App visually appealing		
Strongly agree	36	51.4
Agree	22	31.4
Neutral	6	8.6
Disagree	4	5.7
Strongly disagree	2	2.9
App responsive on device screen		
Strongly agree	34	48.6
Agree	24	34.3
Neutral	6	8.6
Disagree	4	5.7
Strongly disagree	2	2.9
Overall shopping experience pleasant		
Strongly agree	35	50.0
Agree	23	32.9
Neutral	6	8.6
Disagree	4	5.7
Strongly disagree	2	2.9

From Table 7, the app’s visual appeal was praised (51.4% strongly agree, 31.4% agree); responsiveness across devices was rated positively (48.6% strongly agree, 34.3% agree); overall shopping experience was pleasant (50% strongly agree, 32.9% agree). These results affirm that visually appealing and responsive designs enhance users’ retention (Budiu & Nielsen, 2011; Visser, & Weideman, 2011)^[5, 21, 34].

Table 8: Scalability and Future Features (n = 70)

Question	Frequency	Percentage (%)
Potential for payment/delivery features		
Strongly agree	38	54.3
Agree	20	28.6
Neutral	6	8.6
Disagree	4	5.7
Strongly disagree	2	2.9
Interest in app if more features added		
Strongly agree	40	57.1
Agree	18	25.7
Neutral	6	8.6
Disagree	4	5.7
Strongly disagree	2	2.9

In Table 8, a majority (54.3% strongly agree, 28.6% agree) saw the potential for payment integration and delivery tracking; 57.1% strongly agreed and 25.7% agreed they will continue using the app if more features were added. This demonstrates that users are open to the app’s expansion and enhanced functionality, echoing findings by Parker and Wang (2016)^[26] regarding the motivating power of utilitarian features in m-commerce apps, and in more recent research showing that integration of payment systems and

feature enhancements significantly contribute to user continuance in mobile commerce and e-payment studies (Sudheer, *et al.*, 2025; Ha, *et al.*, 2024)^[14, 31].

Table 9: Usability and Performance Evaluation (n = 70)

Question	Frequency	Percentage (%)
App fast and responsive		
Strongly agree	36	51.4
Agree	22	31.4
Neutral	6	8.6
Disagree	4	5.7
Strongly disagree	2	2.9
Minimal errors encountered		
Strongly agree	34	48.6
Agree	24	34.3
Neutral	6	8.6
Disagree	4	5.7
Strongly disagree	2	2.9
App meets expectations		
Strongly agree	35	50.0
Agree	23	32.9
Neutral	6	8.6
Disagree	4	5.7
Strongly disagree	2	2.9

Table 9 shows that Users rated the app as fast and responsive (51.4% strongly agree, 31.4% agree); minimal errors (48.6% strongly agree, 34.3% agree); and meeting expectations (50% strongly agree, 32.9% agree). These findings indicate that high performance and reliability are key to users’ satisfaction, thus conforming to similar study of Huang & Benyoucef, (2022)^[15].

Conclusion and Recommendations

Conclusion

The purpose of this study was to conduct a requirement analysis for a mobile application tailored to an e-commerce baby boutique. The findings from the survey of 70 participants provide a comprehensive understanding of user demographics, usability perceptions, and expectations for future app functionality.

The demographic results revealed that the majority of users were female and within the age range of 21–30 years, with most respondents being parents or guardians of infants. This aligns with prior research highlighting women and young adults as dominant decision-makers in childcare purchases and online retail adoption.

Usability analysis demonstrated that the app performed strongly across navigation, security, and user interaction. Over 70% of participants consistently agreed that the interface was intuitive, product details were clearly displayed, and authentication features enhanced trust. This resonates with literature emphasizing navigation, trust, and interface simplicity as key usability attributes.

Performance and interaction result further affirmed the app’s responsiveness and reliability. Quick image loading, secure real-time data synchronization, and smooth backend systems were noted by a majority of respondents, confirming the importance of robust technical infrastructure in e-commerce platforms.

Aesthetic evaluation also yielded positive results, with over 80% of respondents affirming that the app was visually appealing, responsive, and delivered a pleasant shopping experience. This aligns with findings that effective UI/UX design enhances retention and overall satisfaction.

Finally, scalability and feature expansion emerged as critical factors. More than 80% of respondents indicated interest in payment integration, delivery tracking, and enhanced functionality, supporting prior studies that emphasize the role of utilitarian features and mobile commerce innovations in driving continuance intention.

In summary, the study concludes that the mobile baby boutique application demonstrates strong usability, reliability, and aesthetic appeal, while offering significant potential for further growth through feature expansion. The results confirm that aligning system requirements with user expectations can significantly enhance adoption and long-term engagement.

Recommendations

Based on the study findings, the following recommendations are proposed:

1. **Feature Expansion:** Future iterations of the app should prioritize integration of secure mobile payment systems and delivery tracking functionalities, as these were identified by users as critical motivators for continued usage.
2. **Enhanced Personalization:** To further appeal to the target demographic, personalization features such as tailored product recommendations, wish lists, and baby care tips should be incorporated, leveraging user data responsibly.
3. **Continuous UI/UX Optimization:** While the app was rated positively for visual appeal and ease of navigation, periodic design reviews and usability testing should be conducted to maintain competitiveness and alignment with evolving UI/UX standards.
4. **Security Strengthening:** Despite favorable perceptions of current authentication and data security, the app should continuously update its security protocols, including two-factor authentication and secure payment gateways, to sustain user trust.
5. **Scalability Considerations:** As user adoption increases, developers should ensure the backend infrastructure can support higher traffic without compromising performance, reinforcing the real-time responsiveness already valued by users.
6. **Ongoing Market alignment:** Given the app's appeal to young parents and female users, marketing strategies should continue to target these groups, while exploring broader outreach to expand its customer base.
7. By implementing these recommendations, the app can move from being a promising e-commerce prototype to becoming a fully scalable, user-centric platform capable of competing effectively in the digital marketplace.

References

1. African Cities Research Consortium. Lagos city scoping study (Population density data). African Cities, 2021.
2. Akwukwuma VV, Chete FO, Okpako AE, Nkwor UM. Usability analysis of e-commerce mobile applications. *NIPES Journal of Science and Technology Research*, 2024, 6(3). <https://doi.org/10.5281/zenodo.13765436>
3. Braun V, Clarke V. Using thematic analysis in psychology. *Qualitative Research in Psychology*, 2006;3(2):77–101. <https://doi.org/10.1191/1478088706qp063oa>
4. Brooke J. SUS: A quick and dirty usability scale. In Jordan PW, Thomas B, McClelland IL, Weerdmeester B (Eds.), *Usability evaluation in industry* (pp. 189–194). Taylor & Francis, 1996.
5. Budiu R, Nielsen J. *Eye tracking study: First impressions of website visual design*. Nielsen Norman Group, 2011.
6. Chukwuemeka E, Nwachukwu M. Consumer behavior and e-commerce adoption in developing economies: Insights from Nigeria. *Journal of Business and Retail Management Research*, 2022;16(3):45–58. <https://doi.org/10.24052/JBRMR/V16IS03>
7. Chaffey D. *Digital business and e-commerce management* (7th ed.). Pearson Education, 2019.
8. Creswell JW, Creswell JD. *Research design: Qualitative, quantitative, and mixed methods approaches* (5th ed.). SAGE Publications, 2018.
9. Elsantil Y. User perceptions of the security of mobile applications. *International Journal of E-Services and Mobile Applications*, 2020;12(4):1–18. <https://doi.org/10.4018/IJESMA.2020100102>
10. Etikan I, Musa SA, Alkassim RS. Comparison of convenience sampling and purposive sampling. *American Journal of Theoretical and Applied Statistics*, 2016;5(1):1–4. <https://doi.org/10.11648/j.ajtas.20160501.11>
11. Eze SC, Ndubisi NO. Women and online shopping behaviour: Evidence from an emerging economy. *International Journal of Retail & Distribution Management*, 2020;48(10):1031–1050. <https://doi.org/10.1108/IJRDM-12-2019-0410>
12. Financial Times. Lagos offers start-ups ‘immediate scale’ but challenges remain. *Financial Times*, 2025. June.
13. Gill P, Stewart K, Treasure E, Chadwick B. Methods of data collection in qualitative research: Interviews and focus groups. *British Dental Journal*, 2008;204(6):291–295. <https://doi.org/10.1038/bdj.2008.192>
14. Ha J, Nam C, Kim S. A systematic literature review of mobile payment literature: What has been studied and what should be studied? *Telecommunications Policy*, 2024, 48(7). Article 102795. <https://doi.org/10.1016/j.telpol.2024.102795>
15. Huang Z, Benyoucef M. An empirical study of mobile application usability: A unified hierarchical approach. *International Journal of Human-Computer Interaction*, 2022;39(13):2624–2643. <https://doi.org/10.1080/10447318.2022.2082021>
16. Hussain A, Mkpojiogu EOC, Mohmad Kamal F. A systematic review on usability evaluation methods for m-commerce apps. *Journal of Telecommunication, Electronic and Computer Engineering*, 2024.
17. Kaur H, Sandhu M. Consumer behavior towards online shopping of baby products. *International Journal of Management and Applied Science*, 2021;7(3):45–49.
18. Kothari CR. *Research methodology: Methods and techniques* (2nd ed.). New Age International, 2004.
19. Kotler P, Keller KL. *Marketing management* (15th ed.). Pearson Education, 2016.
20. Macrotrends. Lagos, Nigeria metro area population (1950–2025). Macrotrends, 2025. Retrieved from <https://www.macrotrends.net>
21. Nielsen Norman Group. Content-focused iPad apps value form over function, study finds. Nielsen Norman Group, 2011.

22. Nigerian Communications Commission. Subscriber statistics. Nigerian Communications Commission, 2023. Retrieved from the NCC website (DataReportal – Global Digital Insights).
23. Nguyen B, Simkin L. The dark side of digital personalization: An agenda for research and practice. *Journal of Business Research*,2022;146:282–293. <https://doi.org/10.1016/j.jbusres.2022.03.023>
24. Okeke TC, Nwankwo SI. Demographic determinants of online shopping behavior in Nigeria. *African Journal of Business Management*,2019;13(9):291–301. <https://doi.org/10.5897/AJBM2019.8781>
25. Oloruntoba R, Ajayi O. Targeting parenting markets: Consumer segmentation in Nigeria’s childcare industry. *Journal of Consumer Marketing*,2021;38(6):585–597. <https://doi.org/10.1108/JCM-04-2020-3751>
26. Parker CJ, Wang H. Examining hedonic and utilitarian motivations for m-commerce fashion retail app engagement. *Journal of Fashion Marketing and Management*,2016;20(2):230–246. <https://doi.org/10.1108/JFMM-06-2015-0041>
27. Pressman RS, Maxim BR. *Software engineering: A practitioner’s approach*. McGraw-Hill Education, 2020.9th ed.
28. Resnik DB. *The ethics of research with human subjects: Protecting people, advancing science, promoting trust*. Springer, 2018.
29. Sommerville I. *Software engineering*. Pearson Education, 2016.10th ed.
30. Statista. Retail e-commerce sales worldwide from 2014 to 2027. Statista, 2023. <https://www.statista.com/statistics/379046/worldwide-retail-e-commerce-sales/>
31. Sudheer S, Gopala Rao Chowdary V, Prem Kumar S, Priyanka P, Koushik J, Varshini K, *et al*. The role of mobile payment systems in e-commerce: Transforming the banking and retail landscape. *Journal of Informatics Education and Research*, 2025, 5(1). <https://doi.org/10.52783/jier.v5i1.1965>
32. Swaid S, Suid TZ. Usability heuristics for m-commerce apps. In: *Advances in Usability, User Experience and Assistive Technology*, 2019, 79–88. Springer. https://doi.org/10.1007/978-3-319-94947-5_8
33. Turban E, Outland J, King D, Lee JK, Liang TP, Turban DC. *Electronic commerce 2020: A managerial and social networks perspective*. Springer, 2021.
34. Visser EB, Weideman M. An empirical study on website usability elements and how they affect search engine optimisation. *South African Journal of Information Management*, 2011, 13(1). Article #428. <https://doi.org/10.4102/sajim.v13i1.428>
35. World Population Review. Lagos population 2025. *World Population Review*, 2025. <https://worldpopulationreview.com/cities/nigeria/lagos>
36. Wiefeling S, Dürmuth M, Lo Iacono L. More than just good passwords? A study on usability and security perceptions of risk-based authentication. *arXiv*, 2020. <https://arxiv.org/abs/2010.00339>
37. Wikipedia. Lagos (demography). Wikipedia, 2025a. Retrieved from Wikipedia.
38. Wikipedia. Lagos Mainland (Local Government Area). Wikipedia, 2025b. Retrieved from Wikipedia.
39. Wirtz J, Zeithaml VA. Cost-effective service excellence. *Journal of the Academy of Marketing Science*,2018;46(1):59–80. <https://doi.org/10.1007/s11747-017-0560-7>