

# Technology adoption and the performance of *Adire* textile firms

## Abstract

The study investigated the types of technology adopted in *adire* textile firms and evaluated the effect of the adopted technologies on business performance in Osun State, Nigeria. Three *adire* textile processing centres were randomly selected from each Senatorial District. Questionnaire was administered to fifteen designers (managers inclusive) from each of the selected processing site totaling one hundred and twenty-two (122) respondents. The data was analysed using descriptive and inferential statistics. The result showed that majority (77%) adopted traditional dye, batik, eleko, oniko, and alabere techniques, while 23% used freehand and stencil techniques. None employed Computer Numerical Control (CNC) or Computer-Aided Design (CAD) software. A positive and significant relationship exists between affordability and dye technology ( $r = 0.279$ ;  $p < 0.01$ ). There was a positive and significant relationship between increase in price and batik technology ( $r = 0.301$ ;  $p < 0.01$ ) and communication technology ( $r = 0.191$ ;  $p < 0.05$ ). The study concluded that technologies adopted in the study area contributed significantly to *adire* business performance implying that adoption of modern technology will improve the operations.

**Keywords:** *Adire*, technology, adoption, performance, textile firms

Volume 12 Issue 1 - 2026

Onen-Bassey Bassey Titus, Oyebola Abiodun Isaac, Diyaolu Idowu Jamiu, Adedeji Funke Tawakalitu, Olaposi Titilayo Olubunmi  
Obafemi Awolowo University, Ile-Ife, Nigeria

**Correspondence:** Diyaolu Idowu Jamiu, Obafemi Awolowo University, Ile-Ife, Nigeria

**Received:** December 28, 2025 | **Published:** February 4, 2026

## Introduction

Nigeria is a culturally diverse nation endowed with creativity, traditional skills, and rich artistic heritage. Among the country's many indigenous crafts, textiles occupy a significant position, playing important roles in cultural identity and tourism development.<sup>1,2</sup> They often communicating personality, status and prestige.<sup>3</sup>

*Adire*, a Yoruba resist-dyed textile, is one of Nigeria's most enduring indigenous crafts. Evidence suggests that related strip-woven fabrics existed as early as the eleventh century, as shown by textile fragments found in Mali's Tellem caves.<sup>4</sup> *Adire* production uses local materials such as raffia, indigo dye, and handwoven cotton fabrics. The term *adire* is derived from two Yoruba words *adi* (to tie) and *re* (to dye), describing a process in which fabric sections are tied, stitched, or knotted before dyeing to create patterned motifs.<sup>5</sup> Depending on design preferences, producers may incorporate seeds, pebbles, or tight stitching to generate various resist effects.

*Adire* is traditionally produced by women in southwestern Nigeria and carries strong aesthetic and cultural meanings. Several varieties of *adire* exist, including *adire eleko*, created using a cassava-paste resist applied with quills or wooden tools.<sup>6,7</sup> Classic motifs include *adire eleso*, *osubamba*, and *alakete* with knotting, binding, folding, stitching, and clamping.<sup>8</sup> Over the years, innovations such as combining tie-dye with batik have expanded design possibilities. *Adire* continues to thrive due to its popularity among artists and consumers, and its craftsmanship has contributed to Nigeria's visibility in global fashion markets.<sup>8,9</sup> The craft also supports employment and local economies. The early twentieth-century textile boom, enabled by European merchants who supplied factory-produced cloth, further expanded the scale of *adire* production.<sup>10</sup>

Within the informal sector, enterprises are typically small-scale, labour-intensive, and reliant on personal capital and family labour.<sup>11</sup>

Limited production capacity remains a persistent challenge in the Nigerian *adire* textile firms. Manual production methods restrict output, as resist-dye and hand-printing techniques are labour-intensive

and time-consuming.<sup>12</sup> Stenciling and freehand drawing further limit scalability, making it difficult for producers to meet growing demand.<sup>13</sup> Without effective technology evaluation, innovations may fail to perform as expected in the total quality aspect.<sup>14</sup>

Although recent innovations have emerged in *adire* production, there is limited empirical documentation on the types of technologies adopted, factors influencing adoption, and their effects on production performance in Osun State. This gap underscores the need for the present study.

The study therefore aims to assess the technologies adopted by *adire* producers in Osun State. Specifically, it seeks to identify the technologies adopted, examined the factors influencing the adoption, and evaluated how these technologies affect the performance of *adire* processing centres. Findings will benefit scholars and policymakers by providing updated evidence on technology adoption patterns and their implications for strengthening the *adire* industry.

## Material and methods

The study was carried out in Ile-Ife, Ede and Osogbo, in Osun State, Nigeria. Osogbo is notable for indigo dyeing in Nigeria. The population of this study consists of *adire* textile designers.

The study employed multi-stage sampling technique. Three senatorial districts were selected in Osun State including the Osun Central District, Osun West district and Osun East Districts. Three *adire* textile processing centres were randomly selected from each Senatorial district. A questionnaire was administered to fifteen (15) designers and managers from each of the selected centres totaling one hundred and twenty-two (122) respondents. Ethical considerations were ensured by obtaining informed consent from all participants before data collection.

## Results and discussions

Table 1 shows the characteristics of the *adire* centres. Specialisation centred on Tie-dye/Batik (41.8%) and Tie-dye/Batik/Eleko (27.9%).

All the centres produced Batik and tie-dye using similar technology. Training modes include *Adire* School (38.5%), apprenticeship/Industrial Training (35.2%), family tutelage (23.8%) and no formal training (2.5%).<sup>8,15</sup> Over 74.6% of centres were established after 2001, with 40.2% established since 2011, confirming rapid growth in Osogbo, the traditional home of indigo dyeing.<sup>16</sup> The majority (73%) had less than 10 years' experience in the business reflecting dominance of young practitioners and apprentices, while those with 11–30 years provide training.<sup>17</sup>

**Table 1** Characteristics of the *Adire* textile firms

Characteristic	Category	Frequency	Percentage
Area of Specialization	Tie and Dye	13	10.6
	Batik	15	12.3
	Tie and Dye/Batik	51	41.8
	Tie and Dye/Batik/ Eleko	34	27.9
	Adire Eleko/ Batik/ Bleaching	9	7.4
	1971 – 1980	4	3.3
Year of Establishment	1981 – 1990	17	13.9
	1991 – 2000	10	8.2
	2001 – 2010	42	34.4
	2011 – 2020	49	40.2
	Below 10 years	89	73
	11 – 20 years	16	13.1
Years of Experience	21 – 30 years	12	9.8
	31 – 40 years	4	3.3
	41 years and above	1	0.8
Mode of Training	Apprenticeship / Industrial Training	43	35.2
	Family Tutelage	29	23.8
	Adire School	47	38.5
	No Formal Training	3	2.5
	Loan from Bank	21	17.2
	Personal Savings	81	66.4
Source of Capital	Government Grant	2	1.6
	Loan from Friends and Family	6	5
	Mobilization of Advance Payment	12	9.8

Table 2 shows technology adoption in *adire* production. A majority (77%) of *adire* producers adopted traditional dye, batik, eleko, oniko, and alabere techniques, while 23% used freehand and stencil techniques. None employed CNC or CAD software, confirming the predominance of manual batik and *eleko* methods indigenous to Osogbo.<sup>8,18</sup> About 46.7% combined knotting, binding, folding, and stitching (using the *iko*/raffia-based resist techniques), 17.2% used knotting and folding, while stitching is rarely adopted (0.8%). Also, 55.7% relied solely on mobile phones for customer communication, 36.1% used mobile plus web, and 8.2% included e-mail. This reflects a growing digital outreach.<sup>19</sup>

**Table 2** Technology adoption in in the *Adire* firms

Characteristic	Category	Frequency	Percentage
Types of Technology Adopted	Dye/ Batik technology	94	77
	Adire eleko/eleko/ oniko/alabere/ Freehand & Stencil	28	23
	CNC/CAD	0	0
	Knotting	10	8.2
	Binding	6	5
	Folding	16	13.1
	Stitching	1	0.8
	All of the above	57	46.7
Techniques Used from Tying	Knotting and Binding	2	1.6
	Knotting, Binding, Folding	9	7.4
	Knotting and Folding	21	17.2
	Mobile Phone	68	55.7
Communication Technology	E-mail	10	8.2
	Mobile Phone and Web	44	36.1
	Direct / German dye	31	25.4
	Dipping dye	19	15.6
Dye Used for Production	Indigo dye	16	13.1
	All of the above	22	18
	Direct and Dipping dye	30	24.6
	Direct and Indigo dye	4	3.3
Use of Computer Design	Yes	36	29.5
	No	86	70.5

Majority (70.5%) still depended entirely on manual sketching while 29.5% used graphic design.<sup>13</sup> Sources of capital were predominantly personal savings (66.4%), bank loans (17.2%), family/friends (4.9%), government grants (1.6%), and advance payments (0.8%). There is a limited formal financial support for the artisan.<sup>20</sup>

Table 3 shows the factors influencing technology adoption in *adire*. There is a positive and significant relationship between increase in sales and age of processing centre ( $r = 0.231$ ;  $p < 0.05$ ) which suggested that when a firm is located in a particular area for a very good number of years, it tends to have more patronage than a newly opened firm in the same location.<sup>21</sup> There is also a positive and significant relationship between education and access to information ( $r = 0.186$ ;  $p < 0.05$ ). Information on technology adoption is needed to improve efficiency. When a firm adopts a new technology, it improves performance.

Table 4 presents the result of multiple linear regression analysis for the nexus between technology adoption and factors influencing adoption. The residual (0.709) implied a positive nexus between technology adoption and factors. The proportion of  $R^2$  indicates that

the model is reliable since the goodness of fit is 50% which shows that about 50% variation in technology adoption is being captured by the variation of affordability of technology, reduction of hazard, market demand from customer, size of processing centre and observation of other technologies. Irrespective of the factors, technology adoption would increase by 0.967%. A unit increase in price of new technology could reduce its affordability by 0.376%. This result is expected because when the price of a commodity increases, the quantity

demanded reduces or the commodity may not be bought. Reduction of hazard was also a significant determination of technology adoption ( $p < 0.05$ ). The coefficient of determination was 0.281 which indicated that a unit increase in hazard from a technology may cause 0.281 decreases in the adoption of such technology. This further suggested that in *adire* textile making, hazardous chemical may discourage its adoption. The coefficient for size of processing centre is 0.177 which is significant ( $p < 0.05$ ).

**Table 3** Factors influencing technology adoption in *Adire* textile firms

Factors	Dye Tech	Eleko	Alabere	Stencil	Freehand	Batik	Oniko	Comm
Affordability of Technology	0.279 (0.002)**	–	–	–	–	–	–	–
Increase in Price	–	–	–	–	–	0.301 (0.001)**	–	0.191 (0.036)
Complexity of Technology	–	0.180 (0.047)	–	–	–	–	–	–
Availability of Labour	–	0.264 (0.004)**	0.184 (0.034)	0.277 (0.002)**	–	0.497 (0.000)**	–	–
Increase in Sales	–	–	–	0.231 (0.011)	–	–	–	–
Awareness & Access to Information	–	–	–	–	–	–	–	–

**Table 4** Regression analysis of factors influencing technology adoption in *Adire* textile processing centres Cont'd

Variables	B	Std. Error	Beta	T	P
(Constant)	0.967	0.215		4.5	0
Affordability of Technology	-0.376	0.106	-0.33	-0.545	0.001
Complexity of Technology	0.025	0.074	0.03	0.34	0.734
Reduction of Hazard	-0.281	0.066	-0.345	-4.271	0
Availability of Labour	0.069	0.095	0.071	0.724	0.471
Education	-13	0.115	-0.01	-0.114	0.91
Awareness and Access to Information	-0.114	0.085	-0.114	-1.342	0.183
Market demand from Customer	0.176	0.082	0.373	3.244	0.036
Government Policy	0.139	0.079	0.164	1.766	0.081
Age of Processing Centre	0.093	0.095	0.087	0.985	0.327
Size of Processing Centre	0.177	0.078	0.207	2.284	0.025
Observation of Dye Technology	-0.192	0.085	-0.204	-2.245	0.027
Location of Processing Centre	-0.006	0.112	-0.005	-0.053	0.958
Availability of Training	0.055	0.123	0.046	0.449	0.654
Perceived Usefulness	-0.099	0.118	-0.91	-0.84	0.403

R = 0.709, R Square = 0.503, F = 3.486, Sig = 0.000

Table 5 shows the effect of technologies adopted on performance of *adire* textile. Performance variables were measured with profit of the *adire* processing centre in the last three years in binary scale such as improvement and no improvement. Also, the table shows the Wald statistics and related probabilities that provide index of significance of each feature of technology adopted variable as independent variable on profit of the *adire* textile processing centres. Freehand technology ( $r = 4.304$ ;  $p < 0.038$ ), contributed significantly to the profit of *adire* fabric making in the study area. Dye technology ( $r = 0.784$ ;  $p < 0.000$ ) is highly significant to performance of *adire* textile processing centres. Also, Batik technology ( $r = 15.894$ ;  $p < 0.000$ ) contribute significantly to the performance of the *adire* textile. This implied that about 77% of *adire* fabric makers in the study area produced batik on daily basis; this has contributed more significantly to its profit.

Communication technology ( $r = 0.260$ ;  $p < 0.031$ ) such as mobile phone, electronic mail, and web have contributed significantly on the overall performance of the selected *adire* textile processing centres in the study area as it enables the artists and managers relate well with customers both locally and internationally. The constant is negative which implies that the sales of *adire* products in the study area had a negative coefficient value of -5.470. It is highly significant at 1% probability level and could reduce business performance by N5.47k. In addition, technologies adopted in the study area contributed significantly to business performance of *adire* textile processing centres while sales made at the same study area had a negative contribution. This establishes that technology is transforming the textile firms (Figures 1–3).<sup>22–33</sup>



**Table 5** Binary logistic regression on the effect of adopted technologies on the performance of Adire textile processing centres

Technology	B	Wald	Sig.	Exp(B)
Freehand Technology	0.209	4.304	0.038*	0.232
Dye Technology	0.784	12.568	0.000**	0.457
Batik Technology	0.951	15.894	0.000**	2.589
Communication Technology	0.26	4.646	0.031*	0.771
Constant	-5.47	13.683	0.000**	0.004

\*\*p &lt; 0.01 (Significant at 0.01)

\*p &lt; 0.05 (Significant at 0.05)

**Figure 1** Adire Designers busy with drawing pattern on fabric at Nike Art Gallery.**Figure 2** Adire textile designers during dyeing process at processing centre.**Figure 3** Adire designers drawing pattern on fabric using freehand technology.

## Conclusion

The study concludes that *adire* textile processing centres adopt a range of technologies, including freehand, batik, *adire* eleko, *adire* oniko, dye, and communication technologies. The adoption of these technologies has contributed significantly to the business performance of the processing centres, particularly in terms of efficiency, productivity, and sales growth. However, the findings reveal that formal financial support available to artisans remains limited, which may constrain the extent and speed of technology adoption.

The use of information and communication technologies indicates a growing level of digital engagement among artisans, enhancing access to market information and customer networks. A positive and significant relationship was observed between sales growth and the age of the processing centres, suggesting that more established centres—often benefiting from better location and reputation—attract higher patronage. Additionally, education was found to have a positive and significant relationship with access to information, highlighting the role of educational attainment in improving awareness and utilization of technological innovations.

Furthermore, access to information on technology adoption was shown to improve operational efficiency and overall performance. At the same time, concerns about hazardous technologies were identified as a significant determinant of adoption decisions, indicating that artisans may delay or avoid adopting technologies perceived as unsafe. This underscores the importance of promoting safer technologies and strengthening awareness of hazard-reduction measures to encourage sustainable technology adoption in *adire* textile processing.

## Recommendations

- 1) Government agencies, microfinance institutions, and non-governmental organizations should design accessible and affordable credit schemes specifically targeted at *adire* textile artisans.
- 2) Regular training programmes should be organized to improve artisans' technical skills and knowledge of modern textile technologies. Emphasis should be placed on safe production practices and hazard-reduction measures to reduce health risks and encourage wider technology adoption.
- 3) Stakeholders should promote the use of information and communication technologies by providing digital literacy training and affordable internet access. Increased ICT use will enhance market access, customer communication, and information sharing, leading to improved sales and business sustainability.
- 4) Adult education programmes and extension services should be strengthened to improve artisans' educational capacity and access to relevant information. Enhanced education will improve awareness of technological innovations and support informed decision-making in technology adoption.
- 5) Efforts should be made to strengthen market demand for *adire* products through branding, exhibitions, trade fairs, and online platforms. Increased market demand will motivate artisans to adopt improved technologies and expand production.

## Acknowledgments

None.

## Funding

None.

## Conflicts of interest

No conflict of interest declared

## References

1. Bamidele TA, Yusuf TG. Nigeria tourism development: The role of indigenous textile sector. *Int J Excell Tour Hospit Cater*. 2013;6(1):2.
2. Diyaolu IJ. Role of Dress in Socio-cultural events among the Ijebu-Yoruba, Ogun State, Nigeria. *J Home Econ Res*. 2010;13:35–41.
3. Adiji B, Bankole O. Assessment of hand-crated dyed and printed textile designs in selected cities in South-Western Nigeria. *Int J Contemp Appl Sci*. 2015;2(3):18–20.
4. Labode O. State of traditional attires usage among the contemporary society in south-west Nigeria. 2013;8(1):98.
5. Solomon G, Abubakar E. Tie-die adire among the Jekun people. *Mgbakoi-gba J Afr Stud*. 2015;4.
6. Adebayo OK, Kolawole JA, Atunwa BT. Small scale entrepreneurship enterprise combination of tie-dye and batik fabric production and its impact on fashion industry in Nigeria. *Arabian Group J*. 2017;6(11):1–6.
7. Diyaolu IJ. Sustainable pathway for the indigenous Aso-òkè fabric. *TEXTILE*. 2025;23(3-4):352–363.
8. Areo MO, Kalilu R. Paradigmatic appraisal of techniques and technology of adire in the last five Decades- Geography of centre African Research Review. *Afr Res Rev*. 2013;7(3):97–98.
9. Muhammed Y, Adams J. Informality of economic growth in Nigeria 1980 – 2014. *J Econ Public Finance*. 2017;3(3):405.
10. Omotosho OO, Akarakiri JB, Irefer IA, et al. Factors influencing technological innovations in adire textile industry in south-western Nigeria. *Niger J Cloth Text*. 2015;2(1):1–8.
11. Cathy-Austine O, Matthew O. An explorative study of contribution of the informal sector to economic activities in Lagos State, Nigeria. *Res Support*. 2017.
12. Diyaolu IJ. Framework for Àdirẹ Elékò cultural sustainability and technology options. *Fashion Text Rev*. 2025;6:230–244.
13. Adewuyi PA. Prototype of a CNC technology based adire fabric pattern sketcher college of engineering, Bell University of Technology. *Eng Appl Sci Res*. 2020;47(4):439–446.
14. Diyaolu IJ. Total quality management practices in Nigerian textile industry. In: Msahli S, Debbabi F, editors. *Advances in Applied Research on Textile and Materials - IX*. Springer; 2022:234–242.
15. Tomori S. *The impact of adire on the cultural heritage and economic growth of Ogun State*. [Unpublished thesis]. Achievers University; 2011.
16. Ojelade LO, Basir MD, Oyeniyi TF. Adire in Osogbo Nigeria: It's uniqueness, technology and significance. *Int J Humanit Soc Stud*. 2018;6(11).
17. Apotemole BE. *Diaspora investment and technological spillover in the grooming industry in the Lagos metropolis, Nigeria*. [Master's thesis]. Obafemi Awolowo University; 2019.
18. Diyaolu IJ, Irefer IA, Akarakiri JB. Technology choices in Nigerian textile industry. *Int J Home Econ*. 2018;11(1):3–8.
19. Anwar KA. *Non-literate and low-literate mobile phone users: Do they acquire literacy?* [PhD thesis]. University of Toronto; 2014.
20. Akinola AO. Entrepreneurship: funding and financial strategies in Nigeria. *J Account Audit Finance Res*. 2014;4(1):115–128.
21. Dissanayake CA, Jayathilake W, Wickra HV, et al. A review of factors affecting technology in agricultural sector. *J Agric Sci Sri Lanka*. 2022;17(2):280–296.
22. Ogunyemi AA, Diyaolu IJ, Awoyelu IO, et al. Digital transformation of the textile and fashion design industry in the global south: a scoping review. In: Saeed RA, Bakari AD, Sheikh YH, editors. *Towards new e-infrastructure and e-services for developing countries*. Springer; 2023:391–413.
23. Orisadare EA, Achukwu OE, Ogunyemi AA, et al. Digitalisation and green strategies: a systematic review of the textile, apparel and fashion industries. *Circ Econ Sustain*. 2025:1–53.
24. Kalilu R, Areo M. Technology and adaptation in Yoruba indigo dyeing. *Int J Text Fashion Technol*. 2015;5(5):5–10.
25. Tavakolnia E, Makrani SV. Location, industry, competition and profitability. *Asia J Finance Account*. 2016;8(2):31.
26. Teeratsirikool L, Siengthai S, Badir Y, et al. Competitive strategies and firm performance: the mediating role of performance measurement. *Int J Product Perform Manag*. 2013;62(2):168.
27. The short story of adire. *The Guardian*. 2016:52.
28. Toauab O, Issor Z. Firm performance: definition and measurement models. *Eur Sci J*. 2019;15(1):93.
29. Tonda E. Technology challenges and tools for the implementation of the water-related sustainable development goals and targets. *U-Water Annu Int Zaragoza Conf*. 2015:15–17.
30. Toritseju RP, Agboma F. Dwarfed giant: impact of trade and related policies on SMEs in the Nigerian textile industry. *Int J Acad Res Bus Soc Sci*. 2018;8(6):602–629.
31. Triplett K, Lori L. *Adire African Indigo Resist*. C&T Publishing; 2015.
32. Tsai L. An empirical study of the acceptance of electronic chart display and information systems in the shipping industry. *Int J Shipp Transp Logistics*. 2016;8(4):425–441.
33. Ullah A, Khan D, Zheng S, et al. Factors influencing the adoption of improved cultivars: a case of peach farmers in Pakistan. *Cienc Rural*. 2018;48(11):88.