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# **Role of Infrastructure Adequacy in the Adoption of Digital Book Production and Distribution Hardware**

By

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## **Abstract**

*Digital book production machines are adopted in many academic and educational environments to enhance book production and distribution beyond what could be accomplished through the printed book. In developing economies like Nigeria where book production and distribution is badly affected by poor infrastructure, adoption of these machines is likely to make a positive difference, but it appears that publishers are not eager to adopt them for reasons yet to be clearly understood. Explanations in available literature revolve around infrastructure deficit in the areas of power supply, telecommunication bandwidth, postal facilities, Internet service providers (ISP) facilities, digital content developers, venture capital and e-payment instruments. This study, therefore, investigated the extent of adoption of print on demand (POD) distribution machines and compact disc (CD/DVD) replicating machines in Nigeria using a survey design involving 109 publishers selected purposively. Findings indicate that adoption level is low (POD, 9.2%; CD/DVD, 12%) and interest very high (POD, 61.5%; CD/DVD, 61.5%). Only the perceived adequacy of digital contents development facilities and financial facilities played statistically significant roles in the adoption level of print on demand machines and CD/DVD replicating machines. Thus, it could be inferred that infrastructure adequacy plays a significant role in digital hardware adoption but not as extensively as the literature purports.*

**Key Words:** Infrastructure deficit, digital publishing, hardware, print on demand, compact disc

## **Background to the Study**

As the world of publishing adjusts to the challenges and opportunities presented by the Internet, many publishers take steps to digitize contents and distribute digital contents by various means (Tiamiyu, 2005). Whereas university presses strive to install print on demand machines, other categories of publishers seem to have need for compact disc replicating machines (Tucker, 2018). In Nigeria, where endemic infrastructure deficit is the bane of business, the complaint has been that digital publishing suffers a setback due to infrastructural challenges (Okojie, 2014).

Attempts to encourage publishers to pay attention to the acquisition of hardware necessary to drive their businesses in the twenty-first century (Nwankwo, 2005) seem to be marginally successful. In the same vein, calls on local publishers to produce content in digital formats seem to be unnecessary due to the thinking that facilities such as power supply must be adequately provided by government before digital publishing could take place (Baensch,

2011). But recent studies suggest that there is remarkable improvement in infrastructure needed for digital publishing (Christopher and Ifeduba, 2014).

### **Statement of the Problem**

Publishers all over the world are producing contents in compact disc format, installing print on demand machines or facilitating the installation of such machines to develop market for digital publishing. And publishing researchers have conducted studies on e-commerce, e-promotion, e-book adoption and other aspects of digital publishing Bruns (2010) but there is a dearth of studies on the adoption of hardware innovations, especially compact disc formats and print on demand.

The aim of this study, therefore, is to investigate the adoption of digital publishing hardware (compact disc replicating machines and print on demand machines) and their correlates in Nigeria. Three research questions were posed to interrogate the subject.

### **Research Questions**

*RQ1 To what extent are print on demand machines adopted in Nigeria?*

*RQ2: To what extent are CD/DVD machines adopted in Nigeria?*

*RQ 3: What are the roles of perceived adequacy of enabling infrastructure in the adoption extent of those digital publishing hardware?*

### **REVIEW OF LITERATURE**

Enabling infrastructure refer to those facilities the adequacy of which would naturally encourage digital publishing. In the context of this study, they are variables such as power supply, telecommunication bandwidth, postal facilities, content development facilities, venture capital and e-payment instruments. Publishers intending to adopt digital publishing innovations are naturally expected to consider the adequacy of some or all of these facilities.

Studies indicate that there are arguments that innovative publishing is negatively affected by lack of enabling facilities in Nigeria on the one hand (Ayo, 2006). On the other hand there are also indications that the state of enabling facilities is improving (Conford, 2011). Ayo (2006) examined the operations of about 100 organizations in Lagos to understand the prospects of e-commerce implementation in Nigeria and observed that Nigerians sourced for information online but made purchases offline due to lack of adequate e-commerce infrastructure. The study's e-commerce analysis indicated that 88% had web presence, 97% had Internet connection, 0% had corporate e-payment arrangement and none was actively participating in e-commerce online. The study stated that though their goods and services are displayed online, they recorded no sales because of poorly adopted e-payment instruments. The study observed that available cards were mostly ATM cards used for settlement of local transactions but more recent works indicate that the e-payment situation is improving (Ayo, 2006; Eyitayo, 2011, Conford, 2011; Whitman, 2011).

The study also found that there was a government and private sector initiative which operated under the aegis of the National e-government Strategies limited (NEGST) and the National Information Technology Development Agency, NITDA. But there was no clear indication of governments position on the provision of these enabling facilities needed for digital publishing in the findings of the study and NITDA policy documents (Ayo, 2006; Kemabonta, 2011).

Generally, the argument has been that publishers must be able to set up appropriate system to receive payment for books purchased online and have a cost-effective means of shipping and delivering books to the buyers. In essence, payment problems may be among the reasons for inability to publish for the world market. But more recent works by Conford (2011) and Whitman (2011) indicate that e-payment instruments are available and have been

adopted only by a few local publishers. To overcome the problems associated with lack of e-commerce facilities, Adediji (2008) recommended that local publishing houses should establish separate e-commerce departments because this has become integral part of best practices on the global publishing scene. According to Adediji, a survey of the web presence of Nigerian businesses on the Internet revealed that Nigerian publishers were non-starters in the business of electronic commerce.

Ayo and Ukpere (2010) classified the e-payment systems available to publishers and other local businesses into four: online credit card payment system, electronic cheque system, electronic cash system and smart card-based electronic payment systems. Their study stated that by 2008, Internet-enabled payment involving the use of mobile devices stood at 0.2% and concluded that the level of adoption of e-payment systems in Nigeria was generally not encouraging. Publishing stands to benefit from available e-payment systems, if it could embrace digital publishing innovations. This is because the currency of the Internet is the credit card, which accounts for about four out of five e-commerce transactions. But it appears that many potential customers either dislike paying by credit card or do not have one (Caincross, 2001, Ikpaahindi, 2011).

From the opposing side of the discourse are observations and studies indicating that e-payment instruments are now available to an appreciable level. For instance, Whitman (2011) stated that local web payment options had begun to make an appearance in the Nigerian Internet arena, with opportunities to transact businesses online. The available instruments include Netnaira, Surepay, Cash Envoy and the Virtual-terminal Network which renders mobile web and card services. Whitman explained that half of the 1,142 respondents to a survey on the Digital Lifestyles of Connected Nigerians had completed online transactions, and there are several sites offering these sales opportunities, the big names being taaffoo.com, walahi.com, naijareads.com, debonairbookstone.com (books and e-readers) and Kalahari.com.ng (Whitman, 2011; Eyitayo, 2011).

Conford (2011) also observed that a substantial and critical mass of institutions in the Lagos area creates a digital pool of internationally connected academics and researchers who can drive e-commerce using effective web payment systems already adopted by online bookshops such as walahi.com, naijareads.com, Kalahari.com.ng. Furthermore, there are indications that some financial card printing companies were building facilities to print international and domestic credit cards in the country (Akinyede and Afolayan, 2006).

Due to the critical role of banks in the financial environment (provision of capital) the expectation is that they should cooperate and collaborate with these companies to introduce an efficient e-commerce payment instrument in Nigeria. Adesanoye (2007) argued that the banks find it too difficult to be book-friendly in dispensing their loans, a situation which leads to lack of capital, inhibiting the growth of the book industry, especially the growth of small publishers. He made reference to a 1997 survey conducted by Christensen, Odonyo, Sow and Fretellessen which indicated that 80% of publishers surveyed in Nigeria indicated that lack of capital was the most challenging factor affecting their businesses. The argument of the banks is that book projects do not bring quick returns and the increasing difficulty to buy foreign currency with badly devalued naira. Commenting on this, Adesanoye explained thus:

What the publisher was able to purchase with 70 kobo in 1985, he requires over N135 to buy today... put another way, the Nigerian publisher needs today at least 192 times the amount of Naira he had needed to purchase the same items from abroad in 1985 (Adesanoye (2007:6).

This foreign exchange situation could affect digital publishing in several ways; for instance, when a publisher has to pay for networked distribution services, content development

services or import electronic book for local readers (Balascau, 2014; Cragg and Mills, 2014). The expectation is that affected publishers would jump at the prospect of digitizing their titles to reduce cost of operations but there is yet insignificant empirical evidence to ascertain the actual trend of adoption of digital publishing innovations and the determining factors among them (Cruz, Neto, Munoz-Gallego, and Laukkanen, 2010; Dasgupta, Paul and Fuloria, 2011; Ensor, Montez and Wannemacher, 2012; Palani and Yasodha, 2012).

Power supply is essential for profitable digital publishing and this seems to be a major challenge for publishers in Nigeria. A study on the use of electronic resources in university libraries found that 16.8% of respondents indicated that power supply was a major setback to the use of electronic resources in the libraries, and that bandwidth and related challenges made difficult their attempts to use or adopt electronic resources (Ekwelem, Okafor and Ukwoma, 2009). Olatokun (2006) also found that inadequate electricity supply was a major barrier to the use of ICTs, especially outside Nigeria's major towns and recommended the establishment of a National Infrastructural Backbone (NIIB) for publishing and related businesses. James (2011) conducted a SWOT analysis of Nigeria's publishing sector and explained that at the time of her survey, there was no stable electricity, that the interviewees said they could not even remember the last time there was power supply from the Power Holding Company of Nigeria (PHCN). But some scholars argue that the global economic meltdown had aggravated the infrastructure inadequacies in Nigeria (Kolawole, 2011).

Similarly, Amkpa and Abba (2009) identified lack of adequate power supply as major factors inhibiting the implementation or adoption of information and communication technologies. Onuoha (2006) also argued that adequate technical expertise, communications infrastructure, a stable economy, reliable source of power and a literate population must be in place for Nigeria to be in position to take advantage of the opportunities presented by the Internet and the World Wide Web. Adesanoye (2005: 137) stated that in spite of huge financial outlays made to provide reliable electric power in Nigeria, "the average Nigerian still finds that most of the time, he has no electricity to either do his work or enjoy his play". Publishers and potential consumers of digital books are among the Nigerians referred to. Electricity bills, maintenance of transformers and power generating sets are the consequences of inadequate power supply and these could be substantial in Nigeria (Alimole, 2005; Iwuh, 2011). Conford observed that enthusiasm for digital publishing was widespread in Nigeria and summed up the power supply factor thus: "Nigeria (155million) has a population three times that of South Africa (49 million) and in 2007 had about 9% of the generating capacity of South Africa" (Conford, 2011:2).

Availability and adequacy of advanced technologies for content development and content management play significant roles in the adoption of technology. The experience of some local publishers who attempted to adopt digital publishing innovations seems support this position. For instance, Nwankwo (2002) and Nwankwo (2005) having participated in collaborative print-on-demand publishing, argued that inadequate production technology and institutional infrastructure among other challenges resulted in a distorted knowledge production situation in Nigeria. Ozioko, Igwesi and Eke (2011) also found that lack of access to advanced technology inhibits the generation and dissemination of local contents in Nigeria.

Telecommunication facilities, reliable Internet connection and bandwidth are also crucial enabling facilities for digital publishing. These are useful facilities expected to be available before meaningful adoption of digital publishing innovations can take place. It is also important to appreciate that they are all dependent on electricity. The inadequate state of telecommunications services in Nigeria, by 1997, all but precluded Nigeria from full participation in digital publishing (Ifaturoti, 1997; Aliu, Olaseni and Mathew, 2012). For the publishing industry to go digital and meet the book challenges imposed by the Universal Basic Education, UBE, investment in Information Technology infrastructure, should cover

facilities to support websites, full Internet access, video and teleconferencing facilities and electronic mailing (Obanya, 2005; Aliu, Olaseni and Mathew, 2012; Ireferin, Abdul-azeez and Tijani, 2012). Other scholars have also observed that digital publishing infrastructure should include computer laboratories, fibre optic backbone, bandwidth, gateways, workstations, printers, servers and routers. As at 2011 low bandwidth was a common experience for many publishers (Ikpaahindi, 2011).

Other studies made reference to a survey that supports this position. That online feasibility study conducted by the American Association for the Advancement of Science (AAAS) at the universities of Zambia, Makerere, Ghana and Cheik Anta Diop concluded that low bandwidth Internet connections made it very difficult for these universities to optimally access and adopt online journals. Low Internet Connecting Speed was found to be a factor inhibiting adoption of digital technologies (Miclure, Jaeger and Bertot, 2007). A study by Xiaoming and Kay (2007) found that market adoption is related to telecommunication infrastructure level whereas another study associated scholarly publishing to adequacy of editorial management infrastructure (Ball, 2017). Other studies found that cost of telecom equipment was coming down in Uganda and other countries (Tusubira, 2010; Lu and Ram, 2011; Roberts and Grover, 2012).

Efficient postal services are essential for the timely delivery of print books ordered online and Aladesuyi (2004) stated that the publishing industry in Nigeria lacks the support of an efficient postal system and other infrastructure that aid book production, pricing, promotion and distribution. According to Nwoga (2007) public postal service in Nigeria is slow and unreliable. With regard to cross-border book publishing in Africa, which should be enhanced by digital publishing innovations, Alabi (2007) described digital publishing innovation adoption as very expensive in Nigeria and blamed it on inadequate infrastructure including postal system. Universities and other tertiary institutions are usually in the forefront with regard to demand for, and postage of downloadable contents directly or through publishers (Conford, 2011). In this regard, universities and publishers collaborate to solve the problem of publishing infrastructure, according to Tusubira (2010) who observed that, in Africa, only South Africa can compare with the rest of the world in terms of connectivity and intellectual property output, having got over 10 gigabits dedicated to research and education (Tusubira, 2010; Lu and Ram, 2011; Roberts and Grover, 2012).

Digital networking, especially Internet-enabled networking, helps to close the gap between researchers and publishers and adequacy of Internet Service Providers, ISPs, is important for digital publishing innovation adoption (Batambuze, 2010). Scholars have argued that such a book market with a functioning infrastructure for African writers, publishers, distributors, booksellers and readers would not be created by transnational publishers but by strongly supporting indigenous publishers (Bgoya, 1992; Batambuze, 2010). In Namibia, Internet connectivity at a reasonable speed was provided by three private providers and the government, a situation which enabled commercial Internet cafes to operate in most urban centres of the country (Namhila and Hillebrecht, 2002).

**Theoretical Framework:** This study is anchored on aspects of the Technology-Organisation-Environment framework which states that status of technological equipment, organizational preparedness and environmental characteristics determine innovation adoption extents in organisations (Tornatzky, & Fleischer, 1990).

## METHODOLOGY

A questionnaire was administered on 109 publishing firms located in 23 cities across 27 states in Nigeria. The study covered each of the six identified sections of the publishing industry--indigenous commercial publishers, former multinational, university presses and

other institutional publishers (Nwoga, 2007). Over 72% were indigenous publishers. Details are presented in Table 1:

**Table 1: Profile of Organizations**

SN	Organization Type	Responses	Percent
1	Indigenous Commercial Publishers	79	72.5
2	Other Institutional Publishers*	11	10.1
3	University Presses	6	5.5
4	Former Multinational	5	4.6
5	Others (e.g. Braille and Comics Publishers)	8	7.3
	<b>Total</b>	<b>109</b>	<b>100</b>

\*Publishers such as Nigerian Institute of International Affairs (NIIA) and Nigerian Institute of Advanced Legal Studies (NIALS).

Data collected with the questionnaire was supported with in-depth interview of six publishers—two university presses, two commercial publishers and two other publishers purposively selected (Wimmer & Dominick, 2011).

## PRESENTATION AND ANALYSIS OF DATA

Adoption level of two hardware innovations (print on demand, P.O.D, machines and CD/DVD replicating machines) was investigated. Two research questions probed the extent, in terms of stages, of adoption of these innovations. The first research question states:

### **RQ1 To what extent are print on demand machines adopted in Nigeria?**

Publishers were asked in a questionnaire if they had adopted, had plans to adopt soon, interested but had no plan to adopt and if they were aware of the machines or not. Tables 2 and 3 show a summary of their responses:

**Table 2: Print-on-Demand Machines Adoption Stages**

SN	Extent of Adoption	Frequency	Percent
1	Interested but no Plan	67	61.5
2	Not Aware	16	14.7
3	Just Aware	13	11.9
4	Already in Use	10	9.2
5	Plan to Introduce in 12 Months	2	1.8
	<b>Total</b>	<b>109</b>	<b>100</b>

The responses indicate that ten print-on-demand machines (9.2%) are already in use at the time of data collection. It also indicates that interest is high (61.5%) and there is over 11.9% awareness of the machine's existence among the publishers whereas 14.7% clearly indicated that they are not aware of the machine. Among the university presses that deal in scholarly books, there was also a zero adoption scenario, a situation which could be explained by the poor, if not moribund, state of many university presses in the country. But one

university press respondent proffered an additional reason for this adoption behaviour: “We do little or no commercial scholarly publishing to warrant the purchase of such expensive machines. Universities specializing in distance learning would have enough student customers to justify the investment and that is why the National Open University of Nigeria acquired the machine”.

**RQ2: To what extent are CD/DVD machines adopted in Nigeria?**

About 12% of the publishers have either adopted compact disc replicating machines or plan to do so soon but interest is also relatively high at 61.5%. Nearly 14% were not aware of the existence of compact disc replicating machines. The few publishers that were already producing compact discs (8.3%) also did not market them separately. They attached the CDs to textbooks. The interview responses also indicate that publishers are aware of and interested in installing digital publishing hardware, yet actual adoption of hardware innovations is limited to computers and accessories, modem for Internet access and manuscript transfer to foreign printers, uploading facilities and compact disc replicating machines. Details are presented in Table 3:

**Table 3: Adoption Stages of Compact Disc Replicating Machines**

SN	Extent of Adoption	Frequency	Percent
1	Interested but no Plan	67	61.5
2	Not Aware	15	13.8
3	Just Aware	14	12.8
4	Already in Use	9	8.3
5	Plan to Introduce in 12 Months	4	3.7
	<b>Total</b>	<b>109</b>	<b>100</b>

**Role of Enabling Infrastructure in the Adoption of Digital Publishing Hardware**

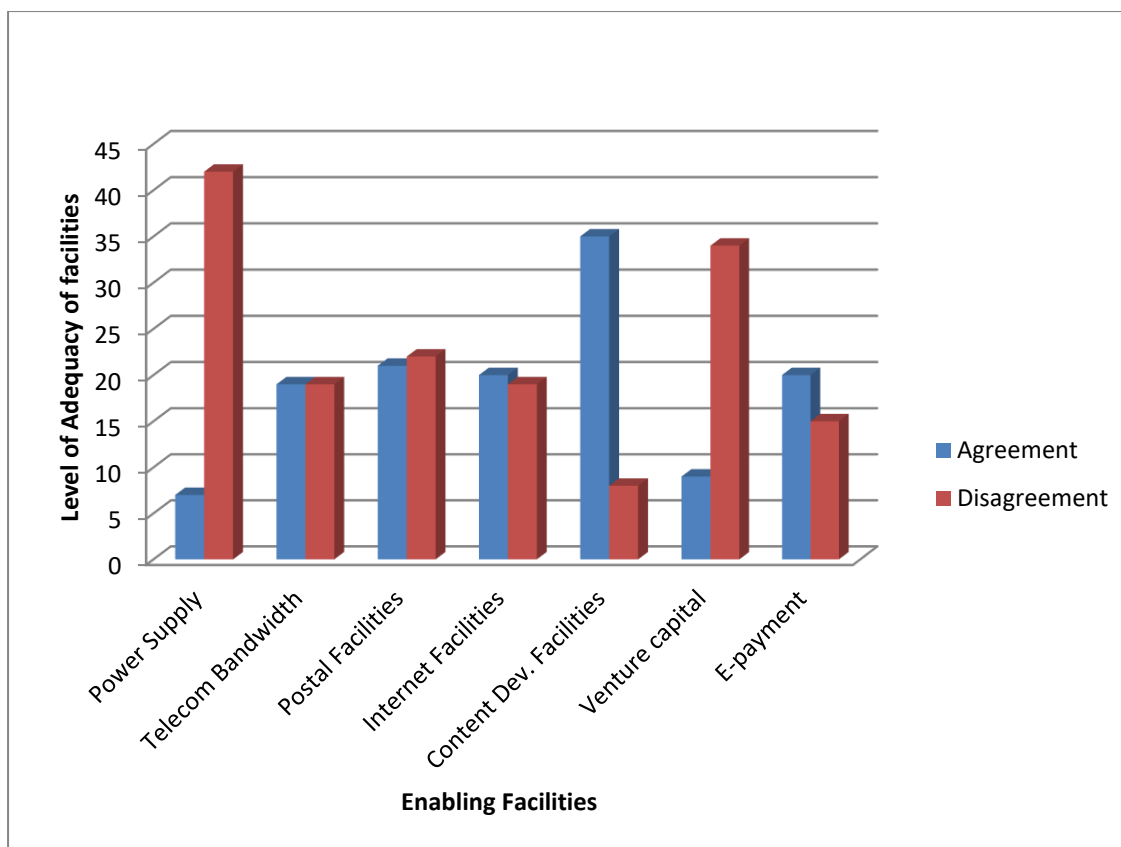
This section presents results and findings in respect of research question two, which states:

**RQ 3: What are the roles of perceived adequacy of enabling infrastructure in the adoption extent of digital publishing hardware in Nigeria?**

Enabling infrastructure are those essential for the production, promotion and consumption of digital books. Perceived adequacy of these could motivate publishers to adopt digital innovations. The respondents were, therefore, asked to indicate their levels of agreement or disagreement to statements on the adequacy of power supply, telecommunication bandwidth, postal facilities, Internet service providers (ISP) facilities, digital content developers, venture capital and e-payment instruments. Their responses are summarised in Figure 3:

**Figure 1:**





### Perceived Adequacy of Enabling Facilities

Figure 1 shows that power supply (15.6%) was inadequate for digital book production just as a similar facility, venture capital, (17.4%) was perceived to be inadequate. From these findings, it could be inferred that the perceived adequacy of power supply and venture capital play a role in the adoption level of digital publishing innovations in Nigeria since digital hardware are capital-intensive and require constant and stable energy supply. In other words, the publishers perceive that these two facilities which are crucial for the adoption of digital publishing innovations are in short supply, a perception which perhaps accounted for the low adoption level. These findings are in line with views and findings in the literature (Adesanoye, 2005; Conford, 2011).

Content development facilities are necessary for the production of books in digital format, and Figure 1, shows that content development facilities were adequate. It could, therefore, be inferred that respondents' perception of the adequacy of this facility accounted for the relatively low adoption level of digital publishing hardware. It is also likely that market development efforts contributed to this perception as an interviewee explained: "Inter West Africa limited has made efforts to educate us on the importance of digital publishing and the available content development services".

In the same vein, Figure 1 shows that e-payment facilities needed for e-commerce on digital books were moderately adequate. From these findings, it could be inferred that adequacy of e-payment facilities played a significant role in the adoption level. However, adequacy of postal, telecommunication and Internet facilities played no significant role in the adoption level of digital publishing hardware. This supports findings in previous works indicating that there is substantial improvement in the hitherto inadequate bandwidth, postal and Internet facilities in the country (Nwoga, 2002; Aladesuyi, 2004; Conford, 2011).

### Correlating Digital Hardware innovation adoption with adequacy of enabling infrastructure

Pearson correlation coefficient was computed to test if there is a relationship between the adoption level of digital hardware innovations (P.O.D printing machines, CD/DVD replicating machines) and the perceived adequacy of enabling facilities. Correlation results indicate that there was a moderate positive correlation between the adoption level of digital hardware innovations and the perceived adequacy of digital content services at  $r = .329$ ,  $N = 69$ ,  $p = .006 < 0.05$  and a weak positive correlation between the adoption level of ISP facilities at  $r = .283$ ,  $N = 68$ ,  $P = .019 < 0.05$  and financial facilities at  $r = .292$ ,  $N = 64$ ,  $p = .019 < 0.05$ . These findings imply that the more available digital content services, ISP facilities and financial facilities are the higher would be publishers' inclination to introduce POD machines and CD/DVD machines. Conversely, the less available these facilities are the lower publishers' inclination to adopt POD and CD/DVD replicating machines would be. These results are as one would expect.

However, there was a weak, positive but insignificant correlation between the adoption level of digital hardware innovations and the perceived adequacy of postal facilities at  $r = .158$ ,  $N = 70$ ,  $p = .190 < 0.05$ ; and a weak, negative correlation with power supply at  $r = -.228$ ,  $N = 65$ ,  $p = .056 < 0.05$  and telecommunication facilities at  $r = -.003$ ,  $N = 63$ ,  $p = .984 < 0.05$ . These findings indicate that adequacy of power supply, postal facilities and telecommunication bandwidth played no significant role in the adoption level of POD machines and CD/DVD replicating machines. A breakdown is presented in Table 4:

**Table 4: Correlation of CD/DVD and POD Machine Adoption with Adequacy of Six Enabling Infrastructure**

Pearson correlation statistics	Adequacy of Enabling Facilities					
	Power Supply	Telecom Facilities	Postal Facilities	Financial Facilities	Digital Content Services	ISP Facilities
Pearson r	-.228	-.003	.158	.292*	.329*	.283*
Sig. (2-tailed)	.056	.984	.190	.019	.006	.019
N	65	63	70	64	69	68

**\*Correlation is significant at the 0.05 level (2-tailed)**

It was hypothesized that there was no relationship between the adoption level of POD machines and CD/DVD replicating machines and the perceived adequacy of six categories of facility. These findings support the hypothesis only partially because the adoption level has significant correlation with the adequacy of three of the facilities and no significant relationship with the other three. In other words, there is a significant relationship only between the adoption level of digital publishing hardware and adequacy of digital content facilities, ISP facilities and financial facilities.

### Discussion of Findings

These findings are consistent with other studies and explain that finance could be the reason why about 61.5% was interested in hardware innovations, but only 9.2% actually adopted the innovation. These findings reflect the current changing situation in the industry. Whereas some scholars argued that inadequacy of financial facilities and digital content development facilities played a major role in the adoption of digital publishing innovations (Snowhill, 2001; Nwankwo, 2005) more recent studies indicate that these facilities are getting more affordable by the day (Conford, 2011; Christopher and Ifeduba, 2014). Further explanations given by one interviewee support this thinking, thus:

We do little or no commercial scholarly publishing to warrant the purchase of such expensive machines. Universities specializing in

distance learning would have enough student customers to justify the investment and that is why the National Open University of Nigeria acquired the machine.

This statement suggests that there is an awareness gap with regard to the affordability of some of the facilities perceived as very expensive; a suggestion which supports UNESCO'S recent study involving Nigeria publishing (UNESCO, 2015).

With regard to content development facilities, the findings contradict explanations offered by UNESCO (2015) indicating that awareness is low. In this study, awareness of existing content development services is higher than expected but there is no clear explanation from previous studies for the low adoption level. However, Rogers' (1995) Diffusion of Innovations theory, explains that between the time of awareness and actual adoption, the influence of change agents and opinion leaders could facilitate adoption just as their absence could delay adoption. This implies that there might be need for the enlightening influence of change agents before awareness and interest could lead to adoption. Moreover, the present study suggests that the multinational publishers generally perceived as opinion leaders in the industry are not in the forefront of digital innovation adoption. This could be partly because their primary business focus is textbook publishing for which these machines are not very important currently.

### **Concluding Remarks**

The aim of this study was to investigate the role of perceived adequacy of infrastructural facilities on publishers' adoption of digital publishing hardware-- print on demand machines and CD/DVD replicating machines. It was found that only the perceived adequacy of digital contents development facilities and financial facilities played statistically significant roles in the adoption level of print on demand machines and CD/DVD replicating machines. It is therefore safe to conclude that there is a relationship between the adequacy of digital contents development facilities and financial facilities and the extent of adoption of hardware innovations. However, contrary to the suggestions in the literature, the perceived adequacy of power supply, telecommunication bandwidth, postal facilities and Internet service providers (ISP) facilities have no significant relationship with the adoption level of hardware innovations.

**Recommendations:** Now that awareness has increased, interest is very high and adoption very low, it will be appropriate to convert interest to adoption by encouraging publishers' associations to play the role of change agents, enlightening their members on the changing infrastructural situation in the country. They should also highlight the advantages of digital publishing hardware to educational institutions, especially the big federal universities. Adopting a cluster or group approach may be the best way to adopt print on demand machines.

### **REFERENCES**

Adesanoye, F.A. (1995). *The Book in Nigeria: Some Current Issues*. Ibadan: Sam Bookman.

Adesanoye, F.A. (2005). Book publishing in Nigeria: an overview. *Issues in Book Publishing in Nigeria*. Eds. F.A. Adesanoye & A. Ojeniyi. Ibadan: Heinemann Educational Publishers. 115-142.

- Adesanoye, F.A. (2007). Rebuilding the publishing industry, rebranding the NPA. *The Publisher* Vol. 14. 3 – 13.
- Akinyeye, R.O. & Afolayan, J.O. (2006). Electronic payment system revolution in Nigerian banking industry. *Nigeria Computer Society Conference Proceedings of the 20<sup>th</sup> Annual National Conference*. Eds. Itegboje, A.O. & Oyeyinka I.K. 106 -110.
- Aliu, A.H; Olaseni, O E & Mathew, O.O. (2012). Effect of ICT on the reading habit of students of Rufus Giwa polytechnic, Owo. *Canadian Journal on Scientific and Industrial Research*. 3. 4: 238-245.
- Amadi, M.N. (2011). Supporting Learning in the Digital Age: E-learning Strategies for National Open University of Nigeria *US-China Education Review B7*, 975-981.
- Amkpa, S.A. and Abba, T. (2009). Factors inhibiting the implementation of information and communication technology (ICTS) in Nigeria university libraries. *The Information Technologist*. 6. I: 14-21.
- Ayo, C.K. & Ukpere, W.Y. (2010). Design of a secure unified e-payment system in Nigeria: a case study. *African Journal of Business Management* 4 : 9. 1753-1760.
- Ayo, C.K. (2006).The prospects of e-commerce implementation in Nigeria. *Journal of International Banking and Commerce*, December. 11:3 From <http://www.arraydev.com/commerce/jibe>. Retrieved on 20/1/10.
- Baensch, R. (2010). Publishing Studies. *Encyclopedia of Library and Information Sciences*, 3<sup>rd</sup> edition. London: Taylor & Francis. 4372-4379.
- Baensch, R. (2011). Technology and the future of the book: new digital publishing in Nigeria. *Book Industry, Technology and the Global Economic Trend*. Lagos: Nigerian Book Fair Trust. 20-31.
- Balascau, M. (2014). Romania's book sector explained, *International Publishers Association Newsletter*. August.3-3.
- Ball, C. E. (2017). Building a Scholarly Multimedia Publishing Infrastructure. *Journal of Scholarly Publishing* Vol.48 Issue 2 pp. 99-115
- Batambuze, C. (2010). Digital publishing in Africa: lessons from the PALM project transcript, information for change workshop hold in Nairobi, Kenya, September 2010 at [www.informationforchange.org](http://www.informationforchange.org). Retrieved on 23/03/11.
- Bruns, K. (2010). The distribution of scholarly books: present situation and future challenges. *Scholarly Publishing in Africa: Opportunities & Impediments*. Ed. S. Ngoben. Pretoria: The Africa Institute of South Africa. 129 – 144.

Caincross, F (2001) *The Death of Distance. How the Communication Revolution is changing our Lives*. Boston: Havard Business School Press.

Conford, R. (2011). Digital publishing in West Africa: what works, what doesn't and why" transcripts from the information for change workshop held in Lagos, Nigeria, May. From <http://publishingperspectives.com/08/digital-publishing-West-Africa>. Retrieved on 02/02/12

Christopher and Ifeduba (2014). Engendering Sustainable Development through the Adoption of Digital Publishing Innovations. Ariwa, E. (Ed) *Green Technology Applications for Enterprise and Academic Innovation*. Pennsylvania: IGI Global pp.118-132

Cragg, P.B. & Mills, A.M. (2014). Internet adoption by small firms. From <http://encyclopedia.jirant.org-articles>. Retrieved on 20/3/15

Cruz, P. Neto, P; Munoz-Gallego, T; Laukkanen, T. (2010). Mobile banking rollout in emerging markets: evidence from Brazil. *International Journal of Bank Marketing*. 28. 5: 342-371.

Dasgupta, S., R. Paul, & Fuloria, S. (2011). Factors affecting behavioral intentions towards mobile banking usage: Empirical evidence from India. *Romanian Journal of Marketing*. 3. 1: 6-28.

Ekwelem, V.O; Okafor, V.N.& Ukwuoma, S.C. (2009). Students use of electronic information sources at the University of Nigeria Nsukka. *African Journal of Library, Archive and Information Science*. 19. 1: 89 – 97.

Ensor, B; Montez, T. & Wannemacher, P. (2012). *The state of mobile banking 2012, evidence for Europe*. *Research Institute of Applied Economics, Working Paper, 2014/13*

Eyitayo, S. A. (2011). Book, technology and infrastructural development: what the future holds for the book industry in Nigeria. *Book Industry. Technology and the Global Economic Trend: Lagos: Nigerian Book fair Trust*.32-44.

Ifaturoti, A. (1997). The information age and African publishing. *BPN Newsletter*. 21. December.

Irefin, I. A. Abdul-Azeez, I.A & Tijani, A.A. (2012). An investigative study of factors affecting the adoption of information and communication technology in small and medium scale enterprises in Nigeria. *Australian Journal of Business and Management Research*. 2.2: 1-10.

Iwuh, J.J. (2011). Problems of the book publishing industry in Nigeria: the Onibonjo Publishers experience after 50 years. *PNIA Quarterly*. 75. 3: 1-7.

Kemabonta, I. (2011). Technology and the future of the book: a NITDA perspective: paper presented on May 5 at the Nigeria international book fair, University of Lagos, Nigeria.

- Kolawole, S. (2011). Investment in Basic Education. *Book Industry. Technology and the Global Economic Trend*: Lagos: Nigerian Book Fair Trust.1-3.
- Lu, Y. & Ram, K. (2011). Understanding the link between information technology capability and organizational agility : an empirical examination.*MIS Quarterly*.35. 4: 931-954.
- Mclure, C.R.; Jaeger, P. T & Bertot, J.C. (2007). The looming infrastructure Plateau space, finding connection speed and the ability of public libraries to meet demand for free interest access. *First Monday*. 12. 13: 1-18.
- Nwankwo, V. (2002). Print-On-Demand: An African publisher's Experience. *African Publishing Review*. 2. 5: 28 – 39.
- Nwankwo, V. (2005). Print-On-Demand: an African publisher's experience. *Issues in Book Publishing in Nigeria*. Eds F.A. Adesanoye & A. Ojeniyi. Ibadan: Heinemann Educ. Books. 173 – 183.
- Okojie, V. (2014). Emergence of e-book and the survival of the physical book in Africa: a paper presented at the Nigerian international book fair, University of Lagos on 6<sup>th</sup> May, 2014.
- Olatokun, W.M. (2006). National information technology policy in Nigeria: prospect challenges and a framework for implementation. *AJLAIS*. 16. 1: 9-18.
- Onuoha, A.C. (2006). Automated indexing and abstracting series in Nigeria libraries. *Nigerbiblios*. 17. 182: 10-21.
- Ozioko,R.E; Igwesi, U. & Eke, H.N. (2011). Generation and dissemination of local contents using ICT for sustainable development. *PNLA Quarterly*.75.1.35-43.
- Palani, A.& Yasodha, P. (2012). A study on customer perception towards mobile banking in Indian Overseas Bank Chennai. *International Journal of Marketing and Technology*. 2. 4: 262-276.
- Pan, M.J. & Jang, W.Y. (2008). Determinants of the adoption of enterprise resource planning within the technology-organization-environment framework: Taiwan's communications. *Journal of Computer Information Systems*. 48. 3: 94-102.
- Roberts, N. & Grover, V. (2012). Leveraging information technology infrastructure to facilitate a firm's customer agility and competitive activity: An empirical investigation. *Journal of Management Information Systems*. 28. 4: 231–270.
- Rogers, E. (1995). *Diffusion of Innovations*, 2<sup>nd</sup> edition, New York: The Free Press.
- Snowhill, L. (2001). E-books and their feature in academic libraries: an overview.*D-Lib Magazine* 7:719.
- Tiamiyu, M. (2005). Prospects of Nigerian book publishing in the electronic age. *Issues*

*in Book Publishing in Nigeria*. Eds. F.A. Adesanoye & A. Ojeniyi. Ibadan: Heinemann, Nigeria. 143 – 157.

Tornatzky, L & Fleischer, M. (1990). *The Process of Technology Innovation*. Lexington: MA, Lexington Books.

Tucker, D.H. (2018). History of book publishing. *Encyclopaedia Britannica*. From [www.britannica.com](http://www.britannica.com)

Tusubira, F. (2010). Securing affordable high speed connectivity and efficient ICT access and usage for African researchers and educators: transcripts from a case study presented at information for change conference in Nairobi, September 21.

UNESCO. (2015). Nigeria: overview of OA in Nigeria @ <http://www.unesco.org/new/en/communication-and-information/portals-and-platforms/goap>

Wimmer, R & Dominick, T. (2011). *Mass Media Research: An Introduction*. Belmont: Wadsworth Cengage Learning.

Xiaoming, & Kay, C.S. (2004). Factors affecting internet development: an Asian survey. *FirstMonday*.9.2 :1-15.