

# ICT Sector, Output and Employment in Nigeria: An Input-Output Analysis

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## 1. Introduction

- A new telecommunication liberalisation policy came on-board in 2001;
- The policy gave rise to private telecommunication firms: ECONET (now AIRTEL), MTN, GLOBACOM, ETISALAT (now 9MOBILE); and a government-owned, NITEL (now rested);
- This led to increased access to telecommunication facilities/services by Nigerians;
- The number of active voice call increased from about 400,000 before 2001 to about 162,522,772 in the second quarter of 2018;
- The teledensity also increased from around 0.4% before 2001 to about 120% in 2018;
- The percentage of people using internet increased from 0.06% in 2001 to around 27.68% in 2017;
- The percentage contribution of ICT to GDP increased from 0.16% in 1999 to about 8.40% in 2016;
- ICT achieved the highest contributor to the economy among the information technology subsectors;
- About 6.97 trillion naira generated as revenue to the government, representing 8.69% of GDP by 2015.

## 2. Objective of the Study

- To estimate the output and employment contributions of ICT to the economy;
- Three categories of contribution of ICT are considered: direct, indirect and induced;
- Direct contribution is generated when ICT sector makes purchases;
- Indirect contribution is generated in the sectors that supply input to ICT sector;
- Induced contribution is generated when employees/households connected to ICT and ICT-related sectors spend their income on goods/services within the economy.

## 3. Extant Literature on Nigeria ICT Sector

- Awoleye et al. (2012), Asogwa, Ohaleme and Ugwuanyi, (2013), Azubuike and Obiefuna, (2014) and Akanbi, Adebayo and Olomola, (2015);
- Most of the studies were simple descriptive analyses and some were econometric analyses using Ordinary Least Squares and Vector Autoregressive methods;
- Studies have addressed issues related to ICT in relation to poverty, employment, investment and evolution of ICT industry in Nigeria;
- No study has employed input-output model to estimate output and employment contribution of ICT sector in the Nigerian economy.

## 4. Evolution of ICT Industry in Nigeria

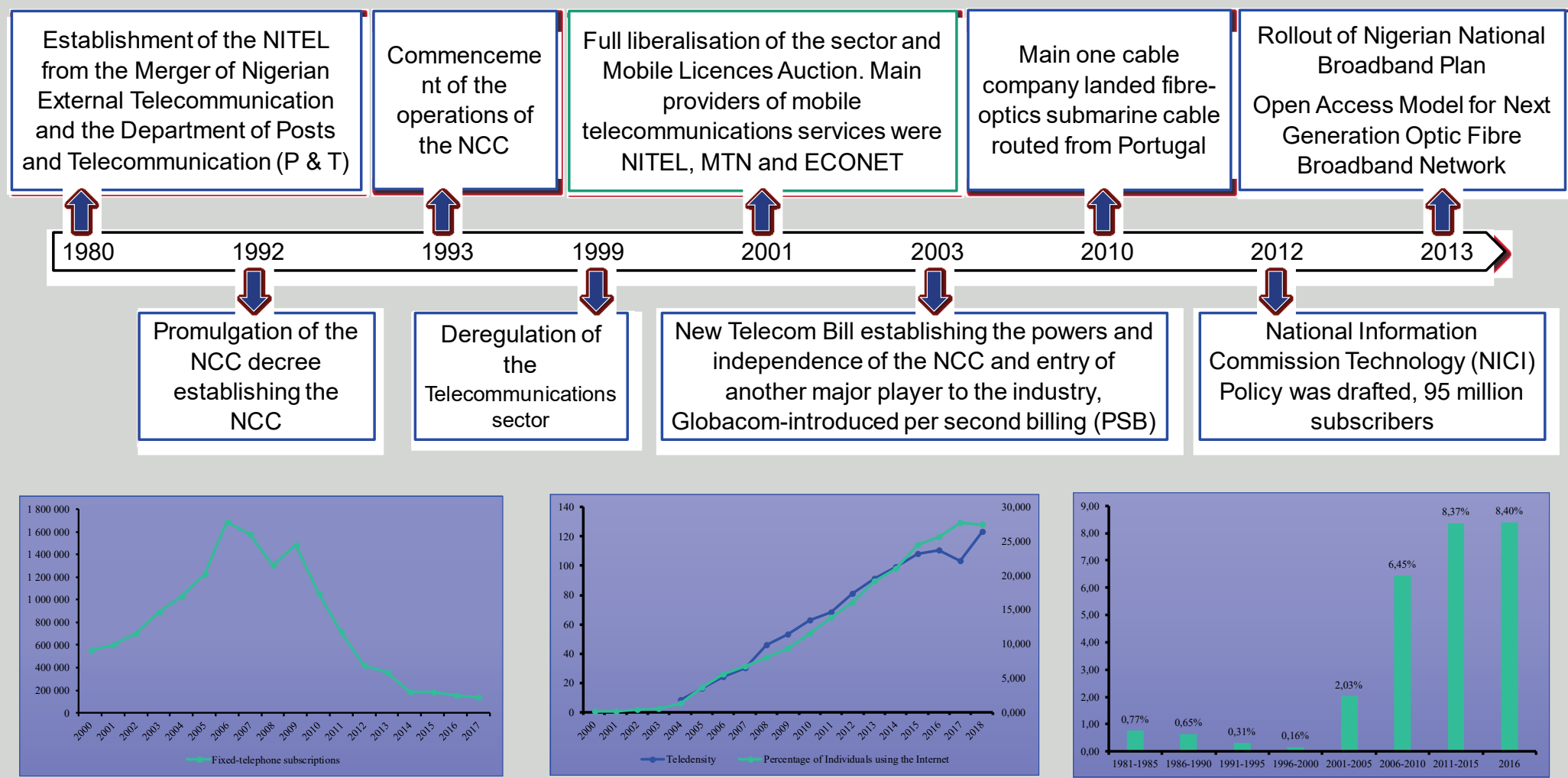


Fig. 2: Fixed Telephone Subscription

Fig. 3: Percentage of Individual Using the Internet and Teledensity

Fig. 4: ICT Contribution to Gross Domestic Product (1981-2016)

## 5. Methodology: Input-Output Model of Nigeria

- The input-output model used in this study follows Miller and Blair (2009), Keček, Žajdela Hrustek and Dušak (2016), Garza-Gil, Suris-Regueiro and Varela-Lafuente, (2017);
- The economy consists of several sectors denoted as  $n$  sectors;
- The total value of domestic output of a sector  $i$ , say, ICT, is denoted as  $x_i$ ;
- Equation 1 below shows how the output of the sector is distributed as sales to other sectors as an intermediate input ( $z_{ij}$ ) and to final demand  $f_i$ ;
- The final equation 4 contains the core  $(I-A)^{-1}$  of the model;
- Microsoft Excel used to estimate the model for each year (2001, 2006 & 2011);
- Input-Output Tables of Nigeria for 2001, 2006 & 2011 constitute data for the model.

$$x_i = z_{i1} + z_{i2} + \dots + z_{ij} + \dots + z_{in} + f_i = \sum_{j=1}^n z_{ij} + f_i \quad (1)$$

$$X = Z + F \quad (2)$$

$$(I - A)X = F \quad (3)$$

$$X = (I - A)^{-1}F \quad (4)$$

where  $(I - A)^{-1}$  is the Leontif's inverse matrix

## 6. Estimated Model Results

SECTOR	DIRECT (₦ million)	INDIRECT (₦ million)	INDUCED (₦ million)	TOTAL (₦ million)	RANKING
AGRICULTURE	0.00	159.74	538.65	698.39	6
MINING&QUARRYING	0.00	30.18	42.13	72.30	9
MANUFACTURING	15.78	1,020.99	842.21	1,878.98	3
UTILITIES	22.04	700.68	187.82	910.53	5
BUILDING&CONSTRUCTION	2.87	139.54	441.44	583.85	7
ICT	5.96	17,004.75	48.15	17,058.86	1
FINANCE&INSURANCE	0.28	769.35	270.66	1,040.29	4
TRANSPORT	13.13	330.99	100.93	445.04	8
SERVICES	177.32	4,470.81	1,363.28	6,011.42	2
TOTAL	237.37	24,627.02	3,835.27	28,699.66	
Value of Output produced in the Economy				6,877,187.58	
Contribution of ICT Sector to Output produced in the Economy (%)				0.42%	
Contribution of ICT Sector to Output produced in other Sectors (%)				0.17%	

SECTOR	DIRECT	INDIRECT	INDUCED	TOTAL	RANKING
AGRICULTURE	0	1,895	6,390	8,285	4
MINING&QUARRYING	0	6	9	15	9
MANUFACTURING	0	7,649	6,213	13,862	3
UTILITIES	0	3,277	852	4,128	6
BUILDING&CONSTRUCTION	0	617	1,913	2,530	7
ICT	43,316	424	124	43,864	2
FINANCE&INSURANCE	0	188	66	254	8
TRANSPORT	0	4745	1,392	6,137	5
SERVICES	0	35,214	10,328	45,542	1
TOTAL	43,316	54,015	27,286	124,617	
Total Employment in the Economy				43,591,862	
Contribution of ICT Sector to Employment in the Economy (%)				0.286%	
Contribution of ICT Sector to Employment in other Sectors of the Economy (%)				0.185%	

SECTOR	DIRECT (₦ million)	INDIRECT (₦ million)	INDUCED (₦ million)	TOTAL (₦ million)	RANKING
AGRICULTURE	0.00	461.71	8,561.39	9,023.10	3
MINING&QUARRYING	0.69	306.69	1,704.82	2,012.21	7
MANUFACTURING	9.98	570.20	4,180.73	4,760.91	5
UTILITIES	14.07	390.18	756.67	1,160.92	9
BUILDING&CONSTRUCTION	4.60	195.39	4,761.66	4,961.65	4
ICT	77.31	200,731.06	3,769.11	204,577.48	1
FINANCE&INSURANCE	1.04	492.58	1,800.41	2,294.03	6
TRANSPORT	18.51	427.14	1,455.57	1,901.23	8
SERVICES	386.45	8,916.08	30,383.09	39,685.61	2
TOTAL	512.65	212,491.03	57,373.44	270,377.13	
Total Output produced in the Economy				18,709,790.00	
Contribution of ICT Sector in the Economy (%)				1.445%	
Contribution of ICT Sector to Output of Other Sectors (%)				0.352%	

SECTOR	DIRECT	INDIRECT	INDUCED	TOTAL	RANKING
AGRICULTURE	0	2,060	38,195	40,255	3
MINING&QUARRYING	0	26	146	172	9
MANUFACTURING	0	4,891	35,243	40,134	4
UTILITIES	0	4,421	8,275	12,695	7
BUILDING&CONSTRUCTION	0	684	16,278	16,962	6
ICT	33,533	322	655,955	689,810	1
FINANCE&INSURANCE	0	184	670	853	8
TRANSPORT	0	5,888	19,231	25,119	5
SERVICES	0	32,621	100,487	133,108	2
TOTAL	33,533.32	51,095.95	874,478.99	959,108.26	
Total Employment in the Economy				50,284,901.83	
Contribution of ICT Sector to Employment in the Economy (%)				1.907%	
Contribution of ICT Sector to Employment in Other Sectors (%)				0.536%	

SECTOR	DIRECT (₦ million)	INDIRECT (₦ million)	INDUCED (₦ million)	TOTAL (₦ million)	RANKING
AGRICULTURE	0.00	44,215.84	76,212.41	120,428.25	5
MINING&QUARRYING	110.38	59,794.46	18,831.75	78,736.59	6
MANUFACTURING	960.56	147,168.39	77,512.21	225,641.16	3
UTILITIES	67.96	1,790.48	3,884.64	5,743.08	9
BUILDING&CONSTRUCTION	5,235.06	56,699.83	112,998.89	174,933.77	4
ICT	662.13	557,964.26	24,421.33	583,047.71	2
FINANCE&INSURANCE	193.14	6,172.27	5,999.98	12,365.40	8
TRANSPORT	4,384.04	27,560.23	8,463.77	40,408.03	7
SERVICES	100,420.57	631,293.21	193,870.60	925,584.37	1
TOTAL	112,033.83	1,532,658.97	522,195.57	2,166,888.37	
Total Output Created in Nigerian Economy				58,812,360.78	
Contribution of ICT to Output produced in the Economy (%)				3.684%	
Contribution of ICT to Output produced in Other Sectors (%)				2.693%	

SECTOR	DIRECT	INDIRECT	INDUCED	TOTAL	RANKING
AGRICULTURE	0	75,079	129,409	204,488	3
MINING&QUARRYING	0	2,170	682	2,852	8
MANUFACTURING	0	96,662	50,581	147,243	4
UTILITIES	0	3,274	6,844	10,119	7
BUILDING&CONSTRUCTION	0	18,155	33,123	51,278	6
ICT	112,179	2,262	5,003	119,443	5
FINANCE&INSURANCE	0	962	907	1,869	9
TRANSPORT	0	240,216	63,646	303,862	2
SERVICES	0	695,669	184,321	879,990	1
TOTAL	112,179	1,134,449	474,517	1,721,145	
Total Employment in the Economy				51,411,897	
Contribution of ICT to Employment in the Economy (%)				3.348%	
Contribution of ICT to Employment in Other Sectors of the Economy (%)				3.115%	

- ICT sector reforms resulted in increased employment in the services sector;
- Manufacturing and building and construction sectors benefited from ICT contribution to output;
- Employment benefits of ICT reforms highest in terms of induced employment in 2001 and 2006;
- Sectors that benefited from induced employment effects: agricultural, transport & manufacturing;
- Building and construction and financial and insurance sectors benefited from the output effects of ICT sector but not translated to the employment;
- The sector that benefited in the least from ICT sector reforms is the mining and quarrying sector.

## 7. Conclusions

- ICT sector's contribution to the economy estimated in terms of output and employment effects/contributions (direct, indirect & induced) of the sector;
- ICT sector's contribution to output (GDP) rose from ₦28,699.66 million in 2001 to ₦2,166,888.37 million by 2011;
- The sector's contribution to employment increased from 124,617 (employees) in 2001 to about 1,721,145 (employees) at the end of 2011;
- Services' sector is the biggest beneficiary of ICT contribution to output and employment;
- The other sector that benefited immensely from ICT sector's activities is the manufacturing sector while the building and construction sector and agricultural sector occupy the third and fourth positions respectively;
- Mining and quarrying sector benefited minimally from ICT contribution to output and employment;
- It is found that most of the benefits that accrued to other sectors were from induced effects/contribution of ICT sector thereby underscoring the centrality of employees/households' expenditure in deepening and spreading the benefits of ICT sector's activities;
- It is recommended that government efforts be directed at deepening integration of ICT sector's activities into the economy.