

**State of Readiness of Nigerian Construction Industry towards Digital Transformation: The Construction Professionals' Perception.**

**Abstract:**

**Aim:** This study examines the extent of readiness of Nigeria construction firms toward digital transformation within the study area.

**Study Design:** it was a survey research, questionnaires containing information relating to digital Technologies, trend and transformation were administered randomly to selected construction practitioners in Anambra State, Nigeria.

**Place and Duration of the Study:** The study was conducted in Anambra State, Nigeria for a period of 6 months.

**Methodology:** A total of 84 questionnaires were administered to selected respondents; 80 copies were completed, returned and found useful, thus, giving a response rate of 95%. Data collected were analysed and presented using mean, percentages, relative importance index (RII), bar charts and pie charts.

**Results:** The study found out that 63% of construction professional are satisfied with their firm readiness to digital transformation. However, the application of digital technologies skills and its transformation in the study area is still at foundation level. The use of mobile and social technologies (83%), entrepreneurship (73%) and Customer experience & strategic thinking (59%) are common in the study area while InMemory Databases skills (36%), Cloud Computing (39%) and Big Data Analytics (44%) are rare. Furthermore 35%, 53% 1% and 11% of the firms are planning to kick up digital transformation, undergoing some forms of digital transformation, attained or don't see the need for digital transformation respectively.

**Conclusion:** The study was concluded by recommending that construction practitioners should be properly sensitised on the need to understand and conceptualise on how digital transformation and technology will impact construction processes & activities and ability to manage or work within digitally-savvy environments.

**Keyword:** Digital skills & technology, Digital transformation, construction industry, construction professionals, Anambra state.

## 34 **1.0: Introduction:**

35 Rapid advances in digital technology is redefining the world today, because of the reduction in  
36 the cost of advanced technologies [1]. As technology become cheaper, it becomes quite common  
37 and accessible to the wider population. Hence, the combination effect of these technologies –  
38 mobile, cloud, artificial intelligence, sensors and analytics, among others, are accelerating this  
39 progress exponentially [1]. Consequently, businesses today are becoming highly competitive  
40 with the advancement in Technologies (particularly Information & Communication Technology).  
41 Hence, digitalization has become a hot debate topic for the moment and has become a driving  
42 force for innovation and transformation of industries globally [2 – 8]. To be relevant in today's  
43 business, digitization is not optional [2, 9]. Comparing, the volumes of businesses conducted  
44 electronically with analogue transaction, it's clear the former has gained momentum against the  
45 later [4, 10, 11]. Thus, it's a clear indication that the much-anticipated digital era is now a reality  
46 [4, 8, 12]

47 Digital transformation, refers to the extent to which companies are adopting the new wave of  
48 information and communications technologies, such as cloud-based services, mobility, big  
49 data/analytics, and social business, to transform their businesses, gain competitive advantages,  
50 increase efficiency, generate new opportunities and new markets, support business growth,  
51 develop new products and services, and drive new profits (improve the bottom line) [5]. Put  
52 differently, digital transformation is an innovation that connect technology, data science, devices,  
53 design and business strategy to change a business process or customer experience; through  
54 putting customer, device, organization or business process at the centre of change to improve  
55 agility, revenue and cost by connecting the physical world to the digital — code — world [9].  
56 Simply, digitalization simply means the conversion of analogue information into digital  
57 information which entails the intersection of new technologies, new capabilities, and changing  
58 customer behaviour [13, 14]. Therefore, Digital transformation is more than technology [9].

59 Going digital is not about technology; rather making customers' lives easier [13]. The sole  
60 purpose of this transformation is to make business digital; through this, put the customer, device,  
61 organization or business process at the centre of change that improves agility, revenue and cost  
62 which help the business compete for digital customers [9, 15]. Also, it helps organizations  
63 become more efficient and productive, remain competitive, achieve meaningful growth and  
64 sustainability [2, 16]. Furthermore, Philip and Thompson [11] stress that the future of our  
65 industry is facing a high degree of complexity, extreme competition and uncertainty with respect  
66 to the outcomes of climate change, availability of resources and the disruptive nature of  
67 innovation. Therefore, digital transformation is more important now than ever before. We live in  
68 an era of transformation of technology, social values, and the way work is done. In order to meet  
69 an increasingly global and competitive environment, organizations are undergoing re-  
70 engineering, work process redesign, and other forms of restructuring and basic changes of the  
71 way work is accomplished and Nigeria construction is not exonerated from this wind of change.  
72 Construction industry in Nigeria just like its counterpart in the developed and other developing

73 economies; needs to embrace this technology in its totality in order to remain in business.  
74 However, the big question is how prepared are construction firms and professionals within the  
75 study area toward this transformation? On this note, this study attempts to examine the readiness  
76 of Nigeria construction industry toward digital transformation. Particular attention is devoted to  
77 essential requirements for digital transformation and digital transformation skills and channels.

## 78 **2.0: Literature Review**

### 79 **2.1: *Digital Transformation in Construction Industry***

80 Construction industry generally is currently experiencing a paradigm shift from traditional paper-  
81 based to digitally managed information exchange format, which other industries such as aircraft  
82 manufacturing and banking have adopted and benefited from long ago [17]. Stressing on this,  
83 Bahl [9] argued that no industry is immune to the impact of digital disruption, even the highly  
84 regulated industries, such as financial services, are under intense pressure to recast their  
85 operations. Also, this wave of disruption is not just for companies; even the society is feeling the  
86 heat of transformation towards a better future that is digitally driven [18]. Hence, technologies  
87 are changing businesses today and making clients/consumers to break the normal norms of any  
88 business and every business requires a digital orientation, meaning a digital focus in all business  
89 processes and functions [19,20]. However, [21 – 24] observed that the construction and real  
90 estate sector, for example, ranks lowest in terms of digital maturity (i.e. Industry lags behind  
91 other industries in using ICT). So, to avoid being left out of competition, construction industry  
92 needs to change its modus operandi in this digital era. This has to happen rapidly because most  
93 clients and/or consumers are going digital [6]. Roughly 40% of the world population today are  
94 digital and those that cannot keep up with pace may be running the risk of being push out of  
95 business by competitors that respond rapidly [6, 25].

96 Becoming a digital enterprise, construction industry professionals will be required to thoroughly  
97 re-engineer the industry through a digital lens in terms of its processes and customer engagement  
98 [15]. Also, it will have to develop a digital strategy with a defined scope and objectives on how  
99 to achieve the transformation; because ultimate power of a digital strategy lies in its scope and  
100 objectives [6, 22]. It's important to note, that the evolving nature of technology, makes  
101 transformation not a one-time investment and initiative; but the organizational, operational, and  
102 technological foundations be put in place to foster constant evolution and cross-functional  
103 collaboration [26]. To make this work, the strategy developed should be as such that it will win  
104 the hearts and minds of people at all levels in the organization [18]. When, the industry is fully  
105 digitalised, it is believed that it will better clients experience directly or indirectly [6, 15, 26]

### 106 **2.2: Essential Requirements for Digital Transformation**

107 Advancement in information and communication technology (ICT) is transforming the whole  
108 world into a global village where goods and services can be made available with minimum  
109 restrictions and delays [27]. Thus, the proliferation of online businesses is gradually becoming

110 commonplace, because the number of online customers is increasing tremendously [6]. For  
111 instance, in Nigeria, Alvarez et al., [28] projected that 38% of Nigerians have access to internet  
112 with mobile telephone subscription rate of 78.8 per 100 people. Accordingly, 60 million  
113 Nigerians are internet users. Based on the average internet penetration rate of 14% as postulated  
114 by [28] for African countries, the number of internet users in Nigeria will increase overtime.  
115 Therefore, to go digital, the following are germane according to [6,15, 18, 22, 26, 28,29]:

- 116 ➤ First, define the global digital target picture as it affects your business and formulate  
117 strong visions, strategy and officers who will ensure its deployment across the business;
- 118 ➤ Analyze customers' responses towards digital channels employed and study other  
119 industries' digital initiatives - these collective learning formed the basis to kick start  
120 digital transformation;
- 121 ➤ A well-developed infrastructure such as sets of technologies that enables digital work and  
122 interactions between companies and customers are required;
- 123 ➤ stakeholder acceptance/preparedness is paramount towards achieving meaningful  
124 transformation/changes, it is crucial to establish a high level of digital awareness;
- 125 ➤ Digital transformation, ultimately, is a matter of executive vision and leadership; so, it  
126 requires collective buy-in and engagement from all, employer and employees alike  
127 whereas technology is just an enabler;
- 128 ➤ Organizations must provide up-to-date product information online and engage with  
129 online communities to provide advice on their products
- 130 ➤ Corporate cultures also need to move toward a digital mind-set; innovation should be  
131 rewarded, and additional digital expertise can be brought in to help employees embrace  
132 the digital world and acquire the necessary skills and knowledge. Culture needs to  
133 support collaboration and creativity
- 134 ➤ Finally, find partners whose capabilities complement your own (Forrester, 2015).

135 Solis, Li and Szymanski [20] summarised these requirements into three key elements upon which  
136 digital transformation efforts are built as:

- 137 i. It is most effective with pointed vision and supportive leadership.
- 138 ii. Optimizing the digital customer experience becomes the initial objective.
- 139 iii. Change materializes through the formation of a digital transformation team

### 140 **2.3: Digital Transformation Skills and Channels**

141 From [3, 25, 26, 29] studies, the skills needed for digital transformation are;

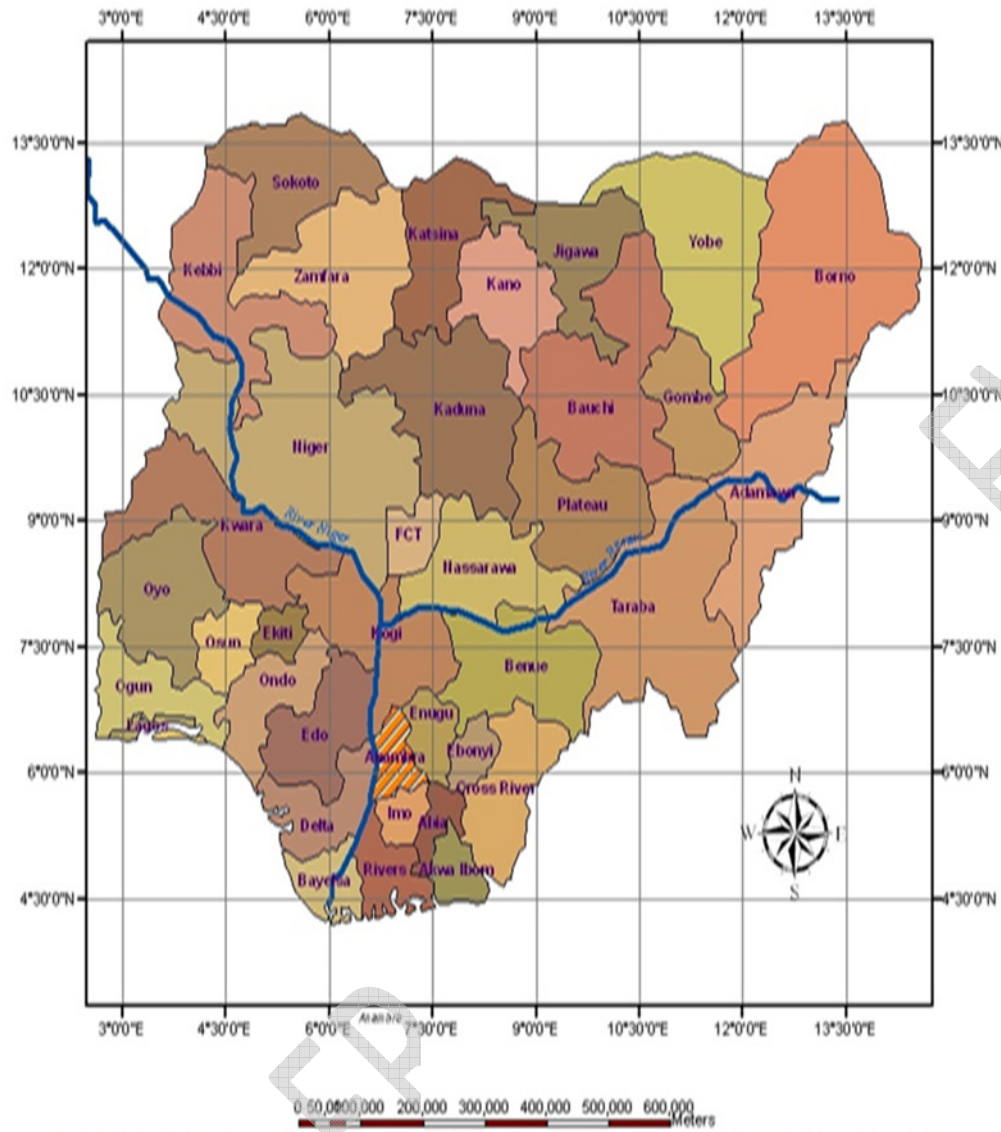
- 142 ✓ Specific technologies – mobile/social
- 143 ✓ Analytics & insights;
- 144 ✓ Digital Security
- 145 ✓ Novel Interfaces
- 146 ✓ Entrepreneurship

- 147 ✓ Cloud Computing: Provide users and enterprises with various capabilities to store and
- 148 process their data in either privately owned, or third-party data centres
- 149 ✓ InMemory Databases
- 150 ✓ Product Service Offerings
- 151 ✓ Internet of Things
- 152 ✓ Big Data Analytics
- 153 ✓ Business Networks
- 154 ✓ Business Change Management
- 155 ✓ Customer experience and strategic thinking

### 156 **3.0: Methodology**

157 This study is carried out in Anambra State, Nigeria, using a survey method. The name Anambra  
158 was derived from the Anambra River (Omambala) which flows through the area and is a  
159 tributary of the River Niger. Anambra State is a south-eastern state and one of the 36 states of  
160 Nigeria. Its bounded by Delta State to the west, Imo State and Rivers State to the south, Enugu  
161 State to the east, and Kogi State to the north (see fig. 1). Anambra State consists of twenty-one  
162 (21) Local Government Areas. They are: Aguata, Awka North, Awka South, Anambra East,  
163 Anambra West, Anaocha, Ayamelum, Dunukofia, Ekwusigo, Idemili North, Idemili South,  
164 Ihiala, Njikoka, Nnewi North, Nnewi South, Ogbaru, Onitsha North, Onitsha South, Orumba  
165 North, Orumba South and Oyi (see fig 2). The major urban centres of Anambra state are Onitsha,  
166 including Okpoko; Nnewi, and Awka, the state capital. Awka and Onitsha developed as pre-  
167 colonial urban centres while Nnewi as post-colonial urban centre. Anambra is the eighth-most  
168 populated state in the Federal Republic of Nigeria and the second-most densely populated state  
169 in Nigeria after Lagos State. It has an estimated average density of 1,500–2,000 persons per  
170 square kilometre and over 60% of its people lives in urban areas. It is one of the most urbanized  
171 states in Nigeria.

172 The population of this study constitutes of fully registered professionals particularly Architects,  
173 Builders, Structural Engineers and Quantity Surveyors, residing and practicing in the study area.  
174 The population of these professionals as obtained from the various secretariats in the state is 105  
175 (see table 1).



176

177 Fig. 1: Map of Nigeria showing Anambra State

178 Source: [30]



179

180 Fig 2: Map of Anambra State showing the Local Government Areas

181 Source: [30]

182 **Table 1: Population Distribution**

S/NO	Professionals	Population Size	Sample size
1	Architects	15	12
2	Builders	34	27
3	Quantity Surveyors	25	20
4	Structural Engineers	32	25
	Total	105	84

183 Source: Field survey, (2018)

184 Taro Yamani sample size method is employed to determine the appropriate sample size for this  
185 study.

186 Taro's formula is represented as:

187 
$$i.e. n = \frac{N}{1+N(e)^2}$$

188 Where "n" is the sample size, "N" is the population (105) and "e" is the level of confidence (i.e.  
189 95%).

190 Thus, the sample size

$$n = \frac{105}{1 + 105(0.05)^2} = 84$$

191  
192 Data are collected through structured questionnaire administered to the selected respondents or  
193 their representatives. Accordingly, out of a total of 84 questionnaires administered, only 80  
194 questionnaires are completed, returned and found useful. This corresponds to response rate of  
195 62.92%.

196  
197 **Table 2: Distribution of Questionnaire and Percentage Response**

Questionnaires	Frequency	Percentage (%)
Number of questionnaires returned	80	95.23
Number of questionnaires not returned	4	4.76
<b>TOTAL</b>	<b>84</b>	<b>100</b>

198 Source: Field Survey (April, 2018)

199 Being a descriptive research, tables, line –chart, mean and histogram are used for data  
200 presentation. However, Relative Important Index (RII) is used for ranking and computed using:

$$201 \quad RII = \frac{\sum Fx}{A * N}$$

202 Where:

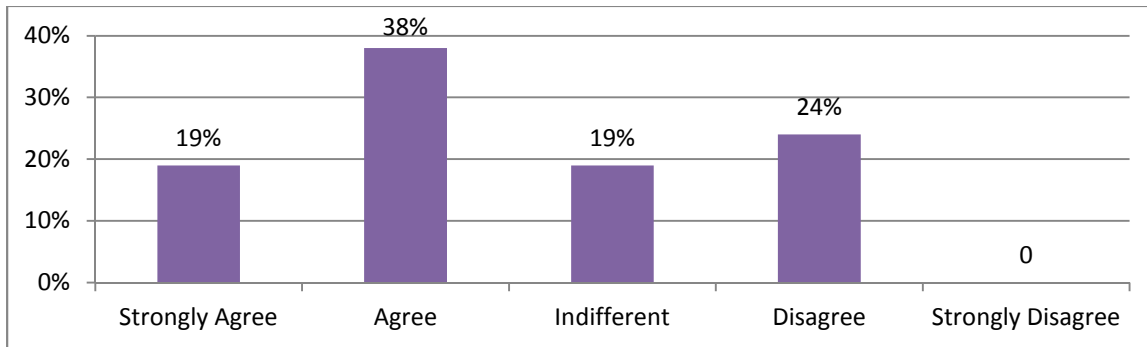
203  $\sum Fx$  = Weight given to each statement by respondents and ranges 1 – 5

204 A = Higher Response Integer

205 N = Total Number of Respondents



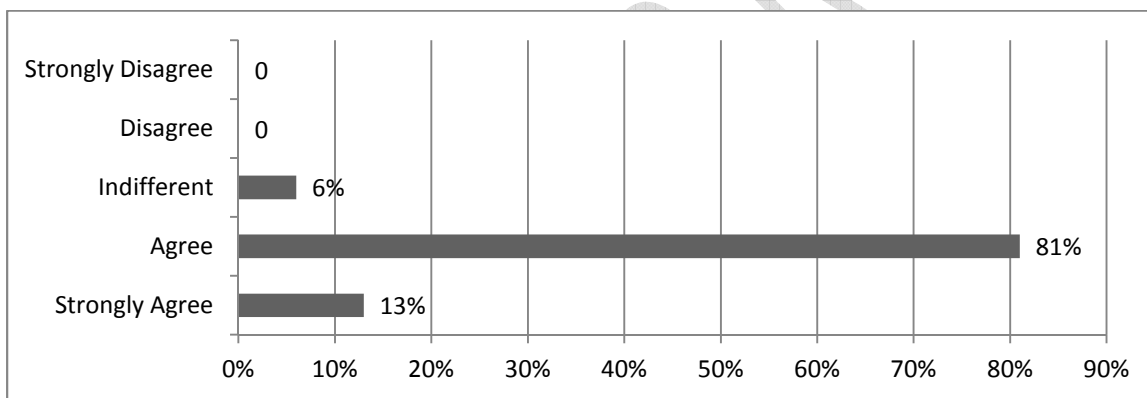
206 **4.0: Results and Discussion**



207  
208 Fig. 3: Firms Current reaction to Digital Transformation

209 Source: Field Survey (2018)

210 Fig 3 reveals that 57% of the respondents are satisfied with their firm current reaction toward  
211 digital transformation. However, 19% and 24% of the respondents are indifferent and not  
212 satisfied with the current digital transformation reaction of their firm.

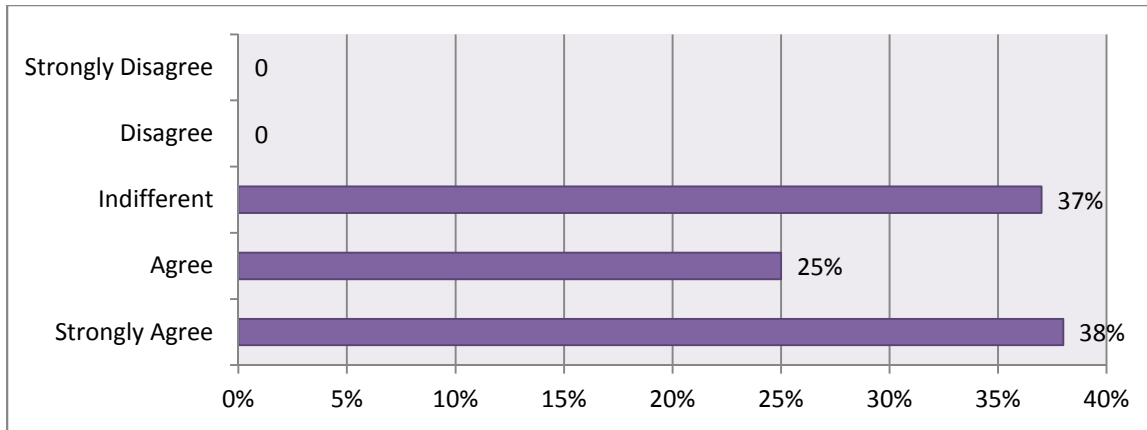


213  
214 Fig. 4: Leadership Understanding of Relevant Digital Trends/Transformation

215 Source: Field Survey 2018

216 From the response in Fig. 4, 94% of the respondents are satisfied with their leadership  
217 understanding on digital transformation whereas 6% of the respondents are indifferent.

218



219

220 **Fig. 5: Level of readiness of firm to digital transformation**

221 **Source: Field Survey 2018**

222 Fig. 5 discloses that 63% of respondent are satisfied with their firm readiness to digital  
 223 transformation while 37% of the respondents are indifferent.

224 **Table 3 : State of Digital Transformation**

State of Digital Transformation	Frequency	Percentage
Planning to take-off formal digital transformation	28	35 %
Undergoing formal digital transformation	42	53 %
Has attained formal digital transformation	1	1 %
Don't see the need for digital transformation	9	11 %
Total	80	100

225 **Source: Field Survey (2018)**

226 The response in table 3, indicates that 35% of the respondents are planning to kick up digital  
 227 transformation, 53% of the respondents are undergoing some forms of digital transformation;  
 228 whereas, 1% and 11% of the respondents have attained or don't see the need for digital  
 229 transformation respectively.

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235 **Table 4: Respondents' Perception on the application of digital technological Skills**

Digital Technologies and transformation skills	Frequency of Occurrence					( $\Sigma F$ )	$\Sigma Fx$	Mean	RII	Ranking
	5	4	3	2	1					
Specific technologies – mobile/social Analytics & insights;	36	24	16	4	0	80	332	4.15	0.83	1 <sup>st</sup>
Digital Security	0	20	36	8	16	80	220	2.75	0.55	4 <sup>th</sup>
Entrepreneurship	4	16	12	20	28	80	188	2.35	0.47	7 <sup>th</sup>
Cloud Computing	5	48	24	0	3	80	292	3.65	0.73	2 <sup>nd</sup>
InMemory Databases	1	4	28	4	43	80	156	1.95	0.39	11 <sup>th</sup>
Product Service Offerings	3	3	20	16	38	80	143	1.79	0.36	12 <sup>th</sup>
Internet of Things	0	28	16	4	32	80	200	2.50	0.50	6 <sup>th</sup>
Big Data Analytics	2	16	8	34	20	80	186	2.33	0.47	8 <sup>th</sup>
Business Networks	3	2	28	20	27	80	174	2.18	0.44	10 <sup>th</sup>
Business Change Management	4	8	20	24	24	80	184	2.30	0.46	9 <sup>th</sup>
Customer experience and strategic thinking	0	20	24	16	24	80	208	2.60	0.52	5 <sup>th</sup>
(5) Very High (4) High (3)Moderate (2)Low (1)Not at all										

236 Source: Field Survey (2018)

237 Table 4, discloses the use of mobile and social technologies (0.83) with regards to the application  
 238 of digital technology skill ranked first in the study area; closely followed by entrepreneurship  
 239 (0.73%) and Customer experience and strategic thinking (0.59). On the other hand, InMemory  
 240 Databases skills (0.36), Cloud Computing (0.39) and Big Data Analytics (0.44) ranked lowest in  
 241 the list.

242 **Table 5: Respondents view on the Innovative skills and abilities lacking in their firm**

S/N	Innovation skills and abilities	Response (Frequency)	Response (Percentage)
1	Understanding construction activities and being able to conceptualize how digital transformation can impact construction processes and activities	24	30 %
2	Readiness to experiment and take risks	16	20 %

3	Ability to manage or work with digitally-savvy environments	20	25 %
4	Ability to use digital technologies to execute construction work	12	15 %
5	Readiness to share and collaborate	8	10 %
<b>Total</b>		<b>80</b>	<b>100%</b>

243 **Source: Field Survey (2018)**

244 Table 5 reveals that Understanding construction activities and being able to conceptualize how  
 245 digital transformation can impact on construction processes and activities (30%) top the list of  
 246 Innovative skills and abilities lacking in construction firm. Followed by Ability to manage or  
 247 work with digitally-savvy environments (25%) and Readiness to experiment and take risks  
 248 (20%). However, the table discloses that Ability to use digital technologies to execute  
 249 construction work (15%) and Readiness to share and collaborate (10%) are least in the list. Thus,  
 250 with proper sensitization the construction stakeholders in the study area can actually use digital  
 251 technologies in their activities and are ready to collaborate. Therefore, the table suggests that  
 252 construction should be sensitised on how take risk and work in digitally savvy environment with  
 253 its impact on construction activities.

254

## 255 **5.0: Conclusion & Recommendations:**

256 Digital technologies are gradually penetrating into the business, practices and procedures of  
 257 construction industry globally. This situation, introduces lots of changes into the industry.  
 258 Because of this, most construction firms are gradually changing their mode of operation to  
 259 digital base in-order to compete favourably. Consequently, 63% of respondents are satisfied with  
 260 their firms' readiness to imbibe digital transformation. The awareness of the benefits of digital  
 261 transformation to most leaders in the construction firms in Nigerian construction industry  
 262 particularly in Anambra State, is steadily on the increase. Thus, greater percent of the  
 263 construction professionals are quite satisfied with their firms' current reaction toward digital  
 264 transformation. However, the application of digital technologies skills and its transformation in  
 265 Nigerian construction particularly in the Anambra State is still at foundation level. The use of  
 266 mobile and social technologies, entrepreneurship and Customer experience & strategic thinking  
 267 are common in the study area, while InMemory Databases skills, Cloud Computing and Big Data  
 268 Analytics are rare. Furthermore 35%, 53% 1% and 11% of the firms are planning to kick up  
 269 digital transformation, undergoing some forms of digital transformation, attained or don't see the  
 270 need for digital transformation respectively.

271 It's time to say goodbye to analogue leadership. Accordingly, its recommended that construction  
 272 practitioners should be sensitised on the following:

- 273 i. The need to understand and conceptualise on how digital transformation and technology  
274 could impact on construction processes & activities to be pursued;  
275 ii. Ability to manage or work with digitally-savvy environments; and  
276 iii. Readiness to experiment and take risks.

277 Thus, with proper sensitization, the construction practitioners in the study area coupled with the  
278 provision of the needed digitalised environment could create a viable climate in which the firms  
279 could collaborate to achieve higher economies of scale. The construction firms in Anambra will  
280 be totally transformed from being analogue to digital. When this happens, construction industry  
281 in Anambra State will stand a chance to compete favourably with its counterparts within and  
282 outside the country, thus, contributing its quota to the improvement of the GDP of the State.

283

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