

AN ASSESSMENT OF THE INFRASTRUCTURAL READINESS FOR TRANSITIONING TO A CASHLESS SOCIETY IN NIGERIA: NAVIGATING TECHNOLOGICAL LIMITATIONS IN THE ENFORCEMENT OF A CASHLESS POLICY

MSc Research Project Fintech

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MSc Project Submission Sheet

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Configuration Manual

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1. Introduction

The configuration manual functions as a user guide, providing technical specifics, specifications, and procedures necessary for replicating the research analysis in the study titled "An Assessment of the Infrastructural Readiness for Transitioning to a Cashless Society in Nigeria: Navigating Technological Limitations in the Enforcement of a Cashless Policy". It encompasses hardware and software configurations, ensuring reproducibility and transparency for researchers to validate findings and scrutinize thesis results.

2. Technical Specifications

2.1. Hardware Configuration

Table 1: Hardware Specifications for research					
Processor Intel(R) Core (TM) i3-8130U CPU @ 2.20GHz 2.20 GHz					
Memory	12.0 GB				
System configuration	64-bit operating system, x64-based processor				
Operating System	Windows 10 Pro				

2.2. Software Configuration

Table 2: Software configurations for research						
R Studio	R programming language and Rstudio 2023.06.1+524 "Mountain Hydrangea" release for Windows	e For Descriptive Statistics, Chi-square Test, Cronbach's Alpha Test and Factor Analysis.				
Microsoft Excel	Version 2202 Build 16.0.14931.20128 64-bit	The data was converted to a CSV format for Excel, enabling frequency analysis and numerical representation of five-point Likert scale responses (1 to 5).				
Microsoft Word	Version 2202 Build 16.0.14931.20128) 64-bit	For writing report				
Google Form		An online questionnaire development tool that operates through a web-based application.				

3. Data Analysis

3.1. Data

This research project employed a quantitative primary data collection method in alignment with the Unified Theory of Acceptance and Use of Technology (UTAUT) constructs. Data was gathered through a questionnaire accessed via Google Forms, and subsequently downloaded to Excel for analysis.

3.2. Data Preprocessing on Excel

The acquired survey data was visualized and subjected to preliminary processing through Microsoft Excel. The levels of agreement were assessed using a five-point Likert scale, where (5) signified "Strongly Agree," (4) indicated "Agree," (3) denoted "Indifference," (2) represented "Disagree," and (1) corresponded to "Strongly Disagree." The Excel "Replace"

function was employed to transform "Prefer to not say" responses into "PTNS," guaranteeing both uniqueness and uniformity.

3.3. Data Analysis on R Studio

3.3.1. Installation of Packages

Table 3: Package Installations					
Name	Version	Use			
library(readxl)	1.4.3	reading Excel files			
library(dplyr)	1.1.2	data manipulation			
library(tibble)	3.2.1	data structure			
library(skimr)	2.1.5	summary statistics			
library("FactoMineR")	2.8	multivariate analysis			
library("factoextra")	1.0.7	data visualization			
library(corrplot)	0.92	correlation plot for variables			
library(ggplot2)	3.4.2	data visualization			
library(psych)	2.3.6	psychological measurement			
ilorary(psycii)		for Cronbach's Alpha test			
library(gridExtra)	2.3	arranging plots			
library(grid)	4.3.1	grid-based graphics			
library(nFactors)	2.4.1.1	factor analysis			
library(RcmdrMisc)	2.7-2	miscellaneous R Commander			
library(GPArotation)	2023.3-1	factor rotation			

3.3.2. Data Preparation

- Import Dataset The data is imported into the software using the code snippet below
 setwd("c:\\Users\\hp\\OneDrive\\Desktop\\LAYO\\Third Semester\\THESES")
 Survey <- read.csv("SURVEY.csv", header=T, na.strings=c(""), stringsAsFactors = T)</pre>
- Removal of unnecessary columns which includes timestamp, serial number (S.N), and country of residence since all respondents are Nigerians.

```
Survey_Org <- subset(Survey, select = -c(Timestamp, Country.of.residence, S.N))
```

• Renaming of variables or columns to clearly signify the UTAUT constructs they represent, namely performance expectancy (PE), effort expectancy (EE), social influence (SI), and facilitating conditions (FCS).

```
colnames(Survey_Org)[5:6] <- paste("EE", 1:2, sep="")
colnames(Survey_Org)[7:12] <- paste("FC", 1:6, sep="")
colnames(Survey_Org)[13:15] <- paste("PE", 1:3, sep="")
colnames(Survey_Org)[16:19] <- paste("SI", 1:4, sep="")</pre>
```

• Data was thoroughly examined for missing values, and fortunately, no missing data was found.

<pre>sapply(Survey_Org,function(x) sum(is.na(x)))</pre>								
Age	Gender Occ	upation	Location	EE1	EE2	FC1	FC2	
0	0	0	0	0	0	0	0	
FC3	FC4	FC5	FC6	PE1	PE2	PE3	SI1	
0	0	0	0	0	0	0	0	
512	513	514						
0	0	0						

3.3.3. Data Analysis

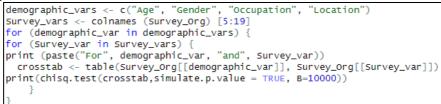
- **Descriptive analysis** Utilizing the `skimr()` package and code `summary(Survey_Org)`, descriptive statistics like mean, standard deviation, skewness, kurtosis, and standard error were employed to depict demographic frequency distribution characteristics.
- **Chi-Square test** To carry out this the following steps were carried out:
 - \rightarrow Use `glimpse(Survey_Org)` and `dim(Survey_Org)` to view the dataframe concise summary and dimensions respectively.
 - \rightarrow Convert from factor and replace the demographic variables (age, gender, location, and occupation) with numerical values

```
> Survey_Org$Age <- as.numeric(factor(Survey_Org$Age, levels = c('18-29', '30-39', '4
0-65', 'PTNS'), labels = c(1, 2, 3, 4)))
> Survey_Org$Gender <- as.numeric(factor(Survey_Org$Gender, levels = c('Male', 'Femal
e', 'PTNS'), labels = c(1, 2, 3)))
> Survey_Org$Location <- as.numeric(factor(Survey_Org$Location, levels = c('Rural',
'Urban'), labels = c(1, 2)))
> Survey_Org$Occupation <- as.numeric(factor(Survey_Org$Occupation, levels = c('Emplo
yed', 'Self Employed', 'Unemployed', 'Student'), labels = c(1, 2, 3, 4)))
```

 \rightarrow Convert back the numerical demographic variables back to factor

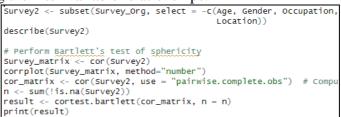
```
Survey_Org$Age <- factor(Survey_Org$Age)
Survey_Org$Gender <- factor(Survey_Org$Gender)
Survey_Org$Location <- factor(Survey_Org$Location)
Survey_Org$Occupation <- factor(Survey_Org$Occupation)</pre>
```

 \rightarrow compute chi test which determines the significant relationship between the demographic variables and the UTAUT modelled questions with the function snippet below:



• **Crobach's Alpha** – New data frames were generated corresponding to the categories within the UTAUT model for each question. The outcomes were acquired using the function `psych::alpha()`.

- Factor Analysis A separate data frame was formed, excluding demographic data, since the analysis is applicable solely to values.
 - \rightarrow **Bartlett's Test of Sphericity** This is utilized to determine if a correlation matrix significantly deviates from an identity matrix, as indicated by the cor() function. This test aids in evaluating the suitability of data for factor analysis by examining the inter-variable relationships.



→ Scree plot – This is employed to display the eigenvalues of the factors derived from the factor analysis. This visualization is graphically represented using ggplot() to offer a clear visual depiction of the eigenvalues' significance in the context of the analysis.

```
FAfit <- fa(cor_matrix,nfactors = ncol(survey2), rotate = "none")
n_factors <- length(FAfit$e.values)
FAfit$e.values
scree <- data.frame(
    Factor_n = as.factor(1:n_factors),
    Eigenvalue = FAfit$e.values)
ggplot(scree, aes(x = Factor_n, y = Eigenvalue, group = 1)) +
    geom_point() + geom_line() +
    xlab("Number of factors") +
    ylab("Initial eigenvalue") +
    labs( title = "Scree Plot",
    subtitle = "(Based on the unreduced correlation matrix)")</pre>
```

→ Exploratory factor analysis – An initial factor analysis was conducted to unveil latent factors elucidating the interrelations among observed variables. The utilization of varimax rotation aimed to enhance the comprehensibility of these factors' interpretations, streamlining the analysis process.

```
efa_result <- fa(cor_matrix, nfactors = 4, rotate = "varimax")
print(efa_result)
factor_loadings <- efa_result$loadings
print(factor_loadings)
fa.diagram(efa_result, main="Factor Analysis")</pre>
```

Subsequent to the initial factor analysis, a refined exploration was undertaken employing Kaiser's rule and promax rotation. This aimed to enhance the structural coherence, streamline the model by consolidating factors, and augment interpretability. Findings indicated that the essence of the dataset's variance is succinctly represented by two factors, underscoring their substantial relevance in the analysis.

```
kaisers_rule <- EFA_result$values > 1
num_factors_kaiser <- sum(kaisers_rule)
rotated_efa <- fa(cor_matrix, nfactors = num_factors_kaiser,
rotate = "promax") |
print(rotated_efa)
fa.diagram(rotated_efa, main="Factor Analysis")
```

APPENDIX - TABLE 2: STATISTICAL ANALYSIS ON CONSTRUCT							
Questions	Variables	Mean	Standard Deviation (sd)	Skewness	Kurtosis	Standard Error (se)	
The present electronic payment							
infrastructure in Nigeria effectively caters to		3.09	1.26	0.04	1.25	0.1	
the requirements of diverse demographic	EEI	3.09	1.20	-0.04	-1.25	0.1	
segments (age, gender, occupation).							
The current infrastructure for cashless							
payment provides users with a high degree	EE2	4.82	0.52	-4.23	23.39	0.04	
of convenience and usability							
The availability of reliable internet							
connectivity is crucial for a successful	FC1	4.7	0.75	-3.09	10.04	0.06	
transition to a cashless society.							
The current physical infrastructure, such as							
noint of cold terminals and outometed teller							
machines, are deemed sufficient in	FC2	2.91	1.34	0.27	-1.31	0.11	
facilitating cashless transactions.							
The current payment infrastructure that							
enables cashless transactions sufficiently							
caters to the demands of both urban and	FC3	2.56	1.31	0.49	-1.06	0.11	
rural regions of Nigeria							
For a cashless society to succeed,							
cooperation between governmental							
organisations, financial institutions, and	FC4	4.66	0.65	-2.83	11.33	0.05	
technology suppliers is essential.							
The current cashless payment infrastructure	FC5	3.6	1.13	-0.58	-0.55	0.09	
ensures secure and private transactions.							
The existing cashless payment infrastructure in Nigeria supports seamless integration							
	FC6	2.85	1.24	0.06	-1.23	0.1	
across various sectors (e.g., retail,							
transportation).							
Financial literacy programs are necessary to		150	0.72	-2.13	5 75	0.06	
6 6	PE1	4.56	0.72	-2.13	5.75	0.06	
cashless payment methods.							
Alternative payment methods (e.g., mobile		1.00	0.07	1.00	1 (0	0.07	
	PE2	4.23	0.85	-1.28	1.69	0.07	
readiness for a cashless society in Nigeria.							
User confidence in the security of cashless		4.07	0.07	1.40	1 40	0.07	
e	PE3	4.37	0.85	-1.42	1.43	0.07	
transition to a cashless society in Nigeria.							
The Nigerian regulatory framework is	A X 4	a 40		0.5		0.00	
	SI1	3.48	1.15	-0.6	-0.57	0.09	
the use of cashless payment technologies.							
The advent of cashless payment methods		a a f			0.00		
6 5	SI2	3.81	0.99	-0.8	-0.08	0.08	
inclusion in Nigeria.							
Financial incentives and rewards for using							
	SI3	3.81	1.11	-0.82	-0.11	0.09	
adoption in Nigeria.							
Awareness campaigns and education							
initiatives play a crucial role in promoting	SI4	4.44	0.75	-1.37	1.63	0.06	
the adoption of cashless payment methods	-IU	1.77	0.75	1.57	1.05	0.00	
in Nigeria.							

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