A STRUCTURAL EQUATION MODELING APPROACH TO FACTORS INFLUENCING ADOPTION OF URBAN SELF-SUPPLY WATER SYSTEM IN YOLA, NIGERIA

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I hereby declare that this thesis entitled *"A Structural Equation Modeling Approach to Factors Influencing Adoption of Urban Self-Supply Water System in Yola, Nigeria"* is the result of my own research except as cited in the references. The thesis has not been accepted for any degree and is not concurrently submitted in the candidature of any other degree.

Signature   :   ....

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Date   :   22nd August, 2017

DEDICATION

Dedicated to our friend Hayatu Tukur Bakari; my brothers Hamma Sanda, Ali Garga and Kamaluddeen; and my land-lady Haj. Maimuna (Maman-Sarki) who all left this ephemeral world during the course of this study.

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ABSTRACT

Self-supply systems are privately owned household water-supply systems designed to supplement or totally replace main water supplies. Self-supply system adoption as a protective response is now a common phenomenon in all urban centres in Nigeria. This is because the centralised public sector approach that aimed to provide urban water supply has failed in most of the cities. Studies have documented the public water supply problems, others have explored how citizens cope with the situation; but, there are few scholarly studies that focused on understanding and modelling protective behaviour among households with water supply inadequacies in the urban centres. This study, therefore, fills this gap by testing the Protection Motivation Theory, in the urban self-supply domain. Using mixed method research design; stratified sampling was employed to administer 695 household questionnaires from a total of 49,578 households. Twenty seven stakeholder questionnaires were purposefully administered, and 6 key-informant interviews were conducted. The data was analysed using Statistical Package for Social Sciences version 22 and Structural Equation Modelling with AMOS version 22. The result shows that self-supply is prevalent. Education, income, and housing ownership of respondents have a statistically significant relationship with self-supply system adoption, while household size, duration of stay and gender do not. The result also shows that social standing construct has no effect on adoption intention, while threat and coping appraisals constructs significantly predicted adaptive behavioural intentions which in turn significantly predicted actual adoption. The model accounted for 53% of the variance in intention to adopt and 28% of actual adoption of the self-supply system. The study also revealed ground water quality, self-supply-system inventory, recognition and regulation as four broad concerns about the phenomenon. One of the implications of these results is the need for an appropriate combination of policy, legislation, and advocacy on self-supply. The study recommends the use of this empirical evidence as a basis to assimilate self-supply into the urban water supply management framework.

ABSTRAK

Sistem bekalan air sendiri ditakrifkan sebagai peningkatan kepada sistem bekalan air di rumah yang dibiayai sepenuhnya oleh pemilik. Sistem ini kini digunakan secara meluas sebagai langkah alternatif di semua pusat bandar di Nigeria. Sistem bekalan air sendiri ini digunakan kerana kegagalan sektor awam dan kerajaan dalam menyediakan bekalan air bandar di sebahagian besar bandar-bandar. Kajian-kajian lepas telah mengenal-pasti permasalahan berkaitan bekalan air awam, manakala kajian-kajian lain lebih menjurus kepada bagaimana rakyat menghadapi keadaan dan permasalahan ini. Terdapat juga beberapa kajian yang memberi tumpuan kepada tingkah laku pemahaman dan model di kalangan isi rumah disebabkan oleh kekurangan bekalan air di pusat-pusat bandar. Oleh itu, kajian ini mengisi jurang dengan menguji Teori Motivasi Perlindungan, dalam sistem bekalan air sendiri di bandar-bandar. Kajian ini menggunakan kaedah penyelidikan bercampur yang melibatkan kaedah kaji selidik dan temu bual. Menggunakan persampelan berstrata, 695 isi rumah telah disasarkan daripada 49,578 sampel. Dua puluh tujuh soalan telah disasarkan kepada pihak-pihak berkepentingan dan maklumat lanjut diperoleh daripada enam responden dari sesi temuduga.Data dianalisis dengan menggunakan SPSS analisis versi 22 dan *Structural Equation Modeling'* dengan aplikasi AMOS versi 22. Hasil kajian menunjukkan bahawa bekalan diri adalah lazim yang dipengaruhi oleh lima faktor. Pendidikan, pendapatan, dan pemilikan perumahan mempunyai hubungan yang signifikan secara statistik dengan sistem penerimaan bekalan diri, manakala saiz isi rumah dan tempoh penginapan tidak ketara kepada sistem bekalan air sendiri. Dapatan kajian juga menunjukkan bahawa konstruk sosial tidak mempengaruhi pemilik dalam penggunaan sistem, manakala ancaman dan konstruk penilaian penyelesaian adalah mempengaruhi tingkah laku pemilik rumah dalam mengguna-pakai sistem bekalan air sendiri. Model ini mengesahkan bahawa 53% daripada isi rumah mempunyai niat untuk menerima pakai manakala 28% daripada mereka telah menggunakan sistem bekalan air diri. Implikasi dapatan kajian ini mencadangkan bahawa tindakan yang sesuai yang diperlukan adalah dari segi dasar, undang-undang, dan sokongan kepada sistem bekalan diri. Kajian ini mencadangkan bahawa bukti empirikal dalam kajian ini digunakan sebagai asas untuk mengasimilasikan sistem bekalan diri ke dalam rangka kerja pengurusan bekalan air bandar.

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AGPSR	-	Adamawa Geo-Physical Survey Report
AMOS	-	Analysis Moment of Structures
AVE	-	Average Variance Extracted
AWB	-	Adamawa Water Board
CFA	-	Confirmatory Factor Analysis
CFI	-	Comparative Fit Index
CPWWC	-	Code of Practice Water Well Construction
CR	-	Critical Region
DF	-	Degree of Freedom
DFID	-	Department for International Development
DHS	-	Demographic and Health Survey
EC	-	Electrical Conductivity
EFA	-	Exploratory Factor Analysis
EPD	-	Environmental Protection Department
EU	-	European Union
EVLN	-	Exit Voice Loyalty and Neglect
FAO	-	Food and Agricultural Organisation
FCT	-	Federal Capital Territory
FMWR	-	Federal Ministry of Water Resources
GWQ	-	Ground Water Quality
IFI	-	Incremental Fit Index
JMP	-	Joint Monitoring Programme
KMO	-	Kaiser-Meyer-Olkin
LPD	-	Litre per Person per Day
LWC	-	Lagos Water Corporation
MDG	-	Millennium Development Goals

MI	-	Modification Indices
MLE	-	Maximum Likelihood Estimation
MWE	-	Ministry of Water and Environment
NBS	-	National Bureau of Statistics
NFI	-	Normed Fit Index
NGO	-	Non-Governmental Organisation
NAFDAC	-	National Agency for Drugs Administration and Control
NPC	-	National Population Commission
P	-	Probability Value
PCA	-	Principal Component Analysis
PCFA	-	Pooled Confirmatory Factor Analysis
PFI	-	Parsimonious Fit Index
PHD	-	Primary Health Department
PMT	-	Protection Motivation Theory
RMSEA	-	Root Mean Square Error of Approximation
RWSN	-	Rural Water Supply Network
SDG	-	Sustainable Development Goals
SDSN	-	Sustainable Development Solution Network
SEM	-	Structural Equation Modeling
SERAC	-	Social and Economic Rights Action Centre
SON	-	Standard Organisation of Nigeria
SPSS	-	Statistical Package for the Social Sciences
SRMR	-	Standardised Root Mean Square Residual
SSI	-	Self-Supply Integration
TLI	-	Tucker-Lewis Index
TPB	-	Theory of Planned Behaviour
TRA	-	Theory of Reasoned Action
UN	-	United Nations
UNCHS	-	United Nations Centre for Human Settlement
UNICEF	-	United Nations Children's Emergency Fund
US	-	United States
USA	-	United States of America
USD	-	United States Dollar
USEPA	-	United States Environmental Protection Agency

USGS	-	United States Geological Surveys
VBN	-	Value Belief Norm
WASH	-	Water Sanitation and Hygiene
WBD	-	Water Borne Disease
WHO	-	World Health Organisation
WQI	-	Water Quality Index
WQM	-	Water Quality Monitoring
WSSISN	-	Water Supply and Sanitation Interim Strategy note
WSP	-	Water and Sanitation Programme

LIST OF SYMBOLS

%	-	Percentage
e_x	-	Error Measurement
⬭	-	Latent Construct
▭	-	Observed Variable
→	-	Effect
↔	-	Correlation
*	-	Significant at 95% significance level
**	-	Significant at 99% significance level
***	-	P-value significance
<	-	Less than
>	-	Greater than
R	-	Residual
R^2	-	Coefficient of Determination
β	-	Beta Coefficient
α	-	Cronbach's Alpha
χ^2	-	Chi-Square

CHAPTER 1

INTRODUCTION

1.1   Background of the Study

Water is one of the necessities of life. The supply of clean water is necessary for human life and health, yet close to one billion people lack the means to safe water supply (WHO and UNICEF, 2012). Causes of water supply problems in urban areas of the developing countries have been highlighted by several authors as an interplay of several interrelated factors, this includes high rate of urban population growth (Niemezynowicz,1999; Ramakrishna, 2009); technical, institutional and social constraints (Dawoud, and Raouf, 2008, Van Rooijen, Turral, and Biggs, 2009); lack of investment in water supply infrastructure, inadequate resource in terms of personnel and equipment (Emoabino and Alayande, 2007, Aladenola and Adeboye, 2010); difficulty in management, operations and maintenance, pricing as well as failure to recover the cost of water by utilities and above all endemic corruption and entrenched inefficiency (Montgomery and Elimelech, 2007, WSSISN 2000, Ma'aruf, 2005). Nigeria is a signatory to the United Nations International Drinking Water Supply and Sanitation Decade whose objectives was to supply water to all citizens of the country between 1980 and1990 (FMWR,2004). It was also among the 189 countries worldwide in September 2000 at the UN General Assembly to endorse the United Nations Millennium Declaration, the Millennium Development Goals. In spite of the considerable investment in this essential human requirement, 70 million (42%) of Nigerians still do not have access to water in adequate quantity and quality (WHO and UNICEF, 2012).

The public sector has not been successful in meeting more than a small proportion of the demand for water (WHO and UNICEF, 2008). Their performance as measured by coverage, the number of days of supply and duration of supply to consumers is inadequate and therefore the demand left unsatisfied is met by Small Scale Commercial Water Providers (SSCWP) (Solo, 1999; Collington and Vezina, 2000; Ayalew et al., 2010). These unfortunate situations had made households in towns and cities of Nigeria and indeed sub-Saharan Africa resort to alternative sources such as rainwater harvesting (Mohammed, 2009; Ishaku et al., 2012) as well as a re-emergence of self-supply (Shuaibu et al., 2015).

The rate of urbanisation in Africa is faster than everywhere else in the world. The urban growth rate in the African region has been at an average of 5% annually for more than twenty years. By the year 2030, half of the population of Africa is expected to live in the urban areas (UN, 2006). Worldwide, it is probable that up to 663 million people in 2015 were still using wells, springs and surface water, which were not protected. Of all the people using unimproved drinking water sources, almost half of them live in sub-Saharan Africa (JMP, 2015).

Nigeria is the most populated African nation, with a population of 170 million people (NPC, 2006). Nigeria's water resource is estimated to be 286.2 km^3/year of renewable water assets, aggregating to 1893 m^3/per capital per year (FAO, 2010). The government of the federation is mindful of this abundant resource which should be taken control of and use to the advantage of the state. In an effort to get the most out of this resource, numerous interventions have been provided for the administration of this resource, and the infrastructure for the delivery of water across the country. The Water Resources Ministry at the Federal level is delegated with bringing about the general course of action and monitoring machinery for the improvement and exploitation of water resources. Across the country, water supply is the obligation of the various states. Therefore, governments at the state level have established Water Agencies, called Boards or Corporations. These water agencies are to operate and manage water systems for the provision of services in municipal and semi-urban areas (NWSSP, 2000). The Nigeria water supply and sanitation

policy declare that water is an economic as well as social good, and therefore encourages the independence of state water agencies.

Ironically, notwithstanding the ample water resources, the creation of water works in the country together with a course of action which explains the approaches and realistic targets, the water supply condition in the country could be pronounced as unwarranted. Over time, progress in household water provision has not been very remarkable. In 1990, 40% of the populace had access to water sources that are secured. This proportion considerably improved to 52% in 2000, and in the similar pattern, to another sizable increase to 63% in 2010 (WHO/UNICEF JMP, 2015). In rural areas, where there is a preponderance of Nigerians, only 51% had access in 2010, which marginally increased to 57% in 2015 (WHO/UNICEF JMP, 2015). While there is a marginal increase of access in rural areas, the reverse is the case in the urban area. For example, in 1990, 79% of the metropolitan residents had access. This drops to 77% in 2008 and 75% in 2010 respectively (JMP, 2010). By the 2015 access to had improved to 81%. The absurdity of Nigeria's water supply situation is, while marginal improvement is recorded in access to improved water sources, pipe onto premises connections in urban areas have declined from 32% in 1990 to 3% in 2015 (JMP, 2015). This means while access has improved, it has more to do with self-supply and commercial water services than the public water supply.

In 2015, Nigeria is among the 147 countries that have met the MDG drinking water goal of reducing by half by the year 2015, the share of people lacking the means to safe drinking water and essential sanitation (JMP, 2015). Sustainable access does not guarantee adequacy, consistency in supply, and quality of water supply even in Abuja, the federal capital of Nigeria. According to Abubakar (2012), Abuja is a strategic capital city that has master plans to direct its growth and expansion, and also receive disproportionate portion of national income in service delivery in relation to other cities, but, in a research carried out on the delivery of the most essential metropolitan services, that is, water supply and sanitation in Abuja, Abubakar (2012) concludes that the centralized public sector method is unsuccessful in delivering sufficient municipal services in the city. As a result, informal

alternative options such as patronising water vendors, drilling private boreholes and local wells were developed to deal with poor municipal services.

In spite of the millions of dollars spent on water supply schemes in the federal capital as proclaimed by the management of the FCT, a lot of people residing in so many of the housing estates in Abuja do not have pipe- borne water extended to their households (http://leadership.ng 05/04/2014). Even households connected to the FCT water board do not enjoy uninterrupted supplies, as a result, are forced to rely on alternative sources. For instance, troubled by the unreliable delivery of water to their households, combined with the high estimated (no water meters) monthly bill the FCT water corporation charges residents, tenants of Efab Housing Estate in October 2013 held an assembly and resolved to discontinue the services of FCT water board, one of the residents told LEADERSHIP Weekend (a celebrated newspaper company in Nigeria).

"Our decision was based on the fact that we noticed that the FCT Water board workers were cheating us every month when they come to collect monthly water bills from residents of the estate. Sometimes they will impose as much as N7, 000.00 or more on each duplex as a monthly water rate. The most annoying aspect of it is that water supply is not regular, but still, the charges are high".

Ever since reaching this resolution in October 2013, LEADERSHIP Weekend has noticed hundreds of private borehole schemes have been set up in the housing estate as self-supply sources. Every single one of these self-supply projects cost between N350, 000 (USD1, 750) and N400, 000 (USD2000). An investigation by the LEADERSHIP Weekend reporter also indicates that every flat in the estate is either preparing to construct one or has already constructed its own personal borehole. This, by their estimation, will result in the development of thousands of private boreholes in just one housing estate of the Federal Capital Territory. Gwarimpa housing estate, which is presumed to be the largest in sub-Saharan Africa, is only partially linked to the FCT water supply. This has compelled its residents to rely on water vendors as well as drill water boreholes. Because of its size, the number of boreholes in that estate can only be imagined as there is no exact figure.

The upsurge in private borehole construction in Abuja is disturbing. Virtually every single household recognises this as the only solution to get portable water to their homes. In the same inquiry by LEADERSHIP Weekend, it was revealed that only housing estates located in Asokoro, Maitaima, Old Garki and Wuse have a connection to the FCT pipe born water system. This means the numerous housing estates spread around the capital city were devoid of connection to public water supply. Incidences of water hawkers have become a growing dominant eyesore in a lot of estates in Abuja.

The story is the same across most Nigerian cities. A situation where the majority of urban water circulates outside a formally operated centralized piped system can pose a serious challenge to sustainable development if not managed efficiently and equitably (Kooy et al., 2016). Today, more than 1.7 billion people live in river basins where depletion through use exceeds natural recharge, a trend that will see two-thirds of the world's population living in water-stressed countries by 2025 (UN Water, 2015). A call for attention to the importance of ecological sustainability with respect to self-supply water system adoption is therefore imperative to meet the Sustainable Development Goals (SDGs) number 15, which is "life on land". This is explained as, to protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss (SDSN, 2015).

1.2   Problem Statement

Yola North, the administrative and commercial capital of Adamawa State, Nigeria, has a population of 250, 000 people with about 50,000 households. It has a central water supply infrastructure based on both surface and ground water. The Yola treatment plant with an installed capacity of 28,800 m^3/per day is supported by forty two submersible boreholes with a combined capacity of 3,024 m^3/per day. Yet, the average monthly water supply is 9 days lasting for an average of two hours with only 20 lpd supply (Shuaibu et al., 2015). This situation have resulted in households becoming reliant on the installation of decentralized water systems, in particular,

borehole water supply systems (Ishaku et al., 2010). Despite the cost of constructing such boreholes the numbers keep increasing, even though unguided. This is because households have to find a way of coping with water supply inadequacies. Although the immediate course of the protective coping behaviour expressed in form of exiting the public water supply services, voicing concerns over water supply inadequacies through complaints and demonstrations, remaining loyal or neglecting the situation have been documented; the overarching motivation for the protective coping behaviour have received less attention.

Therefore, it is likely that the decision to adopt a borehole water supply system is not only a factor of cost, but also a factor of individual's perceptions of water use, water shortages issues, and the belief in one's ability to challenge the situation. There is therefore, the need to estimate and assess the interrelationship between these factors and how they co-influenced the decision to adopt borehole water supply system. This is with a view to assess and document how motivated are households to become self-reliant through self-supply water system adoption, and the all-encompassing reasons for such motivations on the one hand; and the apprehensions expressed by scholars (Obeng-Odoom, 2012; Andreasen and Møller-Jensen, 2016; Satterthwaite, 2016) on the unguided self-supply water system adoption phenomenon with respect to social, economic, and environmental repercussions on the other hand.

1.3   Research Gap

Studies have recognised the failure of cities in the developing world to deliver adequate municipal services to the rapidly growing number of people (Abubakar and Doan, 2010; Nganyanyuka et al., 2014; Chakava et al., 2014; WHO and UNICEF, 2015). In Nigeria, at the national level, studies have investigated resident's responses to the deficient delivery of urban services (Abubakar, 2016; Acey, 2008; Ahmad, 2017; Ishaku et al., 2010; Olajuyigbe et al., 2012). In Yola, previous research on private urban water provision focused on either its contribution (Ishaku et al., 2012 and Shuaibu et al., 2015) or the quality of water from such

outfits (Onugba and Aboh, 2009; Akindawa et al., 2010 and Bashir and Olalekan 2012). These studies directly or tacitly used the Exit, Voice, Loyalty and Neglect (EVLN) model to explore the various ways in which households responds to unsatisfactory urban services in a bit to protect themselves from such inadequacies. Although the immediate course and the different protective coping behaviour have been known, there are no documented scholarly studies that focused on understanding the overarching motivations for the protective coping behaviour. Scholars (Chakava et al., 2014; Andreasen and Møller-Jensen, 2016; Satterthwaite, 2016; Kooy and Walter, 2016) have also highlighted the insufficient attention paid to water sources outside the scheme water network.

There are very few studies on understanding the motivations for protective behaviour in response to urban water supply problems (Montginoul et al. 2005; Montginoul and Rinaudo 2011; Thomas et al. 1987; Thomas and Syme 1988, Hurlimann 2011 and Roseth 2006). These studies dealt with issues of shortages and conservation, or higher real volumetric prices of household water as the motivations for protective response in the developed world. In the developing world, self-supply is a response to mediocre urban water supply (Zerah, 2010; Majuru et al., 2016). Studies of self-supply in this part of the world has been on how it is or should be used to enhance access to water in the rural or peri-urban areas (RWSN, 2011; MWE, 2012; Butterworth et al., 2013) or on measures to improve quality, quantity and sustainability of self-supply sources, mostly hand dug wells (Martin and Gordon 2011; Grönwall et al., 2010; Oluwasanya et al., 2011; RWSN, 2009). Other studies on Self-supply focused on water lifting technologies (MacCarthy et al., 2013; Guzha et al., 2007; Michael Snell, 2004). Such studies dwell on the ease with which households can now undertake self-supply as a result of improved technology.

1.4   Research Questions

1. How is the self-supply phenomenon within the urban water supply network?
2. How do the various determinants of protection motivation co-influence self-supply adoption intention?

3. How influential is the householder's intention to adopt self-supply on actual system adoption?
4. What are the concerns on the urban self-supply phenomenon?
5. How can self-supply water system adoption among households be explained and predicted?

1.5   Research Aim

The aim of this study is to provide a model that will test whether an adaptation of Protection Motivation Theory will successfully explain and predict the adoption of urban water self-supply system among households, as well as raise the concerns on the phenomenon with a view to informing regulatory policy decision.

1.6   Research Objectives

1. To explore urban water self-supply system within the water supply network.
2. To estimate and assess how the various determinants of protection motivation co-influence adoption intention of urban water self-supply system.
3. To appraise and analyse the causal relationship between adoption intention and actual adoption of urban water self-supply system.
4. To establish the concerns on the adoption of urban water self-supply system with a view to informing policy decision on the phenomenon.
5. To provide a model that will explain and predict the adoption of urban water self-supply system among households.

1.7   Significance of Study

This study contributes to knowledge by developing a model for understanding protective behaviour among households in urban environments of the developing world with water supply inadequacies. The model is aimed at testing whether an adaptation of Protection Motivation Theory will successfully explain and predict the adoption of self-supply through on-site private boreholes among urban households.

The study will bring about an understanding of the rationale behind the adoption of self-supply by households as the model assumes that in choosing a course of action, individuals deliberates on the consequences of their present response to a situation, as well as the cost and benefit of adjusting the present or assuming a new response to the situation. Thus, Protection Motivation Theory allows the identification of obstacles and facilitators to adoption of protective behaviour.

This study could likewise enlighten those making policy of key insights influencing residents' inclination to adopt and utilise private boreholes at the household level, inside the urban domestic water supply network. This will bring about the need for policy recognition of self-supply in the urban area, as well as an urban water supply master plan that incorporates the government, and private individual water supply sources.

1.8   Scope of the Research

Yola is the geographical site to which the study is particularly referred. Though other countries and cities will be mentioned within the realm of this thesis, the study will be particularly limited to Yola North on an empirical basis; other examples of places where self- supply is used will be on a general basis.

The functional scope of this study covers an attempt to explain and predict the adoption of self-supply through on-site private boreholes among urban households in Yola, as a response to public water service unreliability by adapting Protection Motivation Theory; a human awareness model embedded in the investigation of how fear moderates the way people safeguard themselves from undesirable events. Protection motivation theory suggests that people safeguard themselves from undesirable events based on the evaluation of four factors: the degree of harmfulness of an event, the possibility of the incident happening if no protective response is assumed or a current one adjusted, the effectiveness of a suggested response in dealing with the harmful incident, and the ability of the individual to execute the suggested response. In this study, the negative threat is public water service unreliability in Yola and the potential stress associated with reduced availability of water for everyday activities. Using an expanded protection motivation framework, the decision to install or use a decentralised water system on one's property was conceptualised as a product of perceived threat of water shortages and the belief in one's ability to deal with it within the purview of moral obligation, subjective knowledge and social influence. The inter-relationships between these variables were confined to a multivariate data analysis technique called structural equation modelling (SEM) using Analysis of Moments Structures (AMOS).

Other public services such as sanitation, refuse disposal and the provision of power are further than the extent of this exploration as they need entirely distinct inquiries. This study relies essentially on raw information obtained from respondents using inquiry form, semi-structured conversations with key persons of interest in this inquiry and personal monitoring of water supply facilities and service, as well as an assessment of archived information and documents composed from local utility and development agencies, public libraries and online.

1.9   Thesis Structure

The systematic arrangement of organizing case-study research report which is founded on five sequential sections of, introduction, literature review, methodology, findings and recommendation, highly suggested for academic dissertation or journal articles (Yin, 2009) is adopted for this thesis, but with an addition of a chapter on the study area.

The introduction chapter presents the overview of the study. These include background information, which describes the nature of the research problem with reference to the prevailing literature on water supply services. Statement of research problem point to the core of the research problem being studied, identified the actual problem, and looked at the extent to which preceding studies have investigated the problem. The missing elements in the existing literature which this study aims to extend knowledge to has been highlighted in the research gap. Research questions outlined the queries that arose in the course of relating the research problem with other researchers' assessment of the matter. The aim of this research summarised the goal to be realised at the end of the study and the objectives detailed the stages to be followed in order to realise the aim. The scope of the study outlined the extent the research covered and the problem the research attempted to solve. The importance of this study is given in the significance of the study.

Chapter two discussed Self-Supply as an approaches to water supply with management at the household level, its concept and definition. Groundwater as a source of self-supply and the various ways it is accessed was also discussed. After that, the global practice of self-supply in which self-supply practice from the developed and the developing worlds was looked at. Incidences from USA, France, and Australia on the one hand, as well as those from Vietnam, Indonesia, and India on the other hand, were presented. Sub-Saharan Africa represented by incidences from Zambia, Zimbabwe, Uganda and Nigeria were discussed before presenting the motivational indicators for self-supply water system use among households. Motivational indicators for self-supply system use among households look at the motivation to drill as vital in predicting self-supply adoption. The theoretical context

of the research looked to the field of social psychology in trying to understand self-supply adoption among urban households. The conceptual framework identified and discussed the underlying context of assumptions of the chosen theoretical background for this study. It discussed the validation of these assumptions from previous studies, the confirmation of the relevance of the identified variables, and the presumed relationship among them for this research.

The study area in chapter three outlined its historical perspective, location and size, climatic conditions, vegetation, geology, and population. Also included in the study area is water supply, in which both the public and the private outfits were looked at. The private water supply is further divided into private commercial and private personal.

The methodology in chapter four outlined the research design, data required, research population, sampling procedure, research instruments, validity and reliability of the instruments. Also outlined were descriptive analysis techniques used, and statistical techniques used in analysing the quantitative data collected. The hypothesised relationships between the independent and the dependent constructs of the study were outlined and discussed. Also discussed was structural equation modelling using analysis of moment structures (AMOS), as the statistical tool and the software used in conducting the analysis of the data collected, respectively.

Data analysis in chapter five presents the analysis of the data collected in the course of this research. Data from the household and stakeholder surveys were subjected to descriptive and inferential analysis. The socio-economic status of the sample formed the context in which the associated risks of unreliable water supply, as well as the capacities of households in responding to such inadequacies, were assessed. Because there is a hypothesized relationship between these variables and quantity and/or quality of urban services provision (Brelsford et al., 2017), in which its inadequacy results in self-supply system adoption, Chi-square (χ^2) test of independence was used to determine if there are differences across the wards, in terms of the socio-demographic characteristics of concern in this study. The phi or Cramers V values of the Chi-square (χ^2) test were used to test the actual relationship

between household's socio-demographic variables and self-supply water system adoption. In an attempt to evaluate how influential are protection motivation factors on self-supply water system adoption, a descriptive analysis of all the items measuring the ten sub-constructs of the study was first conducted for an understanding of the data, before the eventual modelling of the main constructs of the study, via structural equation modelling.

Chapter six presented the conclusion of the study. It made a recap of the methods and findings, presents strength and limitations of the study, the implications of the study and recommendations for further studies.

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