Societal Structure and Organizational Structure as Predictors of Information and Communication Technology Users' Beliefs About the Environment

Samali Violet Mlay[1], Sonny Juma Nyeko [2] and Robert Kyeyune[3]

Abstract

This investigated the influence of societal structure and organizational structure on Information and Communication Technology users' beliefs about the environment in the Ugandan context. Environmental sustainability is currently a call for urgent attention around the World. Our study was guided by two specific objectives; to establish the effect of societal structure on ICT users' beliefs about the environment in Uganda and to establish the effect of organizational structure on ICT users' beliefs about the environment in Uganda. The study adopted the belief action outcome (BAO) model of Nigel P. Melville. A cross-sectional quantitative research design, using a post-positivist paradigm with a quantitative analytical survey research methodology was used. We used a self-administered survey, with a questionnaire as the tool for data collection. A sample of 384 respondents was selected using simple random sampling and we obtained back 362 usable questionnaires. Correlations, regressions and structural equation modeling were analyzed using SPSS and AMOS. The results show that societal structure and organizational structure have a positive significant effect on ICT users' beliefs about the environment. We make a contribution by adopting the BAO model in a developing country context, in which literature about beliefs about the environment is limited. We recommend that there should be more deliberate organizational top management support and finances to run environmental conservation initiatives that will ultimately impact individual's beliefs about the environment. Additionally, societal actors who influence other people should be empowered to shape ICT users' beliefs about the environment.

Keywords: Societal structure, organizational structure, beliefs about the environment, green IS.

Introduction

For a long time, "sustainability" has been one of the most pressing issues in the world. The World Commission on Environment and Development defined sustainability as meeting the needs of the present without compromising the ability of future generations to meet their own needs (WCED 1987). The Organization for Economic Cooperation and Development (OECD, 2009) reported climate change and energy use as the most outstanding environmental issue in human history; information and communication technology (ICT) use being a significant contributor to this issue. Consequently, the Millennium Development Goal (MDG) 7 is to ensure environmental sustainability. Studies on sustainability have over the years been conducted by many scholars (Ali & Bailur, 2007; Coffey & Toland, 2019; Elkington, 1999,

[1] Makerere University Business School - Uganda
Email: smlay@mubs.ac.ug
[2] Makerere University Business School - Uganda
[3] Makerere University Business School - Uganda

Gholami, Watson, Hasan, Molla & Bjorn-Andersen, 2016; Melville, 2010; Sayeed & Onetti, 2018; Nyeko, Mlay, Amerit & Nyero, 2022a; Nyeko, Mlay, Among & Nyero, 2022b; Watson, Elliot, Corbett, Farkas & Feizabadi, 2021). These studies indicate the pertinence of environmental sustainability over the past decades.

Information and communication technology has been fronted both as an enabler of environmental sustainability as well as a contributor of environmental degradation. According to Rivera, Håkansson, Svenfelt and Finnveden (2014) ICT creates both a positive and negative impact on the environment. The positive arises from the impacts and opportunities created by the ongoing use and application of ICT, for example virtual goods, virtual stores, tele-working, tele-meetings, tele-collaboration, which mostly present a positive impact on the environment by reducing emissions from movement. The negative impact on the other hand arises from the production and usage of ICT, thereby increasing consumption of energy, emission of greenhouse gas and improper disposal of non-recycled ICT solid waste.

In order to tap into information technology (IT) for environmental sustainability, "green information technology" (green IT) and "green information system" (green IS) have been propounded. Green IT has been described as mitigating against the undesirable environmental effects of the design, manufacture, use, and disposal of IT (Murugesan, 2008 as cited in Molla, Abareshi & Cooper 2014). Green IS on the other hand refers to the "integrated and cooperating set of people, processes, software, and information technologies to support individual, organizational, or societal goals" (Watson et al., 2010, p. 24). Green IS encompassing the beliefs and actions of individuals using IT to contribute towards environmental sustainability. The terms green IT, green IS and green ICT have often been used interchangeably. Lokuge, Sedera, Cooper and Burstein (2021) posit that for environmental sustainability to be achieved through IT, the focus has to shift to making production processes greener. This shift is by applying environmentally sustainable practices using IT while making IT itself greener; implying application of both green IT and green IS. According to Lokuge et al., (2021) these initiatives result in mindset change of employees; changing their beliefs about the environment and how and what they do with ICT that can improve environmental sustainability.

Uganda, like the rest of the World, is faced with the problem of environmental degradation and is making some strides towards environmental sustainability. This move can be seen through the deliberate efforts by the Government of Republic of Uganda to develop environmental guidelines and specifically guidelines for ewaste management (Government of Uganda, 2012). However, the implementation of these guidelines is still lagging behind. Notable are the increasing pile up of ewaste, poor recycling efforts, low up-take of ICT for virtual goods, and continued importation of poor quality and used electronics (Government of Uganda, 2012; Government of Uganda, 2020b; Nyeko et al., 2022a; Nyeko et al., 2022b). This trend, if not urgently checked will worsen environmental degradation in Uganda and subsequently the surrounding areas. According to Shevchuk and Oinas-Kukkonen (2016) behavior modification is pertinent in order to build a pro-environmental mindset. Therefore, a need to investigate people's beliefs about the environment as one way of ultimately exploring green IS for environmental sustainability in Uganda is pertinent. Sayeed and Onetti (2018) posit that pro-environmental actions can be addressed as a social responsibility using organizational resources and commitment. Therefore, communally addressing environmental sustainability is imperative.

The people of Uganda fall under high context culture, which is highly characterized by societal and collective decision making. This implies that one's society and organization may impact their beliefs about the environment.

This study adopted the belief action outcome (BAO) model developed by Nigel P. Melville that explains the relationship between information systems and environmental sustainability. The BAO model explains how individuals view ICT as a solver of all problems but in the end over use it till they deplete natural resources and then try to use it to avert the depletion (Melville, 2010). The model tests how "societal structure" and "organizational structure" affect "beliefs about the environment", sustainability actions, the behavior of social system and the behavior of the organization. According to Melville (2010) beliefs about the environment are formed as a result of tensions arising within individuals out of conflicts between organizational values and personal values that are shaped by society. Melville (2010, p.6) defines societal structure as the "cultural or normative patterns that define expectations of agents about each other's behavior and that organize enduring interrelationships". Organizational structure on the other hand is defined as "ways in which an organization divides its labour into distinct tasks and achieves coordination among them".

A study by Butler, Daly and Hackney (2015) established that adoption of Green ICT is largely premised on a web of social and institutional mechanisms that act together to produce needed outcomes such as Green IS practice. Additionally, Molla et al., (2014) established that organizational fields among others influence the formation of IT professionals' environmental beliefs and attitudes. This means that the social and organizational structures play a significant role in shaping a person's beliefs about the environment. Many organizations make very little contribution towards Green IS due to the costs associated with it. However, it has been reported by Saldanha et al., (2022) that an environment-focused green IT organizational strategy positively influences the association between green IT standards and financial profit. Meaning that organizations that place focus on the environment are more likely to improve their Green IT standards and ultimately make more profits.

While studies on how one's societal structure and organizational structure affect their beliefs about the environment have been conducted in many developed countries (Butler et al., 2015; Lokuge et al., 2021; Melville, 2010; Molla & Abareshi, 2011; Molla et al., 2014; Sayeed & Onetti, 2018; Watson, Elliot Corbett, Farkas & Feizabadi, 2021), there is dearth of literature on the same in Uganda. The Uganda Vision 2040 aims to promote a green economy, among which guiding principles include science, innovation and compliance, resource use efficiency (Government of Uganda, 2020a). ICT has been fronted as one of the ways to foster environmental sustainability in Uganda. Uganda's National Development Plan III (2020/21 – 2024/25) includes digitalization and innovation, technology development and transfer (Government of Uganda, 2020a). Worthwhile to note is that Uganda is a developing country, with a different contextual setup than the developed countries where these studies were conducted. Even though Uganda banned importation of used ICT products (The East African, 2010), a lot of used products are still being imported. Many people cannot afford brand new products but may afford a refurbished one which may cost less than half the price of the new one. Therefore, the economic challenges of Uganda as a developing country may contribute towards green IS practices. This is coupled with the poor ways in which these products are

eventually disposed (Nyeko et al., 2022a, Nyeko et al., 2022b). This has seen a rise in ewaste in Uganda. The negative effect of ICT as propounded by Rivera et al, (2014) is evident in Uganda, specifically regarding ewaste (Nyeko et al., 2022a, Nyeko et al., 2022b). It was therefore imperative to conduct this study given the contextual difference from the developed economies where similar studies were conducted.

The main objective of our study therefore was, to investigate societal structure and organizational structure as predictors of ICT users' beliefs about the environment in Uganda. This main objective was guided by two specific objectives;

Objective 1: To establish the effect of societal structure on ICT users' beliefs about the environment in Uganda.
Objective 2: To establish the effect of organizational structure on ICT users' beliefs about the environment in Uganda.
In order to achieve these objectives, we tested two hypotheses derived from review of extant literature in the succeeding Section;

Hypothesis 1: Societal structure has a positive significant effect on ICT users' beliefs about the environment in Uganda.
Hypothesis 2: Organizational structure has a positive significant effect on ICT users' beliefs about the environment in Uganda.

Theoretical Background and Review of Related Literature
We adopted a narrative review approach when reviewing related literature; a narrative review has the advantage of presenting a thorough and critical overview of extant literature on the author's topic. In this Section, we describe extant research and how it informs our study.

Information Systems (ISs) and Environmental Sustainability
ISs impact environmental sustainability at three levels; direct or first-order effects, enabling or second-order effects and systematic or third-order effects (Butler et al., 2015; Rivera, et al., 2014; Watson et al, 2021). The first-order effects are the direct negative effects from the production, usage and disposal of computer equipment. These negative effects arise from the high power consumption, carbon emissions and the improper disposal of the hardware. The second-order effects are positive from usage of ICT in other processes in ways that help conserve and preserve resources. For example, ICT is used in transportation, logistics, energy production through smart grid technology among others. The third-order effects are long-term and dynamic. These are widespread positive socio-economic effects of ICT such as on economic structures and lifestyles (Butler et al., 2015; Watson, 2021). Examples of third-order effects include the advance of Internet of Things, electric vehicles, wireless sensor networks among others.

Studies have shown that IS can play a central role in environmental sustainability by enabling implementation of sustainable businesses and societal processes (Butler et al., 2015; Lokuge et al., 2021; Melville, 2010; Molla et al., 2014; Seidel, Recker & vom Brocke,, 2013; Watson et al., 2021). Therefore, there should be a continuous agenda to place IS at the fore to address environmental degradation. Lokuge et al., (2021) front greener processes through IT, for

example measuring employees' carbon emissions using software (p.4). Aside from the direct effect on environmental sustainability, which such a process would have, it also has the ability to change the employees' mindset and beliefs about the environment by making them more aware of environmental sustainability using IT/IS. They also recommend that IT itself should be made greener through green data centers and reduction in greenhouse gas emission. ICT in developing countries has however, many times presented a big challenge to the environment due to poor ewaste management, lack of ewaste legislative policies and a lax in enforcement where the policies are available (Aborele, Urquhart & Nudurupati, 2015; Nyeko et al., 2020a; Nyeko et al., 2020b).

ICT and the Environment in Uganda

Uganda, like the rest of the World has environmental sustainability challenges as a result of the high population and constrained use of the scarce resources (Yunus, 2017). A growing need for sustainable usage of resources to mitigate the problem is imperative. ICT has been fronted as one of the ways to foster environmental sustainability in Uganda. Uganda's National Development Plan III (2020/21 – 2024/25) includes digitalization and innovation, technology development and transfer (Government of Uganda, 2020a). This move makes ICT a central facilitator of various business processes. There has been a boost in the application of ICT in various processes in the country to tap into the second-order and third-order effects of IS. Resultantly, it is more visible to see ICT in education, commerce, an uptake of telework among others. However, the first-order effects of ICT are not lost to Uganda. Ewaste accumulation for example has become a concern (Nyeko et al., 2020a; Nyeko et al., 2020b). Ewaste poses one of the biggest negative impacts on the environment, after global warming. Uganda is a member of the Basel Convention on the control of trans-boundary movement and disposal of hazardous waste. The Government of Republic of Uganda has in the recent past developed the ewaste management policy and guidelines for ewaste management with the objective of reducing environmental degradation (Government of Uganda, 2012).

While ICT usage is on the increase in Uganda, it has presented both positive and negative effects on the environment. In order to harness the positive effects of ICT on the environment, it is imperative to study ICT users' beliefs about the environment and use the findings to steer the green IS agenda in Uganda. Nyeko et al. (2022a) investigated the drivers and inhibitors of ewaste management in Uganda and established attitudes as one of the predictors of ewaste management. We steer the debate on green IS in Uganda by investigating how the societal structures and organizational structures shape an ICT user's beliefs about the environment. We therefore, present our theoretical background using the BAO model, which has been used for similar studies; on societal structures, organizational structures and beliefs about the environment.

Theoretical Background

This study was conceptualized basing on the belief action outcome (BAO) model developed by Nigel P. Melville. BAO explains the relationship between information systems and environmental sustainability. This relationship involves human behavior and social, organizational and environmental perspectives (Melville, 2010). The theory is based on the micro-macro relations propounded by Coleman (1986, 1994) that looks at three classifications of sustainability (Melville, 2010). Coleman looks at sustainability as; how the cognitive states of

sustainability arise (belief formation), the sustainability practices of both individuals and organizations (action formation) and the environmental and financial performance. Therefore, the level of analysis is both micro and macro. According to the theory, there are three types of relations; how the social structure affects the psychic states of one's beliefs, desires and opportunities (macro-level variables), how psychic states affect individual action (micro-level variables), and how a combination of individual actions affect the behavior of the social system (macro-level variables) (Gholami, Sulaiman, Ramayah & Molla, 2013; Mithas, Khuntia & Roy, 2010; Molla et al., 2014). Social systems comprise both individual and corporate actors (Coleman, 1986). The micro-macro-model of Coleman (1986) proposes "links between the influence of social and organizational sustainability contexts (macro-level issues) on individuals' and organizations' beliefs about the environment (micro-level) and the influence of their beliefs on sustainability actions and subsequent outcomes (at both macro- and micro-levels)" (Molla et al., 2014, p.131).

Melville (2010) further introduces the organizational structure and behavior of organization that lead to dual socialization and dual outcomes. The dual socialization is how the individual psychic is shaped by social structure (labelled 1 in the diagram below) and organizational structure (labelled 1'). An individual's belief formation is shaped by the conflicts between the values of the organization such as profits and personal values, which are formed by the expectations of the society to save the environment. The dual outcomes are how the combination of individual actions may improve organizational performance (labelled 3') and environmental performance (labelled 3). The cost expended and effort of an individual should be seen to improve both the organizational and environmental performance. Organizations are homogenous agents comprised of many individuals with different behaviors, influenced by the society (labelled 4, 4', 5, 5'). The BAO model is illustrated in figure 1;

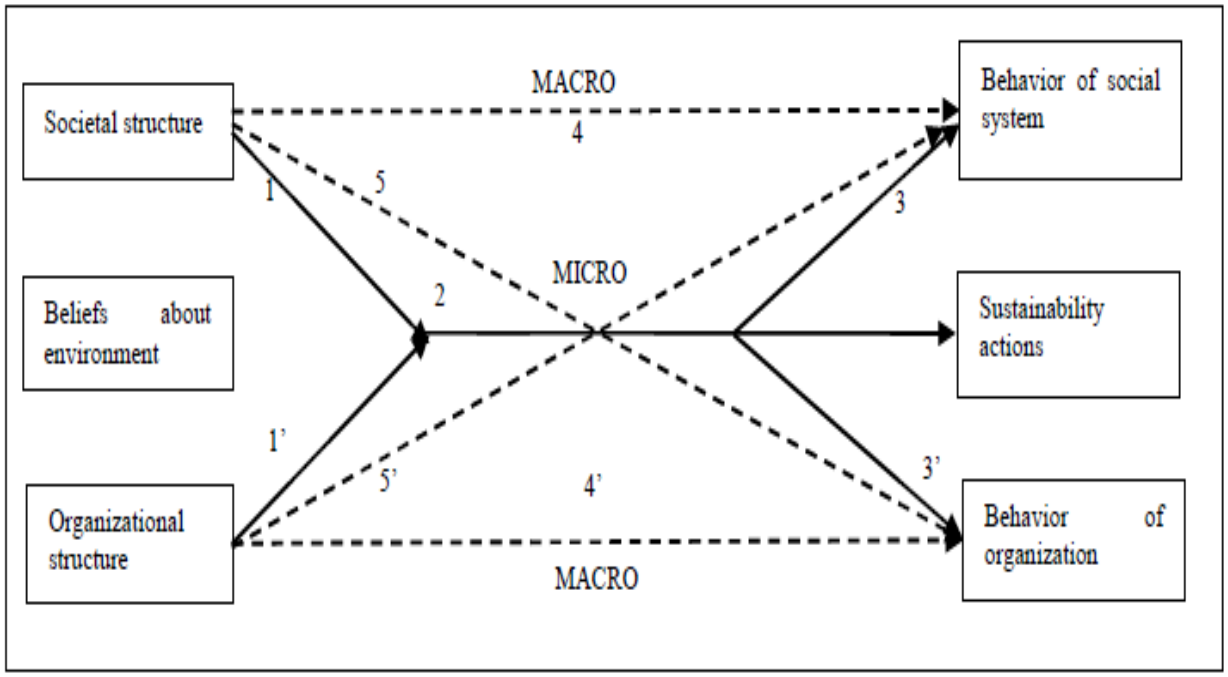


Figure 1. The Belief Action Outcome Model (Melville, 2010, p.6)

According to the model, the macro levels (social structure) affect the psychic state of an individual (Labeled 1). The psychic state in turn affects the individual actions (Labeled 2). Individual actions cumulatively affect the behavior of macro level variables such as the social system (Labeled 3).

Table 1: The Belief Action Outcome Terminology

	Belief Formation	**Action Formation**	**Outcome**
Description	How psychic states (beliefs, desires, opportunities, etc.) about the natural environment are formed.	How psychic states about the natural environment translate to actions.	How sustainability actions affect social and organizational systems. How macro states affect behavior of society and organizations.
Analysis Level	Macro–micro	Micro–micro	Micro–macro (links 3 and 3'). Macro–macro (links 4, 4', 5, and 5').
Constructs	Societal structure: cultural or normative patterns that define expectations of agents about each other's behavior and that organize enduring interrelationships. Organizational structure: ways in which an organization divides its labour into distinct tasks and achieves coordination among them. Psychic state: Beliefs, desires, opportunities, and so on.	Action: something done by an individual, such as adoption of an information system to improve organizational recycling or facilitate ride sharing.	Behavior of society: functioning of society and natural environment (includes performance). Behavior of organization: functioning of organization (includes performance).

Source: Melville (2010, p.6)

The BAO model is a generic model, which can be used in many studies with relatively minor reorganization. The model also doesn't have a definite outcome (it measures sustainability actions, beliefs about the environment, behavior of social system and organization as the dependent variables). The model categorizes beliefs about the environment under dependent variables but places it under independent variables in the figure even though it has a mediating effect in the relationship between societal structure and sustainability actions and organizational structure and sustainability actions. This study adopted BAO model with a specific focus on Coleman's belief formation by analyzing the interaction of societal structure, organizational structure and beliefs about the environment. These variables measure how the societal structure and organizational structure affect beliefs about the environment. Sustainability actions, behavior of the social system and behavior of the organization were not the purview of this study and therefore, were not adopted. This study applied the BAO model at an individual unit of analysis with ICT users forming the unit of inquiry. Studies such as those of Gholami et al. (2013) and Molla et al. (2014) applied the BAO model at the individual unit of analysis rather than the organization. This model has mostly been adopted in studies based on developed

countries. This study expands the model by adopting it in a developing country with a high context culture; hence a possibly different role and impact of the society and organizational structure than in developed countries.

Societal Structure and Beliefs About the Environment

There has been calls to shape the beliefs about the environment through societal groups. Melville (2010) posits that cultural and normative patterns of the societal structure define the expectations of persons about each other's behavior and enables them to organize long lasting interrelationships that can help shape among others, their beliefs about the environment. Nobel Prize Winner Professor Muhammad Yunus fronted social businesses as one of the most efficient ways of achieving environmental sustainability (Yunus, 2017). These are businesses geared towards solving societal problems by engaging members of the society or community. For example, organizing the community to collect ewaste for purposes of recycling them, where the proceeds return to the community. ICTs are often used within the society and therefore, the society can be organized in these long lasting interrelationships to influence each other on how to best use it in ways that will mitigate the negative impacts on the environment.

The Association of Information Society developed an agenda to share knowledge with organizations such as societal groups to achieve a positive impact on sustainability of the environment using IS (Watson et al., 2021). According to Sayeed and Onetti (2018) the impact of ICT on the environment can be addressed as a social responsibility, thereby highlighting the influence of the society. Butler, et al. (2015) adopted the Institutional theory to explain how the normative and cultural-cognitive influences determine the societal fields in which we interact. They posit that normative influences operate within values (something that is preferred or desirable) and norms (means through which desirable or preferred things should be achieved). On the other hand, the cultural-cognitive influences as posited by Butler, et al. (2015) operate through mechanisms from symbolic systems, cultural rules, and shared perceptions and understandings (p.2). They define mechanisms in terms of actors, problem situations, problem-solving activities (such as habits of perception and action and necessary resources, and their responses. This shows that the normative and cultural-cognitive influences as encompassed in the societal structure have the ability of shaping a person's beliefs about the environment. Molla et al. (2014) also advocate for society collective action to tackle environmental problems. Furthermore, a study by Nyeko et al. (2022a) also established that e-waste management is a collective effort that is best done by involving all stakeholders or actors. This further goes to point to the societal structure, which can be used to influence one's beliefs about the environment.

Organizational Structure and Beliefs About the Environment

In order to achieve environmental sustainability, it is necessary to use organizational resources and imperative to build organizational commitment (Sayeed & Onetti, 2018). It sometimes takes organizational resources to develop organizational green IS and its commitment. Watson et al. (2021) propose that green IS should be shared within organizations. This is because organizations have regulations and policies that can be effected or even enforced on the employees or community. Butler, et al. (2015) explain how regulative influences can shape organizational fields. They too established that regulations establish rules, which help guide, monitor, and punish people within an organization. These regulations in effect can shape one's

beliefs about the environment. According to Molla and Abareshi (2011, p4) "an organization's belief and value system associated with eco-sustainability as well as the influence of external institutions can drive organizational actions to green IT". The influence of the organization can also be looked at from the bottom up or top down approach. The bottom up expresses how individuals and their beliefs, perceptions, capabilities, and innovativeness shape organizational and societal actions, while the top down approach expresses the individuals' influence and power in the organizational structures (Melville, 2010; Molla et al., 2014).

Lokuge et al. (2021) further assert that green management through using greener processes using IT and making IT green make the employees more mindful of environmental sustainability. They recommend using organizational infrastructure and processes such as; administrative infrastructure to promote sustainable behavior of individuals and waste management; organizational processes such as greening processing and introducing sustainable component in performance reviews and; skills such as trainings in sustainability. Therefore, when the organization develops an eco-sustainability motivation, it becomes easier to shape individuals' beliefs about the environment.

Methodology

A cross-sectional quantitative research design was adopted for this study. The research, adopted a positivist paradigm with a quantitative analytical survey research methodology. A positivism paradigm relies on revelation of knowledge through a neutral and measureable investigation where the knowledge is independent of the learner (Hair et al., 2010). Snapshot quantitative and primary data on societal structure, organizational structure and beliefs about the environment were used for the study. The study population comprised 799,060 people in Uganda who are employed in the formal sector, both in the public and private sector (Karugaba, 2022). The use of ICT is wide spread though at varying levels and therefore, the employees use ICT to communicate and do several other activities at their work places. The estimated sample size was 384 respondents. For populations above 10,000, a sample of 384 is recommended (Bartlett, Kotrlik & Higgins, 2001; Krejcie & Morgan, 1970). The unit of analysis was an individual, with the unit of observation and unit of inquiry being the ICT users in organizations; both Public and Private. These respondents were stratified into five regions of Uganda and selected using simple random sampling.

The measurement of societal structure, organizational structure and beliefs about the environment was adopted from studies of Melville (2010). Data were collected using a self-administered survey by employing a pre-coded questionnaire as the tool. The questionnaire elicited responses about societal structure, organizational structure and beliefs about the environment using a five point likert scale anchored as 1 – strongly disagree, 2 – disagree, 3 – not sure, 4 – agree and 5 – strongly agree. The questionnaire was pretested for face validity, content validity and reliability. Face validity was done by 8 experts in green IS research and quantitative research methods. Content validity index (CVI) was computed for content validity while Cronbach's Alpha Coefficient was computed for reliability (Cronbach, 1951). The CVI and Cronbach's Alpha Coefficient respective results were; societal structure (S-CVI .83, Cronbach's Alpha coefficient .83), organizational structure (.83 and .87) and Beliefs about the environment (.96 and .92). All the CVI and Cronbach's Alpha Coefficients were above the acceptable threshold of .7 (Lynn, 1986; Nunnally, 1987).

Diagnostic tests for normality, linearity, multicollinearity and homogeneity of variance were run to check if the model fits the data well. Exploratory Factor analysis was done using SPSS 22.0 statistical packages in order to reduce the dataset by finding the most important factors among the list of factors on the questionnaire in order to eliminate the less important factors in the final analysis of data. Thereafter, correlations and regressions were estimated to test the relationship between predictor variables and the criterion variable in order to make conclusions about the hypotheses. We adopted the utilitarianism ethical position because of our usage of analytical survey methodology, which generalizes the findings. The respondents were invited to participate at their own volition and were assured that their identities were anonymous and their responses will be kept confidential. Researcher bias stemming from our own experiences and knowledge of green IS was reduced by adopting a realism ontological perspective and objectivism epistemological stance.

Analysis and Interpretation of Findings

Statistical assumptions of normality, linearity multicollinearity and homogeneity of variance were tested before conducting multivariate analysis to avoid biased and wrong results (Hair et al., 2010). The sample data were drawn from a normally distributed population. Results from 362 respondents were used for analysis giving a response rate of 94%. Validation of measures was done using exploratory factor analysis (EFA). The main results of our study are presented through correlation results and regression analysis results as presented hereafter.

Sample Characteristics

A total of 362 were filled and returned. Both the unit of inquiry and unit of analysis were individuals; respondents who use ICT in any form at their places of work. Table 2 presents the characteristics of respondents.

Table 2: Respondent characteristics

Characteristic	Group	Freq	%
Gender	Male	209	58
	Female	153	42
	Total	362	100
Age group	<20	2	1
	20-30	186	51
	31-40	152	42
	41-50	19	5
	>50	3	1
	Total	362	100
Education level	Diploma	30	8
	Bachelor Degree	171	47
	Postgraduate Diploma	24	7
	Master Degree	129	36
	PhD	3	1
	Other	5	1

	Total	362	100
Type of organisation	Public	125	35
	For Profit Private	170	47
	Not for Profit Private	66	18
	Other	1	0
	Total	362	100
ICT use	Yes	357	99
	No	5	1
	Total	362	100
Type of device	Phone	325	90
	Desktop computer	270	75
	Laptop	145	40
	Tablet	84	23
	Other	18	5
Knowledge of non biodegrability	Yes	220	61
	No	142	39
	Total	362	100
Knowledge of toxic chemicals	Yes	225	62
	No	137	38
	Total	362	100
Knowledge about Green ICT	Yes	101	28
	No	261	72
	Total	362	100

Source: Primary Data

Results in Table 2 show that most of the respondents were male (52%) compared to females who were 42%. Most of the respondents were 20-30years and 31-40 years which is reflective of the age distribution in Uganda. Most of the respondents were Bachelor degree holders (47%), followed by Master degree (36%). The other respondents were Diploma holders (8%), postgraduate Diploma (7%), PhD and other (such as professional courses) were both 1%. Most of the workforce in Uganda follows that pattern, showing representativeness of the sample. Most of the respondents work in for profit private companies (47%), others were in public/government organisations (35%), not for profit private organisations like NGOs were 18%. Results further show that 99% of the respondents use ICT devices. However, a look at the questionnaires were the respondents said no to ICT usage, they went ahead to select some of the devices they are using. Results indicate that 90% of the respondents use phones, 75% use desktop computers, 40% use laptops, 23% use tablets while 5% indicated other (for example printers, photocopiers among others). The respondents could select more than one device for this question depending on their devices. Asked if the respondent was aware that computing devices are not biodegradable, 61% said they are aware while only 39% are not. Additionally, 62% of respondent are aware that toxic chemicals are used in the manufacture of computing devices while 38% are not aware. Lastly, only 28% know about green ICT while most of them (72%) are not aware.

Exploratory Factor Analysis Results

Exploratory Factor Analysis (EFA) is an exploratory tool in which the values of observed data are expressed as functions of a number of possible causes in order to find which are the most important. EFA was done in order to reduce the dataset while finding the most important factors among the list of factors on the questionnaire. This enabled the elimination of less important factors in the final analysis of data to remain with the most important ones. Components were checked to make sure those with communalities less than 0.4 are removed. Kaiser-Meyer-Olkin (KMO) was used to verify the sampling adequacy for factor analysis. The variable should have KMO >.05; values less than that would lead to recollection of data or changing of the research questions. Values between 0.5 and 0.7 are mediocre, values between 0.7 and 0.8 are good, values between 0.8 and 0.9 are great and values above 0.9 are superb (Hutcheson & Sofroniou, 1999). Bartlett's test of sphericity should be significant (less than .05), Keiser's criteria of Eigenvalue should be greater than 1 for samples greater than 250, average communality should be greater than 0.6, Correlation Matrix Determinant more than .00 (Field, 2009).

Component Matrix for organizational structure

Organizational structure consisted of 13 items. Components were checked for communalities less than .5 and 6 of the items were removed leaving 7 items.

Table 3: Component Matrix for organizational structure

		Organizational Structure
My organisation has a policy that guides disposal of ICT hardware in consideration of the environment.		.817
My organisation has a policy that guides recycling of ICT hardware in consideration of the environment.		.808
My organisation has a designated person(s) to champion environmental conservation.		.741
My organisation has implemented server virtualisation.		.712
My organisation has a policy that guides re-use of ICT hardware in consideration of the environment.		.692
My organisation has implemented cloud computing.		.652
My organisation uses thin client computing.		.641
Eigen Value		3.690
% of Variance		52.713
Cumulative % of variance		52.713
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.878
Bartlett's Test of Sphericity	Approx. Chi-Square	1114.298
	Df	55
	Sig.	.000

Source: Primary Data

According to the results in Table 3, the factor loadings for the items ranged between .641 and .817 and the Eigen Value is 3.69 which is greater than 1. The percentage of variance explained is 52.713 of the variance in organizational structure. The KMO is .878 which is greater than .05 meaning the values are great. Bartlett's test of Sphericity of Approx.Chi-Square= 1114.29,

DF=55, p<.001 is significant, which indicates that correlations between items were sufficiently large for factor analysis.

Rotated Component Matrix for societal structure

Societal structure consisted of 11 items measured using 2 constructs. Components were checked and items with communality less than .5 were removed; as a result, 1 item that had communality less than 5 was removed.

Table 4: Rotated Component Matrix for societal structure

		Cultural influence	Normative patterns
The people in my community who actively participate in environmental conservation are rewarded.		.739	
My community has local environmental conservation programs.		.693	
My community has available resources to use for environmental conversation.		.680	
Some of the political leaders I know engage in conserving the environment.		.591	
I have had media exposure to environmental issues (e.g. through newspapers, documentaries, movies, radio etc).			.715
Some of my friends engage in conserving the environment.			.655
Some of the organisations in my community engage in conserving the environment.			.627
Some of my family members engage in conserving the environment.			.611
Some of my religious members engage in conserving the environment.			.611
Eigen Value		2.592	2.371
% of Variance		28.797	26.339
Cumulative % of variance		28.797	55.136
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.			.823
Bartlett's Test of Sphericity	Approx. Chi-Square		593.546
	Df		28
	Sig.		.000

Source: Primary Data

The results in Table 4 reveal the rotated factor loadings for the items ranged between .591 and .739 and the Eigen Values are 2.59 for cultural influence and 2.37 for normative patterns which are both greater than 1. The percentage of variance explained are 28.79 for cultural influence and 26.34 for normative patterns altogether giving 55.14% of the variance in societal structure. The KMO is .823 which is also greater than .05. Bartlett's test of Sphericity of Approx.Chi-Square= 593.55, DF=28, p<.001 is significant, which indicates that correlations between items were sufficiently large for factor analysis.

Rotated Component Matrix for beliefs about the environment

Beliefs about the environment consisted of 27 items measured using 3 constructs; desires, opportunities and beliefs. Components were checked and items with communality less than .5 were removed; as a result, 9 items were removed because they didn't meet the threshold.

Table 5: Rotated Component Matrix for beliefs about the environment

		Desires	Opportunities	Beliefs
I desire to re-use my ICT hardware in order to conserve the environment.		.672		
I desire to see a reduction of landfills of e-waste.		.648		
I desire to telecommute in order to conserve the environment.		.633		
I desire to reduce the amount of printing I do.		.615		
I desire to recycle my ICT hardware in order to conserve the environment.		.547		
I desire to dispose of ICT hardware in ways that are environmentally friendly.		.509		
Implementing Green ICT can help recycle ICT hardware.			.822	
Implementing Green ICT can help re-use ICT hardware.			.799	
Implementing Green ICT can help reduce landfills of e-waste.			.789	
Implementing Green ICT can help reduce carbon emissions.			.787	
Implementing Green ICT can help reduce power consumption.			.750	
Implementing Green ICT can help reduce paper consumption			.724	
Implementing Green ICT can help conserve the environment.			.538	
I believe the environment can be conserved through proper disposal of ICT hardware.				.647
I believe the environment can be conserved by reducing the amount of carbon emission.				.638
I believe environmental issues directly affect my life.				.546
I believe the environment can be conserved by reducing energy consumption.				.528
I believe the environment can be conserved by recycling ICT hardware.				.525
Eigen Value		5.201	5.199	3.15
% of Variance		21.672	21.662	13.124
Cumulative % of variance		21.672	43.334	56.458
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.				.911
Bartlett's Test of Sphericity	Approx. Chi-Square			3836.117
	Df			351
	Sig.			.000

Source: Primary Data

The eigenvalue for desires is 5.201, opportunities is 5.199, that of beliefs is 3.15 which are all above 1. The rotated factor loadings for the items ranged between .509 and .822. The percentage of variance explained by the three factors are 21.67 for beliefs, 21.66 for opportunities and 13.12 for desires altogether giving 56.46% of the variance in beliefs about the environment. Additionally, KMO is .911, also greater than .05 meaning the values are superb. Bartlett's test of Sphericity of Approx.Chi-Square= 3836.12, DF=351, $p<.001$ is significant, also indicating that correlations between items were sufficiently large for factor analysis.

Diagnostic tests

It is important to test for statistical assumptions before conducting multivariate analysis to avoid biased and wrong results (Hair et al., 2010). Assumptions of normality, linearity

multicollinearity and homogeneity of variance were tested and were upheld as presented and explained subsequently.

Normality Test

Normality test was done to determine whether the sample data was drawn from a population with a normal distribution. The Kolmogorov-Smirnov test was used in this study to test the null hypothesis that the data set was from a normally distributed population.

Table 6: Normality Results

	Kolmogorov-Smirnov[a]		
	Statistic	Df	Sig.
BAENVMT	.086	362	.060
OGSTR	.107	362	.080
STRUCT	.120	362	.106

	Kolmogorov-Smirnova		
	Statistic	Df	Sig.
BAENVMT	.086	362	.060
OGSTR	.107	362	.080
STRUCT	.120	362	.106

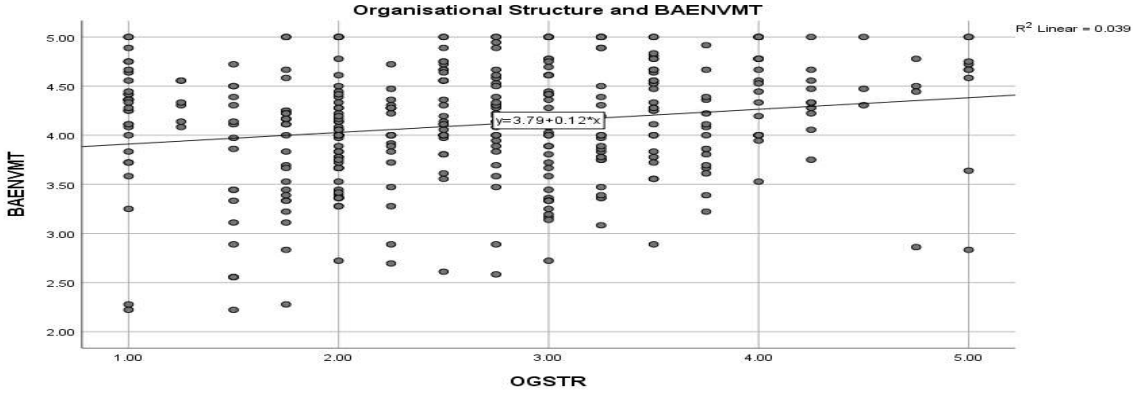
Source: Primary Data

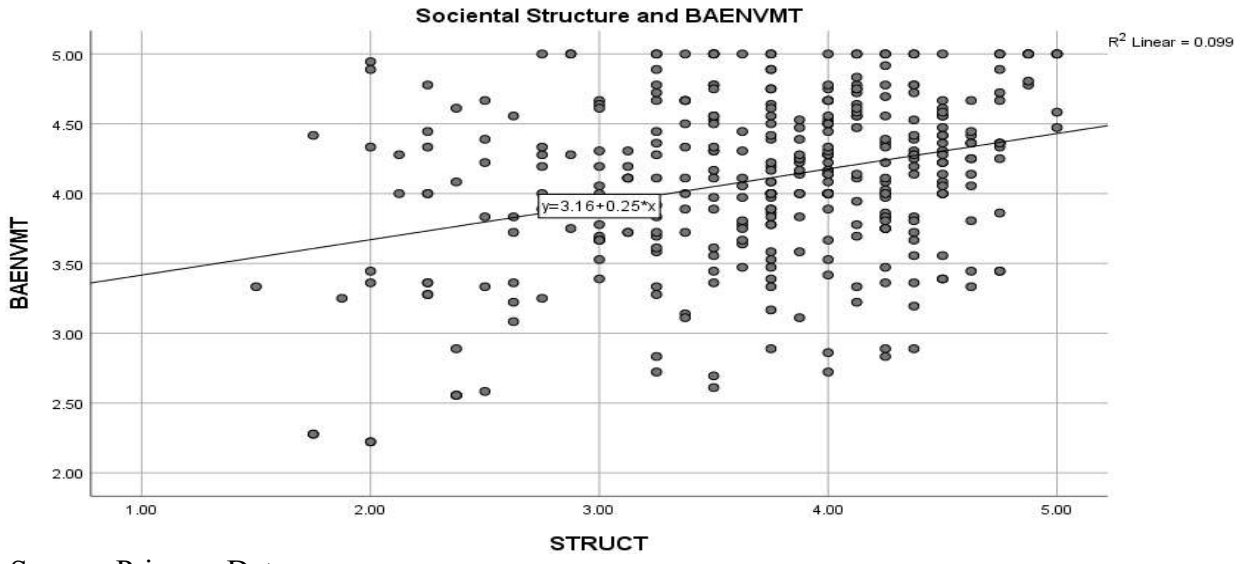
According to the results in Table 6, the p-values for the three variables are 0.06, 0.08 and 0.11 which are all larger than the significance level (0.05). This shows that we failed to reject the null hypothesis meaning that the data set follows a normally distributed population.

Linearity

Linearity was tested using scatter plots for the variables. Scatter plot matrices are used to roughly determine if there is a linear correlation between multiple variables. It is done by plotting values of one variable against the value of another variable (Field, 2009). They show the extent to which one variable is affected by another. The correlation coefficient (r) greater than 0.1 (or r2 greater than 0.01) is considered strong while that below is weak (Field, 2009); r= 0.13 or r2= 0.0169 (zero correlation), r= 0.35 or r2= 0.123 (weak), r= 0.55 or r2= 0.303 (moderate positive), r= 0.75 or r2= 0.562 (strong positive), r= -0.59 or r2= -0.348 (moderate negative), r= -0.85 or r2= -0.753 (strong negative). The results are presented in Figure 2.

Fig 2: Linearity test results





Source: Primary Data

The results of the scatterplot for organizational structure and beliefs about the environment show a coefficient of determination r^2 of 0.039 showing a weak correlation between the two variables. Results for Societal structure and beliefs about the environment have a coefficient of determination r^2 of 0.099 showing a weak positive correlation.

Multicollinearity

Multicollinearity was analysed to ensure that collinearity does not pose a problem for multiple regression to test the hypotheses. Variance inflation factor (VIF) was used to measure how much the variance of the estimated regression coefficients are inflated as compared to when the predictor variables are not linearly related. According to Field (2009, p. 224) "the VIF indicates whether a predictor has a strong linear relationship with the other predictor(s)". The threshold for VIF is 10; therefore, VIF above 10 should cause concern of collinearity. Tolerance which is a reciprocal of VIF (1/VIF) should therefore, not go below 0.1.

Table 7: Multicollinearity Results

Coefficientsa

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	3.064	.158		19.436	.000		
	OGSTR	.074	.031	.123	2.389	.017	.931	1.074
	STRUCT	.227	.042	.282	5.477	.000	.931	1.074

a. Dependent Variable: BAENVMT

Source: Primary Data

Results from Table 7 show the VIF and Tolerance respectively for societal structure is 1.074 and .931, organizational structure is 1.074 and .931. Therefore, VIF for both the predictor variables are below 10 and Tolerance is above 0.1 meaning there is no multicollinearity between the predictor variables.

Homogeneity of Variance

Homogeneity of variance was estimated in order to establish the validity of the assumption that the statistical properties of any one part of the overall dataset are the same as any other part. Homogeneity of variance for groups of data was tested using Levene test (F). "Levene's test tests the null hypothesis that 'the variances in different groups are equal' (i.e. the difference between the variances is zero)" (Field, 2009, p.150) by doing a one-way ANOVA. The interpretation is that if the Levene's test is significant at $p \leq .05$, the null hypothesis is incorrect, meaning the variances are significantly different and homogeneity of variance assumption has been violated and vice versa (Field, 2009).

Table 8: Test for Homogeneity of Variance

Test of Homogeneity of Variance

		Levene Statistic	df1	df2	Sig.
BAENVMT	Based on Mean	.001	1	360	.970
OGSTR	Based on Mean	.003	1	360	.958
STRUCT	Based on Mean	.070	1	360	.792

Source: Primary Data

According to the results in Table 8, the Levene's test is not significant at 0.01 revealing that the null hypothesis is correct. This means the variances are not significantly different and homogeneity of variance assumption has not been violated.

Data Analysis

Parametric assumptions of normality, linearity multicollinearity and homogeneity of variance were upheld and therefore Pearson correlation and regression parametric analysis was adopted.

Correlation Results

Pearson correlation was run to measure and describe the direction and strength of the relationship between two variables (Field, 2009). The results of Pearson correlation are presented in Table 9 below;

Table 9: Correlation Results

		Organizational Structure	**Societal Structure**	**Beliefs about the Environment**
Organizational Structure	Pearson correlation	1		
	Sig. (2-tailed)			
Societal Structure	Pearson correlation	.262**	1	
	Sig. (2-tailed)	.000		
Beliefs about the Environment	Pearson correlation	.197**	.314**	1
	Sig. (2-tailed)	.000	.000	
**. Correlation is significant at the 0.01 level (2-tailed).				

Source: Primary Data

The results show that both societal structure and organizational structure are positively associated with beliefs about the environment, with coefficients of $r = .314$, $p < 0.01$ and $r = .197$, $p < 0.001$. This means that the more the societal structure and the organizational structure are cohesive towards environmental sustainability, the more the ICT users' beliefs about the environment increases.

Regression Results

Linear regression was thereafter analyzed to describe the relationship between the predictor variables and outcome variable and to establish if the model is significant to predict variability in beliefs about the environment. These helped to test the hypotheses. The results are presented in Table 10 below;

Table 10: Hierarchical Regression Model

	Model 1			Model 2		
Variable	B	Beta	VIF	B	Beta	VIF
Constant	3.792**			3.064**		
Organizational Structure	.118**	.197**	1.000	.074*	.123*	1.074
Societal Structure				.227**	.282**	1.074
R^2	.039			.113		
Adjusted R^2	.036			.108		
R Square Change	.039			.074		
Sig. F Change	.000			.000		
F	14.541			22.853		
Sig	.000			.000		

(Primary Data Source)

The results in Model 2 reveal that societal structure and organizational structure account for 10.8% of the variability in beliefs about the environment. The Model is useful for predicting ICT users' beliefs about the environment with F-ratio (F) of 22.85, which is significant at $p<0.001$. According to Model 2, a change in societal structure increases ICT users' beliefs about the environment by 28.2%, which is significant at $p<.001$ (significance is .000). VIF and Tolerance for societal structure is 1.074 and .931 respectively. Additionally, a change in organizational structure increases ICT users' beliefs about the environment by 12.3%, which is significant at $p<.05$ (significance is .017). VIF and Tolerance for organizational structure is 1.074 and .931 respectively. Subsequently, according to the results; hypothesis H_1: Societal structure has a positive effect on ICT users' beliefs about the environment has been supported. Additionally, hypothesis H_2: Organizational structure has a positive effect on ICT users' beliefs about the environment has also been supported.

Discussion of the Findings

In the discussion section, we adopted a narrative review approach to show how our study fits into the extant literature.

Societal Structure and Beliefs About the Environment

Our first hypothesis (H_1) was, societal structure has a positive significant effect on ICT users' beliefs about the environment in Uganda. The outcome of societal structure is expected to be a better performance of society and natural environment. This outcome was measured on an individual level and not organizational level. The results established that societal structure has a positive effect on ICT users' beliefs about the environment, thereby supporting H_1. Among the two variables that affect beliefs about the environment measured in our study, societal structure explains the highest variance. Meaning that, in Uganda, the influence the societal structure has on an ICT user has a higher influence on their beliefs about the environment than the influence of organizational structure. Our results established those social actors such as community, cultural and religious leaders have a high influence on ICT user's beliefs about the environment

when they convey messages regarding environmental sustainability. This may be attributed to the cultural context of the Ugandan people. Uganda falls under the high context culture; where people do things communally as opposed to individually (Gamsriegler, 2005; Hall, 1976).

These findings are consistent with studies of Gholami et al. (2013), Mithas et al. (2010) and Molla et al. (2014) who found positive relationships between societal structure and beliefs about the environment. Molla et al. (2014) established that society has to take a collective action in order to tackle environmental problems. More-so, Butler et al. (2015) indicated that normative and cultural-cognitive mechanisms have the ability to shape a person's habits of cognition; including their beliefs about the environment. More so, our findings extend the BAO model of Melville (2010) by showing the influence of societal structure on an ICT users' beliefs about the environment using empirical evidence from a developing country context.

Organizational Structure and Beliefs About the Environment

Hypothesis H_2 of our study was, organizational structure has a positive significant effect on ICT users' beliefs about the environment in Uganda. Melville (2010) introduced organizational structure to the BAO model because it was found to lead to dual socialization. Human beings are social animals and therefore, dual socialization is how the individual psychic is shaped by social and organizational structure. The values of the organization shape an individual's belief formation towards the environment (Melville, 2010). Organizational structure therefore, plays an important role in shaping one's beliefs about the environment. On that premise, hypotheses H_2 was formulated. The results established that organizational structure has a positive effect on beliefs about the environment. These results are in support of H_2 that also hypothesized a positive relationship.

The items on organizational structure were geared towards establishing if organizations have programs and policies geared towards green IS. Many organizations are implementing green IS initiatives in order to inculcate sustainable practices (Bengtsson & Ågerfalk, 2011; Seidel, et al., 2013; Watson et al., 2010). The low explained variance of the effect of organizational structure on beliefs about the environment can be attributed to the poor management support within the organizations which was one of the questions to measure organizational structure. Many organizations, view environmental sustainability and green management as a costly responsibility rather than an opportunity and therefore, many organizations abandon green management programs before they come to fruition (Lokuge et al., 2021). Saldanha et al. (2022) argue that firms can either be cost focused or environmental focused in their green IS organizational strategy. The cost-focused strategy leads to organizations saving costs but hindering investment in green IS while the environmental focused strategy leads to investing in green IS but increasing costs. Our results on organizational structure revealed quite little effort on the side of Ugandan organizations, that can be attributed to the costliness of doing it as supported by extant literature. Many organizations in Uganda do not have any deliberate plans or funds towards sustainability. Subsequently, in Uganda, the influence of organizational structure on an ICT users' beliefs about the environment has a weak though positive influence.

Other studies such as that by Sayeed and Onetti (2018) established that in order to achieve environmental sustainability, organizational commitment has to be secured and organizational resources are expended. Mithas et al. (2010) also established that in order to foster beliefs about

the environment, it is necessary to have top management commitment. Their finding established that top management commitment is positively associated with the importance accorded to green IS in an organization. Environmental sustainability has resulted in some organizations becoming creative and introducing new greener products such as recyclable products and reduction of operational costs through green management (Lokuge et al., 2021). According to BAO of Melville (2010, p.2), it is pertinent for organizations to develop a common information system where the members are educated on causes and effects of environmental impacts in order to realize an organizational adoption of green IS.

Conclusions and Implication

We contribute to environmental sustainability through IT by investigating the effect of societal structure and organizational structure on ICT users' beliefs about the environment. Both hypotheses were supported; societal structure has a positive significant effect on ICT users' beliefs about the environment in Uganda, organizational structure has a positive significant effect on ICT users' beliefs about the environment in Uganda. We make a contribution by adapting the BAO model in a developing country context, in which literature about beliefs about the environment is limited. Among the two predictors in the model, we have established that societal structure has the biggest influence on ICT users' beliefs about the environment. The implication of the findings of societal structure is that there should be more emphasis on cultural and normative factors, which influence people in order to improve their beliefs about the environment. For example, the religious and political leaders had a great impact, and therefore, they should be used to inform and form environmental beliefs of the society members.

The importance of organizational structure in ICT users' beliefs about the environment point to the fact that there should be more emphasis on environmental conservation by organizations. This emphasis can be done by placing more prominence on organizational promotion of beliefs about the environment. Management in organizations should be interested in leading and supporting initiatives to raise beliefs about the environment because they have been found to ultimately lead to green IS practices, which offer benefits directly to the organization as well.

Recommendations

There should be more deliberate societal engagements to empower communities with programs and finances to run more environmental conservation initiatives that will ultimately impact individual's beliefs about the environment. The Government of Republic of Uganda has grassroots structures such the Local Council, which can be patterned with and funded to institute community initiatives to raise individuals' beliefs about the environment. There should be deliberate policies instituted to empower people of influence in societies such as religious and political leaders to inform and form the environmental beliefs of people in their society. For example, through loud speakers placed in local communities and managed by religious establishments or the local council to convey messages about green ICT.

Further, Management of organizations should become interested in leading and supporting organizational environmental programs. For example, appointing green IS champions in organizations was found to increase people's beliefs about the environment. These champions should be supported using organizational resources. Additionally, organisations should develop green ICT policies because they were found to shape users' beliefs about the environment.

Implications for future work

This study adopted part of the BAO model. It didn't undertake to investigate sustainability actions of the ICT users in Uganda following their beliefs about the environment. It also didn't study the behaviour of the social system and the organization in Uganda as influenced by societal structure and organizational structure. We propose that the study is extended to include those variables as per the BAO Model.

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