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A Study on User Adoption of Advanced ICTs in Uganda : Focused on GIS/GPS Gorilla Tracking System

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우간다에서의 고급 정보통신기술 수용도 연구 : GIS/GPS 고릴라 추적 시스템 사례

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Uganda is a country blessed with the biggest number of mountain Gorillas in the whole world. These animals contribute at least 12% in revenue generation to the Tourism sector through tracking by both local and foreign tourists who pay for the tracking permits. However, Gorilla tracking is also a big challenge even in the presence of highly skilled and well-trained game rangers. Development and implementation of a secure Computer and Mobile based Gorilla Tracking (GT) system that uses GIS and GPS technologies would be the most ideal technology to use. Therefore, this study aimed to find out the critical factors that would affect the Behavioral Intention of the would-be users to successfully decide to use such GIS/GPS-GT system. We used the existing UTAUT model to integrate six factors such as Performance Expectancy, Effort Expectancy, Employee Peer Influence, Facilitating Conditions, Behavioral Intention and System Use. However, Infrastructure Availability and Non-Technical Facilitating Conditions were added to reflect Ugandan ICT context. This amended UTAUT model was used to carry out the survey. The questionnaire was emailed to 220 government employees in the fields of ICT, Tour and Travel, Environmental Groups officials and Farmers who garden near the game reserves. A total of 133 were obtained fully completed, whereas 127 were deemed usable thus yielding a response rate of 58%. The analysis results show that except for non-technical facilitating conditions, effort expectancy, peer influence, performance expectancy and infrastructure availability positively affects behavioral Intention to use GIS/GPS-GT. This indicates that people in Uganda don't bother about regulations and rules in regard to using information system. As long as the system does what they want it to, anything else does not matter. As an employee in an organization is told to use a system by their supervisor, they have no objection to otherwise they risk losing their job. This implies that, supervisors have a great responsibility in the process of developing, implementing and using the system in Uganda.

Keywords : Gorilla Tracking (GT), Information System (IS), UTAUT, GIS/GPS, and Uganda.

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1. Introduction

Uganda in particular, is a country blessed with the biggest number of mountain Gorillas in the whole world (400) on estimate. This has greatly promoted the tourism industry. With a diverse collection of tourism activities, Gorilla Trekking is one of the biggest contributors ($8m) to the Tourism Industry growth and ($1.2bn) in revenue to Uganda's GDP annually. According to Uganda Wild Life Authority publications (2013), Tracking Permit costs between $300 and $500.

These Gorillas are best known for moving in groups or families with the male as head and move uncontrollably in the thick dark forests on the borders with D. R. Congo and Rwanda. Both local and foreign tourists come to have a physical viewing, an experience they call 'one in a lifetime.' Nevertheless, their tracking has been a big challenge even in the presence of highly skilled and well-trained tour guides/ game rangers when it comes to locating them in real time. This challenge can be attributed to use of outdated techniques of tracking. This includes mapping the recent animals' footstep marks, which can be easily visible during the rainy seasons. Statistically, the average percentage of successful viewings stands at 75%, which can be increased, to higher percentages. Furthermore, Gorillas are unaware of the boundaries and view it all as a single habitat.

Currently, these Gorillas live a life not well monitored because they live in thick and impenetrable forests thus exposing them to Poaching, Habitat loss, Disease, War unrest and conflicts with the Locals. More so, in the tourism industry, a tourist's satisfactory experience can be attributed to the spatial information and context they get exposed to and the ease of access; this factor cannot be achieved by word of mouth of a tour guide but rather with the assistance of information communication technologies (ICTs).

A combination of both Geographic Information Systems (GIS) and Global Positioning Systems (GPS) technologies is being used globally in tracking and monitoring livestock and marine world with high temporal and spatial resolution [19]. However, so far, there is no case study of the use of GIS/GPS technology to specifically track and monitor endangered Gorilla species in Uganda and neighboring countries of Rwanda and D. R Congo, which are their natural habitats.

Technology acceptance is an active area of research where several models and theories have been proposed to understand the drivers of technology adoption. One of the most prominent models is the Unified Theory of Acceptance and Use of Technology UTAUT [4]. According to Van Raaij and Schepers [23], a critical factor to successful implementation of any system is largely dependent on user's acceptance of the system. A long tradition of research on technology acceptance has established that; the (potential) user's perceived ease of use and perceived usefulness are key factors in explaining the acceptance and use of new technologies.

In this paper, the research aimed at finding out the factors that would affect future development and implementation of a computer and or mobile-based GIS/GPS-Gorilla Tracking (GT) system that could assist in an efficient and effective monitoring of the Gorillas in Uganda. It is also focused on understanding the influence of ICTs use on employees in government and private institutions and more specifically the Tourism sector in Uganda.

2. Literature Review and Background

2.1 GIS and GPS Technology

In recent years, there has been a rapid increase in the development and manufacturing of GIS and GPS technologies and their applications, which can be taken advantage of by the tourism industry. Integrated GPS and GIS techniques including navigation, tracking, guiding, gaming, health monitoring and social networking, make it possible to put maps and information, driven by a person's current location, onto mobile devices and computers [8]. This technology has been mostly realized in its applicability in the behavioral ecology of animals, such as migration routes, habitat selection, territorial selections and many more, for example the migration routes of white cranes in 1995 [16]. All these information systems, from manual to informal to computer-based, are or can be designed, operated and used by people in a variety of organizational and environmental settings and contexts. GIS technology not only assists in the analysis and viewing of data, but also helps in decision making and planning, which can be a factor that would lead efficient and effective monitoring of the endangered Gorillas in Uganda.

Objects or individuals location knowledge is one of the main factors for service personalization in the In LBS (Location Based Service) service. The LBS applications are divided into four main areas : (1) Information and navigation

services; (2) Emergency assistance; (3) Tracking services; (4) Network related services [8, 10]. However, for this paper, the main focus is on tracking services. The development of LBS relies on advances in computer science and related technologies. Location related information has become an important resource for both mobile and desktop users due to the discovery and or development of mobile computing devices and cheap location sensing systems.

An example of applying GIS Technology in animal tracking existed in India forests to hold over half the world's tiger population [2]. The forest rangers found it hard to track the tigers. A combination of Adhoc Networks GPS and GIS was considered to be helpful in that aspect. This project focused on the advantages the system offers, where communication between the animal's device and the system user was via GSM cellular network that allowed real-time tracking and the communication in remote forest areas was established using Ad-hoc network.

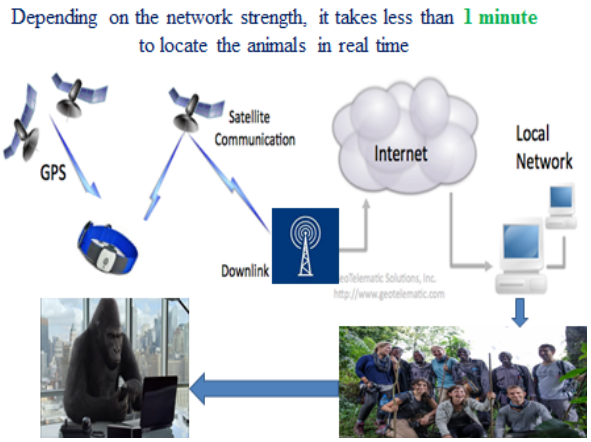
As another example, Mortiz et al. [16] carried out an animal tracking study on the Logone Floodplains called Yaayre in Fulfulde in the Chad Basin. They used DC 20 (GPS) to record geographic distance, speed, true direction, and elevation. Maps were created in ArcGIS to examine visually whether animals followed the same orbit.

In similar, Tangora et al. [22] developed a GPS/GSM collar system to combat cattle rustling in Italy. The system was able to identify the incorrect position of the cattle and the warning messages displaying the main GPS data were sent promptly to the farmer, these messages would continue until animals had been repositioned. This highlighted the potential of the GPS/GSM collar as an anti-theft system according to the field test results.

2.2 GIS/GPS-Gorilla Tracking System

Some case studies on the use of such technologies as GIS and GPS to control animal movements have not been widely reported in as many literatures as one would expect. It is believed that such knowledge and already proved study can be used and improved to develop a GIS/GPS-GT system in Uganda. The most favorable combination of GIS and GPS is the wireless one which is a combination of wireless, Internet and GIS technology as shown in <Figure 1>.

This GIS/GPS-GT system works in such a way that a tracking chip is placed on the one identified head of the family (Gorillas move in families of 10 with a leader) and another



<Figure 1> GIS/GPS Gorilla Tracking System

can be the sick one amongst the family members. The chip can communicate to the hand set or computer with the help of GIS/GPS and satellite images showing real time location can be transmitted as well. The system has to be protected within a given radios with a strong firewall to prevent the "smart" poachers who would try to get the coordinates of the chips and expose the Gorilla ecology and that of other animals. There can also be a booster in form of a MAST in case the local cellular network coverage is shared regionally between Rwanda, Congo and Uganda. If such technology is implemented it can help to locate these animals in real time and thus a lot of time is saved which allows for more viewing. <Table 1> compares Traditional Animal Tracking Systems with GIS/GPS ones.

<Table 1> Traditional vs. GIS/GPS Tracking Systems

Traditional animal tracking systems	GIS/GPS Gorilla Tracking systems
Manually Provisioned	Self-Provisioned
Dedicated Hardware	Shared Hardware
Fixed Capacity	Elastic Capacity
Pay for Capacity	Pay for Use
Capital and Operational Expenses	Operational Expenses
Managed via System Administrator	Managed via application program interfaces (APIs)

As seen in <Table 1>, using a GIS/GPS-GT system presents to the users many different benefits, but the most important one is its ability to have different databases integrated in one environment, for example one layer can be about an animals health records (in animal tracking and monitoring), and another different layer about the animals movements and

locations at different times and much more other information and these layers act as databases.

2.3 Technology Adoption and Acceptance Theories

This study compared different but relevant prior research models that explain factors that affect individual behavioral intention to use a particular information system (IS), which results in actual system use [23]. Firstly, the theory of reasoned action (TRA) inspires the majority of models including Unified Theory of Acceptance and Use of Technology (UTAUT), technology acceptance model (TAM) and many more. TRA is one strategy for developing a theoretical base for understanding the constructs and processes in a user's acceptance or rejection of information technologies in work environment. By focusing the attention on users' attitudes, some studies [14, 15] define the theory to state that one's action (use) is a function of one's intention. They further used the theory to state that the behavior (e.g. toward an information system or system use) is best predicted by intentions. The TRA is a fundamental model that was created by social psychologists to study conscious intentional behavior [3, 21].

TAM was designed to predict information technology acceptance and usage related to labor [21]. TAM was also the first model to mention about psychological factors affecting computer acceptance. The TAM model assumes that both perceived usefulness and perceived ease of use of the new technology are central in influencing the individual's attitude towards using that technology. An individual's attitude is hypothesized to influence the behavioral intention to use a technology, resulting to actual use [23].

The Unified Theory of Acceptance and Use of Technology (UTAUT) model is one of the most comprehensive and definitive theoretical models in the information systems discipline [27]. This model has been used in many studies since its invention [25]. The UTAUT model integrates other seven Technology adoption and acceptance theories developed earlier and is totally composed of the four core determinants of usage intention [24].

Of the four core determinants, performance expectancy refers to the degree to which an individual believes that using the system will help him or her attain gains in job performance. Effort expectancy means the degree of ease associated with the use of the system, whereas social influence represents the degree to which an individual perceives that important others believe he or she should use the new system. Facilitating conditions refers to the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system.

From the viewpoint of UTAUT Application in the field of ICT and Research, Tan [21] applied the UTAUT to understand factors affecting use of English e-Learning Websites in Taiwan. Results for the study demonstrated that performance expectations, effort expectancy, and social influence have positive effects on behavioral intention, and this has a positive effect on use behavior.

On the other hand, Al-Awadhi et al. [5] adopted UTAUT model for exploring e-government service adoption factors in a developing country of Kuwait. The results of the study confirmed that, performance expectancy, effort expectancy and peer influence determine students' behavioral intentions. The study further indicates that behavioral intention and facilitating conditions are also determinants of e-government services use by the students. These studies indicate that UTAUT can be used to significantly predict the behavioral intention to use a new system.

3. Research Methodology

3.1 Research Model

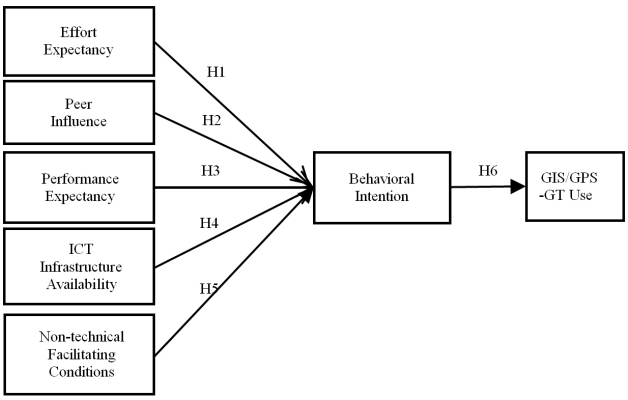
The purpose of this research is to analyze the potential and benefits of using new and advanced technologies that are influential in driving economies to greater levels in terms of development. In particular, this study aimed to find out the points of concentration for the implementation of new and advanced technologies (GIS/GPS-GT) from the stakeholder's perspective in Uganda.

Based on literature review, limitations recorded in prior existing models e.g. Technology Acceptance Model (TAM), have been addressed and such barriers would prevent the use of GIS/GPS-GT as per the context of this study. Although TAM is a model applicable to a variety of technologies [1], there has been criticism for it not providing valuable information about individual's opinion of novel systems [18], this as well, encouraged the researcher to adopt UTAUT model. Although the UTAUT model is relatively new, its suitability, validity and reliability in technology adoption studies in different contexts has been proven [2]. As a result of literature review, it is shown that some cases did not apply the UTAUT

model despite of the similar environment to a Gorilla Tracking system [2, 16, 22, 23]. Therefore, the researchers were highly motivated to adopt the UTAUT model to validate it in the new systems acceptance (Behavioral intention to use the system) in the tourism industry to track endangered Gorillas in Uganda.

UTAUT is a factor framework model that incorporates the four main independent variables (Effort Expectancy, Employee Peer Influence, Performance Expectancy and Facilitating Conditions) with one interdependent factor (Behavioral intention, BI) and one dependent factor (System Use) [27]. However, Moon [18] stresses that, to choose additional factors for technology acceptance model, target technology, main users and the context should be first considered as the important issues. An amendment was therefore inevitable for the UTAUT model to suit the current study context in Uganda (See <Figure 2>).

The researchers added Infrastructure Availability (IA) factor and this construct was intended to specifically measure issues like GSM network coverage in areas where the system would be deployed (thick forests and game reserves). In information technology, IA refers to basic physical and organizational structures and facilities (e.g. network coverage, equipment and power supplies) needed for the operation of a society or enterprise continuously operating for a desirably long period of time.



<Figure 2> Research Model with Hypothesis

ICT Infrastructure Availability is treated as a new factor in this study, and hence a key factor in the influence of behavior intention towards the acceptance and use of the new GIS/GPS-GT. Someone may argue that this could have been facilitated for in Facilitating Conditions Factor, however the study had all the conviction based on the first author's personal experience with network coverage in the study area (Rural Uganda) and thus had to make it clear for the respondents. This is a critical aspect in introducing such a technology in such geographic areas.

Facilitating conditions was replaced with Non-technical Facilitating Conditions (NTFC) and was measured based on the perception that for such a system to be successful; government policy on the use of ICTs and promotion in Uganda must be available and clear (e.g. laws and regulations). Unlike in previous research where it directly affects system use, this study presumed that NTFC directly affect BI based on the perception that people have developed the behavior of wanting to know the legal implications associated with a system before they use it.

Behavioral Intention measurement included the intention, prediction and planning to use the GIS/GPS-GT system. This study also replaced Use behavior with GIS/GPS-GT Use. System use is defined as the frequency, duration, and intensity of an employee's interactions with a particular system [20, 25]. Therefore, this GIS/GPS-GT Use factor was measured to find out whether people want or plan to use the GIS/GPS-GT Use system in Uganda.

For the amended UTAUT model in this study, Effort expectancy was also measured based on the ease, flexibility needed to use the GIS/GPS-GT system and ease of learning to use such system. Peer Influence was assessed with the perception that GIS/GPS-GT system users have a sense of feeling obliged to be loyal to their supervisor's decision or suggestion. Performance Expectancy refers to the degree to which an individual perceives some progress in Gorilla Tracking performance using GIS/GPS-GT system.

Many previous studies have examined the influence of four factors on BI in UTAUT; these relationships have been supported by some studies [5, 24, 25]. In similar, this study presents six hypotheses using the amended UTAUT model to measure the relationships between five independent constructs and BI, and then between BI and GIS/GPS-GT use below;

H1 : Effort expectancy would positively affect Behavioral Intention to use GIS/GPS-GT

H2 : Peer Influence would positively affect Behavioral Intention to use GIS/GPS-GT

H3 : Performance Expectancy would positively affect Behavioral Intention to use GIS/GPS-GT

H4 : Infrastructure Availability would positively affect Behavioral Intention to use GIS/GPS-GT

H5 : Non-Technical Facilitating Conditions would positively affect Behavioral Intention to use GIS/GPS-GT

H6 : Behavioral Intention by the user towards using the system would positively affect GIS/GPS-GT use

3.2 Measurement of Constructs

This study used survey questions that have been measured in existing literature. All latent variables were tested using a number of items with reference to various construct scales previously published [5, 25]. A seven point Likert-type scale was used to measure all items (1 = strongly disagree, 4 = Neutral, 7 = strongly agree). The authors adapted wording relevant to this research specificity from existing items. Respondents had to indicate the extent to which they agreed with a certain statement, ranging from "strongly disagree" (1) to "strongly agree" (7).

Behavioral Intention was developed by some researchers [7, 11, 25]. Of the five core determinants, Effort Expectancy, Peer Influence and Performance Expectancy were developed by Venkatesh et al. [25]. Infrastructure Availability and GIS/GPS-GT Use were developed by the authors in order to reflect the current status of Gorilla Tracking system in Uganda, whereas Non-Technical Facilitating Conditions was developed by Venkatesh et al. [25]. For each factor, the survey questions are stated in Appendix.

The survey questions were developed in consideration of the current ICT environment in Uganda and some relevant studies [5, 7, 11, 25]. They were validated by ten experts and then distributed for the main survey. So, it is judged that the reliability and validity of the questionnaire was sufficiently secured in this study.

4. Data Analysis and Result

4.1 Survey and Respondent's Profile

A survey questionnaire was used to meet the research's aim. The questionnaire was emailed to 220 government employees in the fields of ICT, Tour and Travel, Environmental Groups officials, and Farmers who garden near the game reserves, these were the main target group for the analysis. However, the research left the form open to anyone who would pick interest in providing feedback. It was designed to be short, easy and unambiguous for respondents to complete. The researchers did not choose the sample for only practical intentions, but also had the perspective that ICTs are becoming important in the sector of service delivery and once this system is implemented the target group will be its main users and beneficiaries thus knowing their perception will be useful in improving the services. In this survey, things like anonymity and confidentiality of the respondents were guaranteed.

Out of 220 questionnaires sent to respondents, within four months, a total of 133 were obtained fully completed, 127 were deemed usable thus yielding a response rate of 58%. A large number of respondents were males (70.1%) and females (29.9%). About 97.6% of total respondents were in the age range of 21~35 years. <Table 2> represents respondent's profile of Ugandan citizens who participated in this study.

<Table 2> Respondents Profile

Category		Classification	Percentage(%)
Gender	Male	89	70.1
	Female	38	29.9
Age	~20	1	0.8
	21~25	37	29.1
	26~30	73	57.5
	31~35	14	11.0
	36~40	1	0.8
	41+	1	0.8
Understanding GIS or GPS	Very limited	1	0.8
	Some	26	20.5
	Quite a lot	70	55.1
	Extensive	30	23.6

4.2 Measurement Model Analysis

Data collected through the surveys were analyzed using Statistical Packages for Social Science (SPSS). Structural equation modelling (SEM) [13] was also used in order to identify the cause and effect relationships between the constructs in <Figure 2>. First of all, both reliability and validity analyses were carried out to investigate if the survey items match our intent. The items were also examined for scale reliability. For the seven constructs of the amended UTAUT model, the Cronbach's alpha scores are all greater than 0.7, meaning high internal consistency. Convergent validity was first evaluated by examining the t-test for factor loading and was then evaluated by investigating the composite reliability and average variance extracted (AVE). Discriminant validity

was evaluated by investigating the composite reliability and AVE (see <Table 3>).

As can be shown in <Table 3>, all the factor loading scores exceed 0.5, indicating that the measurement items appropriately represent the constructs. The composite reliability and AVE measures are greater than the threshold of 0.7 and 0.5, respectively, and therefore we can conclude that the convergent validity of the measurement model is satisfactory.

The discriminant validity of the measurement model was demonstrated by evaluating the correlations among the questions. For discriminant validity, a measure should be associated with all measures of the same construct larger than it does with any measures of other constructs. With satisfactory discriminant validity, the average variance extracted (AVE) from the construct should exceed the variance shared between the construct and other constructs in the model. <Table 4> indicates the correlation matrix with correlations between the constructs and the square root of AVE on the diagonal. Therefore, the discriminant validity was reasonable.

<Table 3> Measurement Constructs and Item

Constructs	Measurement Items	Factor Loading	Reliability (Cronbach' α)	Composite Reliability	AVE
Effort Expectancy	EE1	0.878	0.873	0.858	0.668
	EE2	0.875			
	EE3	0.882			
Peer Influence	PI1	0.839	0.767	0.861	0.678
	PI2	0.745			
	PI3	0.833			
Performance Expectancy	PE1	0.867	0.886	0.900	0.693
	PE2	0.875			
	PE3	0.850			
	PE4	0.793			
Infrastructure Availability	IA1	0.595	0.718	0.783	0.551
	IA2	0.866			
	IA3	0.796			
Non-Technical Facilitating Conditions	NFC1	0.866	0.849	0.765	0.521
	NFC2	0.892			
	NFC3	0.841			
Behavioral Intention	BI1	0.985	0.834	0.862	0.677
	BI2	0.826			
	BI3	0.715			
GIS-GTS use	USE1	0.806	0.846	0.866	0.683
	USE2	0.864			
	USE3	0.885			

<Table 4> Discriminant Validity

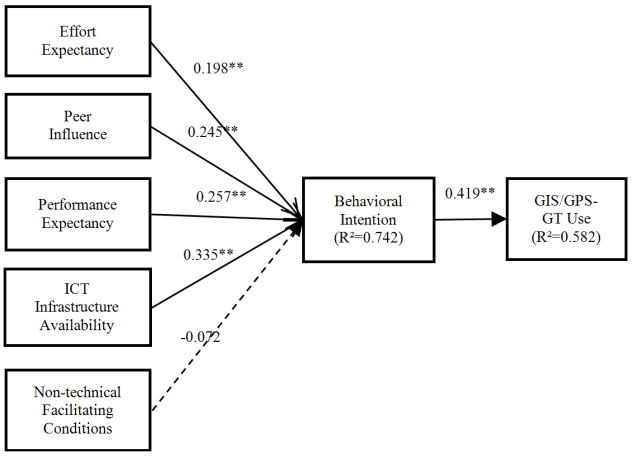
Constructs	EE	PI	PE	IA	NTFC	BI	USE
EE	**0.817**						
PI	0.130	**0.823**					
PE	0.204	0.176	**0.742**				
IA	0.154	0.219	0.161	**0.742**			
NTFC	0.054	0.000	0.031	0.223	**0.721**		
BI	0.300	-0.361	0.350	0.449	0.044	**0.822**	
USE	0.054	0.144	0.178	0.219	0.089	0.394	**0.826**

Note : EE (Effort Expectancy), PI (Peer Influence), PE (Performance Expectancy), IA (Infrastructure Availability), NTFC (Non-Technical Facilitating Conditions), BI (Behavioral Intention), USE (GIS/GPS-GT Use).

4.3 Path Coefficients and R^2 Value

The analysis of the causal relationship in the structural equation model is shown in <Figure 3>. The assessment of the structural model includes estimating the path coefficients and the R^2 value [12]. The path coefficient represents the size of the relationship between the independent and dependent variables. On the other hand, the R^2 value indicates a measure of the predictive power of a model for the dependent variables. The analysis results is interpreted based on the R^2 values of the dependent variable, which is described by the independent variables, as well as through the path coefficient's magnitude, sign, and statistical significance.

Both <Figure 3> and <Table 5> show path coefficients, their significance level and R^2 values of the endogenous variables. The analysis results indicate that only one hypothesis has a non-significant effect and other hypotheses are adopted. Effort expectancy (b = 0.198, p < 0.05), Peer influence (b = 0.245, p < 0.05), Performance expectancy(b = 0.257, p < 0.01) and Infrastructure availability (b = 0.335, p < 0.01) increase BI to use GIS/GPS-GT. H1, H2, H3 and H4, which argue that effort expectancy, peer influence, performance expectancy and infrastructure availability positively affects BI to use GIS/GPS-GT, were accepted and the path coefficients were 0.198, 0.245, 0.257 and 0.335, respectively.



Note : **significant at the 0.01 level.

<Figure 3> Analysis Results of SEM

However, non-technical facilitating conditions does not show a significant effect on BI to use GIS/GPS-GT which deserve our attention. H5 was not statistically significant and therefore were rejected. The R^2 value of the endogenous construct is 0.742 (BI to use GIS/GPS-GT). H6 which insists that BI positively affects GIS/GPS-GT use was supported at a 99.9% confidence level and the path coefficients was 0. 419. In addition, the model explained 58.2% of GIS/GPS-GT use.

<Table 5> Hypothesis Test Analysis

Hy	Path	Est.	S.E.	C.R.	P-V	Remark
H1	EE → BI	0.198	0.065	2.203	0.028*	Adopted
H2	PI → BI	0.245	0.135	2.459	0.014*	Adopted
H3	PE → BI	0.257	0.077	2.784	0.005**	Adopted
H4	IA → BI	0.335	0.156	2.889	0.004**	Adopted
H5	NTFC → BI	-0.072	0.056	-0.790	0.429	Rejected
H6	BI → USE	0.419	0.108	3.975	***	Adopted

Note) *p < 0.05), **p < 0.01, ***p < 0.001.

5. Conclusion, Discussion and Future Study

5.1 Conclusions and Discussion

This study shows that only one hypothesis has no significant effect while the other five hypotheses have significance and thus were adopted. IA remains significant and a strong factor of behavioral intention and EE, PI and PE are significant predictors of behavioral intention similar to some studies [6, 25].

The tests evidence of the overall model adequacy and or reliability clearly demonstrates that the amended UTAUT model efficiently describes the relationships between PE, EF, PI, IA and NTFC and BI to use the Information System in Uganda. If BI is to be perceived as the leading action indicator of System Use, then the amended UTAUT model including their associated attributes is important for the successful development and use of the information system (IS).

Based on this study, for effective planning and decision-making, future developers of GIS/GPS-GT system need to focus on NTFC in Uganda. NTFC includes things like rules and regulations for using ICTs in Uganda. This factor is not popular and most times is ignored, which results in systems use being challenged in courts of laws in case of a shortcoming. NTFC was not supported by the model, mainly because, people in Uganda don't bother about regulations and rules in regard to using information system, as long as the system does what they want it to, then, anything else does not matter.

This study suggests that (1) a big number of Ugandans are computer literate and thus introduction of a new information system would not require much investment in computer use training of the users (2) the youths are more enthusiastic about new technologies, this would also be a good factor in the adoption because they still have an adoptive mind set (3) animal tracking systems are not popular in Uganda, therefore there in case such a system is to be developed in the future, the researchers recommend for a comparison with countries like Korea that already have several systems (4) ICT Infrastructure is also readily available which would support the use of GIS/GPS-GT and (5) however there is much awareness of ICTs in Uganda, people still don't care much about the facilitating conditions (technical or non-technical) and they are also easily influenced by peer to use a system. As an employee in an organization is told to use a system by their supervisor, they have no objection to otherwise they risk losing their job.

This study also serves as evidence of the appropriateness of UTAUT model to measure information system (IS) and new Technology adoption. While the original UTAUT model design has not been widely used in third world developing countries like Uganda, this study makes it a reliable model to measure Behavioral Intention to use IS. By taking into account of two more and or modified factors (IA and NTFC), UTAUT model power was proven in this study.

5.2 Theoretical and Practical Impacts

This study aimed at testing (1) leading factors towards behavioral intention to use an Information System (2) the influence of technology acceptance factors on the behavioral intention of the user, (3) which independent factor among all the factors in the amended UTAUT affects BI more than the others, and (4) whether BI affects GIS/GPS-GT use. These factors proved significant in influencing BI.

This study is similar to the results of some studies [6, 25] because they are all formed on the basis of UTAUT. However, this is a bit different in that our study includes other factors like Infrastructure Availability and Non-Technical Facilitating Conditions and their influence to behavioral intention to use GIS/GPS-GT, which will involve more advanced technologies.

Theoretically, this research contributes to the extension of knowledge for Ugandan adoption and use of new technologies. Most of the adoption research and models have been applied in developed countries [26]. However not so many studies have been conducted and tested the level of Technology acceptance and adoption in Uganda, and most especially in the field of tracking information systems.

This study also based on the results, has practical implications for professionals. It provides explanations of the factors that one would consider as best 'practices for' positive behavioral intention to use an Information System. Results for Four factors of the amended UTAUT apart from Non-Technical facilitating conditions (NTFC) significantly affected behavioral intention to use the IS. Thus this study made a suggestion that if NTFC factor had been clearly introduced to the would-be system users, their behavioral intention to use new technologies would be positively affected. An important emphasis of employee communication at the earliest stages about the Non-Technical contents regarding the new system would help to facilitate its adoption. In regard to this, project managers should explain to users of systems and give them a platform to express and or identify implications that they think affect their intention to use the information system [9].

Also, the findings in this study, show that if a supervisor thinks it's better to introduce a new system in an organization, the intended users will think it's the right decision, this shows a high level of submissiveness and peer influence by employees towards their immediate supervisors. This implies that, supervisors have a great responsibility in the process of developing, implementing and using the system in Uganda.

Furthermore, the study provides technology adoption researchers with valuable implications. It's in support on the aspect that PE, PI, EE and IA positively affect behavioral intention to use an information system. Practitioners and academicians can use our research results to determine factors affecting the behavioral intension to use new technologies. This is in line and consistent with some studies that indicate that positive effect on behavioral intension to use an information system leads to the actual use [3, 4, 25].

5.3 Limitations and Future Research Directions

In spite of the fact that our research contributed to studying the acceptance and adoption of new technologies (information system), there are some limitations and challenges that the researchers had to face. Firstly, the data in this study were collected from only one country Uganda, which is a developing country, and yet these new technologies and the

model best suite developed countries where advanced technologies are being used on a daily basis. Therefore, future studies are necessary to make a comparison between two countries for example South Korea that produces these technologies and systems and Uganda which would use these systems, this in a way helps developers to figure out which works in which country [17].

In addition, this study does only examine the acceptance of new technologies and specifically, an animal tracking system in the tourism sector of Uganda; the results may not be a generalization to other tracking systems and countries. Thus the researchers recommend carrying out future model validation and findings in other tracking systems and or other countries.

Similarly, this study was limited in regard to time factor. The respondents are the least number because there was not enough time to collect more data, thus the researcher would wish to advise any future researchers intending to use this study to bare in mind that this study does not represent the majority of the targeted population.

In final, the GIS/GPS Gorilla Tracking system can accelerate the exposure of Gorilla's ecology, which enables people to easily hunt Gorillas. Therefore, it should be noted that the system won't be implemented based on the number of tourist but rather the easy of and convenience of being able to view the gorillas.

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<Appendix>

Effort Expectancy

EE1 Learning to operate the system would be easy for me.
EE2 I would find the system flexible to interact with.
EE3 It would be easy for me to become skillful at using the system.

Peer Influence Assessment

PI1 People who are important to me think that I should use the system.
PI2 People who influence my behavior think that I should use the system.
PI3 I would use the system if my Supervisor requested to use it.

Performance Expectancy

PE1 Using the system would enable me to accomplish tasks more quickly.
PE2 Using the system would enhance my effectiveness on the job.
PE3 If I use the system, I may save a lot of time on routine job tasks.
PE4 The system would enable me to access Gorilla information any time I need it.

ICT Infrastructure Availability

IA1 There is enough Network coverage in areas gazetted for wild life.
IA2 There are adequate hardware, software and Network technologies in Uganda.
IA3 There is security and authentication technology in Uganda.

Non-Technical Facilitating Conditions

NTFC1 There is a strong availability of financial resources to implement such projects.
NTFC2 There are adequate laws regarding the use of Technology.
NTFC3 There is an e-Government strategic plan to support implementation of such projects.

Behavioral Intention Assessment

BI1 I think I will use GIS/GPS-GT in the next few months.
BI2 I am certain to use GIS/GPS-GT in the next few months.
BI3 I'm planning to use GIS/GPS-GT in the next few months.

GIS/GPS-GT use

USE1 I decide to use GIS/GPS-GT in the next few months.
USE2 I make up my mind to use GIS/GPS-GT in the next few months.
USE3 I will use GIS/GPS-GT in the next few months.