

THE INFLUENCE OF INFORMATION TECHNOLOGY SYSTEM ON PERFORMANCE OF INTEGRATED BORDER MANAGEMENT IN EAST AFRICA

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Abstract: The concern for intensive efficiency has emerged as a result of the increasing mobility of persons and goods, countries have to address the challenge of ensuring a balance between open and at the same time secured and controlled borders. In order to respond to this challenge, the East African Community has developed the concept of “Integrated Border Management” which is key its border management strategy. The purpose of this study was to establish the influence of Information Technology System on performance of Integrated Border Management in East Africa. The study employed a descriptive research design to determine the relationship between Information Technology Systems and performance of Integrated Border Management in East Africa. The results of the findings depicted that the existing ICT hardware has greatly improved the performance of the integrated border management. The ICT software, ICT network and people’s attitude has a great influence on the performance of integrated border management. The existing hardware, software, network and people’s attitude have a positive effect on clearance of products, cut cost of management, improved electronic payment system, improved speed of clearance, improved transparency and real time monitoring. Better and more sophisticated hardware, software and network systems should be put in place for efficiency in border management. Policies should be put in place to increase on knowledge awareness to the community on the importance of the integrated border management.

Keywords: Integrated Border Management, hardware, software, network, people’s attitude.

1. INTRODUCTION

Border management may be defined as all legal and administrative efforts a sovereign state undertakes to secure, safeguard and enhance the sovereignty, security, safety and integrity of its territory. Border management, therefore, is key to any national migration policy. In this regard, the Office of the President through a circular number 1/2008 designated the Department of Immigration as the Lead Agency at Immigration Control Border Posts (McLinden, 2010). Border management is a multi-faceted activity that requires distinct forces with different backgrounds, training and skills. In order to enhance border security and efficiency the policy advocates for the involvement of all border stakeholders and the strengthening of border management committees to deal with cross-cutting border issues. They include border threats and risks, border intelligence, information management and data collection, security, document forgeries and frauds; irregular immigrants, refugees, trans-national crimes and terrorism (Kolowski, 2011).

The integrity of physical borders remains critical to effective border management. Even with the increase of international travel exponentially, the border management systems have contended with additional risks associated with these movements. Risks such as illegal immigration, human smuggling and terrorist attacks have shown weaknesses in the

state's ability in the management of borders effectively. Governments have invested heavily in implementation of new border management frameworks (Kolowski, 2011). The threats on global border management increased due to the increase in use of fraudulent travel documents, terrorism, trans-national crimes, among them, smuggling and trafficking in persons, drug trafficking, money laundering, trafficking in small arms and recently piracy (Kolowski, 2011).

Border management has been made easy by the introduction of the information technology system in operation and the running of the border matters. An information system used in the border operations is a collection of relevant equipment, software programs, networks and personnel involved in the delivery of an automated Integrated Border Management (IBM) (Monar, 2017). According to Monar (2017), Integrated Border Management (IBM) on the other hand, is the strategic control and supervision of border agency activities to address the common challenge of efficiently monitoring and controlling the movement of legitimate people and goods while ensuring the maintenance of secure borders and meeting national legal requirements.

The concern for intensive efficiency of Integrated Border Management emerged with the consequences of 9/11. After the infamous attacks on the Pentagon and the World Trade Center in September 2001, the European Council invited member states to enhance controls at external borders and improve surveillance measures provided for in the Schengen Convention (Vallet, 2016). Every country's has local concerns which are common concerns, hence, making Border management a common concern among nations. The growth and development of countries together critically depends on countries working together on these common border and security challenges (Vallet, 2016).

According to Bigo (2014), IBM may be categorised into; international integration (between neighbouring countries) and domestic integration (between government agencies within a country or customs union). Both types require interagency cooperation and coordination at ports, parallel processing, harbours, and land border points of entry (collectively referred to as ports of entry) for high joint efficiency of these border institutions. For the second category, neighbouring or contracting national authorities must also cooperate to align border-crossing facilities and procedures (Bigo, 2014).

Globally, the advancements in communication and transportation technology has increased the potential for international migration around the world. As international migration becomes less inhibited by physical or economic constraints and becomes more of a function of legal constraints imposed by states, it becomes an increasingly important issue in politics among states (Eski, 2016). As a result, international migration is an issue area for possible international cooperation within international organisations or through the formation of less formal international regimes. Despite the increase in the number of international regimes over the past few decades in wide areas, the international cooperation among states to regulate international migration has been very limited (Eski, 2016). Putting the international refugee regime aside, there is little in the way of international cooperation on international migration at the global level—no international migration regime exists.

At the regional level, there has been development in the migration regimes within and to the African Union. A regime governing intra-AU migration was first articulated in the Treaty of Addis Ababa, reaffirmed in the Single African Act (SAA) (Sulaksono *et al.*, 2017). In order to a line with the AU standards the progress continuous implemented and updated the National Integrated Border Management Strategies and their Action Plans. The Western Balkans countries were encouraged the U.N Secretary-General to continue efforts (Linnell *et al.*, 2016). The time to transport goods across its border will be reduced by improved border infrastructure, which in turn will contribute to reducing trade costs and effective controls in East Africa (EAC Secretariat, 2015).

At the national level customs procedures, documentation, regulations and standards, are in the process of being harmonised and simplified. Improvements have taken place in the areas of infrastructure and information and communication technology (Cannon, 2016). In order to improve cooperation among different national border agencies more training for border agencies personnel was suggested. To facilitate trade, the workshop participants pointed out the need for a common definition of border management concepts among border agencies and actors. Moreover, they proposed that assessments and studies be made on the status of coordination and integration of border management systems in Africa, as well as a new approach to developing these systems so to include all actors, including communities.

The government recognises that IBM is a key element in the Trade Facilitation Cluster of the Action Plan for Boosting Intra African Trade that was endorsed by the Assembly of the Heads of State and Government of the AU in 2012. According to Prokkola (2013), the Action Plan aims at deepening Africa's market integration thereby leading to the creation of a Continental Free Trade Area. The ultimate goal of improving African trade is to enable sustainable economic growth and alleviate poverty (Nantima *et al.*, 2015). This study will inform policy and decision-makers, politicians, senior

border management personnel and other stakeholders on the importance of IBM and its downfalls on East Africa regional trade development and service delivery. Policy development and dissemination is also another important area that informs and facilitates policy makers in formulation of sound decisions and strategies.

2. REVIEW OF LITERATURE

Yu, and Huang (2014), did a study of human blacklisting to expose the latest laws in the European nations as discriminative and unnecessary. Their focus was on; the global apartheid of the EU's external border regime explaining that the establishment of advanced information technology tools and equipment of Integrated Border Management has, in the long run, enabled facilitation of the flow of persons and goods across the national border in line with the European standards and best practices. Implementation of measures and activities in the system of Integrated Border Management based on the Strategy for Integrated Border Management and the National Action Plan for Integrated Border Management, and in line with the Schengen Guidelines, has made it possible to build a system that will develop a database for border management data that will, in turn, be connected to the Integrated Border Management Information System, so as to ensure access to and exchange of information between government agencies that have border management competencies (Yu & Huang, 2014).

In his study titled; Collaborative border management based in Germany, Horvath *et al.* (2015) asserts that the Federal Police querying the German police database and the Schengen Information System (SIS) for verification and authenticity procedures is done in order to secure the border. After clearance the applicant looks into an iris recognition camera, which produces a biometric template of the iris scan (Horvath *et al.*, 2015). This is added to the participant's personal data, encrypted and filed under his or her passport number in a local database. To enter an auto-control lane, travellers place their passport on a document reader and data from the machine-readable zone to check whether the passport holder is enrolled. Aftermath, the automatic doors open and the traveller enter the inner control area, where there is submission of the IRIS scan then compared to the template generated at enrolment. Upon the success of the verification and the traveller not listed on any watch lists, they are given permission to cross the border (Côté-Boucher *et al.*, 2014).

Hammoudeh *et al.* (2017) did an explicit study titled; A New Architecture for Border Management. In the study, the authors noted that in most countries, for IBM to be successfully created the consent of the governmental authorities and a mandate from the President or a similar official (such as a Prime Minister) with authority over the relevant agencies is required. The usually includes the establishment of a working group or task force that will perform the work (Hammoudeh *et al.*, 2017). A legal review of domestic statutes and regulations is also required to determine any additional authority that may be necessary to implement IBM. In which a lead agency is then nominated to conduct the process. For an Effective and successful IBM should begin with domestic interagency cooperation. Therefore, we start our detailed discussion with domestic integration efforts as the foundation for implementing either type of IBM (Hammoudeh *et al.*, 2017).

He also did a study on coordinated border management where he explains that for the implementation of an international IBM program, concerned nations were demanded to negotiate regional and national strategies based on specific border management problems and goals (Wu *et al.*, 2017). Action plans to implement those strategies are usually developed by individual countries, but they must be coherent with neighbouring countries' plans. An example is a recent work being done in the Barents Region between Russia, Lithuania and Poland to strengthen the ties between those countries. Twinning projects, in which agencies of a developing/transition country work directly with corresponding agencies of a developed country, provide necessary training and guidance to the developing/transition country and facilitate greater interagency cooperation between the participating nations (Hammoudeh *et al.*, 2017).

Security has slowed the flow of people and goods and increased frustration of travellers and businesses. These disruptions are serious due to the fear of undermining economic opportunities in border regions, weaken competitiveness and erode social ties for example; in the highly integrated North American economy (Massey, Pren & Durand, 2016). The border groups are the mostly affected and are generally situated in border communities. These groups have quite an experience with the border and are most aware of the variability of border policies and management practices. These groups, are known as stakeholders in this study, are in a unique position because of their proximity to border operations and functions. Thus, it is important to assume that their opinions and ideas should be carefully considered for the continuing and new efforts to improve border policy and move forward (Massey *et al.*, 2016).

Hammoudeh *et al.* (2017) surveyed core border management disciplines. The survey focused on risk-based compliance management in India. The authors discovered that the people living on India's international border particularly on land borders face a lot of problems like harsh living conditions, lack of access to public amenities and difficult terrain. The frequency shelling from across the border thinly spread out administration and inadequate social and economic infrastructure hence making life in these areas difficult. In order to generate a feeling of alienation among the border population concerted efforts are being made by our hostile neighbours through allurements, subversion and promotion of religious fundamentalism (Prokkola, 2013). The border population has many other disadvantages as under; lack of infrastructure, fear of unknown threat of aggression by enemy, vulnerability to actions of border criminals, restriction/control over movement by forces, cross border shelling, and firing. The lack of industrialisation/economic progress, lack of infrastructure, neglect by Government being frontier areas, means of communication, water, medical, water education and remoteness also cause problems to the local community (Wu *et al.*, 2017).

3. RESEARCH METHODS

Research methodology gives details on the type of design and methods applied in the study. The methodology employed in the study was a descriptive research design. The target population defines those units for which the findings of the study are meant to generalize. The target population comprised of all the security officers of border points in East Africa who total to 6,280 men and women. The study applied probability sampling, specifically, stratified sampling and subsequently, simple random sampling. This study employed a structured questionnaire to collect primary data. The study conducted a pilot test to ensure the validity and the reliability of the study instrument –the questionnaires.

The collected data were analysed using SPSS version 22 as the main data analysis tool. The units of analysis used in the study were descriptive and inferential data where descriptive statistics involved mean, standard deviation, frequency and percentages. The inferential statistics used in the study was regression analysis as that was deemed appropriate for the study by the respondents. The study results were then presented in the form of tables, charts and graphs for easy understanding and interpretation.

Multiple linear regressions were used to analyse the relationship between independent variable and dependent variable. The following regression analysis equation was used:

$$Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \epsilon$$

Where: X_1 = ICT Hardware effects, X_2 = ICT Software effects, X_3 = ICT Networks effects and X_4 = People's Attitude effects respectively

ϵ = Standard Error

Y = Performance of Integrated Border Management

4. RESULTS AND FINDINGS

4.1 Response Rate

The number of questionnaires that administered was 376. A total of 335 questionnaires were duly filled and returned indicating a response rate of 89% where 57% (n=191) of the respondents were male and 43% (n=144) of the respondents were female. As shown in figure 4.1 below:

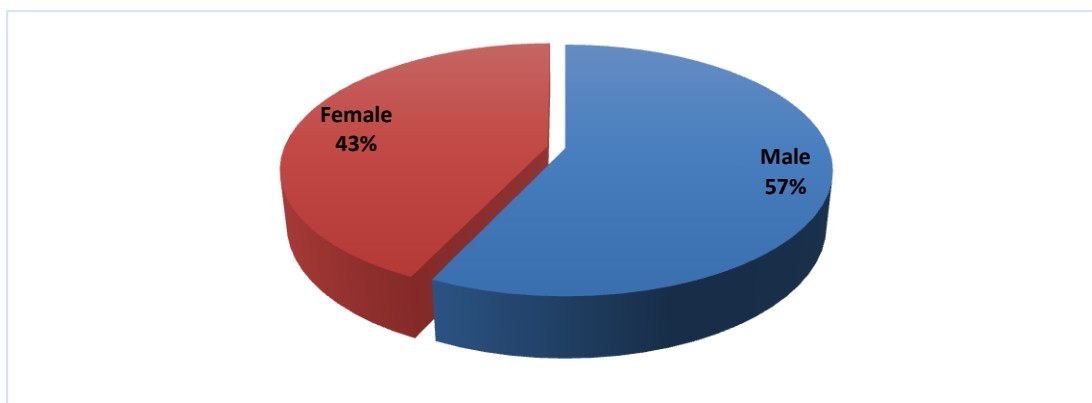


Figure 4.1: Response Rate

4.2 Highest Level of Education of the Respondents

The study findings in Table 4.1 indicate that the majority (49% n=165) of the respondents have a Degree level of education, followed by Tertiary at 25% (n=83) response rate. The least response from the table is Primary school (1% n=3) indicating that most of the respondents in the study have a formal level of education.

Table 4.1: Highest Level of Education of the Respondents

Level of Education	Frequency	Percent
Primary	3	1
Secondary	18	5
Tertiary	83	25
Degree	165	49
Masters	66	20
Total	335	100

4.3 Age of the Respondents

Results in table 4.2 reveals that majority of the respondents 39% (n=131) were aged 30 – 35 years followed by 28% (n=95) those who were aged between 24 – 29 years then 17% (n=56) who were aged between 36 – 41years indicating that the participants were people of good age who are informed with the current issues in their carrier since majority of the respondents were between the ages of 24 – 41 years.

Table 4.2: Age of the Respondents

Age	Frequency	Percentage
18-23 Years	21	6
24-29 Years	95	28
30-35 Years	131	39
36-41 Years	56	17
42 Years and Above	32	10
Total	335	100

4.4 Working Experience in the current Employment

Results in figure 4.2 reveal that (11% n=35) of the respondents had worked in their current employment from 12 years and above followed those who had worked for between 1 – 5 years (32% n=107) then finally (57% n= 193%) those who worked from 6 – 11 Years. The results, therefore, indicate that majority of the respondents have adequate experience in the border sector as they had worked for more than three years.

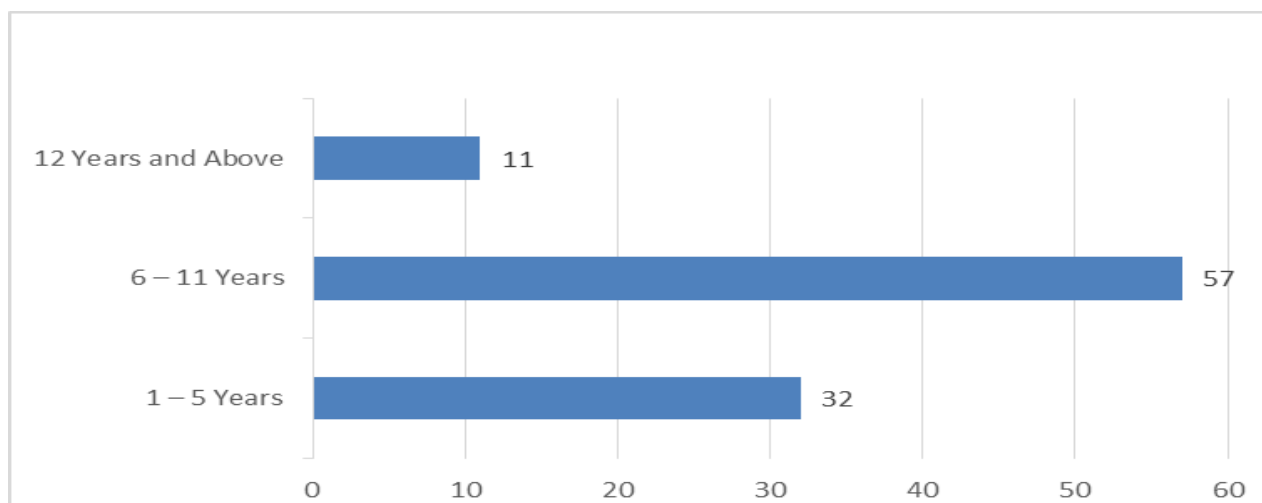


Figure 4.2: Work Experience in the Current Employment

4.5 Reliability Analysis of the Variables

Table 4.3: Reliability Analysis of the Variables

	Cronbach's Alpha	No. of Items
ICT Hardware	.856	40
ICT Software	.921	40
ICT Networks	.874	40
People Attitude on ICT	.863	40
Performance of Integrated Border Management	.879	40

Reliability of the instrument that was used in the study was evaluated through Cronbach Alpha which measures the internal consistency. The study findings in Table 4.3 on the pilot test indicate that ICT Hardware had a Cronbach's reliability alpha of 0.856, ICT Software had a Cronbach's reliability alpha of 0.921, ICT Networks had a Cronbach's reliability alpha of 0.874, People Attitude on ICT had a Cronbach's reliability alpha of 0.863 and Performance of Integrated Border Management had a Cronbach's reliability alpha of 0.879 indicating that the scales measuring the objectives had a very high reliability and therefore no amendment on the objectives was necessary. This implied that the research instruments were adequate and had reasonable internal consistency to give very reliable results since their Alpha value was greater than 0.7. Zinbarg (2005) states that an alpha coefficient of 0.7 or higher indicates that the gathered data are reliable as they have a relatively high internal consistency and can be generalised to reflect opinions of all respondents in the target population about the study problem.

4.6 Findings

Performance of Integrated Border Management.

The study discovered that the efficiency and effectiveness of operations of border management have quite improved the performance of the management to a greater percentage as compared to their previous state. Border management is now accountable for every action taken or operations taking place at the border. The study also found out that the management operations are no longer influenced by bureaucracy and that other parties are involved in the decision making process. According to the study the management system of the border is very consistent in its operations and maintained transparency to increase credibility of management operations. This has gained a sense of trust from the people and increased the acceptance of ICT existence in border management. The border management is reported to be very consistent in their operations and that they have maintained a given type of clearance system for their operations which has reduced various risk associated with clearance of goods.

Effect of Hardware on the Performance of Integrated Border Management in East Africa

The study findings indicate that the respondents are aware of the existing hardware being used in integrated border management. The findings indicated that the existing hardware has quite gone an extent to improve the clearance of products by the application of E-Systems adopted. The study also depicted that the available hardware has extensively increased and improved their electronic payment of customs and filing of returns at the quite easily and more efficiently. Various risks associated with clearance of goods at the border have been extensively reduced by the existence of the hardware that has prevented the loss of data of track of goods due to their reliability of the hardware. While larger percentage of the respondents disagreed with the fact that the existence of hardware has improved the speed of clearance and border operations. Some respondents explained that the reason behind this is that the available hardware is sometimes breaking down reducing the speed of the process or some are quite slow in their processing capabilities leading to a lot of delays in the process.

The study found out that despite the existence of the hardware the integrated border management has not managed to minimize the overhead cost of the border operations as they seem to remain constant or worse as explained by some of the respondents. A higher percentage of the respondents indicated that the existing hardware had made the integrated border management to improve the real-time monitoring on the status of products and goods movement as a sign of increase in security of the border management. According to the findings in the study more efficiency and traceability of container has increased to a greater extent as. The existing hardware has reduced theft, diversion and counterfeiting of goods and products at the border to a greater as indicated by the findings.

The Effect of Software on the Performance of Integrated Border Management

The study findings indicated that the existing software in place had improved the clearance of products by the application of E- Systems in the management of the border. Clearance has been made easier, faster and more credible. It has also reduced the risk associated with the clearance of goods by increasing security and safety measures. The study indicated that there is an improvement in the electronic payment of customs and filing of returns at the border and it has made it easier for operations by the border management. There has also been a cut in the cost of management due to the existence of E-customers as one of the systems. The existing software has made the integrated border management to improve the speed of clearance and border operations making it more efficient and time-saving at the border. Several customers can be served at the shortest time possible.

The study also indicates that the existing software has improved on the transparency of the border operations making it more convincing and trusted by the customers. The real-time monitoring on the status of the products and goods movement has improved over time. The software existence has also improved on the efficiency of container traceability, thus increasing its safety and accountability. With the existence of the ICT software, theft, diversion and counterfeiting have reduced at a greater extent as explained by the respondents.

The Effects of Network on the Performance of Integrated Border Management.

The study indicated that through the use of existing network-integrated border management has improved on the clearance of products by increasing speed and efficiency through the use and application of electronic commerce. The network has also made the border management cut cost of operations due to the existence of electronic commerce customers. The study also indicates that the integrated border management has improved on the electronic payment of customs and filing of returns at the border by the help of the existing network.

The study found out that despite the existence of the network, the risk associated with the clearance of goods at the border is not reduced. The respondents further explained that there had been frequent cases of cyber-attack to the existing network making it not the most reliable system of operations. Though the existing network has made the border management improve on the speed of clearance and border operations because every important data is contained in the network, this study indicated that the overhead cost of operations had been minimised by the existing network making it cheaper and more manageable.

The integrated border management has improved on the transparency of the border operations by the use of network making it more credible to the customers. According to the study, the existing network has improved the real-time monitoring on the status of products and goods movement hence saving time of operations. This has made the process much faster and efficient. There has also been an improvement in the container traceability and its efficiency due to the presence and application of the integrated border network. The reports on or instances of loss of track of containers have decreased. According to the study, the existing network has failed to reduce theft, diversion and counterfeiting at the border. The respondents claimed that malicious activities are still on the rise as those in control of the networks do most of them.

The Effects of People's Attitude on the Performance of Integrated Border Management

The study has indicated that the positive attitude of people concerning the existing ICT has improved the clearance of products by the application of E-Systems at the border. Most of the respondents were in support of the existing, while a few are negative towards it. This supportive nature of the people encouraged more operations to take place and management to come up with more and better strategies for the operations. The study proves that people's behaviour or attitude towards ICT has failed to cut cost of operations because the majority fear the idea of using it.

The findings then proved that the people's idea and attitude towards ICT have led to a decrease in the use of electronic payment of customs and filling of returns due to fear of harking or changing of data or important details. The study indicated that most of the people's attitude towards ICT has tremendously reduced the risk associated with clearance of goods at the border like vulnerability to actions of criminals and restriction /control over movement by forces and loss of data in any way. The positive attitude of the local community towards ICT integration has led to the improvement of the monitoring on status of products and goods movement as they have accepted the adoption of ICT in the clearance process and are encouraged by the easy assistance that ICT has provided in the efficient and traceability of containers. The study proves that theft, diversion and counterfeiting of goods have not reduced despite the people's attitude towards ICT making it a major concern for the integrated border management.

4.7 Regression Variance (ANOVA)

Table 4.4: Regression Variance (ANOVA)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	39.480	4	9.870	147.076	.000 ^b
	Residual	22.146	330	.067		
	Total	61.626	334			

a. Dependent Variable: Performance of Integrated Border Management

b. Predictors: (Constant), Peoples Attitude on ICT, ICT Networks, ICT Hardware, ICT Software

4.8 Regression Coefficients

Table 4.5: Regression Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	11.038	.462		23.907	.000
	ICT Hardware	.377	.172	.744	21.347	.000
	ICT Software	.680	.043	.831	8.735	.000
	ICT Networks	.163	.032	.373	2.990	.007
	Peoples Attitude on ICT	.028	.023	.123	9.763	.000

a. Dependent Variable: Performance of Integrated Border Management

Based on the linear regression model, $Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + u$, the model therefore becomes; $Y = 11.038 + 0.377 X_1 + 0.680 X_2 + 0.163 X_3 + 0.028 X_4 + u$

Where Y = dependent variable (Performance of Integrated Border Management)

α = constant

$\beta_1, \beta_2, \beta_3$ and β_4 are coefficients of independent variable variables

X_1, X_2, X_3 and X_4 are independent variables (ICT Hardware, ICT Software, ICT Networks and Peoples Attitude on ICT).

Testing at 5% significant level, the regression analysis in table 4.5 is significant since all the p-values (Sig. $p < 0.05$) testing at the one-tail test. The findings indicate that every unit increase of ICT Hardware by 37.7%, a unit increase of ICT Software factor by 68%, a unit increase of ICT Networks by 16.3% and a unit increase of Peoples Attitude on ICT by 2.8% would increase Performance of Integrated Border Management by one unit taking into considerations the other variables to be constant value and the value for the standard error

5. CONCLUSION AND RECOMMENDATION

Based on the study findings, the study concludes that the existing hardware has had a great improvement in the border management operations by reducing risks, and improved electronic payment systems and filling of returns. The existing hardware has failed to improve on the clearance at the border due to due to various possible malfunctions of the machines and equipment used in the operations.

The study also concluded that the available software like the E- systems have quite improved the performance of the border management by cutting the cost of management, increasing the speed of clearance, improved transparency and improved the level of efficiency of container traceability making increasing the security of the goods and products.

The network has improved the communication between the border management therefore the pace of operations has increased as well as transparency of the operations making more credible. Network existence at the border stills creates a platform for continuous cyber-attacks and increasing insecurity of border operations.

The study also concluded that the operations of the integrated border management are highly influenced by the surrounding people's attitude on ICT. Most of the people had a positive attitude towards ICT, therefore, encouraging its

use in the border management and increasing the performance of the border management. Some had a negative attitude due to fear of malpractices like theft, diversion and counterfeiting at the border reducing the performance of the border management. The study finally concluded that the efficiency, bureaucracy, accountability, and consistency of the border management have improved on the performance of the integrated border management to a greater extent. The information technology system in existence has quite made a significant change on the performance of the integrated border management to a greater extent

Recommendations

The recommendations are based on the objectives of the study:

From the findings, the study recommends that there is a significant need for the integrated border management to work towards updating and improving their hardware by bringing in more updated and modern sophisticated machines for the operations. The governments should come in and assist their respective border management to replace the old and outdated machinery with the new ones and repair the faulty or replace when necessary. The study recommends that on the second objective, the border management software system should be periodically updated to improve its efficiency and speed and reduce the risks related to software.

The network system by the help of the government should be updated and aligned to the most recent network in order to improve on its firewall system therefore making it more advanced against hacking or any cyber-attacks. The study finally recommends for the encouragement of the peoples attitude towards the operation of the integrated border management by creating awareness and enlightening the surrounding community on the importance of the integrated border management system and its management.

There should be political agreements to enhance cross-border cooperation in the region and should be a priority for governments in order to enhance the efficiency and effectiveness of border crossing points. This will prevent conflict and encourage cross-cultural cooperation and in addition will improve security and wellbeing in the regional context. The study recommends further research to be done on the strategies that can be implemented to improve the information technology systems operation on border management.

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