Full Length Research Paper

Automation and customs tax administration: Empirical evidence from Uganda

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Automation is a topic that has soared in importance particularly on the efficiency of custom tax administration. This paper investigates the adoption of automation by Uganda Revenue Authority (URA), a semi-autonomous agency mandated with tax administration in Uganda. The adoption of automation in URA was aimed at achieving efficiency and increase revenue. The paper reports findings based on cross sectional approach to investigating URA's experiences with automation, efficiency and effective tax administration. The evidence suggests a positive correlation of automation and the cost of tax administration, automation and effectiveness of revenue collection while automation was negatively and significantly related with tax clearance time. The paper makes significant empirical contribution to analysing tax automation and administration cost, time efficiency and effectiveness of revenue collection. Some of the results are inconsistent with the notion that automation leads to efficiency in tax administration.

Key words: Automation, efficiency, tax administration, Uganda revenue authority.

INTRODUCTION

Automation based approaches have become an important vehicle for achieving efficiency in tax admini-stration, (UNCTAD, 2006). Hence, automation impacts on the efficiency of tax administration. Efficiency of tax administration is defined as costs, tax clearance time and effectiveness of revenue collection. Replicating what other 90 nations have done, Uganda Revenue Authority (URA) adopted the UNCTAD developed Automated System for Customs Data and Management, which is fully integrated and covers the complete tax clearance process. The system handles customs declarations, accounting procedures, and transit and suspense procedures, generation of trade data that can be used for statistical and economic analysis (United Nations Economic Commission for Europe, 2007).

Several studies have identified automation as a predictor of efficiency and research shows a link between customs administration efficiency and automation (Engman, 2005). However, he posits that the costs of implementing, maintaining and operations are substantial,

echoing the view advanced by Hawley (1996). This is backed by the evidence from URA indicating that the tax administration costs for the period 2005/2006 were 77.2% higher than the budgeted cost while for the period 2006/2007 they exceeded the budgeted cost by 112.7%. Further, URA continued to witness tax processing and clearance delays, despite its use of computer programmes transfer electronic information required by tax authorities to authenticate tax declarations, accurate assessment of tax dues, increased time efficiency, reduced tax administration cost, and improved effectiveness of revenue collection (Sykesville, 2003).

Recent studies associate a significantly positive impact of automation on containing the high cost, time inefficiency and ineffective manual procedures of tax administration and revenue collection, corruption, delays and computing errors (Vasudevan, 2007); Peled (2000); Zineldin (2007). These scholars posit that automation is an avenue to efficiency and effectiveness in terms of clearance time and cost of revenue collection. Except a few recent reports highlighting the importance of automation in the performance of organization, no known research has assessed the impact of automation and information adoption in customs tax administration in

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Uganda. The study thus, attempts to fill this gap assessing the impact of automation on customs tax administration. In the process, we examine the relationship between automation and customs tax administration efficiency. Using correlation and regression analysis we determine the relationship and the predictor power of the variables.

RELEVANT LITERATURE

Tax administration

Tax administration is rooted in the theory of revenue exaction which Albright (2008) describes as a corollary that gives an undisputed justification of the positive theory of the state and its relationship with the market economy. Though Thomas (2008) explains the importance of the theory of revenue exaction in a more succinct manner, he leaves a gap by dealing more with taxation theory than tax administration. Both Thomas and Albright in their contribution fail to adequately show how the theory of revenue exaction relates to tax admini-stration, an aspect this paper sets out to investigate.

The critique against the revenue exaction theory is directed at the fact that despite its providing a rational basis for a taxation mechanism, it is silent about what this mechanism is (Gunning, 2007). Additionally, how should it be conducted in order to achieve the desired administrative efficiency defined in terms of time lag, cost and effectiveness in terms of revenue collection (Gunning, 2007). The theory is therefore, insufficient in underpinning taxation, tax administration, and how this administration can be enhanced by automation. It needs to be complimented by the efficiency theory and the effectiveness paradigm both of which provide the rational basis for adopting automation in tax administration (WTO, 2007).

At this stage there is a need to make a distinction between a tax and taxation which Albright (2008) makes a distinction between a tax as being any payment by economic agents and individuals to the government and taxation which focuses on the methodologies for determining the means of raising taxes, the types and rates of taxes. The debate as advanced by McKee (2008) focuses on the system and methods of raising the needed resources. Therefore, taxation includes a mechanism of legislation, policies and plans, which determine the different types and rates of taxes (Parsons, 2006, 2007; Abichandani, 2008), while Moore and Schneider (2004) opines that the implementation of the enacted system is what constitutes tax administration.

Recent research by Tomsett (2008) supports the view that the administration of any adopted taxation system should be acceptable and easy for taxpayers and efficient (Kennedy and Sugden, 2007). According to Graham and Wendy (2003) most forms of taxes are less efficient hence much more money is invested and less is collected in revenue. In some countries with large informal sectors, even the administration of income tax may not be efficient because employers in these sectors tend to evade the income tax of their employees (Travis, 2004; Lee, 2005; Tretton, 2007). What is not clear from the debate is the emphasis on a good tax administration system being efficient and effective, but failing to show how such efficiency and effectiveness can be achieved.

Automation of customs administration

Automation of tax administration is derived from the general concept of automation, a concept that delineates a process of having machines to accomplish tasks hitherto performed wholly or partly by humans (Fox, 2001; Gutierrez, 2006 and 2008; Kochan, 2005). Computerization aids the conduct of complex processes accurately, efficiently and effectively (Hollingum, 2006, 2007). Shivakumar (2007) as well as Gutierrez (2008) emphasize the appropriate application of automation to tax administration. Automation of tax administration allows tax data entry, automated processing, computation and analysis as well as automatic production of tax reports and feedback required for control and risk management purposes (Moore, 1999; Holniker, 2005; Partch 1997) . According to Vasudevan (2007), automation of tax administration includes developing powered computer programmes to carry out tax assessments and computations; and to determine tax dues at high levels of speed and accuracy (Guido, 2007).

Automation argues Katsuya-Takii (2003) is a catalyst and stimulus for customs modernization. Customs automation is usually part of an overall tax administration reform (Rao, 2000) and modernization programme (Greenwood et al., 2008; Guido, 2007; Gutierrez, 2006). Automation of customs administration is the processing of customs documents by the computer-assisted treatment of electronically transmitted information. Booze et al. (2007) see the main functions of automation of cus-toms administration to include: controlling cross-border flow of goods, ensuring compliance with government rules and regulations, collecting of the duties and taxes due according to the national customs tariff and tax code, and protecting a country against the importation of goods and materials intended for illegal purposes. Customs automation makes extensive use of computer systems consisting of comprehensive and integrated software packages which Greenwood et al. (2008) describes as cargo control, to monitor all movements of importation, transit and exportation, and ensure that all goods are duly cleared before release; and declaration processing, to capture and process data for duty and revenue collection. Swindley (2007) adds payment and accounting, to register and account for payments by importers and exporters; and risk management, to select those consign-ments bearing higher risks, concealing duty and tax non-compliance, illegal importation of drugs or materials

aimed for terrorist activities. Finally Graham and Wendy (2003) adds statistics and reporting, to extract data for dissemination of foreign trade statistics and to generate management reports for customs for efficient communication between customs, traders, and other government agencies. The system increases trans-parency in the assessment of export and import duties and taxes, reduces substantially the customs clearance time, and predictability. The overarching benefit is the direct and indirect reduction in administration cost and increased effectiveness in collection of customs revenue (Katsuya-Takii, 2003). Vasudevan (2007) observed that automating customs administration leads to increased collection of duties and taxes due to the uniform application of laws and regulations; the automated calculation of tax dues; and built-in security. It also results into more effective revenue collection and administration controls; improved and timely foreign trade statistics as trade data are an automatic by-product of the computerized system; and less corruption due to transpa-rency and automated procedures. The notable benefits advanced by Ward and Dietmar (2007) are faster release of cargo passing through customs clearance; simpler procedures and documents, based on international standards; reduced physical examination of goods; separation of payment of duties and taxes from physical clearance of goods and faster electronic lodgment of customs declarations, using Direct Trader Input or other on-line connections. Holniker (2005) highlighted other advantages as: reduced customs auditing of documents. Notwithstanding the foregoing benefits, Ward and Dietmar (2007) noted that automating customs administration has cost implications, which vary from country to country and according to the initial situation of the customs administration in terms of available ICT technology, human expertise and the structure of tax administration (Peled, 2008). The success Booze et al. (2007) argues, depends on strong political will and support for the automation/modernization processes; appropriate legal instruments, a transparent and collaborative approach by stakeholders, cooperation between the public and private sectors; and a phased implementation of the customs automation systems (Hollingum, 2005; Gutierrez, 2008).

DATA AND RESEARCH METHODOLOGY

The study employed quantitative survey to test empirically the relationship between automation and tax administration efficiency based on the data from URA.

Study design

A cross sectional survey was conducted among URA staff, an agency responsible for tax administration. The cross sectional design was used because it was based on quantitative questionnaire data collected on all the variables of the study.

Study sampling

The population of the study consisted of the 200 technical employees of URA based in Kampala District. The size of the sample was 109 respondents comprising tax officials from all departments of URA. It included 2 Commissioners, 5 Assistant Commissioners, 13 Station Managers, 30 Supervisors, and 59 Revenue Officers working in URA offices located in Kampala district. These respondents were targeted because they were in a position to competently and convincingly provide data about tax administration and revenue collection in relation to the installed computerized or automated system. The sample was selected using purposive sampling to enable select only those respondents who worked as tax collectors, and exclude employees in the support group category.

Before the field research, a pilot study was conducted in order to test both the questionnaire and employee approach to the automation. The pre-test was on a group of URA staffs who were expected to identify questions most valid for the study. The questionnaire was accordingly modified to come up with final questionnaire that was used to collect the data. On the scale reliability, the pilot data was used to run Cronbach's alpha tests in order to check on the reliability of the metric measure used in the study. Most of the measures received satisfactory alpha values of 0.894, which were above the recommended estimates of reliability (Nunnally, 1967).

The questionnaire was distributed after seeking approval and clearance from the URA and the consent of the respondents, who were required to return the questionnaires within two weeks. How-ever, the interviews were extended to 21 days taking into account the busy schedules of some of the respondents yet their input was critical. One hundred and nine questionnaires were returned and were included in the analysis. The sample proved to be institutionally representative of the URA staff in the user depart-ments where automation had been implemented. Automation was measured using the scales validated in previous research and the items in the automations were adapted from those of automation in customs administration and efficiency. Each question was score 1 low to 5 strongly agree.

Statistical analysis

The data was entered and analysed in the Statistical Package for Social Scientists (SPSS) programme. Descriptive statistics were performed for mean scores and proportions. Bivariate Pearson correlations were used to test the relationship between automation and efficiency of tax administration while the regression models tests were performed to establish the prediction powers of the auto-mation. Results were recorded as mean standard deviations (SD), p-values standardized and unstandardized regression coefficients.

RESULTS

Table 1 shows the means, standard deviations and correlation. The results show that automation is significantly and positively correlated to the cost of tax administration (r = 0.708, Sig. < 0.01). This implied that the cost of tax administration increased with increasing automation at URA. Further results were that a significant and negative relationship between automation and clearance time of tax declarations (r = - 0.634, Sig. < 0.01) existed. This relationship implies that the time taken to clear tax declarations reduced with increased computeri-zation of tax administration at URA. Additional evidence

Table 1. Mean, standard deviation and correlations (N = 109).

Variables	M	SD	1	2	3	4
Automation	3.70	1.041	1.000			
Cost of tax administration	3.92	1.355	.708**	1.000		
Clearance Time	2.08	1.029	-.634**	-.542**	1.000	
Effectiveness of revenue collection	3.97	1.158	.667**	.652**	.700**	1.000

* Correlation is significant at the 0.05 level (2-tailed). ** Correlation is significant at the 0.01 level (2-tailed).

Table 2. Prediction model.

Dependent variables	Standardized coefficients			Independent variable: Automation
	Beta	T	Sig.	
(Constant)		7.296	0.000	R-square = 0.746
Cost of tax administration	0.501	4.456	0.000	Adjusted R-square = 0.703
Clearance time	0.401	-1.941	0.002	F-value = 16.674
Effectiveness of revenue collection	0.444	2.099	0.000	Sig. = 0.001

evidence from Table 1 indicated a positive and significant relationship between automation and effectiveness of revenue collection (r = 0.667, Sig. < 0.01), implying that the level of effectiveness of revenue collection realized increased with increased computerization.

The regression output which is reported in Table 2 confirmed that automation predicted 70.3% of the cost of tax administration, clearance time and effectiveness of revenue collection (Adjusted R^2 = 0.703, F = 16.674, Sig. < 0.01). A critical examination of the standardized Beta coefficients reveals that automation significantly and positively predicted the cost of tax administration (Beta = 0.501, t = 4.456, sig. < 0.01). It significantly and positively predicted effectiveness of revenue collection by Beta = 0.444, t = 2.099, Sig. < 0.01) but negatively and significantly predicted clearance time by Beta (Beta = 0.401, t = -1.941, Sig. < 0.01). Generally, results obtained indicated that automation predicted the cost of tax administration and effectiveness of revenue collection though predicted clearance time negatively.

DISCUSSION

The study was an investigation into the automation and efficiency in customs tax administration. In as much this study deals with inconsistencies of the relationship between automation and efficiency of customs tax administration.

The results are suggestive on a number of counts with respect to the automation and its effects on efficiency of the customs tax administration. The results appear puzzling when judged against the perspective of standard automation models like Greenwood et al. (2008). They show mixed findings on the relationship between automation and efficiency of customs tax administration

in contrast to previous studies of Peled (2008); Sykesville (2003); Ward and Dietmar (2007). Whereas these showed that automation of tax administration reduces the cost of tax administration, the study showed that automation culminated into a moderate reduction in the cost of revenue collection and an overall increase in the cost of tax administration, quite the opposite of what traditional models of automation would predict. That is a phenomenon that begs explanation. What was done in URA was partial automation of the customs department that was considered to be the single major source of tax revenue. Automation could reduce the cost of customs tax administration if the interruptions in the computerized systems are minimized, procurement of soft ware and internet services providers improved and there is full instead of partial automation. Most of the evidence was anecdotal but organisations that invest in full automation both lower the costs and improve the efficiency of the tax administration.

Secondly, the relationship between automation and clearance time of tax declarations was predictive but inversely correlated. This implied that with advance in automation, the clearance time reduced much in line with Greenwood et al. (2008); Guido (2007); Katsuya-Takii (2003); Tait (1991) and Zineldin (2007) that automation of tax administration culminates into increased time efficiency because it reduces the time taken to clear tax declarations. However, further analyses revealed that efficiency was achieved in information access on imports and exports but there were mild delays in re-ceiving and assessing some tax declarations across the different units in the organization. This points to the fact that other departments had not fully automated and therefore, could not reap from the customs tax auto-mation, which is at the receiving end of the chain. This means that URA as a whole did not fully benefit from automation, because of

partial process automation. URA therefore need to automate the entire process covering all the departments to ensure it achieve full benefit of automation, which translates into efficiency tax administration.

The results last but not least, suggest that the relationship between automation and effectiveness of revenue collection was significant, positive and predictive, implying that with automation of customs tax administration, the effectiveness of its revenue collection increased in line with findings by other scholars (Dubroof 1991; Backhaus, 2005; Booz et al. 2007; Goch, 2008; Greenwood et al. 2008; Guido, 2007; Raman and Francis, 2008). However, despite the general improvement in the effectiveness of revenue collection due to automation of customs tax administration in URA, the improvement was perceivably moderate. This was because only the customs department was automated. The results point to the need for enhancement of the effectiveness of revenue collection by URA focusing on setting higher revenue collection targets and installing a computerised system that supports employees to accomplish the subsequently assigned daily revenue collection tasks and effectively checking taxpayers who defraud.

Conclusions

Several major findings were presented in this paper. The results and evidence from the URA suggested that whereas automation leads to efficiency of tax administration, this was rejected as automation had not led to efficiency through cost reduction, reduction of clearance time and effectiveness. The implications were that URA achieved the computerisation of customs tax administration at an increasing rate of costs due to incomplete automation of all the systems. Secondly, the impact of automation on the clearance time of cargo meant that the computerization of customs tax administration at URA failed to fully solve the delays in the clearance time, hence, not realising the purpose of automation. Thirdly automation impacted minimally on the effectiveness of revenue collection as the increase in effectiveness was prior to automation. From a policy standpoint, the results suggested that automation leads to cost reduction. However, the complexity of automation resulting from integration of various heterogeneous disciplines means that its application to any process such as tax administration goes through phases and stages until the whole process is fully accomplished. This explains why automated customs tax administration is developed and adopted in phases, and dealing with the contributing factors like break downs and full automation can achieve noticeable efficiency.

The study contributed to the previous empirical research in several ways. First employing a cross sectional study we were able to capture the presence of contradictions in the advocacy for automation and warn of the impediments to adoption if not full integrated and

well supported and implemented. The study managerial policy implication is that URA should seriously consider fully automation with all the necessary accessories and back up systems to avoid idle time due to non operation. There is therefore, need for URA to reduce the administration cost resulting from the computerisation of its customs tax administration process.

LIMITATIONS AND FURTHER RESEARCH

Although, the magnitude of this research was large, its findings are subject to a number of limitations. The first limitation refers to the automation of the organization. This empirical study targeted the URA which was implementing automation but that was not fully implemented particularly to all units. This means that the results were not fully based on a completed automated system and they do not reflect a fully operational automated system as compared to the previous studies. In as much as this may hinder generalization of the findings. A second limitation is the level of technology acceptance attributes in URA which was not part of the study but might have been resisted by the staff of URA because the anticipated loss of jobs through rationalization and automation. Besides automation would have implications for the employees' discretion in their decisions hence, affecting their relationship with their clients.

Based on the findings, further research could validate the relationship between tax administration and automation in all areas of tax administration as opposed to the partial automation of customs activities alone. In addition the efficiency constructs and its components can further be investigated and so are the other antecedents of automation and efficiency.

A study of the technology acceptance, automation and efficiency would be the next study.

REFERENCES

Abichandani RK (2008). Income Tax Administration in India. Gujarat: National Informatics Centre.

Albright, HJ (2008). Principles of Taxation.

Backhaus JG (2005). Computerized Taxation and Entrepreneurship: An Austrian Approach to Public Finance, J. Econ.Stud.,2 (16): 75-99.

Booze R, Allen J, Hamilton ME (2007). Customs automation in Sub Saharan Africa.

Engman M (2005). The Role of Automation in Trade Facilitation

Fox P (2001). Automation: Crossing the Final Frontier. J. Autom., 21(2): 200-223.

Goch D (2008). Computerised Taxation and Finance, Management Decision, 3 (2): 89-119.

Graham S, Wendy LP (2003). Harmonization of International Taxation: The Case of Inter-listed Stocks. Manage. Fin.,, 29 (1): 778-799.

Greenwood CL, Jr, Thapan A, Ahmed J, Kertzman D, Kelly B, Balbosa J, (2008). Enhancing Revenue Collection and Strengthening the Criminal Prosecution of Tax Evasion Cases.

Gunning JP (2007). Developments in Economic Theory in Relation to the Subjects of Public Finance.

Guido S (2007). Community Revenue Collection System.

Gutierrez N (2006). Issues in Revenue Administration, Tax Compliance, and Combating Corruption.

Gutierrez N (2008). Information Technology in Support of the Tax Administration Functions and Taxpayer Assistance.

Hawley JK (1996) Automation Doesn't Automatically Solve Problems, Quality Progress.

Hollingum J (2005). Modular Automation Beats the Recession, J. Comput., 15 (2): 455-489.

Hollingum J (2006). Looking to Automation to Enhance Productivity, J. Comput.15 (2): 655-689.

Hollingum J (2007). Optimizing the Benefits of Automation through Design, J. Comput., 15 (2): 755-789.

Holniker, D. (2005), Computerization of Commercial Tax System.

Katsuya-Takii J (2003). Prediction Ability of Customs Automation, Rev.Econ. Dynam., 6: 80-98.

Katsuya-Takii, J. (2004). Efficiency Theory.

Kennedy JA, Sugden KF (2007). The Impact of Taxation on the Capital Budgeting Decision of Companies.

Kochan A (2005). Prodel – Islands of Automation, J. Automa., 16, 4, 199-233.

Lee A (2005). Property Taxation under Conditions of Rapid Urban Growth: the Singapore Experience, J. Pro. Valuat. Invest., 11 (4): 96-132.

McKee A (2008). Allocating the Burden of Taxation Justly, Int. J. Soc. Econ., 17 (3): 178-213.

Moore M, Schneider A (2004). Taxation, Governance and Poverty: Where Do the Middle Revenue Countries Fit? IDS Working Paper 230, Institute of Development Studies, University of Sussex.

Moore W (1999). Working Smarter with Automation, Construction Equipment.

Nunnally JC (1967), Psychometric Theory. New York, McGraw-Hill.

Organisation for Economic Co-operation and Development (2007). Tax Administration in OECD and Selected Non-OECD Countries: Comparative Information Series (2006) prepared by the February 2007 Forum on Tax Administration, accessed on 23rd January 2008.

Parsons, G. (2006). Expenditure on property: management aspects of taxation, Pro. Manage., 7 (2): 712-734.

Parsons G (2007). Taxation and the House. Property Manage., 8(4): 243-286.

Partch K (1997). The Coming Impact of Information Technology, Supermarket Business.

Peled A (2000). Creating Winning Information Technology Project Teams in Public Sector, Team. Perform. Manage., 6 (½); 200-235

Peled A (2008). Modernization of Tax Administration and Revenue Collection.

Raman S, Francis P (2008). Computerization of the Taxation Process.

Rao Govinda (2000): Tax Reform in India: Achievements and Challenges in Asia-Pacific Development J.

Shivakumar S (2007). Advancing the Cause of Automation Technology, J. Automat. Comput.,2 (2): 33-55.

Swindley DG (2007). Computerization of Tax Administration, Int. J. Fis. Manage., 21 (3): 199-233

Sykesville MD (2003). Tax Administration Computerization, J. Tax. Admin.,6: 233-267.

Tait, A. A. (1991) (ed). Value-Added Tax: Administrative and Policy Issues. Washington D. C: International Monetary Fund

Thomas M. (2008). Public Finance: The Principle of Taxation.

Tomsett, E. (2008). European Property Investment Taxation, J. Pro. Fin., 1, 4, 33-78.

Travis, B. (2004). Taxation and Corporate Strategy in the Sing e Market, J. Finan. Regul. Compl.,12, (1): 20-44.

Tretton D (2007). Where is the World of Property Valuation for Taxation Purposes Going, J. Pro. Invest. Finan.,25 (5): 234-256.

United Nations Conference on Trade and Development (2006). ICT Solutions to Facilitate Trade at Border Crossings and in Ports, Technical Notes No. 94. UNCTAD (2006)

United Nations Economic Commission for Europe (2007). Automated System for Customs Data and Management.

URA (2003/2004 – 2007/08). URA Annual Revenue Bulletin for 2003/2004, Kampala:

Vasudevan R (2007). Changed Governance or Computerized Governance,

Computerized Tax Administration Processes in Tamil Nadu, India, J. Tax Plan. Adm., 4 (1): 101-112.

Ward N, Dietmar J (2007). CAREC Customs Automation, Technical Paper presented at a Conference held at Beijing on the 23-25.

World Trade Organization (2007). Use of Customs Automation Systems, Technical Note 3.

Zineldin, M (2007). Tax Administration, International Journal of Fiscal Adm. Plan., 18 (1): 235-276.