

## **Smart Taxation (4Taxation): Effect of Fourth Industrial Revolution (4IR) on tax compliance in Rwanda**

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### **Abstract**

*The fourth industrial revolution (4IR) has led to the raise of smart taxation (taxation). Smart taxation has come up with different technological innovation that eases tax declaration, tax registration, tax payment interactions. These technological innovations in the tax system aim at enhancing tax compliance. The purpose of this study was to examine the effect of Smart taxation on the tax compliance in Rwanda taking RRA as the case study. Descriptive and explanatory research design were used. The study population comprised of 650 employees of RRA headquarter from which 284 samples were selected using Yamane's formula. Data were collected from both primary and secondary sources using questionnaire and document review methods. Data was analysed using both descriptive and factor analysis. The fitness of the model was tested using both absolute and incremental fitness tools. The findings from the survey revealed that there is a positive and strong correlation between smart taxation and tax compliance as evidenced by multiple R-square of 96. The researchers recommended that Training of the employees and taxpayers in new skills to be able to comfortably use the new technological innovation that comes along with the fourth industrial revolution. Continue educating the taxpayers about the aim of taxation and modes of taxation to enhance tax compliance since tax education influences tax compliance*

**Keywords:** 4IR, 4Taxation, Tax compliance, Tax, Digitalization, information technology.

### **1. INTRODUCTION**

The world is currently embracing the fourth industrial revolution (4IR) after the three previous industrial revolutions. Since the introduction of hydraulic and

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steam engine in first industrial revolution in Great Britain, there have been two major technological innovation in the world. The second revolution introduced the separation and assembly of products which helped in the mass production. The third industrial revolution introduced electronics and information technology and enhancement of the automation of the manufacturing process. The fourth industrial revolution (4IR) is a continuation of the third industrial revolution, and it is characterized by widespread application of cyber-physical systems in different business operations (Kapera, 2017).

The 4IR connects human bodies with high technology artificial systems. This revolution is driven by advanced information technology that allows every economic sector to transform the political and existing economic models. According to the Schwab (2017), the 4IR is formed by technologies such as artificial intelligence, machine learning and internet. These technologies are currently changing the way of doing business. Due to these technological advancements, taxpayers can register, declare and pay taxes online from their respective workstations with the support of technology. Avoiding physical presence at the tax offices reduces compliance cost to taxpayers and maximize revenue collections from the RRA perspective.

Previous studies Manyika et al. (2016), Moyo (2017), Gasoyi (2018) have indicated that acceleration of ICT innovation is opening the ways for Africa to integrate the global economy. Tan (2016) points out that a 20% investment in Information Communication Technology (ICT) contributes 1% to the GDP, 2.1% to increase in competitiveness, 2.2% increase in the innovation and 2.3% in productivity. The study also revealed that investment in ICT improves the quality of life, reduce the education gap and rise efficiency in the industrial production. This therefore implies that investment in ICT by development countries is no longer a choice to think about but a priority if the African

countries are to achieve the sustainable development goals and the African Agenda 2063.

Lucy (2018) underlines, this Revolution is believed to spearhead transformative changes through the fundamental interruption of virtually all sectors of the global economy. If the 4IR capabilities are integrated well into the society, this will provide an opportunity to restore the environment, address inequalities and combat poverty thereby directly contributing to Africa Agenda 2063 and SDG ambitions (Andrea, 2017). 4IR enables network of smart machines interconnection which help to create, analyse and share information. Marr (2018) recognizes 4IR as the smart way of doing business. He further argues that the connected technology is embedded in the company's assets and the people which market by the development of analytics, robotics cognitive technologies, AI, quantum computing and the internet of things. Information technological development is changing the way data and information is used and how to make companies more competitive in production.

The fourth industrial revolution has led to the newborn baby in the administration of taxes which is referred to as the Smart taxation (4Taxation). This has led to digitalization of the tax system whereby the taxpayer can be able to register, declare and pay taxes online (Visharesky and Chekina, 2018). According to Kovacev (2019), the technological innovations that comes with the fourth industrial revolution which include internet of things, machine learning, artificial intelligence, robots are creating a new platform for tax administration across the globe. The digitization of tax system has changed the mode of tax assessment, tax declaration, tax collection and payment and interaction between the taxpayer and the tax administrator.

Smart taxation is centered at minimizing revenue losses by detecting and preventing external tax evasion, that is smuggling, as well as all other forms of

evasion and thus enhance tax compliance. Hannah (2013) points out those technological innovations in the tax system will automatically lead to improvement in the tax compliance which will lead to increase in the tax revenues. The study further points that technological innovations help to combat several causes to revenue losses such as understatement of sales, omission of some transaction in recording, tax evasion and others to minimize the tax liability (Hannah, 2013). Governments today are under increasing pressure to improve the delivery of public services in cost-effective ways. To meet this challenge for example tax authorities are turning to smart taxation (Manyika et al., 2016). To date, the use of ICT is prominent in business and tax settings. Notably, tax authorities across the globe are continuing to use Smart in the tax administration (Mandola 2013; Gasoyi, 2018; Manyika *et al.*, 2016; Alm *et al.*, 2020)

Improving tax compliance is the main goal of every country (Alm *et al.* 2020). Taxpayers are obliged to declare and pay their taxes on time. According to Mandola (2013) “tax compliance involves both the truthful reporting of taxable income and the timely payment of tax dues”. To combat the noncompliance problem, several tax administrators have opted for the adoption of smart taxation. Various researchers have tried to conduct studies on the impact of technological innovations on the tax compliance using different research approaches and have come up with contradicting results regarding the effect of fourth industrial revolution on tax compliance.

Ndayisenga and Shukla (2016) analysed the effect of tax payment system and Electronic Billing Machine System (EBM) on the tax compliance. They found out that both electronic tax management system which consist of Tax Payment System, Mobile Tax Payment System and EBM System contributes to timely

tax payment and reduced operational cost for both RRA staffs and taxpayers. Their results are limited due to the fact they only considered two components of the fourth industrial innovation hence they are not conclusive on the effect of fourth industrial revolution on the tax compliance. Vishrevsky and Chekina (2018) analysed the impact of fourth industrial revolution on the tax system. The study reviewed literature and found out that introduction of robots that comes with the 4IR will lead to loss of jobs in the tax administration process. Their findings cannot be concluded in the current study since their study did not look the effect of fourth industrial revolution on the tax compliance.

Ayodeji (2014) examined the impact of electronic taxation on tax administration in Nigeria. The study used an exploratory research design. The findings indicated that electronic tax system influences tax administration. However, it is important to note that, this study did not consider the impact of electronic tax system on the tax compliance. Alm, *et al.* (2020) examined the new technological evolution on the tax compliance. The study found out that new technological innovations have positive correlation with tax compliance. Although this study incorporated all variables that are related to new technological innovations, the findings were based on literature review there is no statistical test of the significance of the variables on tax compliance.

Naibei, *et al.* (2011), examined the impact of Electronic Tax Registers on Value Added Tax (VAT) compliance among private business firms in Kisumu city, Kenya. The findings revealed that use of ETRs has got a significant positive impact on the VAT compliance in Kenya. However, the results of this finding cannot be concluded in Rwanda since it was based on one component of Smart taxation (4Taxation). In addition to that, the study only considered compliance in one type of tax, and ignored other types of taxes, therefore further studies

need to be conducted to analyse the effect of other components of (4Taxation ) on the tax compliance in Rwanda.

As highlighted above, most of the previous researchers have tested the relationship between technological innovations using a literature review. There are limited studies that empirically tested impact of smart taxation on tax compliance. This study contributed to the existing literature in two ways. Firstly, the study empirically tested the effect of all technological innovations that come with fourth industrial revolution (Smart taxation) on tax compliance in the Rwandan context by collecting the data from the field. Secondly, the study contributed to methodological approach by employing a partial least square structural modeling. Previous studies that have empirically tested the relationship between technological innovation and tax compliance have used multiple regressions and have only tested two technological advancements. In this study factor analysis was carried out using a structural equation modeling (SEM) from where a model showing the effect of fourth industrial revolution (smart taxation) on tax compliance was constructed using a partial least square.

## **2. LITERATURE ON SMART TAX (4TAXATION) AND TAX COMPLIANCE**

This section provides a theoretical and conceptual framework of the literature that relates to the study variables.

### **2.1 Theoretical review on tax compliance**

The following two theories on tax compliance anchored this study.

#### **1) Fiscal exchange theory**

The theory recognizes the fact that public expenditure enhances tax compliance (Horn, 2013). The availability of a public good which is in relation to the tax paid increases tax compliance among the community. In this case the theory

recognizes that tax compliance is a function of public good provided by the government. Although the theory brings in some reality regarding the willingness of taxpayers to comply with the relevant tax laws, it is important to note that, this theory fails to recognize the fact that tax is non-*quid pro-quo*. Therefore, tax compliance cannot be enhanced by the amount of public goods provided by the government. In addition, theory fails to reorganize the importance of technological innovation in enhancing tax compliance. It is important to note that, the technological innovation that comes along with the fourth industrial revolution (Smart taxation) is changing the scope of tax compliance as evidenced from prior studies.

Steenburgen (2017) examined the importance of EBM in revenue collection in Ethiopia. Explanatory research design was used. Data was collected from the VAT registered taxpayers using questionnaire and documentation. Descriptive and inferential statistical analysis tools were used to analyse the data. The study found out that EBM has helped in combating tax evasion in Ethiopia. The researcher recommended tax authorities to create awareness to the people the importance of EBM.

Mudiaga & Igbekoyi (2019) examined the relationship between electronic taxation and tax compliance in the fast-food restaurants in Nigeria. Data was collected from both primary and secondary sources using questionnaire and on-desk research. Data was analysed using both descriptive and structural equation model and regression. The results indicated contradicting views in relation to the correlation between electronic tax system and tax compliance as some results indicated a positive correlation whereas other results indicated a negative correlation. It is important to note that, the results of this study cannot be uprooted and planted in the Rwandan context because of the following reasons; firstly the study was conducted in an economic environment that is

different from that of Rwanda; secondly, the study only looked at the perceived values of the electronic tax system on the side of customers but did not look at the extent to which the technology is helping to improve tax compliance. Therefore, more studies need to be carried out in this area.

Abera (2019) analysed the impact of electronic tax filing on the tax compliance in Ethiopia. The study used an explanatory research design where quantitative data was collected using questionnaire and documentation from both primary and secondary sources. The study used a population of 150 large taxpayers and the data were analysed using STATA software. The findings revealed a statistically significant correlation between electronic filing and tax compliance. The study only considered electronic filing which is composed of e-declaration and e-payment other components of smart taxation such EBM, Single electronic window system, custom mobile declaration and e-suggestions as being used in Rwanda currently were not considered in the study. Furthermore, the study ignored the impact of tax penalties, tax education, compliance risk management, intelligence, tax review, fraud investigations, tax appeals and tax audits as influencing factors on tax compliance. The study conducted Alm *et al.* (2020) show that tax education, tax penalties and tax audit have an influence on tax compliance

Odongo (2016) examined the effect of electronic tax filing systems on tax compliance among small and medium enterprises within Mombasa. Primary data was collected using a questionnaire. Data was analysed using a statistical regression using the constructs of electronic tax system. The findings indicated that electronic tax system has a strong correlation with tax compliance. However, it is important to note that this study only looked at two components of smart taxation which are e-declaration and e-payment. Other components



such EBM, Single electronic window, custom mobile declaration, and e-suggestions were ignored.

Utetiwabo, *et al.* (2018) analysed the effect of electronic tax system on tax compliance in Rwanda taking Nyarugenge as the case study. A correlational and descriptive research design was used. Primary data was collected using questionnaire and secondary data was collected using an on-desk research. The findings revealed a strong correlation between electronic tax and tax compliance. Like any of the above-mentioned prior studies, this study does show a factor analysis of smart taxation on the tax compliance. This study contributed to the existing knowledge by showing the factor analysis in relation to the tax compliance in Rwanda.

## **2) Social influences theory**

This theory is based on the effect of individual behaviours on the tax compliance. The theory recognizes the fact that the behaviour of the taxpayer can be influenced through the social interaction with others (Samson, 2012). This therefore means that tax compliance can be enhanced by a social relationship among the taxpayers. Thus, tax compliance in this case is a function of individual reference group such as relatives, neighbours, and friends. However, the theory fails to recognize the fact that individual behaviour can either be influenced positively or negatively. If the individual behaviour is influenced positively towards tax compliance, then the theory is very applicable. However, if the individual behaviour is influenced negatively against tax compliance, then the theory may not be applicable. The negative behaviours of the taxpayers to comply with tax can be influenced through technological innovations, tax education and tax penalties which the theory fails to recognise.

Alm *et al.* (2020) conducted a study on the influence of tax compliance using a literature survey. The study found out that tax education and tax penalties have got a significant influence on the tax compliance. However, it is important to note that, the findings of this cannot be generalized in this study since it did not empirically test the significance of tax education and tax penalties on the tax compliance.

## **2.2 Smart Taxation (4Taxation) in Rwanda**

Digitalization of the tax system has been a major concern of many countries. In August 2013, legislation was introduced in Rwanda, to assist firms' book-keeping, to level the playing field amongst all retailers, and, most importantly, to reduce tax evasion for value added tax (VAT). This legislation, announced in Ministerial Order 002/13/10, and the accompanying Commissioner General (CG) rules. All the reforms in Rwanda's tax base system were aimed at improving tax collections, administrations, and above all tax compliance. In a bid to improve tax compliance, Rwanda Revenue Authority (RRA) decided to opt for electronic tax management system which includes e-registration, e-declaration e-payment, , e-suggestions and electronic EBM order to improve on tax collection in the country. These tax reforms include the EBM, online declaration and payment and online tax registration.

In addition, the Government introduced electronic single window system in order to support the import and export. In addition, Rwanda Revenue Authority also developed a mobile web application that is used to declare goods at the customs. The custom mobile declaration is used by small taxpayers who import or export goods with a custom value less than five hundred thousand Rwandan Francs 500,000 RWF. Under this technology, the taxpayer registers his/her

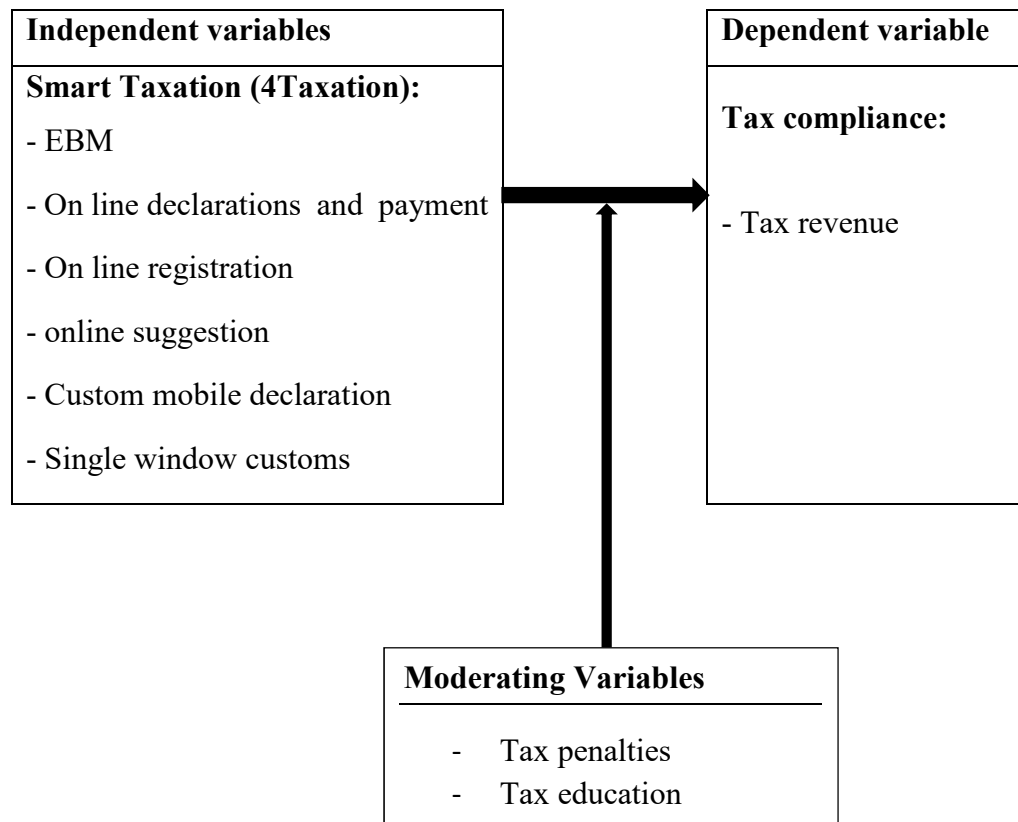
credential with the tax administration which helps to notify the taxpayers on matters regarding custom declarations and payment.

Naibei *et al.* (2011) conducted a study to assess the reasons for the adoption of electronic fiscal system in Kenya. A descriptive research design was used in the study. Data was collected from both primary and secondary sources using questionnaire and documentation. Descriptive analytical tools were used to analyse the findings. The findings show that the system was introduced to reduce fraud in the invoice and to have easy access to information.

Muwonge (2011) examined the influence of electronic tax filing systems on the tax compliance in Uganda. The study used both exploratory and explanatory research approaches. The study population included importers, customs agents and the tax officials. Data was collected from both primary and secondary sources using questionnaire and documentation. Descriptive and inferential data analysis tools were used to analyse the data. The findings show that electronic tax filing enhances tax compliance. The study only analysed electronic declaration and ignored other components that have come along with the fourth industrial revolution. Therefore, its findings cannot be generalized in assessing the effect of smart taxation and tax compliance in Rwanda.

### 2.3 Conceptual framework

This part shows the hypothesized relationship between the independent and the dependent variables.



**Figure 1:** Conceptual framework

**Source:** Researchers (2020)

The alternative study hypothesis was that Smart taxation significantly affects tax compliance in Rwanda. The independent variable which is Smart taxation (4Taxation) was measured by the extent to which the electronic tools such as EBM, online declaration, online payment, online registrations, single electronic window system, electronic suggestions and custom mobile declaration affect

the tax compliance which was measured using tax revenue collected. However, for the relationship to exist, tax revenues and tax penalties must be put into consideration.

### **3. RESEARCH METHODOLOGY**

#### **3.1 Research design**

This study used descriptive and causal research design. Descriptive research design was used to describe the extent to which smart taxation has affected tax compliance in Rwanda. Causal research design was used to establish the relationship between Smart taxation and tax compliance in Rwanda. Use of a combination of descriptive and causal approach has been recommended where one approach not fully test the hypotheses that researcher intends to test (Mugenda 2008, Kasomo, 2006 and Kothari 2006). Mudiaga and Igbekoyi (2019) used a combination approach to analyse the effect of electronic filing on tax compliance.

#### **3.2 Population of the study and sampling**

The target population for this study included employees of RRA headquarter. The total number of populations used in this study was 650 employees of RRA. These included employees from both the domestic and customs tax. The sample size was determined using the Yamane's (1967) formula.  $n = \frac{N}{1+N(e)^2}$  The population was divided into two stratum which are domestic tax and customs tax. However, the respondent within each stratum was purposively selected.

Where  $n$  is the sample size,  $N$  is the population size and  $e$  is the level of precision.

$$n = \frac{650}{1 + 650(0.05)^2} = \frac{650}{2.625} = 247$$

### **3.3 Data collection and analysis**

Data were collected from both primary and secondary sources. The primary data was collected using a questionnaire. Secondary data was collected from the published reports, books and website of Rwanda Revenue Authority. Use of secondary data in the research has been recommended by Saunders *et al.*, 2007, Gasoyi (2018) Manyika *et al.* (2016) where the study involves analysis of relationship between variables. Data were collected from both primary and secondary sources were captured using SPSS template and SPSS Amos from where the analysis was carried out. The SPSS was used to analyse the descriptive statistics Where SPSS Amos was used in factor analysis through the structural equation modelling (SEM). The descriptive statistics were analysed using frequencies, percentages, mean and standard deviation. Partial least squares structural equation modelling (SEM) was used to analyse the correlation between the independent variables (Smart taxation) and dependent variable (Total tax revenues) using the SPSS Amos a factor was considered significant when the P-value is less than 5%. This is in line with the study conducted by Mudiaga and Igbekoyi (2019) who used both descriptive and SEM in their research. The fitness of the model to predict correlation between the study variable was tested using Chi-square, comparative fit index (CFI), Normal Fit Index (NFI) and the Chi-square minimum degree of freedom (CMIN/df). The model was considered fit when the P-value of the Chi-square is less than 5%, when the CFI, and NFI are above 90% whereas when the CMIN/Df is below 5.

#### **3.3.1 Analytical Model**

The independent variable which smart taxation, will be measured by the extent to which current technological is influencing tax compliance. The current technological innovations used in tax administration in Rwanda include EBM,

Online Declaration (OD), Online Payment (OP), Online registration (OR), single Electronic Window system (SEW), Online Suggestions (OS) and Custom Mobile Declaration (CMD). Being an ordinal data, some transformation was made to ensure that the variables are normally distributed.

Smart taxation (ST) = f(LnEBM, LnOD, OP, LnOR, SEW, OS, CMD)

$$ST = \beta_0 + \beta_1LnEBM + \beta_2LnOD + \beta_3OP + \beta_4LnOR + \beta_5SEW + \beta_6OS + \beta_7CMD + \alpha \dots\dots\dots 1$$

The dependent variable which tax compliance (TC) will be measured using tax revenue. An increase in tax revenues (TR) shows an increase in tax compliance.

TR = f(ST)

$$TR = \beta_0 + \beta_1ST + \alpha \dots\dots\dots 2$$

Substituting equation 1 in two

$$TR = \beta_0 + \beta_1LnEBM + \beta_2LnOD + \beta_3OP + \beta_4LnOR + \beta_5SEW + \beta_6OS + \beta_7CMD + \alpha \dots\dots\dots 3$$

Alm et al. (2020) show that tax education (TE) and Tax Penalties (TP) have got a strong correlation with tax compliance. Therefore, the moderating variables will include tax education and tax penalties. Incorporating the moderating variables into equation 3

$$TR = \beta_0 + \beta_1LnEBM + \beta_2LnOD + \beta_3OP + \beta_4LnOR + \beta_5SEW + \beta_6OS + \beta_7CMD + \beta_8LnTE + \beta_8TP + \alpha \dots\dots\dots 4$$

#### 4. RESULT AND DISCUSSION

This section presents the findings of the study, the analysis and interpretation of the results Findings were derived from the questionnaires to employees of RRA Gasabo branch. It attempts to analyze data generated from the study which include qualitative and quantitative information collected from the respondents.

**Table 1: Extent to which Smart Taxation and other variables affect tax compliance**

Variables	Not at all	Small extent	Average extent	High extent	Very high extent
	%	%	%	%	%
Electronic Billing Machine (EBM)		5.6	6.6	37.1	49.6
Online Declaration (OD)		5.0	7.6	28.0	59.4
Online Payment (OP)		1.8	15.8	22.7	59.7
Online Registration (OR)		10.2	20.4	30.2	39.1
Single Electronic Window (SEW)		4.0	11.3	29.6	55.1
Tax penalties	1.8	14.7	25.1	22.7	39.8
Tax education		2.7	7.8	24.7	64.9
E-suggestions	5.1	10.7	12.2	32.2	39.8
Custom mobile declaration		9.0	14.6	24.4	52.0

Source: Survey data (2020)

Table 1 shows the extent to which Smart taxation and other moderating variables affect tax compliance in Rwanda. The results from the survey show that 5.6% of the respondents indicated Electronic Billing Machine (EBM) affect tax compliance to small extent, 6.6% indicated average extent, and 37.1% indicated large extent whereas 49.6% indicated a very high extent. The findings from the survey revealed that EBM affect tax compliance to high extent. The findings further show that 5.0% of the respondents indicated that online declaration (OD) affect tax compliance to small extent, 7.6% indicated average extent whereas 28.0% and 59.4% indicated high and very high respectively. The findings regarding online payment (OP) show that 1.8% of the respondents indicated small extent, 15.8% indicated, 22.7% indicated high and 59.7% indicated very high.



Furthermore, the findings show that 10.2% of the respondents indicated small extent of the influence of online registration (OR) on tax compliance in Rwanda 20.4% indicated average extent whereas 30.2% and 39.1% indicated high and very high respectively. Regarding single electronic window, the findings show that 4.0% indicated very small extent, 11.3% indicated average extent whereas 29.6% and 55.1% indicated high and very high respectively. The results further show that 1.8% of respondents indicated tax penalties influences tax compliance to small extent, 14.7% indicated average extent whereas 22.7% and 39.8% indicated high and very high respectively. The results regarding how tax education influences tax compliance show that 2.7% of the respondents indicated very small, 7.8% indicated average extent whereas 24.7% and 64.9% indicated high and very high respectively. More still, the results show that 10.7% of the respondents indicated that e-suggestions influences tax compliances to small extent, 12.2% indicated average, 32.2% and 39.8% indicated high and very high respectively. The findings on the influence of custom mobile declaration on the tax compliance show that 9.0% of the respondents indicated small extent, 14.6% indicated average extent, 24.4% and 52.0% indicated high and very high extent respectively.

The results from the survey revealed that smart taxation influences tax compliance by high extent. The results conform to the findings from the previous studies. The study conducted by Mudiaga and Igbekoyi (2019), Utetiwabo et al. (2018) and Abera (2019) show that electronic tax system influences tax compliance. The further revealed that tax education and tax penalties influences tax compliance to a large extent. This is consistent with the findings from the study conducted by (Alm *et al.*, 2020).

**Standardized Factor analysis**

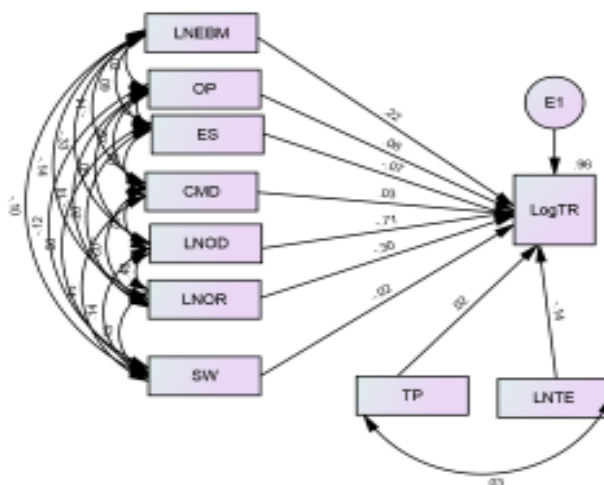


Figure 2: Standardized default model

Source: Survey data (2020)

**Table 2: Regression Weights: (Group number 1 - Default model)**

		Estimate	S.E.	C.R.	P	Label
LogTR <---	LNEBM	12.718	.825	15.418	***	par_1
LogTR <---	OP	.688	.124	5.553	***	par_2
LogTR <---	ES	-.606	.124	-4.884	***	par_3
LogTR <---	CMD	.215	.091	2.371	.018	par_4
LogTR <---	LNOD	-27.749	.610	-45.496	***	par_5
LogTR <---	LNOR	-14.152	.718	-19.715	***	par_6
LogTR <---	SW	-.172	.127	-1.359	.174	par_7
LogTR <---	TP	-.151	.123	1.230	.219	par_8
LogTR <---	LNTE	7.205	.706	-10.202	***	par_9

Source: Survey data (2020)

Figure 2 shows the path analysis of the study variables which are also reflected in the table 2. The results in table 2 show the significance of the correlation between the dependent and the independent variable. The results from the survey show that there is a statistical significance between EBM and tax revenues as reflected by a P-value less than 5%. This means that EBM influences tax compliance. This is inconsistent to the findings from the study conducted by Steenburgen (2017) and Abera (2019) who also found out that EBM positively influences tax compliance.

The results further show that there is a statistical significance between online payment (OP), e-suggestions (ES), custom mobile declaration (CMD), online declaration (OD) and online registration (OR) as reflected by the P-value which is less than 5%. The results conform to the findings from the previous studies. The study conducted by Mudiaga and Igbekoyi (2019), Odongo (2016), Naibei (2011), Gupta (2012) show that electronic tax system influences tax compliance. Similar findings are also seen in the study conducted by Amabali (2009) who show e-filing affects tax compliance. Furthermore, the results indicated a strong correlation between smart taxation and tax compliance as evidenced by a multiple R-square of 96%. This implies that of the variation in tax revenue, 96% is caused by the studied variable as indicated on figure 2. The findings concur with the findings from the previous studies. The study conducted by Utetiwabo *et al.* (2018) show a strong correlation between electronic tax system and tax compliance.

More to that, the findings from the survey indicated that single electronic window system and tax penalties do not significantly leads to tax compliance as evidenced by the P-value which is greater than 5%. This contradicts to the findings from the previous studies. The study conducted by Alm *et al* (2020) show that tax penalties and single electronic window system significantly affect

tax compliance. The findings further revealed that tax education significantly influences tax compliance as evidenced by the P-value of less than 5%. This is consistent with the findings from the study conducted by (Alm, *et al.*, 2020).

**Table 3: Standardized Regression Weights  
(Group number 1 - Default model)**

	<b>Estimate</b>
LogTR <--- LNEBM	.223
LogTR <--- OP	.076
LogTR <--- ES	.068
LogTR <--- CMD	.033
LogTR <--- LNOD	-.711
LogTR <--- LNOR	-.301
LogTR <--- SW	-.019
LogTR <--- TP	-.016
LogTR <--- LNTE	.137

Source: Survey data (2020)

Table 3 shows the regression estimates of the study variables. The results from the survey show that when the use of LnEBM goes up by 1 standard deviation, the logTR goes up by 0.223 standard deviations. The results further show that when online payment goes up by 1 standard deviation, the logTR goes up by 0.076 standard deviations. When the E-suggestions go up by 1 standard deviation, logTR goes up by 0.068 standard deviations. Furthermore, when the custom mobile declaration goes up by 1 standard deviation, the logTR will go up by 0.033.

The results further show that when LNOD goes up by 1 standard deviation, logTR goes up by 0.711 standard deviations. When business supervision goes up by 1 standard deviation, logNPL goes down by 0.067 standard deviations. When LnOR goes up by 1 standard deviation, logTR goes down by 0.301 standard deviations. An increase in the SW by 1 standard deviation, logTR goes

down by 0.019 standard deviations. When tax penalties go up by 1 standard deviation, logTR goes down by 0.009 standard deviations. More to that, when the LnTE (tax education) goes up by 1 standard deviation, logTR goes down by 0.137 standard deviations. The results revealed a positive relationship between EBM, online payment (OP), online declaration (OD), online registration (OR), Tax education (TE) and customs mobile declaration and tax revenue. This implies that an increase in smart taxation as reflected by the above variables will lead to tax compliance. The results further indicated that there is a negative relationship between tax penalties, single electronic window and tax compliance. This implies an increase in tax penalties leads to a decrease in the tax compliance. The defaults model can be restated as below:

$$TR = 0.69 + 0.223LnEBM + 0.076OP + 0.068ES + 0.33CMD - 0.711LnOD - 0.33LnOR - 0.019SW - 0.16TP + 0.137LnTE$$

**Unstandardized factor analysis**

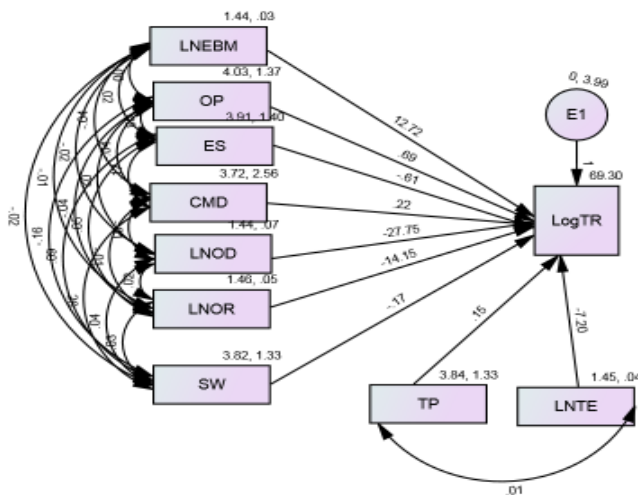


Figure 3: Unstandardized factor analysis

Source: Survey data (2020)

**Table 4: Means: (Group number 1 - Default model)**

	<b>Estimate</b>	<b>S.E.</b>	<b>C.R.</b>	<b>P</b>	<b>Label</b>
<b>LNEBM</b>	1.442	.009	165.283	***	par_31
<b>OP</b>	4.031	.055	73.023	***	par_32
<b>ES</b>	3.909	.056	70.044	***	par_33
<b>CMD</b>	3.716	.075	49.231	***	par_34
<b>LNOD</b>	1.442	.013	113.028	***	par_35
<b>LNOR</b>	1.458	.011	137.602	***	par_36
<b>SW</b>	3.818	.055	70.021	***	par_37
<b>LNTE</b>	1.449	.009	153.322	***	par_38
<b>TP</b>	3.840	.054	70.557	***	par_39

Source: Survey data (2020)

Figure 3 and Table 4 shows the values of unstandardized default model. Table 4 shows the mean and significance of the mean of the study variables. The results from the survey show that probability of getting critical ratios as large as 165.2, 73.0, 70.4, 49.0, 113.0, 137.6, 70.0, 153.3 and 70.5 of the studied independent variable in table 4 above in absolute value is less than 0.001. In other words, the mean of all variables studied is significantly different from zero at the 0.001 level (two-tailed). This, therefore, means that there is a low probability of getting large variable.

**Model Fit Summary**

**Table 5: CMIN**

<b>Model</b>	<b>NPAR</b>	<b>CMIN</b>	<b>DF</b>	<b>P</b>	<b>CMIN/DF</b>
Default model	50	62.277	15	.000	4.152
Saturated model	65	.000	0		
Independence model	10	764.581	55	.000	13.901

**Table 6: Baseline Comparisons**

Model	NFI	RFI	IFI	TLI	CFI
	Delta1	rho1	Delta2	rho2	
Default model	.919	.701	.937	.756	.933
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

Table 5 and 6 tests the fitness of the model to predict the relationship between study variables. The test was made using the three measures of the model fitness which are absolute model fit, incremental model fit and parsimonious fit. The result on absolute fitness of the model was done using probability of Chi-square and root mean square error adjustment. The results show that the probability of Chi-square is 0.000 which is below 5% thus the model is fit to predict the relationship. The researchers also tested the incremental model fit using the comparative fit index (CFI) and the normal fit index (NFI). The results show both the CFI and NFI are above 0.9 hence indicating that the model is fit to predict the relationship between study variables. Another test that was conducted was parsimonious test. The results show that CMIN/DF is equal to 4.152 which is below 5.0 thus the model fit to predict the relationship between the study variables

## 5. CONCLUSION AND RECOMMENDATIONS

The findings established that smart taxation (4Taxation) contributes significantly to tax compliance in Rwanda. This was evidenced by a high correlation between Smart taxation (4Taxation) and tax compliance as measured by a multiple R-square of 96%. The results further established that

there is a positive and significant relationship between introduction of EBM and tax compliance. This, therefore, means that introduction of EBM has had a positive impact on tax compliance in Rwanda. Furthermore, the study established that there is significant positive relationship between online tax payment and tax compliance in Rwanda. The study further established that custom mobile declaration has a significant and positive influence on tax compliance in Rwanda. This means that introduction custom mobile declaration has eased the declaration by traders and thus enhancing tax compliance in Rwanda. The study also established that tax education contributes positively and significantly to tax compliance in Rwanda. This, therefore, means an increase in tax education improves tax compliance. The results further established that tax penalties do not significantly contributes to tax compliance in Rwanda as evidenced by a P-value greater than by 5% and there is a negative correlation between tax penalties and tax compliance in Rwanda. This means that increase in tax penalties leads to a decrease in tax compliance. Furthermore, the results established that there is a significant relationship between online declaration, online registration, online suggestions, and tax compliance in Rwanda as evidenced by a P-value that is less than 5%. However, the results contradicted from previous research by showing a negative relationship between online declaration, online registration, online suggestions, and tax compliance.

The researcher has come up with the following recommendations to support electronic tax management system and revenue collection in Rwanda

1. RRA management should keep on upgrading their tax technology to have an up to date system for effective service delivery since smart taxation positively affect tax compliance



2. Training of the employees and taxpayers in new skills to be able to comfortably use the new technological innovation that comes along with the fourth industrial revolution.
3. Continue educating the taxpayers about the aim of taxation and modes of taxation in to enhance tax compliance since tax education influences tax compliance
4. RRA should focus on other proactive measures to enhance voluntary tax compliance rather than increasing tax penalties as there is an inverse relationship between tax penalties and tax compliance in Rwanda.

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