

Adoption of Information Technology by Micro-enterprises. Evidence from the Democratic Republic of Congo (DRC)

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Abstract

Although the Democratic Republic of the Congo has huge mineral reserves, it is one of the deprived countries caused by the continuous instability. Moreover, the micro-entrepreneurs have a very low level of knowledge in information technologies and its application in their businesses despite microenterprises can be crucial for the job generation, the improvement in their level of technologies and finally in the economic growth of their environment. The present research work aims to analyse what socioeconomic factors determine IT adoption and use in microenterprises in order to improve its sustainability. Through a quantitative and a qualitative research we studied the current situation of microbusinesses regarding their level of ICT. The results show that management and economic characteristics as well as the education level of the employees determine the level of IT adoption and use. This paper contributes with root evidence about the ICT use as an engine of sustainability development among the Democratic Republic of the Congo.

Keywords: Micro-enterprises, Democratic Republic of the Congo (DRC); ICT4D; business skills, management

1. Introduction

The Democratic Republic of the Congo (DRC) is the second largest country in Africa by area with a population of over 75 million. Despite the long war since 1998 has devastated the country, the DRC is the nineteenth most populated nation in the world. Furthermore, more than ninety per cent of deaths are from malaria, diarrhea, pneumonia and malnutrition, aggravated by displaced populations living in unsanitary and overcrowded conditions that lack access to shelter, water, food and medicines. Nevertheless, the DRC is one of the wealthiest nations in natural resources. Even though the DRC has the majority of the world's coltan reserves (used in mobile phone manufacture), and is rich in cobalt, copper and diamonds it's economy drawn day by day (Exenberger and Hartmann, 2007). Despite its potential, the Congolese people are being consistently assigned the lowest nominal GDP per capita in the world with an Human Development Index (HDI) rating of 0.433 (World Bank, 2015).

In this context microenterprises can be the vital as ley agents of development and growth and it is interesting to focus on them, in their management and economic issues through the use of Information Technologies (IT). The IT include computers and software use in the companies according to the Partnership on Measuring IT for Development (2018) and

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also mobiles phone according to the Congolese micro-entrepreneurs surveyed. Nowadays the modernisation of small enterprises can be the tool to enhance productivity, infrastructure communications and social relations as well as transform and update a whole society. However, there is scarce knowledge about what different IT resources can support new business projects in different sectors in Africa (Chowdhury, 2003; Heeks, 2010; Mengiste and Aanestad, 2013; Ojo, Janowski and Awotwi, 2013; Mansell, 2014). If DRC were supported by strategic governmental policies and investments within ITs, it could offer new opportunities of IT improvement achieving broadband technology adaptation (Armenta et al., 2012). Yet the effectiveness of IT projects can be very much constrained by limited access to infrastructure, limited formal education, insufficient training and financial and political constraints (Pade-Khene, Mallinson and Sewry, 2008, 2011).

This research work aims to analyse what socioeconomic factors determine IT adoption and use in microenterprises in order to improve its sustainability because more than four billion people still do not have access to the Internet, and 90% are from the developing world. Bridging this digital divide is crucial to ensure equal access to information and knowledge, and as a consequence foster innovation and entrepreneurship in line with the Sustainable Development Goals Fund, Goal 9 proposed by United Nations . This research is conducted in one of the poorest areas of Kinshasa, where households live on less than \$2 per day. One hundred and twenty micro-entrepreneurs were randomly surveyed about their current situation regarding their sociodemographic, economic and management characteristics and their level of IT in line with Mason (2014) and Karlan and Valdivia (2010).

The structure of the paper is as follow: a contextualisation in the DRC is made with a literature review and a bibliometric analysis about IT and micro-entrepreneurship in Africa. In the next section the instrument, data gathering, sample and methods are described. Multivariate statistics models were defined where main variables are treated. Finally, several findings, discussion and interesting conclusions are presented.

Contributions of this research paper can be the addition of empirical evidence, at a microeconomic level of the management and IT adoption and use in microenterprises, as the engine of local economic growth (Bollou, 2006; Bollou and Ngwenyama, 2008; Oliveira and Fraga, 2011; Bankole and Bankole, 2017; Asongu, Le Roux and Biekpe, 2018) due to the scarcity of researches in the area about this topic. The results can be used to develop a guide of good practices for micro-enterprises in the DRC that will develop these with more success, prosperity, growth and competitiveness. According to the OECD countries with greater investment in these technologies are also leading the growth rates of productivity (OECD, 2010).

2. Information Technologies and Microentrepreneurs in the Democratic Republic of Congo (DRC)

Having done a bibliometric analysis about IT microentrepreneurship in Africa, several trends have been identified. In clusters 1 and 2 Boukarie leads research in IT for health issues. Asongu (2018, 2017 and 2016) is identified as an important research cluster which analyses how IT enhances human development in Sub-Saharan Africa. Another important cluster, leadered by Mutula (2010, 2006, 2005), investigates IT as a challenge to

break the digital division in Africa. Finally, Bankole (2017, 2015) studies the effects of IT innovation on Africa's socioeconomic development and human behavior changes.

Concretely, to cover the different aspects of IT impact in entrepreneurship in Africa we have also analysed the diffusion of IT in low income countries, IT adoption and use. This diffusion in these communities has been rapid. ITs and a right financing can contribute to development in different ways. Firstly, ITs can aid development producing economic growth, saving and making money (Abraham, 2007; Donner and Escobari, 2010; Levy et al., 2010); a positive return on investment can be achieved at both individual (Jensen, 2007) and community microenterprise levels. Secondly, IT adoption and use can enable development sustainability, thus showing that IT enables the development of additional assets and other financial strategies driving new outcomes (Molla and Al-Jaghoub, 2007; Heeks and Arun, 2010). IT adoption can maximize development through an educational virtuous cycle (Kivunike et al., 2009; Olatokun, 2009) where IT training increases both capabilities and motivation in employees and carries out functions in villages and microenterprises of developing countries. As a result, a critical mass of evidence about IT contribution to development is only now starting to emerge.

The technology evolution has given the possibility to generate and use data from a strategic perspective. This is a key factor for small businesses that need information to deal with the uncertainty in a competitive market (El Louadi, 1998). Maswera, et al., (2008) or Cooper and Burgess (2000) highlight the importance of ITs in small companies to overcome the disadvantages of firm size, limited financial, technological and human resources, and limited exposure to the global market. An optimal use of ITs by SMEs could drive them to a better adaptation to a changing environment and a higher degree of competitiveness. In an economy such as the Congolese, composed largely of microenterprises, IT adoption is a requirement for economic development and growth (Pérez, Urquía and Muñoz, 2010; Tanabe and Watanbe, 2005; Ismail and King, 2005).

There are researches that shown that a long-term social and economic development requires an enabling environment where IT are a key factor (Dasuki, Abbott and Azrikatoa, 2014; Ojo et al., 2013; Hilty and Ruddy, 2010; Ghaus-Pasha, 2007; Mbaku, 2000). Also, the relationship between IT and technological efficiency has been also studied in developing countries (Bollou and Ngwenyama, 2008) and similarly in developed countries (Brynjolfsson and Hitt, 1998; Solow, 1957). From a global point of view it is accepted that IT holds a great potential for development, industrialization and economic growth (Tongia, Subrahmanian and Arunachalam, 2004). Major areas of development include more effective monitoring and assessment techniques, such as remote sensing, the transformation of information and communication technology. The developmental implications of these new technologies are already apparent. For example, the rapid growth in mobile telephones has empowered rural farmers by improving access to market information (Webersik and Wilson, 2009). Some research in DRC SMEs demonstrates that a majority reported a cell phone, making this tool the most popular, some reported an e-mail address, and a minority reported a firm website (Kabongo and Okpara, 2014). Some researchers have argued that the mobile phone is a more accessible, less expensive means to "close" this global divide (Kenny, 2002), other poses that mobile phones are a powerful tool for managing daily life (Pérez, Urquía and Rautiainen, 2018; Tickner, 2010). This research is distinctive taking into account the problems with IT diffusion and

adoption problems in the sub-Sahara area (Ewusi-Mensah, 2012) such as power failure, poor telecommunication infrastructures that difficult the use of ITs with a stable supply of electrical power which is scarcely considered in the studies . A trend of research has taken the microenterprise as the unit of analysis, and sought to understand the contribution of IT to development through IT impact on micro and small sized enterprises. A variety of business-management frameworks have been used to analyze enterprise relations and enterprise variables (Heeks and Molla, 2009). Esselaar, Stork and Ndiwalana (2006) found that in African SMEs, IT adoption is related to higher labour productivity and sales turnover.

One of the main problems encountered in Congolese micro-businesses, one is the low level of training in IT and business skills among the employees and entrepreneurs. Educational institutions cannot ensure business training that pushes economic growth and a lack of knowledge about the different IT resources cannot support new business projects. However, this low level of industrialization joint with IT’s rich natural resource base and strategic policies and investments, could drive to opportunities for the growth of both ITs and the economy.

As shown in table 1, DRC’s people have one of the lowest nominal GDPs per capita and Human Development Index (HDI) ratings in the world in spite of its natural resource potential (World Bank, 2019) (see Table 1).

Table 1. Human Development Index (HDI) for DRC

DRC	HDI rank	137
Human Development Index(HDI)	Value	0.606
Life expectancy at birth	(years)	65.1
Expected years of schooling	(years)	11.4
Mean years of schooling	(years)	6.3
Gross national income (GNI) per capita	(2011 PPP \$)	5.694
GNI per capita rank minus HDI rank		-5
HDI rank		133

Source: Own elaboration

Moreover, research in microfinance has demonstrated empirically that financing resources should be combined with long term training in business programs in order to increase skills in entrepreneurship, IT, accounting, finance and leadership (Bali and Varghese, 2011; Barnes, Gaile and Kibombo, 2001; Brannen, 2010; Lakwo, 2006). Currently, a growing number of microfinance organizations are attempting to build human capital of micro-entrepreneurs to improve their businesses and help further the basic mission of poverty alleviation (Karlán and Valdivia, 2010; Verrest, 2013).

This entire context developed at a theoretical level, for small and micro enterprises, has undergone many important and very rapid changes (in the last three years) as a consequence of the global pandemic of COVID-19. Globally, many of these enterprises have not survived, but this situation is much more worrying in areas of the world that have fewer resources and strategies to ensure their survival, as is the case in most countries on the African continent. Some very current works focus on this issue, for example authors such as Ladzani (2022) propose as a solution the revision of all regulations affecting this type of companies looking for changes that facilitate their momentum, also strengthening

the development of their skills and accelerating the transfer of knowledge of the digital economy to their managers.

Others such as Bakibinga-Gaswaga *et. al* (2020) warn through their work of the loss of the achievements made the five years after the Adoption of the 2030 Agenda on Sustainable Development, if the threats of the pandemic are not countered in time (COVID-19). This threat will be further exacerbated in Sub-Saharan Africa, due to its level of poverty, poor health and limited access to services that worsens the situation compared to other parts of the world. For this reason, more than ever, public-private collaboration is needed, together with multisectoral and technological approaches, which offer possibilities for responding to the problems arising as a result of this pandemic. Faced with this situation, these countries also face other inherent problems such as political instability, illiteracy, lack of digital-technological resources and lack of infrastructure.

As highlighted in Fatoki's work (2021), small, medium and micro enterprises (SMMEs) play a fundamental role in Sustainable Development, through the generation of income thanks to employment and the generation of wealth, contributing to the reduction of poverty and inequality and therefore, stimulating economic growth. However, this dynamic has slowed down, diminished and even disappeared as a consequence of COVID-19. In his work, this author makes recommendations to counteract the negative effects of this situation. Among other works that share this concern with a similar point of view and seek initiatives that soften the negative consequences of this whole situation are Bruwer *et. al* (2020); Onoshakpor *et. al* (2020); Rajagopaul *et. al* (2020); Zeidy (2020); Anakpoy Mishi (2021); Bimba and Primosa (2021); Chinazor (2021); Ibrahim (2021); Manyati and Mutsan (2021); Naidoo (2021); Nyamboga and Ali (2021); Svenson (2021); Beizitere *et. al* (2022); Fridayani and Chiang (2022); and Fubah and Moos (2022).

Therefore, the following research questions are defined in an attempt to develop further which variables are determining factors in IT adoption:

RQ1: Do sociodemographic characteristics determine IT adoption?

RQ2: Do management and economic characteristics influence IT adoption?

3. Instrument, Sample Description and Methodology

3.1 Instrument

There is a previous study of the DRC micro-enterprises by discussions with the Non Profit Organizations (NPOs) working there to the empirical part of our study research. This project work was done through a virtual platform created to this effect where researchers and NPO directors were included. A field study was made during July 2018, following work in previous years to design and adapt the survey following Karlan and Valdivia (2010) and Mason (2014). The survey was prepared and the area was chosen because it was one of the poorest in Kinshasa, Mikondo, where household income is below \$2 per day. The question about IT adoption referred to computers and software used in the company according to the Partnership on Measuring IT for Development, which is an international, multi-stakeholder initiative to improve the availability and quality of ICT data and indicators, particularly in developing countries; but when discussing what the micro-entrepreneurs understood about IT we found mobiles should also be included. Finally, the micro-enterprises were also asked if they followed any kind of basic

management accounting or tax planning or what financial resources they had. Together with the fourteen questions one of the researchers asked them “informally” other questions or even to expand and explain some of the fourteen questions which helped to have more information about the context of their situation. These included whether the economic and social Congolese context has affected the IT adoption. Other issues the survey tried to cover were IT diffusion (Rogers, 1995; 2003) meaning that the information provided by IT is useful in covering issues such as access to different financial resources, market prices for their products, accounting and tax packages; compatibility meaning the beneficial perception of the IT adoption; complexity barrier referring IT can only be implemented if there are enough computer skills and education to demand it. Finally, the survey tried to ask about perceived usefulness and perceived ease of use of IT implementation by the micro-entrepreneurs (Davis, 1989 and Davis, Bagozzi and Warshaw, 1989).

Further, our analysis is based on understanding the behaviour of organizational actors which was gained by observations during the quantitative survey designing a qualitative survey in parallel. A quantitative along with a qualitative survey was designed. Comparison and use of both numerical and qualitative data (case study research design) may be useful in line with Yin (1984).

The quantitative survey was divided into a first section where a description of the microenterprise characteristics was asked for: sector, establishment date, sales figures, number of employees and level of education. In a second section there were questions about skills and knowledge in accounting and finance and in transversal ones such as using IT.

In our qualitative research, we gather information directly from the interviewees in an exploratory and inductive manner trying to build convincing explanations through the interpretation of details and categories in the data, though this involves subjectivity (Hines, 1988; Golden-Biddle and Locke, 1993). The qualitative analysis was done with interviews about IT adoption and companies' work. Differences in these variables may reveal the differences in the IT adoption by micro-entrepreneurs. Improved understanding of DRC context may facilitate deeper analyses and economic development. Additionally, the qualitative survey helped to understand and cover any translation and culture problems that could appear from the surveyed and surveyors. Regarding the questions about financial resources it is important to highlight that the main financial resources used by Congolese micro-entrepreneurs are mainly an “informal” type of financial resources. One of the main resources used in the DRC is the Likelemba or savings wheel, its working process is like that of a Pelton turbine or a water wheel. Some authors have researched on this similar type of finance and have called it Rotating Savings and Credit Associations (ROSCA) (Armendáriz and Morduch, 2010) built on informal understandings among friends or family pooling resources, from agricultural subsistence, meeting fourteen times a month and an average pot made of \$25. Another financial resource used in the DRC is mutuality (Bruyns, 1957). The basic features of a mutuality are the following: a more organized but rigid structure than a familiar structure, a continuous running of the organization, an anonymous character, and a group of managers elected by all members who will try to manage the mutuality optimally. Although mutuality is a very well-known and used financial resource in the DRC, currently the situation has changed in big cities,

and as there are banks, savings banks, and microcredit institutions, mutuality is currently used by a minority of entrepreneurs. A third type of common financial resource in the DRC but the simplest is a card which consists of a popular investment from a person who wants to save some money but is unable to do it at home or in a bank. So they go to a microfirm and buy a card from the company (a “Bwaka carte”) which has no interest payments during the period. The money collections can be daily or monthly with a free quota that the customer decides; the microbusiness can use it but has no other benefits during this period. A fourth system of financial resource is denominated “Likelemba plus cash”, This system has the same principles as the Likelemba described before but has two differential characteristics: one is that all of its members have to be entrepreneurs and the other is that a cash fund will be created in a $(1/n)^{12}$ each round for each member. This n^{th} part will be part of the denominated “common cash fund”, the distribution of the money works as a credit and it is given to the member who justifies the need for a profitable business. Micro-credits are an alternative solution for people to access small financial credits without needing another guarantee than themselves and their capacities. However, monetary resources the micro-companies are financed with, interestingly, do not have any influence on IT adoption. This is logical because when asked these entrepreneurs answered that access to any type of micro-credit or loan is limited and the majority of these companies finance with their savings or some type of “informal lending” of their friends or families in line with Pellegrina (2011). When the informal survey was taking place the Congolese micro-entrepreneurs described Likelemba and Bwaka carte as two types of informal lending. These micro-companies talked about using them and they consist of informal meetings of the family or neighbours or friends where they lend to each other with no guarantee of paying back but their own personal word.

3.2 Data gathering

Data collection was done with the aid of two NPOs, one called Bwato and another called Kivuvu, both working in the DRC in Kinshasa (Mikondo) and Matari. These NPOs are considered reliable partners because they have created kindergartens and primary schools, pharmaceutical and medical dispensaries in the poorest areas around Kinshasa. A survey was sent during July 2018 to micro-companies with between 1 and 10 employees in Mikondo, selected randomly among all the poorest areas of the DRC (households living on less than \$2 a day) where the NPOs Bwato and Kivuvu are already helping. The survey was designed to research variables such as the company’s age, the entrepreneur’s education level or the sectors where the micro-businesses belong, determining the IT adoption by employees and entrepreneurs together with accounting, finance and tax skills. NPOs have always been interested in offering IT in areas where they work in order to alleviate poverty and social inequalities in line with Pick, Gollakota and Singh (2014).

3.3 Sample description

The number of micro-enterprises surveyed was a hundred and twenty micro-companies; eighteen micro-enterprises were eliminated because they did not answer the survey correctly. The time consumed was three weeks where all mornings were spent asking an average of five micro-entrepreneurs each day. The variables used were several following the research studies in micro-companies. Some variables were socio-

demographic whereas other variables were the sales volume of the companies and the use of accounting and tax management, classified as management and economic characteristics. Some variables were continuous such as the sales volume or the age of the company and some were Likert values from 1(seldom) to 5(often) (see Table 2).

Table 2. Variables

	Variables	Values
Dep	IT level	Likert values from 0: never; 5: always
Sociodemographic characteristics	Sector	Primary, Industry, Services
	Type of business entity	Familiar, Individual
	Company's age	<5 years to more than 25 years range
	Number of employees	Range from none to more than 10 employees
	Employees Education	No studies; Primary; Secondary; Graduate; Master; PhD
	Employer Education	No studies; Primary; Secondary; Graduate; Master; PhD
Management and economic characteristics	Accounting	Likert values from 0: never; 5: always
	Tax Planning	Likert values from 0: never; 5: always
	Management training	Likert values from 0: never; 5: always
	Financial resources use	Likert values from 0: never; 5: always
	Sales volume	Range from less than 10.000\$ to more than 25.000 \$

Source: Own elaboration

Interestingly it was found that the majority of micro-entrepreneurs in the sample belong to the services sector with only a minority devoted to the agricultural sector and manufacturing (less than 8%). The services sector is where most of the micro-entrepreneurs belong, more specifically to the following sectors: nutrition, sales of building elements, leather, electronics and electricity repair, paper and reprographic trade, mechanical engineering of bicycles and motorcycles primarily, pottery design, metals and clockwork' shops, health and pharmaceutical dispensaries and beverage factories.

To ensure the validity of the questionnaire we have used the coefficient of reliability Cronbach's alpha, which provides a measure of the internal consistency of the test and the result is 0.720. The acceptable values of the alpha range go from 0.70 to 0.95 (Cronbach, 1951; Nunnally and Bernstein, 1994) meaning the test is reliable.

The education level of the majority of the employers' is until Secondary school although a small percentage has graduate studies (20% approximately). It is important to highlight that there is still a small percentage of micro-entrepreneurs who have no formal studies. The employees' education level is 27% in secondary and graduate level (3%). However, a majority of the remaining percentage do not have formal studies. Thus, in our study respondents' low level of education and limited or non-existent computer experience must be taken into account. In the long run education must increase together with computer skills so more IT training will be needed. There is a large percentage of enterprises that do not use any external financial resources (59%) but finance their businesses with their own or family savings. When asked about the IT adoption together with management accounting and tax planning many answered they did not know the software and only some of the micro entrepreneurs used IT together with management accounting and tax planning for their micro-companies.

Table 3. Descriptive statistics

	N	Minimum	Maximum	Mean	Std. Deviation
IT use	102	1	5	1,22	,660
Type of business entity	111	0	1	,65	,456
Sector	102	1	4	3,85	,626
Company's age	102	1	5	1,94	,932
Sales	102	1	5	1,52	,971
Firm size	102	1	6	1,25	,667
Employer's education level	102	1	6	2,94	,933
Employees' education level	102	1	4	1,68	,977
Accounting use	102	1	5	1,93	1,027
Tax Management	102	1	5	1,91	,996
Financial sources	102	1	4	1,85	1,151
Management training	102	1	5	1,87	,807
Valid N (listwise)	101				

Source: Own elaboration

3.4 Methods

This paper applied a backward linear regression weighed by the variable Firm size to investigate the relationship between IT adoption and the company's characteristics, management characteristics and sales volume. After coding the responses and examining the average scores for each aspect of the job, a regression was conducted using IT adoption as the dependent variable. Hence, this method applied to our research allows us to assess the relationship between a dependent variable and several independent variables such as company's characteristics (sector, employees and entrepreneurs' education level) or management factors (management accounting, tax planning, management training, financial resources and sales volume).

We have only transcribed in this text the opinions we thought relevant of 10 micro-entrepreneurs (Director of NGO Kivuvu, Director of NGO Bwato, Pharmacy owner, Sales manager of a craft work business, Engine repair workshop owner, Sales manager of a shoe-repair shop, Grocery shop owner, Hairdresser, Drugstore owner and Bakery saleswoman). In order to deepen in the analysis we have followed the traditions of qualitative, descriptive and interpretive case research as another authors such Vaivio and Sirén (2010) or Chua (1986).

4. Results and Discussion

4.1 Quantitative research

According to the model results, signs of the coefficients are compatible with expectation (see Table 4). The model was significant at 99% of confidence level. The majority of management and economic variables were statistically significant. Regarding the sociodemographic characteristics, only Type of business entity ($B=0,293$, $P\text{-value}=0,013$) and Employees' education level ($B=-0,129$, $P\text{-value}=0,015$) were significant, considering that the analysis were done with the variable Firm size as a weighed factor. However, the results show an inversely relationship between the Level of IT use and the level of education of the employees.

In the case of the management and economic characteristics, the variables Sales (B=0,126, P-value=0,028), Accounting use (B=0,28, P-value=0,000) and Management training (B=0,254, P-value=0,007) show a positive relationship with IT while the variable Financial sources (B=-0,085, P-value=0,075) is significant also but it has an inverse relationship with the dependant.

We observed that there were more similarities than differences in the IT adoption by micro-entrepreneurs in poor areas of DRC that have not been fully researched aligned with more similarities than differences found in the analysis.

The results of our research indicate IT adoption is determined by the company's management and economic variables. Additionally, the more sales volume the micro-entrepreneurs have the more IT they need because the use of ITs is associated with an increase of sales at the market in line with (Zanello, Srinivasan, & Shankar, 2014).

The education level of the entrepreneur does not significantly influence the IT adoption differing from the results obtained in Bollou and Nwengyama (2008) and Bollou (2006). Additionally, the employee's education influences IT adoption inversely, this could be explained because the higher the employees' education the more clearly they understand the risk of IT application that could directly lead to job destruction.

Table 4. Results

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	0,202	0,183		1,102	0,273
Sales	0,126	0,056	0,188	2,232	0,028
Employees' education level	-0,129	0,052	-0,182	-2,480	0,015
Accounting use	0,280	0,072	0,398	3,905	0,000
Financial sources	-0,085	0,047	-0,122	-1,799	0,075
Management training	0,254	0,093	0,286	2,733	0,007
Type of business entity	0,293	0,116	0,174	2,525	0,013
Adjusted R Square	0,580				

a. Dependent Variable: IT use; b. Weighted Least Squares Regression - Weighted by Firm size. Predictors: (Constant), Company's age, do you think you need Contabilité, finances, Contabilité fiscale training, Sector, Employees' education level, Financial sources, Type of business entity, Employer's education level, Sales, Tax Management, Accounting use

Source: *Own elaboration*

Interestingly these micro-firms deal with low sophisticated financial resources and have a low level of IT adoption. However, there is a large percentage of enterprises who have no financial resources, meaning these micro-entrepreneurs have not considered the possibility of micro-financing mainly for these reasons: the first reason is that when some of them have tried to access micro-credit they have been rejected (Pellegrina, 2011) and the second reason is because these entrepreneurs are very risk-averse (Karlán and Appel, 2011). Although IT adoption is low in general, it is highly influenced by sales volume, employees' education level, accounting use and tax management of the micro-enterprise. This relation between sales volume and IT is very logical because if companies have more sales they need additional accounting and tax management and therefore, additional ITs. The IT

adoption has no influence in the access of entrepreneurs to microcredit but mainly because the IT adoption is in a very preliminary state and they are not used as an aid for accounting, budgeting or financial studies contrary to Chowdhury (2003).

4.2 Qualitative research

In this section some of the surveyed people's conversations recorded and considered relevant are going to be transcribed (see Annex). Regarding what kind of IT the micro-entrepreneurs use in their businesses the interviewees 2 and 3 told us that they use the basic technologies. *"I think IT use in micro-businesses refers almost exclusively to mobile phones. Currently, broadband (ADSL) is also being introduced slowly"* (interviewee 2). *"We use the basic IT mobiles, broadband and Internet"* (interviewee 3).

There are some problems that justify why micro-businesses don't want to implement ITs or can't do it as the interviewee 1 explains. *"Causes of not adopting IT are the payment of high electricity bills or gasoline, how expensive it is to import devices, the misuse by employees (who also use them for their own affairs rather than just for the company) and frequent robberies done by bandits"* (interviewee 1).

The IT link with the level of education of the employees is an interesting issue because they don't think that the level of education could determine inversely as the pottery manager told us. *"I don't believe the employees' education can negatively determine IT adoption and use. One thing is to have a lot of interest in the new I, and another thing is knowing how to handle them correctly. I think the Congolese are not afraid of adopting IT, on the contrary, they are keen to get into the digital world, both those who are educated and those without major studies"* (interviewee 4). *"The Congolese have generally innate entrepreneurship skills and are more self-motivated when they have less wealth as Yunus says "poverty develops entrepreneurship skills". With almost anything they are able to carry out activities that allow them to survive in difficult conditions"* (interviewee 1). *"Among the main problems encountered in micro-businesses, one is the lack of IT and financial and accounting skills among the potential entrepreneurs"* (interviewee 9).

The Belgian colonial legacy for IT diffusion and adoption is a very controversial issue with influence for either the diffusion or the adoption of ITs in some way. *"More than Belgian, I think that European and American people are the ones who have other interests rather than the economic and technological development of DRC. I think the Congo represents a very rich area for the export of IT raw materials such as coltan, and so foreigners are almost exclusively concentrated in their own businesses and do not consider contributing positively towards Congolese people"*(interviewee 6).

IT adoption is considered an aid for micro-enterprise development and sustainability in Africa, specifically in the DRC, as the interviewee 1 told us. *"I think like other countries, also in the DRC, micro-enterprises development would be facilitated by the adoption and use of IT"* (interviewee 1). *"Enterprises are isolated from entry into the economic gearing. Such situations slow down the enormous potential of micro-entrepreneurial organizations to generate jobs and contribute to economic development programs within the country"* (interviewee 10).

There are some variables like the lack of continuous training that the manager of the engine repair workshop considers could influence IT adoption which at the same time can affect productivity and sustainability. *"Perhaps obtaining no credit for purchasing new ITs or having a responsible use of ITs (free of corruption) or having a lack of continuous training would optimize IT adoption"* (interviewee 5).

The hairdresser, although focused on a local clientele, thinks that the micro-entrepreneurs are motivated to adopt IT (understood as mobile phones), because they are an open

window abroad (understood as a way to increase the clientele from other towns). *“The micro-entrepreneurs are trying to adopt ITs because it is more cost-effective and, additionally, it opens the doors to the world giving micro-companies an international dimension”* (interviewee 8).

When asked about the low IT adoption by their companies they explained that when in 2010 Kivuvu sent 100 computers from Spain to Mikondo and distributed them to micro-enterprises who needed them most, there were so many power failures, that the majority of the computers did not work two years later. In particular, the director of NPO Kivuvu thinks that the social and economic situation of the DRC has influenced IT adoption. *“Precisely the lack of infrastructure (roads, public offices, etc.) determines the need to adopt the media faster in spite of their higher costs (an increasing number of people prefer having money to own a mobile than feeding themselves...)”* (interviewee 1). *“The decline in social enterprises has accelerated the turning of Congolese society into subsistence based livelihoods with important consequences for day-to-day natural resource management. Therefore, an emerging social economy of small organizations is presently being created despite the prerequisite legal sanctions to safeguard and support their development. In such conditions, banks and other potential creditors are reluctant to provide these small entrepreneurs with loans”* (interviewee 2).

5. Conclusions

A critical mass of evidence about IT diffusion, adoption and contribution to development is only now starting to emerge. More such evidence is needed; especially evidence from a microeconomic point of view. Low average educational and computer skills provide different implications useful for the implementation of IT in developing countries. The implications of our work impact on micro-entrepreneurs, governments and NPOs seeking to improve their sustainable development. There is a direct impact on individual micro-entrepreneurs who have risked starting a business. Policy makers need to make an effort improving their resources in IT's training for their citizens in order to deepen their IT knowledge to encourage sustainability and entrepreneurship. Furthermore, improvements in IT adoption and use will help to reduce the digital divide allowing new relations and network structures and drive those countries to a digital economy (Heeks, 2010).

Improving IT knowledge is important and as universities in developed countries learn from this experience they can organise their development programs to establish a long term training program for micro-enterprises specialising in IT, accounting, financial and tax training in the poorest zones in order to support the micro-entrepreneurs towards the continuous improvement and sustainability in line with Ewusi–Mensah (2012); Larsen et al. (2010); Karlan and Valdivia (2010). In this trend many authors have studied the impact of different IT implemented with compulsory training in business skills in different African countries and their impact in the improvement of families and households as a whole (Verrest, 2013). Some microfinance programs have the responsibility of making the cooperation for development projects sustainable through IT adoption encouraging decision-making towards enhancement where entrepreneurs will learn by themselves in line with Karlan and Valdivia (2010).

Although all these previous issues are decisive, in no case should it be forgotten that since the appearance of COVID-19, many IT-related issues have changed and have accelerated both at the technological and communication levels, generally modifying societies, their way of relating to each other and above all how they communicate. All this evolution has

had consequences for SMMEs, for which a thorough review of their situation and future opportunities after the pandemic will be necessary.

Contributions of this research paper are: the influence of some company's management and economic variables and the IT adoption and use and the relationship between education level of employees and IT in line with Walshan and Sahay (2006). Finally, the information we find with the quantitative information that was complemented with the qualitative "field study" information. For example, the inverse relation between employees' education and IT adoption was further explained with the qualitative information about risks and motivation.

As future research lines, this project has already created a long life learning platform with researchers who will study this area to demonstrate more deeply the impact of IT both in financial and human capital outcomes and non-financial outcomes in micro-enterprises. Finally, the results of this work not only provide a practical guide that can help small businesses in the DRC to overcome their difficulties, prosper, grow and be competitive, but also a starting point to identify their deficiencies and propose improvements to contain and mitigate the damage caused to these businesses by the pandemic, a fundamental aspect in future studies.

As limitations it is important to mention that these surveys could not be made until one of the researchers could be physically in Kinshasa with the directors of the NPO, because with the quantitative questionnaire a qualitative survey must be done to explain some questions. Other factors, such as the support of policy makers, the colonial legacy, and the problems of IT adoption and diffusion faced by sub-Saharan African countries, should be further explored (Davis, 1989; Davis et al., 1989; Ewusi-Mensah, 2012; Rogers, 1995, 2003).

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Appendices

List of the follow-up interviews

- 1) Director of NGO Kivuvu
- 2) Director of NGO Bwato
- 3) Pharmacy owner
- 4) Sales manager of a craft work business
- 5) Engine repair workshop owner
- 6) Sales manager of a shoe-repair shop
- 7) Grocery shop owner
- 8) Hairdresser
- 9) Drugstore owner
- 10) Bakery saleswoman