Chapter 10
Cameroon: Innovations and ICT and Their Combined Performance Effects on Small, Medium, and Micro-sized Enterprises

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Abstract A firm's performance is a result of many factors including its ability to innovate and use ICT. Investments in ICT and innovation are also seen as a driver of productivity and competitiveness, enhancing the continuity of a business. This chapter assesses these two sources of performance and examines possible synergies between different types of innovations through ICT and their effect on the performance of small, medium and micro-sized enterprises (SMMEs). The data used is the General Census of Companies in Cameroon conducted with 93,969 companies by the National Institute of Statistics (INS). The chapter uses a multiple regression model to assess the direct effects of innovative activities and the use of ICT tools in business practices, as well as the combined effect of different types of ICT innovations on SMMEs' performance. The statistical analysis shows that the integration of innovations and ICT is very low in Cameroonian SMMEs but that this increases systematically with company size. The econometric analysis shows that ICT helps increase SMMEs' performance by supporting innovations. Thus, innovations accompanied by a firm's further use of ICT have a significant influence on its performance. However, specific investments in innovations and the use of existing ICT resources lead to differentiated performance in terms of strong effective market changes, creating new markets and improving goods and services.

Keywords Innovation · ICT · SMME · Performance

JEL Classification Codes O 32 · L 25

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1 Introduction

Many studies converge to emphasize the importance of small, medium, and micro-sized enterprises (SMMEs) in the economic fabric of both developed and developing countries. Considering substantial cell market economies, SMMEs played an important role in innovations, job creation, and development in industrialized countries during the twentieth century (Quiles 1997). In developing countries, mainly in sub-Saharan Africa (SSA), SMMEs are the dominant forms of business organizations, representing between 95 and 99% of the business environment depending on the country: about 99% in Cameroon with a strong representation (89%) of individual companies (INS 2009), 93% in Morocco, 90% in the Democratic Republic of Congo, and 95% of manufacturing activity in Nigeria (OECD 2006). Despite this, SMMEs' contribution to gross domestic product (GDP) is estimated at less than 20% in most African countries, while it is up to 60% in OECD countries (Admassu 2009). In addition, SMMEs operating in sub-Saharan African countries on average employ less than 30% of the workforce in the manufacturing sector, while this is 74.4% in Asian countries, 62.1% in Latin American and Caribbean countries, and 73.1% in OECD countries (Ondel'ansek 2010). In Cameroon, SMMEs employ 61% of the workforce and their contribution to GDP is estimated at 31% (INS 2009).

Beyond this contrast, it should be noted that in developing countries such as Cameroon, SMMEs present a huge potential for job creation, for stimulating entrepreneurship, and in creating an industrial fabric that is capable of adapting to the needs of large companies. It could therefore be assumed that they can contribute more to economic growth in Cameroon if they manage to find better combinations between information and communication technology (ICT) and innovations to boost productivity and get better performance. More generally, the use of ICTs as a lever for profits from the innovativeness of companies comes from their ability to accelerate innovation processes (Pavlou and Sawy 2006) and from their ability to better identify emerging markets' needs (Tambe et al. 2012). Numerous works on this subject claim that generally problems related to the use of ICT tools for doing business and the separate and joint adoption of different types of innovations are the first barrier to SMME development—more important than corruption, poor infrastructure, or abusive taxation (Dibrell et al. 2008; Huang and Liu 2005). In fact, for proper operations, SMMEs need a good combination of ICTs and innovations. However, it appears that since the reform of the telecommunications sector in Cameroon (law 98/014), the use of ICTs alone has no significant impact on a firm's performance, and innovation activity considered separetly has a nonlinear impact on its performance (Mbassi and Alain 2012). So the implementation of new ICT systems alone will be insufficient to generate positive effects on SMMEs' productivity.

To these problems are added those related to innovations that can be defined according to the OECD Oslo Manual (2005) as the implementation of a new product (good or service) or a new or significantly improved process, a new marketing method or a new organizational method in business practices, workplace

organization, or even external relations. It thus distinguishes four categories of innovations: Firstly, product innovation which is the introduction of a new good or service significantly improved in terms of its characteristics or the use to which it is intended. Secondly, process innovation which is the implementation of a new or substantially improved method of production or distribution. Thirdly, marketing innovation, which is the implementation of a new marketing method, involving significant changes in product design or packaging, product placement, product promotion, or product pricing. And fourthly, organizational innovation, which refers simultaneously to new forms of work organization, knowledge management systems, methods of mobilizing workers' creativity, and new forms of relationships between companies and their economic environment. Whatever its form, economists generally agree that innovation is one of the ways of being more efficient and gaining a competitive advantage by addressing the needs of the market (Dibrell et al. 2008; Hajjem et al. 2010; Tirole 1995).

Considering innovations and ICT as the drivers of productivity and competitiveness, different scholars from around the world argue that innovations and ICT are important sources of growth and business performance (Balachandre and Friar 1997). Since there are hardly any publications on innovation practices and their impact on SMMEs in Cameroon, this chapter attempts to fill this gap by assessing the impact of SMME innovations and use of ICT tools on their performance. More specifically, this chapter:

- Examines the importance that SMMEs in Cameroon in relation to the concepts of innovations and ICT in order to face competition and so ensure their sustainability and performance;
- Assesses and analyzes the effects of innovations and use of ICT in business practices on SMMEs' performance;
- Assesses and analyzes the combined effects of different types of innovations and ICT on SMMEs' performance; and
- Provides policy recommendations that can create a favorable framework for innovations and ICT in SMMEs in Cameroon.

The rest of the chapter is organized as follows: The following section reviews relevant literature related to innovations and business performance and ICT and business performance and establishing a link between innovations, ICT, and performance. Section 3 presents the methodology and data used. Results and conclusions are then discussed in Sect. 4. The chapter ends by outlining the limitations of the study and giving suggestions for future research.

2 Literature Review

Business performance is a result of many factors, including the ability to innovate and invest in ICTs. Thus, it is important to find out the relationship between these.

2.1 Innovation Behavior and SMMEs' Performance

Innovation plays an important role in the success of a product in the market and hence in a firm's performance. The acceptance of the Schumpeter (1939) thesis establishing that intensive R&D innovations are the engine of economic development leads to the assumption that most successful companies are those which manage to develop innovations with a high degree of novelty or radical innovations. While this assumption had been accepted for long, recent analyses are more critical. For example, researching this subject in America and Germany Dowd and Burke (2000) found only a mitigated relationship. Similarly, Markides (2000) identified more than 30 firms that became international leaders (such as Dell) without making any technological innovations. Also, continuous development of incremental innovation waves is given credit for the rise of Japanese companies (Markides 2000). This strategy has proved to be more effective than the slower development of radical innovations.

Thus, the link between innovations and performance is more complex than initially assumed. Some researchers (e.g., Balachandre and Friar 1997) used technical characteristics assessed by obtaining a patent or the intensity of efforts in development research (R&D) to measure the degree of novelty of a firm. Companies with a patentable innovation may prefer the strategy of secrecy (Tidd and Driver 2000) given the fact that the dissemination of information caused by the diffusion of the patent can reduce profits linked to the knowledge crystallized in it. In addition, the deliverance of a patent is only an indicator of the recognition of innovation and does not give information on the importance of the novelty it bears. For St-Pierre and Mathieu (2004), SMME innovations are often unpatentable because on the one hand delays or administrative requirements do not suit the reality of SMMEs and on the other hand, the disclosure obligations of certain strategic information about an innovation may place a company in a vulnerable position vis-à-vis its competitors with more resources. Thus, given the fact that some patents are filed only to block development among competitors the question about the usefulness of patents remains open. This shows how the indicator of measuring innovations through the number of patents filed leads to an underestimation of the importance of innovations.

In addition, budget utilization for R&D activities to measure the importance of innovations in firms can significantly understate their actual effect on performance because companies do not always measure the actual amount of money being spent on R&D and beyond that R&D processes are often diffused and unorganized. As Audretsch (1995) suggests, R&D activities are not all aimed at producing innovations, but may also be oriented to the imitation of a new technology or its transfer within a company, or they may simply target an increase in productivity and efficiency (Raymond and St-Pierre 2010). Thus, R&D activities, allocated resources, and the possession of patents fail to fully define the degree of innovations in companies, if not to understand some elements of the process that can lead to

innovations. Crépon et al. (2000) use two methods (the decision to patent an innovation that varies from one company to another and the share of products less than five years in corporate sales) to assess firms' productivity gains attributable to R&D. They find that productivity growth explained by the number of patents is quite important and that large companies (those with large market shares or which are diversified) commit more often than others to formal research programs. This confirms the existence of Schumpeterian effects. In addition, while studying the innovation activities of French companies, Hajjem et al. (2010) took into account selectivity problems. Not taking into account the time component necessary for a proper understanding of the innovation process allowed the authors to show that different types of innovations (product, process, organizational and marketing innovations) had significant positive effects on the productivity of French companies.

This difficulty in demonstrating a link between innovations and performance is due to the creative destruction phenomenon because innovation destroys products, techniques, and obsolete markets while creating new ones. According to Schumpeter (1942), creative destruction allows growth through the investments resulting from it and also generates the evolution of capitalism. It generates imbalances while creating a new equilibrium. Yet, Dibrell et al. (2008), using a survey of 311 American SMMEs, highlight the lack of a direct relationship between innovations (products and processes) and performance (measured by the rate of profitability and the growth rate). Similarly, Jansen et al. (2006) found lack of direct effect of operating innovations on the financial performance of 238 firms. Their study shows the moderating role that the dynamism and competitiveness of the environment plays, having significant cross-effects on performance.

Faced with the problems of competition and growth, innovations become important because they can place a firm in a quasi-monopoly for a longer or shorter time (Liouville 2006). Firms innovate in this case to defend their current position relative to their competitors and to obtain new competitive advantages (Tirole 1995). A firm may respond by innovating not only to avoid losing market share to the benefit of an innovative competitor, but also to take the lead in order to grab a strategic market position relative to its competitors. Roper and Love (2002) show that the probability of exporting is positively related to product innovations in British and German companies. For British companies, innovations are positively related to the intensity of exporting. This relationship is reversed in Germany, and this is explained by the fact that the needs of this country, which at the time of the study was undergoing profound structural reorganization after reunification, presented significant market opportunities for innovative businesses. Faced with a lack of consensus in the literature on the innovation–performance relationship, next we review literature on the use of ICT and SMMEs' performance.

2.2 The Use of ICT and SMMEs' Performance

The use of ICT is growing in companies for different tasks such as communication, search for information, marketing, group work, management accounting, and prospecting. In its early days, the impact of ICT on performance was unreliable as, for example, expressed by the ICT productivity paradox (Solow 1987). Many authors were interested in the differences in ICT productivity growth between the USA and European countries. Beyond macroeconomic issues, ICT use in industrial firms was an opportunity for economists to focus on the evolution of organizations, their productivity, and employee working conditions (Benghozi et al. 2000) and thus the performance of firms (Greenan and Mairesse 2006). Greenan and Mairesse studied the impact of ICT investments and use on a firm's performance. Leavitt and Whisler had already predicted in 1958 that the use of ICT (including computer use) would lead to the disappearance of the middle management because ICT would perform their usual tasks and moreover improve the performance of firms. Subsequently, despite researchers' increasingly growing interest in the topic, studies on the effects of ICT on productivity emerged with the main assumption that the implementation of a new ICT system alone was insufficient to generate positive effects on a firm's performance (measured by productivity).

Following this trend, Black and Lynch (2001) analyzed the effects of ICT on the productivity of US manufacturing firms. They showed that the reorganization of work through ICT had a positive and significant effect on labor productivity. Investigating major US companies in the same sector, Bresnahan et al. (2002) demonstrated that ICT, just like new products and services, positively affected the demand for skilled workers and labor productivity of firms. In French manufacturing firms, Janod and Saint-martin (2003) and Ben Aoun et al. (2010) show that reorganizations had a positive effect on the productivity of factors while they did not alter the labor and capital growth rate. They conclude that firm reorganization induced by the use of ICT is a source of performance improvement built on a more efficient use of factors of production.

Following these, numerous works using econometric estimates and very divergent methodological approaches have achieved concrete results, which are not always generalizable (Aral and Weill 2007). For example, Huang and Liu (2005) conclude that ICT investments taken separately have no significant direct impact on the performance of a firm. However, Cardona et al. (2013) indicate that the effect of ICT on productivity is positive and significant. Thus, the role of ICT cannot be analyzed solely as an investment in tools (hardware and software), but has to also be seen in the development of a specific capacity of the firm that offers an opportunity to develop a competitive advantage (Liang et al. 2010). Bocquet and Brossard (2007) show that investments in ICT generate value at the organizational level, but that this value depends on the level of additional resources, the competitive environment, and the macroeconomic situation.

Certainly, the role and specificities of ICTs in SMMEs' operations had been a subject for debate. Relationships with ICT are not evident for small-sized

organizations (Deltour and Lethiais 2014). These types of businesses often develop a sense of 'impotence' in the face of ICT because of possible systematic difficulties and high levels of computer illiteracy. The link between ICT and SMMEs' performance can be influenced by additional factors such as the implementation of relevant ICTs, their complexity, their quantity, and associated skills needed by users. According to Aral and Weill (2007), ICT assets (equipment and investments) and ICT capabilities (ICT skills, ICT practices) can be combined with innovations and with material and human resources to improve SMMEs' performance.

2.3 Support for Innovation Activities Through the Use of ICT on a Firm's Performance

Prior research on the interaction between ICT and innovation capacity on a firm's performance presents contradictory results. But ICT has a positive influence on the relationship between innovations and SMMEs' performance. Based on an investigation of 297 large enterprises in Taiwan, Huang and Liu (2005) show that the interaction variable between companies' innovation capacity (R&D rates) and ICT capital (ICT investment rate) is positively related to performance, showing a synergistic effect. Similarly, Dibrell et al. (2008) found a lack of a direct link between innovations and performance and demonstrated an indirect relationship through the importance given to ICT by executives. By investigating a model of 311 American SMMEs, they emphasized the mediating role of ICT on performance. Kmieciak et al. (2012) on the other do not confirm the positive effect of ICT on the relationship between innovation capacity and performance of firms. In the framework of the OECD Working Group on Luxembourg firms, Ben Aoun (2010) concludes that there is a positive relationship between the use of ICT and innovativeness. Similarly, Raymond et al. (2013) show that the ability to innovate has an effect on the growth and productivity of these firms. However, the increased use of ICT by companies focusing on the ICT integration process does not strengthen the effect on their performance.

These contradictory findings can be explained by different types of operationalizations, analysis tools, and dimensions: Kmieciak et al.'s (2012) study uses multiple regressions on data from 109 Polish SMMEs, while Raymond et al. (2013) perform a quantitative investigation with 309 Canadian manufacturing SMMEs with different frameworks. Ben Aoun (2010) estimates a probit model with random effects correcting the endogeneity of ICT, while Deltour and Lethiais (2014) use a multiple correspondence analysis model extended to the use of ICT in Luxembourg firms. Some authors propose an analysis focusing on specific ICTs. This is the case with Aral et al. (2012) who emphasize the importance of distinguishing the effects of information technology, the role of ICT taken as a whole and effects of specific tools that can be associated with policies. These specific ICTs can strengthen companies' innovation capacities. In the context of product innovation, Pavlou and

Sawy (2006) identify three situations in which new product development skills can be enhanced through ICTs: appropriate use of project management and resource management systems; appropriate use of knowledge management systems; and appropriate use of collaborative work systems. Asdemir et al. (2012) show that the use of ICT tools and software effectively enhance the collaboration between those responsible for innovations and consequently reduce the development cycle. They also reduce development costs, increasing the possibilities for different achievements and reuse, and finally improve the quality of the conceived product. Tambe et al. (2012) analyze how external data collection practices supported by ICT are a source of innovation (product) and productivity. Meanwhile, Kmieciak et al. (2012) put forward the idea that some ICT tools enable a better understanding of the market by facilitating communications with customers, who participate (via e-mail, discussion forums, social networks) to design products that meet their expectations. Although this opening to customers is often limited (Kuusisto and Riepula 2011), it can be high in some cases.

Given this divergence of ideas in developed countries, a comprehensive study in developing countries would be welcome not only to assess the importance of innovations and ICT in their economies but also their combination on SMMEs' performance. This need to deepen the research in the Cameroon context is reinforced by the poor existing literature regarding Cameroon and sub-Saharan Africa, whereas SMMEs are the dominant forms of business organization in sub-Saharan Africa (SSA) representing between 95 and 99% depending on the country, mainly about 99% in Cameroon with a strong representation (89%) of individual companies (INS 2009). Moreover, Africa is among the continents with the highest technological penetration.

3 Methodology

Given the lack of consensus from previous researches and the poor existing literature regarding Cameroon and sub-Saharan Africa, the objective of this research was to assess the impact of innovations and the use of ICT on SMMEs' performance in Cameroon. In particular, we tested the existence of a reinforcing effect caused by innovations supported by ICT on the performance of SMMEs.

3.1 Data Source

The data used for this research was from the General Census of Enterprises done in 2009 by the National Institute of Statistics (INS). This census involved 93,969 companies and institutions operating in Cameroon. It represented 86.5% of the tertiary sector, 13.1% of the secondary sector, and only 0.4% of the primary sector. The main objective of the census was to gain a better understanding of the current

situation of enterprises and institutions in order to develop strategies for public authorities, economic operators, and other analysts to effectively play their roles. In general, the informations in this survey are related to companies, their managers and employees, business environment, technological innovations, ICT use and production stock. It covered the entire country by targeting all economic units spotted in the field. We focused only on SMMEs operating in professional fixed and permanent locations (having a permanent business address). From the 93,969 companies and institutions surveyed, we extracted 36,976 that matched our study's requirements. The classification used here is that of the National Institute of Statistics (INS 2009), which considers those businesses with not more than five employees and an annual turnover of less than US $27,275 as micro-businesses; small businesses are companies with between six and 20 employees and an annual turnover of between US $27,275 and US $180,820; and medium enterprises are companies with between 21 and 100 employees and an annual turnover between US $180,820 and US $1,818,182.

3.2 *Specification of the Econometric Model*

The context of innovations and ICT analyzed in this work is devoted to measuring the output of innovative activities accompanied by the use of ICTs in terms of productivity. While many authors have measured firms' performance, they have not used the same measuring instruments. Some (e.g., Gauzente 2011) used countable indicators of a company that were calculated by assessing their annual reports and were associated with their economic and financial performance such as the growth in the sales turnover, the production of goods and services, the value added, the rough operating surplus, the rough operating result, and the net operating profit. Apart from these indicators, other authors (e.g., Charreaux 1997; Louizi 2011) used financial ratios such as profitability (ratio between realized benefits and sales turnover), capital turnover (ratio between sales turnover and investments), investment output (ratio between realized benefits and investments), credit output (ratio between net benefits and total assets), assets output (ratio between net benefits and stockholders' equity), and Tobin's Q.

The context of innovation and ICT analyzed in this chapter is devoted to measuring the output of innovation activities and of the use of ICT in terms of productivity. To estimate the productivity of firm i, one can postulate a relation binding its gross margin Y_i to its inputs—capital (K_i) and labor (L_i) (see, e.g., King and Park 2004):

$$Y_i = \theta_i f(K_i, L_i) \tag{1}$$

where factor θ_i collects the productivity of the company.

By supposing a functional form of a Cobb–Douglas equation type, we can obtain a log linear relation as:

$$\ln Y_i = \ln \theta_i + \beta_K \ln K_i + \beta_L \ln L_i \tag{2}$$

The measurement of performance used in this study can be the sales turnover, profit, or added value. Each measurement integrates at least one of the three following shutters: the quantity and the set of market products, the selling prices of goods, and the costs of the acquisition of goods. Each of these shutters can be affected by the entrepreneur's characteristics, the company's characteristics, and related commercial practices. In our analysis, we consider two main inputs: the capital which we approximate by the investments made by the company since its creation and the labor factor which includes the total number of permanent and temporary workers, which is a fraction of the annual total number of working hours performed by these employees.

Productivity θ_i is unobservable by the econometer. We make the assumption that it depends on the characteristics of the entrepreneur (like Paulson et al. 2006) and on the characteristics of the company and the market (see King and Park 2004). We hold with these authors by supposing that productivity depends, beyond other determinants, on the capacity to innovate and the use of ICT tools. We can thus express the logarithm of productivity θ_i of company i as:

$$\ln \theta_i = \alpha_0 + \gamma X_i + \lambda Z_i + \tau C_i + \varepsilon_i \tag{3}$$

where X_i is a vector of variables related to innovation activities, Z_i the vector of the variables related to ICT, and C_i the vector of variables related to innovation activities supported by ICT. The term ε_i can be seen as errors of measurement or shocks on a firm's productivity and are independently and normally distributed with zero as mean.

By combining Eqs. 2 and 3, we obtain a reduced form of the model where the logarithm of the production is explained by the logarithm of the stock of capital in the SMME, the logarithm of employment plus the contribution of innovations and ICT and the combination of both:

$$\ln Y_i = \alpha_0 + \gamma X_i + \lambda Z_i + \tau C_i + \beta_K \ln K_i + \beta_L \ln L_i + \varepsilon_i \tag{4}$$

Taking into account the broad variance in the size and type of the company and the heterogeneity of its activities, the traditional assumption of the constant variance of the stochastic term of error in this model is likely to be violated. We thus supposed heteroscedasticity by expressing the variance of errors like a multiplicative function of all explanatory variables of the model (see, e.g., Harvey 1976 or Greene 2003). The parameters of the model are estimated by the maximum likelihood method. Given the size of our sample (4078 SMMEs), the standard deviations might not be correctly estimated if we use the asymptotic matrix of

variance–covariance. We therefore used the bootstrap method to estimate standard deviations and testing the significance of the coefficients.

3.3 Variable Selection

In terms of variables representing innovation activities in SMMEs, the capacity to innovate was measured through the level of investments in R&D (Huang and Liu 2005). An alternative approach consists of estimating the capacity of acquisition of the results of R&D centers that the company has been able to implement. Thus, Subramanian (1996) stresses that measuring the innovation capacity must be done in a multidimensional way. Among the different dimensions of innovation capacity in this chapter are investments in experimental R&D, the acquisition of R&D services, and the launch of new products in the market.

Variables related to the use of ICT by SMMEs are characterized by two complementary dimensions highlighted by Aral and Weill (2007): ICT assets and internal IT skills. ICT assets correspond to investments in equipment and software in an enterprise. In this chapter, we use functions' computerization rates, measured by the rate of access to computers and the rate of employees who can use computers. For a set of possible positions within a company (accounting and finance, sales, purchasing, inventory, logistics/distribution, and human resources management), the use of Internet, intranet, and online business practices were assessed.

In the variables related to support of innovation activities through ICT, ICTs dedicated to innovation correspond either to investments in specific tools (acquisition of machinery, software, equipment, and other external technologies) related to the implementation of technological innovations, or the increased use of ICT tools available as part of innovative activities. In addition, the training of employees to ICT for innovation activities is an important indicator of human capital (Abeysekeraa and Guthrieb 2004). We introduce an interaction variable (innovation capacities dedicated to ICTs) in the model that combines innovative capacity and the fact of having accompanied innovations through investments in ICTs, or a more developed use of these technologies in business. We added two control variables in this model which allow us to complete the analysis of the sources of performance (Table 1).

3.4 Statistical Analysis of the Explanatory Variables

The use of computers in business is a common practice. However, only 51.79% of SMMEs in Cameroon have at least one computer as a work tool (with an average of seven computers per SMME depending on size). The presence or absence of this business ICT tool is not always linked to the ability of staff members to use it. In fact, less than 50% of the staff members mastering ICT use effectively have access

Table 1 Description of variables

Variables	Descriptions
Dependent variable	
VA	Added value in the year of the survey in US $
Variables linked to innovation activities	
R&D	Experimental R&D 1 = Yes, 2 = No
SER_R&D	Acquisition of R&D services 1 = Yes, 2 = No
NOU_PROD	New products in the market 1 = Yes, 2 = No
Variables linked to ICT usage	
UTIL_TIC	ICT usage 1 = Yes, 2 = No
TAUX_ORDI	Computer access rate TAUX_ORDI = number of functional computers/number of people mastering computer use
NET	Internet connection: 1 = Yes, 2 = No
AF_NET	Online business practices 1 = Yes, 2 = No
Variables linked to support of innovation through ICT	
F_TIC	IT skill training for innovation activities 1 = Yes, 2 = No
LOG_INNOV	Software acquisition linked to technological innovations. 1 = Yes, 2 = No
MA_INNOV	Machinery acquisition linked to technological innovations. 1 = Yes, 2 = No
COMB	Combination innovation-ICT innovation capacity X ICT use rate
Control variables	
SA	Sector of activity (operation) of the SMME 1 = Primary sector, 2 = Secondary sector, 3 = Tertiary sector
ENR	Business environment 1 = Good, 2 = Fairly Good, 3 = Bad

Source Compiled by the authors, based on RGE (2009)

to a computer at work. While ICT penetration in the country remains uneven regarding the sector of activity, it is much more visible in the tertiary sector (58.24%) and the secondary sector (41.42%), but less so in the primary sector (0.34%). This sector is characterized by a high level of computer illiteracy among working personnel.

In general, the anchoring of ICT is low in SMMEs. Barely one-third of the SMMEs are connected to the Internet (35.9%) and an even lower proportion has an

intranet (18.39%) in its working environment (INS 2009). A study by the Ministry of Communication in 2005 said that 12% of the businesses were connected to the Internet. Four years later (INS 2009), there was a clear improvement which is explained by the strong competition observed in the telecommunications sector and the considerable cut-down of media costs such as those on computers, phones, and network access. Moreover, looking beyond the tertiary sector (e.g., banks) that largely uses intranet, other sectors are still at the embryonic stage of developing this tool. The use of Internet for business transactions (e-commerce) only affects a quarter (25.99%) of SMMEs as a whole. It is experienced much more by the service sector (58.24%) (e.g., transport) and the secondary sector (41.42%) (e.g., extraction, manufacturing, construction). This weak Internet usage may be partly explained by the way in which the Internet market operates. Thus, two years after the observation made by the Ministry of Post and Telecommunications in 2007 (INS 2009), the underutilization of possibilities offered by Internet remain valid. We generally find that the ICT indicators listed here increase systematically with the size of a company, that is, the larger a company, the higher these indicators.

Overall, only 7.33% of the SMMEs reported using results of research centers. The primary sector (agriculture, for example) which usually experiences an extensive dissemination of results from research centers uses them the most. Very few firms have devoted budgets for technological innovations ($16,683.63 on average). The acquisition of innovative machinery and equipment (5.37%), innovation-oriented software (4.05%), and ICT-related training for innovative activities (3.24%) are the three areas where they spend more of their budgets (Table 2).

When it comes to the business environment, only 2.53% entrepreneurs had a good opinion about it, 16.11% had a fairly good opinion, 36.46% thought it was bad, while 44.90% did not have an opinion. Despite efforts by the government and GICAM (main employers' federation in Cameroon) to improve the business environment, a majority of the business leaders were pessimistic and therefore worried about the future of their businesses. In general, the most optimistic CEOs were in the primary sector (agriculture, livestock) and to a slightly lesser extent in the service sector (banks and insurance). The more pessimistic ones were in the secondary sector (trade, industries).

4 Econometric Results

Our regression results are given in Table 3. The results show that innovation capacities and abilities in ICT taken separately do not have the same results on the performance of SMMEs as they do when they are combined.

– Individual effects of innovations and ICT on SMMEs' performance

Table 2 Descriptive statistics

Variables	Descriptions	
Standard production factors		
VA	Added value in the year of the survey in US$	Mean = 11,621.50 Standard deviation = 144,181.82 Min = −1476; max = 1,818,181,82
Variables linked to innovation activities		
CAP_INNOV	Innovation capacities	Mean = 9,176.213 Standard deviation = 460,525.8 Min = 0; max = 2.93e + 07
RESUL_R&D	Exploitation of R&D results	Yes = 7.33 No = 92.67
R&D	Experimental R&D	Yes = 1.62 No = 98.38
SER_R&D	Acquisition of R&D services	Yes = 0.96 No = 99.04
NOU_PROD	New products in the market	Yes = 0.71 No = 99.29
Variables linked to ICT usage		
NOM_ORDI	Number of functional computers	Mean = 7.112 Standard deviation = 28.7 Min = 0; max = 623
CAP_TIC	ICT capacities	Mean = 7641.3 Standard Deviation = 267,047.8 Min = 0; max = 1.65e + 07
TAUX_ORDI	Computer access rate TAUX_ORDI = number of functional computers/number of people mastering computer use	Mean = 0.4938 Standard Deviation = 0.8323 Min = 0; max = 20.83
UTIL_TIC	ICT use	Yes = 51.79 No = 48.21
NET	Internet connections	Yes = 35.90 No = 64.10
AF_NET	Online business practices	Yes = 25.99 No = 74.01
Variables linked to support for innovations through ICT		
LOG_INNOV	Software acquisition linked to technological innovations	Yes = 4.05 No = 95.95
MA_INNOV	Machinery acquisition linked to technological innovations	Yes = 5.37 No = 94.63
COMB	Combination CAP_INNOV X CAP_TIC	Mean = 2.50e + 07 Standard deviation = 0.47e + 08 Min = 70; max = 3.56e + 10

(continued)

Table 2 (continued)

Variables	Descriptions	
Control variables		
SA	Sector of activity of the SMME	Primary = 0.34 Secondary = 41.42 Tertiary = 58.24
ENV	Business environment	Good = 2.53, Fairly Good = 16.11, Bad = 36.46, No opinion = 44.90

Source Authors compilation, based on RGE (2009)

Table 3 Econometric model's results

Variables	Independent variable VA
	Coefficient
LOG_COMB	0.0215031* (0.03386)
CAP_TIC	−0.027223 (0.02223)
CAP_INNOV	−0.0044528 (0.03625)
NOMB_ORDI	0.0034129** (0.00173)
UTIL_TIC	0.4161848*** (0.14822)
RESULT_R&D	0.6061973*** (0.18940)
SER_R&D	−0.9015664* (0.4958)
ENV_1	0.2885192 (0.30378)
ENV_2	0.4062594*** (0.15219)
ENV_3	0.5731813*** (0.12592)
SA_1	2.479741**
SA_2	1.538525*** (0.16287)
NET	−0.3456903** (0.13807)
Constant	1.589216*** (0.07343)

Source Authors compilation based on RGE (2009)
R^2 = 0.0429; R^2 Adjusted = 0.0399; Prob $(X > F)$ = 0.0000; F = 14.02; Observation = 4078; ***(1%), **(5%), *(10%)

The innovation capacities and ICTs' abilities taken separately have an insignificant negative effect on the performance of SMMEs. This negative effect of innovation capacities and of SMMEs' computerization is because of difficulties returns on investments for both these activities in SMMEs. Developing and implementing innovations has significant costs, but the benefits of their withdrawal remain uncertain commercially. Similarly, the cost of computerization is high as technologies tend to become obsolete quickly and this makes it difficult for a firm to get distinguished from other firms. These results are consistent with those of Dibrell et al. (2008) who concluded that the direct effect of innovation capacities on performance was insignificant. Huang and Liu (2005) noted the existence of a non-linear relationship between a firm's innovation capacities and performance, which reflects a positive effect up to a certain investment threshold in R&D and then a negative effect. To explain this negative effect, they based their analysis on the concept of diminishing returns of R&D which states that the production rates increase but this increase is lesser than the increase in R&D.

Contrary to the positive impact of the effect of ICT capacities on SMMEs' performance found in prior research (Dibrell et al. 2008; Huang and Liu 2005), we find this effect to be negative and insignificant especially as configuring ICT into an asset requires individual and collective skills to the point where ICT-led companies are tempted to look at the external labor market to tap new skills. This is not necessarily effective for SMMEs. This contradictory result is probably due to the various measures used for determining ICT capacities. While Dibrell et al. (2008) measured ICT abilities by the overall budget allocated to ICT, we followed the approach used by Aral and Weill (2007) and first considered computerization resources and second the use of ICT tools in business practices. This orientation was guided by Cameroon's context as outlined earlier: an insignificant budget for ICT. Rather than basing our study on the budget, we found it best to look at its dissemination.

– Combined effects of innovations and ICT on SMMEs' performance

The combined effect of support for innovation activities by ICT was positive and significant at a 10% level. This result is explained by the fact that ICT can have benefits such as effectiveness, efficiency, being an aid in decision-making, increased communication, or mobility that affect the tasks performed by a firm. For this, the effect of innovations on performance will become concrete when accompanied by ICT. Further, the degree of anchoring of ICT tools and their usage in a company enables managers and employees to accelerate the innovation process, and thus improves the firm's performance in terms of process streamlining and cost reduction. Similarly, an innovative SMME benefits from ICT in a social dialogue. This means that the implementation of intranet in a firm can boost commercial innovations, since e-mails or social e-posts can replace billboards. The demonstration of a synergistic effect between ICT and innovations is consistent with Huang and Liu's (2005) results for large firms. These results differ from those put forward by Raymond et al. (2013) using a sample of Canadian SMMEs. The use of ICT tools

specifically mobilized for innovations favors exploitative activities. While there may be software dedicated to innovation management, digital media for innovation uses collaborative ICT tools. That is why Dibrell et al. (2008) show that the innovation capacity of a firm affects its performance only through increased ICT resources, with the direct effect being insignificant.

By focusing on the relationship between ICT and innovations, using the Internet for business transactions increases Cameroonian SMMEs propensity to innovate (Table 3). ICT's use for production and human resource management operations and quality management operations is favorable for SMMEs' innovation activities. The disparity in results (the negative impact of the Internet and the positive effect of using ICT tools) suggests that different types of ICT equipment and their usage have distinct effects on innovation activities. If these results confirm that not all ICT investments produce equivalent effects on the propensity to innovate, they are consistent with those obtained by Nguyen Thi and Martin (2011) for Luxembourg data. Our analysis also reveals that to ensure the best conditions for success in innovations through ICT, companies will have the advantage of playing on three basic factors: space, time, and materiality. ICT enables companies to overcome physical limits of space by smoothly managing the spatialization of the value chain. The relation to time is also changed by ICTs. They open instant, transparent, and comprehensive access to information. In addition, ICTs have also revolutionized the nature of products and services, providing access to electronic distribution of services and immaterial goods. These observations on Cameroon's data suggest that the use of ICT allows a company to work with its customers and suppliers and so benefit from new ideas and expertise. Internally, ICT (intranet) facilitates group work and team synergy through fluid exchange and information flow. In this part of the implementation of the intranet, for example, e-mail messages can replace billboards; this is the same for typing of conventional forms for business operations.

– Business environment and sector of activity

Considered as the model's control variable, the business environment positively influenced SMMEs' performance at 1%. This result confirms the conclusion of Jansen et al. (2006) according to which the dynamism of the business environment and the degree of competition has an impact on the performance of SMMEs under certain conditions. Also, the significance of the sector of activity confirms Forsman's (2011) results according to which the sector of activity acts on innovation activities and also on performance, the latter being influenced by the nature of the activity. This strong positive and significant influence of the business environment and sector of activity variables, respectively, at the 1 and 5% threshold can be attributed to the implementation of government policies in the private sector in order to ease conditions of starting and operating a business.

5 Conclusions

SMMEs occupy an important place in the Cameroonian economy and constitute almost all of the country's economic fabric. Despite their strong representation in the productive sectors, SMMEs contribute little to GDP and employment in the country. Convinced that they can contribute to more economic growth in Cameroon if they manage to find better conditions for their development and thus improved performance, this work aimed to highlight the link between innovations, ICT, and SMMEs' performance. To achieve this objective, the analyses were based on data collected through the General Census of Businesses conducted by the National Institute of Statistics (INS 2009), covering 93,969 companies and institutions operating in Cameroon. For this, we performed an analysis in two steps: First, a descriptive statistics analysis was done using different variables, and then an econometric analysis to test the significance of these variables was done.

From descriptive statistics, we found that the anchoring of ICT is low in SMMEs. Only 51.79% of the SMMEs had at least one computer as a working tool. Similarly, only one-third of the SMMEs were connected to the Internet (35.9%), and a lower proportion had an intranet (18.39%) in their work environment. Therefore, the use of the Internet for business transactions (e-commerce) affected only about a quarter (25.99%) of the SMMEs. This weakness in Internet use may be partly explained by the way the Internet market operates in Cameroon: weak connection flows, very high connection costs, and limited Internet supply. When 4G connections are already functioning in most African countries, Cameroon is still having difficulties in completely providing 3G connections. This infrastructural environment hinders the development of e-businesses. Thus, a more efficient Internet supply will be an incentive for SMMEs to integrate its use in their business activities. To this, we can add weak migration to business credit cards (Visa, Paypal, Mastercard, etc.) for online transactions. Banks in Cameroon should reduce paper transactions by delivering business credit cards to their customers. The government in synergy with network operators should ameliorate the functioning of the Internet market: a high-quality connection and lower connection costs by opening the market to other economic agents. We also found that the ICT indicators listed here increased systematically with the size of a company. Given the means that the bigger companies have, they can benefit considerably from their ICT investments. SMMEs will benefit more from their ICT investment as they keep expanding.

The econometric analysis led us to the following results: Taking into account the weaknesses in innovation activities in all SMMEs in our sample, we could detect a nonsignificant negative effect of innovations and ICT capacities on the performance of SMMEs when taken separately. However, a combination of ICTs and innovations was positive and had significant relationship with performance. The effects of innovation on performance cannot be sufficiently important unless accompanied by ICT. The role of ICT in innovations, however, is more important as the anchoring of ICT use in SMMEs speeds up the innovation process. It thereby improves

a firm's performance in terms of reducing costs and streamlining processes. To market a new product, a SMME can publish offers and advertisement, develop various activities such as e-commerce and social exchange with customers and even create partnerships through the Internet. First, ICTs bring about a big change in attitudes and the way information is processed by SMMEs. ICTs also participate in the dematerialization and the creation of added value. Secondly, ICTs improve the level of decision-making and facilitate interactions and collaborations between employees and managers. Finally, they accompany the setup and implementation of innovations, thereby improving the performance of SMMEs. Therefore, SMMEs should orientate their ICT investments to those directly linked to innovations in order to improve their performance. To maximize the effects of innovations in SMMEs, it is important to focus on three dimensions that transform markets: market size, interconnection with customers and partners, and rich and diversified content. By allowing customers to access products and services regardless of their location, ICTs help companies reach new markets. While integrating innovation-focused ICTs for improving firms' performance, the cybercrime phenomenon pops up. Solving this and establishing a competitive economic environment may induce competition favorable for innovations and thus better performance.

References

Abeysekeraa, A., and J. Guthrieb. 2004. Human capital reporting in a developing nation. *The British Accounting Review* 36: 251–268.

Admassu, Tadesse. 2009. 'Quelles perspectives de financement pour les PME en Afrique?'. *La revue de PROPARCO*.

Aral, S., and P. Weill. 2007. IT assets, organizational capabilities, and firm performance: How resource allocations and organizational differences explain performance variation. *Organization Science* 18 (5): 763–790.

Aral, S., E. Brynjolfsson, and M. Van Alstyne. 2012. Information, technology and information worker productivity. *Information Systems Research*, 12: 1–19.

Asdemir, O., R.D. Banker, and I. Bardhan. 2012. Understanding the impact of collaboration software on product design and development. *Accounting Faculty Publications.* Paper 35. Available at http://ir.stthomas.edu/ocbacctpub/35

Audretsch, D.B. 1995. *Innovation and industry evolution*. Cambridge: The MIT Press.

Balachandre, R., and J.H. Friar. 1997. Factors for success in R&D projects and new product innovation: A contextual framework. *IEEE Transactions in Engineering Management* 44 (3): 276–287.

Benghozi, P.J., P. Flichy, and A. Iribarne. 2000. Le développement des NTIC dans les entreprises françaises. *Réseaux* 104: 31–58.

Ben Aoun, L., A. Dubrocard, and H. Tudor. 2010. TIC, innovation et effets perçus dans les entreprises luxembourgeoises, *Economie et Statistiques*, Working papers du STATEC et Observatoire de la Compétitivité.

Black, S.E., and L.M. Lynch. 2001. How to compete: The impact of workplace practices and information technology on productivity. *The Review of Economics and Statistics* 83 (3): 434–445.

Bocquet, R., and O. Brossard. 2007. The variety of ICT adopters in the intra-firm diffusion process: Theoretical arguments and empirical evidence. *Structural Change and Economic Dynamics* 18: 409–437.

Bresnahan, T.F., E. Brynjolfsson, and L.M. Hitt. 2002. Information technology, workplace organization and the demand for skilled labor: Firm-level evidence. *Quarterly Journal of Economics* 117 (1): 339–376.

Cardona, M., T. Kretschmer, and T. Strobel. 2013. ICT and productivity: Conclusions from the empirical literature. *Information Economics and Policy* 25 (3): 109–125.

Charreaux, G. 1997. Vers une théorie du gouvernement des entreprises, in G. Charreaux (ed.) *Le gouvernement des entreprises*, Economica, 421–469.

Crépon, B., E. Duguet, and J. Mairesse. 2000. Mesurer le rendement de l'innovation. *Économie et Statistique* 334.

Deltour, F. and V. Lethiais. 2014. Innovation et performance des PME : une approche par la contribution des technologies de l'information. *Association Internationale de Management Stratégique (AIMS)*, XXIII Conférence Internationale de Management Stratégique.

Dibrell, C., P. Davis, and J. Craig. 2008. Fueling innovation through information technology in SMMEs. *Journal of Small Business Management* 46 (2): 203–218.

Dowd, M.K. and R. Burke. 2000. In innovation, is it true that nothing succeeds like success? Engineering Management Society: Proceedings of the 2000 IEEE, available at http://ieeexplore.ieee.org/document/872565/?reload=true

Forsman, H. 2011. Innovation capacity and innovation development in small enterprises a comparison between the manufacturing and service sectors. *Research Policy* 40 (5): 739–750.

Gauzente, C. 2011. Mesurer la performance des entreprises en l'absence d'indicateurs objectifs: quelle validité? Analyse de la pertinence de certains indicateurs. *Finance Contrôle Stratégie* 3 (2): 145–165.

Greenan, N., and J. Mairesse. 2006. Réorganisations, changements du travail et renouvellement des compétences. *Revue Économique* 57 (4): 1121–1135.

Greene, W.H. 2003. *Econometric analysis*, 4th ed. Prentice Hall: Pearson Education Inc.

Hajjem, O., P. Garrouste, and M. Ayadi. 2010. Effets des innovations technologiques et organisationnelles sur la productivité: une extension du modèle CDM. Post-Print halshs-01208095, HAL.

Harvey, A.C. 1976. Estimating regression models with multiplicative heteroscedasticity. *Econometrica* 44 (3): 461–465.

Huang, C.J., and C.J. Liu. 2005. Exploration for the relationship between innovation, IT and performance. *Journal of Intellectual Capital* 6 (2): 237–252.

INS/RGE. 2009. Le recensement général des entreprises au Cameroun, Août-Novembre.

Janod, V., and A. Saint-Martin. 2003. Impact des réorganisations du travail sur les performances des entreprises manufacturières: une analyse sur donnée françaises 1997–1999. *Revue économique* 54 (3): 637–648.

Jansen, J., F. van den Bosch, and H. Volberda. 2006. Exploratory innovation, exploitative innovation, and performance: effects of organizational antecedents and environmental moderators. *Management Science* 52 (11): 1661–1674.

King, R.P., and T.A. Park. 2004. Modeling productivity in supermarket operations. *J Food Distrib Res* 35 (2): 42–55.

Kmieciak, R., A. Michna, and A. Meczynska. 2012. Innovativeness, empowerment and IT capability: Evidence from SMEs. *Industrial Management and Data Systems* 112 (5): 707–728.

Kuusisto, A., and M. Riepula. 2011. Customer interaction in service innovation: Seldom intensive but often decisive. Case studies in three business service sectors. *International Journal of Technology Management* 55 (1/2): 171–186.

Liang, T.P., J.J. You, and C.C. Liu. 2010. A resource-based perspective on information technology and firm performance: A meta analysis. *Industrial Management and Data Systems* 110 (8): 1138–1158.

Liouville, J. 2006. 'Degré d'innovation et performances des entreprises: Limite des recherche actuelles et nouvelles perspectives pour le management de l'innovation', *AIMS,* XVème conférence Internationale de Management Stratégique, Annecy/Genève, 13–16 Juin.

Louizi, A. 2011. 'Les déterminants d'une Bonne Gouvernance' et la performance des entreprises Françaises: Études empiriques, Université Jean Moulin Lyon 3, Université de Sfax, Thèse de doctorat en Sciences de gestion sous la direction de ROTH F.

Markides, C. 2000. *All the right moves: A guide to crafting breakthrough strategy*. Boston MA: Harvard Business School Press.

Mbassi, Sone and A. Alain. 2012. TIC, Changements Organisationnels et Performances Economiques des Enterprises au Cameroun, ICBE-RF Research Report No. 35/12.

Nguyen Thi, T.U. and L. Martin. 2011. *The relationship between innovation and productivity conditional to R&D and ICT use: An empirical analysis for firms in Luxembourg* Working Papers 11, Development and Policies Research Center (DEPOCEN), Vietnam.

Paulson, A.L., R.M. Townsend, and A. Karaivanov. 2006. Distinguishing limited liability from moral hazard in a model of entrepreneurship. *Journal of Political Economy* 114 (1): 100–144.

Pavlou, P., and O. Sawy. 2006. From IT leveraging competence to competitive advantage in turbulent environments: The case of new product development. *Information Systems Research* 17 (3): 198–227.

OECD. 2007. *Travaux de Synthèse sur Le financement des PME et des entrepreneurs*. Paris: Février.

Ondel'ansek, K. 2010. Les contraintes de financement des PME en Afrique: le rôle des registres de crédit. Thèse de Doctorat, HEC Montreal.

Quiles, J. 1997. *Schumpeter et l'évolution économique: Circuit, entrepreneur, capitaliSMME*. Paris: Nathan.

Raymond, L., F. Bergeron, and A.M. Croteau. 2013. Innovation capability and performance of manufacturing SMEs: The paradoxical effect of IT integration. *Journal of Organizational Computing and Electronic Commerce* 23 (3): 249–272.

Raymond, L., and J. St-Pierre. 2010. R&D as a determinant of innovation manufacturing SMMEs: An attempt at empirical clarification. *Technovation* 30 (3): 48–56.

Roper, S., and J.H. Love. 2002. Innovation and export performance: Evidence from the UK and German manufacturing plants. *Research Policy* 31: 1087–1102.

Schumpeter, J. 1942. *Capitalisme, socialisme et démocratie, éd française*, Paris, Payot 1990.

Schumpeter, J.A. 1939. *Business cycles: A theoretical, historical and statistical analysis of the capitalist process*, 461. New York: McGraw-Hill Book Company.

Solow, R. 1987. We'd Better Watch Out, *New York Times* Book Review, 12 juillet.

St-Pierre, J. and C. Mathieu. 2004. 'Innovation de produits et performance: une étude exploratoire de la situation des PME canadiennes', 7ème Congrès International Francophone en Entrepreneuriat et PME, *Association Internationale de Recherche en Entrepreneuriat et PME (CIFEPME)*, 27, 28 et 29 October 2004. Available at: www.airepme.org

Subramanian, A. 1996. Innovativeness: Redefining the Concept. *Journal of Engineering and Technology Management* 13 (3/4): 223–243.

Tambe, P., L. Hitt, and E. Brynjolfsson. 2012. The extroverted firm: How external information practices affect innovation and productivity. *Management Science* 58 (5): 843–859.

Tidd, J., and C. Driver. 2000. Technological and market competencies and financial performance, in J. Tidd (ed.) *From knowledge management to strategic competence*. London: Imperial College Press.

Tirole, J. 1995. *Théorie de l'Organisation Industrielle, Economica et The Theory of Industrial Organization*, MIT Press.

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