ADOPTION OF INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) IN SMALL AND MEDIUM ENTERPRISES (SMEs): THE CASE OF CAMEROON

A THESIS

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CERTIFICATION

This thesis entitled “Adoption of Information and Communication Technology (ICT) in Small and Medium Enterprises: the Case of Cameroon”, by “Ntwoku Tchuinkep Habib”, under the supervision of “Yukihiko Nakata”, Ritsumeikan Asia Pacific University, Japan, is hereby submitted for the partial fulfillment of the Masters in Business Administration in “Innovation and Technology Management”. This research has not been submitted in any other university or institution previously for the award of a degree.

APPROVED BY

DECLARATION

I, "Ntwoku Tchuinkep Habib", hereby declare that the work presented herein is genuine work done originally by me and has not been published or submitted elsewhere for the requirement of a degree program. Any literature, data or works done by others and cited within this dissertation has been given due acknowledgement and listed in the reference section.

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ABSTRACT

SME development programs have become a priority in many economies worldwide and have seen an increasing proportion of developing countries embarking on SME policies for economic growth and poverty alleviation. In this knowledge-based era, ICT has been presented as an important device to overcome the inherent challenges that make SMEs vulnerable. Despite recent reports on the success of information-rich economies, many developing countries are still not catching up with the trend. It is therefore important to analyze the adoption of ICT at the SME level in developing countries.

The analysis of the adoption of ICT at the SME level was based on the SME sector in Cameroon. Initially, it was verified that there is a relationship between ICT diffusion and SME performance using cross-country evidence. From these results, we recommended the implementation of ICT development policies in order to improve SME growth.

By fitting the Bass model to the actual data of adopters in Cameroon SMEs, it was found that the decision to adopt both computers and internet was mostly influenced by imitation, word-of-mouth. From these results, promotion of inter-firm cooperation was proposed to speed up diffusion. Also, SMEs with greater sizes, multiple number of plants and whose owners have higher education have a greater tendency to adopt computers. From these analyses, training programs were recommended to help SME owners improve their skills for a better adoption.

In sum, an analysis of ICT adoption is important for decision making regarding development policies.

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LIST OF ABBREVIATIONS

ICT: Information and Communication Technologies

IT: Information Technology

GDP: Gross Domestic Product

GSM: Global System for Mobile

ME: Medium-sized Enterprises

SME: Small and Medium Enterprises

SE: Small-sized Enterprises

TAM: Technology Acceptance Model

TPB: Theory of Planned Behavior

TRA: Theory of Reasoned Action

UNCTAD: United Nations Conference on Trade and Development

VoIP: Voice over Internet Protocol

VSAT: Very Small Aperture Terminal

VSE: Very Small Enterprises

1. INTRODUCTION

1.1 Background of Study

Lately, governments in both developing and developed countries have initiated programs meant to enhance the development of Small and Medium Enterprises (SMEs). Advocates of SME policies such as the World Bank argue that SMEs enhance competition and entrepreneurship, which in turn has external benefits on economic-wide efficiency, innovation and aggregate productivity growth (Beck, Demirguc-Kunt, & Levine, 2005). More so, they advance that SMEs have the potential to create jobs due to their labor-intensive nature. These attributes have made SME development programs a priority in many economies worldwide and has seen an increasing proportion of developing countries embarking on SME policies for economic growth and poverty alleviation. While there are many skeptical views concerning the validity of Pro-SME policies, the fact that SMEs account for a large share of firms and employment in developing countries is a good enough reason to focus on them.

However, SMEs have some intrinsic characteristics that make their sector very vulnerable and ephemeral. SMEs, as an entity, are inherently short of cash and have a limited range of markets. They lack funds for extensive marketing strategies and are thus compelled to operate in small markets (Burns, 2001). This makes it difficult for small firms to diversify their business risk and also obliges them to make short-term decisions. Consequently, SMEs generally have a lower life span than large firms do and their development is a sensitive issue.

"In the twentieth century, mankind made a transition from a matter-based economy to a knowledge-based economy" (Contractor & Lorange, 2002). Hence, entities started drifting away from emphasis on natural resources to focus on ideas,

design and organization. This shift was a game changer for SMEs since it had the potential of helping to level the competition between firms of different sizes. This is because in this paradigm, knowledge resources rather than physical resources determine growth. Scholars such as Burton-Jones (1999) then proposed models based on knowledge-led growth, knowledge-centered organizations and knowledge supply to enable companies to thrive in this novel economic environment. Most of these models are focused on information transfer within or without the company boundaries.

Turban, Leidner, Mclean, & Wetherbe (2004) claim that information technology (IT), an organization can help build the organizational memory and knowledge to withstand any challenge in the business environment at any given time. They insist that knowledge, as an asset, must be exchangeable among persons, and must be able to grow in order for an organization to succeed. Information and Communication Technology (ICT) has established itself as one of the most effective tools to exchange and cultivate knowledge. Recent literature has thus addressed the importance of modern ICTs in the management of knowledge through disciplines such as "Knowledge Management System". This implies that ICT has become a determining factor of the success of an organization in this knowledge-based era.

It is safe to say that, the advent of internet and other modern information and communication technologies, changed the rules of the game. The strongest individuals or business entities are those with the most access to relevant information- and who take proper advantage of it (Arreymbi, Agbor, & Adnan, 2008). Firms thus regard ICT as an important tool to achieve competitiveness in the knowledge-based economy. It is no surprise ICT has been presented as an important weapon to combat the inherent disadvantages of small firms discussed above.

OECD (2004) for example, believe that in an effort to boost SME growth, ICT should be seen as a crucial factor to help overcome the current problems faced by Small and Medium Businesses. This institution demonstrated that ICT and e-business applications provide many benefits across a wide-range of intra- and inter-firm business processes and transactions. Consequently, government and development agencies have been encouraging the adoption of ICT in an attempt to boost economic growth through SME growth in developing countries especially.

Despite these advantages, rapid growth of ICT at the firm level in developing countries is yet to materialize. Arreymbi *et al.* (2008) highlighted that despite recent reports on the success of information-rich economies, many developing countries are still not catching up with the trend. It is thus important to analyze the adoption of ICT at the SME level in developing countries. The pertinent research questions thus follow;

1) Is there a relationship between ICT Adoption and SME's performance?
2) What influences the decision to adopt ICT at the SME level?
3) What are the demographic characteristics of ICT adopters?

Answering these questions would enable a better understanding of the relevance of ICT adoption to the SME level. It would equally give indications of how the acceptance and diffusion process of ICT takes place in the SME sector. Studying the diffusion process would help find out which SMEs acquired ICT, when they did so and the reason that led them to do so at one given time or another. If the SMEs can be identified according to the moment in time at which they adopted ICT, the behavior of the SMEs concerned could be characterized. Such information could help speed the acceptance and diffusion of ICT at the SME level, if at all deemed necessary

The study was conducted in Cameroon SMEs. Cameroon is a developing country located in Central Africa. The Cameroon government has been seeking ways to boost its economic growth and alleviate poverty. In this light, the government, coupled with the support of World Bank has turned to SME development policies to address its issues. The increasing interest in SMEs in the country, has been justified by the establishment of a ministry in charge of Small and Medium Enterprises in 2004.

The fact that Cameroon was one of the first African countries to adopt the GSM system back in 1989 (Emage, 2006) shows that it has always strived to be a frontrunner as far as ICT is concerned in Africa. Cameroon has struggled to enact several policies aimed at improving ICT infrastructure in the territory. Hence, the investigation of ICT diffusion in Cameroon SMEs is important since it could help suggest better policies to speed its diffusion.. Equally, it could help determine whether policies directed at ICT development in order to improve SME's welfare are legitimate. It is worth mentioning that computer ownership and internet access within the SMEs were used as a proxy of ICT, in this study.

1.2 Objectives

The main objective of the research is to analyze the adoption of ICT at the SME level using Cameroon, a developing country, as case study. In order to reach this goal, the following specific goals must be attained;

1) To examine the relationship between ICT diffusion and SME performance using a cross-country evidence.
2) To find out the factors that influence the decision to adopt ICT in Cameroon SMEs
3) To identify SMEs according to the moment in time at which they adopted ICT
4) To explore whether the behavior of the SMEs that adopted ICT could be characterized by their demography.
5) To establish the reason for adopting or rejecting ICT at the SME level in Cameroon.
6) To recommend policies based on the findings.

2. LITERATURE REVIEW

2.1 Role of SMEs in the Economy

There has been a lot of back and forth arguments about the importance of SMEs and whether or not governments should employ pro-SME policies in view of boosting economic growth. Lately, scholars, government agencies, Nonprofit Organizations (NPOs), and companies have drawn increase attention at the SME sector. In developing countries especially, pro-SME policies have been vaunted as a great tool for poverty reduction and rapid economic growth (Beck, Demirguc-Kunt, & Levine, 2005). Equally, pro-SME policies have been encouraged in developed countries as they are considered to play an important role in creating new industries, increasing employment opportunities, encouraging competition in the market and vitalizing regional economies (Tsukahara, 2006). Studying past literature will help clarify on this matter and for context sake, emphasis shall be laid on developing countries.

2.1.1 Definition of SMEs

SMEs statistical definition usually varies per country. However, most of the time the choice whether or not a company is an SME is based on the number of employees, value of assets or value of sales (Hallberg, 2000).

In Japan for example, the new Small and Medium Enterprise Basic Law set the definition of SMEs based on number of employees, capital size and industry. Here, company in the wholesale industry is considered an SME if it has not more than 100 million yen as capital and less than 100 employees; for the retail and service industry, the upper limit is 50 employees and not more than 50 million yen for capital. Enterprises in the manufacturing and other industries should have 300 or less employees with a capital of not more than 300 million yen to be considered in the SME sector

(Small and Medium Enterprise Agency Japan, 2000). For the USA, it is 500 employees and for European Union countries, it is 250 employees (Hallberg, 2000).

There is also a sector which some might refer to as microenterprises. This generally involves businesses with not more than five (5) employees. It is also believed that a significant proportion of these microenterprises are usually in the informal sector or shadow economy.

Generally, countries adopt different statistical definition for SMEs based on their different policy targets. Nowadays, most economies have policies put in place to cater for the SME sector. Governments thus establish these definitions based on the proportion of companies in the economy that they believe require special attention. In other words, the definition of SMEs set by a country depends on its policy concept or priorities. For example, Japan changed its policy concept from "rectifying the gap between large firms and SMEs in terms of productivity" to "developing and growing a wide range of SMEs for greater economic vitality" (Small and Medium Enterprise Agency Japan, 2000).

. This orientation led to an alteration in definition of SMEs as they increase the upper limit of capital size in order that their pro-SME policies can cover a wider range of companies.

More generally, it is noticed that governments of developed countries set greater upper limits of number of employees and capital size than developing countries when defining the SME sector. A logical reason for this could be the fact that companies are more productive in thriving economies. Also, rich economies can afford to cover a larger proportion of businesses with government spending than developing economies can.

2.1.2 Debate on SME Policy Promotion

There has been a lot of back and forth discussions regarding the role of SMEs in the economy. Lately, governments and nonprofit organizations across the world have been encouraging policies directed at developing the SME sector. Such pro-SME policies include provision of subsidies, training programs and others. Government agencies have paid unprecedented attention to SMEs. Countless countries have created a separate ministry in charge of Small and Medium Enterprises. Developing countries have been encouraged by international organization to follow the SME route in order to achieve economic welfare. It is mostly believed that development of the SME sector would help reduce poverty and boost economic growth. Scholars have conflicting views on these assertions. Discussing their various views could help locate the significance of SME related studies to policy makers.

SME advocates advance that SMEs increase the number of firms in the market. This leads to intense competition and thus compels firms to be more competitive and creative. Simply put, SMEs development encourages competitiveness and entrepreneurship. In such an environment firms become more efficient and productive in order to survive. This overall results in economic-wide efficiency, innovation and productivity growth (Beck, Demirguc-Kunt, & Levine, 2005).

Secondly, some scholars claim that SMEs are more productive than large firms are, but the fact that they lack financial markets and other institutions' support, hinders their growth. It is well known that one of the major problems faced by SMEs is finding resources to finance growth. Despite their productivity, SMEs have limited financial instruments available to fund their projects. This renders direct government financial

support and other pro-SME programs necessary to fill the gap and keep this fertile sector healthy (Beck, Demirguc-Kunt, & Levine, 2005).

Thirdly, SME proponents argue that the expansion of this sector would increase employment since this sector is considered more labor-intensive with a higher job creation capacity (Hallberg, 2000). As a result, subsidizing this sector could be a good strategy to combat poverty. In developing countries for example, a considerable fraction of SMEs operate in the informal sector. Hence, pro-SME programs might promote migration of informal businesses into the formal sector to have access to finance. This could help these SMEs expand further while simultaneously enabling the government to recoup revenue that is lost to the shadow economy. This win-win situation would aggregately improve economic welfare.

An important factor that has been added recently as an argument for SME-policy, is the fact that SME development contribute to social transformation to a democratic, market-based system as pointed out by Smallbone & Welter in 2001.

However, there are skeptical views on the efficacy of the SME-focused policies. Some scholars argue that large firms can enjoy economies of scales, which in turn cuts down production cost and can thus make companies more efficient. Also, economies of scale gives firms a better opportunity to invest in R&D (Research and Development) with positive productivity effects. Large firms may consequently be a better option to enhance productivity and innovation than SMEs.

Researchers have denied the assertion that SMEs contribute more to job creation. Although it is true that job creation rates are high for small firms, it is also noticed that their job destruction rates are equally high. SME sector is a ferocious environment with low survival rate. In other words, small firms have a high birth rate

and high death rate. Hence, the resulting net job creation rates in small firms might not match up with large firms on an extended period (Hallberg, 2000). This implies that large firms provide more secure jobs and therefore higher quality jobs than small firms do with an overall positive effect on poverty reduction. More so, empirical evidence shows that the type of industry more significantly determines the labor-intensity than the size of the firm within an industry does (Little, 1987). This translates that policies directed at subsidizing certain industries better address the employment issue than the pro-SME policies do.

A neutral view has been proposed where rather than focusing on pro-SME policies, the focus should be on improving the business environment. That is, emphasizing on the creation of a business atmosphere that favors competition and private commercial transactions. Although this view may somehow promote SMEs, it is initially aimed at improving the environment faced by all businesses, be it large or small firms.

From the above debate, we realize that pro-SME policies have very often being justified based on SMEs capacity to increase employment and better boost economic growth and efficiency. Nevertheless, empirical evidence does not always prove this true. So much so that, it is difficult to vindicate SME policies based on economic benefits. The question that naturally arises is whether the government should encourage policies aimed at developing the SME sector. The following section would attend to answer this question.

2.1.3 SME Contribution to the Economy

SMEs have been of vital importance to the welfare of different economies be it developing, transition or developed countries.

SMEs have a rather dynamic role in developed countries. Evidence from the US for example, show that SMEs are an important source of employment growth and innovation. Audretsch (2002) demonstrated that the net employment gain between 1990 and 1995 was greater among SMEs than among large firms. Also, SMEs had a patent rate per employees greater than that of larger firms.

In an attempt to prove how important the role of the government is to the development of SMEs in a transition economy, Smallbone & Friederike (2001) conducted survey in Eastern Europe countries. They argued that SMEs could grow and survive in adverse environments due to their entrepreneurial qualities. Nevertheless their contribution to economic development in terms of job creation, and external income generation will be limited if the government does not create a system that will favor the private sector development. In other words, they acknowledge the potential of SMEs to contribute to economic development but insist that this role can only be fulfilled if the government gives them the necessary ingredients to operate this sector.

Similar conclusions were drawn by Jepessen (2005) when working with developing countries. His paper was set to discuss whether and under what conditions SMEs can achieve their economic and social role in a developing country. Adopting a qualitative approach to investigate the case of SMEs in South Africa, he found that a small fraction of SMEs can contribute to economic and industrial development, but most cannot. Just like Smallbone and Friederike (2001), he concluded that SMEs contribution to economic development depends on whether the government has the

willingness and appropriate policies to promote the SMEs and went a step further by adding that the government should have the necessary resources and should receive international support to achieve its goals.

Using a cross-country approach Beck, Demirguc-Kunt, & Levine (2005) investigate whether SMEs have a causal impact on economic growth and poverty alleviation. They employed regression analysis on 45 countries in order to analyze the relationship between the size of the SME sector and both economic growth and measures of poverty alleviation. They concluded that directly subsidizing SMEs to boost economic growth and alleviate poverty is not justified empirically. In other words, using Pro-SME policies might not be the best way to combat poverty and accelerate growth despite the fact that a prosperous SME sector characterizes a flourishing economy.

Hallberg (2000) in his discussion paper conceded the argument that SMEs might not have a direct causal link with economic growth and poverty alleviation. However, he justified pro-SME policies by simply stating that SMEs account for a large share of firms and employment in the economy and should thus be catered to, for the economy's welfare. This argument is true for any country, be it a low-income country, middle-income country or even high income country. For example; A high-income country like Japan has about 90% of its companies being SMEs, low-income country like Cameroon has about 80% of companies in the SME sector. Thus, their predominant presence irrespective of the economy is a good enough reason to attend to them. More so, in developing countries, SMEs and micro enterprises are the emerging private sector. They could therefore form the base for private sector-led growth.

OECD Conference Proceedings strengthen this argument in 2004 by showing that SMEs contribute over 55% of GDP and 65% of total employment in high-income countries, while they contribute about 70% of GDP and 95% of total employment in middle-income countries and over 60% of GDP and 70% of total employment in low-income countries. In sum, the debate could be settled by recognizing that pro-SME policies are legitimate giving their large size and contribution to the economy.

It is important to understand the issues of SMEs in order to enact the policies that would best serve them. They lack funds for extensive marketing strategies and are thus compelled to operate in small markets (Burns, 2001). This makes it difficult for small firms to diversify their business risk and also obliges them to make short-term decisions. Consequently, SMEs generally have a lower life span than large firms do and their development is a sensitive issue.

More so, globalization has made the SME sector even more ferocious since enterprises face major challenges in strengthening their human and institutional capacities to take advantage of trade and investment opportunities (OECD, 2004).

In developing countries especially, SMEs are challenged by the globalization of production and the shift in the importance of various determinants of competitiveness (Wolf, 2001). More so, the rapid spread of ICT and continuous decrease in communication cost has resulted in more integrated markets in different parts of the world. This means that in an attempt to enhance competitiveness of the SME sector at national and even international level, it is crucial for governments to consider the ICT factor in their policies. Nowadays, information technology is pivotal in many businesses. It is difficult to gain competitive advantage and survive without some

adoption or implementation of this advancement in technological products (Kharuddin, Ashhari, & Nassir, 2010).

2.2 Relationship between ICT Adoption and SMEs

At this point, it is clear that ICT has benefits that cut across different sectors of an economy in both developed and developing countries. "ICTs have the largest beneficial impact in conjunction with other changes, including a new set of ICT skills/training, structural changes within business models and the economy, and institutional and regulatory adjustments" (ITU, 2006: 39).

Various studies have been undertaking to show the relationship between the adoption of ICT and business performance or to empirically prove the benefits of ICT usage to business entities. According to some scholars, these advantages might be enjoyed differently depending on the country, industry or firm concerned. Hence, it is important to consider the economy being scrutinized when making assumptions.

Studies have shown that ICT investments contribute to returns at the firm level. Using Solow's Model, Dedrick, Gurbaxani, & Kraemer (2003) showed that although there is a significant IT contribution to returns, the magnitude of contribution varies extensively across the firms. In other words, some firm with similar IT investment might have performed differently. There was strong evidence that the difference in performance was influenced by organizational capital. Organizational capital here refers to management practices such as job training, business process restructuring, and others. In simple terms, ICT investment yields corresponding returns for the firms who perfectly integrate ICT into their organizational structure. This view is commonly accepted by most scholars and could be expanded to industries and even country economies.

The above literature makes it clear that when gauging the benefits of ICT to performance, it is useful to look further than just the direct relationship between these two variables. As a matter of fact, "ICT is not simply a tool for automating existing processes, but is more importantly an enabler of organizational changes that can lead to productivity" (Dedrick, Gurbaxani, & Kraemer, 2003). Thus, ICT adoption might lead to different outcomes in different entities.

For example, Morikawa (2004) undertook a study in Japan to analyze the relationship between ICT and innovation activities in the SME sector and also the relationship between ICT and profitability. Having response from questionnaires distributed to a considerable sample of SMEs, regression analysis was made. It was discovered that there is a positive relationship between IT equipment and firm's performance. In other words, ICT diffusion was found to be a reliable indicator of better performance especially when it comes to small firms. He concluded that the Japanese policy aimed at encouraging ICT diffusion among Japanese SMEs was viable. However, the relationship should not be considered quantitative since the data used was of a discrete nature. More so, as earlier mentioned, caution is required when using these results for deductions, as results might vary depending on each country's institutional structure.

Lopez-Nicolas & Soto-Acosta (2010) looked at the benefits of ICT to SMEs from a different angle. They sought to evaluate the effect of ICT adoption and usage on Organizational Learning (OL) in SMEs. They sampled SMEs of not less than 10 employees in a particular region of Spain and distributed questionnaires to help them measure the knowledge creation processes. Employing hierarchical regression analyses, they found that adoption of ICT enhances SMEs knowledge creation, which in turn

enhances Organizational Learning. These findings are important as they show one of the ways in which ICT adoption could be appropriately molded into the organization to eventually improve SME performance.

Kharuddin, Ashhari, & Nassir (2010) made a study directed at finding out if informed decision enables the SMEs to increase business efficiency and stay competitive. To investigate this pertinent issue they focused on the adoption of accounting information systems in SMEs in Malaysia. The research proceeded through questionnaire and data was collected for a five year period for the SMEs in question. Using regression analysis to analyze the resulting panel data, it was found that adopting information systems is crucial for SMEs as it helps improve business efficiency and competitiveness. More generally, it could be interpreted that information systems provide SMEs with the right capabilities and resources to overcome the competitive pressure from within the SME industry and also from the larger firms. Although their study was focused on information system, the results could be translated to ICT overall as it is impossible to dissociate information system and ICT.

In trying to examine the impact of ICT use on SMEs in Africa, Susan Wolf (2001) used enterprise survey data from two East African countries to study how ICT usage influences micro-level competitiveness. On the same token, she sought to analyze the macroeconomics of ICT diffusion and its growth effect. Using descriptive and regression analyses of the SME data, it was found that ICT investment has a great influence on total factor productivity once a certain limit is passed. At the macro level, using an information-theoretic approach it was established that ICT is instrumental in reducing information asymmetry. This in turn could create new opportunities and

enhance the efficiency of resource allocation. From a macro perspective this would then lead to faster growth and diversification of the economy

In an endeavor to have more generalized results on the relationship between ICT adoption and SME performance, some scholars have employed a cross-country approach. Despite its advantages in drawing more generalized conclusions, this approach is not prevalent due to the absence of comparable international data on SMEs (Beck, Demirguc-Kunt, & Levine, 2005).

Patrakosol & Lee (2009) undertook a research to determine how IT utilization contributes to better relationship-level inter-firm performance between two countries; USA (developed country) and Thailand (developing country). Basically, the study was set to show that IT technical capabilities had a positive relationship with inter-firm performance across the two countries. Surprisingly enough, they found that technical IT capabilities benefited inter-firm relationship in Thailand (the developing country) more than in USA the developed country. More so, in Thailand IT adoption had a greater impact on innovation performance than in the USA. Overall, it was shown that ICT capabilities helps improve inter-firm performance.

Another cross-country research in this field was conducted by Ark et Al.,(2002) to scour the contribution of ICT to productivity growth at the macro-level. Here, 16 (sixteen) OECD countries were sampled and re-categorized into two (2) sets, namely; European Union and North America for easy comparison. These countries' industries were grouped into ICT producing, ICT using and non-ICT using industries and their corresponding contributions to Gross Domestic Product (GDP) was computed. The difference in productivity growth between EU and North America could be successfully explained using ICT diffusion in these regions. This implies that the

productivity growth rate of the nations concerned was very much linked to the proportions of the ICT groups mentioned above.

So far, it could be seen that most studies aimed at establishing a relationship between ICT and SME performance consider two variables; the firms' productivity and ICT investments. However, there are still conflicting views when investigating the relationship between them at the macro level. Using a cross-country approach to examine the association between ICT diffusion with respect to SMEs productivity might help settle these differences. This explains the choice of the methodology in this paper

2.3 Models and Theories of Adoption/Diffusion of ICT

So far, many theories and models have been proposed to interpret the adoption of ICT in a system. Studies on ICT adoption tend to take three (3) main approaches according to Pedersen (2003), namely the adoption approach, the domestication approach and the diffusion approach.

2.3.1 Adoption Approach

In this approach, social and individual decision-making concepts are applied in order to explain the adoption decision of users. Some well-known models in this sphere are; Technology Acceptance Model (TAM), Theory of Reasoned Action (TRA), and Theory of Planned Behavior (TPB). The TAM suggests that when individuals are presented a new technology, a number of factors influence their decision about how and when they will use the said technology (Manueli, Latu, & Koh, 2007). These factors are perceived usefulness and perceived ease of use. These theory was introduced by Davis (1989) and has since then been used by many scholars in the technology adoption related studies. TAM is sometimes criticized for not controlling external factors (variables) such as economic factors, influence from competitors, suppliers and other

effects in its analysis of the decision-making factors. The Theory of Reasoned Action (TRA), which was introduced by Fishbein and Ajzen in 1975 and 1980 respectively, has been integrated into the TAM to overcome some of its weaknesses. The TRA is based on behavioral intentions; one's attitude towards performing the behavior and one's subjective norm with respect to performing a behavior. Theory of Planned Behavior (TPB) is an extension of the TRA. It deals with conditions where the individual has no control of their behavior (Manueli, Latu, & Koh, 2007). This model has been applied to decipher people's behavior in several fields such as public relations, advertising campaigns and others.

Studies of Adoption of new technologies are usually applied for marketing research. As industry players can use this model to evaluate the adoption potential of a new product. For example, Pedersen (2005) in his study on the adoption of mobile internet services, found that there was a significant relationship between perceived usefulness of the technology and external influences such as disposable income of households. This kind of findings can help the service provider when trying to sell his product in a new locality.

2.3.2 Domestication Approach

Domestication approach focuses on the process in which technology becomes an integral part of our everyday habits (Manueli, Latu, & Koh, 2007). Thus, it emphasizes on the process by which a technology find its way into our day-to-day activities. This approach emerged from an empirical and theoretical projects influenced by emerging literature on consumption in the early 1990s (Katz, 2003). Pederson (2005) suggests that domestication research findings should be used to provide a model that would explain the adoption of complex technologies such as mobile telephony services.

Studies of this sort could be aimed at explaining the adoption process or describing the consequences of a new product's use from a social perspective.

Fischer (1992) using a domestication approach analyzed how the telephone technology permeated and transformed the essence of daily activities. Other technologies that have been studied using this approach are television and personal computers (Silverstone & Haddon, 1996). Here, they focused on explaining the dynamics of innovation, by privileging the role and perspective of the consumer. In other words, they looked at ICT as a social and cultural process.

2.3.3 Diffusion Approach

A classical diffusion approach is Rogers diffusion of innovation theory. Rogers diffusion of innovation theory involves the process by which an innovation is communicated through certain channels over time among the members of a social system (Rogers, 1962). Here, the characteristics of the innovation as perceived by the members of a social system, determine its rate of adoption. This theory comprises four elements: innovation, communication channels, time and the social system. In sum, new ideas are conveyed through networks and depending on the nature of the network and the role of its opinion leaders, the innovations are either adopted or rejected (Manueli, Latu, & Koh, 2007).

a) Innovation

The characteristics that determine how quickly an innovation is adopted are; relative advantage over existing products, compatibility, complexity, trialability, observability to the people within the social system.

b) Communication

Two main communication channels through which information get from one individual to another, are identified; mass media channels; which are more effective in creating knowledge about innovation and interpersonal channels; which are more effective in changing attitude towards a new idea. These two channels influence the decision to adopt or reject a new idea.

c) Social system

The social system comprises a boundary within which an innovation is diffused. The focus here is on how the social system's structure affects the diffusion.

d) Time

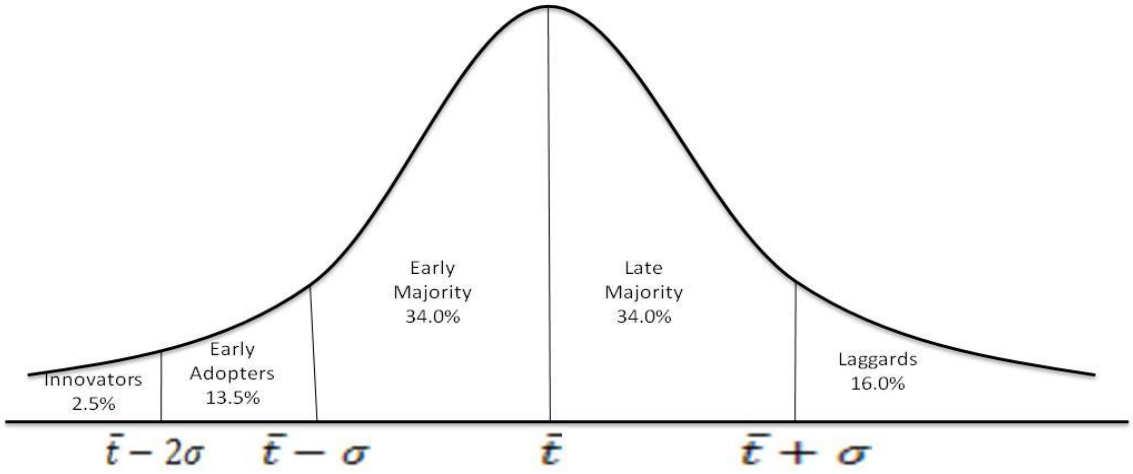
The time dimension could be implicated in the diffusion process in three ways; innovation decision process, innovativeness and rate of adoption. The innovation decision process is the mental process through which an individual passes from first knowledge of an innovation to confirmation of his decision. Innovativeness is the degree to which an individual is relatively earlier in adopting new ideas than others. Rate of adoption refers to the number of members of the system that adopt innovation in a given time.

Rogers (1983) developed a methodology to determine the adopter categories. Here, he assumed that noncumulative adopter distribution follows a bell-shaped curve. Thus, the mean time of adoption ($\bar{t}$) and its standard deviation (σ) is required in order to generate the normal adopter distribution. Following the inflection or turning points of the normal curve, five adopter categories could be derived, as presented on Table 1 below.

Table 1: Adopter Categorization of Rogers Diffusion Model

Adopter Category	*% Adopters*	*Areas covered under normal curve*
Innovators	2.5	Beyond $\bar{t} - 2\sigma$
Early Adopters	13.5	Between $\bar{t} - \sigma$ and $\bar{t} - 2\sigma$
Early Majority	34.0	Between $\bar{t}$ and $\bar{t} - \sigma$
Late Majority	34.0	Between $\bar{t}$ and $\bar{t} + \sigma$
Laggards	16.0	Beyond $\bar{t} + \sigma$

Source: Hashim (2007)



Source: Martinez, Polo, & Flavian (1998)

Figure 1: Adopter Categorization of Rogers Diffusion Model

Rogers model of diffusion is easy to use. More so, the fact that the diffusion curve is assumed to be normal, permits the continuous acceptance of the product to be included and predicted in the adopter categories. In addition to this, it offers mutually exclusive standardized categories, which allow results to be compared, replicated and generalized across studies (Mahajan, Muller, & Srivastava, 1990). This attributed has made Rogers diffusion model one of the most accepted and employed model to investigate diffusion of products.

2.3.4 Bass Diffusion Model Vs Rogers Diffusion Model

Despite Rogers model simplicity, it provides no analytical or empirical evidence of why the size of the adopter categories should be the same for all new products (Mahajan, Muller, & Srivastava, 1990). In other words, its theoretical constitution does not explain why the size of innovators should be 2.5% regardless of the product being concerned. More so, Peterson (1973) argued that it is misleading to apply the basic normality assumption to different type of innovations and innovations environment. To prove the normality assumption is far from reality, he cited a number of instances where the product or innovation exhibited a non-normal distribution of adopters.

Mahajan, Muller, & Srivastava (1990) showed that the Bass diffusion model could be a more suitable way of developing the adopter categories of a new product. The reasons they advanced this premise is that;

1) The bass model does not assume the diffusion process exhibits a normal distribution,
2) It exploits certain unique analytical properties of diffusion models to derive adopter categories,
3) Inter-study comparisons can be made using the common values of the model's parameters that describe the adopter distribution,
4) Continuous acceptance of new products can be included in the adopter categories.

Bass diffusion model overcomes the shortcomings of Rogers model by generating a category structure which consist of a size of adopters not identical for all innovations. At the same time, it retains the advantages of Rogers model such as the

possibility of predicting and linking continuous acceptance of new products to the model and the opportunity to compare results across studies. More so, among the different diffusion models used, Bass model is the only one that explicitly considers the communication process for innovation diffusion proposed by Rogers (Mahajan, Muller, & Srivastava, 1990). This makes Bass diffusion model an ideal substitute to the classical diffusion approach proposed by Rogers. It is for this reasons that Bass model was made a basis for the study of diffusion of ICT in Cameroon SMEs.

2.4 Theoretical Framework of Bass Diffusion Model

The Bass model proposes that the probability of purchase of a product (or adoption of technology as the case may be) at a given point in time is a linear function of the total proportion of previous buyers driven by innovation and imitation (Bass, 1969).

$$P(t) = p + qF(t) \qquad (1)$$

Where:

$P(t)$: Probability of purchase

$F(t)$: Total proportion of previous buyers

p: coefficient of innovation (external influence)

q:coeffiecient of imitation (internal influence)

The coefficient of innovation, p, is most commonly accepted as the coefficient of external influence. That is, the spread of an innovation due to external sources of information such as mass media. This basically involves any agent other than prior adopters that could influence the diffusion process including sales people and

government agencies too. Similarly, the coefficient of imitation, *q*, is referred to as the coefficient of internal influence. That is, one that measures the spread of an innovation due to internal or interpersonal source of information such as word-of-mouth. In other terms, adoption of a technology here is as a result of personal contact.

The number of people who have not yet adopted the technology is 1 – *F(t)*. That is, the total fraction of potential adopters in a population (which is 1) minus the total proportion of previous buyers. From there, we can express the number of adopters at a given time t as the number of people who have not yet adopted times their probability of purchase, mathematically:

$$f(t) = [1-F(t)]P(t) \qquad (2)$$

Substituting *(1)* into *(2)* yields the following equation

$$f(t) = p + [q - p]F(t) - qF(t)^2 \qquad (3)$$

Integration of equation *(3)* yields the S-shaped cumulative adopter distribution, F(t) (the total proportion of previous buyers), which is modeled by Bass Model *(with p, $q \geq 0$)* as follows:

$$F(t) = \frac{1-e^{-(p+q)t}}{1+\left(\frac{q}{p}\right)e^{-(p+q)t}} \qquad (4)$$

Substituting equation *(4)* in equation *(3)*, yields the following model:

$$f(t) = \frac{p(p+q)^2 e^{-(p+q)t}}{(p+qe^{-(p+q)t})^2} \qquad (5)$$

Equation *(5)* above, yields the noncumulative adopter distribution. By employing a first and second order differential of equation (5) with respect to time *(t)*, we can find the turning points of the curve. Thus when $f'(t)=0$ we can derive the peak time of adoption denoted as T*.

The peak time of adoption, that is the point where *f(t)* reaches its maximum, should correspond to the inflection point of *F(t).* In other words, the point of time when the noncumulative adopters attain the critical mass should correspond to the time when the cumulative adopters reach the turning point of the S-shaped curve. Making *t* the subject of the equation when *f'(t)=0* yields the following results;

$$T^* = -\frac{1}{(p+q)} \ln\left[\frac{p}{q}\right] \qquad (6)$$

In the same light, we can compute F(T*), the total proportion of previous adopters at peak time T* and we can also compute f(T*), the number of adopters at peak time, T*. This is done by substituting the T* in the corresponding equations. Mahajan, Muller, & Srivastava (1990) went a step further to propose a method to determine innovation-specific adopter categories using this model. Mathematically;

$$F(T^*) = \frac{1}{2} - \frac{p}{2q} \qquad (7)$$

$$f(T^*) = \frac{1}{4q}(p+q)^2 \qquad (8)$$

Equally, the second order differential, $f''(t)$, of the noncumulative adopter distribution is;

$$f''(t) = \frac{-p(p+q)^4 e^{-(p+q)t}}{\left(p+qe^{-(p+q)t}\right)^4}\left[\left(p+qe^{-(p+q)t}\right)\left(-p+2qe^{-(p+q)t}\right)+3qe^{-(p+q)t}\left(p-qe^{-(p+q)t}\right)\right] \qquad (9)$$

Thus solving for t when *f''(t) = 0*, gives the following 2 solutions;

$$T_1 = -\frac{1}{(p+q)} \ln\left[(2+\sqrt{3})\frac{p}{q}\right] \qquad (10)$$

And, $$T_2 = -\frac{1}{(p+q)} \ln\left[\frac{1}{(2+\sqrt{3})}\frac{p}{q}\right] \qquad (11)$$

The observations on the curve could help determine the adopter categories. Studies have shown that trends can be used as an indication of the adoption pattern that the population of potential adopters may exhibit in its acceptance of the innovation

(Mahajan, Muller, & Srivastava, 1990). These trends can be obtained from the rates of change along the whole distribution. As a matter of fact, these trends for the Bass Model were summarized as illustrated in the table below.

Table 2: Different Trends of Adopters' Noncumulative Distribution

Time interval	$\frac{df(t)}{dt}$	$\frac{d^2f(t)}{dt^2}$
$0 - T_1$	*Increasing faster*	*Increasing rate*
$T_1 - T^*$	*Increasing slowly*	*Decreasing rate*
$T^* - T_2$	*Decreasing slowly and then faster*	*Increasing rate*
$T_2 - \infty$	*Decreasing fast and then slowly*	*Decreasing rate*

Source: Mahajan, Muller, & Srivastava (1990)

Based on these identified patterns, one can categorize adopters into four (4) groups, namely: early adopters, early majority, late adopters, and laggards. Following the noncumulative adopters distribution of the Bass model, one notices that the curve cuts the ordinate (y-axis). Thus *f(t=0)* is the fraction of adopters who initiated the diffusion process, also referred to as innovators. This assumption leads to five (5) categories of adopters just like Rogers Diffusion Model. This makes it easier to compare the size of each corresponding category in both models. In addition, it is worth mentioning that the categorization of the adopters of both models is based on the same analytic reasoning. That is, the classification of the adopters is based on the inflection points of each of the distributions.

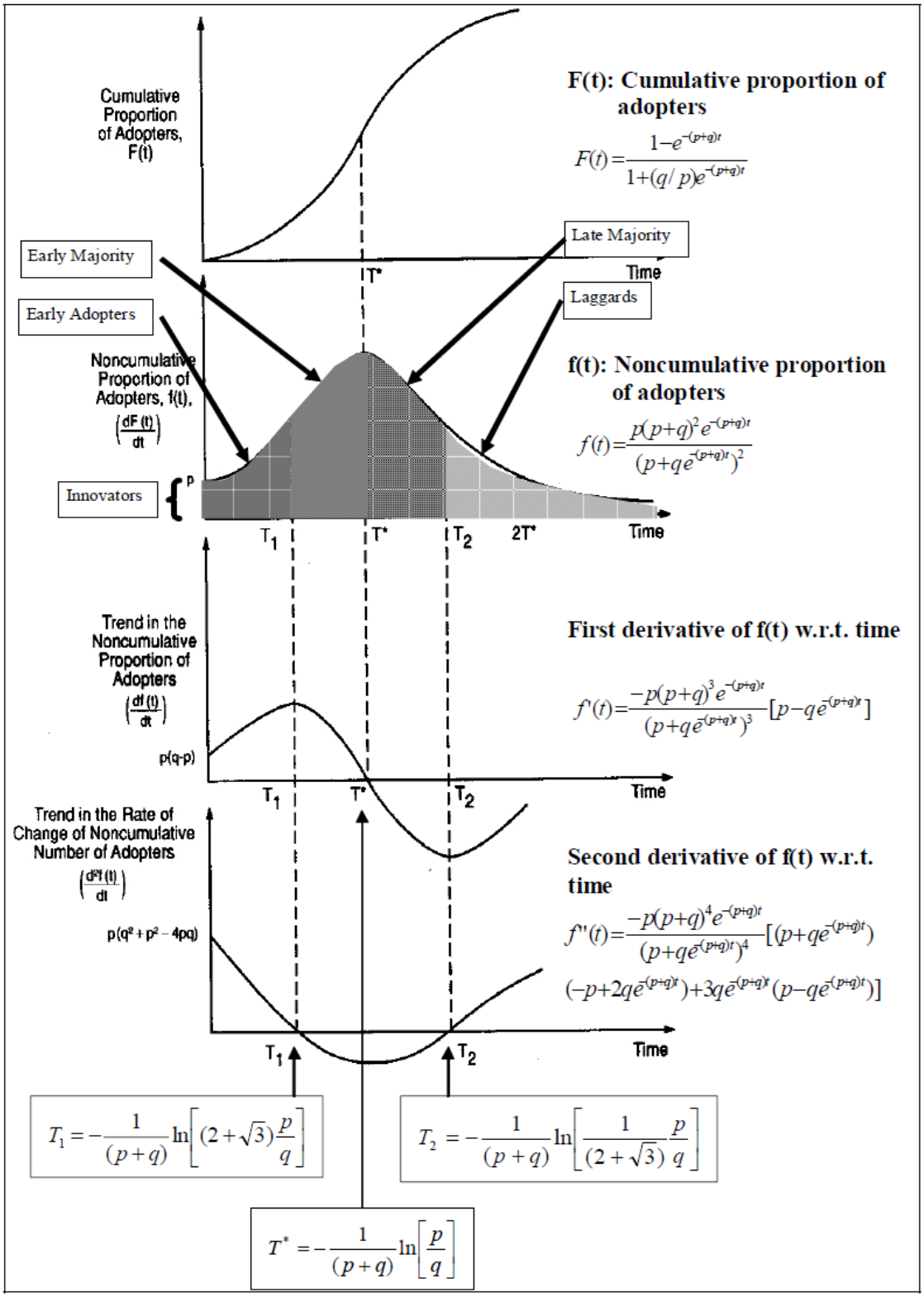
In addition to this, the size of each category of adopters can be calculated when the corresponding time intervals are known. In order to obtain the proportion of individuals included in each category of adopters, one simply has to calculate the cumulative proportion of adopters *F(t)* using the equation *(4)* at each of T_1, T^*, and T_2

respectively, and deduct the proportion in the previous categories. Table 3 describes this procedure.

Table 3: Different Category of Adopters in Bass Model

Adopter Category	Time Interval	Size of Adopter interval
Innovators	-	P
Early Adopters	Up to T1	p – F(T1)
Early Majority	T1 to T*	F(T*) – F(T1)
Late Majority	T* to T2	F(T2) – F(T*)
Laggards	Beyond T2	1 – F(T2)

Source: Wong, Yap, Turner, & Rexha (2011)



Source: Wong, Yap, Turner, & Rexha (2011)

Figure 2: Determination of Adopters Category using Bass Model

3. THE CASE OF CAMEROON

3.1 Introduction to Cameroon's Economy

Cameroon is located in the crossroad between central Africa and West Africa. It is a developing country blessed with a variety of natural resources. It is often referred to as "Africa in miniature" since it embodies most of the continents characteristics. It is a very diverse country with a multitude of landscapes, climates and ethnicities. Cameroon currently has a population of about 19.9 million according to the United Nations(2010) spread over 475,000 km^2.

After independence in the 1960s, agriculture accounted for more than 40% of the GDP, while secondary sector contributed about 15%. Economic growth was mostly generated from a mixture of cash crops and subsistence crops. The economic growth was accelerated after the discovery of oil in the 1970s. The exploitation of oil coupled with intense agriculture saw the Gross Domestic Product (GDP) and export raise greatly. The resulting internal and external surpluses caused an increase in both private sector and government investments (Soderling, 1999). Cameroon thus experienced an economic boom with its growth rate increasing at an average rate of 6% per year with crude oil and agriculture being its main source of growth.

In 1986, when the market prices of oil, cocoa and coffee plummeted, Cameroon's economy collapsed. The CFA franc became overvalued thus making Cameroon's agric products more expensive and less competitive on international markets. These series of events plunged the country's economy into a long and deep crisis, which ended in 1995 after the currency was devalued (Nkama, 2006).

The government of Cameroon with the support of the World Bank and UNDP set up a macro-model aimed at identifying the country's main economic aggregates.

This framework was put in place to ultimately serve the Poverty Reduction Strategy Program (PRSP) directed at speeding economic diversification and boosting GDP (Nkama, 2006).

More recently, real economic growth accelerated to 4.1% in 2008, thanks to good results in the oil sector, ongoing infrastructure work, increased energy supply and programs to boost agriculture (African Development Bank, 2009). In an attempt to improve these results, the government has launched many development projects across the nation. The government has also put in effect policies aimed at promoting SME growth to achieve its goals.

3.2 SME Law in Cameroon

According to the Cameroon Law, SMEs are subdivided into three groups; Very Small Enterprises (VSEs), Small-sized Enterprises (SEs) and Medium-sized Enterprises (MEs). The SMEs are categorized in the National SME file on the basis of number of permanent employees and turnover when they registered. A company is considered a VSE if it has no more than 5 employees and an annual pre-tax turnover of no more than 15 (fifteen) million CFA francs. SEs are companies with 6 (six) to 20 (twenty) employees and an annual pre-tax turnover ranging from 15 (fifteen) million to 100 (one hundred) million CFA francs (National Assembly of Cameroon, 2010). An enterprise shall be considered an ME if it has 21 (twenty one) to 100 (one hundred) employees and an annual pre-tax turnover of more than 100 (one hundred) million CFA francs and less than 1 (one) billion CFA francs. Some difficulties might arise when trying to classify an enterprise, in that case the main criterion considered becomes the annual pre-tax return. However, for an SME to be considered as being setup it must fulfill the conditions for legal existence and the formalities specified by the law and regulations in force.

In order to support and oversee the policies above, the ministry in charge of Small and Medium Enterprises was created in Cameroon in 2004. Among others, this ministry has the responsibility to (National Assembly of Cameroon, 2010);

- To promote and supervise SMEs
- To help enhance socio-economic development of the country
- To establish, in partnership with other professional bodies, a database for investors in this sector
- To undertake studies in view of promoting information flow and migration of informal enterprises into the formal sector

The National Institute of Statistics in partnership with Social Security body (CNPS) latest survey in 2003 indicates that 80% of companies in Cameroon are SMEs. As a matter of fact out of 72,258 enterprises registered to the CNPS, 57,806 are in the SME sector (Research ICT Africa, 2006). The Littoral region leads the pack with 46.9% followed by the Center region with 19.4%. This explains the choice to conduct the survey for this study in these 2 regions since they account for about two third of the total population of SMEs in the country.

These figures should be taken with caution as they could be misleading since they just account for the companies registered with the Social Security body. However, a significant number of businesses in Cameroon operate in the informal sector and are thus not taken into consideration in the above statistics.

3.3 Current State of ICT in Cameroon

ICT in Cameroon is still in an infant stage. In most developed countries, access to computers, internet, telephony, radio and television are considered basic goods, which should be available to everyone in the society, this is not the case in Cameroon (Linden, 2011). Despite the increase in telecommunication market by more than 30% per year since 2002, penetration and usage is still far from adequate due to limited availability and affordability (Emage, 2006). However, the proliferation of cybercafés and public telephones has been helping fill this void. Emage (2002) adds that, ICT demand and usage is currently driven by personal activities or market strategies of the communication providers due to absence of coherent ICT policy.

Attributes of mobile and wireless technology systems such as low overhead cost, digitalized networks, falling costs of technological devices and ease of use, have helped facilitate their penetration into localities of the country. The mobile subscriptions have been growing at over 270% per annum for the last five years and now represent well over 80% of all phones in the country (Emage, 2006). In 2008 estimates showed that about 80% of the population had access to a phone (Arreymbi, Agbor, & Adnan, 2008).

However, looking at the Internet connectivity the number is still very low and the awareness of Internet among the general population is often nonexistent as the Internet penetration level is just around 4% in 2009 (Linden, 2011). The most popular Internet services are the Web, site hosting, e-mail, discussion forums and voice over Internet protocol (VoIP) service. Connections are by very small aperture terminal (VSAT) technology, public switched network, radio or wire leased line, or wireless (Wifi) (African Development Bank, 2009).

4. METHODOLOGY

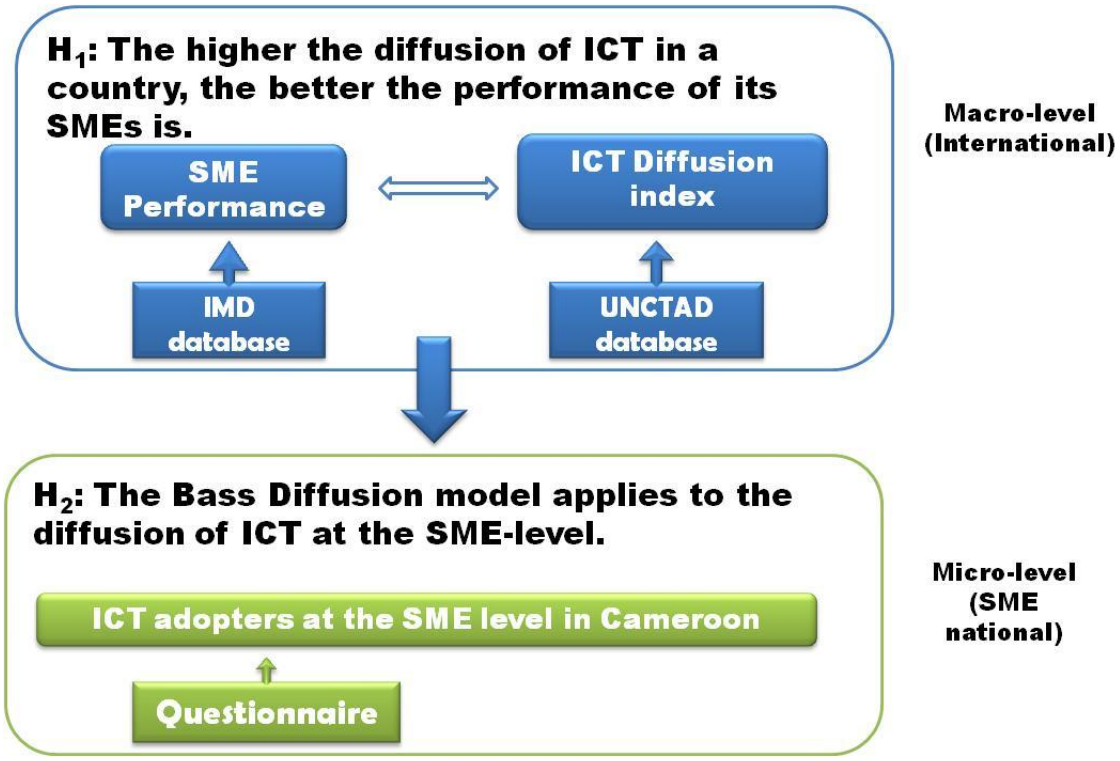


Figure 3: Research Framework

4.1. Collection of Data

In order to verify the first hypothesis, it is important to collect data for SME performance and ICT Diffusion. Data for SME performance was obtained from IMD (World Competitiveness online) database. The IMD data provides an SME efficiency index for 58 countries based on their impact on global economy. These 58 countries shall be used in our cross-country analyses. As for ICT Diffusion, the data was collected from United Nations Conference on Trade and Development (UNCTAD) report, and is solely based on the year 2005.

The ICT Diffusion index is designed to evaluate ICT development using indicators of ICT diffusion across countries (United Nations Conference on Trade and

Development (UNCTAD), 2006). It measures the ICT diffusion index by averaging dimensions of connectivity and access. Connectivity here comprises the indicators; internet subscribers per capita, number of PCs per capita, number of telephone mainline per capita and the number of mobile phone subscribers per capita. Whereas Access consists of; the cost of local calls, GDP per capita, adult literacy rate and internet users. Index scores for each of these indicators are computed using the formula; value achieved / maximum reference value. Then the corresponding indicators are averaged in order to obtain the measure for access and connectivity.

The SME performance and the corresponding ICT diffusion index for the year 2005 across the given 58 countries was then correlated in order to establish, if any, a relationship between these two variables.

The second part of the research involved the distribution of questionnaires to SMEs in Cameroon. The questionnaire is designed to obtain information about adoption of ICT at the SME level in Cameroon. One hundred (100) questionnaires were personally distributed in two (2) regions of Cameroon; Littoral region and Central region, the economic and administrative capitals respectively. A purposive sampling was conducted in these two regions in order to reach the targeted sample in due time.

In order to model the diffusion pattern of ICT for SMEs in Cameroon using Bass model, the data required is the time of its adoption. The constructed questionnaire therefore sought information in the following areas; (a) adoption time of ICT proxy, (b) characteristics of the respondents, (c) Reasons for adoption or rejection of ICT proxy.

The second hypothesis involves finding out whether the Bass Model can be applied to the ICT diffusion in Cameroon. The two ICT proxies that were used for this research are; computer per capita and internet subscribers per capita. “Per capita” in this

context refers to the small firms surveyed. Thus, the survey was structured to find out whether the firm concerned possessed computer for business purposes, regardless of the number of computers in the firm. In the same light, internet subscription was determined by finding out whether the firm in question had internet access, regardless of the number of employees who actually had access to internet within the company.

Generally, internet subscribers refers to those who pay for access to public internet, be it an IP or TCP connection. Internet subscribers is one of the main indicators of ICT diffusion. According to the United Nations Report; Core ICT Indicators (2005) this statistic is measured irrespective of the type of speed of access, the type of device used to access the internet or the method of payment. This implies that this indicator includes individuals who pay for internet via the cost of telephone calls. The fact that internet subscribers contain proportions of mobile telephone subscribers renders it an appropriate measure of ICT in this analysis.

Internet Subscription per firm in the Republic of Cameroon was collected from the questionnaire submitted to the SMEs. Internet subscription data usually appears as the proportion of the total population that has internet access. The data obtained from the survey would therefore be expressed as a percentage of the total adopters investigated.

The questionnaire was made up of 13 structured questions to address the three (3) main parts stated above. Previous models that have been developed to examine the adoption of ICT at the firm level, identified numerous factors that determine ICT adoption in a firm. Bayo-Moriones & Lera-Lopez (2007) identified the five (5) most accepted factors, namely; environment, firm structural characteristics, human capital, competitive strategies and internal organization. Elements of this model were adopted

when structuring the questionnaire in order to further explore agents that might have affected the adoption of ICT at the firm level.

a) Environment

The business sector in which the firm operates might have an important influence on the ICT adoption process. For example, it is expected that a firm in the service sector would be more eager to adopt ICT due to its higher data processing needs. More so, firms in different lines of business have to deal with different business environment, which may affect the ICT introduction (Hollenstein, 2004). It was thus important to have a question based on the firm's business sector to capture the environment factor.

b) Firm Structural Characteristics

A firm's decision whether or not to adopt a technology is limited by its structural characteristics (Bayo-Moriones & Lera-Lopez, 2007). A firm's characteristics influence its ability to introduce an innovation in line with the cost-benefit analysis involved. Some commonly used structural characteristics are; firm size and multinational ownership.

Firm size has been used repeatedly in studying firm's behavior with respect to adoption of new technologies. The logic behind this is the fact that large firms are believed to more easily absorb the cost associated with adoption of new technologies than small firms do. As previously mentioned, number of employees is the usual indicator of the firm's size.

Multinational ownership is another structural characteristic worth considering as a factor that influences ICT adoption. According to Abrahamson & Rosenkopf (1996), the existence of a network outside of the organization strengthens awareness of

innovation and thus increases the likelihood of its adoption. Hence, external networks could be instrumental to the adoption of an innovation. However, multinational ownership as a factor was deliberately excluded from the questionnaire since the SME sector in Cameroon is predominantly made up of locally owned companies.

Instead, the multi-plant characteristic was used as a substitute for multinational ownership. This is because the fact that a company has several plants could help increase the need for ICT adoption to enable the said company to integrate its plants into an internal network.

Theoretical arguments with respect to the impact of firm age on ICT adoption are not conclusive. As highlighted by Dunne (1994), "a positive impact on adoption in case of older firms reflecting specific (technological) experience might be balanced by negative effects for this category of firms due to lower adjustment costs in younger companies with a more up-to-date capital stock". Considering this factor is important since it could add value to ongoing research in this field.

In sum, number of employees, multi-plant establishment and firm's age were the chosen indicators to represent structural characteristics of the SMEs in our survey.

c) Human Capital

It is well known that human resource is an important asset to a firm. The firm's overall ability to assess technological opportunities and to take advantage of them depends on the firms human and knowledge capital (Cohen & Levinthale, 1989). Hence, human capital is a factor that often reoccurs in studies directed at adoption of ICT at the firm level. Two proxies for human capital in this respect are educational level and age of the work force.

It is often advanced that qualified workers increase organizational readiness for innovation. According to Arvanitis (2005), the fact that high-skilled workers have higher educational level enables them to boost ICT usage and impacts. Educational level is thus an appropriate measure for human capital.

As for age of workforce, sociological researchers have often asserted that young managers seem more enthusiastic towards ICT adoption and vice versa. Older workers are usually more reluctant to accept innovation because this usually necessitates abandoning work practices that might have been accumulated for years. In Cameroon especially, the recent technological influx has very much revolutionized individuals' interaction with the environment. Finding out how different age groups deal with these changes could be very enriching.

Most SMEs in Cameroon still have a centralized organizational structure with a large amount of decisions being made by the company's manager (who is usually the company owner). This means that the decision whether or not to adopt a new technology will depend on the manager's educational level and age. The questionnaire therefore sought to inquire information about these two factors based on the owner's attributes.

d) Competitive Strategy

Theorists in the strategic management field have identified two main business-level strategies. Hitt *et al.* (2007) claim that two ways of achieving potential competitive advantage are through cost leadership or differentiation. He goes further to define cost leadership as achieving overall goal by reducing process cost. On the other hand, differentiation involves possessing the capability to distinguish the firm's product

by performing more highly valued activities and commanding a premium price on the product.

ICT could help firms to achieve cost leadership by improving efficiency across business processes. For example, implementing ICT software at different stages of the production cycle could help make better decisions and cut-down costs associated with errors. Equally, ICT can achieve a differentiation advantage by securing relationship with customers through better quality servicing (Bayo-Moriones & Lera-Lopez, 2007) such as e-banking.

Inquiring the various reasons for adopting ICT from the respondents, could help determine the strategy of the firm.

e) Internal Organization

Firms have different ways of organizing their resources and activities. It is generally accepted that decentralization has positive effects on innovativeness of a firm since it gives workers at different levels of management space for creativity. More specifically, Perez, Sanchez, Carnicer, & Jimenez (2005) showed that ICT helps firms to decentralize and breakdown hierarchy since it facilitates vertical communication across the organization.

However, it has already been mentioned that most Cameroon SMEs have a centralized organizational structure. This limits the relevance of this factor to the case at hand. Internal Organization was thus not considered in this study.

Summarily the 13 questions were selected based on a robust theoretical model based on the five (5) factors developed by Bayo-Moriones & Lera-Lopez (2007). These indicators of ICT adoption at the firm level were applied to this study to enrich the understanding of the factors that might have influenced the adoption of ICT in

Cameroon SMEs. The time factor of adoption of ICT was of equal importance since it is based on that data that we can develop the Bass Diffusion Model. Finally the computer ownership and internet access as proxies for ICT adoption was an instrumental question since it helped us determine whether the SMEs adopted or rejected the technology.

4.2 Analyses Tools

Simple Correlation analysis was employed in order to bring out the relationship between SME performance and the corresponding ICT diffusion index across nations. The statistical software, SPSS, was used for the correlation analyses of these two variables.

The time series data for computer ownership and internet subscription in the SMEs was analyzed using the original Bass Model *[*the one in equation *(5)]* in order to test the applicability of the model to Cameroon's data. The statistical software package, "CurveExpert", was employed in order to find the best fit for the curve given the data obtained from questionnaires. This software performs nonlinear regression analyses based on a least-square method.

As shown in Fig 3.1, the methodology employed in this research was a mixed method design, including the use of secondary data (database) at some point and primary data (questionnaire) at some other. Also, the analysis involved the use of varied statistical tools namely from; simple correlation to non-linear regressions.

4.3 Hypotheses

1) The higher the ICT diffusion of ICT in a country, the better the performance of its SMEs is.
2) The Bass diffusion model can be applied to the diffusion of computers within the SME sector in Cameroon.
3) The Bass diffusion model can be applied to the diffusion of internet within the SME sector in Cameroon.

The first hypothesis was set to find out whether there is an association between the ICT infrastructure development and the SME efficiency on a cross-country level. The second and third hypotheses are meant to explore whether the Bass diffusion model could fit the actual data of adopters of these two ICT proxies. Fitting the model to the actual data would enable to determine:

- The factors that influence the decision to adopt these ICT proxies in Cameroon SMEs
- The adopter category structure of Cameroon SMEs
- Whether there is a relationship between SMEs adopter categories and their demography

5. RESULTS AND DISCUSSIONS

5.1 Diffusion of ICT and SME performance: Cross-country Evidence

The strong relationship between the level of ICT development within a country and its corresponding SME efficiency is clear. As shown in Figure 4 below, when the SME efficiency of a country is plotted against its corresponding ICT diffusion index, a trend could be established from the relationship. It is observed that countries with a high ICT diffusion index tend to have better SME efficiency overall. Correlating these two variables results in a correlation coefficient (R) of +0.767. This indicates a strong positive relationship between ICT diffusion index and the SME efficiency at the cross-country level. This translates that the higher the ICT development within a country the better the performance of its SMEs is.

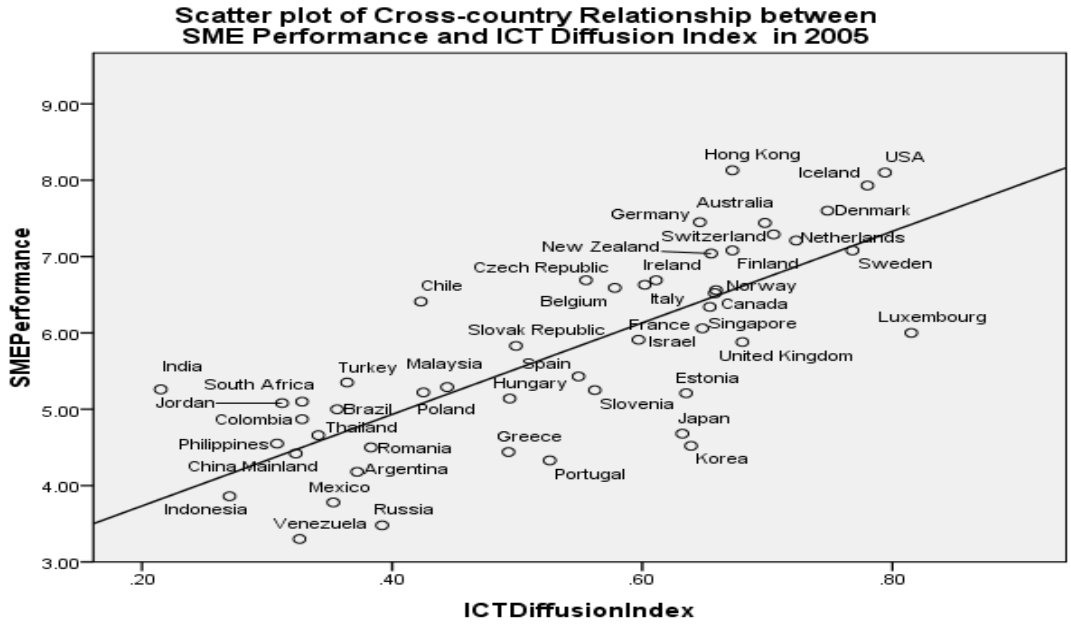


Figure 4: Cross-country Correlation between SME Performance and ICT Diffusion Index in 2005

From Figure 4, few outliers n could be noticed. The position of nations such as Venezuela and Russia could be explained by their communist heritage. Thus, their SME sector is not very competitive since large firms owned by the government dominate their economy.

The hypothesis has been verified as it has been shown that there is a strong positive correlation *(R=0.78)* between the ICT diffusion across countries and their corresponding SME performances. In other words, we expect the performance of SMEs to be better in countries where there is better ICT diffusion.

5.2 Diffusion of ICT in Cameroon SMEs

5.2.1 Attributes of the Sampled SMEs in Cameroon

As earlier mentioned, the survey was conducted in the two main regions of Cameroon; Yaoundé and Douala. These two (2) regions comprise more than 60% of the total number of SMEs according to Research ICT Africa (2006). Out of 100 questionnaires that were distributed, 93 of them filled correctly.

From Table 4 below, it can be seen that about 43% of firms that responded have their headquarters in Douala and close to 57% have their headquarters in Yaoundé. The five (5) categories for number of employees can be reconciled with the 3 official categories of SMEs in Cameroon; 1 to 5 employees for Very Small Enterprises (VSEs), 6 to 20 employees for Small Enterprises (SEs), more than 20 employees for Medium Enterprises. Regrouping the data in that format, results in about 23.65% of firms being in the VSE group, 35.79% of in the SE group, and 40.86% in the ME group. This composition shows a significant proportion of each SME type represented in the data.

The firms surveyed could also be grouped based on the business sector in which they operate. The business sector was divided into the 9 groups that feature on the business sector in Table 5.

These categories represent a revision of the 6 categories proposed by OECD and AfDB report in 2009. They could be further merged into three (3) main sets namely, the primary, secondary and tertiary sector. Reorganizing the aforementioned business sectors into these 3 main groups, yields 5.38% of respondents in the primary sector, 21.51 % in the secondary sector, and 73.11% in the tertiary sector. According to Research ICT Africa (2006), three quarters of SMEs in Cameroon are in the tertiary sector. This implies that 73.11% respondents in the tertiary sector in this study is representative of the actual SME sector distribution in the country.

Table 4: Composition of Sample

Characteristics	Sample Composition	
Location of headquarters of company		
Yaoundé	53	(57.0%)
Douala	40	(43.0%)
Year company was established		
Before 1995	18	(19.4%)
1995 to 1999	15	(16.1%)
2000 to 2004	32	(34.4%)
2005 to present	28	(30.1%)
Number of plants		
1	35	(37.6%)
2	26	(28.0%)
3	11	(11.8%)
4	5	(5.4%)
5 or more	16	(17.2%)
Number of employees		
1 to 5	22	(23.7%)
6 to 10	16	(17.2%)
11 to 15	7	(7.5%)
16 to 20	10	(10.8%)
20 and beyond	38	(40.8%)
Business sector		
Agriculture, Mining, Forestry	5	(5.4%)
Manufacturing	11	(11.8%)
Construction	9	(9.7%)
Wholesale & Retail, repairs	21	(22.6%)
Hotels and Restaurants	7	(7.5%)
Transport and Communication	8	(8.6%)
Financial and other Business services	14	(15.1%)
Education, Health, Social	9	(9.7%)
Other	9	(9.7%)
Total	93	(100%)

5.2.2 Bass Diffusion Model for Adoption of Computers in Cameroon SMEs

This section analyses the diffusion of computers within the SME sector in Cameroon. From the survey, out of the 93 firms that completed the questionnaire, 15 indicated that they had not yet started using computers. In other words, about 16% (15/93) of firms had not adopted computers.

The resulting data of adopters of computers yielded 23 years of diffusion data, from 1988 to 2010, that is summarized on the Table 4 below. The percentages (%) column represents the noncumulative diffusion pattern of computer use while the cumulative percentage (Cum %) represents the cumulative diffusion pattern of computer ownership.

Table 5: Year Respondents (SMEs) First Began Using Computers

Years	Time period (t)	Number of Firms	%	Cum. %
1988	1	1	1.08	1.08
1989	2	1	1.08	2.15
1990	3	0	0	2.15
1991	4	0	0	2.15
1992	5	1	1.08	3.23
1993	6	1	1.08	4.30
1994	7	1	1.08	5.38
1995	8	1	1.08	6.45
1996	9	1	1.08	7.53
1997	10	4	4.30	11.83
1998	11	9	9.68	21.51
1999	12	1	1.08	22.58
2000	13	6	6.45	29.03
2001	14	12	12.90	41.94
2002	15	6	6.45	48.39
2003	16	5	5.38	53.76
2004	17	9	9.68	63.44
2005	18	8	8.60	72.04
2006	19	3	3.23	75.27
2007	20	3	3.23	78.49
2008	21	1	1.08	79.57
2009	22	2	2.15	81.72
2010	23	2	2.15	83.87

5.2.2.1 Bass Diffusion Model Parameter Estimation

Using the Bass diffusion model for analysis, two (2) important graphs can be derived from the data in Table 5 above, namely; the noncumulative diffusion pattern of SMEs over a 23-year period and the cumulative diffusion pattern over the same period of years. The data comprises frequency of computer adoption at the SME level over a 23-year period. Since this data is initially in the noncumulative form, Bass

noncumulative diffusion pattern [equation *(5)*] would better serve the analyses. For this sake, the frequency of firms that adopted computers across the years was expressed as a percentage of the firms' total number in order to fit the data in the model.

The solution for the Bass model parameters was obtained using a statistical software package. Figure 5 and Figure 6 show the fit of the Bass diffusion model to the actual data. The automated estimation procedure provided a good fit to the data, with the following fit statistics: p = 0.00175, q = 0.35044, with a correlation coefficient (R) = 0.78 and standard error = 0.02 for the noncumulative distribution.

$p = 0.00175$ [A]

$q = 0.35044$ [B]

The point T* could be graphically estimated from the statistical software package. However, having determined the parameters of the Bass diffusion model, the manual computation should yield more graspable results and could equally be used for verification.

The second hypothesis of this study has been verified as the bass diffusion model had an adequate fit to the actual data of computer adopters at the Cameroon SME level. This is shown by the strong correlation (0.78) between the actual data and modeled data, accompanied with the low standard error (0.02) at a 95% confidence level.

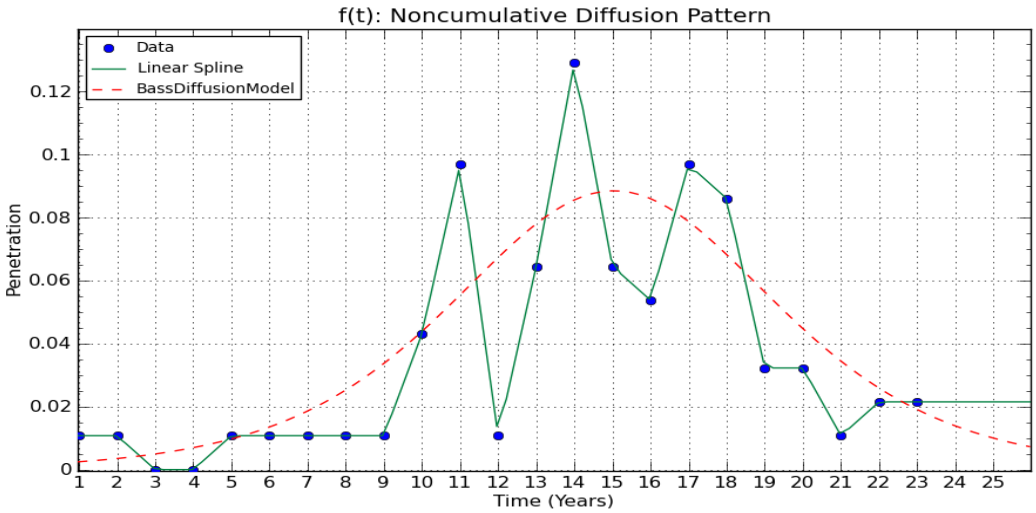


Figure 5: Fit of Bass Diffusion Model to Actual Data of computer adoption in Cameroon SMEs

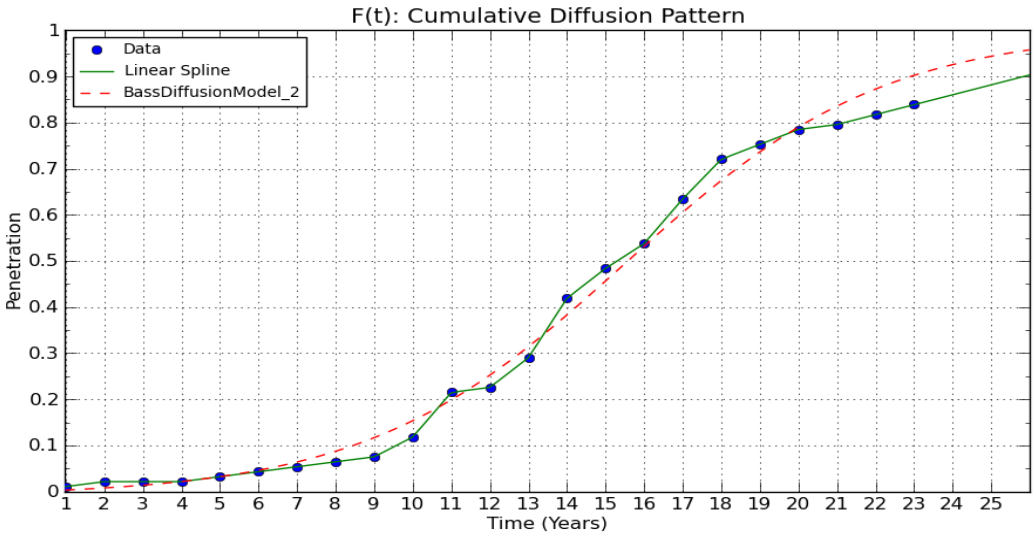


Figure 6: Fit of Bass Model to Actual Data of Cumulative diffusion pattern of computer Adoption in Cameroon

Table 6: Fit statistics for computer adoption in Cameroon SMEs

p	*Q*	*R*	r^2	*Confidence Level*	*Standard Error*
0.00175	0.35044	0.78	0.61	95%	0.02

Recall that equation *(6)* is $T^* = -\frac{1}{(p+q)} \ln\left[\frac{p}{q}\right]$

Thus substituting [A] and [B] into equation (6), gives;

$$T^* = -\frac{1}{(0.00175+0.35044)} \ln\left[\frac{0.00175}{0.35044}\right]$$

$$T^* = 15.05 \qquad [C]$$

$$T^* \cong 15$$

As earlier stated, *p* represents the coefficient of innovation and *q*, the coefficient of imitation. This means that the interpretation of the solved parameters of the Bass diffusion model can be made by representing the coefficients as a ratio "*q/p*". A lower value of the ratio *q/p* indicates that the adoption of the product exhibits a relatively lower imitation effect than innovation effect. Equally, a higher value of the ratio *q/p* shows a relatively higher imitation effect than innovation effect.

Mahajan, Muller, & Srivastava (1990) investigated a variety of products and found values of the *q/p* ratio ranged from *9.0* to *85.7.* Martinez, Polo, & Flavian (1998) conducted a similar study on the Bass diffusion model of home appliances and found that the *q/p* ratio did vary from 6.5 to 68.79.

Findings

The *q/p* ratio for the adoption of computers in the SME sector in Cameroon was found to be *q/p = 200.25 (0.35044/0.00175).* Compared to the range exhibited by past studies, the computed ratio *q/p* of 200.25 is a relatively high *q/p* ratio. This means that the adoption of computers at the SME level in Cameroon has a relatively higher imitation effect than most products. In other words, in Cameroon SMEs, internal sources play an important role in the adoption of personal computers. Such internal sources have already been identified as word-of-mouth or any other type of first-hand

contact the SMEs had with this technology. It could also be insinuated that SMEs in Cameroon are less likely to adopt a technology based on publicity and other external sources. They would rather decide to use computers because their peers have already used it.

The value of the *q/p* ratio (200.25) for the adoption of computers in Cameroon SMEs greatly diverts from the range of a variety of products investigated in past studies. This is partly because the earliest period of adoption available in this study (1988), was not nearly the year of introduction of personal computers (PC) in the Cameroon market. Most SMEs that existed during the introduction of PC have most probably run out of business at the time this study was conducted. Especially when considering the economic crisis that ravaged the Cameroon economy in the mid 80s resulting in the windup of most firms. Not being able to include the earliest adopters of personal computers in Cameroon SMEs, might have affected the innovation effect to a certain degree.

When *Mahajan et al* conducted a study on the diffusion of PCs in 1990 in U.S households, they found the *q/p* ratio to be 29. These results are considerably different from that of Cameroon SMEs. The disparity might also be due to differences in culture, goals and other factors. Looking more deeply into the characteristics of the adopters could help explain this gap. Analyzing the characteristics of the adopters with respect to their categories is critical for a better understanding of the diffusion process at the SME level in Cameroon. As previously explained, to determine the adopters' categories, we have to solve for T_1 and T_2.

From equation *(10)* we know $T_1 = -\frac{1}{(p+q)}\ln\left[(2+\sqrt{3})\frac{p}{q}\right]$

Recall that $p = 0.00175$ and $q = 0.35044$

Therefore $T_1 = -\frac{1}{(0.00175+0.35044)} \ln\left[(2+\sqrt{3})\frac{0.00175}{0.35044}\right]$

$$T_1 = 11.31 \qquad [D]$$

Equally, from equation (11) we know $T_2 = -\frac{1}{(p+q)} \ln[\frac{1}{(2+\sqrt{3})}\frac{p}{q}]$

Therefore $T_2 = -\frac{1}{(0.0168+0.12)} \ln[\frac{1}{(2+\sqrt{3})}\frac{0.00175}{0.35044}]$

$$T_2 = 18.78 \qquad [E]$$

Table 7 recapitulates all the values that were computed in this section

Table 7: Summary of calculated values of Bass Model for Computer Adoption

Variables	Value
p	*0.00175*
q	*0.35044*
q/p	*200.25*
*T**	*15.05*
T_1	*11.31*
T_2	*18.78*

5.2.2.2 Determination of Adopter Categories

As already explained, the size of each category of adopters can be calculated when the corresponding time intervals are known. In order to obtain the proportion of individuals included in each category of adopters, the value of $F(T_1)$, $F(T^*)$ and $F(T_2)$ must be determined. Having already computed the values of the parameters of the Bass diffusion model, these variables can be calculated using equation *(4)*.

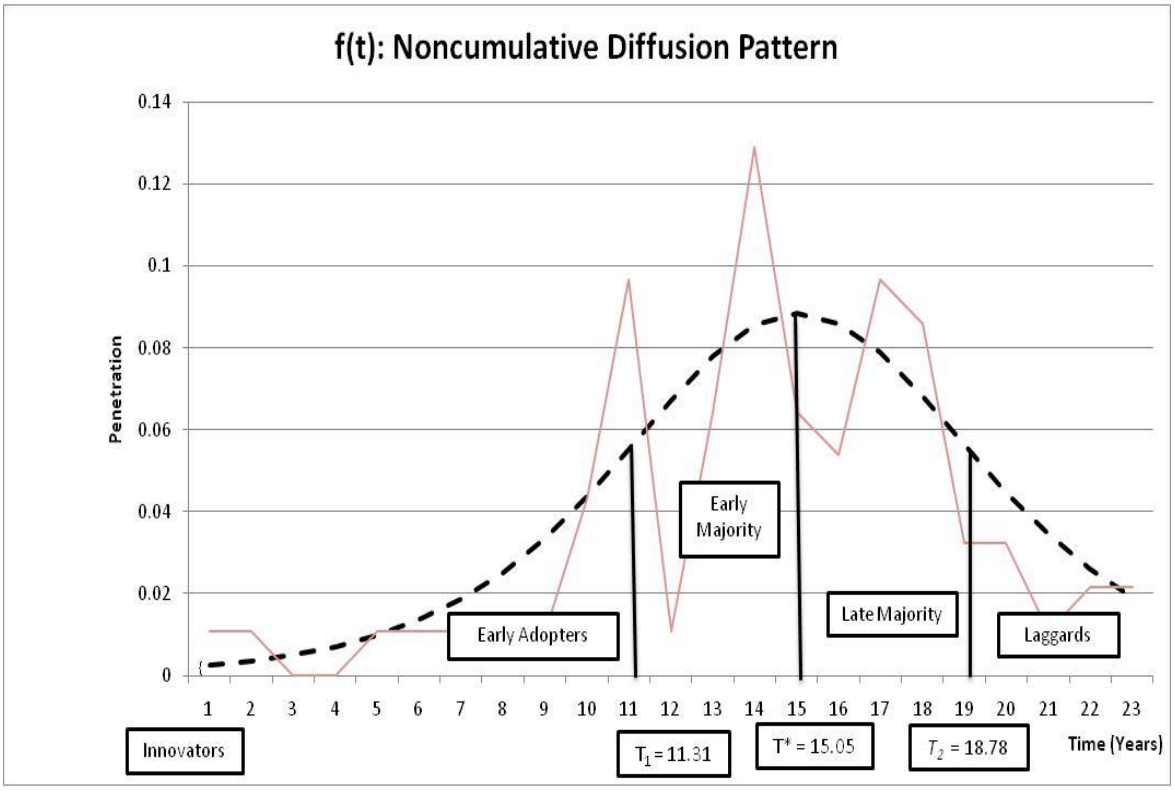


Figure 7: Noncumulative Diffusion Pattern for the Adoption of Computers showing Adopter Categories

To find *F(T1)*, we substitute [A], [B] and [D] into equation *(4)*

$$F(T_1 = 11.31) = \frac{1 - e^{-(0.00175+0.35044)(11.31)}}{1 + \left(\frac{0.35044}{0.00175}\right) e^{-(0.0168+0.12)(11.31)}}$$

$$F(T_1 = 11.31) = 0.2075$$

Similarly, to find *F(T*)*, we substitute [A], [B] and [C] into equation *(4)*

$$F(T^* = 18.78) = \frac{1 - e^{-(0.00175+0.35044)(18.78)}}{1 + \left(\frac{0.35044}{0.00175}\right) e^{-(0.00175+0.35044)(18.78)}}$$

$$F(T^* = 18.78) = 0.4977$$

To find F(T2), we substitute [A], [B] and [E] into equation (4)

$$F(T_2 = 18.78) = \frac{1 - e^{-(0.00175+0.35044)(18.78)}}{1 + \left(\frac{0.12}{0.0168}\right) e^{-(0.0168+0.12)(18.78)}}$$

$$F(T^* = 18.78) = 0.7872$$

Table 8 summarizes all the information obtained above

Table 8: Establishing the computer adopters' categories for Cameroon SMEs

Adopter Category	Time Interval (years)	Expression for the Adopter Category Size		Value of the Adopter Category Size in %
Innovators	-	p	*0.00175*	*0.17*
Early Adopters	Up to T_1	$F(T_1) - p$	*F(11.31) – 0.0168*	20.57
Early Majority	T_1 to T^*	$F(T^*) - F(T_1)$	*F(15.05) – F(11.31)*	29.02
Late Majority	T^* to T_2	$F(T_2) - F(T^*)$	*F(18.78) – F(15.05)*	28.95
Laggards	Beyond T_2	$1 - F(T_2)$	*1 – F(18.78)*	21.28

Having determined the size of the categories using the Bass diffusion model, the next step is to find out to what extent the modeled size of adopters per category differs from the observed size of adopters per category. This would enable the identification of the degree of error in the modeled data. It will also allow the understanding of how well modeled data fits to the observed data. Table 9 displays the observed size of the adopters categories. These sizes are obtained from the observed data by using the same cut-off points as determined by T_1, T^*, T_2. The cut-off points are approximated to the nearest whole number and their corresponding sizes are found by deducting the cumulative fraction of the previous categories.

Table 9: Year SMEs started using computers and adopter category classification

Adopter Category	Time period (t)	Number of Firms	%	Cum. %	Observed percentage Adopters %
Innovators	0	-	-	-	0
Early Adopters	1	1	1.08	1.08	21.15
	2	1	1.08	2.15	
	3	0	0	2.15	
	4	0	0	2.15	
	5	1	1.08	3.23	
	6	1	1.08	4.30	
	7	1	1.08	5.38	
	8	1	1.08	6.45	
	9	1	1.08	7.53	
	10	4	4.30	11.83	
	11	9	9.68	21.51	
Early Majority	12	1	1.08	22.58	27.24
	13	6	6.45	29.03	
	14	12	12.90	41.94	
	15	6	6.45	48.39	
Late Majority	16	5	5.38	53.76	26.88
	17	9	9.68	63.44	
	18	8	8.60	72.04	
	19	3	3.23	75.27	
Laggards	20	3	3.23	78.49	24.73
	21	1	1.08	79.57	
	22	2	2.15	81.72	
	23	2	2.15	83.87	
Not yet adopted	-	15	16.13	100	

Table 10 compares the Bass-modeled size of adopters categories with the observed size of the adopters categories. As observed, there is a close concordance between the modeled categories and the observed categories of adopters. The

innovators, early adopters' categories showed an excellent fit, recording less than one percent degree of error. While the laggards was the category with the highest discord (3.45%). Overall, these differences appear to cancel out each other, producing a negligible degree of error across the whole distributions.

Table 10: Comparison of adopters' Category Size Between Modeled and Observed Data

Adopter Category	Percentage Adopters (Bass Model)	Percentage Adopters (Observed)	Degree of Error
Innovators	0.175	0	0.175
Early Adopters	20.57	21.15	0.58
Early Majority	29.02	27.24	1.78
Late Majority	29.95	26.88	3.07
Laggards	21.28	24.73	3.45

5.2.2.3 Variation of Characteristics of SMEs across the Category of Adopters

It is possible to find out whether the established adopter categories exhibit some particular characteristics. To analyze this, the chi-square test for independence could be employed. This statistical tool will indicate whether there is a significant association between adopter categories and stipulated set of characteristics. These characteristics have been identified in the previous sections as; company age, owner's age, number of plants, number of employees, business sector, and owner's education level.

Given that the size of innovators is considerably small (0.175%), it was combined with the early adopters for convenience. This results in four (4) adopter categories with an adjusted size of categories that is depicted in Figure 8 below;

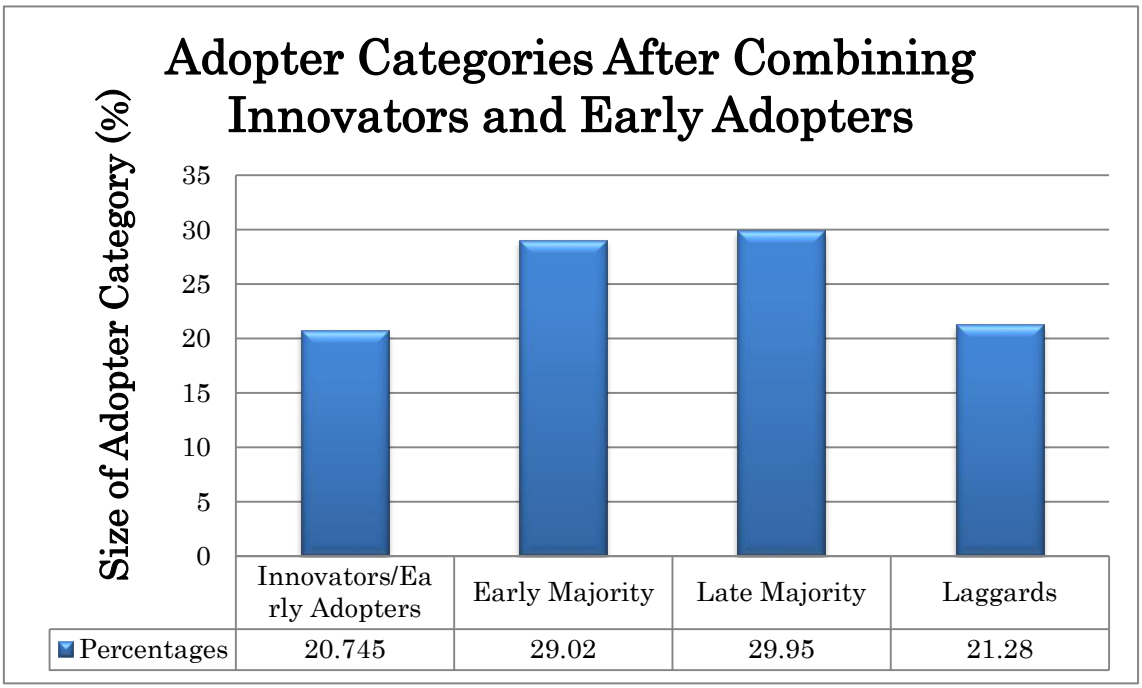


Figure 8: Size of Adopters' categories After Combining Innovators and Early Adopters

The number of respondents in each adopter category could be compared with respect to the independent variables chosen in the previous section. Recall that the independent variables were basically grouped based on three (3) of the agents of ICT adoption at the firm level proposed by Bayo-Moriones & Lera-Lopez (2007). These agents are; the firm's environment, the firm's structural characteristics, human capital. The chosen independent variables for each of these three agents are displayed in Table 11 below;

Table 11: Classification of Factors that Influence ICT Adoption

Indicators of ICT Adoption at firm level	Independent Variables
Environment	Business Sector
Firm's Structural Characteristics	Firm Size (number of employees)
	Multi-plant (number of Plants)
	Firm's Age
Human Capital	Education Background
	Owner's Age

The adopter category and the given independent variables are categorical variables. Hence, chi-square statistic can be employed to test the association between the adopter category and the given independent variables. Table 12 shows the chi-square statistic for each of these independent variables (indicators of ICT adoption at the firm level). The resulting *p-value* of the chi-square is matched with the set alpha levels or significance levels *(0.01, 0.05, 0.1)*. If the *p-value* of a variable is less than one of the three set significant levels, it means there is a relationship between the concerned variable and the category of adopters. The asterisk (*) at the side of the Pearson Chi-square in Table 12 indicates variables that depicted such relationships at respective significant levels.

Table 12: Chi-square Results for Demographics of SMEs Across Categories

Independent Variable	*p-value*	Chi Square
Business Sector	1.160	30.775
Number of employees	0.000	49.864*
Number of plants	0.097	22.541***
Firm's Age	0.000	65.342*
Education Background	0.024	27.643**
Owner's Age	0.106	10.466

* significant at p=1%

** significant at p=5%

*** significant at p=10%

Findings

From the Table 12 above, it was found that the company's age, number of plants and number of employees each have a significant relationship with the adopter categories. On the other hand, the owner's age and the business sector had no relationship with computer adopter categories in Cameroon SMEs. The variables that showed dependence shall be examined individually to find the exact difference of proportions within their groupings with respect to the adopter categories.

5.2.2.3.1 Number of Employees

Table 13: Cross-tabulations Showing Relationship Between Adopters' categories and Number of Employees

Number of Employees * Adopter Category for PC Adoption in SMEs Cross-tabulation

			Adopter Category				
			Innovators/Early Adopters	Early Majority	Laggards	Late Majority	Total
Number of Employees	1-5	Count	2	3	3	(+) 14	22
		Expected Count	4.7	5.9	5.9	5.4	22.0
	6-10	Count	1	4	(+) 7	4	16
		Expected Count	3.4	4.3	4.3	4.0	16.0
	11-15	Count	0	(+) 2	(+) 5	0	7
		Expected Count	1.5	1.9	1.9	1.7	7.0
	16-20	Count	0	(+) 5	(+) 4	1	10
		Expected Count	2.2	2.7	2.5	2.7	10.0
	21 or more	Count	(+) 17	11	6	4	38
		Expected Count	8.2	10.2	10.2	9.4	38.0
Total		Count	20	25	25	23	93
		Expected Count	20.0	25.0	25.0	23.0	93.0

(+) observed count higher than expected count

Using the chi-square statistic, it has been established that the number of employees is associated to the adopter categories. In other words, number of employees

can be used as a factor to distinguish between the adopters of each category. More so, from Table 13 it is observed that SMEs having not more than ten employees (1 to 5 and 6 to 10 employees) are more likely to adopt computers later – these cells have observed counts greater than expected counts. On the other hand, the SMEs with more than 10 employees are more likely to adopt the computer technology earlier. Hence, Very-Small Enterprises (VSEs) in Cameroon would most probably be later adopters and Medium-sized Enterprises (MEs) would most probably be earlier adopters with respect to computer acceptance.

These results translate that as the number of employees increase, the probability of belonging to the first category of adopters also increases. This suggests that the bigger the size of the firm the more liable it is to start using computers. This finding is consistent with ICT indicators literature that advances that large firms are able to allocate more resources to face expenses involved in the adoption of new products such as computers (Hwang, Ku, Yen, & Cheng, 2004). More so, a large number of employees lead to an increase of operations within the firm, which in turn grows the need for tools to process these multiple operations.

5.2.2.3.2 Number of plants

Table 14: Cross-tabulations Showing Relationship Between Adopters' Categories and Number of Plants

Number of Plants * Adopter Category Cross-tabulation

			Adopter Category				
			Innovators/Early Adopters	Early Majority	Late Majority	Laggards	Total
Number of plants		Count	0	0	(+) 1	0	1
		Expected Count	0.2	0.3	0.3	0.2	1.0
	1	Count	6	8	8	(+) 13	35
		Expected Count	7.5	9.4	9.4	8.7	35.0
	2	Count	4	7	7	(+) 8	26
		Expected Count	5.6	7.0	7.0	6.4	26.0
	3	Count	1	2	(+) 6	1	10
		Expected Count	2.2	2.7	2.7	2.5	10.0
	4	Count	(+) 2	(+) 2	1	0	5
		Expected Count	1.1	1.3	1.3	1.2	5.0
	5 or more	Count	(+) 7	(+) 6	2	1	16
		Expected Count	3.4	4.3	4.3	4.0	16.0
Total		Count	20	25	25	23	93
		Expected Count	20.0	25.0	25.0	23.0	93.0

(+) observed count higher than expected count

The chi-square analysis on Table 12 shows a 99% confidence that there is a relationship between the category of adopters of computers and the number of plants of the SME. A critical assessment of Table 14 makes the direction of this relationship more evident. It is observed that SMEs that have four (4) or more plants tend to be in the innovators/early adopters category and early majority category (as shown by the

cells where the observed count is more than the expected count). Conversely, firms that have less than three (3) plants are most likely to be in the laggard category. It can thus be assumed that the more plants a Cameroon SME has, the higher is the probability that it would adopt computers early. This finding is consistent with past research by Dasgupta, Agarwal, Ioannidis, & Gopalakrishnan (1999) who advanced that firms with many establishments have more complex coordination problem and a greater need for information movement, this makes them more likely to adopt computers. Simply put, firms that have units in different locations are more likely to turn to innovative tools such as computers in an endeavor to facilitate inter-unit coordination.

5.2.2.3.3 Education Background

Table 15: Cross-tabulations showing relationship between adopters' categories

Education Background * Adopter Category Cross-tabulation

			Adopter Category				
			Innovators/Early Adopters	Early Majority	Late Majority	Laggards	Total
Education Background	Primary School	Count	0	0	0	(+) 1	1
		Expected Count	0.2	0.3	0.3	0.2	1.0
	Some Secondary School	Count	2	1	1	(+) 7	11
		Expected Count	3.0	2.4	2.7	3.0	11.0
	Completed High School	Count	3	(+) 5	4	(+) 6	18
		Expected Count	3.9	4.8	4.8	4.5	18.0
	Undergraduate	Count	0	(+) 6	(+) 5	0	11
		Expected Count	2.4	3.0	3.0	2.7	11.0
	Graduate	Count	(+) 11	8	8	7	34
		Expected Count	7.3	9.1	9.1	8.4	34.0
	Professional Training	Count	(+) 4	(+) 5	(+) 7	2	18
		Expected Count	3.9	4.8	4.8	4.5	18.0
Total		Count	25	20	23	25	93
		Expected Count	25.0	20.0	23.0	25.0	93.0

(+) observed count higher than expected count

The chi-square analysis in Table 12 shows that the education background of the manager is significantly related to the adopter category in which the corresponding SME falls. This relationship has a significance level of 10%. Table 15 gives us more insight on the relationship between these two categories. It is observed that SME owners with a low level of education tend to adopt computers later than companies with a higher level of education do. This is seen by paying attention to the cells where the observed count is greater than the expected count. For example, SME whose owners had primary school and some secondary school level of education were most likely to fall in the laggard category. Equally, companies whose owners had graduate education or technical training in a specific field had a higher probability to be found in the innovators/early adopter category. Generally, advanced technologies such as ICT sufficiently skilled worker to be adopted and used adequately. The above finding is consistent with previous literature by Bresnahan, Brynjollfsson, & Hitt (2002) who proved that skilled labor was directly proportional to computerization at the firm level.

5.2.2.3.4 Age of Company

Table 16: Cross-tabulations Showing Relationship Between Adopters' Categories and Age of Company

Company Age * Adopter Category Cross-tabulation

			Adopter Category				
			Innovators/Early Adopters	Early Majority	Late Majority	Laggards	Total
Company Age	Before 1995	Count	(+) 11	3	2	2	18
		Expected Count	3.9	4.8	4.8	4.5	18.0
	1995 – 1999	Count	(+) 9	(+) 5	1	0	15
		Expected Count	3.2	4.0	4.0	3.7	15.0
	2000 – 2004	Count	0	(+) 15	(+) 10	7	32
		Expected Count	6.9	8.6	8.6	7.9	32.0
	2005 – 2011	Count	0	2	(+) 12	(+) 14	28
		Expected Count	6.0	7.5	7.5	6.9	28.0
Total		Count	20	25	25	23	93
		Expected Count	20.0	25.0	25.0	23.0	93.0

(+) observed count higher than expected count

The chi-square analysis on Table 12 equally demonstrates a relationship between the age of the company and the adopter category. This relationship has a significance level of 10% implying that there is a 90% confidence about the validity of these results. The nature of the relationship could be further determined using the cross-table analysis on Table16. Following the trend of the cells where the observed count is more than the expected count, it is apparent that the older companies tend to adopt the computer technology early while the younger companies tend to fall in the later categories. For example, it is observed that the companies founded before the

2000s have a higher probability of falling in the innovators/early adopters category. Similarly, companies that were established in the 2000s, tend to adopt computers later.

This is partly explained by the fact that companies cannot adopt a technology before their establishment as a company. It is therefore obvious that a firm's year of adoption would depend on the year the company was established. This implies that this result cannot be used to establish the relationship between the age of the company and its adoption capacity.

Regardless, Schumpeter (1934) found that new companies are more likely to start with new ideas or technologies to render the older firms obsolete – he termed this process creative destruction. This concept suggests that younger firms are more innovative than older firms are and thus more likely to adopt a new technology than older firms. To investigate this assertion, Table 17 was designed to show the proportion of SMEs that adopted computers during their entry relative to the proportion that adopted later.

Table 17: Proportion of SMEs that Adopted Computers During their Entry Relative to the Proportion that Adopted Later

Year of establishment	Adoption during year of establishment		Adoption after year of establishment	
	Number of firms	%	Number of firms	%
Before 1995	5	27.8	13	72.2
1995 – 1999	9	60	6	40
2000 – 2004	23	71.9	9	28.1
2005 and beyond	16	88.9	2	11.1

From Table 17, we observe that the proportion of firms not adopting computer technology in their year of entry reduces as time goes by. In other words, younger

companies took less time to adopt computers than the older firms did. This translates that younger firms are more innovative than the older firms are. Figure 9 uses a chart to depict this information. This finding in Cameroon SMEs supports Schumpeter's concept that established (old) firms take more time to adopt a new technology unlike new firms.

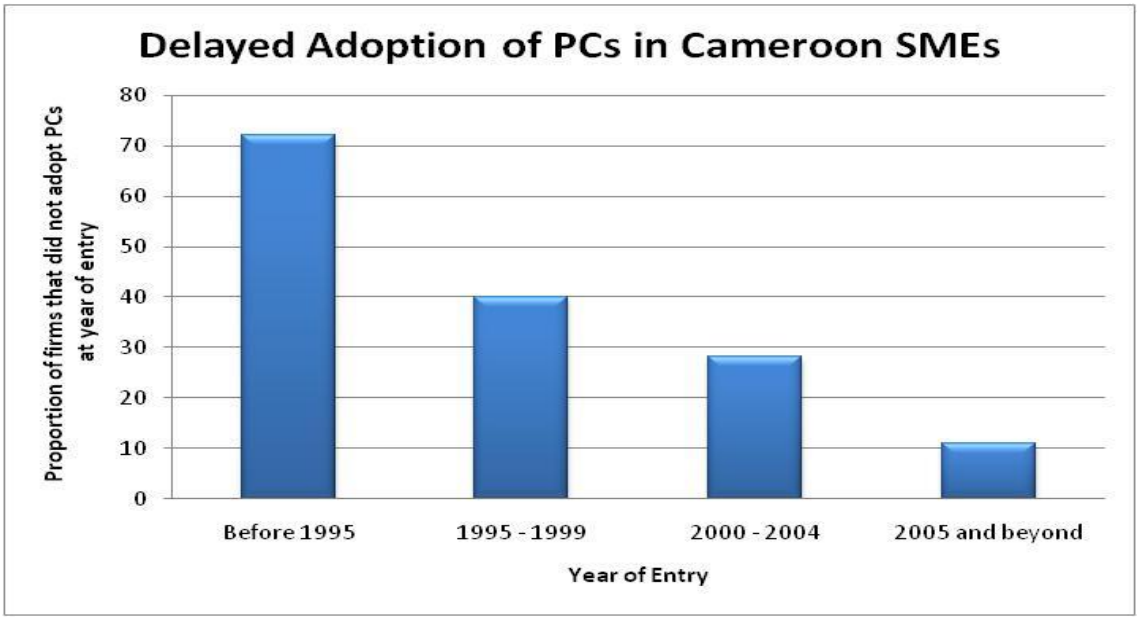


Figure 9: Proportion of SMEs that Did not Adopt Computers in the Year of Entry

Surprisingly, going back to Table 12, no relationship was found between the category of adopters and the business sector. We expect that service industries for example, are more reliant on data processing and should therefore depend more on IT. However, the results for adoption in Cameroon SMEs did not support that view.

More so, there was no relationship between the category of adopters and the age of the owners.

5.2.3 Bass Diffusion Model for Adoption of Internet in Cameroon SMEs

So far, the analysis of adoption of ICT was carried out using possession of personal computers in the firm. However, there are many other indicators of ICT. An

indicator that has gained a lot of interest lately is internet subscription. Internet subscription has established itself as one of the major ICT indicators within a firm due to the various opportunities it presents for business entities. Consequently, adoption of internet at the firm level was also examined using the Bass diffusion model.

From the survey, out of the 93 firms that completed the questionnaire, 27 indicated that they had not yet subscribe for internet access within their firm. In other words, about 29% of firms had not yet adopted internet.

The resulting data of adopters of internet yielded 14 years of diffusion data, from 1998 to 2010, that is summarized on the Table 18 below. The percentages (%) column represents the noncumulative diffusion pattern of internet within the small firms while the cumulative percentage (Cum %) represents their cumulative diffusion pattern.

Table 18: Year respondents (SMEs) First Began Using Internet Within the Company

Years	Time period (t)	Number of Firms	%	Cum. %
1998	1	5	5.38	5.38
1999	2	0	0	5.38
2000	3	4	4.30	9.68
2001	4	17	18.28	27.96
2002	5	5	5.38	33.33
2003	6	4	4.30	37.63
2004	7	8	8.60	46.24
2005	8	8	8.60	54.84
2006	9	1	1.08	55.91
2007	10	5	5.38	61.29
2008	11	1	1.08	62.37
2009	12	3	3.23	65.59
2010	13	4	4.30	69.89
2011	14	1	1.08	70.97

5.2.3.1 Bass Diffusion Model Parameter Estimation

Using the Bass diffusion model in Table 18 to analyze the data, the graph showing the noncumulative diffusion pattern and the cumulative diffusion pattern of SMEs over a 14-year period can be obtained. The data comprises frequency of internet adoption at the SME level over a 14-year period. Since this data is initially in the noncumulative form, Bass noncumulative diffusion pattern [equation *(5)*] would be employed for the analyses. More so, the number of firms was expressed as a percentage of their total number in order to fit the data in the model.

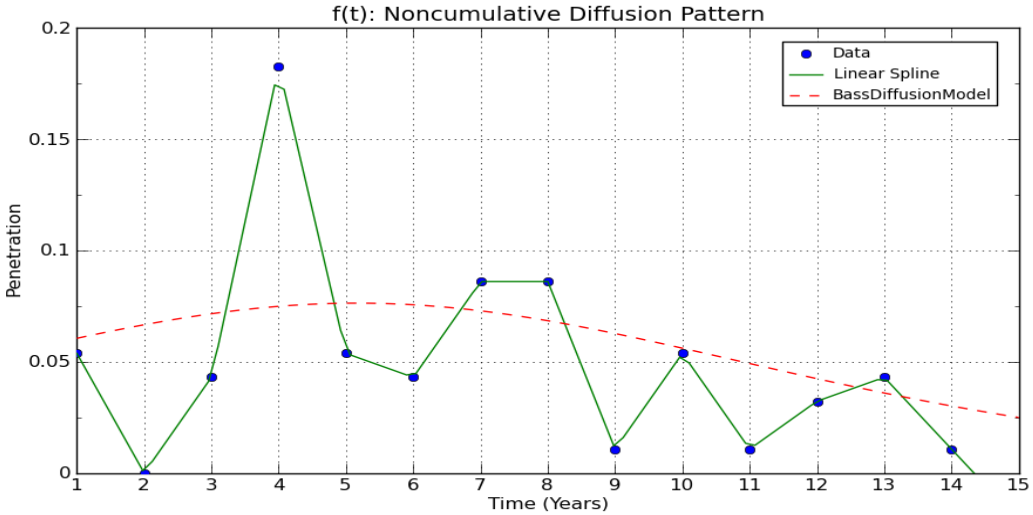


Figure 10: Fit of Bass Model to Actual Data of Noncumulative Diffusion Pattern of Internet Adoption in Cameroon SMEs

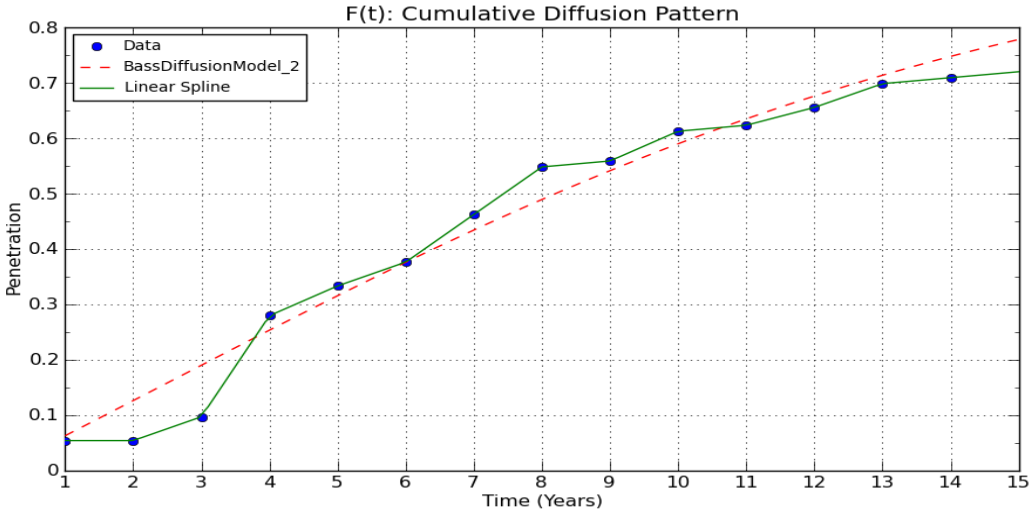


Figure 11: Fit of Bass Model to actual data for cumulative diffusion pattern of Internet Adoption in Cameroon SMEs

Table 19: Fit statistics for internet adoption in Cameroon SMEs

p	*q*	*r*	r^2	*Confidence Level*	*Standard Error*
0.0538	0.1818	0.39	0.15	95%	0.04

Using the same statistical software package, the solution for the Bass model parameters was derived. Figure 10 shows the fit of the Bass diffusion model to the actual data. The automated estimation procedure provided a mild fit to the data, with the following fit statistics: $p = 0.0538$, $q = 0.1818$, with a correlation coefficient (R) = 0.39 and standard error = 0.04 for the noncumulative distribution. Unlike the case of the adoption of computers, bass diffusion pattern had a less good fit to the actual data as shown by its weak correlation.

The third hypothesis of this study has been verified as the bass diffusion model had a mild fit to the actual data of computer adopters at the Cameroon SME level. Even though the correlation was weak *(R=0.39)* with a standard error of *0.04* at confidence level of 95%, the model is still applicable. According to Mahajan *et al*. (1990) the applicability of the Bass diffusion model is compromised if it yields the wrong signs for *p* and *q*. Hypothesis was thus accepted since this is not the case in this study.

$p = 0.0538$ [I]

$q = 0.1818$ [J]

Having determined the parameters of the Bass diffusion model, the manual computation approach shall again be used to obtain the remaining variables.

Recall that $T^* = -\frac{1}{(p+q)} \ln\left[\frac{p}{q}\right]$ *(6)*

Thus substituting [A] and [B] into equation (6), gives;

$$T^* = -\frac{1}{(0.0538+0.1818)} \ln\left[\frac{0.0538}{0.1818}\right]$$

$T^* = 5.17$ [K]

$T^* \cong 5$

As earlier stated, *p* represents the coefficient of innovation and *q*, the coefficient of imitation. The *q/p* ratio for the adoption of internet in the SME sector in

Cameroon was found to be *q/p = 3.38 (0.1818/0.0538)*. Similarly, to the *q/p* ratio of computers ownership in Cameroon SMEs, the subscription of internet within small firms exhibits a higher imitation effect than innovation effect. In other words, the decision to use internet access within small firms was influenced by internal sources such as word-of-mouth or contact with the technology.

Findings

This means that in Cameroon SMEs, internal sources play an important role in the adoption of personal computers. Such internal sources have already been identified as word-of-mouth or any other type of first-hand contact the SMEs had with this technology. It could also be insinuated that SMEs in Cameroon are less likely to adopt a technology based on publicity and other external sources. They would rather decide to use computers because their peers have already used it.

Nonetheless, compared to the range exhibited by past studies, the computed ratio *q/p* of 3.38 shows a relatively low *q/p* ratio. For example, Mahajan et al. (1990) investigated a variety of products and found values of the *q/p* ratio ranging from *9.0* to *85.7*. It could be argued that the products used in previous studies were of a different nature with internet, since they were mostly electrical appliances. Conventional knowledge would drive us to expect an even higher *q/p* ratio for internet technology since internet has a network nature: its value as a technology is predicate on the number of people who adopt it. In other words, interpersonal factor should have a great influence on the decision to adopt internet. As irrational as it seems, q/p ratio for the adoption of computers in Cameroon SMEs was higher than that for the internet adoption.

The reason is that, most Cameroon companies were skeptical about internet technology during its introduction. The uses of internet were not perceivable to the companies. To date, companies still have doubts of the application of internet to their organizations. It is later shown in this study that, most SMEs think internet could not be applied to their line of business. To boost internet adoption in the SME sector, the government had to promote through publicity and subsidies. These aggressive government strategies helped increase the internet subscription in the business sector and led to a relatively high coefficient of innovation *(p)*, which upsets the coefficient of imitation *(q)* and results in a relatively low *q/p* ratio.

More so, Firth et al. (2006) conducted a similar study using online community as a product and found the *q/p* ratio to be *5.05*, which is not too far from that of internet adoption in Cameroon SMEs *(3.38)*.

Analyzing the characteristics of the adopters with respect to their categories is critical for a better understanding of the diffusion process of internet at the SME level in Cameroon. As previously explained, to determine the adopters' categories, we have to solve for T_1 and T_2.

From equation (10) we know $T_1 = -\frac{1}{(p+q)}\ln\left[(2+\sqrt{3})\frac{p}{q}\right]$

Recall that p = 0.0538 and q = 0.1818

Therefore $T_1 = -\frac{1}{(0.0538+0.1818)}\ln\left[(2+\sqrt{3})\frac{0.0538}{0.1818}\right]$

$$T_1 = -0.42 \qquad [L]$$

Equally, from equation (11) we know $T_2 = -\frac{1}{(p+q)}\ln[\frac{1}{(2+\sqrt{3})}\frac{p}{q}]$

Therefore $T_2 = -\frac{1}{(0.0538+0.1818)}\ln[\frac{1}{(2+\sqrt{3})}\frac{0.0538}{0.181}]$

$$T_2 = 10.76 \qquad [M]$$

Table 20 recapitulates all the values that were computed in this section

Table 20: Summary of Calculated Values of Bass Model for Internet Adoption

Variables	Value
p	*0.0538*
q	*0.1818*
q/p	*3.38*
*T**	*5.17*
T_1	*-0.42*
T_2	*10.76*

As already explained, the size of each category of adopters can be calculated when the corresponding time intervals are known. However, since the result of T_1 *(-0.42)* is negative as shown in Table 20, the determination of the adopter categories is not feasible and shall thus not be pursued in this study.

5.3 Reason for Adoption/Non-Adoption of Internet

So far, Bass diffusion model has been used to establish the factors that influence the decision to adopt a product. Knowing these factors could help authorities in designing the appropriate strategy to speed up the diffusion process if deemed necessary. Inquiring from the respondents the reason for their adoption or rejection of the technology could give more light on this matter.

5.3.1 Reasons for Adopting Internet

Out of the 93 SMEs surveyed in Cameroon, 66 have an internet access within the company (70.97%). The respondents were given eight (8) choices to explain the reason for adopting internet; to obtain general information, to provide information about their products, for order exchange, to purchase software, for data analyses (records), to

receive customer feedback and for e-commerce. The respondents were allowed multiple responses. The information generated could be is summarized in Table 21 below.

Table 21: Frequencies of Reasons for Adopting Internet

		Responses		
		N	Percent	Percent of Cases
Reasons for Adoption of Internet	General information	50	24.0%	75.8%
	Providing Information about product	27	13.0%	40.9%
	Order Exchange	36	17.3%	54.5%
	Purchase software	7	3.4%	10.6%
	Records	42	20.2%	63.6%
	Receiving customer feedback	18	8.7%	27.3%
	E-commerce	28	13.5%	42.4%
Total		208	100.0%	315.2%

Findings

From Table 12, it is observed that the 66 SMEs that have adopted internet in Cameroon generated a total of 208 responses. The bar chart in Figure 12 is a representation of the frequencies of the multiple reasons SMEs have for adopting internet. As seen on the chart the most voted for reason for subscribing to the internet is to obtain general information. Business entities use the internet to research goods and services appropriate for their company's development. In the midst of a knowledge-based society, it is even more important for firms to obtain information on emerging technologies and new trends, in order to stay relevant in an increasingly

competitive environment. Nowadays, the strongest players are those that have access to relevant information - and thus take maximum advantage of it (Arreymbi, Agbor, & Adnan, 2008). From the results on the chart, it could be assumed that most Cameroon SMEs have acknowledged that acquisition and usage of information is instrumental to their success. Hence, most Cameroon SMEs that adopt internet do so to gain information that will enable them to be more competitive in their respective industry.

The next most elected reason for adopting internet was records. Companies have the urge to use online applications that can help them analyze and transfer their data to the appropriate parties. Most multi-plant SMEs in Cameroon used internet as a medium to send reports and records to their other branches. Internet offers a more efficient way (compared to postage, fax, telephone and travel) to communicate reports to different branches of a company (Dholakia & Kshetri, 2004). Most SMEs turned to internet in order to use emails to efficiently transfer business data to the appropriate unit.

In the same light, SMEs in Cameroon adopt internet for easy transfer of data to its partners. Firms view emails and other web-based tools as a cheaper, faster and more accurate way of exchanging orders with suppliers and customers. Exchange of orders with partners via the internet is a significant reason for adopting internet at the firm-level in Cameroon as confirmed by 17.3% responses.

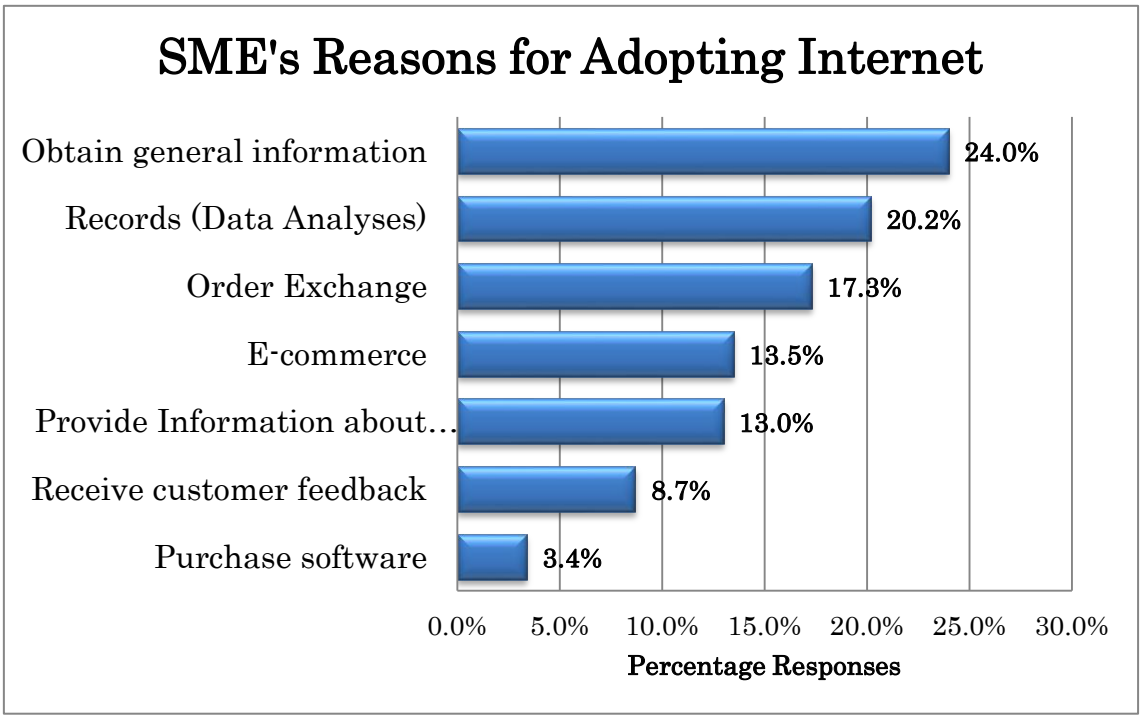


Figure 12: Reasons SMEs in Cameroon Adopt Internet

Figure 12 shows that "providing information about the product" was another frequent reason (13.0%) for firms to adopt internet in Cameroon. Hence, SMEs that adopt internet also hope to use it to advertize their products in order to reach new markets and/or new partners. Many firms have employed websites and blogs in an attempt to give their product both national and international exposure. Cameroon firms embark on this method to find potential customers, investors and suppliers.

SMEs in Cameroon equally adopt internet in order to receive feedback from customers. Internet could be used to conduct customer surveys at cheaper rates and it also offer a means for firms to stay in touch with their clients. Adoption of the internet in order to purchase software was not a common reason. This is because Intellectual Property Rights (IPR) laws are not rigorous in Cameroon. Hence, firms and individuals can get away with illegal acquisition of software packages. Consequently, purchase of

software would not be a popular reason to adopt internet since it is unlikely that firms be prosecuted for using unregistered software.

Surprisingly, e-commerce was a frequent reason (13.5%) for firms to subscribe to the internet. In other words, a considerable proportion of Cameroon SMEs are adopting internet to exploit the opportunities brought forth by e-commerce. At present, Cameroon does not yet have the necessary ICT infrastructure and banking infrastructure to support e-commerce. This implies that the small businesses that have adopted internet anticipate e-commerce would become a viable business model.

5.3.2 Reasons for Not Adopting Internet

As mentioned in the previous sections, 27 out of the 93 (29.03%) firms analyzed have not yet subscribed for internet access within their establishments. The respondents were given six (6) choices to explain the reasons for not having internet access, namely; does not apply to the business model, lack of ICT skills, too costly, lack of customer access, does not trust the technology. The respondents were enabled multiple responses to explain the reason for not having subscribed the firm to internet access.

Table 22: Frequencies of Reasons for not Adopting Internet

		Responses		
		N	Percent	Percent of Cases
Reasons for non-adoption of internet	Does not apply to business	17	35.4%	63.0%
	Lack of Skills	5	10.4%	18.5%
	Too Costly	19	39.6%	70.4%
	lack of customer access	3	6.3%	11.1%
	does not trust technology	3	6.3%	11.1%
	does not know	1	2.1%	3.7%
Total		48	100.0%	177.8%

Findings

Focusing on these 27 non-adopters of internet, Table 22 shows that 48 total responses were generated. The bar chart in Figure 13 is a representation of the reasons SMEs have not yet adopted internet as an ICT tool in Cameroon. As portrayed in the chart below, the most common reason firm's have not yet subscribed to the internet in Cameroon is the high cost. According to Emage (2006), Cameroon was then one of the countries where the cost of internet access was highest in the world: $140 per month for 40 hours browsing, coupled with subscription cost between $49 and $147 depending on the usage pattern. An increase in the number of competitors offering internet services in Cameroon has caused its prices to drop by about 90% with subscription cost that have fallen by about 50% (Nforngwa, 2009). These prices are still not low enough considering the economic conditions of the country. More so, Cameroon has some of the highest rates compared to other countries with similar economic profile such as

Senegal. The high rates make it difficult for the Cameroon SMEs, who lack financial resources, to adopt internet.

From the same results, it can be assumed that most SMEs pursue a "cost-leadership strategy". This means, they focus on cutting-down the process cost in order to achieve their organizational goals. They might thus not be willing to adopt internet since it would entail selling at a premium price.

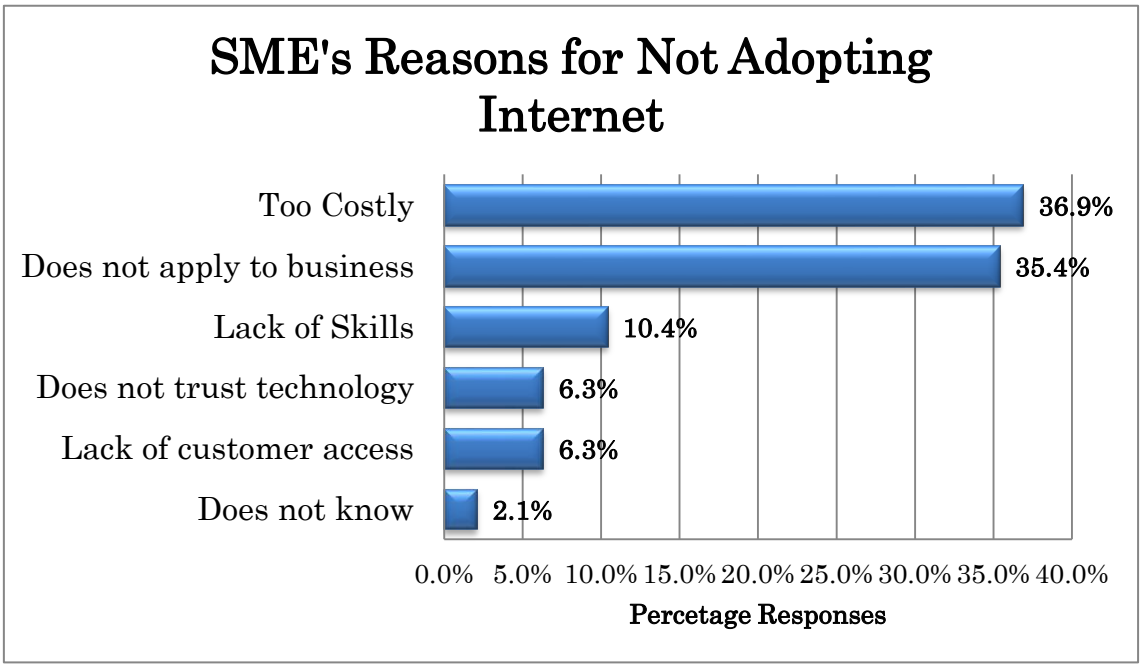


Figure 13: Reasons for not adopting internet at the firm level in Cameroon

Many small firms in Cameroon believe that internet access will not be a useful tool for their business as shown by the 35.4% responses on Figure 13. This is because most small firms have a limited market scope due to regional concentration of institutions in the city, lack of complementary transportation system and capital constraints. Most companies are located in the two major cities to ease contact with its suppliers, financial institutions and customers. They thus do not need tools like internet for communication with partners. More so, poor transportation network compel the

firms to focus on their urban markets. In addition to that, Internet has little coverage in the outskirts of the city. SMEs therefore have no incentive to adopt internet since the infrastructure limits their market scope.

Another considerable reason SMEs in Cameroon do not adopt internet is lack of skills (10.4% responses). Many firms lack knowledge on how best to utilize internet to serve their organizational goals. As pointed out by Yitamben & Tchinda (2009), in looking into the training program of the Chamber of Commerce, there was no program then on how to use the internet. They also insisted on the need for a more vigorous campaign to inform community groups of the availability of these resources and usefulness to the firms.

Some less highlighted reasons for the non-adoption of internet are; lack of customer access, skepticism and ignorance. Some managers are reluctant to give up their traditional business process to adopt ICT out of fear. They regard internet as an unsafe tool through which a lot of their sensitive business information could be leaked and used against them. On the other hand, some managers just do not know how they can implement internet into their business model.

6. POLICY RECOMMENDATIONS

Earlier, it was verified that ICT diffusion and SME performance are complementary. This study showed that governments that improve ICT infrastructure nation-wide are expected to have a more competitive SME sector and eventually a more thriving economy. This assertion justifies the implementation of policies aimed at developing ICT infrastructure in order to make the SME sector more viable. With that in mind, policies aimed at improving ICT adoption shall be proposed below;

Promoting cooperation between small firms in Cameroon; This would be an effective way to speed up the diffusion of ICT in the SME sector since results from this study show that the decision to adopt ICT in Cameroon is mostly influenced by interpersonal factors, imitation. Cooperation can be instilled in the SME sector by enacting policies that encourage partnerships and joint ventures.

Pursuing the development of cloud computing infrastructures; most SMEs surveyed elected high internet cost as a major obstacle to its adoption. Cloud computing is regarded as a technology that cuts down cost and increases efficiency of small firms, especially. Establishing and proposing this technology to SMEs might help increase the adoption of internet.

Supporting computer literacy and higher education; it was found that skilled workers are more likely to adopt ICT. Hence, training programs such as seminars, workshops are an effective way to improve the quality of labor of the SME owners and eventually accelerate the acceptance of ICT.

7. CONCLUSIONS

This research was set to analyze diffusion of ICT at the SME level. To achieve this, it was essential to first establish whether there is a relationship between ICT adoption and SME productivity. This issue had to be addressed in order to find out if ICT development policies are a legitimate way to enhance prosperity in the SME sector. The diffusion process of ICT in Cameroon SMEs was then examined to find out what influenced their decision to adopt ICT at a specific time, and what character they exhibited with respect to the moment in time when they adopted ICT.

Earlier in this study, the relevance of ICT adoption to SME prosperity was investigated by using cross-country evidence that included the combination of data from two different sources. It was verified that ICT diffusion and SME performance are complementary. Governments were thus proposed to enact policies that would enhance ICT infrastructure nation-wide in order to make SME sector more competitive.

The study then focused on the adoption of ICT at the SME level in Cameroon using the Bass model. The calculated *q/p* ratio of *200.25* for computer adoption in Cameroon's SME sector suggested that the decision to adopt PC is mostly imitative, influenced by word-of-mouth. Hence, interpersonal channels is the best way to speed up PC diffusion giving the negligible percentage (0.17%) that was found to be true innovators. Inter-firm cooperation was recommended to speed up diffusion. The results also showed that SMEs of greater size or with numerous plants exhibit a greater tendency to adopt computers. More so, highly educated SME owners were found to have a higher probability to adopt computers. Training programs such as workshops

were thus recommended to upgrade SME owners' skills in order to increase ICT adoption.

The calculated *q/p* ratio of *3.38* for internet adoption at the SME level in Cameroon, suggested that decision to adopt internet is equally imitative, influenced by personal contact with the technology. Consequently, interpersonal communication channels are the best way to speed up the acceptance of internet. However, the adoption of internet in Cameroon SMEs has a considerably higher percentage of true innovators than that of PC adopters. This implies that external sources such as mass-media are useful in the early stage of adoption.

A significant proportion of SMEs identified the cost of internet as the main obstacle to its adoption. This translates that finding ways to cut-down internet costs would enhance its proliferation as most SMEs in Cameroon can be assumed to pursue a cost-leadership strategy. Setting up and promoting cloud computing infrastructure was proposed as an effective way to help SMEs adopt internet at relatively cheaper cost.

On the other hand, many SMEs adopted the internet to obtain a variety of information. This shows that Cameroon SMEs are aware of the knowledge-based era in which they exist and are thus striving to access proper information and take advantage of it. An interesting result is that many SMEs that adopted internet did so to take advantage of e-commerce regardless of the fact that the current ICT infrastructure does not accommodate e-commerce. This could be an indication of the path that small businesses in Cameroon intend to take.

In sum, analysis of ICT adoption is important for effective decision making regarding development policies aimed at improving the SME sector in developing countries which in turn improves the aggregate economy.

REFERENCES

Abrahamson, E., & Rosenkopf, L. (1996). Social Network Effects on the Extent of Innovation Diffusion: A Computer Simulation. *Organization Science , 8* (3), 289-309.

African Development Bank. (2009). *African Economic Outlook.* OECD Publications.

Ark, V. B., Inklaar, R., & McGuckin, R. (2002, December). "Changing Gear" Productivity, ICT and Services Industries: Europe and the United States. *Groningen Growth and Development Centre* .

Arreymbi, J., Agbor, A. E., & Adnan, A. (2008). Critical Analysis of Why ICT Uptake is Slow in Emerging Economies - the Case of Cameroon. *Advances in Computing and Technology,The School of Computing and Technology 3rd Annual Conference*, (p. 165). London.

Arvanitis, S. (2005, June). Computerization, Workplace Organization, Skilled Labour and Firm Productivity: Evidence for the Swiss Business Sector. *Economics of Innovation and New Technology* , 225-249.

Audretsch, D. B. (2002). The Dynamic Role of Small Firms: Evidence from the U.S. *Small Business Economics , 18*, 13-40.

Bass, F. M. (1969). "A New Product Growth for Model Consumer Durables": The Bass Model. *Management Science , 15* (5), 215-227.

Bayo-Moriones, A., & Lera-Lopez, F. (2007). A firm-level analysis of determinants of ICT adoption in Spain. *Technovation , 27*, 352-366.

Beck, T., Demirguc-Kunt, A., & Levine, R. (2005). SMEs, Growth and Poverty: Cross-country Evidence. *Journal of Economic Growth* , 199-229.

Bresnahan, T. F., Brynjollfsson, E., & Hitt, L. M. (2002, February). Information Technology, Workplace Organization, and the Demand for Skilled Labor: Firm Level Evidence. *The Quarterly Journal of Economics* , 339-376.

Burns, P. (2001). *Entrepreneurship and Small Businesses.* New York: Palgrave.

Burton-Jones, A. (1999). *Knowledge Capitalism: Business, Work, and Learning in the New Economy.* London: Oxford University Press.

Cohen, W. M., & Levinthale, D. A. (1989). Innovation and Learning: The Two Faces of R&D. *The Economic Journal , 99*, 569-596.

Contractor, F. J., & Lorange, P. (2002). The growth of Alliances in the Knowledge-based Economy. *International Business Review* , 485-502.

Dasgupta, S., Agarwal, D., Ioannidis, A., & Gopalakrishnan, S. (1999). Determinants of Information Technology Adoption: an extension of Existing Models to Firms in a Developing Country. *Journal of Global Information Management , 7* (3), 30-40.

Dedrick, J., Gurbaxani, V., & Kraemer, K. L. (2003). Information Technology and Economic Performance: A Critical Review of the Empirical Evidence. *ACM Computing Surveys , 35* (1), 1-28.

Dholakia, R. R., & Kshetri, N. (2004). Factors Impacting the Adoption of the Internet among SMEs. *Small Business Economics , 23*, 311-322.

Emage, A. J. (2006). Sustainable Development in the Information and Communication Technology Industry (ICT) in Cameroon. A Case Study of ICT in Cameroon. *Dietz Berlin* , 70-80.

Firth, D. R., Lawrence, C., & Clouse, S. F. (2006). Predicting Internet-based Online Community Size and Time to Peak Membership Using the Bass Model of New Product Growth. *Interdisciplinary Journal of Information, Knowledge, and Management , 1*, 1-12.

Fischer, C. S. (1992). *America Calling A social History of the Telephone to 1940.* California: University of California Press, Ltd.

Hallberg, K. (2000). *A Market-Oriented Strategy for Small and Medium Scale Enterprises.* Washington DC: World Bank and IFC.

Hashim, J. (2007). Information Communication Technology (ICT) Adoption Among SME Owners in Malaysia. *International Journal of Business and Information , 2* (2), 221-240.

Hitt, M. A., Ireland, R. D., & Hoskisson, R. E. (2007). *Strategic Manaement. Competitiveness and Globalization: Concepts and Cases* (8 ed.). Mason: South-Western Cengage Learning.

Hollenstein, H. (2004). Determinants of the adoption of Information and Communication Technologies (ICT) An empirical analysis based on firm-level data for the Swiss business sector. *Structural Change and Economic Dyanmics , 15*, 315-342.

Hwang, H.-G., Ku, C.-Y., Yen, D. C., & Cheng, C.-C. (2004). Critical Factors Influencing the Adoption of Data Warehouse Technology: A Study of the Banking Industry in Taiwan. *Decision Support Systems , 37* (1).

Jepessen, S. (2005). Enhancing Competitiveness and Securing Equitable Development: Can Small, Micro and Medium-sized Enterprise (SMEs) do the trick? *Development in Practice , 15* (3 and 4), 463-474.

Katz, J. E. (2003). *Machines That Becomes Us: The Social Context of Personal Communication Technology.* New Jersey: Transaction Publishers.

Kharuddin, S., Ashhari, Z. M., & Nassir, A. M. (2010). Information System and Firm's Performance: The Case of Malaysian Small and Medium Enterprises. *International Business Research , 3* (4), 28-35.

Linden, M. (2011). *The Role of Institutions and ICT Entrepreneurship in Developing Countries - The case of Cameroon.* Stockholm: KTH Industrial Engineering and Management Industrial Management.

Little, I. M. (1987). Small Manufacturing Enterprises in Developing Countries. *World Bank Economic Review , 1* (2), 203-235.

Lopez-Nicolas, C., & Soto-Acosta, P. (2010). Analyzing ICT Adoption and Use Effects on Knowledge Creation. *International Journal of Information Management , 30*, 521-528.

Mahajan, V., Muller, E., & Srivastava, R. K. (1990). Determination of Adopters Categories by Using Innovation Diffusion Models. *Journal of Marketing Research , 27* (1), 37-50.

Manueli, K., Latu, S., & Koh, D. (2007). ICT Adoption Models. *20th Annual Conference of the National Advisory Committee on Computing Qualifications (NACCQ)*, (pp. 175-181). Nelson.

Martinez, E., Polo, Y., & Flavian, C. (1998). The Acceptance and Diffusion of New Consumer Durables: Difference Between First and Last Adopter. *Journal of Consumer Marketing , 15* (4), 323-342.

Morikawa, M. (2004). Information Technology and the Performance of Japanese SMEs. *Small Business Economics , 23*, 171-177.

National Assembly of Cameroon. (2010, April 13). *SME Law in Cameroon.* Retrieved March 03, 2011, from www.minpmeesa.cm: http://www.minpmeesa.cm/uploads/pdf/SME_LAW.pdf

Nforngwa. (2009, August 29). *Internet Prices Drop in Cameroon.* Retrieved July 04, 2011, from www.voanews.com: http://www.voanews.com/english/news/a-13-2009-08-25-voa22-68805722.html

Nkama, A. H. (2006). Analysing the Poverty Impact of the HIPC Initiative in Cameroon. *African Development Review , 18* (3), 330-352.

OECD. (2004). Promoting Entrepreneurship and Innovative SMEs in a Global Economy: Towards a More Responsible and Inclusive Globalization. *2nd OECD Conference for Ministers Responsible for Small and Medium-sized Enterprises.* Istanbul: OECD Publications.

Patrakosol, B., & Lee, M. S. (2009). IT capabilities, Interfirm Performance, and the State of Economic Development. *Industrial Management and Data Systems , 109* (9), 1231-1247.

Pedersen, P. E. (2005). Adoption of Mobile Internet Services: An Exploratory Study of Mobile Commerce Early Adopters. *Journal of Organizational Computing and Electronic Commerce , 15* (2), 203-222.

Perez, M. P., Sanchez, A. M., Carnicer, P. d., & Jimenez, M. J. (2005). The Differences of Firm Resources and the Adoption of Teleworking. *Technovation , 25*, 1476-1483.

Peterson, R. A. (1973). A Note on Optimal Adopter Category Determination. *Journal of Marketing Research , 10* (3), 325-329.

Research ICT Africa. (2006). *Towards an African e-Index: SME e-Access and Usage.*

Rogers, E. M. (1962). *Diffusion of Innovation* (1 ed.). New York: The Free Press.

Rogers, E. M. (1983). *Diffusion of Innovation* (3 ed.). New York: The Free Press.

Silverstone, R., & Haddon, L. (1996). Design and the Domestication of ICTs: Technical Change and Everyday Life. In R. Silverstone, & R. Mansell, *Communication by Design:The Politics of Information and Communication Technology* (p. 44). New York: Oxford University Press Inc.

Small and Medium Enterprise Agency Japan. (2000). *Outline of the Small and Medium Enterprise Basic Law*. Retrieved May 25, 2011, from www.chusho.meti.go.jp: http://www.chusho.meti.go.jp/sme_english/outline/02/01.html

Smallbone, D., & Welter, F. (2001). The Role of Government in SME Development in Transition Economies. *International Small Business Journal* , 63-77.

Soderling, L. (1999). *Structural Policies for INternational Competitiveness in Manufacturing: The Case of Cameroon.* OECD Publications.

Tsukahara, O. (2006, December 15). *SME Financing in Japan*. Retrieved May 05, 2011, from www.jasme.go.jp: www.jasme.go.jp/indexe

Turban, E., Leidner, D., Mclean, E., & Wetherbe, J. (2004). *Information Technology for Management: Transforming Organizations in the Digital Economy* (5 ed.). California: John Wiley & Sons Inc.

United Nations Conference on Trade and Development (UNCTAD). (2006). *The Digital Divide Report: ICT Diffusion Index 2005.* United Nations Publications.

United Nations. (2005). *Core ICT Indicators. Partnership on Measuring ICT for Developmemnt.* UNESCWA.

Wolf, S. (2001). Determinants and Impact of ICT Use for African SMEs: Implication for Rural South Africa. *Trade and Industrial Policy Strategy Annual Forum.* Muldersdrift.

Wong, D. H., Yap, K. B., Turner, B., & Rexha, N. (2011). Predicting the Diffusion Pattern of Internet-Based Communication. *Journal of Internet Business Applications Using Bass Model Parameter Estimates for Email* (9), 26-50.

Wright, M., Upritchard, C., & Lewis, T. (1997). A Validation of the Bass New Product Diffusion Model in New Zealand. *Marketing Bulletin , 8* (2), 15-29.

Yitamben, G., & Tchinda, E. (2009). Internet Use Among Women Entrepreneurs in the Textile Sector in Douala, Cameroon: Self-taught and Independent. In I. B. Webb, *African Women & ICTs: Investigating Technology, Gender and Empowerment.* London: MPG Books Group.

APPENDIX

Questionnaire

A) When was your company established?

☐1) Before1995

☐2) 1995 - 1999

☐3) 2000 - 2004

☐4) 2005 - 2009

☐5) 2010 or later

B) In what age group is the owner of the company?

☐1) Less than 25

☐2) 25 - 34

☐3) 35 - 44

☐4) 45 or more

C) Where is the headquarters Located (Province, Division) _____

D) How many plants does your company have?

☐1) 1

☐2) 2

☐3) 3

☐4) 4

☐5) 5 or more

E) How many employees does your company have?

☐1) 1 - 5

☐2) 6 - 10

☐3) 11 - 15

☐4) 16 - 20

☐5) 20 or more

F) In what business sector is your establishment?

☐1) Agriculture, Mining, Forestry

☐2) Manufacturing

☐3) Construction

☐4) Wholesale & Retail, repairs

☐5) Hotels and Restaurants

☐6) Transport and Communication

☐7) Financial and other Business services

☐8) Education, Health, Social

☐9) Other_____

G) Does your company use computers?

☐1) Yes

☐2) No

H) If yes, since what year does your company use computers (year)? _____

I) Does your company have Internet access?

☐1) Yes

☐2) No

J) If yes, since what year does your company have internet access (year)? _____

K) Why would your company use computers and internet? (Multiple answers accepted)

☐1) General information search

☐2) Provide information about company's product, services and technology

☐3) Order exchange with suppliers and customers

☐4) Purchase software, office equipment

☐5) Records (collection, analysis and reporting of data)

☐6) Receiving customer's feedback

☐7) E-commerce

☐8) I don't know

L) Why does your company not use the computer and internet? (Multiple answers accepted)

☐1) Does not apply to the type of enterprise/product

☐2) Not enough skilled personnel

☐3) It is too costly for my company

☐4) Customer's access to the internet is insufficient

☐5) Do not trust technology/security

☐6) I don't know

M) Highest level of education completed by owner

☐1) Primary

☐2) Some secondary

☐3) Completed High School

☐4) Professional training (apprenticeship, etc)

☐5) Undergraduate

☐6) Post graduate