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## The Impact of Internet Banking on the Performance of Micro and Small Enterprises in Costa Rica: A Randomized Controlled Experiment

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## **A Randomized Controlled Experiment**

Comisión Asesora en Alta Tecnología (CAATEC)

**September 2011**

**Inter-American Development Bank**  
Department of Research and Chief Economist

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## **Abstract**\*

This paper uses a randomized controlled experiment in Costa Rica to determine whether IB use by Banco Nacional de Desarrollo's micro and small enterprise (MSE) clients has an impact on their performance, measured in terms of productivity, increase in sales, and cost reduction. Results from the intervention group surveys indicate that Internet use is limited in MSEs' daily operations because of limited access to computers and the relatively low penetration of Internet services in employees' activities. In addition, firms have limited knowledge about the uses of the Internet as a business development tool. These results contrast with the reported benefits obtained by a small group of firms. Those benefits include reduced costs, higher sales, and better contact with customers.

**JEL:** D22, D83, O14, O38

**Keywords:** Information and communication technologies, Internet banking, Costa Rica, Micro and small enterprises, Small and medium enterprises, Business development.

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## 1. Introduction

Policymakers and development practitioners acknowledge the leading role of information and communication technologies (ICTs) for development (Dutta and Mia, 2009; UNCTAD, 2009). For instance, Millennium Development Goal (MDG) 8 aims at making available the potential benefits of new technologies (ICTs in particular) to poor regions of the world. In Latin America, limited access by small and medium enterprises (SMEs) to ICTs is regarded as a key obstacle for business growth (Dutta and Mia, 2010), and information and communication technologies are therefore seen as helping SMEs strengthen their operations and grow their businesses. Nonetheless, the impact of ICTs on development depends on how accessible these technologies are to firms, particularly SMEs ( Monge-González et al., 2007).

Monge-González et al. (2005) evaluated the importance of ICTs in the improvement of productivity and competitiveness of SMEs in five Central American countries (Costa Rica, El Salvador, Guatemala, Honduras, and Nicaragua). The authors concluded that internal factors that favor the adoption of ICTs in SMEs include the use of computers and the Internet by most employees, the existence of a budget to purchase and maintain computers and Internet services, a focus on scientific activities associated with business activities (such as increased levels of knowledge about modern software and advantages of using Internet services), and a willingness to venture into e-commerce. The main finding of the study was that the use of ICTs by SMEs in their business processes is still limited.

In the case of Costa Rica, using econometric techniques, Monge-González et al. (2007) found that BN-Desarrollo (a microfinance program at Banco Nacional, the country's largest bank) has positively impacted SMEs since 2000.<sup>1</sup> Among other results, an important share of the companies surveyed indicated that broader access to credit has improved their business and helped them increase their sales. Moreover, the quantitative analysis suggests a positive impact of access to credit through BN-Desarrollo on SMEs' productivity. In

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<sup>1</sup> According to official figures, 70 percent of total credit for SMEs granted by formal (regulated) financial intermediaries in Costa Rica is allocated through BN-Desarrollo. The study is based on data from 304 companies, divided in two groups: those affiliated to BN-Desarrollo, and another sub-sample of similar companies (controlled group) that do not have access to a similar credit program. A random sample was constructed with several control criteria to avoid selection bias and heterogeneity problems.

addition, employment has increased within the program-affiliated firms, with a direct impact on community development.<sup>2</sup>

Monge-González et al. (2007) found that only 16 percent of BN-Desarrollo affiliates use Internet banking (IB) services. This outcome could be partly explained by the fact that SMEs have limited access to ICTs (Monge-González et al., 2005). However, 78 percent of BN-Desarrollo customers that have access to Internet make use of IB tools. Moreover, Banco Nacional has a consolidated IB program, with a majority of medium and large firms as users.<sup>3</sup>

Although IB is accessible to every client firm of Banco Nacional that has access to the Internet, not all companies make use of it. For instance, Monge-González et al. (2005) found that 86 percent of SMEs in Costa Rica knew about IB, but only 25 percent make use of it. Moreover, in the case of BN-Desarrollo clients, Monge-González et al. (2007) found that 21.1 percent of micro and small enterprises have access to the Internet (inside the firm), but many of them do not use IB tools (22 percent).

There are many possible reasons why firms do not use IB even when they have access to the Internet at the workplace. In some cases, security, lack of interest, or cultural issues (i.e. a preference for personal interaction at the bank branch) could contribute to this outcome. Another reason could be limited knowledge of how to use IB tools in a productive way or even lack of knowledge about how IB tools can improve a firm's performance.

BND was created in 1999, as the Banco Nacional's micro, small and medium enterprise financing program. The program has more than 56,000 clients registered in the databases, which account for 25 percent of total bank credit lending. The group of clients is diverse, from different productive sectors and covering all regions of the country.<sup>4</sup> About 90 percent of these firms are micro and small enterprises (MSEs).

This study aims to answer the question whether Internet banking (IB) tools impact firm performance. A randomized controlled experiment (RCE) will be conducted to identify whether the use of Internet banking by BN-Desarrollo (BND)'s MSE clients has an

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<sup>2</sup> The impacts on productivity were estimated with Pearson and Spearman correlations, while a hedonic prices model was calibrated to estimate the impact on employees' welfare from BN-Desarrollo-affiliated firms.

<sup>3</sup> A question that arises is whether the limited access from SMEs to IB tools is the result mainly of limited Internet services in the country (lack of infrastructure) or the outcome of other factors.

<sup>4</sup> Further details available at <https://www.bncr.fi.cr/PortalMiPyME>

impact on their performance (productivity, increase in sales, and cost reduction). Exploring the relationship between IB use and firm performance will contribute to a better understanding of how access to IB for MSEs could enable business growth, and therefore facilitate the formulation of public policies.

## **2. Literature Review**

The main objective of this study is to identify the impact of Banco Nacional's (BN) Internet banking (IB) services on micro and small enterprise (MSE) clients' performance. Much of the existing research in banking and ICT focuses on its impact on the availability of finance for SMEs, the development of the banking industry and financial markets, and the influence of technological sophistication on bank-customers relationships (Han, 2007). In addition, issues related to online banking impacts have focused mainly on the consumer (individual). Research on access to online financial services and organizational customers (enterprises) performance is scarce (Gehling et al., 2007).

According to Wade et al. (2004), the literature suggests two approaches to how e-business tools affect firm performance and competitiveness. One is the revolutionary view (RV), which embodies radical organizational changes through the adoption of Internet business solutions (IBS) that help firms to increase revenue through externally focused initiatives, such as new market expansion new products and services development. The other is the evolutionary view (EV), where IBS primarily lead to higher efficiency and reduced costs through improvement of internal processes in key business areas such as financial and accounting information management, human resources, and procurement.

From another perspective, the study by Varian et al. (2002) estimated the impact of the Internet on productivity and growth based on the assessment of eight business areas: a) customer development / e-marketing; b) customer service and support; c) e-commerce; d) finance and accounting; e) human resources; f) procurement and MRO; g) sales force automation; and h) supply chain management. The authors used survey information to estimate the impact of IBS on costs savings and productivity based on business indicators such as annual revenue, gross and net margin, costs of production, and perceptions of general organizational improvements.



From the “supply side,” Gehling et al. (2007) argue that the impact of electronic banking on small businesses depends on several factors related to the bank’s understanding of the relationship between those businesses and their customers, and how well electronic banking services address their business requirements. Liu (2008) argues that Internet customer capital (customer databank, customer trust, customers’ complaint analysis and customer loyalty) and Internet service capital (speed of transaction check, security of transaction, knowledge databank, stability of system, and diversity of services) are significantly correlated with business performance.

Another issue is the willingness of firms (particularly micro and small enterprises) to use Internet banking services. According to Flavián et al. (2006), among the main factors influencing the adoption of online banking reported in the literature are: a) security; b) ease of use, perceived benefits in the service, resistance to change, price and availability of infrastructure; c) image, comparative advantage and compatibility; d) attitude, control of behavior, and existing subjective norms; e) compatibility of the new channel with the individual’s personality, computer skills and the chance to try it out; and f) trust and satisfaction.

Perceived usefulness (expectation of better performance) and perceived ease of use (using an application will not be difficult) are key variables present in the literature for decades, in line with ICTs application development and the Technology Acceptance Model (TAM) approach (Davis, 1989). Additional factors influencing Internet banking use reported by Amin (2009) include perceived credibility, perceived enjoyment, and social norms. In addition, limited financial literacy and the “digital divide” can prevent the use of Internet banking, particularly by low-income customers (Servon and Kaestner, 2008). Casaló et al. (2007) argue that trust is a key mediating factor in the development of online banking.

A central issue of this project is to identify whether the use of ICTs (in this case IB) is contributing to “value creation” or not, through revenues, direct and indirect costs, or returns on investment (ROI), among other potential indicators. The focus for this study will be on “internal organizational impacts,” mainly on costs and ROI (as well as other key financial indicators). Other “external” or RV-related issues will not be assessed.

### 3. Methodology

To achieve the research objective, a randomized controlled trial (RCT) will be conducted in order to estimate the impact of Internet banking on MSE performance. Several studies have evaluated the impact of new financial instruments linked to ICTs on business development (Arbursa, 2001; Monge-González et al., 2007; Mas and Kumar, 2008; Ngatia, 2009). Other studies have focused on the impact on households and firms of particular financial tools, applying RCTs (De Mel et al., 2007; Karlan and Zinman, 2009). This evidence suggests that ICTs can influence the performance of financial organizations, the rate of savings and household income, and SMEs growth. The difference between RCT-based studies and previous literature is the possibility to identify what specific instruments or policies can be more effective when pursuing financial development through broader access to ICTs in developing countries.

An RCT is a study in which subjects are assigned “at random” to receive one or several interventions (i.e., preventive treatment, technical training, or unemployment subsidy). According to Jadad and Enkin (2007), the objective of an RCT is to measure and compare different events, or “outcomes,” that are present or absent after the participants receive the interventions. One of the interventions is regarded as a standard of comparison or “control,” and the group of participants who receive it is called the “control group” (which receives “no intervention at all”). The other groups are called “experimental” and receive one or more alternative interventions.

Among other attributes, RCTs are seen as more precise analytical tools for development research. Traditional methods of measuring program impact may be subject to serious bias due to omitted variables. The critical objective of impact evaluation is to establish a *credible* comparison group, and in this regard RCT methodology helps to control for several possible causes, to see whether specific programs or interventions work or not (Duflo et al., 2008). In addition, experimental research offers the possibility to achieve reliable identification of program effects in the face of complex and multiple channels of causality, which is crucial for development interventions (Banerjee and Duflo, 2008).

### **3. 1 Research Plan**

For this experiment, IB services are randomly offered to a group of existing bank clients (BN-Desarrollo micro and small enterprises). Other clients are randomly chosen to not receive the encouragement. The randomization will ensure that the “intervened” clients (those who get the encouragement) are essentially similar to those who do not. Firms’ performance (in terms of increase in sales, cost reduction, and a financial indicator) are monitored over a period of time (six to nine months) to analyze whether IB tools have a causal effect on that performance.<sup>5</sup>

The hypothesis to be tested is whether the use of IB exerts an effect on BN-Desarrollo client enterprise performance (MSEs). The null hypothesis is that the performance of micro and small firms that use IB tools (treatment group) is similar to that of those firms that do not make use of IB (control group). In both cases (treatment and control groups) we are considering only clients with access to the Internet.<sup>6</sup> That is, the expected average effect of IB on a firm’s performance equals zero, or  $E[Y_i^T - Y_i^C] = 0$ . The final objective is, therefore, to evaluate whether IB tools are impacting MSE performance, measured by different variables (increase in sales, costs reduction, financial indicators).

Two random samples of potential IB users (experimental group) and non-users (control group) were thus selected as:

- **Experimental (encouragement) Group:** BND clients (micro and small firms) that have access to and use the Internet, but do not use IB tools and receive the encouragement.
- **Control Group:** BND clients (micro and small firms) that have access and use the Internet but do not use IB tools and do not receive the encouragement.

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<sup>5</sup> Monge-González et al. (2007) found that some BN-Desarrollo clients use IB tools (16.4 percent). The authors estimated a positive impact of loans (through BN-Desarrollo) on firms’ labor productivity, as well as a positive relationship between loan access and IB use by BN-Desarrollo clients. However, the authors did not assess the impact of IB tools on firms’ performance.

<sup>6</sup> We are not considering among the control group clients without Internet, since we know from previous studies (like Monge-González et al., 2005) that access and use of Internet in fact affect micro and small firms’ performance in Costa Rica.

### ***3.2 Randomization***

There are many different ways to introduce an element of randomization into an experiment. For this study, an *encouragement design* is implemented. In this specific case, the encouragement to make use of Internet banking (IB) is randomly assigned among BN-Desarrollo customers that have access to and use the Internet, but do not use IB.

According to Jameel (2009), encouragement is most useful when the program has to be open to all comers and when take-up is low but can be impacted with incentive easily. One of its advantages is that one can randomize at an individual level. For this experiment, the original encouragement was managed a CAATEC researcher and a BN-Desarrollo account executive who visited the treatment group members in order to advise firms on how to use IB tools. The officers helped their clients learn how to do different transactions and motivated them to integrate payroll payments, credit quota payments, customer invoicing, supplier payments, and other financial transactions within the IB platform.<sup>7</sup>

### ***3.3 Data and Sample Design***

#### ***3.3.1 Baseline***

Data were drawn from several rounds of data collection and from alternative sources. As a starting point, databases from Banco Nacional BN-Desarrollo client firms were explored. According to Duflo et al. (2008), using administrative data (data collected by the implementing organization as part of their normal functioning) linked to information on treatment can reduce the cost of data collection and reduce attrition (failure to collect outcome data from some individuals who were part of the original sample). Another advantage of database availability with detailed information (profiles) from client firms from BN-Desarrollo is that power calculations for the experiment are more feasible.<sup>8</sup>

Power calculations require a preliminary idea of the mean and the variance of the outcome in the absence of the intervention, after controlling for possible covariates and/or stratification. The best way to obtain those estimates is to use previously collected data, ideally from the same country or region (Duflo et al., 2008).

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<sup>7</sup> An electronic security device (token) was given to the firms that received the intervention.

<sup>8</sup> The power of the experiment design is the probability that, for a given effect size and a given statistical significance level, the hypothesis of zero effect is rejected (Duflo et al., 2008).

More than 56,000 clients are registered in BN-Desarrollo databases. The share of BN-Desarrollo credit in total credit from Banco Nacional has increased in recent years, from 22 percent at the beginning of 2007 to 25 percent in December 2009. BN-Desarrollo clients are categorized in 12 groups. A regrouping was done in order to make a detailed classification by firm size and identify a group of distinctive variables from databases. As a result, 41,702 firms were effectively identified and classified. This group of firms represents the population of BN-Desarrollo used for the study. Table 1 describes them by firm size and Internet banking (IB) use. In general, 29 percent of BN-Desarrollo clients make use of Internet banking.<sup>9</sup> Medium-sized firms represent the most important group of clients that use IB, although they represent only 2 percent of BN-Desarrollo clients. Firms with 1 to 5 employees represent 89 percent of total clients and less than 30 percent of IB users. Small firms represent 9 percent of total BN-Desarrollo clients, while 45 percent of them use IB (Table 1). Rural micro firms are mainly agricultural producers. Micro firms are mainly small industry companies and commerce businesses. Small firms are engaged in small-scale industrial activities, commerce, and services.

**Table 1. BN-Desarrollo Clients by Firm Size and Internet Banking Use, 2009-2010**

<b>Firm Size</b>	<b>With Internet Banking</b>	<b>Without Internet Banking</b>	<b>Total</b>	<b>% of Total</b>	<b>% with Internet Banking</b>
RURAL MICRO (1 to 5 employees)	1855	7503	9358	22%	20%
MICRO (1 to 5 employees)	8164	19698	27862	67%	29%
SMALL (6 to 30 employees)	1698	2077	3775	9%	45%
MEDIUM (30 to 99 employees)	408	299	707	2%	58%
	12125	29577	41702	100%	29%

*Source:* Author's compilation with data from BN-Desarrollo, Banco Nacional

Regarding credit balance and banking products, medium-sized firms present the highest averages among BN-Desarrollo clients. They also generate higher average profits for Banco Nacional (Table 2). Medium-sized firms are the least representative in number, but are more relevant in terms of banking operations and IB use. On the other hand, the majority of BN-Desarrollo clients are micro and small sized firms, with lower use of IB. Because of the differences identified among BN-Desarrollo clients according to their size,

<sup>9</sup> Internet banking from Banco Nacional.

the emphasis is on micro and small firms. The identification of IB use options and impacts on firms' performance is assessed. Three groups of firms are used: rural micro, micro, and small firms.

**Table 2. Average Credit Balance and Banking Product Use per BN-Desarrollo Client**

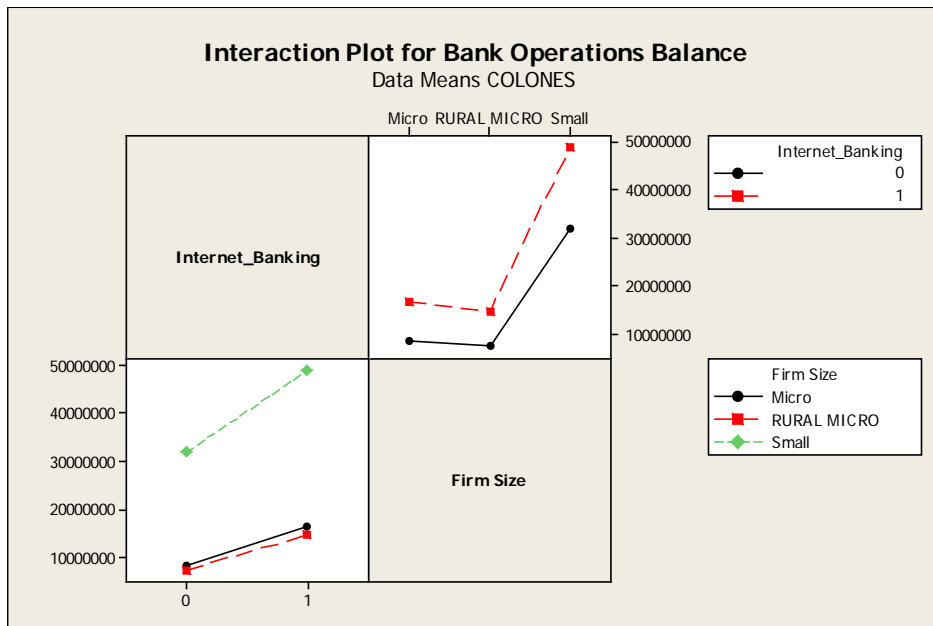
<b>Firm Size</b>	<b>Credit Balance per Firm</b>	<b>Number of Banking Products per Firms</b>	<b>BN profit per Firm</b>
RURAL MICRO (1 to 5 employees)	7,513,722	5	17,012
MICRO (1 to 5 employees)	8,267,373	5	26,181
SMALL (6 to 30 employees)	28,370,881	6	130,075
MEDIUM (30 to 99 employees)	154,172,252	8	778,489

*Source:* Author's compilation with data from BN-Desarrollo, Banco Nacional.

To explore the interactions of two factors (IB use and firm size) with a group of banking response variables, interaction plots are used to identify patterns. Data indicate an interaction between both factors and four variables. In the case of operations with Banco Nacional (balance of all service products, credit, savings, and financial transactions, in colones), small firms have a higher average balance than micro-sized companies. When interacting with Internet banking use, the three groups of companies show higher averages (Figure 1).

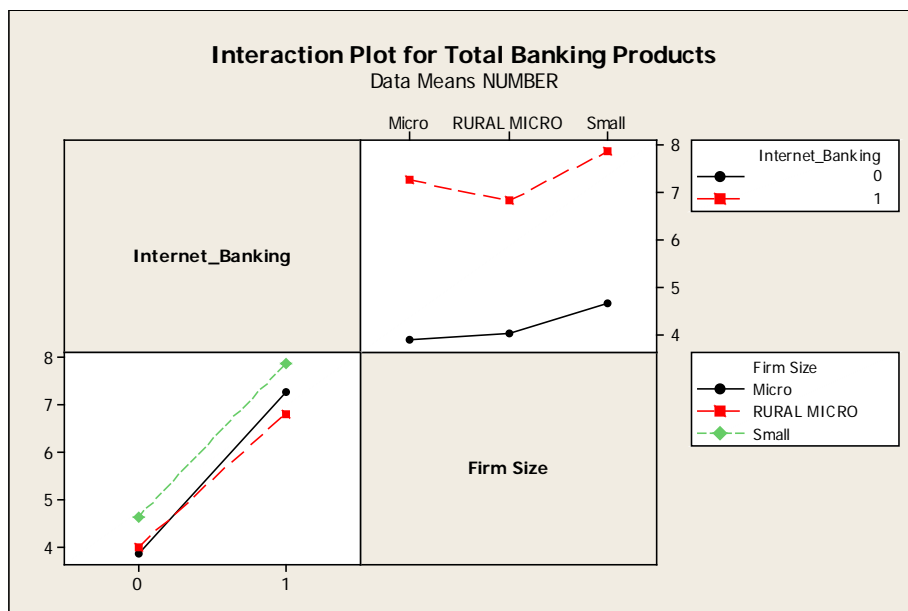
The linkages of BN-Desarrollo clients with the bank are assessed based on the number of financial products they report (i.e., credit operations, debit or credit cards, savings accounts, investments, etc.). Small firms have on average more banking products than micro firms. In addition, the firms that use Internet banking use almost double the number of products on average (Figure 2). Evidence indicates that the number and related amount of operations are related to IB use. If operations are used as an indicator of firm performance, then stronger links with the bank as a client are likely when using Internet banking.

**Figure 1. Interaction between Firm Size and Use of Internet Banking on Banking Balance**



Source: Author's compilation with data from BN-Desarrollo, Banco Nacional.

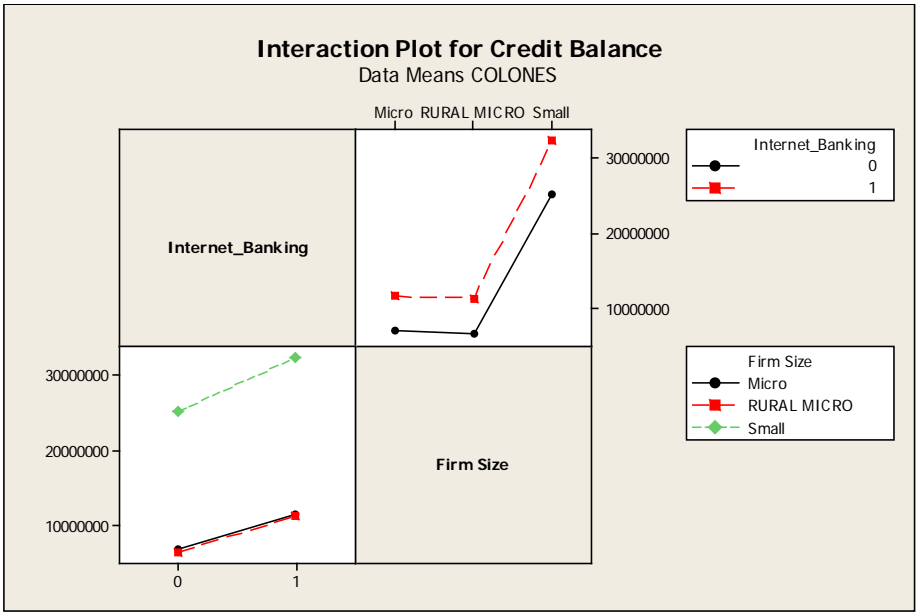
**Figure 2. Interaction between Firm Size and Use of Internet Banking on Firm Banking Products Demand**



Source: Author's compilation with data from BN-Desarrollo, Banco Nacional.

The average credit balance from small firms is significantly higher than micro sized BN-Desarrollo clients. When using Internet banking, micro and small firms show a higher average balance. This result indicates that IB users have more access to loans from BN-Desarrollo (Figure 3). In this way, a better knowledge of firms through higher linkages facilitates a stronger bank-client relationship, which helps reduce transaction costs and improve risk management. Moreover, IB users have better access to loans, through different financial instruments (direct loans, credit cards, etc.) as a result of those stronger linkages with the bank through IB. Data from Banco Nacional indicate that 26 percent of total credit quota payment transactions paid through Internet banking (IB) are made by BN-Desarrollo clients.

**Figure 3. Interaction between Firm Size and Use of Internet Banking on Firm Credit Balance**

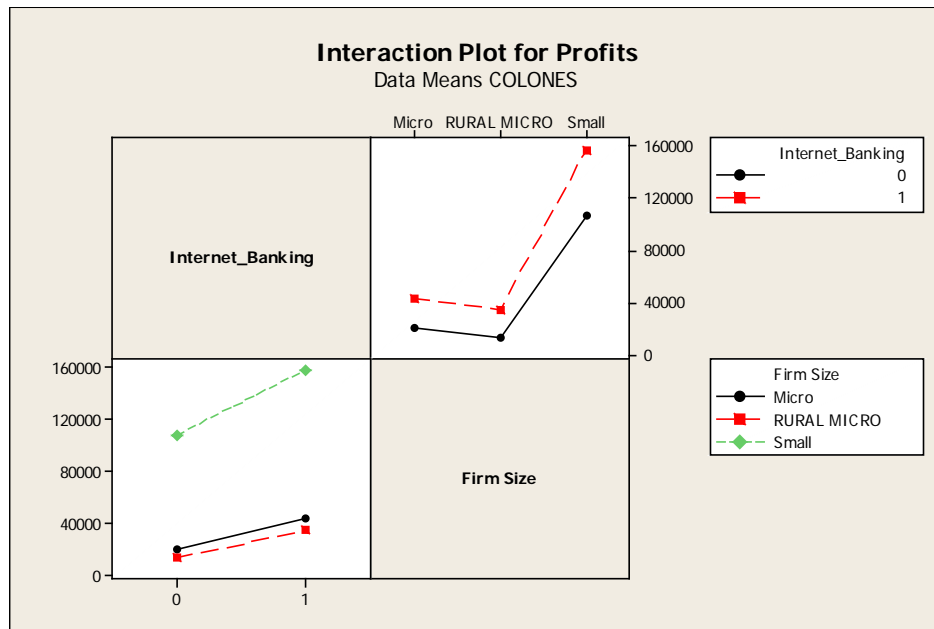


Source: Author's compilation with data from BN-Desarrollo, Banco Nacional.

The evidence supports the notion that Internet banking use is a driver of cost reductions for the bank, increasing profits per client. BN-Desarrollo clients who use IB generate higher average profits for the bank (Figure 4).



**Figure 4. Interactions between Firm Size and Use of Internet Banking on Profits per Firm**



Source: Author's compilation with data from BN-Desarrollo, Banco Nacional.

The interaction plots indicate patterns between firm size and Internet banking use. To determine if those patterns are statistically significant, correlation tests were done. For the four variables assessed (bank operations balance, number of banking products, credit balance, and bank's profit per firm), the null hypothesis of no relationship with Internet banking use was rejected ( $p$ -values  $< 0.05$  in all cases) and the test for equality of means indicates higher levels for those firms that use IB, in all four variables (with an  $\alpha$  of 5 percent).

### 3.3.2 Sample

Random samples were taken from BND data bases in order to select and contact those potential firms to be included in control and intervention groups (using a random number generator to order observations randomly). Telephone surveys were done to identify those firms that do not use Internet banking services (to validate BN databases). The objective was to estimate sample designs from BN-Desarrollo databases. After this exercise, however, inconsistencies with available data bases at BN were identified.<sup>10</sup>

<sup>10</sup> Banco Nacional has been working on database integration and updating since mid-2009.

A baseline survey was then conducted to identify BND clients that have access to the Internet at the workplace and do not make use of IB tools.<sup>11</sup> The survey also helped identify the main reasons for IB non-use and other firm related variables (sales, employment, capital intensity, employee ICTs skills, and innovation activities) complementary to BND data bases information. It includes questions adapted from ICT statistics collection tools developed by UNCTAD (2009) and previous research experience from the CAATEC Foundation.<sup>12</sup>

The questionnaire has four sections and company and interviewer identification data. The first section refers to access and use of the Internet, the second is about the use of the Internet for business purposes, the third describes the current use of financial services by the firm, and the final section is about the business profile and performance of the firm.

The response was limited. However, it helped uncover issues which were not taken into account in the design phase of the study. In addition, as a pilot test, it revealed a key lesson, which was that a direct involvement of account executives was necessary in order to collect all relevant data and achieve a higher response and interest from BN-Desarrollo clients. Objective data on the performance of micro and small firms are not usually available because most firms are neither required by Banco Nacional to publish their firms' financial results nor are they willing to reveal such information voluntarily to outsiders.

Because of that, BN-Desarrollo authorities decided that only the executives were allowed to enroll clients as Internet banking users and collect the baseline data personally through a face-to-face interview for both the intervention and the control groups. Researchers from CAATEC joined the fieldwork for clarification and control. Because of competing demands on the executives' time, the fieldwork took more time than previously estimated. To date, 44 BN-Desarrollo clients assigned to the intervention group have been surveyed and enrolled as IB users.

The process of completing the intervention and interviews with 25 additional BN-Desarrollo micro and small enterprise clients is underway. In addition, the BN-Desarrollo client sample of the control group is being identified and validated with BN-Desarrollo

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<sup>11</sup> The survey data are annexed to this document.

<sup>12</sup> UNCTAD Model Questionnaire for core indicators on use of ICT by businesses and OECD Model Questionnaire for ICT Use by Business.

authorities. Knowing more details about the intervention group permits a better balancing of the control group.

Deaton (2009) argues that heterogeneity treatment is a key requirement for successful experiments.<sup>13</sup> In order to address this issue, BN-Desarrollo's databases and the baseline survey helped to account for relevant variables to create a *balanced baseline* of both groups (experimental and control). This task is crucial, since identifying and isolating the effects of particular (apart from various influential variables) is a central issue.

For this experiment, compliance might not be perfect. In this case, the randomized design is influencing only the probability that a firm receives a treatment (Internet banking) and not the treatment itself. Therefore, account executives' support was requested when selecting control and intervention samples. Information gathered and managed by BN-Desarrollo's account executives was the starting point to identify those clients with access to the Internet at a workplace that does not use IB tools.<sup>14</sup> This action was necessary in order to obtain reliable and updated information on the effective actual use of IB by BN-Desarrollo clients. It also helped identify other relevant variables to begin implementation.

### 3.3.3 Stratification

Stratification was used to improve the accuracy of estimates. It was also helpful in identifying differences in the effects of the treatment on specific subgroups of firms. In this way, the control and treatment groups will be balanced according to five criteria:

1. Geographic location (in this case San José and Cartago provinces)
2. Type of firm. Micro (1 to 5 employees) and small enterprises (6 to 30 employees)
3. Type of productive activity (commerce and services, industry, and agriculture)
4. Availability of high-speed (broadband) Internet in the geographic location (county) of the enterprises. The geographic (county) coverage and availability of high-speed Internet services were obtained through

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<sup>13</sup> The author criticizes what he believes is a common practice among RCTs proponents, not to give all the required importance to heterogeneity (and exogenous effects) issues when constructing an experimental design.

<sup>14</sup> The survey is annexed to this document.

the CISCO broadband barometer database that is developed every six months by CAATEC.

#### 5. Use of other Internet business solutions (IBS) besides Internet banking

In practice, there are differences among micro and small enterprises regarding Internet access and Internet banking use (Monge-González et al., 2005). In addition, the business activity of the firm could determine the potential use of IB. For example, the authors found that agricultural firms have a lower propensity to use Internet services than other firms. Moreover, safe and efficient IB use depends heavily on the availability of high-speed services where the firms are located. Johnston et al. (2007) found differences of IBS impacts on performance related to type of industry, firm size and technology use (also regional). In addition, it is important to take into account the impacts that other IBS have on the firm, to isolate the direct impact of Internet banking. According to Duflo et al. (2008), an estimate of the treatment effect and its variance that take into account stratification can be obtained with an OLS estimation of:

$$Y_{ij} = \alpha + \beta T + M_{ij} + \tilde{v}_j + \tilde{\omega}_{ij} \quad (1)$$

where  $M$  is a set of dummy variables indicating the stratified blocks observations,  $\tilde{v}_j$  and  $\tilde{\omega}_{ij}$  represents the unexplained variance after controlling for  $M_{ij}$ . The OLS estimate of  $\beta$  accounts for the impact of IB on firms' performance ( $Y_{ij}$ ).

In the case of the intervention ( $T$ ), the case of all IB services and each one of the most important IB tools should be evaluated (i.e. payroll payments, credit quota payments, customer invoicing, supplier payments, and other financial transactions). The latter is important since it allows the exploration of different channels through which IB may affect a firm's performance.

## 4. Implementation

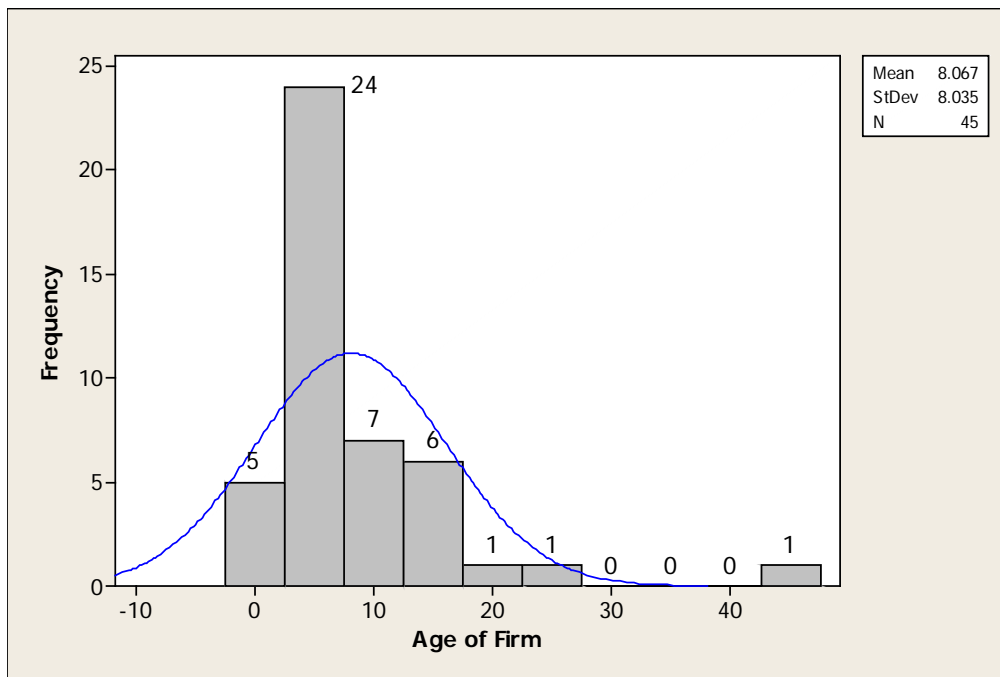
For this study, account executives from BN-Desarrollo have been directly involved in the research process. The intervention and survey test session (with 14 entrepreneurs, all of them current credit beneficiaries of BND) was done with account executives and the research team that made a general presentation of Internet banking and conducted the

intervention: entrepreneurs were given training on the use of Banco Nacional's Internet banking. With support from BN Desarrollo account executives, 31 clients that do not use the Internet banking were added to the previous 14 clients, for a total intervention sample of 45 firms. Eighty-two clients that have access to and use the Internet were identified as the control group.

Currently, the encouragement process has taken place with the identified intervention sample. Some relevant partial results from the sample of intervened firms are detailed next. In terms of markets, 44 out of 45 firms have the local market as their main destination (100 percent of production). Only one firm reports exports to Central America (5 percent of total sales). In terms of sales performance, 7 firms report better growth than competitors, 14 indicate a similar performance to the market average, and 18 firms consider their performance as lower than their market competitors. Most companies started operations in the last decade (Figure 5). There is a group of 10 companies with 15 or more years in operation.

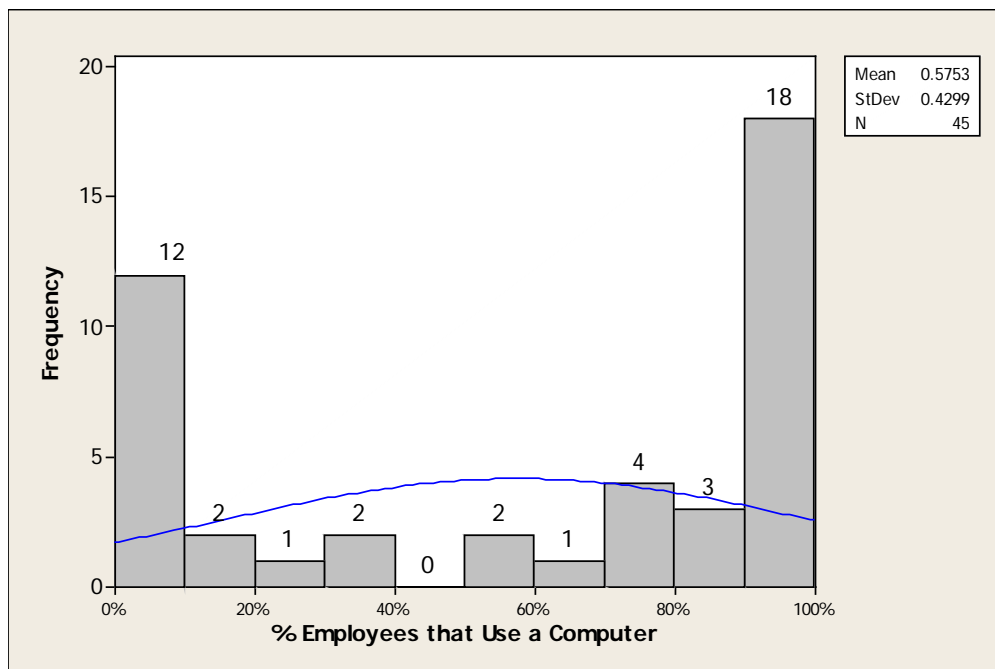
Regarding computer use by employees, 12 out of 45 companies report no access to computers at the workplace. Eighteen firms indicate that all of their employees use a computer for their work. The share of employees that use a computer varies from 10 percent to 80 percent in the case of 15 firms (Figure 6). The limited access to computers might impede productive use of the Internet at the firm.

**Figure 5 Intervention Group: Distribution of Firms by Age**



Source: Survey results database

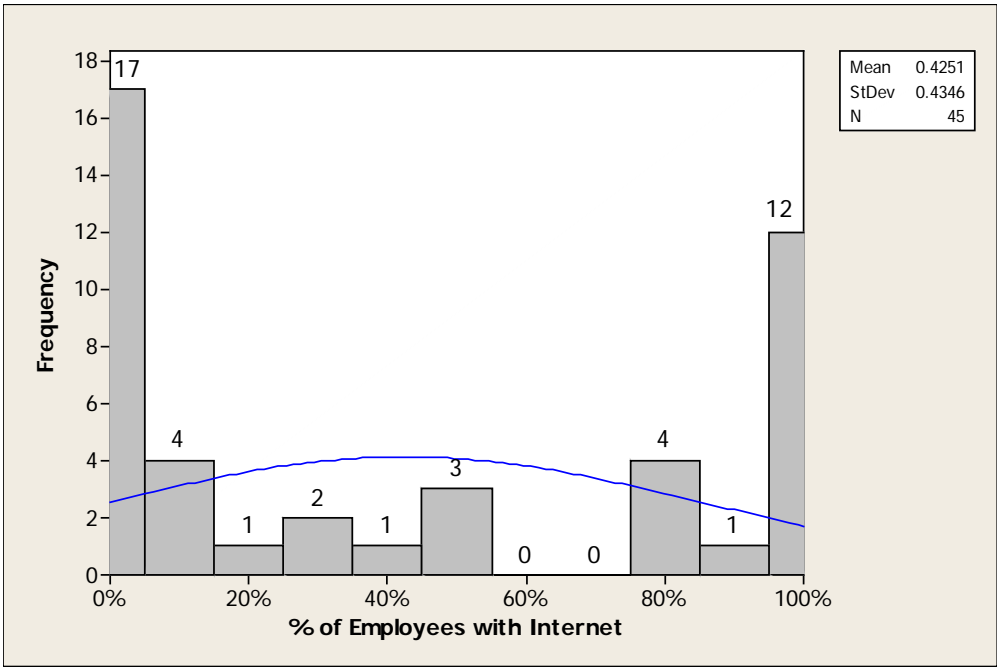
**Figure 6 Intervention Group: Number of Firm Reporting Computer Use by their Employees and Share**



Source: Survey results database

Related to computer use, when asked about Internet use by employees, 17 out of 45 firms indicated that they make no use of the Internet at work. In contrast, 12 firms report Internet use by their employees (Figure 7). The majority of firms are micro-sized, and notwithstanding the small number of Internet users, they represent a high relative share of total employment. The use of the Internet for productive activities might not necessarily be related to the use of Internet banking, which is regularly done by the owner of the company in the case of micro- and small-sized firms. However, the results of computer and Internet access by employees at BN-Desarrollo client firms are indicators of potential use for business activities.

**Figure 7. Intervention Group: Number of Firms Reporting Internet Use by their Employees and Share**



Source: Survey results database

The results described above are more meaningful when exploring whether the Internet is used for business transactions by BN-Desarrollo clients. Of the 45 firms intervened, 5 indicated that they use the Internet to sell products. The share of Internet sales ranges from 10 to 50 percent. Among the benefits of using the Internet as a sales channel, all firms indicated the reduction of transaction time and an improved relationship with

clients. Four firms indicated reduced operational costs and better competition as benefits, while three firms pointed to an increase in sales and the number of customers.

When asked about the main obstacles to using the Internet as a sales channel, more responders indicated “preference for personal interaction with customer” and “impossibility of selling through Internet.” Other reasons indicated included security and privacy reasons and resource limitations (Table 4). The evidence suggests a limited understanding of the potential use of the Internet for business transactions and the scope for obtaining more benefits from its use.

**Table 3. Intervention Group: Use of Internet for Sales**

<b>Respondent</b>	<b>Share of Sales through Internet</b>	<b>Benefits of selling Products through the Internet</b>
Firm 1 Micro	10%	Reduction of transaction time Improvement on customer attention Reduction of operations costs Increase of sales and customers Keep in line with competition Easiness of contacting individual customers
Firm 2 Micro	30%	Reduction of transaction time Improvement on customer attention Keep in line with competition Easiness of contacting individual customers
Firm 3 Micro	30%	Reduction of transaction time Reduction of operations costs Increase of sales and customers Keep in line with competition Easiness of contacting individual customers
Firm 4 Micro	40%	Reduction of transaction time Easiness of contacting individual customers
Firm 5 Small	50%	Reduction of transaction time Improvement on customer attention Reduction of operations costs Increase of sales and customers Keep in line with competition Easiness of contacting individual customers

*Source:* Survey results database

Regarding purchases through the Internet, 12 of the 45 firms report Internet purchases ranging from 1 percent to 80 percent of total purchases. Of them, 7 firms report ease of buying directly without intermediaries and the possibility of finding products not available in local markets as benefits of purchasing through the Internet. One company reported no benefits from Internet purchases (Table 5). It is worth mentioning that firms



that sell products through the Internet are not the same ones that make purchases through the Internet. This result will be further evaluated.

**Table 4. Intervention Group: Obstacles for the Use of Internet for Sales**

Obstacle	Firms Responding
Products cannot be sold through the Internet	22
Security reasons	3
Privacy reasons	1
Preference for personal interaction with customer	13
Small demand through the Internet	4
High administration cost	5
Employees lack knowledge	5
Lack of required financial services	4

*Source:* Survey results database.

**Table 5. Intervention Group: Use of Internet for Purchasing**

Respondent	Share of Sales through Internet	Benefits of purchasing Products through the Internet
Firm 1 Micro	80%	Reduction of transaction time Reduction of operations costs Reduction of production costs Finding products not available in local markets
Firm 2 Micro	10%	Reduction of production costs
Firm 3 Micro	10%	Finding products not available in local markets
Firm 4 Micro	30%	Reduction of transaction time Improvement on supplier attention Reduction of operations costs Reduction of production costs Finding products not available in local markets
Firm 5 Small	20%	Improvement on supplier attention Reduction of operations costs Finding products not available in local markets
Firm 6 Micro	50%	Reduction of production costs Finding products not available in local markets
Firm 7 Micro	50%	Reduction of transaction time
Firm 8 Small	10%	Reduction of transaction time Finding products not available in local markets
Firm 9 Micro	10%	Reduction of transaction time Reduction of production costs Finding products not available in local markets
Firm 10 Micro	50%	Reduction of transaction time Improvement on supplier attention Reduction of operations costs Reduction of production costs Finding products not available in local markets
Firm 11 Small	10%	Reduction of operations costs Finding products not available in local markets
Firm 12 Micro	15%	Reduction of operations costs Reduction of production costs

*Source:* Survey results database.

The intervention work will continue and the results obtained so far will be improved with a larger sample. In addition, the control group analysis for comparisons will be further developed, taking into account the main characteristics identified so far.

## **5. Lessons Learned**

Micro and small-sized firms that are clients of BN-Desarrollo make more limited use of IB services than medium-sized firms. The interaction of IB use and other banking variables is important. Access to credit, acquisition of banking instruments, and stronger linkages with Banco Nacional are interrelated with the use of Internet banking. This finding is relevant since fewer than 30 percent of micro and small firms are currently making use of IB for their operations. The limited use of IB might prevent micro and small firms from forging a stronger client-bank relationship and making better use of banking instruments to improve business performance. These results were obtained from BN-Desarrollo client firms' database analysis. They are the starting point for the study that is complemented and enhanced with the analysis of the intervention and control groups.

Results from the intervention group surveys indicate that Internet use is limited in micro and small firms' daily operations because of limited access to computers and relatively low penetration of Internet services in employees' activities. Firms prefer to purchase instead of selling through the Internet, in many cases because of limited knowledge about the uses of the Internet as a business development tool. This obstacle seems to be more relevant than traditional reasons related to security or limited knowledge. These results contrast with the reported benefits obtained through the use of the Internet by a small group of firms, including reduced costs, higher sales, and better contact with customers. Micro and small companies that use the Internet take advantage of opportunities to improve.

Intervention group firms are relatively mature businesses with several years in operation. They do business on the local market mainly related to industrial and service activities. A question that emerges is whether business diversification or performance improvement might depend on a stronger use of Internet business solutions such as Internet banking services. The main objective of this study is to find evidence of the existence and strength of this relationship. The results obtained suggest that micro and small firms face

important barriers to integrating Internet services into their operational strategies. This might limit Internet banking use, banking services access, and growth potential.

## Annex 1. Sample Identification Questionnaire

### Cuestionario para Clasificación de Clientes BND

Nombre del Cliente: \_\_\_\_\_

Consecutivo N°

Teléfonos: \_\_\_\_\_

#### Identificación de uso de Computadora, Internet y Banca Electrónica

P1. ¿Tiene usted computadora en su Empresa?

Sí

Computadora en las instalaciones de la empresa o en casa de habitación.

No Pase a P3.

P2. ¿Qué porcentaje de los empleados utiliza regularmente la computadora para su trabajo?

%

Incluye a todas las personas de la empresa, empleados, propietario, socios, etc.

P3. ¿Tiene usted Internet en su Empresa?

Sí

Internet en las instalaciones de la empresa o en casa de habitación.

No Pase a P6.

P4. ¿Qué porcentaje de los empleados utiliza regularmente Internet para su trabajo?

%

P5. ¿Cómo se conecta su empresa a la Internet?

Marque la opción válida

Internet en las instalaciones de la empresa o en casa de habitación

Módem analógico (conexión a través de línea telefónica corriente: si usa la Internet no puede hacer llamadas al mismo tiempo)

RDSI (Red Digital de Servicios Integrados)

Acelera o ADLS

Línea dedicada

Cable (RACSA, Amnet o Cabletica)

Inalámbrico (WiMax) o Sky


P6. ¿Usa su empresa los servicios de Banca Electrónica del Banco Nacional?


Sí

No

P7. ¿Usa su empresa los servicios de Banca Electrónica de otro banco que no sea el Banco Nacional?


Sí

No

**Muchas Gracias**

## Annex 2 Implementation Questionnaire

### Cuestionario para Clientes de Banca de Desarrollo del Banco Nacional

Cuestionario N°

Nombre del Entrevistado:

Cargo en la Empresa:

Edad:

Género: Masculino Femenino

Nivel Educativo: primaria completa secundaria completa secundaria incompleta universitaria incompleta universitaria completa

Correo Electrónico: @

#### Sección A: Información sobre el Uso de Internet en la Empresa

P1. ¿Qué porcentaje de los empleados utiliza regularmente la computadora para su trabajo?

%

P2. ¿Qué porcentaje de los empleados utiliza regularmente el Internet para su trabajo?

%

P3. ¿Cómo se conecta su empresa al Internet?

Marque todas las opciones válidas

Módem analógico (conexión a través de línea telefónica corriente)

RDSI (Red Digital de Servicios Integrados)

Acelera o ADLS

Línea dedicada

Cable (Amnet/Cabletica)

Inalámbrico (WiMax, Satelital, otros)

Incluye a todas las personas de la empresa, empleados, propietario, socios, etc.

El uso de Internet puede ser dentro de las instalaciones de la empresa o en otro lugar.

Se refiere a la empresa como abonada del servicio y no a los empleados particulares.

P4. ¿Alguna vez le han ofrecido los servicios de Banca Electrónica del Banco Nacional?

Sí

No

P5. ¿Alguna vez ha utilizado los servicios de Banca Electrónica del Banco Nacional?

<input type="checkbox"/>	Sí
<input type="checkbox"/>	No

P6. ¿Por qué razones su Empresa no utiliza actualmente los servicios de Banca Electrónica del Banco Nacional?

Marque todas las opciones válidas

- Utiliza el de otro Banco (¿Cuál? \_\_\_\_\_)
- Utiliza Banca Telefónica
- No es seguro
- No conoce los detalles o servicios
- El uso es complicado
- No percibe ningún beneficio para la Empresa
- Prefiere visitar la Agencia Bancaria
- Otro \_\_\_\_\_

<input type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/>

P7. ¿Tiene su Empresa un sitio Web propio?

<input type="checkbox"/>	Sí
<input type="checkbox"/>	No

P.8. Año en que comenzó a usar Internet para uso del negocio

P.9. Año en que su empresa comenzó a usar los servicios del Banco Nacional

<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>

**Sección B: Sobre cómo usa su Empresa el Internet para fines del Negocio**

P10. ¿Vende su Empresa bienes o servicios por Internet?

Sí
No

Ir a P13

Se entiende por venta el compromiso asumido por un cliente para comprarle bienes o servicios, cuando este compromiso se concreta por Internet. (Incluye pedidos a través de correo electrónico convencional)

P11. ¿Qué porcentaje de las ventas de su empresa del último año se hicieron por Internet?

	%
--	---

P12. ¿Cuáles beneficios obtuvo su empresa por la venta de productos o servicios por Internet en el último año?

Marque todas las opciones válidas

- No obtuvo beneficios
- Reducción del tiempo de transacción
- Mejora en la calidad de atención al cliente
- Reducción de los costos operativos
- Aumento en el volumen de ventas y/o el número de clientes
- Mantenerse al ritmo con la competencia
- Facilidad de dirigirse individualmente a cada cliente
- Otro \_\_\_\_\_


Inclusive costos de transacción y otros



P13. ¿Cuáles de los siguientes factores son obstáculos para que su empresa venda por Internet?

- Los productos de su empresa no se prestan para ser vendidos por Internet
- Por razones de seguridad
- Por razones de privacidad
- Prefiere mantener el modelo comercial actual (interacción personal)
- No hay un nivel de demanda suficientemente alto (por Internet)
- El costo de administración es alto
- No tiene empleados con las capacidades requeridas
- No tiene servicios financieros requeridos
- Otro \_\_\_\_\_

Marque todas las opciones válidas


Se refiere a reservas de la empresa o los clientes (por ejemplo, de suministrar información sobre la tarjeta de crédito por Internet)  
 Se refiere a reservas de la empresa o los clientes (por ejemplo, de suministrar información sobre la tarjeta de crédito por Internet)

P14. ¿Compra su Empresa bienes o servicios por Internet?


Sí  
 No  
 %  
 Ir a P17

Se entiende por compra el compromiso asumido por la empresa para comprar bienes o servicios, cuando este compromiso se concreta por Internet.

P15. ¿Qué porcentaje de las compras de su empresa del último año se hicieron por Internet?

P16. ¿Cuáles beneficios obtuvo su empresa por comprar productos o servicios por Internet en el último año?

Marque todas las opciones válidas

No obtuvo beneficios	<input type="checkbox"/>
Reducción del tiempo de transacción	<input type="checkbox"/>
Mejora en la calidad de atención del proveedor	<input type="checkbox"/>
Reducción de los costos operativos	<input type="checkbox"/>
Reducción de los costos de producción	<input type="checkbox"/>
Conseguir productos que no existen en el mercado local	<input type="checkbox"/>
La facilidad de comprar sin intermediarios	<input type="checkbox"/>
Otro _____	<input type="checkbox"/>

P.17. ¿Utiliza su empresa el Internet en alguna de las siguientes áreas de trabajo?

Marcar todas las opciones válidas

Finanzas	<input type="checkbox"/>
Reclutamiento interno o externo	<input type="checkbox"/>
Capacitación del personal	<input type="checkbox"/>
Compartir o distribuir información dentro de la empresa	<input type="checkbox"/>
Compartir o distribuir información con otras entidades	<input type="checkbox"/>
Mercadeo	<input type="checkbox"/>
Servicio al cliente	<input type="checkbox"/>
Informática (compra de software)	<input type="checkbox"/>

Incluye facturación y pago por Internet, banca en línea

Por ejemplo, anunciar puestos vacantes interna y externamente

Incluye programas de aprendizaje electrónico

Publicidad en línea, catálogo de productos, listas de precios

Servicio post-venta

Otro \_\_\_\_\_

P.18. ¿Qué beneficios ha obtenido su negocio con el uso de Internet?

Marcar todas las opciones válidas

- Reducción del tiempo de transacciones
- Mejor servicio al cliente
- Menores costos operativos
- Mayores ventas
- Más clientes
- Mantenerse competitivo en el mercado
- Mejor manejo financiero
- Mejor control contable
- Mejor manejo de las ventas
- Mejor manejo de los recursos humanos
- Mejor relación con los proveedores
- Mejores ganancias
- Otro \_\_\_\_\_

**Sección C: Servicios bancarios**

P.19. ¿Cuáles servicios bancarios utiliza la Empresa? **En** la agencia bancaria. Marque todas las opciones válidas

- Cuenta de ahorro
- Inversiones a plazo/fondos de inversión
- Pago de servicios (agua, electricidad, municipalidad, otros)
- Consulta de saldos y movimientos de cuentas
- Tarjeta de crédito
- Tarjeta de débito
- Pago de planilla
- Pago a proveedores
- Transferencias interbancarias
- Consultas sobre inversiones
- Pago de préstamos
- Plan de pensiones

P.20. ¿Cuáles de esos servicios bancarios le gustaría utilizar a través de la Banca Electrónica del Banco Nacional? Marque todas las opciones válidas

- Cuenta de ahorro
- Inversiones a plazo/fondos de inversión
- Pago de servicios (agua, electricidad, municipalidad, otros)
- Consulta de saldos y movimientos de cuentas
- Tarjeta de crédito
- Tarjeta de débito
- Pago de planilla
- Pago a proveedores
- Transferencias interbancarias
- Consultas sobre inversiones
- Pago de préstamos
- Plan de Pensiones
- Otro \_\_\_\_\_

**Sección D: Información adicional sobre su Empresa**

Marque solo Una

P.21. Actividad principal de su empresa

Descripción: \_\_\_\_\_

\_\_\_\_\_

Agricultura, Ganadería, Silvicultura y Pesca

Industria Manufacturera

Servicios

Comercio

P.22. Año de inicio de operaciones de la Empresa

P.23. Número de empleados

Actualmente  
(Durante el 2009)

En el 2008

Cuando se inició la  
empresa

P.24. Valor de las Ventas Totales en Colones

Actualmente  
(Durante el 2009)

En el 2008

En el 2007

Si no responde, ir a taba con  
rangos

**Tabla Para Rangos de Ventas Anuales (marcar con X)**

	Actualmente (Durante el 2009)	2008	2007
<b>Menos de 1,000,000</b>			
<b>De 1,000,001 a 2,000,000</b>			
<b>De 2,000,001 a 3,000,000</b>			
<b>De 3,000,001 a 4,000,000</b>			
<b>De 4,000,001 a 5,000,000</b>			
<b>De 5,000,001 a 7,000,000</b>			
<b>De 7,000,001 a 10,000,000</b>			
<b>De 10,000,001 a 15,000,000</b>			
<b>Más de 15,000,000</b>			

P.25. ¿Cómo se distribuyen sus Ventas Totales? (en porcentajes)


Mercado Nacional

Mercado de  
Exportación  
(Centroamérica)

Mercado de  
Exportación  
(Fuera de  
Centroamérica)

P.26. ¿Cuál es su perspectiva de Crecimiento de Ventas para el 2010? (en porcentaje)

\_\_\_\_\_

P.27. Valor de Activos Fijos (Edificios, Maquinaria, Equipos) en Colones


Actualmente  
(Durante el 2009)  
En el 2008  
En el 2007

P.28. ¿Cuánto pesa la Planilla en las Ventas de su Negocio (en porcentaje)?

--

P.29. ¿En cuánto estima usted las utilidades de su Negocio? (en porcentaje)


Actualmente  
(Durante el 2009)  
En el 2008  
En el 2007

Si no responde, ir a tabla con rangos

**Tabla Para Rangos de Utilidades (marcar con X)**

	Actualmente (Durante el 2009)	2008	2007
<b>Menos del 10%</b>			
<b>De 11% a 20%</b>			
<b>De 21% a 30%</b>			
<b>De 31% a 40%</b>			
<b>De 41% a 50%</b>			
<b>De 51% a 70%</b>			
<b>De 71% a 100%</b>			
<b>Más de 100%</b>			

P.30. En comparación con otras empresas como la suya, ¿estima usted que el crecimiento de ventas de su empresa desde sus inicios hasta hoy ha sido muy superior, superior, igual, inferior o muy inferior que el de las otras?

5. Muy superior      4. Superior      3. Igual      2. Inferior      1. Muy inferior

P.31. En comparación con otras empresas como la suya, ¿estima usted que las utilidades de su empresa desde sus inicios hasta hoy han sido muy superior, superior, igual, inferior o muy inferior que el de las otras?

5. Muy superior      4. Superior      3. Igual      2. Inferior      1. Muy inferior

**MUCHAS GRACIAS**



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