

# INHIBITING FACTORS FOR COMMUNICATION AND INFORMATION TECHNOLOGIES USAGE

## *Five Colombian SMEs Study*

Olga L. Giraldo V. and Eduardo Arévalo S.

*Systems and Computing Engineering, Los Andes University, Calle 19 No 1-37 Este, Bogotá, Colombia*

**Keywords:** Information and Communication Technology- ICT- inhibiting factors, ICT strategic use, small and medium-sized enterprises –SME- in Colombia, SME competitiveness, ICT inhibiting factors in Colombian SMEs.

**Abstract:** Small-to-Medium sized enterprises, SMEs, are the main development engine of economy, particularly in countries in development, as is the case in Colombia. SMEs must use information and communication technologies, ICT, as strategic tools to find their place in the global market; nevertheless, this is not a common situation for Colombian SME. In this work we present the results of a project that attempts to find factors inhibiting five Colombian SMEs toward strategic usage of ICT. Through this study we have looked at the structure and strategy of those enterprises, their value chains, ICT support to value chain activities - how and where they exploit ICT-, managerial attitude toward technology, and appropriation of ICT into business, looking for inhibiting factors. Results show that the most common inhibiting factors are: poor organizational planning; inability to identify strategic use of ICT or no ICT leadership; no funding for ICT projects; lack of ICT expertise and lack of proper ICT usage by final users; and lack of technical support. Even though findings are not conclusive they show an existing trend, and highlight the main ICT inhibitor factors-IF- to be surpassed to attain local sustainable industries.

## 1 INTRODUCTION

Currently Colombia is establishing free trade agreements with its main commercial partners, which is changing the local economic environment, creating new threats and opportunities. Colombian SMEs, Table 1, are not familiar with direct foreign competition. A SME must find factors inhibiting proper ICT utilization to build successful strategies.

Table 1: Colombian enterprise classification.

Type	Employees number	Assets in minimum present established wage
Micro	1-10	Lees than 501
Small	11-50	Between 501 and 5000
Mediun	51-200	Between 5001 and 3000
Big	201 or more	More than 3000

To achieve competitiveness in an open economy, proper ICT usage is mandatory. Most SMEs are not analyzing their business, neither strengths nor weaknesses, to find sources of competitive advantage to maintain present benefits and create

new ones. Instead they are trying to maintain artificial barriers to protect their market.

Huang and Brown (1999) found that there has not been much research of SME's problems, although there is an increasing interest in developed countries (Majocchi and Zucchella 2003; Bell et al. 2004; Williams and Chaston 2004; Fukugawa 2005; Gray and Mabey 2005; McKeiver and Gadenne 2005). Research in Latin American SME behavior cover topics as financial, human resources, culture, regulation, and ICT condition (Berry 2002; Finkelievich 2003; Zevallos 2003; FUNDES 2004), but none specialize in ICT use. Hunter (2004) suggests as an interesting research subject the application of information systems in SMEs particularly for countries in development. Kyobe (2004) found as main IF of IT usage in South African SMEs: lack of top management vision; failure to keep up with new technologies, lack of computer expertise and usage; lack of economic scale in IT use; lack of technical support; and, poor planning and inability to identify strategic use of IT.

We begin this paper describing the present situation of Colombian SMEs emphasizing their main problems. Afterwards, section 3 and 4, present

the methodology we use and a vision of each company studied. Section 5 analyzes, for each company, factors causing proper or improper ICT use. Finally, section 6, exposes our conclusions and future works.

## 2 COLOMBIAN SME BUSINESS ENVIRONMENT

After a long period of economic crisis, Colombian SMEs have once again flourished. They are significant employment generators and efficient redistributors of wealth.

### 2.1 SME Significance in Colombia

Semana (26 May 2003, pp. 73-74) points out that in 2002, Colombian micro enterprises and SMEs comprise 96% of local industry, generate about 40% of gross product, 34% of added value, 60% of industrial employment, and 25% of non traditional exports. According to the Administrative National Department of Statistics, DANE, Encuesta Anual de Manufactura (annual manufacturing survey), 75% of manufacture establishments are SMEs, which generate about 34% of the gross product, 45% of employment and 28% of added value. On the other hand, Rodríguez (2003) shows that in 2001 out of all the Colombian SMEs 37% were services companies, 34% were retailers, 22% were industrial, and 6% were agro industries; 87% had 6 years or more since their creation; during 2002 and 2003, 60% of them decreased their annual utilities; 50% of management have been working in the same business for more than 15 years; 72% of them have undergraduate studies, 16% postgraduate; and 66% of managers are aged between 25 and 45 years.

### 2.2 Main Problems of Colombian SME

The main problems found by Rodríguez (2003) for Colombian SME are: economic and public order instability; low access to financial markets; legal issues; difficult access to marketplaces; no governmental support; low human resource quality; bad transport infrastructure and public services; gremial and SME incompatible interests; and difficult access to technology. Rodríguez (2003) also discovered as main issues delaying SME access to technology: high costs; low public or private funding; no capacity or high cost for customization; low access to ICT products and information services; and high costs of external consulting

services. However, 66% of SME have invested in technology in the last two years: 30% on IT; 28% in business equipment; 12% in product improvement; and 10% in management decision support systems. Managers claim that the main benefits of these investments are: time savings, quality product improvement, and cost reduction.

BDI- ACOPI- DNP (1997) shows that the main problems are: lack of knowledge about ICT potential advantages; negative attitude of managers towards new technologies; and, lack of economic scale to invest in research, appropriation or transfer ICT.

## 3 METHODOLOGY

In order to assess what factors inhibit the appropriation and use of adequate ICT in SMEs we researched five enterprises. The study was divided in four stages: theoretical investigation; selection, analysis and diagnosis of individual SMEs; search for IF, if any; and development of a strategic proposal for ICT appropriation at individual enterprises.

During the first stage we identified previous studies (Huang and Brown 1999; Berry 2002; Finquelievich 2003; Kyobe 2004; Gray and Mabey 2005; Fukugawa 2005) to discover frequent IF of ICT usage in SMEs. To understand SME current situation, we want to identify organizational structure; internal drivers and strategy- mission, vision, values; value chain- VC-, products and services; distribution channels; and ICT infrastructure, architecture and applications.

The second stage began with choosing enterprises to be studied. We decided not to concentrate in a specific industry, neither a typical size, nor a particular composition; companies were randomly selected: different sectors, sizes and characteristics, but all of them have in common an interest in this research. We took this decision to avoid having a bias on our first approach. The only pertinent attribute was that they were SME. Later we found other common features: they are less than 12 years old, have no export profiles and low export potential, and are family owned companies. Their sectors are: Services S-, Commercialization C, and Manufacture M.

The main data collection methods were: review of company internal documentation particularly the web site if available, in site observation, and personal interviews with management and employees. We identified strategy, structure and VC: strategy was inferred from declared objectives

matched with business units’ tactics; structure was built based on corporate resource distribution, decision making processes, and information flow and relationships; VC was depicted by us when they did not have one. ICT data was used to identify how it supports VC activities (Porter 1998) and its level of appropriation in business according to (Andreu et al. 1996; Laudon and Laudon 2004; Kyobe 2004). As a result we had an “instant photo”, a mirror image, of each company. No reflection or suggestions were made at this point; management approval was required to begin the diagnosis.

Table 2: SMEs studied.

	Specific Industry	Direct employees
C1	Automotive, aeronautical and industrial paints	15
S1	Civil engineering consulting	20
S2	Public services consumption measurement	66
M1	Construction material supplier	75
M2	Retailer communication’s software & hardware	11

Meanwhile we moved to the next stage, seeking recurring IF using organizational visions to obtain manager attitude toward ICT strategic usage and IF.

Finally, after manager’s feedback, we designed an ICT adoption proposal for each company to aggregate value to participating SMEs; results are outside of the scope of this paper.

#### 4 CASE STUDIES: FIVE SME DEPICTED

This section describes the five companies we studied, emphasizing on ICT support to VC activities, to find ICT utilization inhibitors factors.

##### 4.1 C1: Automotive, Aeronautical and Industrial Paint Retailer

C1 is a family owned company that provides paints for automotive, aeronautical and industrial sectors, and technical advisory services about their use. C1 wants to be the distribution leader for its main provider.

Its main focus is customer satisfaction maintaining acceptable profits for shareholders and employees. The company builds their external reputation with honesty, loyalty, and respect to

stakeholders and clients. Its strategy is continuously improving customer painting processes through direction and consulting: advice on better utilization to improve final paint quality and training staff; this service is supported by software developed in-house, *Syscolor* and *Sphera*. They have no distribution channels other than a direct sales force. The VC, figure 1, shows that the main value creating activities are those related to *Syscolor* and *Sphera*: starting with software installation at customer location to gather data about paint utilization; afterwards, performing periodical data collection and analysis to generate knowledge about customer painting practices; and finally, giving advice and training to achieve enhanced paint usage.

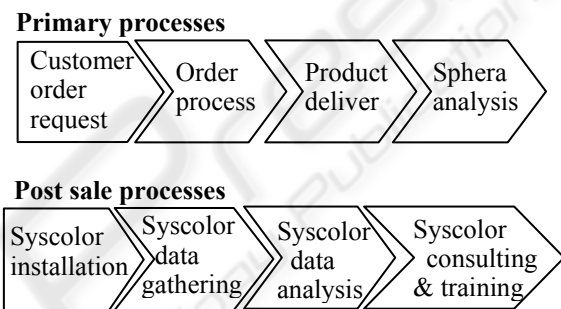


Figure 1: C1 Value Chain.

Internal IT infrastructure and information systems are small enough to support primary activities of its VC; financial and human resource processes are outsourced. Inbound logistic, production, and outbound logistic, are partially outsourced but are well supported according to management. Post sales are very well supported by *Syscolor*. The software was developed by the manager’s son and associate. He has fundamental skills in software development and deep business knowledge. Four years ago, when the company was running out of business, he entered the company; at this time they decided to provide a new service to their customers as a strategy to gain preference. *Syscolor* gathers data from salespeople visits; the system is not connected to the Internet. Nowadays they are planning an upgrade to improve service.

##### 4.2 S1: Civil Engineering Consulting

Created in 1993, S1 offers consulting services in engineering development of public or private infrastructure. Its main values are generating positive social impact and benefits for the community, and customer satisfaction. Their 5-year

vision is to be recognized due to the benefits delivered to communities.

S1 offers consulting for infrastructure design, and construction project execution and control. The company strategy is to create customer satisfaction based on best practices; frequently benchmarking is done, but, paradoxically, performance measurement criteria are not clearly defined. They do emphasize in effective use of technological consulting tools. By 2003, S1 obtained the System & Services Certification, SGS, quality certification on all of their services.

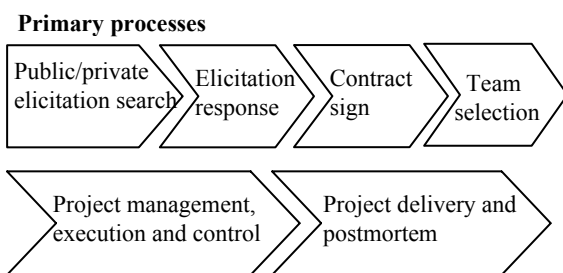


Figure 2: S1 Value Chain.

Project quality is sensible to technical skills of the team, and methodology and tools used. ICT supporting primary activities, figure 2, focuses on team selection and project execution; elicitation and financial control activities are not supported.

The company's financial and inventory activities are supported by *HELISA*, a local ERP; desktop applications support project documentation; *Microsoft Project* is used for project management; and specialized applications are used for technical activities during project execution.

#### 4.3 S2: Measurement of Public Service Consumption

S2's services are consumption measurement and courier delivery for public service companies. We elaborated its organizational chart and VC; the VC is not yet approved by management, so is not presented here. At present time, its main client is *Gas Natural*, the biggest natural gas local distributor.

Its strategic objective for 2010 is to have 5% of the Colombian market offering high quality services and specialized human skills. Currently they do not have information about market share; neither do they have clear criteria about selection of commercial goals. Management is aware of their lack of a strategy, and is searching for an external consultant to develop a marketing plan.

Financial data processing is done using *HELISA*. Consumption measurement of *Gas Natural* uses

*SAL*, a proprietary software; data is entered in mobile terminals, and then transferred to the customer's database; client measurement reports and billing source are done using *Microsoft Excel*.

#### 4.4 M1: Construction Materials Supplier

M1, a family owned company, produces and commercializes construction materials. Its mission is to become the first option in ceramic glues in the local market. Its strategy is centered on innovation, based on market trends, knowledge and technology. It has two business units: ceramic glues and indoor paints. Its commercial objective for 2010 is to reach 30000 gallons of paint and 30000 tons of ceramic glues sales per year. Their main distribution channels are a proprietary sales force, alliances with strategic business partners and arrangements with corporate clients.

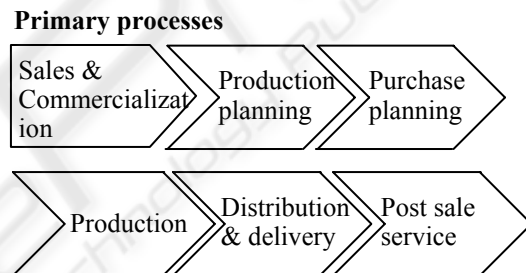


Figure 3: M1 Value Chain.

M1's primary activities, Figure 3, start with sales and commercialization. Production and purchase plans use historical sales data, monthly sales forecasts and product stock data. The main value creating activity is post-sale customized attention.

Internal IT infrastructure and architecture is small, but supports several primary value chain activities. Financial processes are supported by *SIIGO*, another local ERP. The acquisition of *SIIGO* had as main purpose organizing financial processes; the production and sales modules were not appropriately parameterized. Nowadays, M1 is not effectively exploiting the ERP's capabilities because they do not have technical support or help desk for *SIIGO*.

#### 4.5 M2: Retailer of Software & Hardware for Communication

M2, also a family owned company, develops and commercializes software and hardware for retailer telecommunication activities. M2's objective is to be the market leader in telecommunication solutions



but does not have an explicit business strategy or business plan. Through observation we defined its strategy as “Product innovation to seize market opportunities at competitive prices”. Customer satisfaction and quality are not internal drivers.

Their products are: *SETTI*, a billing system for communication rooms and Internet cafes; *SETTI Upgrade*, that fixes some of the product’s bugs; and *SIFRA*, a back office Internet based system to control geographically distributed communication rooms and Internet cafes. Its distribution channels are a proprietary sales force and external commercial agents; recently M2 opened commercially autonomous operations in Peru and Ecuador, but they do not have a clear strategy for expansion. Technology development, figure 4, is the value chain’s main process. No standards are used for product design and development, thus bugs are frequently found by customers during use.

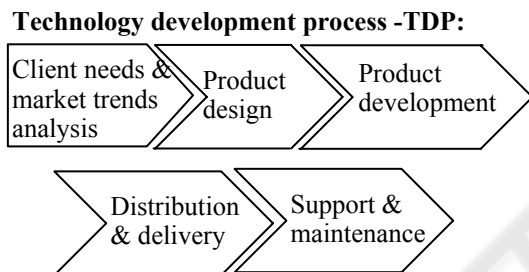


Figure 4: M2 TDP Value Chain

ICT applications are: *HELISA* to support financial process; *SAS*, an in-house developed tool, to manage customer requests; and *SAE*, currently under development, to improve internal process, but, on the one hand, users do not input required data and, on the other hand, development is continuously interrupted.

## 5 FACTORS AFFECTING PROPER ICT USE

All the companies we analyzed, except C1, use ICT to sustain VC support activities, not to be competitive.

C1’s main catalyst factor is the manager’s ability to identify strategic use of ICT. When business was decreasing, they created a software product and a training service for clients. Nowadays, big industrial consumers choose C1 due to these services. The manager declares that funding ICT projects is not a problem because they have skills to develop them or to negotiate service and fair prices with providers.

Presently, they are elaborating corporate plans oriented to new ICT based business services.

S1, the civil engineering consulting company has as explicit strategy benchmarking, not innovation; they imitate the best qualified consulting companies in the market. Its manager is always busy searching for new projects and controlling those in execution, thus has no time for strategic activities. There is no ICT leadership, neither are there resources, particularly monetary, for ICT projects. Skilled professionals are hired for specific projects; knowledge and expertise on ICT, when acquired, is lost. Organizational planning, if any, is reactive and not shared. S1 is not aware of the value of knowledge appropriation, and thus, this is not a regular activity.

S2 has been unable to identify a strategic use of ICT for business activities. Although research in mobile applications is an important trend, S2 is currently not investing in it. Its competitors are offering fraud management and public service reconnection services, but they do not. During our work, S2’s management team realized that they do not have an organizational plan; now they are searching for professional advice. Their operative employees have enough expertise for a proper tactical use of ICT; nevertheless they do not have technical support to improve their performance.

M1’s manager says he has a short term plan, but he does not share it, and frequently changes it; his main priority is to find new products; he has no time to identify strategic use of ICT, and does not care. ICT employees always work to achieve the manager’s changing plan; not to satisfy business activities, to take advantage of ICT, or to be ICT leaders.

M2, a software and hardware retailer company, paradoxically, does not have proper ICT support. They are able to identify strategic use of ICT, fund ICT projects, have ICT expertise and technical support, but are unable to use it for themselves. Its main IF is poor organizational planning. The R&D division is not aligned with its internal plan and management does not care; they are looking for opportunities.

## 6 CONCLUSIONS AND FUTURES WORK

The very first obstacle for ICT strategic usage, we discovered, is that companies frequently do not have an ICT strategy, or have a vague definition of an

ICT strategy, or it is not written nor shared with employees.

A recurring inhibitor factor is the inability, of both management and technological staff, to identify strategic use of ICT and lack of ICT leadership.

Another negative factor is that there is no funding for ICT projects, frequently because of: lack of economies of scale for ICT use; difficulties to access financial markets; and short vision about ICT benefits and strategic impact.

One more recurring factor is the lack of ICT expertise in staff and users, making hard the appropriation and transfer of new ICT services. The roots of this inhibitor factor, we believe, are low wages and no investment in staff training.

The lack of technical support, internal or external staff based, was another recurrent factor.

But the most important IF we found is poor or no organizational planning, no sharing of organizational plans, or short term or reactive planning. Within this frame any effort or investment on ICT is lost.

Future works include extending this work for a larger sample, and proposing guidelines for ICT selection, implementation and use in strategic activities, support and new business creation.

## ACKNOWLEDGEMENTS

We would like to thank Eduardo Frías, Diana Angélica Forero, Diego Sánchez, and Diana Velasco for their participation in this study; Martha Inés Cifuentes and Andrea Herrera for their support and advice; and Nicolás López for his aid reviewing the paper.

## REFERENCES

- Andreu, R, Ricart, JE, & Valor, P 1996, *Estrategia y Sistemas de información*, 2nd edn, McGraw-Hill, Barcelona.
- Bell, J, Crick, D, & Young, S 2004, 'Small Firm Internationalization and Business Strategy: An Exploratory Study of 'Knowledge-Intensive' and 'Traditional' Manufacturing Firms in the UK', *International Small Business Journal*, vol. 22, no. 1, pp. 23-56.
- Berry, A 2002, 'The Role of SME Sector in Latin America and Similar Developing Countries', *Seton Hall Journal of Diplomacy and International Relations*, vol. 3, no. 1, pp. 104-119.
- BID- Banco Interamericano de Desarrollo, ACOPI -, Asociación Colombiana para la Pequeña y Mediana Empresa & DNP- Departamento Nacional de Planeación 1997, *Políticas: Desarrollo de la PyME en Colombia*, BID, Bogotá, pp. 14-42.
- DANE, *Encuesta Anual de Manufactura*, Bogotá, viewed 5<sup>th</sup> October, 2006, [http://www.dane.gov.co/index.php?option=com\\_content&task=section&id=17&Itemid=40](http://www.dane.gov.co/index.php?option=com_content&task=section&id=17&Itemid=40)
- Finquelievich, S 2003, 'ICT and economic development in Latin America and the Caribbean', in *World Summit of Cities and Local Authorities on the Information Society*, 4-5 December 2003, Lyon.
- Fukugawa, N, 2005 'Characteristics of Knowledge Interactions between Universities and Small Firms in Japan', *International Small Business Journal*, vol. 23, no. 4, pp. 379-401.
- FUNDES 2004, *Entorno empresarial. Indicadores del entorno de la pequeña y mediana empresa de PyME en los países Fundes*, viewed 8<sup>th</sup> Mars 2004, <http://colombia2.fundes.org/>.
- Gray, C & Mabey, C 2005, 'Management Development: Key Differences between Small and Large Businesses in Europe', *International Small Business Journal*, vol. 23, no. 5, pp. 467-485.
- Huang, Z & Brown, A 1999, 'An Analysis and Classification of Problems in Small Business', *International Small Business Journal*, vol. 18, no. 1, pp. 73-85.
- Hunter, G 2004, 'Information Systems & Small Business: Research Issues', *Journal of Global Information Management*, vol. 12, no. 4, Editorial Preface, pp i-v.
- Kyobe, ME 2004, 'Investigating the Strategic Utilization of IT Resources in the Small and Medium-Sized Firms of the Eastern Free State Province', *International Small Business Journal*, vol. 22, no. 2, pp. 131-158.
- Laudon, KC & Laudon, JP 2004, *Management Information Systems. Managing the Digital Firm*, 8th edition, Prentice Hall, New Jersey.
- Majocchi, A & Zucchella, A 2003, 'Internationalization and Performance: Findings from a Set of Italian SMEs', *International Small Business Journal*, vol. 21, no. 3, pp. 249-268.
- McKeiver, C & Gadenne, D 2005, 'Environmental Management Systems in Small and Medium Businesses', *International Small Business Journal*, vol. 23, no. 5, pp. 513-537.
- Porter, ME 1998, *On Competition*, Harvard Business Review Book, Boston.
- Rodríguez, AG 2003, *La Realidad de la Pyme Colombiana, Desafío para el Desarrollo*, Fundes Internacional, Colombia.
- Semana 2003, 'PyMe, tiempo de crecer', *Revista Semana*, May 26<sup>th</sup>, ed. 1099, pp 72-84.
- Williams, J & Chaston, I 2004, 'Links between the Linguistic Ability and International Experience of Export Managers and their Export Marketing Intelligence Behaviour', *International Small Business Journal*, vol. 22, no. 5, pp. 463-486.
- Zevallos, E 2003, 'Micro, pequeñas y medianas empresas en América Latina', *Revista de la Cepal*, no. 79, pp. 53-70.