New Information and Communication Technologies Diffusion in Argentina

Gervasio Barraco Mármol¹, Adrián Bender², Néstor Mazza³ and Santiago Nicolet⁴

¹School of Engineering, Universidad Del Salvador, Buenos Aires, Argentina. Email: gervasio.barraco@usal.edu.ar.
²School of Engineering, Universidad Del Salvador, Buenos Aires, Argentina. Email: bender.adrian@usal.edu.ar.
³School of Business, Universidad Del Salvador, Buenos Aires, Argentina. Email: nestor.mazza@usal.edu.ar.
⁴School of Engineering, Universidad Del Salvador, Buenos Aires, Argentina. Email: santiago.nicolet@usal.edu.ar.

Accepted 27 July 2016

This study addresses the adoption of new ICT (Information and Communication Technologies) in Argentina. Rather than concentrating on technical aspects, its sees new ICT from a strategic management perspective, focusing on its diffusion and the economic and competitive associated value. There are many publications describing the progress in terms of technology diffusion in Argentina – the country with the third largest GDP in Latin America –, showing overall annual and regional rates, but without discriminating by technology or ICT type. Our work describes 27 of the most representative new ICTs, shows local indexes that help to understand its adoption level, and offers local experts’ point of view on some of the key factors that help or hinder the early adoption of new technologies.

Keywords: ICT, Diffusion, Technology, Information, Communication, Argentina

INTRODUCTION

The diffusion of ICT, Information and Communication Technologies, and particularly the new ones, represent a highly dynamic and complex phenomenon, which can be approached from multiple perspectives. This work focuses on its implementation and the economic and competitive associated value.

The generation of barriers to entry and competitive advantages, the transformation of industrial segments and the impact on the annual income per capita associated with the new ICTs adoption justify its study (Atkinson et al., 2013).

Argentina is the world's eighth largest country (by area) and has the third largest GDP in Latin America: according to the World Bank it had a GDP per capita of 12,509 USD in 2014. It is also a country with a considerable internal market size and a growing share of the high-tech sector.

Historically, however, its economic performance has been very uneven, with high economic growth alternating with high inflation, severe recessions, income maldistribution and increasing poverty.

Argentina has three Nobel Prize laureates in sciences: Bernardo Houssay, César Milstein and Luis Leloir. It was the first country in Latin America to design and build a research reactor with homegrown technology, has an own satellite program, and 4th generation nuclear power station designs. The public nuclear energy company INVAP provides several countries with nuclear reactors.
Figure 1. Familiarity and Adoption ratios by ICT
identified some recombinant proteins – proteins engineered with laboratory techniques- that are now in the market.

In terms of ICT development, Argentina is positioned among the group of countries with an “Upper IDI”, ranked 52th among 167 countries surveyed according to the 2015 ICT Development Index (IDI) elaborated by the ITU (International Telecommunication Union).

There are many publications describing the progress in terms of technology diffusion in Argentina, showing overall annual and regional rates without discriminating by technology or ICT type (MINCyT, 2012) (MINCyT, 2013) (Fundación Sadosky). Most of them are written by partnerships between public organizations (mainly under the Ministry of Science, Technology and Innovation) and private national chambers (CESSI, CICOMRA, etc.).

For this work, we reviewed new ICT documental sources and selected those technologies that had most appearances. We also gathered information about the adoption of the selected ICTs in local organizations. Two indices were defined in order to describe the adoption and the familiarity level of each ICT. We also used the collected data to classify the ICTs by the phase in which they are, according to the adoption life cycle pioneered by Everett Rogers (Rogers, 1995).

Additionally, we obtained opinions from well-known regional leaders in order to explain certain behaviors observed about ICTs adoption in Argentina.

**MATERIALS AND METHODS**

A first survey was designed to gather information about new ICTs adoption by a particular organization.

We considered that including a large number of technologies in the survey would have a negative effect on the quality of the responses. In order to minimize it, we selected 27 new ICTs, considering it an acceptable
tradeoff be used in the survey. To reduce the number of technologies to 27 we gave priority to those which more appearances had in the studied sources.

For each of the selected ICTs, the survey requested to specify the level of adoption according to one of the following options (being the response not mandatory):

- Not evaluated: when the organization have not evaluated the technology yet.
- In evaluation: when the technology is being evaluated, but is not being used yet, neither have plans nor assigned budgets.
- Not applicable: when the technology was evaluated but has not application in the organization.
- Rejected: when the technology was evaluated but, at least for that moment, its adoption was dismissed.
- Planned: when there are plans with dates and budgets to incorporate the technology.
- Applied: when the technology is being used.

In addition, the survey requested to answer the type, location and size of the organization.

We designed two ratios to analyze the gathered data:
- Adoption: which shows the percentage of companies that have adopted a technology, and is defined as:

\[
\text{Adoption} = \frac{\text{Applied} \, + \, \text{Planned}}{\text{Evaluated} \, + \, \text{Reflected} \, + \, \text{In evaluation} \, + \, \text{Not evaluated}}
\]

- Familiarity: which shows the percentage of companies that have assessed or are assessing a technology. This index would help us to know how informed is a company about the ICT, and

- Familiarity: which shows the percentage of companies that have assessed or are assessing a technology. This index would help us to know how
We categorized ICTs by the adoption phase in which they are. The percentage of organizations that have applied or with plans to be applied a given technology (being applicable) has been used to indicate the phase in which the technology is. According to the life cycle pioneered by Everett Rogers the phases are: Innovation, Early Adoption, Acceleration, Majority Adoption and Maturity (Rogers, 1995).

We placed the studied ICTs in a S-shaped diffusion curve. S-Curve is a measure of the speed of adoption of an innovation and was introduced by Gabriel Tarde (Tarde, 1903).

A second survey was designed to gather experts’ opinions. 22 well-known regional leaders, entrepreneurs and academics were invited to share their perceptions regarding the factors that might accelerate or inhibit the diffusion of new ICTs by local organizations: the lack or deployment of classical ICT solutions, the involved risk, the existence of formal mechanisms that favor its incorporation, etc. The questions were presented using a five-point Likert scale (Likert, 1932) in which the respondents answered according to their level of agreement.

We tested the level of consensus (William J. Tastle & Mark J. Wierman, 2010) for the 6 questions included in the expert’s survey using:

\[
\text{Cns}(X) = 1 + \sum_{i=1}^{n} p_i \log_2 \left(1 - \frac{|X_i - \mu|}{\sigma_x}\right)
\]

Where Cns(X) equal to 0 (zero) represents a deep polarization, and 1 (one) suggest total agreement.
RESULTS

Survey Results

Mostly IT managers, or IT department staff with the enough knowledge to respond about ICT adoption in their organizations, answered the survey.

The survey yielded 151 responses, the general adoption ratio was 31%. This percentage represents the number of technologies applied or with plans to be applied in organizations in which responses indicated they are potentially applicable. It can serve as a primary element of analysis, however, by its characteristics (heterogeneity of organizations and the new ICTs) has limitations that the reader should keep in mind, particularly if it is used for comparisons with other years or other regions.

The industry segments which report a bigger ratio were: IT & Telecommunications, Finance and Insurance, Professional services and Health Care. The differences on companies’ sizes and locations were no significant.
Figure 1 shows familiarity and adoption ratios for each evaluated new ICT.

The general familiarity ratio was 53%.

There was a highly positive correlation between familiarity and adoption ratios (0.96 according to Pearson’s correlation coefficient).

The general familiarity ratio was 53%.

There was a highly positive correlation between familiarity and adoption ratios (0.956 according to Pearson’s correlation coefficient).

Figure 2 shows ICTs grouped into the five adoption phases. The absence of new ICT in the Phase I (Innovation) might be explained by the selection criteria mentioned before.

The adopter distributions follow a bell-shaped curve, the derivative of the S-shaped diffusion curve shown in Figure 3 (Rogers, 1995).

Smartphones, owned by 48% of the population (Pew Research Center, 2016), shows the highest level of diffusion, almost already in Phase 5 (Maturity).

Technologies such as Brain Computer Interface are still in Phase 2 (Early Adoption) following academic research (Ierache, 2013).

**Expert Panel Results**

This section shows the questions of the experts’ survey and their responses.

The expert panel was made of business leaders from multinational corporations, directors of post-degree programs and recognized IT consultants.

Question 1. Most organizations perceive ICTs as a competitive advantages sources.

Question 2. Most organizations in Argentina have not incorporated "classical" ICTs based solutions yet.

Question 3. Argentinean CIOs consider risky to propose innovative solutions based on new ICTs.

Question 4. Argentinean business leaders consider risky to invest in innovative solutions based on new ICTs.

Question 5. Argentinean organizations use new ICTs in the same way other countries with similar levels of development do.

Question 6. ICTs count with articulated diffusion mechanisms that help its adoption.

The main results were:

54% consider new ICTs as competitive advantages sources.

41% consider that new ITC adoption is negatively impacted because most Argentinean organizations have not yet implemented “classical” solution based on ICTs.

55% of Argentinean CIOs consider risky to propose innovated solutions based on new ICTs.

68% indicated that Argentinean business leaders consider risky to invest on innovative solutions based on new ICTs.

46% consider that new ICTs diffusion in Argentina is comparable with other countries which have similar

CONCLUSIONS

This study is a first approach to a complex and highly dynamic subject. The size and composition of the sample don’t allow to make nationwide extrapolations but bring up an initial understanding of the adoption level into the participant companies.

The familiarity ratio of 53%, quantified the new ICTs’ awareness level of whom are involved with new technologies in the studied organizations. The adoption ratio of 31% shown that the number of companies applying (or with plans to apply) new ICTs is encouraging.

The gap observed between familiarization and adoption ratios may be explained by the low perception of the value of ICTs as a source of differentiation/competitive advantage, the lack of ICT solutions to the most basic issues, and the perceived risk of new ICTs adoption.

Mobile Health showed the biggest difference between those rates. It might be explained by the fact that this new ICT is specific to the health area, so it may be familiar to many other organizations, but not applicable to them.

The experts’ answers gave interesting insights regarding the different dominant behaviors and perceptions, where the (perceived) lack of mechanisms to facilitate diffusion appear as the key driver.

On the other hand, CIOs consider new ICTs’ investments less risky that the business leaders, suggesting where the communication reinforcement need to be targeted.

FURTHER RESEARCH

A larger stratified sample will allow to reach companies around the country and obtain national adoption levels as well as indicators by industry types, country regions and company sizes.

Another line of research is being considered to analyze the correlation between the level of new ICT adoption by a given industry and its competitiveness.

REFERENCES


