

## Groupware Effectiveness in Large Latin American Corporations

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### Abstract

Large corporations are looking at Third World countries, particularly in Latin America, to expand their supply and production channels with foreign offices and personnel. Access and experience with technology of those enterprises will determine, in part, the speed at which an organization can expect to fully integrate these new channels and manage remote projects in this area of the world. This paper summarizes CIO's perceptions about the effects that groupware technologies have had in one third of the largest corporations of Monterrey, an industrial center in Mexico and one of the most important manufacturing hubs for Latin America.

The results showed that groupware tools are becoming essential for Latin American corporations, especially to obtain an advanced degree of communication and mutual aid with other organizations worldwide. The research found a generalized positive tendency in secondary effects produced by groupware (e.g. higher productivity, collaboration, and user satisfaction among others). The outcomes did not exhibit any effect that generated an adverse change within the enterprises. The significance of this study lays in Latin American corporations still cautious to start incorporating groupware applications due to a lack of information about the effectiveness or consequences generated after its implementation.

**Keywords:** Groupware, group technologies, collaborative effects

### 1. Introduction

Post-industrial organizations have evolved into transnational entities based on information, requiring space and time interaction between distributed personnel and project teams. High-speed technology maturity and costs decline have sustained this evolution, introducing computer and communication links as accessible solutions for the collaborative work. In this global market, groupware is evolving as a competitive tool to take advantage of economies of scale, while maintaining close contact with worldwide clients [1].

The concept of groupware has existed for a long time, but it is until now that, along with Internet technologies, digital networks, very fast data transmission, videoconferencing, satellite communication and e-commerce, have finally achieved a greater worldwide acceptance [2, 3]. Nowadays, organizational work is centering more and more on teamwork, but traditional computer systems are limited in their ability to create an environment that supports collaboration [4]. Contrary to this, groupware design promotes the cooperation and coordination necessary to aid individuals working together in organizations.

Groupware is a concept that allows several people, in different places and periods of time, to work in common projects, communicate through e-mail, voice or video, learn from each other and coordinate between team members, while modifying established organizational work methods [5]. Its complexity varies from very simple applications (newsgroups and e-mail), to more complex programs (form routing, document administration) and finally to very

sophisticated solutions (interactive systems that link employees with clients) [6].

Although groupware is everything from a facilitator to an efficiency enhancer, not all implementations have been successful due to their failure to consider the internal culture and their being out of scope [7]. Additionally, the CIO's role must be key in the process: they must be involved from the beginning and actively participate in vital decisions (chosen software, costs involved, effort needed).

This work analyzes the current status of cooperative applications and the collaborative culture in Mexico's enterprises. Although multiple investigations about groupware have been performed in North American and European countries, the results cannot be applied directly to Mexico and other Latin American nations due to a sub-developed collaborative culture [8] that provokes fragmentation structures and rivalries inside businesses. The evolution of groupware tools may not be fully established in these countries, but a general understanding exists to incorporate them in their processes and ultimately accomplishing more efficient work methodologies.

## 2. Background: groupware applications

### 2.1. Definition, origin and tendencies

The origins of groupware (also known as collaborative computing, CSCW, multi-user applications or group support systems [13]) can be traced to the late 1960's with work created by Douglas C. Engelbart that tried to increase human intellect through computers. Afterwards, groupware tool's limited scope forced to consider them only as specialized tools designed for collaborative work groups, typically small, oriented to projects with common goals and rigid delivery dates [14].

More recently, with advances in communication devices and the Internet, groupware tools can use collections of networks that permit any-time, any-place organizations to communicate, collaborate, coordinate [3, 4, 5] and control [15] its business processes. In addition to sharing knowledge, expertise and creating inter- and outer- organizational memory [4], organizations will be able to reduce costs, optimize spaces and enhance satisfaction, efficiency and performance [16]. Videoconferences, multi-author applications, electronic mail, BBS, meeting support systems, digital conferences, workflow systems and group calendars [13] are examples of groupware applications.

Aannestad and Hooper [6] consider the next milestone in the groupware market as the creation of systems that promote interactive organizations, where

business processes are flexible and with the quality of being redefined or readjusted so employees can be more efficient. Artificial intelligence is regarded as the technical aspect that will mostly contribute to the growth of groupware in the future [14], allowing the machines to transform from passive agents or information processors, to active agents, augmenting and facilitating human intervention [5, 17].

### 2.2. Groupware effects in enterprises

In today's organizations, teams are essentially management tools [18]. Traditionally teams have only been used in operative ranks, but recently, enterprises are modifying their processes to a cluster centered collaboration [4], considering teamwork now as the normal method of working [10]. There is a general consent that, in the next years, work will be completely performed by task-oriented groups of people and not by individuals or departments, involving an elaborated culture, leadership, vision and information support systems [9].

Researchers have demonstrated that work teams that use group support systems not only may become more productive, but the operative costs can be reduced up to 50% and the project time may be cut to 90% [27]. Strassman [28] clarifies that the majority of the derived benefits are consequences of an enhanced group communication (in written form, because the verbal form limits the available information [29]), instead of accelerating the users' work rhythm.

Even though multiple successful implementations subsist worldwide, groupware has occasionally failed due to implementation [7] and preference difficulties: the users need to understand why they have to change their traditional work methodologies and how they are going to be benefited [30]. Additionally, problems have emerged when the design fails to understand the internal culture [31] and when a limited consideration is given to social relations [32]. Videoconferences and on-line calendars are examples of tools that although produces considerable effects, , have low popularity due to a designers' deficient believe about the use of technology [5].

Multiple studies have been performed to study the effects of groupware tools in organizations, however, their outcomes are so dissimilar that a clear positive tendency cannot be observed [22, 23, 24, 25, 26]. In consequence, there are still no theories that clearly explain the potential effects that groupware applications have in organizations or on its social structures [15].

## 2.4. The case of Latin America

Latin America in general, and Mexico in particular, are regions of contrasts. While Mexican corporations like Cemex represent world class success stories for their effective and innovative use of groupware tools [34], in other enterprises the collaboration culture is just starting to mature.

Numerous cultural differences exist between the people from Mexico and the US. A recent study about cultural differences between Mexico and the U.S.A. [35] found that in both countries, citizens prefer collaboration and adaptation contrary to rivalry and evasion. Mexicans qualified higher in interdependence measures, but they also ranked higher in independence (auto-analysis), a result that differs from the traditional collectivism concepts. One of the greatest dissimilarities is the collectivism and concern to achieve the group's success that prevails in Mexican work teams. Not only Mexicans accomplish higher consensus levels than individualist cultures (i.e. United States and Canada), but they can also express greater satisfaction with their decisions [33].

Not much information exists about the implications and use of groupware applications in Mexico. A significant database has been created in the use of GSS primarily in the United States and Canada, but it would be presumptuous to suggest that these findings can be mapped as examples of groupware achievements in other countries like Mexico. Studies have uncovered positive basis for believing that groupware applications will have a great success in Mexico and all Latin American countries [33], but it will be up to the enterprises to believe this and start modifying their processes into collaborative, and hopefully, more productive schemes.

## 3. Research methodology

A more clear perspective of the actual condition of distributed applications in Latin American businesses can be obtained by examining the biggest organizations, with the largest budgets, personnel and the most interested in being in direct contact with multinational corporations.

This study was performed only with large Mexican enterprises (more than 500 employees and sales above 10 million dollars annually), with headquarters based in the city of Monterrey. The existence of an IT area was required, but not the possession of a groupware tool. The person that was chosen to answer the questionnaire was the CIO or someone that knows in depth the administration of the computing systems in the company.

Extracted from a Mexican directory of statistical data [36], all the businesses that complied with the above qualifications were contacted. The overall sample included 93 organizations of all the possible sectors (table 1). Before the questionnaire was submitted, a trial test was made with two previously selected persons with ample knowledge in collaborative and cooperative applications, which in return recommended minor changes of syntax in some questions and suggested new groupware tools to include in the list. These responses were not considered in the overall results.

**Table 1. Enterprises of Monterrey's metropolitan area grouped by sector [36]**

Sector	Number of Enterprises
Chain Stores	5
Construction	3
Group	34
Automobile Industry	4
Construction Industry	3
Paper Industry	1
Electric Industry	4
Extractive Industry	1
Metal Mechanic Industry	11
Chemistry Industry	1
Textile Industry	3
Food & Beverage Industry	3
Other Commercial Enterprises	4
Other Service Enterprises	13
Other Industrial Enterprises	3
<b>Total</b>	<b>93</b>

The participants received a survey through fax or e-mail with 30 closed end questions, ensuring them anonymity and confidentiality in their responses. The companies that had not responded, received a call two weeks later. Finally, a second phone call was made to the remaining companies a month after the initial contact.

The formula used to calculate the minimum number of responses needed to accept statistically the investigation was Howell's [37] approximation technique based in real power, where power is equal to  $1-\beta$  (probability of not finding the present differences).

$$\delta = \gamma \sqrt{N}$$

Delta ( $\delta$ ) equals the relation between the effect size and the sample, calculated with the relation of *alpha* (probability of finding differences that are not present) and *power*. A table described in Howell [37] was used,

where for an *alpha* ( $\alpha$ ) of 0.5, commonly applied to protect from unexpected results and a *power* of 0.80, *delta* ( $\delta$ ) is equal to 2.80.

The variable *gamma* ( $\gamma$ ), is a function of the effect size that the study wants to measure. Cohen [38] indicates that for medium effect sizes (appropriate for this study) the value of the variable should be set at 0.50.

Finally, *N* yields the number of enterprises necessary to accept the sample, which is 31, as per the following formula:

$$N = \left(\frac{\delta}{\gamma}\right)^2 = \left(\frac{2.80}{0.50}\right)^2 = (5.6)^2 = 31.36 \cong 31$$

For the data analysis, the principal method used was descriptive statistics by distribution of frequencies, which is the grouping of numbers in categories while displaying the quantity of observations in each mutually exclusive category. This tool is useful to organize a great amount of significant data. The following section presents a summary of the responses.

## 4. Results

The number of organizations that responded with a complete survey were 31, representing 33% of the total enterprises in the selected population. A complete statistical procedure was performed to analyze the results, extracting the relevant data from the numbers received.

### 4.1. Tools

Figure 1 shows the most popular groupware tools (top to bottom), being *e-mail* and *shared data access* used both by 96% of the organizations that possess some groupware tool. The number at the end of the bar describes the average number of years that the application has been used in the enterprise. It is clear that Latin American countries have to exploit more the *Videoconferences* and the *Group Support Systems*, representing a very efficient, but expensive, technique to participate in the discussion and organization of dispersed projects.

Figure 2 contains the same data of the previous chart classified by utilization time (in years). It can be observed that, in Mexico, the average operative time has been 5 years in tools like *electronic mail* and *Information Exchange* utilities. In an over-placed graphic, the training time of groupware tools is measured (in weeks). The most difficult to master are the *GSS* (group support systems), the *Information Interchange* applications and the *Document Administration* utilities, with more than a week and a

half of training. The easiest to understand are *Videoconference*, *BBS* and *Brainstorming* software.

### 4.2. Use and implementation

The previous data implies the increasing importance that Mexican organizations give to groupware utilities. However, to identify the significance and impact that these tools have in corporations, it is necessary to know the user's percentage from the total employees. The results showed that 64% of large organizations have more than 71% of their staff using the collaborative applications for their internal and external communication. The contact with the utilities is very wide, in average connecting 54% of the workforce at all levels (from the CEO to the lowest rank). Finally, another relevant fact is that more than 50% of the businesses surveyed have groupware contact between several offices distributed in a number of cities worldwide.

One of the questions in the survey was regarding the obstacles that the CIO's noted while implementing groupware tools (figure 3). The most common, *Different Culture*, was identified by 50% of the executives. This impediment refers to modifications of personnel work since they started using the cooperative applications. The barrier is common in any organization, formed when people have to change the work methods they have been traditionally employing. *Resistance*, the second in frequency, is the opposition that many employees present when they are forced to change their work procedures. All the business that responded the questionnaire found at least one obstacle.

### 4.3. Benefits

Based in a model used by Downing and Clark [22], the object of a group of questions in the survey was to measure the expected benefits before implementing groupware, and compare expectations with actual benefits realized. In table 2, the second column describes the number of businesses that expected the advantage before using the tool. The scale of the degree of realization goes from "0" – not realized at all, to "5" – realized in a very significant way, and sums the organizations that responded to the level. The last column is the average of the responses.

Of particular interest are the unrealized expectations. For example, 71% of the organizations hoped for an increment in employee expertise, while most companies reported not having realized that, with an average of 2.35 on a five point scale. This can be explained because to obtain a measurable increase in expertise it would be necessary to have a very good

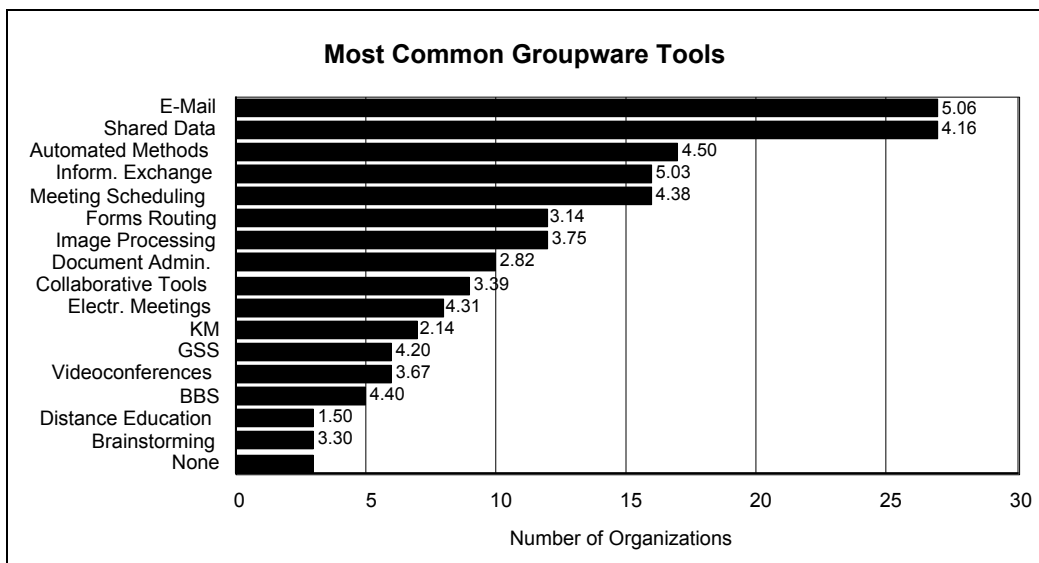


Figure 1. Groupware tools, ordered by popularity

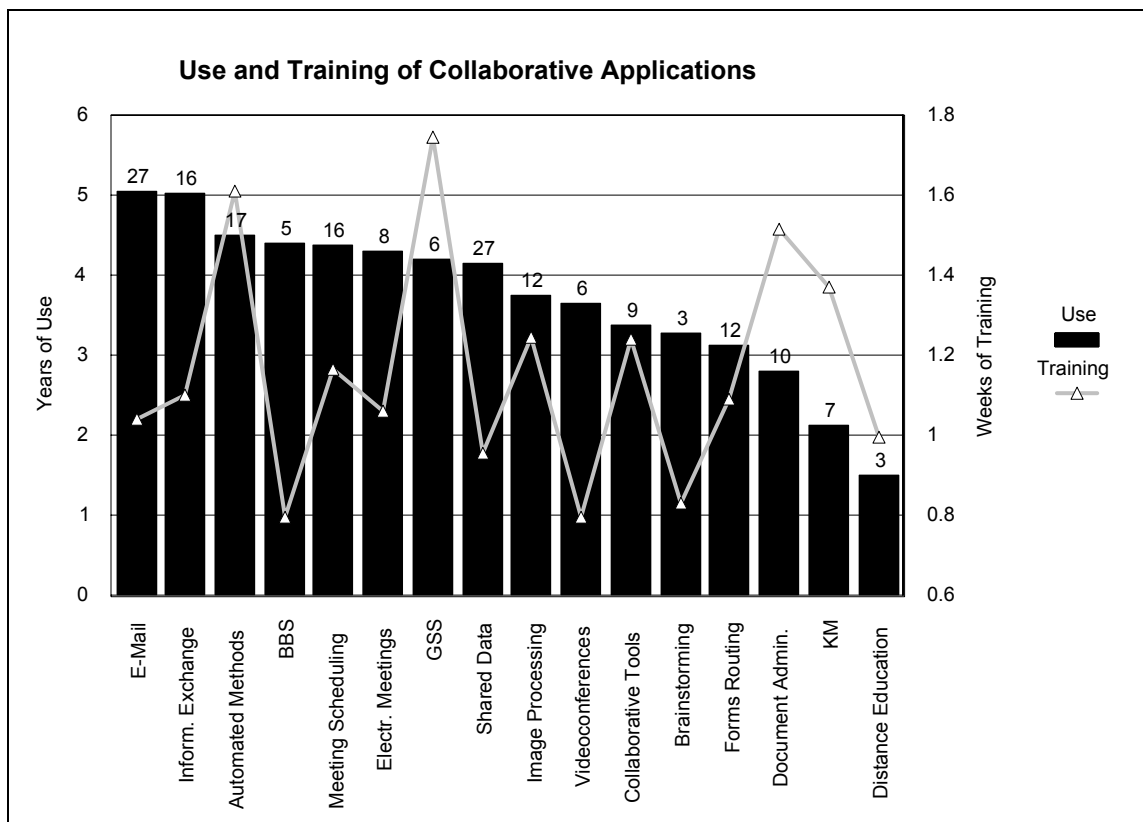


Figure 2. Use and training of groupware tools

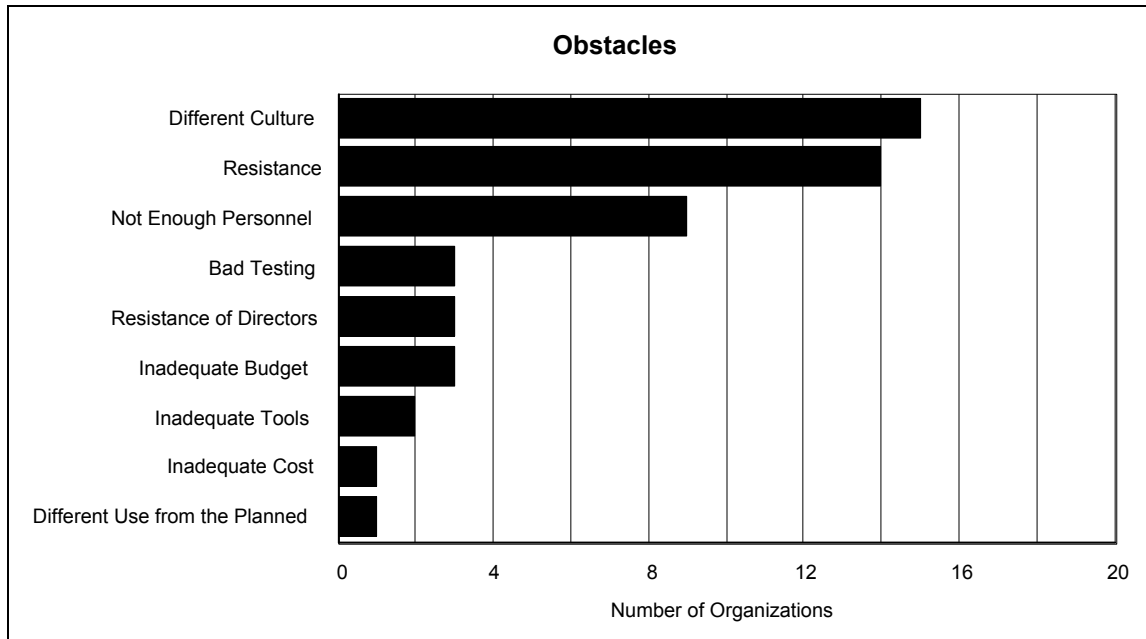


Figure 3. Obstacles presented during implementation

Table 2. Benefits expected / realized

Benefits	Number of Businesses that expected this groupware benefit	Realization Degree	Average of the Realization Degree
Improved customer service	27 (96%)		3.22
Improved communication within the organization	28 (100%)		4.10
Competitive advantages	26 (93%)		3.57
Cost reduction	24 (86%)		3.41
Increased productivity	27 (96%)		3.40
Increase in "expertise"	20 (71%)		2.35

document management and knowledge management systems, while spending time and money recording the workers experience and understanding of problems.

In the opposite case, all the companies expected an increment of communication inside their channels. The results showed that after the implementation companies reported having realized that goal, averaging 4.1 on the scale of 5.

#### 4.4. Effects

The central part of the investigation. Was the analysis of the effects of groupware tools. The measurement scale used was from 1 to 4, being "1" to have a negative effect in the organization, "2" no change, "3" a slightly increase and "4" a significant positive outcome.

While results vary between respondents, even depending on their hierarchical position in the company or role in the implementation, it is important to remember that these outcomes are from the person responsible of the IS department, who should be knowledgeable of the tools and their impacts.

The most significant effects, as reported by survey respondents, were: productivity, access time to information, external response time and work efficiency.

With no exception, all the respondents reported, at least, a slightly increase in some effect. Some respondents recorded no change at all in effects like work meetings, satisfaction, and ascendant and descendant communication; while in quantity of new ideas and work efficiency all the replies were positive.

The effects with the least improvement were work meetings, and ascending and descending communications. A possible cause of this could be the Mexican's working culture and the traditional hierarchical organization. A summary of the results is presented in figure 4.

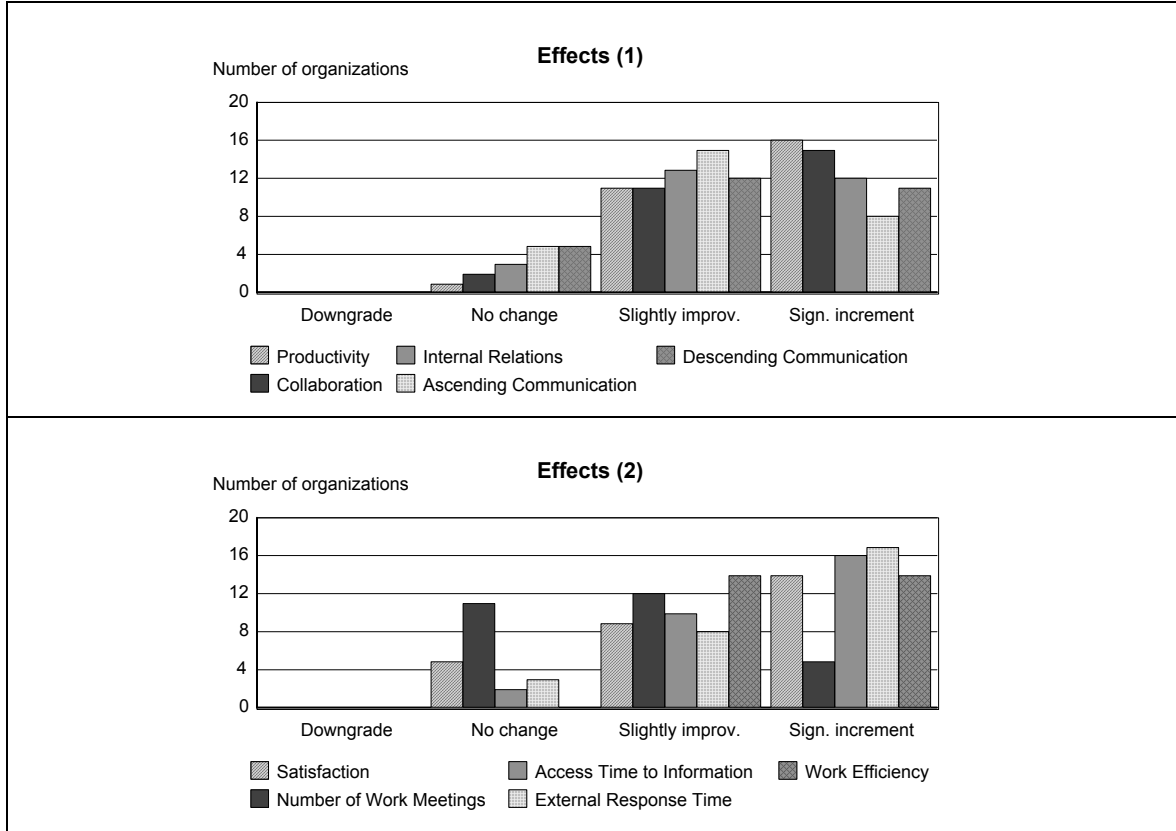
### 5. Conclusions and discussion

Regardless of a diversity in cooperative and collaborative practices among industrialized and Third World nations, groupware technologies are slowly becoming essential for Latin American corporations that desire to manage resources effectively and plan to incorporate first-world technology into their processes. Characteristics of the tools and infrastructure available in these countries have determined certain technologies that will be easier to implement and some that will require additional effort. However, the technology has proven valuable and its use is expected to grow, aiding in the integration of Latin American organizations to

the global markets. The reason of slow diffusion was not considered in the investigation. It is suggested as a topic of future research.

The major conclusions extracted from the research instrument are:

- Corporations in the study recognize the importance of groupware tools to incorporate a cooperative and distributed work scheme. The uncertainty of success and failure has considerably diminished due to positive and relevant successes of international enterprises. Current CIO's acknowledge that these applications will increase the operative efficiency, hopefully resulting in higher product quality, cost reduction and sales increase.
- The most popular groupware tools in Mexico are e-mail and the access to shared data. Knowledge management and distance education are the newest and less used applications.
- Enterprises are disseminating the use of groupware to all areas and departments inside the corporations, maintaining a constant communication between all the levels and all the personnel.
- Before starting any groupware implementation, it is necessary to develop a strategic plan based in necessities, analyze a cost/benefit proposal, calculate a budget and disclose to each and every person of the organization the new working methods. The enterprises can benefit forming an internal specialized team or hiring external consultants working full-time in the execution, even as taking active part in the education and training of the users.
- Historical groupware failures have been essentially attributed to obstacles when users are hostile to their new working environment.
- One should not expect to notice an immediate cost reduction when implementing a groupware tool. The initial costs may soar due to the applications' high cost and expensive infrastructure required. In the majority of the cases, a return on investment is forecasted for the long-term.
- The instrument did not identify any negative effect generated by the groupware tools in use. Several cases were recognized where no effect was noticed, but none were found to decrease its performance. It can be concluded that collaborative and cooperative tools produce mainly positive changes.



**Figure 4. Analyzed groupware effects**

Despite evident ethnicity differences between Latin America and the United States and Canada, groupware tools are transforming the traditional modus operandi, yielding in distributed work schemes. Although mainly cultural factors are involved, large companies in Latin America, and particularly in Mexico, are promoting collaborative work and adopting groupware tools, despite its cost and implications. The majority of the large corporations sampled have already acquired a groupware tool, but it will be time's decision to witness the real effects and consequences produced.

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