EXPLORING HOW INFORMATION TECHNOLOGY IS USED AND PERCEIVED AS A MEANS TO SUPPORT COMPETITIVE ADVANTAGE

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INTRODUCTION

The business value of Information Technology (IT) and the strategic role of IT and its consecuences for the firm have been widely studied under diverse perspectives. An extense recognition to the relationship *IT-Competitive Advantage* has raised (Porter, 1985; Sethi and King, 1994). McFarlan (1984), states that the link between a firm´s use of IT and its competitive advantage is by now well-established, being instances of underinvestment and underutilization as well as instances of exaggerated expectations or overinvestment of IT. Toraskar and Joglekar (1993) consider that this linkage is evident from the espectacular market impact that occurred in several well-documented cases. For McKeen and Smith (1993), the use of IT can have an impact on the competitive market place or it can focus on the firm´s internal operations. While the end result of deploying IT in a strategic thurst is to achieve a competitive advantage or reduce a competitive disadvantage, the primary impact of IT application is either internal to the firm´s operations or external in the market place. Brown et al (1995) consider, regarding information systems, that investment in strategic information systems is advocated by numerous authors as an important way for firms to seek competitive advantage. The sources of this advantage can not be completely understood by only looking at a performance that has been measured at a high level of aggregation. Porter´s value chain (1985) concept dissaggregates the activities, allowing researchers and managers to understand the strategically relevant activities and the linkages among them. The impact of IT positioned in different activities of value chain is identified in scattered literature sources. Even where it provides no lasting competitive advantage, the technology becomes a "strategic necessity" to maintain current competitive position, because failing to attend it results in strategic disadvantage (Clemons, and Kimbrough,1986).

The literature review provides a framework in which the relationship between IT and competitive advantage is considered as two general block´s relationship, regardles of the technological environment and with litlle emphasis on industries such as manufacturing. This situation raises the interest in a new perspective of analysis. Direct references to IT and value chain activities can be found in the IT literature. Dos Santos (1993) considers that the impact of IT investments on the firm cannot be completely understood by looking only at a performance that has been measured at high levels of aggregation. This consideration can be extended to IT use, because at aggregate level reflects overall

use and doesn´t allow the distinction between types of application that lead to identify how IT is being used. As IT Use should not be taked for granted, it seems appropriate to examine how IT is used along the value chain activities in a firm with competitive advantage, considering in the analysis the congruency between attitudes and behaviors toward IT use. Thus, the primary task of this paper is the identification of existing differences between how IT is perceived by the users in an organization as a means to support competitiveness, and how this perception is translated into real hands-on use for effectively support it.

The IT Use Perspective

IT Use is the preferred criteria to use when analyzing the impact of IT on firm´s performance instead of on the investment or expenditure because expenditure is a perspective of how much the firm is *paying* for IT in search of financial information to justify the expenses. It is considered that to be effective, technology has to be used, thus, the investment is required for the use, but by itself, it is hard to believe that it provides a support to competitiveness. George (1989) in a context of a Group Decision Support Systems (GDSS) showed that the availability of technology does not necessarily lead to use; however, use is necessary for technology to influence outcomes. Ives and Jarvenpaa (1991) consider IT Use as the application of IT within an organization´s operational and strategic activities for a particular use. To understand how utilization links to performance, one explanation can be found in the categorization of the different types of IT investment, particularly with respect to performance effects (Weill, 1992), as *transactional* IT when investments cut costs by sustituting capital for labor, *strategic* IT, when investment is made to gain a competitive advantage and *informational* IT, which provides information infrastructure to manage the firm and meet other management objectives besides cutting costs or gaining sales. In later works Weill (1993), states that all IT uses are not alike, and that managers expect IT investment to influence performance in a number of ways.

Attitudes and Behaviors Toward IT Use

According to Fishbein and Ajzen´s (1975) Theory of Reasoned Action (TRA), attitude refers to the amount of affect one feels for or against some object or behavior. Thus, a person´s attitude toward IT refers to the extent to which the person feels the IT is evaluatively good or bad. According to this theory, the inmediate determinant of a person´s behavior is his/her intention to perform the behavior. These authors declare that attitude refers to the amount of affect one feel for or against some object or behavior. Thus, the person´s attitude toward IT refers to the extent to which the person feels the IT is evaluatively good or bad. This basic framework appears well suited to the task of explaining the differences between attitudes towards objects (IT) and behaviors (use). In Fishbein and Ajzen´s (1975) terms, user´s opinions as defined here, is a belief and refers to the extent to which a person believes that an IT possesses two characteristics: importance for the firm performance and personal relevance, being beliefs an object or behavior to some attribute, characteristic or outcome. Ginzberg (1981) investigated how user´s expectations of a pending information system significantly shaped their attitudes toward it. Latter Davis et al (1989) found that attitude concerning systems use significantly influences users´ intentions relate to systems use. It seems reasonable to expect that the more important, the more personally relevant, and the better IT is perceived to be, the more likely they will use IT. More recently, Orlikowski and Gash (1994) argued that an understanding of people´s interpretations, assumptions or

knowledge of about some key aspects of the technology are critical to understanding their interaction with it.

THE STUDY

Research Strategy

Due to the exploratory nature of the research question: How IT is used and perceived as a means to support competitiveness?, a qualitative approach using a case study research strategy is used (Yin, 1994). "How" questions are likely to favor the use of case studies and their derivative "how many" or "how much are likely to favor survey strategies and statistical tests can be used to analyze the data. Case studies, like experiments, are generalizable to theoretical propositions and not to population or univers. Thus, in case study research a combinatory approach can be followed, including a formal survey. Such a survey could be designed as part of the case study and involves both sampling procedures and the instruments used in regular survey, and it would be subsequently analyzed in a similar manner (Yin, 1994 p. 85).

Study Setting

A Mexican manufacturing firm, major player in the international market, was selected as unit of analysis to study how IT is used to support competitiveness. The industry structure consists in two business groups. These groups have fourteen facilities allocated in different geographic points of Mexico. Both of them are in the stock market. This situation allows to identify more easily which of them posess the competitive advantage, considering that if the firm is public its value is reflected in the price of its shares. This is consistent with Wilson´s (1993) reference to outcome variables such as: sales, profit, market share and Return on Investment (ROI), which are considered as performance variables.

Measures

From the IT Use literature, measures of IT Use can be classified into quantitative and perceptual items providing the benefit of two complementary views: how users *perceive*, and how users *use* IT in their daily tasks. To incorporate a large number of both items in the analysis, for each IT use along the organization´s value chain two sets of measures are defined, one for quantitative items and a second set of perceptual items. The quantitative items are identified as reported use, frequency of use, and hours of use of equipment, software and communications facilities. The quantitative set of IT Use has four dimensions: *IT Use* operationalized as weekly hours of use of equipment, software programs and LAN instalations; *Application Type*, operationalized as weekly hours of use for transactional, estrategic or informational purposes; *IT Role*, operationalized as weekly hours of use oriented to support operations and procedures as well as the strategies; and *IT Interactions*, operationalized as the number of interactions within the value chain activities through IT use. User´s perceptions has three dimensions: *Strategic Importance* of IT is operationalized as IT use oriented to support competitiveness; Integrative Strategy is operationalized as the users opinion about the enhancement of IT capabilities in cumulative levels of equipment and software acquisition, and in-house software development*; User´s Perceived Satisfaction* with IT is operationalized as user´s satisfaction with infrastructure support, training in IS, and with infrastructure performance.

The data collection strategy requires the use of two sources. The first, a user´s IT use weekly report filled by each of the 47 employees and middle managers who are IT users and participate in the investigation during six consecutive weeks. This time period allows to configure a six data series for each predictor and to capture the effects of the organization´s business cycle in IT use as well. The second source is a questionnaire-interview. As complementary source of evidence, focused interviews to key respondents were conducted. To perform the quantitative analysis, the simple average of the four quantitative subjective measures used on all the subjects involved in this activity -during six weeks- are computed, and then added to the three perceptual subjective measures used which are measured only once. The total sum provides a weekly index for IT use in that particular activity. This implies that total IT-Use is disaggregate in six components:

ITUINLOG	IT use at inbound logistics
ITUMSALES	IT use at marketing and sales
ITUOULOG	IT use at outbound logistics
ITUPROC	IT use at procurement
ITUHRM	IT use at human resources administration
ITUFIIN	IT use at firm infrastructure

ANALYSIS OF RESULTS AND FINDINGS

Because this phenomenon had not been previously examined empirically, instrument construction and assessment prove to be a major undertaking. When constructing the instrument, attention is given to content validity. Careful planning before items are selected is considered the best way to ensure content validity, which refers to the representativeness and comprehensiveness of the items of the scale. The seven items for both constructs, IT Use and IT Perceptions, are drawn from conceptual definitions in the literature and a representative collection of items is used. In order to assess the semantic, the instrument is revised by two Senior Executives of the organization. The instrument is reduced from 25 to 21 items.

The correct operationalization of the constructs of interest -construct validity- is assessed ahead through a separate analysis of quantitative items and perceptual items. The internal consistency method is selected when assessing the instrument´s reliability. For each construct the correlation among items is calculated. Since the questionnaire for quantitative items is applied for each one of the 6 weeks of the study, the consistency of the reliability coefficients is also analyzed. This is done because two potential problems can occur: a) subjects may respond based on recall, affecting the instrument´s ability to produce consistent results; and b) the problem of reactivity due to the fact that subjects become sensibilized to the instrument and can "learn" to respond as they perceive they are expected to respond.

The internal consistency reliability, which looks at the extend to which the items used to assess a construct reflecta a two common score for the construct, was calculated using Cronbach alphas. The reliability coefficients between test and retest administrations range from .016201 to .93. This high dispersion is related to one of the coefficients (.016201), which is obtained for the sixth week. This coefficient is considered an outlier because the IT Use Report instrument is administered during a national three-day vacation where IT use is irregular and lower than usual. Therefore, only five of the

coefficients are considered for an average (range between .43 to .93), providing an average coefficient alpha equal to 0.59. Reliability for perceptual items is assessed separately (coefficient alpha = 0.52) denoting that measures are moderately reliable. No average is computed due to the single administration of the instrument. One point concerning the coefficient alpha calculation is the fact that the more items included in a scale the higher the alpha coefficient observed. Therefore, the relative low alpha coefficients reported in this study are particularly impressive in light of the relative few numbers of construct items (four items for reported IT Use and three items for users opinions). For this reason, it is considered that they provide adequate support for concluding that the instrument is reliable. Although Nunnally (1967) indicates that for exploratory research, correlations above .70 are the adequate.

For qualitative data collected through interviews, the tactic used to test reliability is the development of a case study protocol, in which the procedures followed in this case are documented as well as the use of the data base developed from the survey´s data. This paper do not include results from qualitative analysis.

After the quantitative analysis of the value chain activities (termed DEPTO for the ANCOVA and for the ANOVA), the simple average of the four quantitative subjective measures used on all the subjects involved in this activity -during six weeks- are computed, and then added to the three perceptual subjective measures used which are measured only once. To avoid confusion between the single variables created and the index, its components will be referred to as items hereafter. The total sum provides a weekly index for IT use in that particular activity. For each week, six indexes are available one for each of the firm´s value chain activities, giving a total of 36 numbers for the total six-week period. Then, for each activity, a regression model is fitted by using the 6 weekly IT-use indexes and the total weekly sales. These data pairs correspond to the same time period. The difference in the magnitude of the slope of the linear regression models represents the extent to which each IT-Use, along the value chain activities, affects competitive advantage.

The Exploration Considering All Types of Items from IT Use Indexes
A first exploration is made for each activity considering the resulting indexes from the sum of all quantitative and perceptual measures and sales. An Analysis of Covariance under the Regression Approach (Weekly sales = IT Use + Depto effect) is performed, results are shown in Table 1. The model explains 10.09% of the variability in sales. The effect of IT Use on sales is declared significant with an estimated significance level of 8%. Raw Regression Coefficient indicates negative slope in the relationship between sales and IT use over the value chain activities (termed Deptos as well). No differences between departments are declared (estimated significance level is 0.839).

Table 1
ANCOVA Under Regression Approach: Sales by Depto with Use

Source of Variation	Sum of Squares	DF	Mean Square	F	Signif. of F (α)
Covariates					
IT USE effect on Sales	200.135	1	200.135	3.253	.082
Main Effects Department	125.842	5	25.168	.409	.839
Explained	1784.427	29	61.532		
Total	1984.562	35	56.702		

Square R $= \dfrac{200.135}{1984.562} = 0.1009$ 10.09 of Sales variation is explained by the model

Covariate: Raw Regression Coefficient   ITUSE   -.748

        To explore how IT use along the value chain activities affects the BUA´s competitive advantage, an individual regression model is fitted for each value chain activity (department). A negative or inverse relationship with the dependent variable Sales, results in five of the six value chain activities, but only one is declared statistically different from zero. Results are given in Table 2.

        For the only significant regression model, the one corresponding to the Inbound Logistics activity (ITUINLOG), the model explains the 47.13% of the variability in sales. The regression coefficient for IT use is significant at the 13% level. Since only 6 data are available, this relaxed significance level is admitted. From this analysis, results indicate that as more IT is used in the Inbound Logistics activities, a reduction of - 2.83% in sales is expected. Some influences in these results are suspected from the index composition, in which the reported perceptions related to the benefits of IT use for the organization are consistently higher than the reported use. This means that among the respondents, the idea that IT use brings benefits to the organization is widely accepted, but the reported use does not correspond to their perceptions. This contradiction is an opportunity to go deeper in the analysis.

Table 2
Individual Multiple Regressions Results ALL ITEMS Considered

Dependent Variable SALES

INDEPENDENT VARIABLES	R Square	F	Sig F (α)	Slope	Significance
ITUINLOG	.47127	3.56529	.1320	- 2.82892	S
ITUMSALES	.28255	1.57533	.2778	- .76388	NS
ITUOULOG	.23782	1.24812	.3265	- 1.14067	NS
ITUPROC	.00454	.01824	.8991	.36816	NS
ITUHRM	.02030	.08288	.7877	- .72583	NS
ITUFIINF	.00822	.03315	.8644	- .17030	NS

To further explore if IT use perceptions are different for the six value chain activities (DEPTO), the perceptual items of the index are analyzed as a single component. The ANOVA results indicate that no two groups are significantly different at the .050 level. Additional to the ANOVA, Depto pairs are compared by using Duncan´s test. All means are assigned to the same set confirming the ANOVA results.

Table 3
ANOVA Perceptual Items Variable IT PER by Variable DEPTO

Source	DF	Sum of Squares	Mean Squares	F Ratio	F Prob.	Significance
Beetwen Groups	5	144.0508	28.8102	.2317	.9465	NS
Within Groups	41	5098.7457	124.3597			
TOTAL	46	5242.7966				

MULTIPLE RANGE TEST: DUNCAN PROCEDURE
Ranges used correspond to a .050 level
    2.86   3.00   3.10   3.17   3.22   Same IT perceived utility

No two groups are significantly different at the .050 level

Homogeneous subset
 (Subsets of groups, whose highest and lowest means do not differ by more than the shortest significant range for a subset of that size)

SUBSET 1

	Group Mean
Group 3	71.6900
Group 4	71.9387
Group 6	72.7880
Group 5	74.1852
Group 2	74.3695
Group 1	77.4367

The general conclusion from this analysis is that the perception of the advantages of IT Use is the same for all the DEPTOS. The presence of an "inflation·" effect in the first analysis´ results is suspected. Using only the four quantitative items of the index (hereafter QUANTI), an aditional analysis in variable ITUINLOG reveals differences in R Square (.25959 < 0.47127 with overall IT Use index components), and in the Slope (- 1.15572 > -2.82892 with overall IT Use). Discriminant validity is supported. A Correlation of the six independent variables for each set of items confirms the presence of such an effect.

CORRELATIONS:	ITUSE	ITQUANTI
SALES	- .6865	- .5095

N of cases: 6   inflated " r " due to IT preceptions

An explanation is given by the literature of quantitative applications in the social sciences. Langbein and Lichtman (1978) consider two distinct causes of discrepancies between the expected values of parameter estimates at different aggregate level of analysis. The first relationship was expected to emerge as a consequence of the organzization's monitoring of distribution volumes (ITOULOG), dealing with suppliers control and accounts payable (ITUPROC). This relationship was supported by the results (0.115 when $.05 < \alpha < .15$). The second relationship was expected because marketing and sales activities (ITUMSALES) affect the orders to suppliers and accounts payable. This relationship was supported by the results as well (0.102 when $.05 < \alpha < .15$). An additional finding, not expected, was the relationship (0.030 when $.05 < \alpha > .15$). between inbound logistics (ITUINLOG) and outbound logistics (ITUOULOG) This is explained because once the product has been distributed, inventories move raw materials and empty materials for production.

An Exploration Using Only IT Quantitative Items
A second exploration for each activity is made considering only the resulting indexes from quantitative items to avoid aggregation bias. As expected, the results of the Analysis of Covariance performed under the Regression Approach are adjusted. The effect of IT Use on sales is declared significant (F raised from 3.253 for all items to 4.374 for quantitative items) with an estimated significance level of 5%. The QUANTI model explains 13.06% (previous All Items model explained 10.09%) of the variability in sales which seems to be consistent with the results obtained (13.99%) in the analysis at aggregate level. The overall Raw Regression Coefficient (-.574) indicates the presence of a negative slope in the relationship between sales and IT use. As was done before, the differences between Deptos are studied by adjusting individual regressions to each department. In comparative results under the All items criteria and the QUANTI criteria, that is with the inflation effect and afer removing it,

differences in R Square appear in all independent variables. The inflation effect seems to be greater for ITUMSALES, ITUHRM, ITUINLOG and ITUOULOG, *reflecting that the respondents perceive the advantages of IT Use, but they are not consistent with its actual real use to support their tasks.* Other differences are found between the two sets of results. While in the first exploration ITUINLOG is the only variable declared significant (at 13% estimated level of significance), in the QUANTI set it is no longer declared significant, eventhough this can be an effect of the limited number of data available. After removing the inflation effect, the regression coefficient for IT use for the finance department increased considerably. Based only on the magnitude of the F-Test, the two areas where IT use is more relevant are identified as Finance and Inbound Logistics.

The most significant finding is that those factors which influence sales volume most strongly are IT use in firm infrastructure (Accounts Receivable and Systems) and IT use in Inbound Logistics (Inventories). One explanation is that both activities have two important characteristics in common: they are controllable by top manager level and they absorb large amounts of capital from the firm. These characteristics suggest that IT strategies can be implemented and manipulated by top management level in the finance area, and as accounts receivable and inventories are short-run in their scope, the results and changes in these IT strategies can be noted relatively soon.

Exploring Average IT Use in the Job Environment

Moving the study´s perspective toward how IT is used in a firm with competitive advantage, data are used to derive figures for IT Use along each value chain activity and of each of the items considered to configurate the previous IT Use index. *Average use* means the % of available capacity used during an eight hour period of work (Labor time in Mexico is 8 hours/day, 40 hours/week). Differences in the rating results reflect variability in each variable composition, providing valuable information to management about how the areas take advantage of IT resources and about how the importance of its use is perceived. Table 4 shows the differences between quantitative and perceptual items along the value chain activities.

Table 4
Quantitative and Perceptual Items All IndependentVariables

Independent Variable	Quantitative Items	Perceptual Items	Total Average Independent Variable
ITUINLOG	47.12	74.41	62.27
ITUMSALES	37.30	74.51	55.91
ITUOULOG	32.41	71.37	51.89
ITUPROC	42.03	71.94	56.95
ITUHRM	44.02	80.26	62.14
ITUFIIN	47.44	72.92	60.18
AVERAGE:	41.72	74.74	58.23

Comparison of the quantitative and preceptual sets identifies differences between the average *use* of IT in the job environment, and the high perceptions of its strategic importance (Table 4 and Graphic

1). This finding is consistent with the idea that competitive advantage is supposed to raise from the use of IT, and not only from the people´s perceptions of its strategic importance. Comparison of the quantitative and preceptual sets identifies differences between the average use of IT in the job environment, and the high perceptions of its strategic importance.

The results in *Application Type* shape an organization which mainly uses IT for transactional uses in the distribution tasks (ITUOBLOG) and it can be said that also in ITUPROC as well, the remaining activities apply IT for strategic uses, with an incipient informational use. Usually, transaction systems must be in place before strategic or informational systems are feasible. These results are consistent with the results obtained in item Role. This is a relevant finding that deals with the *How* of the research question. At this point, the organization´s nature must be considered. Recall that is a production plant integrated to a business group whose main policies and strategic planning activities are defined by a central corporative level. Therefore, it is expected that the transactional type of use prevails. Using IT to contain, reduce, or control costs is a traditional application of IT, and lacks the agresiveness of strategic and informational aplications.

AVERAGE
(item)
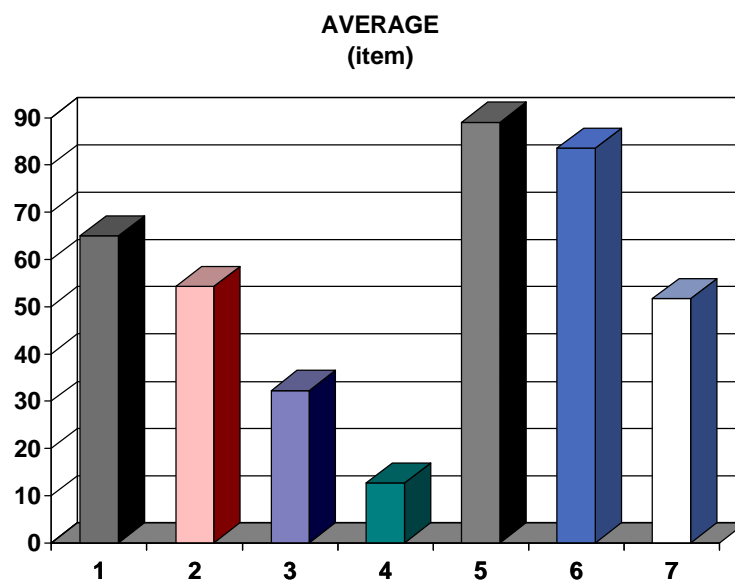
1. Use   2. Application Type   3. Role   4. Interactions
5. Strategic Importance   6. Strategy for IT Integration   7. User´s Satisfaction
Graphic 1   IT Use and Perceived IT Use Importance

Role assigned to IT refers to the use to support the operations or to support the organization´s strategy. Results suggest that for IT, the assigned role is to support the operational procedures in all activities. This is consistent with the nature of the organization as mentioned previously. This results reveal a predominant utility view of IT, which implies that IT infrastructure is seen primarily as a way of

saving costs, this is the tradicitonal role of IT as a utility that provides a necessary and unavoidable service which incurres administrative expenses. Four activities are giving IT an evolving role, while integral role is not shown.

Interactions along the value chain activities using IT means the use of IT to link as many categories of activities as the organization declares to have. This item obtains the lowest results of the set. An interpretation is that the type of tasks are individual and rutinary. They are not connected among them, even when the operations of one area affects another. Each area is independent and a close territory for the others. In Table 5 the largest interactions are identified in the ITUINBLOG (24.06%). Results suggest that with regard to IT interactions this company is an archipielago.

Strategic importance is one of the perceptual items included with the purpose to identify if the IT users are aware of the importance of such a resource for the organization´s position related with its competition. Results in indicate a very high perception of the strategic importance of IT, mainly in the ITUIBLOG (94.4%). The results contradict the low results obtained in the item *Role.*

The findings reported above are somewhat contradictory. The users perceive the strategic importance, but they do not use it, or do not apply it to other types of use rather than operational or transactional. This situation is illustrated by ITUMSALES and by ITUOBLOG with a reported IT use of 60% of its current capacity. The application role is for transactions when the strategic importance rate is 95%.

Strategy for Integration of IT in the following five years reflects the user´s perception of how IT must be developed in the organization in the future. The valuation criteria implies a basic enhancement of the current infrastructure and of the own software developments; the implementation of independent systems in other facilities of the Business Group; the implementation of systems which integrate those facilities, and the implementation of a system which integrates stakeholders as well. Results indicate a highly developed awareness of a strategy that integrates the organization with the external environment in all the chain activities.

Users Satisfaction includes the perceptions of individuals related to IT support, training, performance, and their plans of use which are expected to be greater the more they are satisfied with the performance and the results obtained. In general the users´ declared a low level of satisfaction that can explain their expectations for the strategy to integrate IT in the future as it is evidenced in a previous item.

Exploring IT Use in Each Value Chain Activity

Under the standard of use criteria mentioned in the literature, a low overall average (Graphic 2) results for ITUMSALES (55%). In the foreign sales department, the use of computers and specialized software is declared to be a need. A highest intensity in use is reported by ITUPROC (78%) due to the daily volume of operations that are managed in the plant´s purchase procedures, the areas involved are suppliers and accounts payable who are linked to account and treasury. Inbound logistics represented by the area of inventories includes the tasks of control of raw materials, intermediate materials, and finish product (ITUIBLOG). The precedents report a non-intensive use during the observation period. Their application type corresponds to transactional uses because the nature of the tasks performed does not require strategic decision making. The role played for this area corresponds to operations support, with little interactions with other activities; eventhough, they are the largest figures obtained when all the activities are compared. Respondents perceive high strategic importance of IT use which requires to

follow a strategy of integration based in the enhancement of IT infraestructure to other facilities of the organization and stakeholders as well. Users satisfacion is below 60%. Several areas of opportunity as intensive training and improvement of infrastructure to facilitate interactions can be considered.

Marketing and Sales including activities of international sales (ITUMSALES) present opposite situations of use impacting the average. During the interview in this area, the employees reported that they are willing for IT infrastructure enhancement. High perceptions are observed in the strategic importance of IT. Data reflect applications of the operational and transactional type, with the expected supportive role for operations, and almost inexistent interactions with other activities, but with a high perception of the strategic importance of IT for the firm competitive position, and users satisfaction below 50%.

Distribution activities are represented in the outbound logistics activities (ITUOULOG). During the time period observed, they reflect an average use of 63.8%, which is considered as moderate an application type oriented to operations, almost inexistent interactions with other activities, and a high perceived strategic importance for the organization. The respondents consider it necessary to follow a strategy oriented to link the plant with other facilities of the business group. Users satisfaction is below 50%, suggesting an area of opportunity. Local and nationwide sales areas report through the interview marginal use oriented to elaborate end month reports. This situation impacts the results lowering the average of IT use for this activity.

USE
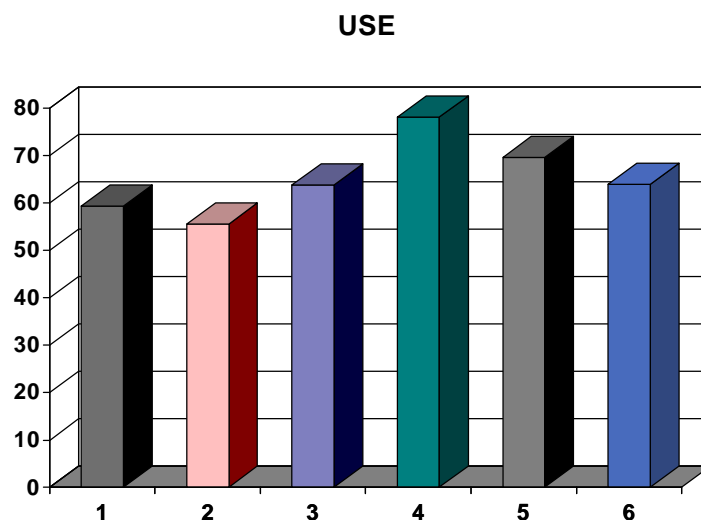
1. ITUINLOG   2. ITUMSALES   3. ITUOULOG
4. ITUPROC   5. ITUHRM   6. ITUFIIN
Graphic 2 Reported Rating for IT Use   All Value Chain Activities

Suppliers control and accounts payable areas are identified with the procurement activities (ITUPROC), which report the highest intensity of use during the observed period. As in the other activities, operational use and operation support role result, low but existent. There is a very high perception of the strategic importance and the vision for an international strategy to follow IT enhancement. In contrast, users satisfaction is the lowest in all activities.

Due to the nature of the organization´s value chain activities, the use of IT for human resources management is mainly allocated in the payroll area. The management and control of salary payments, compulsory social security and retirement security, taxes, saving founds, loans, discounts and all type of movements related to the financial history of the workers and employees are processed in the payroll area with the support of IT. The traditional functions of human resources management, recruiting, selection, development, etc. use IT marginally to support their operations. For this reason, payroll area is selected as representative of the human resources management activities (ITUHRM). This variable registers: the highest perception of the strategic importance of IT for the firm´s competitiveness, a simi-intensive use, operational and transactional type of application, support operations role, almost inexistent interactions and the highest users satisfaction in the independent variables set.

Firm infrastructure (ITUFIIN) activities are identified with accounts receivable management and Information Systems management. The average use is 63.8% which reports application of operations and transactions, an implicit assigned role to support operations, low level of interactions, high perceptions of strategic importance and a medium-term vision of IT integrated nationwide. In contrast, a low level of users satisfaction is reported.

Descriptively, the results suggest the following picture: IT use is determined by the user´s needs to use the technology either explicit or mandatory or implicit. Here behavior (IT use) is said to be directly determined by an implicit need while indirectly determined by attitude (perceptions). This finding is contradictory to the generalized acception that behavior is said to be determined by attitude. Previous analysis shows high levels in the perceptions of IT as important, good and relevant, reflecting a positive attitude (psichologycal state) toward IT. While data contrary reveals low current level of use (behavior).

CONCLUSIONS

The explorations described in this paper show that among the respondents, the idea that IT use brings benefits to the organization is widely accepted, but the reported use does not correspond to their perceptions. Comparison of the quantitative and preceptual sets identifies differences between the average *use* of IT in the job environment, and the high perceptions of its strategic importance this finding is consistent with the idea that competitive advantage is supposed to raise from the *use* of IT, and not only from the people´s perceptions of its strategic importance, while is contradictory to the generalized acception that behavior is said to be determined by attitude.

The analysis shows high levels in the perceptions of IT as important, good and relevant, reflecting a positive attitude (psichologycal state) toward IT. While data contrary reveals low current level of use (behavior) along the value chain. It must be consider that it is Technology use, and not the perception about technology, is the supportive element for competitiveness (Erosa, 1996).

A special feature of this paper is the idea that IT also performs in a technological environment dominated by other technologies and not only as the single star in the services industry. For this reason,

this study contributes, as the Weill´s study (1992) did, with cumulative evidence to the understanding of IT performance in different technological environments, adding an angle of analysis to the generalized perspective that deals with IT performance and IT value in the world of the service industry.

The situation illustrated by this case suggests that for manufacturing organizations, IT use is not only desirable, but it is also necessary. The introduction of IT may be a "strategic necessity" to help maintain current competitive advantage. For firms with a mixed technological environment, IT use can represent a hidden advantage, especially when the core technology is in the mature stage of its life cycle and the technological advantage does not come from that source anymore.

The limitations of this paper are its cross-sectional nature and its scope to a single organization. Further research on the impact of IT regarding its life cycle in competitive advantage is suggested to learn about the timing of IT effectiveness for an organization. Other case studies must be developed either under the perspective of longitudinal studies to observe the relationship along the life cycle development as under the cultural perspective.

BIBLIOGRAPHY

BROWN, R. M., Gatian, M. W,. Hicks, J. O. (1995). Strategic information Systems and Financial Performance. Journal of Management information Systems. Spring Vol. 11. No. 4 :215-248

CLEMONS, E. and Row, M. (1991). Sustaining IT Advantage: The Role of Structural Differences. MIS Quarterly. September. :275-292

DAVIS, F. (1989). Perceived Usefulness, Perceived Ease of Use, and End User Acceptance of Information Technology. MIS Quarterly, September. :319-339

DOS SANTOS, B. and Peffers, K. (1993). Firm Level Performance Effects: A Framework for Information Technology Evaluation Research. Chapter 23. In Strategic Information Technology Management. Banker, Kauffman, Mahmood (Eds). Idea Group :515-546

EROSA, V. E. (1996). Exploring How Information Technology Affects Competitive Advantage in a Core Stable Technology Manufacturing Firm. Doctoral Dissertation. University of Texas at Austin-ITESM-CCM

FISHBEIN, M., and Ajzen, Y.(1975). Belief, Attitude, Intentions and Behavior: An Introduction to Theory and Research. ADDISON-WESLEY, Boston, M. A

GEORGE, J. F. (1989). A Comparison of Four Recent GDSS Experiments. Proceedings of the Twenty-Second Annual Hawaii International Conference on Systems Sciences. Vol. III. :397-402

GINZBERG, M. J. (1981). Finding an Adequate Measure of OR/MS Effectiveness.   Interfaces, 8, 4. August, : 59-62

IVES, B. and Jarvenpaa, S. L. (1991). Aplications of Global Information Technology: Key Issues for Management. MIS Quarterly (15 :1) March :33-49

MCFARLAN. D. (1984). Information Technology Changes the way you compete. Harvard Business Review, 62 (3) :98-103.

MCKEEN, J. D. and Smith, H. A. (1993). The relationship Between Information Technology Use and Organizational Performance. Chapter 20. In Strategic Information Technology Management. Banker, Kauffman, Mahmood (Eds). Idea Group : 405-444

ORLOWSKY. W. J. and Gash, D. C. (1994). Technological Frames: Making Sense of Information Technology in Organizations. ACM Transactions on Information Systems, Vol. 12, No. 2, April :174-207

PORTER , M.E. (1985). Technology and Competitive Advantage, Chapter 5 in Competitive Advantage: Creating and Sustaining Superior Performance. Free Press, NY

PORTER, M. and Millar, V. E. (1985). How Information Gives You Competitive Advantage. Harvard Business Review, July-August :149-160

SETHI, V. and King, W. R. (1994). Development of Measures to Assess the Extent to Which an Information Technology Application Provides Competitive Advantage. Management Science. Vol. 40, No. 12, December. :1601-1620

TORASCAR, K. and Joglekar, P. (1993). Applying Cost-benefit Analysis (CBA) Methodology for Information Technology Investment Decisions. Chapter 6. In Strategic Information Technology Management. Banker, Kauffman, Mahmood (Eds). Idea Group :119-142

WEILL, P. (1992). The Relationship Between Investment in Information Technology and Firm Performance: A Study of the Valve Manufacturing Sector. Information Systems Research. 3 : 4 December :307-333

WEILL, P. (1993). The Role and Value of Information Technology Infraestructure: Some Empirical Observations. Chapter 24. In Strategic Information Technology Management. Banker, Kauffman, Mahmood (Eds). Idea Group. :547-572

WILSON, D. (1993). Assessing the Impact of Information Technology on Organizational Performance. Chapter 22. In Strategic Information Technology Management. Banker, Kauffman, Mahmood (Eds). Idea Group :471-514

YIN, R.K. (1994). Case Study Research Design and Methods. Sage Publications Applied Social Research Methods Series