

Pragmatic Fragility of Information Technology in Latin America: Case studies

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ABSTRACT

Information technologies (IT) have a substantively differential effect in developed countries than in less developed countries. This is illustrated through case studies of public and private institutions from Venezuela, Brazil, and Panama. The case method is used because it provides a richer understanding of the phenomenon and because there are factors structurally linked to the lesser development that both hinder a quantitative analysis and obstruct a proper managerial analysis that would permit a similar profiting from the technology. An analysis of the commonalities in the cases shows how the theoretical concepts of pragmatic, semantic, and syntactic dimension of information can be used to conceptualize why less developed countries cannot benefit from the use of IT in the same way as developed countries do. Thus, we conclude that due to the *pragmatic fragility* present in less developed countries, advanced IT will not reduce but increase the digital divide.

Keywords

Information technology, information systems, information theory, developing countries, digital divide.

INTRODUCTION

Developing countries have hardly contributed to the pool of IT/IS. IT/IS is often ignored or even mocked at in developing countries and when embraced, it is generally in a peculiar mode of a consumer of imported “fashions” from the large world centers of production (e.g. Wilson 2001). Furthermore, some countries are avoiding IT/IS because their leaders see it as a globalization tool used by developed nations to indoctrinate and put a curb on the development of the poor ones.

Unfortunately, the foregoing observations contradict the hope expressed by many (e.g. Nevin 2002) who expect information technologies -and the Internet in particular- to reduce the breach between the rich and the poor nations who long ago lost every hope of catching up by the process of industrialization.

Communication technologies are believed to lower barriers of entry because what a decade ago used to take years, now can take only months or weeks and cost a small fraction of what they used to cost (Peha 1999). Still, the communication infrastructure, the part of the information revolution that is easily implemented, is only a relatively small part of what is needed to successfully surf the information revolution (Lane 1997).

E-commerce is expected to reach over six trillion dollars in the US alone in 2004 (Forrester Research Inc. 2003); however, the gains in efficiency obtained by developed countries by using e-commerce and other forms of advanced IT have yet to be duplicated in less developed countries which is the basis for what we commonly call the *Digital Divide* (Simon 2004). A very clear example of the Digital Divide is the fact that about 75% of all e-commerce is done in the US today and that the US accounts for 90% of all commercial Web sites (Iyer et al. 2002). On the other hand, Africa lacks most of the advanced information and communication technologies (Nevin 2002). However, many developing countries are trying to take advantage of advanced IT by skip the industrialization phase and trying to go from a primarily agricultural economy directly into a service oriented one by using advanced IT (Bhatnagar 1999).

This article complements a prior article by the authors (Ferran et al. 2004) by discussing e-business as a type or dimension of information that we call pragmatic information. Based on it, we show how the use of IT/IS on business has the same advantages and disadvantages than its use on any other type of pragmatic information. This effect of IT/IS on pragmatic information is true for both developed and underdeveloped countries. However, we will illustrate how the lack of (or deficient) complementary infrastructures (like that of a broad set of Laws that properly regulate the activities, a fair and accessible judicial system to enforce them, a comprehensive transportation infrastructure for moving the matter exchanged,

and other traditional services) preclude underdeveloped countries from benefiting from IT/IS in the same way as developed countries do.

METHODOLOGY

The study of IS/IT in less developed countries is constrained by various forms of peculiar cultural, social, and political practices. While the technology used is the same, its use in real life is intermixed with those practices and sometimes the boundaries between technology, phenomenon, and context are not clear. Added to this confounding is the lack of trustworthy statistical information; a deficiency that is structurally linked to less developed countries based on factors inherent to that lack of development.

Factors that hinder quantitative analysis in less developed countries

By definition less developed countries do not count with the same infrastructure and superstructure that are present in developed countries. Some of these hinder any quantitative analysis that we may want to do to compare developed and less developed countries. However, the problem is not only for analysts but also for management. Proper management requires those same numbers to make key management decision. Some of those factors are:

Lack of Benchmarks

The first factor is a complete lack of benchmarks. Organizations in less developed countries argue that they cannot be compared with similar organizations located in developed countries. Some of their arguments are valid; mainly those based on the lack of benchmarks for activities in their environment. This is compounded by the fact that many of the economic indexes of their environment are conflictive and many times untrustworthy. However, many of the arguments are nothing else than excuses to explain notorious deficiencies.

The lack of benchmarks allows the organization to claim achievements that cannot be compared to that of other organizations; triumphs which in some cases are not such but, since they cannot be compared, they cannot be disputed either. However, those triumphs are not only claimed at the organizational level. Mid-level managers also make those claims to top level management who cannot compare or argue that the results presented were mediocre instead of outstanding. Thus, neither stockholders nor top-level managers who are not familiar with IT implementations can critically evaluate the quality, efficiency, or effectiveness of the implementation.

Low Management Accountability

The second factor is the low management accountability typical of less developed countries and of family owned organizations. Accountability would at a minimum assure that the established standards (however low they may be) would have to be satisfied. Underdeveloped countries have very little public participation in most companies. Very few companies are listed in the stock exchanges. Therefore, most companies are free from public or government control. Very few companies undergo a third party audit of their financial statements. In fact, most of the few companies that go through the trouble of auditing their statements still keep the statements and audits private. Not even the local offices of multinational companies have to publish their sales or projection figures, much less their profit margins. The few indexes and figures attributed to those companies are nothing more than gossip, speculations, or assumptions made by specialized media trying to make sense of the economic environment. And no matter how professional those publications try to be, it has to be taken into consideration that most of the advertisement they publish comes from the same companies that they are trying to evaluate.

Triple concealment

The third factor is a triple concealment of the deficiency. It is triple because it involves the technology user (company acquiring the technology), the technology supplier, and the auditing (or consulting) firm. They all tend to conceal any deficiencies in an IT/IS implementation. The technology user hides the deficiencies because it does not want to associate its image (towards stockholders or the public in general) with a deficiency in IT/IS right in the middle of a very sensitive topic as modernization. The technology supplier does not want to point out any deficiencies with the same technology that is trying to keep on selling nor to add increase its list of dissatisfied customers. Finally the auditing firm while it has the duty of reporting the deficiencies it is also very common (in less developed countries) that they already had a stake in the project since most of them are initially recommended by the auditing firm. It is only in the rare cases that the auditing firm had no involvement in the selection and implementation of the technology that they report deficiencies. However, in most cases they end-up involved in the "repair" of those deficiencies and thus loose their independence.

Triple concealment is not exclusive of developing countries (ex. Enron and Parmalat); however, they are far more frequent in less developed countries. Furthermore, given the lack of benchmarks and the low management accountability it becomes very difficult if not impossible to discover the triple concealment.

The case method

Culture, customs, and society have to be taken into account for an IT implementation to succeed in Latin America (Montealegre 1998, 1999, 2001). The lack of quantitative data and the need for in-depth interpretive and critical research makes the case method the ideal methodology to approach this enquire (Walsham 1993; Yin 1994). The case method requires an in-depth recollection of what occurs in each case. It provides a rich understanding of what occurred and why; however, external validity can always be questioned. Selecting key cases (like selecting key informants in some quantitative methods) is crucial to ensure the external validity.

The cases that follow are only a small selection of many more cases to which we had some level of access¹. Our personal experience of over 25 years in the field tells us that the selection is quite representative of what happens in less developed countries; nonetheless, to increase the external validity of the sample, we showed this selection to a group of 10 expert practitioners in less developed countries and got similar responses.

IT IMPLEMENTATION CASES IN LESS DEVELOPED COUNTRIES

Following is a selection of cases on implementation and use of IT in public and private institutions from Venezuela, Brazil, and Panama. To maintain some level of confidentiality, the names of the companies and institutions described are fictitious; however, everything else -including dates- is authentic.

Case No. 1: DeptoStore

Exposition

This is the case of DeptoStore, a relatively large chain of department stores. In 2000 DeptoStore decided to implement an ERP along with its ambitious expansion plan. The ERP selected -developed by a European software manufacturer with worldwide reputation as one of the top systems- was very expensive. The local representative prepared the initial budget. It was then analyzed and approved by external and independent auditors. However, very early in the implementation phase, the budget was found to be notably underestimated. DeptoStore immediately held the local representative and the auditors responsible for the problem. They in turn argued that it was the DeptoStore's fault since they had not provided the necessary documentation for its proper estimation. Furthermore, they also argued that DeptoStore was not making all of the internal changes that had been originally agreed in the contract.

Implementation was suspended and the case brought to trial. The Court decision took over a year and was ambiguous. The explanation for such ambiguity was that (1) the presentation made by the parties was also ambiguous and in some cases inconsistent, and (2) the Court did not have enough expertise to decide on IT/IS cases.

DeptoStore declared bankruptcy while waiting for the Court's decision. It justified the bankruptcy mainly on the unmanageable administrative chaos caused by the interruption of the implementation and the excessive direct and indirect expenses that the chain incurred for the project. As usual, many versions were given of what really happened. Some said that the software house and the external auditors "swallowed" the customer just with the down payment -which at the end resulted in higher earnings than expected since after the bankruptcy they no longer had to provide the services that had already been paid for-. Others said that DeptoStore -or at least a part of its stockholders- found a perfect pretext on the software manufacturer and the external auditor for blaming a bankruptcy planned long before. At the time of writing this article neither versions had been confirmed. At the end, the Court's decision, instead of helping, made things even more confusing.

¹ It is also important to disclose that we may have had some level of involvement (developing, selling, implementing, or auditing).

Analysis

ERP projects that are initially underestimated from a timing and economic perspective are very common in both developed and underdeveloped countries. Resolution of these cases tends to come through private arbitration and therefore public records of the details are not generally available. Very few of them end up in court. It is therefore very difficult to determine the exact number of disputes; however, most industry publications assert that they are quite high. It is the cases that end up in court that show a big difference in the conditions of developed countries and underdeveloped countries. The generalized low quality of public justice services in underdeveloped countries become an added burden instead of a solution to the problem.

In this case there was an opportunity for a technology implementation that would have been highly beneficial for all the parties involved. However, as an aborted project, none of the parties gained something from the benefits of information technology. Any gain that may have been obtained by the individual parties (no matter how large it was) ended up being obscure and detrimental for other IT/IS projects and in general for business development in the area.

The public relation departments (PR) of all the companies involved exploited the determination of the need for an ERP, the selection of a well-known software manufacturer and external auditors, the creation of a large project, and the initial phases of implementation. They publicized the quality of their organizations. They argued that they were working towards a more up-to-date and technological advanced country.

Case No. 2: FleetCo

Exposition

FleetCo is a transportation company that was facing a serious problem of losing trucks. The trucks were lost in some cases due to driver's negligence but in others due to external causes like road thieves. In many cases it was not easy to distinguish between the two and in most of them, internal complicity of the driver was suspected. In some cases part of the merchandise was lost, in others the whole truck was stolen, but the most critical loss was that of control over the fleet. The itineraries were not followed. Connections with the next leg of the trip (planes, boats, trains, and even other ground transportation companies) were often lost. The clients' expectations were frequently not met. And last but not least, the cost of insurance was increasing to levels that threatened FleetCo's competitiveness.

In 2001 FleetCo decided to contract an electronic tracking system from an US-based company. The system would show live tracking with an ample sort of graphical and statistical reports to authorized users through Internet connections. Each truck would have in a secure place a Global Positioning System (GPS) device that would both send and receive satellite signals. In some cases an additional set of communication devices would also be added to reinforce the communication capacity of the tracking unit. Furthermore, this device could also, among other things, block the truck ignition system at the request from an authorized user of the remote tracking station. This user could also alert local police of any problem.

Following foreign recommendations, FleetCo requested an online interaction subsystem with insurance companies and local police. This subsystem would automatically alert the local police of any type of deviation from the scheduled route which would allow them to immediately take local action to visually locate the truck and initiate pursuit if necessary. It was very expensive and difficult to develop a subsystem that could interact with all the different local polices and several insurance companies. Extensive technical tests were done during the following months. The subsystem was finally approved by the IS departments of local police and insurance companies. The subsystem went into production thanks to the expertise of the foreign company selling the tracking system; however, a few months later the expensive subsystem was deactivated at FleetCo's request. During those months the quantity and gravity of those losses increased notoriously. FleetCo had strong motives to believe that the many "technical difficulties" were not such. FleetCo believed that the cause was instead an increase in the base of internal complicity. Now some corrupt police and insurance company employees were part of the scheme. Higher quality and timely information was not only in the hands of the trucking company but also in the hands of those that eventually became accomplices in crime.

Analysis

It was thought that the extensive technical testing that the subsystem underwent would assure that the probability of "technical difficulties" would be very low; nevertheless, it was never possible to determine if the "technical difficulties" alleged by local police were really technical or not. Many local norms and procedures –unknown by FleetCo and the foreign supplier- did not allow full access to investigators. They encountered lots of "red tape". From a technical perspective very

little was determined regarding the robberies. Very little had the quality of the technology to do with the client's decision to suspend its use (even after having spent so much money and effort to put it in place).

Case No. 3: CountyGov

Exposition

New government always starts by making changes in order to make improvements. In this case the idea was to improve management by using IT/IS. The technology selected was the largest and best known American made ERP. The primary criteria for selecting the system included the quantity and quality of counties and cities around the world –especially in the so called first world countries- that were already using the system successfully. The software developer organized several visits for the county officials to several of those foreign places. During those visits the officials closely observed the system functionality; particularly that of tax collection (a critical aspect in county management). The final decision was primarily based on the tax collection features included in the system.

The implementation process started very well. CountyGov officials and employees alike were very excited. The excitement and high expectations were communicated to tax payers in many different forms; however, problems soon arised. The local representative of the software house used a very debatable clause of the contract to argue that the tax collection module was not included in the packaged purchased. Therefore, if CountyGov wanted to include the tax collection module a considerable increase in the investment was required to cover for additional services, licenses, and other costs. At that point CountyGov officials -for political reasons- could not allow public litigation during a highly publicized modernization process. Nonetheless, the County could not afford to make the additional investment. The solution found was to outsource tax collection. CountyGov selected a local third party that had -at least on paper- the structure, technology, and experience to accomplish the task efficiently and a competitive price. This way, the powerful (and expensive) ERP was left to manage the rest of the tasks –mainly accounting-, all very important but none as critical to a County as tax collection.

Analysis

It is possible that, at the end, CountyGov benefited from the “misunderstanding” with the local representative of the American software house. Both from an operation and economic point of view, the local outsourcer seemed to be a very good option; particularly when compared to the additional investment required by the software giant. In any case, CountyGov officials always acted honestly and very decisively through the entire decision process. However, many decisions were based in “gut feeling” and not science since they did not find benchmarks to compare outsourcing to keeping the process internally. There are some benchmarks in developed countries; however, they have little meaning in less developed countries where uncertainty is not only pervasively found in micro-management but in the whole economy and the political environment in general. Furthermore, there are no norms that require their use, procedures that would help them react accordingly, nor Courts that would help them enforce them; all of which is very common in less developed countries.

However, the purpose of this analysis is not to find out whether CountyGov profited from the “misunderstanding” but to see how much advantage was made from the IT project contracted.

Case No. 4: JudCourt and MultinatCo

Exposition

This is a double case: it includes a Judicial Court (JudCourt) and a local office of a multinational company (MultinatCo). Both were facing critical but similar problems in human resource management (HR). Labor conflicts were common; however, most of them were not meant to accomplish labor related claims but to correct internal processes and make them more agile; processes that by failing to work timely and accurately were affecting the well being and quality of life of the personnel. Many of those conflicts could have been avoided by properly reengineering and computerizing those processes that were complex but quite repetitive. Furthermore, at least in the case of JudCourt, the mismanagement of the human resource negatively affected the quality of the service provided. The public often raised complaints regarding insufficient or delayed attention to their cases. Moreover, some cases were left aside due to the high turnover rate and lack of a proper mechanism to relay the pending work to the new employees.

Both, JudCourt and MultinatCo, clearly understood that they needed IS/IT to solve a large part of their problem. Nonetheless, all government agencies in that developing country as well as all foreign offices of MultinatCo were subject to fixed standards in respect to any IT/IS used. They could not just use any application or obtain services from any local supplier.

In the case of JudCourt, the standards were too high and restrictive for any local supplier. Moreover, some of the standards were so deeply hidden in a separate government office that they did not have access to them and thus did not even know what it was they needed to do. In the case of MultinatCo, products and services had to come from the local representative of an IT multinational already selected by the main office. However, the local representative was quite limited. It merely acted as an import agent and did not provide any additional services or customization. The local representative had no incentive to provide more since they knew their condition of a monopoly and became more of an obstacle than a solution provider.

Both, JudCourt and MultinatCo, opted to fund an alternative information system with surplus of (or at the expense of) other accounts. That was because any use of the appropriate accounts would require the dreaded homologation. This budgetary artifact forced them to eliminate parts of the system that would have been very useful. It also caused multiple delays in the development of the modules that were funded. On top of that, they also had to find funds to develop an information subsystem that would transfer the information from the local application to the homologated applications or at a minimum disguise the output to look like if it came from the homologated applications.

Analysis

System homologation is generally accepted as a good practice. If not imposed the company soon faces countless islands of information. Furthermore, maintenance costs may escalate due to the diversity of applications. On the other hand, when the homologation is not viable but still enforced, many requirements go unfulfilled. Thus islands of information do not appear not because all systems are interconnected but because there are no systems to interconnect. Instead of the feared archipelago we end-up worst, with an ocean with no ground to stand on. Instead of best practices we have malpractice.

Case No. 5: ElectoralGov

Exposition

In a Latin-American country numerous political elections took place between 1999 and 2001. With that in mind, the electoral authority (ElectoralGov) decided to use an automatic voting system. After a not very transparent bidding process, a well know European company was selected. The system worked reasonably well; however, the IT provider was blamed for the losses of the losers and for the governmental delays prior to the election. The name of the European company became a commonly used term to denote corruption in local politics. It was also disqualified by both government and opposition to take care of the following elections.

Analysis

Automatic voting systems are not very complex. They just:

- a) Validate each entry
- b) Add a one to the selected election option each time it receives a valid entry
- c) Transmit data through a highly secured channel
- d) Offer summary reports

The validation required on each credit or debit card transaction –used daily by millions of people to make purchases in stores throughout the world- is far more complex to that required by the voting system (a). Any operation done by the simplest accounting system is more complicated than the addition of one vote to the selected option (b). The electronic fund transfer that occurs 24/7 between millions of personal computers requires the same security and occurs in greater volume than those required in election processes (c). The quantity and complexity of the reports required in the simplest management information system (MIS) is much higher than the one required in an election (d).

Therefore, it would be expected that even with the obstacles present in a developing country, an automatic election system would work quite well. And in fact it did in the case at hand. The bad reputation gained by the system developer had very little to do with the technological performance of the system.

CASE COMMONALITIES

When analyzing all the cases together we find that there are a few common elements in them. These common elements fit nicely into a pre-existing theoretical framework of information theory. The framework is one that looks into the dimensions

of information (e.g. Van der Lubbe 1997; Wersig 1996). We will first describe this theoretical framework and then proceed to show the commonalities using the framework's terminology.

Theoretical Framework: Dimensions of Information

Many authors have developed frameworks to classify information per se. In general there are three concepts, types or dimensions of information. (1) Information as form, format, structure, or syntax. This is called the syntactical dimension of information. (2) Information as a symbol, a representation, a map, a reference, a description, news or data about people, things, or actions. This is called the semantic dimension of information. (3) Information as a signal, stimulus, or activation code to a behavior in an organism or system. This is called the pragmatic dimension of information (e.g. Mosterín 1991; Nauta 1972). Additionally, there is a fourth dimension. There is the matter that supports or holds the information. This is called the material dimension of information.

The Syntactic Dimension of Information

The syntactic dimension of information or syntactic information is the information as form. It is the structure and other characteristics that the receiver perceives from the signal (e.g. Morris 1971). It goes from primary characteristics like duration or tone of the acoustic signal to its length in quantity of individual symbols contained in it, to its grammatical structure. For example, the length of the message "Mary drives a car" or the grammatical structure of "Subject - Predicate". Another example of syntactic information is a blank and unsigned check. The form that makes the check is the syntactic information of a payment order. Other common examples of syntactic information are the silhouette of a cloud, the lines in a drawing, the form of a letter, an abstract figure, and the double spiral of the DNA.

The Semantic Dimension of Information

The semantic dimension of information or semantic information is the information as meaning or representation of signals. It is the information as a signal that is connected (by association or some other mechanism) to a memory or to a group of signals previously stored in the memory of the recipient (e.g. Brier 1995; Carnap et al. 1952; Nauta 1972). In this manner, when the recipient receives the signal, he or she can recall a whole concept to which is linked. For example, the sound "Mary" becomes semantic information when the recipient can link it to a set of signals previously stored in his or her mind that may evoke that image of a given woman, her voice, her behavior, etcetera. Furthermore, if the signal is not simply "Mary" but "Mary drives a car" and the recipient also has memories related to the signals "drive" and "car" then the whole signal may evoke the image of a given woman driving a car (something that he or she may or may not have seen before). And if the evoked image is new, it can now be part of the memories available to the recipient in the future. Semantic information is a dataset that is copied from the knowledgebase or database of the sender to that of the receiver. Another example of semantic information is a complete and signed bank check that has not yet been presented to the bank. This check signifies that the undersigned orders the bank to pay a given sum of money to the beneficiary at any time on or after the date written on the check. Other common examples of semantic information are the name of an object, the map of a country, and the genetic code.

The Pragmatic Dimension of Information

The pragmatic dimension of information or pragmatic information is the information as cause of an effect. It is the signal that activates in the receiver an action, process, or behavior expected by the sender (Repo 1986). For example, the message with the order "Mary: Drive the car." becomes pragmatic information as it directs or induces Mary to drive a car. Another example of pragmatic information is the check that, when presented to the bank, triggers the action in the bank teller to hand over a given amount of money to the individual presenting the check (who is also the beneficiary listed in the check). In general, any form of currency may be considered pragmatic information as every time that money exchanges hand (accompanied maybe by some additional signals of specifications) it induces the recipient to provide a specific service or asset. Other common examples of pragmatic information are the access code to an account through an automated teller machine (ATM) and the set of genes that can start the formation of an individual.

The Material Dimension of Information

The material dimension of information or material support of the information is the matter that shows or holds the form or signal. For example, the ink and paper is the material support for printed letters and the hard drive is the material support for

the information stored in it. It is also the ink and paper of the bills (legal tender) and the plastic that makes-up credit cards. Taken to an extreme, it is any material object since they all show some shape.

All information has a syntactic and material dimension. Some information may not have a semantic or a pragmatic dimension.

Using the dimensions of information to see the commonalities in the cases

Using the theoretically grounded framework of dimension of information, we argue that DeptoStore's project covered the aspects of form –or syntax- and meaning –or semantic relationships- in respect to IT/IS. However, the pragmatic part of that information never came to life. The practical objective was never accomplished. IT/IS was present in the syntactic and semantic phase of FleetCo's project. The IT/IS was properly installed and adapted to FleetCo's requirements. However, the pragmatic phase of the project was not concluded. The subsystem was discarded. CountyGov's project is clearly a case of under utilization of the acquired technology (an entire ERP just to do accounting); a case of low exploitation of the pragmatic dimension, clearly attributable to the general conditions of developing countries.

In the case of the JudCourt, the State imported from developing countries only the syntactic and semantic aspects of the information of such good practice: the format of homologation and the relationship or meaning of such format over its dependencies. However, it did not import the pragmatic aspect; its practical implementation is not working. Some insiders say that the problem is nothing more than an internal fight for power, a fight that occurs in both developed and developing countries. However, while the power struggle may be very common and even more ruthless in developed countries, the organizational paralysis that occurs as a result of the struggle is much higher in less developed countries.

In the case of the MultinatCo, the local branch observes the manuals, norms, and procedures. In other words, the syntactic and semantic aspects of the information related to the best practice. But the pragmatic aspect crashes into a condition that is assumed but that it does not occur: the capacity of the local representative of the supplying multinational company to provide the required products and services. In turn, this local representative imports the technology from its headquarters but in many cases it only brings the material support –CDs, manuals, CBTs- and not the required pragmatic knowledge for its employees.

In the case of ElectoralGov it seems that accomplishing the pragmatic aspect of information technology is the factor of least importance in an implementation that takes place in a developing country. The political and sociological factors (formal aspects) that may be attributable to the system seem to be far more important than its efficiency or lack thereof in automatically processing the votes.

Pragmatic fragility

We find that the syntactic and semantic dimensions of information are accomplished in all the cases presented. On the other hand, most of them are lacking the pragmatic dimension. In the case that some of the pragmatic dimension is accomplished it is largely underestimated because in truth that was not what they expected. Furthermore, we can expect that this underestimation on the part of the stakeholders of the rare pragmatic accomplishment is going to affect it negatively in the midterm. This will probably occur through the lack of maintenance or by stirring the next project towards what the stakeholders involved really value. As a result, the pragmatic *digital divide* is not reduced. Neither a deficient automation of good practices nor a successful automation of malpractices will reduce the breach.

We also observe that the *pragmatic fragility* present in these cases is consistent with the infrastructural deficiencies easily found in less developed countries; deficiencies that other authors point to as the root for many of their problems (Simon 2004). IT/IS is now present not only in rich nations but also in the very poor ones (Dutta et al. 2001). However, the pragmatic aspect of IT/IS requires the prior existence of organizations, systems, and people ready to interact accordingly. A purchase order with a valid credit card number cannot accomplish its objective if the receiver cannot deliver the requested product under the conditions specified (e.g. in a given time frame) or if there are no credible financial institutions capable of transferring the funds issued in payment to the seller's account.

Similarly, a weak, forgiving, or inefficient judicial system does not offer the trust required by individuals or corporations to open themselves to new or innovative technologies. The judicial system needs to provide fair and timely solutions. IT/IS is reducing the time it takes to do many things but if the judicial system is going to operate at a totally different pace, users will not risk using it (for a more comprehensive discussion of this point see for example Cowcher 2001).

Users from places where the public and private industrial and service infrastructure have not reached the information revolution will hardly be able to have access to the pragmatic aspect of IT/IS (e.g. Anonymous 2001a; Anonymous 2001b; Mueller 1999). Users would not have the means, methods, and knowledge to control them.

Underdeveloped countries lack the infrastructure and institutions previously mentioned. They are characterized by a deficient industrial and service infrastructure. Their business practices are deficient when benchmarked with international standards.

In essence, IT/IS in less developed countries is mainly used to establish “conversations” (where text, images, sound and any kind of digital information flow back and forth) but does not make or facilitate decisions that can be translated into actions: cash flow, exchange of merchandise, e-commerce, or replacement of a political/corporate leadership for another. “A lot of talk but very little action” which in our terms means a lot of syntactic and semantic information but very little pragmatic information. This scarce and insecure pragmatic use of IT/IS is what we call *pragmatic fragility*.

CONCLUSIONS

The syntactic aspect of IT/IS comes in the form of contracts, budgets, agreements, RFPs, etcetera and is always present. The semantic aspect (the meaning) is generally present and fairly well managed. However, in less developed countries, the pragmatic aspect is the least accomplished (cases 1-4) and valued (case 5) making it the more fragile. This is due to the lack of a supporting infrastructure (transportation, culture, legal system, etc.) typical of those countries. Thus, pragmatic fragility seems to be characteristic of less developed countries.

LIMITATIONS

Quantitative research is needed to complement this study; however, since the lack of trustworthy statistics is commonplace in developing countries such study will be very hard to accomplish. Nonetheless there is a need for some form of triangulation that would provide confirmation of the conclusions made from the cases in this research (Gable 1994; Kaplan et al. 1998; Lee 1991; Mingers 2001).

REFERENCES

1. Anonymous (2001a) The 'digital divide', *Far Eastern Economic Review*, 164, 14, 6.
2. Anonymous (2001b) OECD and developing countries join Dot.force to tackle digital divide, *Organization for Economic Cooperation and Development. The OECD Observer*, 225, 48.
3. Bhatnagar, P. (1999) Electronic commerce, Trade, and Development, *Development Policy Review*, 17, 3, 281-292.
4. Brier, S. (1995) Cyber-Semiotics: On autopoiesis, code-duality and sign games in bio-semiotics., *Cybernetics & Human Knowing (A Journal of Second Order Cybernetics & Cyber-Semiotics)*, 3, 1.
5. Carnap, R., and Bar-Hillel, Y. An outline of a theory of semantic information, 247, *Massachusetts Institute of Technology, Research Laboratory of Electronics*.
6. Cowcher, R. (2001) E-trust, *The British Journal of Administrative Management*, 28, 22-23.
7. Dutta, A., and Roy, R. (2001) The Mechanics of Internet Diffusion in India: Lessons for Developing Countries, *Twenty-Second International Conference on Information Systems, New Orleans, LA*.
8. Ferran, C., and Salim, R. (2004) The Internet and the Digital Divide, *Asian Information-Science-Life*, 2, 1.
9. Forrester Research Inc. Projection for Global E-Commerce, <http://www.forrester.com>.
10. Gable, G.G. (1994) Integrating case study and survey research methods: An example in information systems, *European Journal of Information Systems*, 3, 2, 112-126.
11. Iyer, L.S., Taube, L., and Raquet, J. (2002) Global E-commerce: Rationale, digital divide, and strategies to bridge the divide, *Journal of Global Information Technology Management*, 5, 1, 43-69.
12. Kaplan, B., and Duchon, D. (1998) Combining Qualitative and Quantitative Methods in Information Systems Research: A Case Study, *MIS Quarterly*, 12, 4, 571-586.
13. Lane, C. (1997) Island of disenchantment, *The New Republic*, 217, 13, 17-22.
14. Lee, A.S. (1991) Integrating Positivist and Interpretive Approaches to Organizational Research, *Organization Science*, 2, 2, 342-365.
15. Mingers, J. (2001) Combining IS research methods: Towards a pluralist methodology, *Information Systems Research*, 12, 3, 240-259.
16. Montealegre, R. (1998) Waves of change in adopting the Internet Lessons from four Latin American countries, *Information Technology & People*, 11, 3, 235.

17. Montealegre, R. (1999) A temporal model of institutional interventions for information technology adoption in less-developed countries, *Journal of Management Information Systems*, 16, 1, 207-240.
18. Montealegre, R. (2001) Four visions of e-commerce in Latin America in the year 2010, *Thunderbird International Business Review*, 43, 6, 717-735.
19. Morris, C. (1971) *Writings on the general theory of signs.*, Mouton, Hague.
20. Mosterín, J. (1991) *Variedades de Información, Ciencia, pensamiento y cultura*, 550, 121-144.
21. Mueller, M. (1999) Emerging Internet infrastructures worldwide, *Association for Computing Machinery. Communications of the ACM*, 42, 6, 28-30.
22. Nauta, D. (1972) *The Meaning of Information*, Moton, The Hague.
23. Nevin, T. (2002) Africa's new challenge: Crossing the digital divide, *African Business*, 277, 24-26.
24. Peha, J.M. (1999) Lessons from Haiti's Internet development, *Association for Computing Machinery. Communications of the ACM*, 42, 6, 67-72.
25. Repo, A.J. (1986) The dual approach to the value of information: An appraisal of use and exchange values, *Information Processing & Management*, 22, 5, 373-384.
26. Simon, S.J. (2004) Critical Success Factors for Electronic Services: Challenges for Developing Countries, *Journal of Global Information Technology Management*, 7, 2, 31-53.
27. Van der Lubbe, J.C.A. (1997) *Information Theory*, Cambridge University Press, Cambridge.
28. Walsham, G. (1993) *Interpreting information systems in organizations*, Wiley, Chichester, West Sussex, England.
29. Wersig, G. (1996) Information theory, in: *International encyclopedia of library and information science*, J. Feather and P. Sturges (eds.), Routledge, London & New York, pp. 220227.
30. Wilson, D. (2001) Somewhere over the rainbow, *Communications International*, 28, 3, 56-60.
31. Yin, R.K. (1994) *Case study research: design and methods*, (2nd ed.), Sage, Thousand Oaks, CA.