



Business and Information Technologies

**Information and Communication Technology in India and its Impact on
Business Sectors – a pilot study**

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The Business and Information Technologies (BIT) Research Project

The Center for Management in the Information Economy (CMIE)

The Anderson School of Management at UCLA

INTRODUCTION

The Internet phenomenon was primarily a matter of a fundamental change in information logistics, with the protocols of the web superimposed on a deregulating and increasingly competitive telecommunications environment. It is expected that all the technological and infrastructure developments will change the structure of firms in terms of organization and work process, will change information chains and inter-organizational relationships, and alter the structure of industrial sectors, to the point that the traditional categories do not apply very well.

The Business and Information Technologies (BIT) Study, was initiated at the Center for Management in the Information Economy (CMIE)¹ at the UCLA Anderson School of Management. The main aim of the BIT project is to study the impact of new information technologies on business and industry structure and practice. The study will follow the changes that occur in firms and industry sectors over an extended time horizon. The first step in the process is to do a base line study that establishes the state of this universe, to provide hard information on what is really happening across the economic landscape because of changes in information technologies.

The research reported in this paper is the first pilot study that was conducted in 2003-04 as part of the global BIT project. Other studies were conducted by SDA Bocconi in Italy, and the UCLA Anderson School. This research project had the primary aim of creating the appropriate survey instrument (questionnaire) and pre-testing it. Of course, the project also gained insight into the present state of the adoption of these technologies in Indian industry.

OBJECTIVES OF THE STUDY

The main objective of the research was to investigate the impact of the internet and the new information technologies on the business organizations.

The study was divided into two phases :

Phase 1: Creating the Instrument

- i. To study the existing set up of the Information Technology in the Industry and design the rough draft of the questionnaire.

Phase 2: Pre-testing the questionnaire

- ii. To assess the questionnaire and test its relevance, reliability and validity (keeping in mind the present Indian Business environment) by conducting a pilot (exploratory) study using the instrument designed.
- iii. To identify the critical problems that can arise for the respondents and the researcher through the course of conducting the final field study.

We summarize some salient features of the research project. The study is primarily *Descriptive* in that it does not test the causality of any phenomenon, though to a certain extent it attempts to seek explanation for some common questions. The primary purpose was to capture the present status of Indian corporate that uses these Technologies.

¹ For more details on the Center of Management in the Information Economy visit <http://www.anderson.ucla.edu/cmie.xml>

The initial phase (Phase 1) of the study consisted of unstructured in-depth interviews. This was used to determine the relevance of the underlying hypotheses and design the questionnaire for the pilot study. In the subsequent pilot survey, the questions were formalized.

The survey has used multiple types of variables and scales depending on the nature of the question. For example, the data pertaining to the use of different software packages were Nominal; the measurement of attitudes of the head of the IT departments of companies on the effectiveness of different systems was on a Likert (Interval) Scale. Except the first four respondents (where it was more of an unstructured interview), all the other respondents were given a questionnaire which was to be self administered and mailed back (or collected personally).

SCOPE AND LIMITATIONS OF THE STUDY

Information systems in organizations are in a continual state of development. Increasingly, the Internet has become a vital tool for conducting businesses and a transition is taking place in the business application of these technologies. For example, more and more firms are making it easier for their personnel to have access to the firm's computing and information resources from remote sites. When the project was started technologies like VoIP had not yet had a large role in business applications, but it is already apparent that they will play a large part in the future.

Our limited sample size (30 companies, out of which 2 companies did not respond and one declined to participate in the study) did not permit the use of many statistical/ econometric/ multivariate analysis techniques that require larger data sets. Moreover the research being more descriptive than explanatory, does not attempt to investigate the causality of any phenomenon.

RESEARCH AND SURVEY METHODOLOGY

The research study entailed two major phases.

I. Pre- field Study

- a. Unstructured in-depth interviews were conducted to create the initial questionnaire (the instrument)
- b. Expert opinions on the questionnaire were collected and further improvements were made to the questionnaire.

II. Field Study

- a. A structured questionnaire was prepared and the survey was conducted by explaining the purpose of the research to the respondents and administering the questionnaire.
- b. A split panel test was also conducted to test certain questions that were felt to be inadequate in their design, to evoke responses from the respondents and to test the effect of changing the structure of these questions.

Most of the questions in the survey are not disguised; but to assess certain non-factual variables disguised questions are used. For example, there are some questions pertaining to the effectiveness of email, internet etc. which measure the attitudes of the respondent and we take these data as the proxy for that of the organization as a whole. The rationale behind this is that the respondents are typically top management personnel in the Information Technology department of the organization and they are in a position to assess the impact of these technologies on their organization. In some cases, to test the relevance of hypotheses and to assess the impact of the questionnaire on the respondent, personal interviews were combined with the completion of the questionnaire.

A small-scale split panel study was done by converting certain questions (rewording or changing the format to see the effect of the questionnaire). The objective of split panel test, done mid-way through the study, was to determine which version of a question or a set of questions was "better".

The split panel test was used to test

1. Alternative wordings of questions
2. The effect of changing the order of a set of questions
3. Alternative response options
4. Determining whether some other response options should be provided

Both the panels received identical treatment. The questionnaire version was changed but the mode of administration etc. remained the same to preserve the integrity of the comparisons. Evaluation of the split panel tests was done along with the analysis of the original questionnaire. The techniques included comparison of response distributions and examination of item non-response data.

Modifications in some questions/ items used in the questions were made to increase the response rate and effectiveness of the questionnaire. Some of the respondents had reservations about some questions in the initial questionnaire, due to the sensitive nature of the topics addressed. This necessitated some changes in the later versions of the questionnaire.

References that were especially useful in preparing the questionnaire and for testing the quantitative reliability were "Essentials of Psychological Testing" by Lee Cronbach and "Questionnaire Design and Attitude Measurement" (by A N Oppenheim).

RESPONDENTS AND DATA COLLECTION

The population addressed by the survey consists of Indian firms or their division(s) having P&L (Profit and Loss) responsibility and autonomy, with most of their management staff in India. Since this study was of an exploratory nature, the sampling method employed was Purposive Sampling (judgmental). Ten industries were chosen with representatives from Service and Manufacturing sectors. Some of these industries, like banking, are advanced in the use of information technology, while many others are not. The Industries and the Companies involved in the survey are given in detail in Appendix I.

The main respondents targeted were the Chiefs or Heads of the Information Technology (Information System) Department; typically the CIO, CTO or the equivalent for division or subunits. However, the heads of the information technology function were not available to be surveyed for all respondents. In these cases the next official in the hierarchy was used as a proxy for the head of the Information Technology Department. Also in many cases, the respondent was recommended by the chief (head of the department), usually due to the higher involvement of the employee with the advanced technology projects of the company.

ANALYSIS OF THE QUESTIONNAIRE

The discrimination ability, validity and reliability of the questionnaire were examined. The instrument created was successful in discriminating between different characteristics of the development of information technology across different organizations. The main differentiators noted are:

1. The maturity of the different industry sectors included, with respect to the use of information technologies. A sample of this analysis is shown in Appendix II, using Multidimensional Scaling Analysis done for the use of the different IT tools employed in the companies responding.

The following were found to be grouped as like technologies:

- i. Videoconferencing, voice mail, mailing list, internet, intranet
- ii. EDI, newsgroup, teleconferencing, chat
- iii. Email
- iv. Extranet

The bases for discrimination were “usage pattern” and “the frequency of use”. Detailed research on this with more observations in the sample might bear out some conclusive patterns in the comprehensive field studies. But the main point to be noted here is that, statistically the questionnaire discriminates between the different organizations in the sample under study.

2. The evolution and the development of different industry sectors with respect to information technologies. Most Indian companies are still in the phase of using information technologies as an operational tool and do not employ IT as a strategic tool. This is indirectly reflected by the respondents not answering questions that are strategic in nature. Also the respondents answers to the question “What does e-Business mean to your company?” were as shown in Figure 1.

E-business - Strategic Versus Tactical Tool

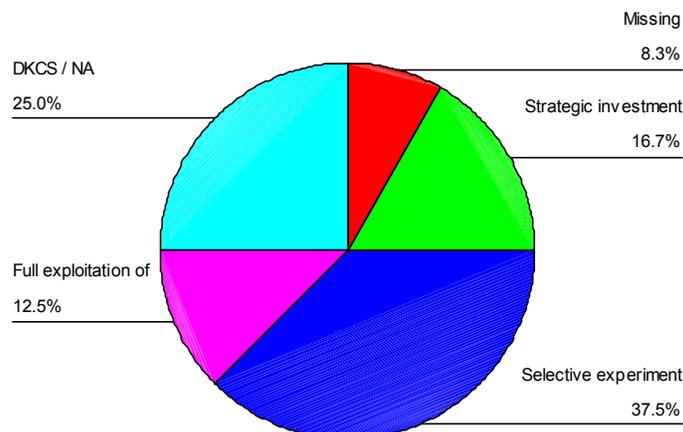


Figure 1 : e-Commerce – Strategic Vs Tactical tool

Most of the questions being factual, there is little concern about the reliability and validity of the questions. For the questions measuring the attitude of the CIO's/CTO's towards technologies that are present in their organizations, reliability tests were performed to ensure that the questions and the scales measured the attitudes effectively.

For example, the correlation between the responses to two questions related to "Age barrier of decision makers" and "Generation gap in using technology" is very high (0.937). One of the two items can be eliminated as they show high correlation and measure nearly the same construct, namely that "the age of the decision makers is affecting (is a barrier in) the implementation of new technologies".

SURVEY RESULTS AND OBSERVATIONS

In the following pages, we summarize the results of the pilot survey. We do not address all the questions and subsections in detail (there are over 124 separate parts to the questionnaire). We have selected a few of the major issue areas and hypotheses for discussion.

Websites and brand/image adaptation on-line

All the companies had websites bearing their brand name and were mainly using the site for maintaining contacts with customers and other stakeholders. The main reasons cited for going online were to reach out and target well-informed consumers, to exploit the relatively favorable cost-benefit characteristics of the Internet as a medium, and to and to present a modern image in the competitive marketplace.

There were no radical changes in the brand characteristics; changes were mostly inconsequential and cosmetic in nature, if any. Firms in the banking industry, however, did change their brand features, logo or other characteristics on their sites.

:Shifts in allocation of promotion and advertising expenditure across channels

Some of the highest spenders on advertising on the Internet media are service sector companies such as banks, insurance, and courier/transportation firms. The major spenders in the manufacturing sector are the FMCG² companies and the pharmaceutical companies. Among the key sectors:

Banking: Firms in this sector appear to spend the most the internet advertising; close to 10% of the overall budget for advertising in a year.

Pharmaceuticals: An average of 5 % of the annual budget is allocated to the internet medium.

Courier: An average of 3 % of the annual budget is allocated to internet media.

² Fast moving consumer goods

Though the FMCG companies preferred not to answer this question, their advertising budget can be assumed to be relatively high for the internet medium, with many of the major portals and websites running advertisements for these consumer goods companies.

Hotel industries do not advertise on portals, but most of the respondents claimed that they get indirect advertising without spending explicitly on advertisements, as many of the travel and hotel reservation portals refer their names and contain links to the hotel home pages.

Some industries like the pharmaceuticals were using media like email more extensively to communicate with their customers about new initiatives pertaining to their fields of specialization or to inform them about new publication and products. In case of pharmaceuticals the main mode of communication between the company and doctors was email.

The main advantages cited by most of the respondents for adopting digital media for advertising were:

- Relative cost-effectiveness of the channel
- Easy targeting of the segments using this medium
- Timeliness of messages
- Potential for interactivity and response

The main reasons that the respondents cited for internet advertising to be less important than conventional advertising media were:

- In most cases, the target consumers are not internet users or they are not often on-line
- It was difficult to gauge the impact of internet advertising
- The lack of the penetration of the internet in India

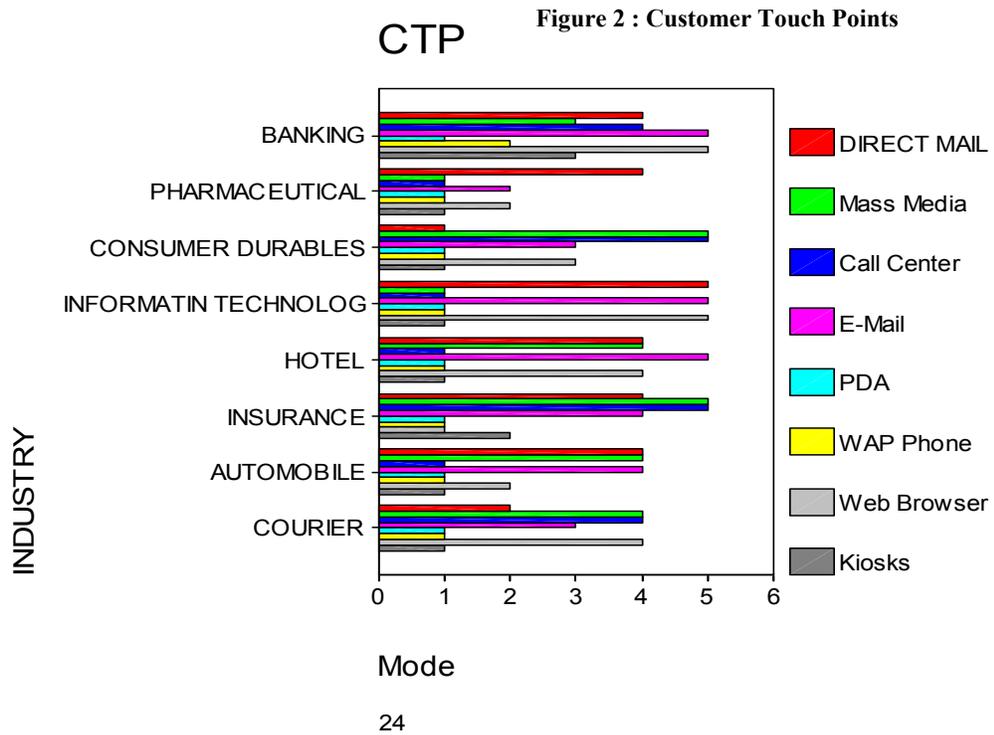
Also internet advertising was thought to be more appropriate for ongoing campaigns, because it was seen as a channel for additional information. Banners and electronic magazines were the main type of advertising used intensively by companies.

In the split panel test, the question pertaining to the “shift in allocation to the online media” was framed as a Likert scaled question. The response to this form was better than asking the percentage of advertising budget directly. This may be because most of the respondents did not know the exact allocation of budgets for the internet medium and it was a cumbersome task for the respondent to search for the data within the organization for individual brands.

Customer touch points, Multiple touch points, Frequency of touch

Usage of the internet technologies has definitely increased the number of customer touch points and the frequency of contact. This is clearly visible through high usage rates of internet based technologies like email, web-browsers etc. However,

conventional media have not been sidelined.



The response rate on these questions was not high. Many of the companies were not monitoring touch points. They were also typically not monitoring web sites to study the behavior pattern of customers, but only for any security breaches or for counting the number of hits on their pages.

Increased investments in backroom for customer data base integration; use of data mining tools for customer analysis

Since databases are an essential part of the CRM implementation, the organizations that have implemented the CRM packages tend to be the ones who have invested heavily in these technologies and thus have their databases integrated to a large extent. And this segment typically consists of banks and hotels in our sample. Other industries do not feel the need to integrate their customer databases as the process is a costly one and difficult to implement. Some organizations like the SBI³ have been facing the problem of database integration due to the geographic spread of branches, and the poor infrastructure available in many locations. Other industries with some degree of data base integration are the courier and insurance industries.

Retailing and Sales On-line

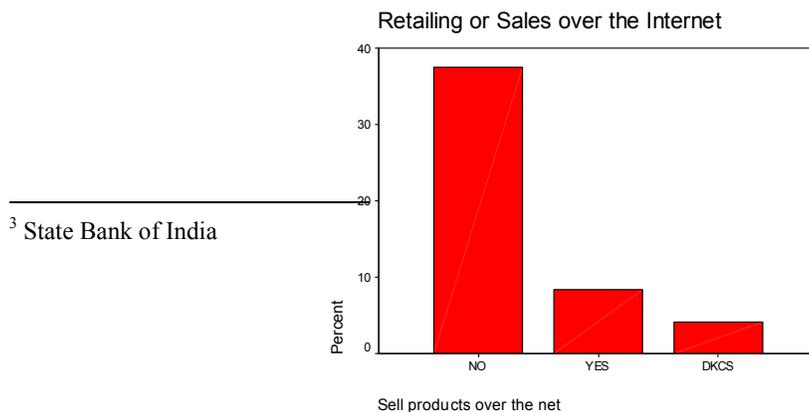


Figure 3 : Retailing over the internet

The use of internet as a business transaction medium is still very low. There are many reasons for this and the major one quoted by many organizations was the poor penetration of the internet in India, and consumers attitudes toward using the internet as a medium of transaction.

Response rates on the question “What is the average number of times you communicate with your customers or vice versa?” was very low. The reason is apparently that data pertaining to customer contact are not either available easily or that contacts are not monitored.

CRM Implementation: the use of software packages, call centers, help desks, on-line support

Out of the 27 companies studied, only 5 had implemented CRM solutions, and only a few major modules were implemented. Many firms (like M&M) who had implemented ERP solutions are extending now to CRM modules.

The main hindrances in the implementation of CRM solutions in India appear to be

- Cost factors: Complete third part CRM solutions (all modules) can be afforded only by very few companies
- Call center technology (used by many of the companies implementing CRM) is heavily dependent upon the penetration of telecommunications which is very low in India
- Lack of available databases of customers which form a crucial part of CRM solutions

Implementation in most companies is in a phased manner (if a standard package like Siebel or Talisma is implemented); or companies have chosen to build in-house customer management solutions.

Technology Use: Email

Email has become a vital tool and almost all the respondents stated that their organization used email extensively.

Technology Use: Bulletin Boards

The response to the question on use of bulletin boards and discussion tools, was moderate. The usage levels for respondents were quite high however.

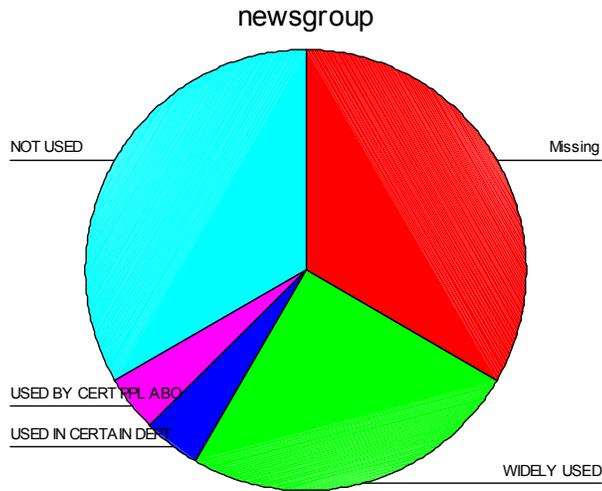


Figure 4 : Utilization of Newsgroups and Bulletin Boards

Restrictions on Internet Access and Use

The main types of restrictions covered in this question were:

- Access to the Net only above a certain Cadre/Level
- Access to Internet for specific departments only
- Access to the internet to employees only with special permissions or requirements.

Among these, there were multiple responses and the most common one was the special permission requirement.

RESTRICT

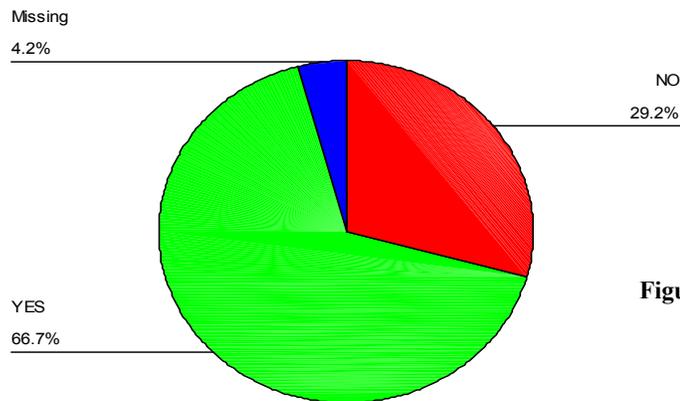


Figure 5 : Restriction of internet Access

Estimating what percentage of the executives on an average use Internet was found to be very difficult by the organizations and the response rate was very low. Most of the respondents marked “not monitored” as their response or attempted an estimate.

The preliminary findings suggest that most of the companies use the internet as a medium of information disbursement. They are yet to mature into the stage of conducting business transactions over the internet or to full fledged e-commerce.

Internal management: Use of ASP models

None of the participants of the survey appeared to use ASP models. The main reasons cited were the lack of bandwidth and the lack of the required software within the company.

Productivity Increases

The respondents regarded on-line technologies as very effective in improving productivity. Figure 6 gives a summary of the responses on a scale of 1 to 5, where 5 represents strong agreement with respect to productivity increases.

INTERNET - EFFECTIVE

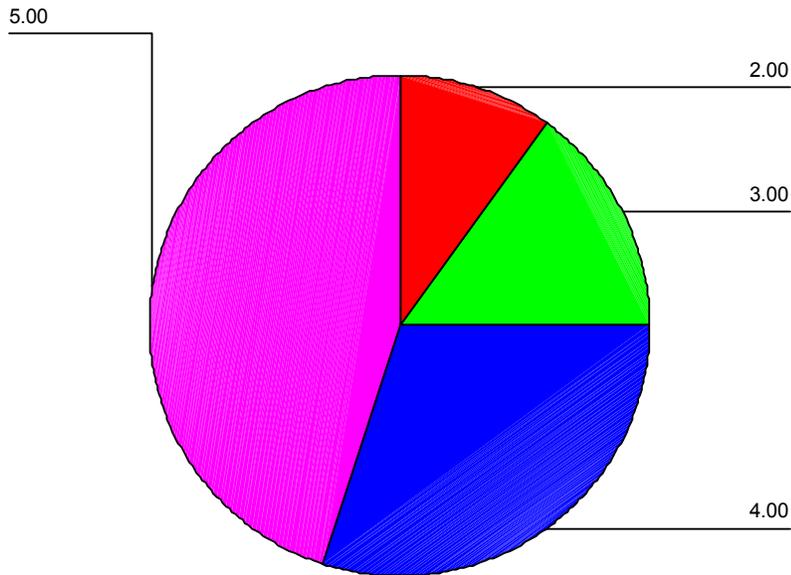


Figure 6 : Effectiveness of the internet

Outsourcing

The extent of outsourcing is increasing with “staff functions”. But since the companies in the sample are from a broad range of industries, this trend is not universal. Banks, hotels and others outsourced much of their IT requirements.

Technology: Supply-side Packaged Solutions

The overall response for this section was the lowest and was not suitable for any statistical or quantitative analysis. “The questions are not very relevant” was the common underlying message from the executives who filled out the questionnaire.

Implementation of SCM software was done only by a few cash rich companies. The implementation of i2 Technologies SCM solution by Asian Paints is one such example. Also e-procurement and online purchasing (e-sourcing) is being done by very few companies in India. Only a few companies like Telco and M&M have pursued such initiatives.

The lack of a real market is the main reason cited by these companies for not going the e-procurement route. Also cited are the reasons that most of the companies are satisfied with the present vendors and suppliers, who are domestic firms and the traditional telephone and fax channels are found to be the best way to communicate with them. Many of the suppliers are not very large volume players and they do not invest in modern information technologies as yet.

One initiative found in the FMCG industry of late is the use of ECR (Efficient Customer Response) systems. The companies that have joined efforts in this project are the FMCG giants – HLL (Hindustan Levers Limited), Procter and Gamble, Nestlé, Colgate Palmolive, Johnson and Johnson, ITC, Godrej Consumer Product Limited, Karnataka Soaps - and major retail chains like Margin Free, FoodWorld and Subiksha. The technology enabler seen here includes the enterprise wide systems deployed in these companies and collaborative systems to be implemented among these companies to monitor SKU flow. Bar codes and scanners are to be deployed in a massive scale and EDI (Electronic Data Interchange) system are to be strengthened. Inter organizational interaction between the different participants has also increased as the result of sharing data pertaining to inventory and stock outs.

Digital hubs are not relevant in the Indian context and the use of e-market places is limited to a couple of industries like steel and automotive parts (examples of these include <http://autopartsasia.com/> and <http://www.steelchange.com>).

The use of EDI was found to be restricted to the FMCG companies only, in the sample studied. Only two companies affirmed using XML (one in automotive and another in the banking sector).

SUMMARY

As a general observation, the main use of internet technologies in most organizations was in utilizing the reach of the internet to improve contacts with the customers and other stakeholders. Many respondent companies had elaborate plans to implement tools for establishing and maintaining their relations with their stakeholders and improve the performance of the organization. The facilities and the information available through the website were also oriented towards this. However, there were limits to the use on-line technologies in executing B2C transactions, primarily because of the low penetration rates of the Internet in the Indian population.

Other important applications were in the internal processes of the companies wherein the tools of modern information technologies were used quite extensively.

The use of supply side solutions is still very low in Indian companies, even among the largest and most sophisticated firms. Much of this can be attributed to the very fragmented nature of the supplier base and of the limited capabilities of second and third tier suppliers.

It is ironic that the implementation of advanced technologies for firms in many of the developed countries is done by Indian software companies, yet when it comes to the utilization of these technologies and the consumption of these technologies, Indian business houses and firms lag behind. Of course, the main reason for this as noted above, is the meager penetration of on-line technologies in both the consumer and industrial populations. We fully expect that as this survey is repeated, it will reveal the significant changes that occur due to economic progress within the country.

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<http://www.statsoft.com/textbook/stathome.html> for statistics and Multivariate Analysis Research Techniques

<http://trochim.human.cornell.edu/index.html> for Research Methodologies

<http://www.ucalgary.ca/~newsted/> for research hints and links/ references to doing research on MIS (Management Information System) Survey Instruments

<http://edf5481-01.fa01.fsu.edu/Guide3.html> on the reliability, validity and other tests

<http://www.wip-j.net/survey2000.html> World Internet Project - Japan.

<http://www.nasscom.org/> NASSCOM's official site.

<http://asia.internet.com/> gives data pertaining to the trends in the technology

<http://www.worldinternetproject.net/> the official site of the World Internet Project

<http://ecommerce.vanderbilt.edu/courses.html> e-commerce research at e-labs, Vanderbilt University

<http://www.ebrc.psu.edu/informs/e-businesscenter.html> gives a list of e-business and centers of management of e-business at various universities.

Appendix I

List of Organizations (and the Personnel) surveyed through the course of the Research Project

	Industry	Name of the Organization
1	Banking	State Bank of India
		UTI Bank
		IDBI Bank
2	Pharmaceuticals	Wockhardt Ltd.
		Nicholas Piramal (I) Ltd.
		Pfizer Ltd.
3	Consumer Durables / Home Appliances	Philips Ltd.
		Onida (MIRC Ltd.)
		Godrej Appliances Ltd
4	IT - Hardware /Software/Services	Zenith Computers Ltd.
		Global TeleSystem Ltd.
5	Courier	Elbee Ltd.
		DHL
		Blue Dart
6	FMCG	Godrej Constrn. Prods. Ltd
		Johnson and Johnson Ltd.
		Colgate Palmolive Ltd.
7	Hotel	Maratha Sheraton
		Holiday Inn
		Le Royal Meredien
8	Insurance	General Insurance Corp.
		Tata AIG
		New India Assurance Corp
9	Automobile	Fiat Ltd
		Mahindra&Mahindra Ltd.
10	Retail	Shoppers Stop
		Pantaloon Ltd.

Appendix II

Results of MDS (Multi dimensional Scaling) Analysis for Different Tools/ Technologies used in the organizations

Stimulus Number	Stimulus Name	Stimulus Coordinates	
		1	2
1	EMAIL	.5423	-.2137
2	INTERNET	.4878	-.0294
3	MLG_LST	.3838	-.0349
4	CHAT	.4350	.0709
5	OLN_TELE	.3800	.0700
6	VOICE	.3857	-.0558
7	NEWSGP	.3785	.0825
8	INTRANET	.3802	-.0551
9	EXTRANET	-4.6771	-.0027
10	EDI	.5384	.1314
11	TELECONF	.3816	.0595
12	VDEOCONF	.3839	-.0227

Derived Stimulus Configuration

Euclidean distance model

