INVESTMENT OPPORTUNTIES IN INFORMATION TECHNOLOGY

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Abstract*: The huge investments in IT infrastructure in various business sectors are indicative for a positive shift in the attitude & belief towards the potential benefits of IT based application and services. This paper work has selected a blend of descriptive, exploratory and investigatory approaches to identify the nature and trend of investments in IT infrastructure across the business sectors. A lot of studies and research were conducted from different perspectives to explore the dependencies of organisational performance over investments in IT infrastructure. The findings however are mixed and in some cases inconclusive also. This comprehensive suggested model could also be used to analyze the impacts of the IT based application and services in Indian business system from different perspectives.*

INTRODUCTION

Information technology has provided tools for effectively managing the information requirements of the organization and it is being widely deployed throughout industry, education, government, and other institutions. The huge investments in IT infrastructure in various business sectors are indicative for a positive shift in the attitude & belief towards the potential benefits of IT based application and services. These shifts are based on perceived usefulness of the IT based applications and services for improving the efficiency and effectiveness of the business processes; however while evaluating the achieved benefits, the managers are still undecided. They are still having the question "are we receiving that kind of return from the investment in IT infrastructure that we should be?" In various studies across the business sectors it was found that there are substantial numbers of organizations which are having significant gaps between the perceived usefulness and actual usefulness of IT based applications and services which they are getting with years. Due to this there is growing concern in assessing Returns on Investments (ROI) in IT infrastructure; however, there is little agreement about best

practices or specific methods for assessing ROI for investments in IT infrastructure. A review of various publications and consultants' white papers presented a variety of possible approaches.

Research Methodology

This research paper is to explore the investments and application patterns of IT based application and services in Indian business system. Within this context it is intended investigate the impacts of various factors at organizational and individual levels that are considered as instrumental in ensuring optimum and quality uses of IT infrastructure. This paper work has selected a blend of descriptive, exploratory and investigatory approaches to identify the nature and trend of investments in IT infrastructure across the business sectors.

The primary data were collected from respondents by classifying them into three levels at planning, management and end users. The sample selections were judgment based and intended to cover all functional aspects of the organizational processes. The business sectors were classified into Manufacturing, BFSI and Others business sectors according to the nature of core business processes. Total 232 valid responses were compiled from 25 IT user organizations.

The purpose of this paper is to get insight into the rate of investments and technology preferences for different business sectors. It is also intended to provide a comparative analysis of preferences for technology across the countries as well as in industry verticals. The components of IT investments were studied by using cross sectional approach to identify the relative weightage trends for each item in the Total cost of ownership of IT in an organization.

Review of Literature

It is remarked that "as the investments in information technology are growing more complex in nature, not all investments are equal, and some may actually depress organizational productivity" *(Austin, 2006)*. With the time various approaches are used to

develop the mechanisms for assessing the business value of IT. It is also suggested that firms do not appropriate all of the value they generate from IT. Hence there is still a requirement for suitable model for understanding the need of IT based application and services for businesses so that the expectation of payoff could be fulfilled.

At national level the studies are conducted to relate the investments in IT with economic performance of a nation. In this case the contribution of IT is analysed in term of economic indicators of a country. For years, there has been considerable argument about whether the IT revolution was paying off in higher productivity. Studies in the 1980s found no connection between IT investment and productivity, a situation referred to as the productivity paradox. Various research from all over the developed world have evidence of a strong positive perfect correlation between IT and economic performance. From the above various studies it find that "investments in IT for industrial developed countries resulted in the IT-induced changes in workforce composition in favor of highly skilled or educated human resources and organizational changes that allow firms to implement IT more effectively" *(Rouben & Donald, 2005*) . It is also suggested that to maximize social returns to IT investment, policymakers in developing countries must address two key deficiencies i.e a lack of knowledge of "best practices" in IT usage and IT-related skill deficiencies in the workforce.

While analyzing the impacts of investments in IT in financial sectors it is found that both cost and profit frontier shifts are strongly correlated with IT capital accumulation. In healthcare sector the data analysis provides evidence for the technology usage–performance link after controlling for various external factors.

From literature review it could be concluded that relating the investments in information technology infrastructure to organizational performance has been a major issue of debate in academic and business areas. A lot of studies and research were conducted from different perspectives to explore the dependencies of organisational performance over investments in IT infrastructure. The findings however are mixed and in some cases inconclusive also.

Data collection and tabulation methods

In this research paper secondary as well as primary data were used. Secondary data were collected from the published reports, cases, survey as well as from the interview excerpts of executives. Primary data were collected trough the method of survey by administering the questionnaire for different levels of users. The mode of interaction was personal and informal. During informal discussion the part of relevant question(s) for the respondents were asked and filled. Before administrating the questionnaire an insight into the extent of uses of IT in the business processes were taken from respondents. After collection, the data were compiled and cross tabulated for interpretation and analysis. Suitable descriptive statistics were selected for the uses during analysis and interpretation.

Findings and analysis

Investment Trends & Technology Preferences

Data for the investments in information technology across the world were collected from different sources as a part of secondary research. The data were compiled and studied on various investigative questions as described in the research methodology.

The secondary data shows that the Global economic problems are impacting IT budgets, however, the IT industry will not see the dramatic reductions that were seen during the dot.com bust. According to the latest research Gartner says "*In a worst case scenario, IT spending increase of 2.3 percent in 2018, down from our earlier projection of 5.8 percent,"* It is further analysed that "*Developed countries , especially the United States and Western Europe countries will be the worst affected, but emerging regions will not be immune. Europe will experience negative growth in 2018, the United States and Japan will be flat."* This survey is further validated by the findings of IDC on worldwide spending on information technology (IT) is expected to slow significantly next year because of the financial crisis, according to a report published on Wednesday. The Framingham, Massachusetts-based company said IT spending in the United States is expected to grow by just 0.9 percent in 2018, much lower than the 4.2 percent growth forecast in August. It said IT spending growth in Japan and Western Europe was also expected to hover around one percent in 2018. At domestic level it is

concluded that the India's domestic IT and ITeS market is expected to cross the Rs. 2,00,000 Crore mark in 2012 compared to Rs. 90,014 Crore recorded in 2017. This translates into a CAGR of 18.4% in the five year period. Both together with IT and ITeS exports revenue of Rs. 3,20,278 Crore, the total IT and ITeS industry size will grow up to Rs. 5,29,976 Crore by the end of the year2012, with a CAGR of 16.5% .

Regarding the growth The Indian IT and ITeS industry grew to Rs. 2,46,609 Crore in CY (Calendar Year) 2017, up from Rs. 2,01,413 Crore in 2016, representing a growth of 22.4%. Of the total industry size of Rs. 2,46,609 Crore, the host country IT and ITeS Market contributed Rs. 90,014 Crore, while the remaining Rs. 1,56,594 Crore was contributed from IT and ITeS exports segment. In 2017, IT Services (excluding ITeS) Exports continued to be the biggest segment at Rs. 97,492 Crore. In 2018, IDC expects the IT and ITeS industry to grow at 20%, with the domestic market growing at 22.4% compared to the IT and ITeS export market growth of 18.9%. The overall industry is projected to be Rs. 5,29,976 Crore by end of the year 2012, with the share of domestic IT and ITeS revenues adding to 40% of the total, compared to the current 37%. The IT and ITeS exports market is likely to more than double to Rs. 3,20,278 Crore in 2012 from Rs. 1,56,594 Crore in 2017. In 2018, it (IT and ITeS exports segment) is expected to clock a growth of 20.4% to touch Rs. 1,86,142 Crore

Table: 1
Overall spending towards IT infrastructure

S.No	Year	Sources		
		Network Magazine	Express Computer	IDC & Dataquest
1	2013-2014	2532.1	2667.0	2620.9
2	2014-2015	2983.5	2960.0	2972.3
3	2015-2016	3860.5	3463.0	3469.7
4	2016-2017	5399.0	5473.4	6123.0
5	2017-2018	6031.0	6992.0	7974.0

It is found that significant level of correlation exists in all findings in the trend of investments in IT infrastructure. Although there are the variations in the total amounts of spending from different survey, but that variations may be attributed to the organisations and areas which are covered for survey. The conclusive finding is that the there is an increasing trends towards IT based application and services.

Relative weightage of investment components in IT infrastructure

The respondents were told to rank the following five components from highest to lowest contribution in total investments in IT infrastructure and assign marks 1 to 5 respectively in decreasing order of contributions towards those investments. The total rank values for each item was calculated along with the average for that. The response rate for each items and the sum of total rank values for each item is tabulated in the table 5.7 along with the relative ranking for each item in term of its contribution towards investments in IT infrastructure of the organisations. The respondents were the information system management levels of users only.

Table -2

Ranking for different investment components in the investment for IT infrastructure

(Respondents*: Information system management levels of users*)

Sl	Items	Response rate	Total Rank Value	Average Rank Value	Ranking
1	Investments to upgrade the existing computing hardware & software	100%	66	1.04	1
2	Investments towards network services management	100%	167	2.65	3
3	Investments in the maintenance of IT infrastructure	100%	101	1.60	2
4	Investment towards the training of the users	100%	255	4.04	4
5	Investments in security tools and measures	100%	356	5.65	5

(Respondents*: Information system management levels of users*)

From the above findings it could be concluded that the investments in IT infrastructure is mainly driven by “compelling requirement for upgradation of existing hardware and software”. Next important component in IT infrastructure investment is the “investments towards the maintenance of IT infrastructure of the organisation” followed by “investments towards training of the users”. The least contributed component in total investments in IT infrastructure is the

"investments towards security tools and measures". It show that the status of awareness towards the security needs in Indian business environment low as compared to other components.

Forester research Inc has conducted survey to find the technological components which are influencing the investments in IT infrastructure. It is found that the network management and application management is constituting largest area for investment in IT infrastructure.

Table - 3

Sector wise relative weightage for investment components

Sl	Items	Manufacturing 195	BFSI 255	Others 495	Total Rank Value
1	Investments to upgrade the existing computing hardware & software	**23**	**30**	**13**	**66**
2	Investments towards network services management	67	40	60	**167**
3	Investments in the maintenance of IT infrastructure	20	**30**	51	**101**
4	Investment towards the training of the users	45	100	110	**255**
5	Investments in security tools and measures	40	55	261	**356**

From this finding it could be concluded that in all business sectors the investments in IT infrastructure is dominated by "requirements to upgrade the existing hardware and software's". However in case of manufacturing and BFSI a comparable investment component is for the "maintenance of IT infrastructure" also. However, there exists a significant variation in the least invested components in total spending for IT infrastructure management. These are as follow

- **In manufacturing sector**- Investments towards network services management
- **In BFSI Sector**-Investments towards the training of the users
- **In other sectors** –Investments towards the security tools and measures

Hence, it could be concluded that the investments in IT infrastructure in the business sectors is mainly due to compelling requirements to upgrade the existing hardware and software's. Indirectly it may be attributed to the high rate of innovations in information technology in hardware as well as software's. However, at this stage we could not conclude that the investments in IT infrastructure are not based on the actual business need. For this the priorities

of decision parameters before investments in IT infrastructure at planning levels of users were studied

χ^2 Test is conducted to check the dependencies of investment components on nature of core business processes as defined in term of business sectors. The calculated value of χ^2 is 433.61 which much higher than the table value 22.0 at df =8 and 0.05 level of significance. Hence we can conclude that the investment components depend upon the business sectors.

Relative weightage of decision parameters for investment in IT infrastructure

The data were collected for planning levels of the system users as they are supposed to decide for investments in IT infrastructure of the organization.

Table- 4
Relative weightage for the decision parameters for investment decision in IT infrastructure (Planning levels of users)

Sl	Decision Parameters	Response Rate	Total Rank Values	Priorities of decision parameters
1	Need to manage the increasing business transactions of business processes	100%	100	5
2	Need of communication & Collaboration	100%	99	4
3	Compatibility requirements of trading partners	100%	201	7
4	Vendor support & after sales services	100%	60	3
5	Actual needs to replace the existing system as these are either outdated or not working properly	**100%**	**49**	**1**
6	Availability of the innovative technology (hardware & software) in the market	**100%**	**51**	**2**
7	Availability of trained manpower to use the proposed information system	100%	302	9
8	Considerations of total cost of ownership for the use of new technology	100%	198	6
9	Evaluation of return on investments in new technology(time & benefits)	100%	401	10
10	Cost of replacement of old system to new system(software, services & processes)	100%	299	8

From the above data it is found that the highest priority for decision parameters is given to "actual needs to replace the existing system as these are either outdated or not working properly". It could be interpreted that the investment decision is highly influenced by the need to

update the IT infrastructure. Next weightage is given to the "availability of innovative technologies in the market". These two findings are indicative that the decision for investment in IT infrastructure is highly influenced by innovations in the technologies itself. The low priority for "evaluation of return on investments in new technology (time & benefits)" indicates that, the Indian business environment lacks the evaluation attitude towards the return on investment in IT infrastructure. It may leads to unpredicted consequence in future, if the requirements of IT based applications and services are not based on the actual needs of the business processes.

Reasons for increasing investments in IT infrastructure

Although there are some disagreement on the rate of increase on investments but all survey were conclusive with increasing trends of investments in IT infrastructure. It was worthwhile to understand the reasons for increasing spending on IT infrastructure. Five points were selected for identifying the most influential cause for increasing investments in IT which was analysed by using cross sectional approach.

Table 5

Reasons for increasing investments in IT infrastructure: *Users levels*

A: Absolute value

Reasons for increasing investments in IT infrastructure	Planning	Management	End Users
Increase in the positive Belief towards IT based application	18	3	7
High rate of technological obsolescence	2	34	6
Growing organisational process requirement	3	15	28
Increased Communication requirements	3	9	8
Cannot Say	6	2	88

χ^2 test is conducted to find the dependency of perceived reasons for increased investment in IT infrastructure. The calculated value of χ^2 is 170.90 which much higher than the table value 22.0 at df =8 and 0.05 level of significance. Hence we can conclude that the perception towards reasons for increasing investment vary with levels of the users.

B: Relative Value in %

Reasons for increased investments in IT infrastructure	**Planning** ***Base:32***	**Management** ***Base:63***	**End Users** ***Base: 137***
Increase in the positive Belief towards IT based application	56.25	4.76	5.10
High rate of technological obsolescence	6.25	53.96	4.37
Growing organisational process requirement	9.37	23.80	20.43
Increased Communication requirements	9.37	14.28	5.83
Cannot Say	18.75	3.17	64.23

Table 6

Reasons for increasing investments in IT infrastructure

A: Absolute values

Reasons for increased investments in IT infrastructure	**Manufacturing**	**BFSI**	**Others**
Increase in the positive Belief towards IT based application	5	10	10
High rate of technological obsolescence	8	20	10
Growing organisational process requirement	15	21	18
Increased Communication requirements	7	10	2
Cannot Say	20	16	60

χ^2 test is conducted to find the dependency of perceived reasons for increased investment in IT infrastructure on business sectors. The calculated value of χ^2 is 34.41 which higher than the table value 22.0 at df =8 and 0.05 level of significance. Hence we can interpret that the there are different reasons for increased investments in IT infrastructure across the business sectors. Although as compared to earlier tests this time the difference between calculated and table value is less.

B: Relative values of findings (in %)

Reasons for increased investments in IT infrastructure	**Manufacturing** *Base: 55*	**BFSI** *Base: 77*	**Others** *Base: 100*
Increase in the positive Belief towards IT based application	9.09	12.98	10.00
High rate of technological obsolescence	14.54	36.36	10.00
Growing organisational process requirement	27.27	27.27	18.00
Increased Communication requirements	12.72	12.98	2.00
Cannot Say	36.36	20.77	60.00

The finding reveals that investments in IT infrastructure for manufacturing sector are dominated by growing organisational process requirements for dependency on IT. However there exists a significantly high level of undefined understanding by "can not say" percentage of respondents. It indicates that the respondents are not evaluating the reasons for investment in IT infrastructure. In BFSI sector it is the high rate of technological obsolescence which is dominating the increased investments in IT infrastructure (36.36 %) followed by growing requirements of organisational processes on IT based application.

Business Sector wise analysis

Table – 7

Business sector wise attitude and belief towards the benefits of IT

A. Absolute value

Sl	**Business Sector**	**Planning**				**Management**				**End users**				**Total**
		+	-	*	**T**	+	-	*	**T**	+	-	*	**T**	
1	Manufacturing	1	4	4	**9**	6	5	2	**13**	9	15	09	**33**	**55**
2	BFSI	8	2	1	**11**	14	0	3	**17**	34	10	05	**49**	**77**
3	Others	4	5	3	**12**	23	6	4	**33**	23	18	14	**55**	**100**
	Total	**13**	**11**	**8**	**32**	**43**	**11**	**9**	**63**	**66**	**43**	**28**	**137**	**232**

B. Relative value in %

Sl	**Business**	**Planning**	**Management**	**End users**

	Sector									
		+	-	*	+	-	*	+	-	*
1	Manufacturing	11.1	44.4	44.4	46.1	38.4	15.3	7.2	45.4	27.2
2	BFSI	72.7	18.18	0.9	82.3	0.0	17.6	69.3	20.4	10.2
3	Others	33.3	41.66	25.0	69.6	18.1	12.1	41.8	32.7	25.4

At planning level of users the findings reflects that in BFSI sector there exist high degree of positive attitude and belief towards IT based application and services.

Table – 8
Phase wise involvements of the users

A: Absolute Value

Phases	Planning	Management	End users
Requirement analysis	8	59	28
Technology evaluation & Purchase	10	38	7
Implementation & maintenance	2	60	85
No Involvement	22	3	52

B. Phase wise involvements (Relative Value in %)

Phases	Planning Base: 32	Management Base: 63	End user Base :137
Requirement analysis	25.0	93.65	20.43
Technology evaluation & Purchase	31.35	60.31	5.10
Implementation & maintenance	3.17	95.23	62.04
No Involvement	68.75	4.76	37.95

It is found that the management levels of users are playing dominating role at all three phases in

Sector levels findings and analysis

Table – 9

Perception towards organizational constraints-Sector wise

A: Absolute value

Organisational Constraints	Manufacturing	BFSI	Others
Negative belief towards the potential benefits of IT	10	2	10
Financial Limitations in investments	8	15	20
Quality of IT Services Design	6	10	20
Nature of Business Processes itself	6	6	9
Need's of Customers	1	19	2
Need's of the Trading Partners	7	6	3
Organisational Hierarchy	5	2	5
User's Skills	7	10	12
Users who opted cannot say	5	7	19

B: Relative value in %

Organisational Constraints	Manufacturing Base :55	BFSI Base: 77	Others Base: 137
Negative belief towards the potential benefits of IT	18.18	2.59	7.29
Financial Limitations in investments	14.54	19.48	14.59
Quality of IT Services Design	10.90	12.98	14.59
Nature of Business Processes itself	10.90	7.79	6.56
Need's of Customers	1.81	24.67	1.45
Need's of the Trading Partners	12.72	7.79	2.18
Organisational Hierarchy	9.09	2.59	3.64
User's Skills	12.72	12.98	8.75
Users who opted cannot say	9.09	9.90	13.86

The findings reveal relative level of various organisational factors which could be considered as hindrances in quality implementation and usage of IT infrastructure in different sectors. The manufacturing sector is dominated by negative belief toward IT based application. BFSI sector is dominated by implementing need of customers in IT based application along with significant level for financial limitations. Others sectors dominated equally by quality of It services design as well as need of the customers.

It is significant to note here, that considerations of users skill are given due importance while considering it as organisational constraints in all sectors.

Conclusion

From these discussions it could be concluded that the Indian business environments and business processes are yet to be restructured from all aspects, to harness the potential of information system. Although the projection for investments in IT infrastructure is very high in domestic market, but that projection is not based on the realistic understanding for the nature of the business processes itself. Besides these the Indian business system is still lacking the attitude for the evaluation of the spending over IT infrastructure, i.e. the spending over IT infrastructure not based on assessments of the return from that investment. The findings from secondary reveals decreasing growth rate of IT investments worldwide. This could be attributed for the recession or may be due to "reassessment by the organisations for return from those investments in previous years on IT infrastructure". In a latest survey by McKinsey it is found that the global business world perceives risks from information technology based disruption and the corresponding increase in importance of IT capabilities for improving business performance and outperforming competitors. The survey found that aspirations from IT are substantially unmet and there is a large gulf between their IT organization's current priorities and what IT could contribute *(McKinsey Global Survey Report-2008)*. It is quoted in that survey "while executives view IT as largely effective in the delivery of basic services, companies still are struggling to get IT to go further. Non companies IT's executives cite shortcomings in how their IT organizations support key activities such as working with the business to develop new, technology-enabled capabilities, or targeting areas where IT can create higher value. The IT executives echo these concerns, highlighting the difficulties they face in partnering with business units to deliver activities that will have a high impact"

Suggestions

It is suggested that the planning for IT infrastructure must be based on the assessments of organizational preparedness on all aspects. The selection of suitable technology and its compatibility with the existing business processes should be considered as prime factor for the success of information system in the organization. The customization of business processes should not exceed beyond the human acceptance limits to meet the demands of IT based applications and services. It may leads to generation of high degree of organisational resistances within the organisation.

The introduction of constructs as organisational preparedness may leads to new dimensions of study in information system acceptance research. The traditional notions for the uses of information system within an organisation would be perceived from different perspective which is broader and comprehensive also. This comprehensive suggested model could also be used to analyze the impacts of the IT based application and services in Indian business system from different perspectives.

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