A Framework for Determining IT Effectiveness: An Empirical Approach

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Abstract
An empirical framework has been developed to understand the factors that influence the benefits that an organization attains from the use of information technology (IT). The key elements of this framework include: a) the linkage between IT objectives and the specific IT investments; b) influence of IT investments, market and economic conditions, and organizational IT capabilities on the IT benefits and impact on an organization; c) the influence of the IT benefits and impact, experienced in the past, on the future IT plans of an organization.

The paper discusses the implications of various relationships as demonstrated through statistical analysis by considering qualitative information on the market and economic conditions within which the firms operate. Our work indicates the need to follow a contingency based approach in formulating IT objectives and making investment decisions for IT projects.

1.0. Introduction and Background

Due to awareness of the potential that information technology (IT) holds, in most organizations, investment in IT is increasing rapidly, often growing faster than sales or profits. Large investments are being made in hardware, software, people, and training to develop and maintain various IT based systems. In such a scenario there is a growing need to seek concrete evidence of the contribution IT is making to the organization, and the value being obtained from the extensive investments in IT projects. Such investments are now regarded as capital investments rather than operating expense (Serafeimidis, 1996).

Concern is being felt in many organizations, that IT function is normally not subjected to the same standards of measurement as other functions. Besides, the need to justify the resources allocated to IT is becoming stronger, especially due to the vague relationship between the investments made in IT and the benefits achieved in the absence of coherent performance measures. A number of studies on IT productivity and business value, defined as the contribution of IT to firm performance have appeared (Corn & Sobol, 1983; Turner, 1985; Bender, 1986; Loveman, 1994; Strassman, 1990; Harris and Katz, 1991; Weill, 1992; Brynjolfsson and Hitt, 1993; Lichtenberg, 1993; Markus and Soh, 1993; Brynjolfsson and Hitt, 1994). The results of past studies are inconclusive. Some studies have found little or negative impact of IT on firm’s productivity, while others have identified significant positive impacts. Brynjolfsson (1993) has identified at least four reasons for this controversy, which include measurement problems, possible time lags between IT investments and impacts, redistribution of outputs within an industry and mismanagement.

The large investments in hardware, software, data, personnel, and training which organizations must make to develop and maintain IT based systems and redesign the organizational mechanisms required to support them, dictate the need to assess whether the investments and effort are yielding the desired results. Companies in Pakistan, recognizing the potentials which information technology holds have embraced it to varying degrees. The issue of assessing the contribution of the investments and the efforts employed in implementing IT based systems becomes even more important in a developing country setting where institutional weaknesses exist at the firm level, organizations follow traditional management styles and structures, firms have limited financial resources, the element of resistance to change is quite strong, and the environment is characterized by relatively higher level of macroeconomic instability.

1.1. Background

Various methods have been developed and used to measure the effectiveness of information systems such as IS usage (Raymond, 1990), user information satisfaction (UIS) (Saarinen, 1996), quality of decision making (King and Rodríguez, 1978), cost benefit analysis (Money, Tromp, and Wegner, 1988) and system quality (Franz and Robey 1986). In addition to these, other approaches include value analysis, critical success factors, simulation, and goal
programming (Szewczak, 1994). Many approaches for IT evaluation have also emerged over the years. These approaches include, comparing IT spending ratios with sector averages, IT investment per employee and comparing actual performance versus goals. All these approaches have been criticized on different grounds. The qualitative measures have been criticized on weak theoretical grounds, narrow scope and inadequate definition of key constructs (Saarinen, 1996). On the other hand IT benefits and the processes through which such benefits accrue are often elusive and difficult to quantify and measure (Barua, Kriebel, and Mukhopadhyay, 1995). This poses a major problem in the development and application of quantitative measures.

Some research endeavors have focused on developing a process oriented model of the enterprise to understand the creation of IT impacts, and a scientific approach to measuring the economic consequences of IT investments (Banker and Kauffman, 1988; Banker, Kauffman and Morey, 1990; Banker & Kauffman, 1991). Such studies are in preliminary stages. Attempts have only been made to develop a theoretical framework. There has been hardly any effort to use empirical data to assess the effectiveness of these frameworks.

The above discussion points towards the absence of a reliable framework which organizations may use to evaluate the returns accruing from investments in IT and understand the process through which these investments contribute to the overall performance.

In this paper an attempt has been made to develop a framework to assess benefits obtained from investments in IT and to acquire understanding of the IT utilization process through which IT related objectives shape IT investments, these investments translate into benefits on the basis of which future IT planning is conducted. Going a step further, an attempt has been made to assess the effectiveness of the framework by using empirical data gathered from 39 companies in different sectors (manufacturing and services).

The methodology and framework developed is presented in the next section. Details of field data collected along with the methodology adopted to test the framework is also presented in this section. Analysis of field data along with the key findings are presented followed by conclusions and ideas on future work.

2.0. Methodology and Framework

Although traditional investment analysis and assessment criteria such as return on investment, net present value, or pay back period could be used to evaluate the success of information systems, but because of the unique nature of the information system investments, they seldom suffice (Saarinen, 1996). Special features of IS investments make obtaining adequate measures of costs and benefits difficult. Hence evaluation of success has to be supplemented by subjective judgments and surrogate measures.

Subjective success evaluation has been improved by the use of multi-item measurement scales of which the best known is user information satisfaction (UIS). UIS offers a standard measuring instrument for comparing results across organizations, systems, and measurement points (Baroudi and Orlikowski, 1988; Ives, Olson and Baroudi, 1983). UIS has been criticized for inadequate definition of the constructs, a poor theoretical base, and a narrow scope. (Chismar, Kriebel and Melone 1985, Galetta & Lederer 1989; Iivari, 1987, Melone 1990, Treacy, 1985).

IS investments are in many ways comparable with investments in production equipment, but there are strong elements of organizational development as well. Further, IS investments share many features with R&D investments having corporate-wide, intangible and long lasting effects (Saarinen, 1996). Hence it seems more prudent to analyze the effectiveness of IS in the light of overall management processes. The potential role of IT in organizational design is well established (Galbraith, 1977; Huber, 1984; Miles and Snow, 1986; Davenport and Short, 1990; Gurbaxani and Whang, 1991; Davenport, 1993; Hammer and Champy, 1993). The literature on IT and the overall management process is less developed by comparison (Mooney, Gurbaxani and Kraemer, 1996).

Organizations employ various resources (which include IS investments) in pursuit of their IS related objectives (Saarinen, 1996). Effectiveness in meeting these objectives depends on the organizational infrastructure and support technology. Holsapple and Luo (1996) has compiled an extensive list of effectiveness measures, but there exists a considerable overlap. In management literature effectiveness has also been viewed in terms of achievement of objectives and goals laid out in the beginning as well as the additional benefits attained (Weihrich and Koontz, 1993). Benefits arising from different functions cumulate to depict the overall performance of the company. The overall performance of the company and future aims become the basis on which future planning is conducted. (Weihrich and Koontz, 1993).

The management process does not exist in isolation. The external environment exerts influence on organization’s management processes. Effective managers scan the external environment regularly, although it is true that they may have little or no power to change the external environment, they have no alternative but to react to it. According to Barua, Kriebel and Mukhopadhyay (1996) it is imperative to incorporate exogenous competitive influences to understand the creation of IT impacts.

Theoretically organizations should follow a systematic way of investing in IT. The process starts with setting of objectives to be achieved from IT, followed by development and implementation of IT action plans in terms of investment in hardware, software, people, training and development of new processes and finally results in further development and modification of existing systems. This process includes purchase of hardware, software
development or purchase for specific targeted systems, hiring of related personnel and provision of training to enhance specific capabilities.

Information on IT investments alone does not provide insights on what the organizations are trying to achieve. For a better insight, IT investments should be viewed as a mix of investment in hardware, software, people, training and process redesign (Hassan, 1993). This aspect also gives insights into the implementation process as knowing the investment priorities it becomes easier to understand the targeted functions or processes.

The overall characteristics, processes and capabilities of a business organization have a direct relation with the investments made in IT. Conversely, IT investments shape the organizational systems, processes and capabilities. This process is usually mutually reinforcing but exceptions do exist. Progressive companies usually are more aggressive in strengthening this linkage.

In the organizational context, implementation process is interaction of the IT action plans and specific organizational variables such as culture of the organization, its business focus, the management processes, organizational capabilities, time period since the inception of computer based systems in the organization, and innovativeness of the organization. This interaction yields benefits which mostly have a direct correlation to the objectives initially laid out but there may also be unplanned benefits. The nature of results and the specific areas of improvement, identified through the interaction of organization specific variables and the IT related variables determine what has been achieved, and in the process explain why certain objectives were achieved and others were not. It also gives insight into unplanned benefits. The benefits can be measured in terms of achievement of the initial objectives, impact on the workforce, management, culture and business processes as well as through analyzing the impact of IT on various abilities of the organization, such as cost competitiveness, ability to develop new products, quality consciousness and customer focus.

These IT related benefits add to the overall performance of the company in marketplace. Finally the benefits accruing from IT and overall performance of the company will influence the future IT plans of the organization.

Along with the internal process, the external environment and the industry dynamics also play an important role in shaping the results and impact on the organization as a whole, and these influence the future planning of the company. The external environmental and industry dynamics is reflected by size, growth and structure of the market, government policies, competition, and status of support industries that provide IT related services.

Hence IT utilization process could be summarized in three steps: (i) understanding the management process involved in IT planning, implementation, and control in an organization; (ii) identifying and assessing the linkages between IT and various organizational plans and capabilities; and (iii) assessing the results achieved through IT keeping in view the impact of the environment and industry dynamics.

A process oriented framework to depict the above described IT utilization process has been developed and is presented in Figure 1. This framework links IT with the management processes and capabilities, illustrates its impacts on various functions of the organization and indicates how these impacts shape the future business and IT orientation. Data was collected from 39 companies on various variables relating to IT investment prioritizes it becomes easier to understand the targeted functions or processes.

2.1. Field Data

A questionnaire was developed based on information required for the assessment of the proposed framework. Data was collected between October 1996 and March 1997 from companies with a minimum of four years experience in using computer based systems.

2.2. Type of Questions

In case of close ended questions the respondent was asked to either rate a specific variable on a scale of 1 to 5 (1 least - 5 most) or disclose some specific values or numbers concerning investment or number of employees. In case of values such as investments in IT, natural log was taken. The difference between the highest and lowest value was calculated and divided by 5 to find out the intervals. On the basis of these intervals the values were converted into a scale of 1-5.

For open ended questions the respondents gave diverse responses. By analyzing all the responses, a set of standard responses were developed and each standard response was mapped to a scale of 1-5.

2.3. Analysis

The framework in Figure 1 is useful for understanding the process through which IT investments translate into benefits and form the basis on which future IT planning is conducted. The IT utilization process framework was captured in a simplified model comprising of only four variables -- one variable for each of the four key components:
Figure 1: A Framework for Understanding the IT Utilization Process

1. Specific IT investments: Total IT investment per employee (TITI)
2. Business Organization: IT Orientation (ITO)
3. IT Benefits and Impact: Competence Building (CB)
4. Future Business and IT plans: Future IT Orientation (FITO)

The specific elements that comprise each of the variables (TITI, ITO, CB, FITO) were selected after extensive review of the literature, analysis of our field experiences and consideration of the data that was available from the studied organizations (see Table 1). Pearson’s Correlation Coefficient was calculated between the variables based on the data collected from the companies.

2.4. Propositions

Four propositions have been developed on the basis of the linkages asserted by the framework.

H-1. Higher IT investment (TITI) (composed of investments in hardware, software, people and training) results in greater competence building (CB) in companies, specifically in the areas targeted for implementation of IT based solutions.

H-2. Stronger commitment and better preparation of an organization towards IT, as depicted by high IT orientation (ITO), should result in greater competence building (CB).

H-3. Companies that achieve higher benefits due to IT, shown in terms of greater competence building (CB), formulate more extensive future IT plans (FITO).

H-4. Companies with stronger IT orientation (ITO) have more extensive future investment IT plans (FITO).

3.0 Analysis and Findings

This section presents analysis of the field data and the associated findings.

The propositions developed on the basis of linkages and relationships explained in the framework were analyzed using Pearson’s Correlation Coefficient. For getting further insights the sample was broken down into manufacturing and services sectors. The reasons for conducting the analysis by dividing the companies into manufacturing and services sectors was that business conditions and industry dynamics in the two sectors were quite different. The manufacturing sector in Pakistan has been protected from outside competition for a long time. While the service sector has operated in a more competitive environment. On the other hand, size usually has a direct impact on whether an organization follows a more structured or ad-hoc approach in terms of utilizing IT. Correlation analysis was again conducted on small and large companies separately. The results are presented in Table 2.
3.1 Findings

3.1.1 IT investment per employee and Competence building

"Higher IT investment (composed of investments in hardware, software, people and training) results in greater competence building in companies, specifically in the areas targeted for implementation of IT based solutions."

Overall results show that there is a significant relationship between IT investment and competence building \((r = 0.34 \ p = 0.04)\). This validates the assertion of the framework that higher IT investments will lead to higher IT related benefits. Results on the basis of manufacturing and service sectors showed that the relationship still holds for the manufacturing sector \((r = 0.50 \ p = 0.03)\). But service sector depicted no relationship \((r = 0 \ p = 1)\). Further analysis on the basis of big and small companies revealed relatively stronger relationship between IT investments and competence building for big companies \((r = 0.57 \ p = .01)\). But contrary to the above findings the small companies category showed inverse relationship \((r = -0.24 \ p = 0.30)\).

3.1.2 IT Orientation and Competence building

"Stronger commitment and better preparation of an organization towards IT, as depicted by high IT orientation, should result in greater competence building."

The relationship between IT orientation and competence building was found to be significant on an overall basis \((r = 0.40 \ p = 0.01)\). This relationship was also found to be significant in all other cases (manufacturing \(r =0.51 \ p = .03\), service \(r = 0.37 \ p = .09\), big \(r = 0.60 \ p = .006\), small \(r = 0.47 \ p = .04\)).

Table 1: Indicators for Testing the Linkages in the Framework

<table>
<thead>
<tr>
<th>IT Investment (TITI)</th>
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<td>Total Investment per Employee</td>
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<th>IT Orientation (ITO)</th>
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<tr>
<td>Innovativeness of the Organization</td>
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<td>Specific Function Chosen for Computerization</td>
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<td>Type of System Implemented</td>
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<td>Number and Experience of IT related Personnel</td>
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<th>Competence building (CB)</th>
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<tr>
<td>Cost Competitiveness</td>
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<td>Ability to Develop New Products</td>
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<td>Quality Consciousness</td>
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<td>More Customer Focus</td>
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<td>Impact on:</td>
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<td>Work Force</td>
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<td>Management</td>
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<td>Operations</td>
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<td>Culture</td>
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<td>Objectives Achieved from Introduction of IT</td>
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<th>Future IT Orientation (FITO)</th>
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<td>Budgets for Hardware, Software and Application</td>
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<td>IT related Human Resource Planning</td>
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3.1.3 Competence Building and Future IT Orientation

“Companies which achieve higher benefits due to IT, shown in terms of greater competence building formulate more extensive future IT plans.”

On an overall basis the relationship was almost non-existent (r = -0.01 p = 0.945), contrary to what was explained in the framework. Manufacturing sector showed similar results to the overall findings (manufacturing r = -0.09 p = 0.725). But the service sector did indicate a non significant relationship (Service r = 0.30 p = 0.18). Similar results were found, when analysis was conducted on big companies and small companies (big r = 0.02 p = 0.92, small r = 0.26 p = 0.27).

3.1.4 IT Orientation and Future IT Orientation

“Companies with stronger IT orientation should have extensive Future IT plans in terms of investments and systems development.”

Overall analysis depicted a weak link between IT orientation and future IT orientation (r = 0.14 p = 0.40). Findings of manufacturing sector revealed a slightly inverse relationship (manufacturing r = -0.11 p = 0.66) depicting that although most of the companies had high IT orientation but that did not translate into higher Future IT investments. While in the service there was a relatively stronger linkage (service r = 0.50 p = 0.02). Big and small company analysis showed similar results as in manufacturing and service sector analysis (big r = -0.13 p = 0.61, small r = 0.36 p = 0.12).

3.2 Discussion

Diverse issues surfaced based on the above findings. According to the overall analysis the stronger relationship between ITO and CB compared to TITI and CB indicates the importance of management’s perception about the impact of IT on various functions of the organization. Management usually has a more detailed understanding of the impacts of those IT based systems that are in use for some time. For recent investments in IT, management heavily relies on perceptions to assess the benefits. Companies while implementing IT do not have very clear and exact understanding of the likely impact and benefits. Hence perceptions attain more importance. That is why there is a stronger relationship between IT orientation (ITO) and competence building (CB) than between IT investments (TITI) and competence building (CB). The relationship between ITO and CB existed in all cases confirming that management’s perception plays an important role whether an organization is in manufacturing or services sector, and is big or small.

Our analysis revealed two categories of companies. First category included those companies which attained higher benefits from IT investments evident in the significant correlation of CB with TITI and ITO, but correspondingly did not make extensive future IT plans. The second category included companies that achieved higher benefits with low IT investments because of limited objectives (no or low correlation of CB with TITI). Although higher future IT investments were made but not proportionate to what was achieved from previous IT investments. The main reason was that the companies in the first category, after the completion of initial exposure to IT felt no urgency for additional investments. While in the second category IT was being used as an operational necessity.

These companies achieved concrete benefits from relatively lower IT investments because of limited objectives. These companies had to commit more resources to future IT plans, either because of the management’s commitment to IT or due to competitive pressures.

Findings on the basis of dividing the companies into manufacturing and service sector and big and small companies provided further insight and reinforced our framework.

In manufacturing sector and big companies the relationship between TITI and CB was validated but it was found that the manufacturing sector has reached a threshold level where IT based systems are being used in various functional areas. This lead to a perception that enough has been done. Most of the investment in such a scenario is being made either in maintaining or upgrading existing systems. Lack of vision on the part of the management to visualize further applications of IT also contributed towards low future IT orientation. Even if the vision exists further computerization demands a major shift in strategy that could require rather large IT investments, longer time frame to achieve concrete returns and much higher technical skill. Due to instability in the macro environment, such a strategy carries extreme risk which most of the companies are not currently willing to undertake. So even after achieving enhancement in CB, companies are refraining from investing in development of new systems.

The analysis of service sector and small companies revealed that most companies had limited objectives and with small increases in IT investments were able to achieve significant results. Most small companies operated in an ad-hoc manner and had very narrow and limited growth objectives. They invested in IT due to business compulsions or owner’s fascination with IT, and did not formulate any specific IT related objectives. Although most companies experienced a change in CB, following their previous experience they made proportionately less future IT investments in the hope that similar results will follow.
Table 2: Correlation Analysis for Various Groups of Companies

(A) Overall Correlation Coefficient Diagram (n = 39)

- Total IT Investment (TITI)
  - IT Orientation (ITO) 0.3373 (p=0.036)
  - Future IT Orientation (FITO) 0.3967 (p=0.012)
  - Competency Building (CB) 0.1395 (p=0.397)

(B) Manufacturing (n=19)

- TITI 0.5037 (p=0.033)
  - ITO 0.5147 (p=0.029)
  - FITO -0.1127 (p=0.656)
  - CB 0.0248 (p=0.92)

(C) Big Companies (n=19)

- TITI 0.5748 (p=0.01)
  - ITO 0.6020 (p=0.006)
  - FITO -0.1251 (p=0.61)
  - CB -0.0891 (p=0.725)

(D) Services (n=21)

- TITI 0.00 (p=1)
  - ITO 0.3725 (p=0.096)
  - CB 0.5006 (p=0.021)
  - FITO 0.2997 (p=0.187)

(E) Small Companies (n=20)

- TITI -0.2444 (p=0.299)
  - ITO 0.4655 (p=0.039)
  - CB 0.3621 (p=0.117)
  - FITO 0.2584 (p=0.271)
Such a perception to a certain extent was influenced by one or more of the following factors (i) relative ease in introducing IT; (ii) competitive pressure; (iii) extensive use of IT by competitors, locally as well as world wide, and (iv) owner manager’s initiative. That is why the relationship between CB and FITO was found to be positive but not significant.

Looking at the behavior of firms in various categories, it has been observed that manufacturing sector and large organizations in all categories depict similar behavior. Table 3 provides a summary of the related factors that influence relationships among four variables (TTTI, ITO, CB, and FITO). Table 4 provides summary of the related factors for service sector and small companies that were found to depict similar behavior.

3.3 Key Inferences from Analysis and Discussion

The above findings were used to improve the framework. In most organizations introduction of IT is a sequential process starting from the basic, relatively easier and standardized systems and moving towards more complicated and customized systems which are interorganizational in nature. The business functionality of IT infrastructure and its dimensions can be defined in terms of “reach” and “range” (Keen 91, Keen and Cummins, 94). Reach refers to location that can be connected via the infrastructure, range determines the level of functionality that can be shared automatically and seamlessly across each level of reach.

Hence when companies embark upon introducing IT, it is a spiral progression. Companies start with relatively easier systems with minimal range and reach. Once the benefits of these systems are completely apparent and the company has reached a certain threshold it moves towards complicated systems, progressing on the reach and range dimension. This shift usually requires high investments and high technical skills. Although some companies do undertake an aggressive approach by introducing IT in different functions simultaneously but this depends on their absorptive capacity. This stepwise approach corresponds to the “S-curve” concept. This concept asserts that most new technologies progress on the basis of a large number of continuous incremental changes, basically through the recombination of existing know-how. Empirical studies have shown that the growth pattern of the merit figure in technology follows an S-shape (Sharif, 1993). Thus the technological change process over a considerable period of time represents a series of sequential substitutions. Any new process or technology initially provides less returns but once it is established each incremental additional effort yield high returns. Once the major benefits have been derived the rate of increase again decreases. This results in the S curve shape.

The level and shape of the S curve for information technology systems could be different for different industries and specific companies in an industry. Mainly because of the peculiar nature of the operations, absorptive capacity, industry dynamics, competitive positioning and orientation towards the application of IT. The S curve concept as highlighted in Figure 2 could be used for multiple purposes stresses that companies will require different performance measures at different stages of IT utilization process due to differences in complexity of systems, user expectations and the efforts required to obtain the new benefits from the use of IT. Similarly, response of the management on the benefits of IT will depend on where a specific organization is placed on the S curve. Manager whose organization is at point 2, for example, will be very positive about IT benefits, while for point 4 the perception will be that the more recent IT investments have not yielded good returns, unless the long-term vision and appreciation of future benefits exists which is more likely in a large organization than a small company.

<table>
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<th>Table 3: Summary of Key Factors for Manufacturing Sector and Big Companies</th>
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<tr>
<td><strong>Competence Building</strong></td>
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<td>Structured approach in</td>
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<td>• Enhancing capability</td>
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<td>• Management’s perception</td>
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<tr>
<td><strong>Future IT Orientation</strong></td>
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<tr>
<td>• Higher investment needs</td>
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<td>• Improved Processes</td>
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Companies at the same point in different stages (1, 4 & 6) will also show different results because of the increasing complexity and correspondingly higher expectation attached to the system. Similarly, an organization will have to make relatively much higher investments in IT, enhance the capability of the human resources and upgrade processes for moving from one stage to the other. Such a shift will also require strong commitment from the management, willingness to undertake such a change and visionary approach towards identifying long term benefits and impacts. Hence it is important that IT projects are viewed in the light of both short-term issues and benefits, and long-term potential.

From our analysis it seems more prudent to follow clustering technique for validating the relationships asserted by the framework. Clustering will need be undertaken with reference to the points identified in Figure 2 at the sampling stage of the research. For example, organizations around point 1 in stage 1 could be identified and by using empirical data from these companies, validation of the relationships among variables can be tested. Similar analysis could be conducted by using data from companies at other points in any of the three stages.

Although difficulties arise for finding an effective procedure through which company’s standing on Figure 2 can be identified. The concept of reach and range can be extremely helpful in this regard.

### 4.0. Conclusion

Many approaches have been developed to assess and evaluate the effectiveness of information technology projects in organizations. But there is lack of a reliable framework that organizations could use to understand the process through which IT investments translate into improvement of the overall performance of a company. Even if a framework exists, attempts have only being made on theoretical construction with no endeavor to use empirical data to test the framework.

This paper presents a framework for conceptualizing the benefits arising from introduction of IT in an organization and tests linkages among the variables which constitute the proposed framework by using empirical data.

Overall analysis validated some linkages and provided insights into why some other linkage were not present. It highlights that management’s perception played an important role in validating these relationships. For further insights the total sample was divided in manufacturing and services industry and then into small and big companies. Our analysis has highlighted the similarities between organizations that are operating under similar market conditions. It was observed that some of the expected hypothesis are not valid due to the influence of qualitative factors that our framework did not quantify. Some of these factors are: IT vision, competitive positioning, industry dynamics, focus on use of IT in organizational systems and IT absorptive capacity of organization. Our findings reinforce the view that a contingency based approach to IT project planning is more appropriate for those organizations that operate in uncertain and more dynamic environments.

Our work has helped in constructing a new approach towards understanding the IT utilization process which promises more coherent results. By incorporating the impact of the above stated factors in the framework it is expected that a refined model for IT planning, utilization and effectiveness could be formulated.

### References


Figure 2: Relationship between Investments in IT and Returns


