Empirical Study

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# Innovation Management in Organizational Context: An Empirical Study

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## Abstract

*Companies have already begun to realize the importance of internal operations and the knowledge driven environment within a company. The effectiveness to contribute towards new knowledge useful for the company, that is, innovation by an employee is dependent on his/her perception of the organization. Using data obtained from an Indian software company, this study examines the effect of some important organizational factors on the "innovation" dimension of its employees, that is, the ability to generate and stimulate creativity and innovation. The study supports the fact that the employee's perception of organizational culture has an impact on the employee's performance on the innovation dimension of performance. Therefore, it is the 'feeling' that guides the individual's behaviour. Thus, the perceived congeniality in the working culture duly supported by the supervisor's encouragement and acceptance of an idea and its reinforcement by appropriate recognition and rewards fosters innovation in the organization. The study also discusses its implications for the industry.*

***Keywords :*** flexibility, innovation, organization culture and management

## Introduction

Economic modules and theories have been postulated in the past that have attempted to predict the future of nations and markets. It was in the mid 1980s that a distinct body of work began to emerge that employed the Darwinian approach to address the questions of economic growth. This approach argued that the key to economic success lie in a nation's ability to introduce valuable new goods, to improve the quality of existing goods and to find more efficient ways to manufacture and deliver these goods. At its core the theory emphasized that "novel ideas" are central in driving economic growth. In fact, even in the 1950s, work led by Nobel Laureate, Robert Solow concluded that technological changes accounted for about eighty per cent of the economic growth in America. Sustained economic growth is possible only by accumulative improvements in capital goods. Therefore, any discussion on the economic future of a company or country must hinge on innovation, invention, discovery and technical progress.

The place for innovation in economic growth has been well-established. Innovative economies have experienced sustained growth and have led the economies of the world (Porter and Scott, 2001). Competition has intensified with expanding globalization. Success, therefore, can be achieved not with just innovation but by reaching world-class innovation (Hamel, 2000). Companies that are more innovative than others have a system of values that encourages individual and collective behaviour to creative endeavours (Prather and Gundry, 1995). It is this meta-theory that has led to the identification of appropriate contextual systems that encourage, cultivate and reinforce creative practices. New ideas are often triggered in an environment unique to the individual such as while taking a bath, gardening and so on (Syrett and Lammiman, 2002). Creativity and innovation will only be sporadic occurrences and will not thrive without a supportive environment and culture.

This study examines the individual's performance on innovation dimension in relation to the employee's perception of the organization in an Indian software company. The study explores the organizational cultural aspects that aid, facilitate or inhibit innovative performance in the organizational context. The issues that are covered through this study are the following:

- People who spark off innovative ideas may come from anywhere in the organization and from all types of professional backgrounds, that is, everyone is capable of being creative and innovative.
- Since creativity and innovation have their origin in an

individual, the employee's perception of the organizational culture is important. Certain dimensions of organizational culture if perceived high by the employee will facilitate the employee's innovative behaviour. Therefore, those employees who are rated high on the innovative dimension of performance would have perceived the organization culture differently as compared to those who have been rated low on the innovative dimension of performance.

## Literature Review

### *Introduction to Innovation Management*

Innovation has become the strategy slogan of the nineties, a mantra for growth for most companies. Innovation in products, services and approaches to serving markets can drive revenues and profits to new heights. But doing better than the competition requires companies to emerge out of their comfort zone. Often seen as an isolated event, break through innovation is being viewed more and more as a process than just an event.

*"Breakthrough innovation is being viewed more and more as a process than just an sporadic event."*

McKinsey studied the top ten companies of USA. A close examination revealed that all these companies fostered a culture that stimulated innovation. The factors have been synthesized in the groups of leadership, environment, aspiration and processes. The key components to creating an innovation supportive environment are relentless pursuit of performance, an outward looking focus – breakdown barrier, creating cross functional teams and learning by doing rather than thinking (Exon, GE, 3M). On the other hand, the companies performing low on innovation were structured and organized with a low will to excel, were too small and fragmented, too inward looking, inflexible, under equipped and had less challenging performance targets. (Kito De Boor, 1997).

Firms must have access to technology to be able to develop technology intensive radical innovations. However, simply having access to technology is not sufficient; the technology must be embedded into new products (Cohen and Levinthal, 1989). To encourage the development of technology intensive radical innovations, besides hiring employees who specialize in science, engineering or technology (Archibugi and Mitchie, 1997), the management needs to follow a different set of business and management practices (Veryzer Jr, 1998, O'Connor 1998, Tushman and Anderson 1986). In addition, technology intensive radical innovations are likely to place the business at risk as they result in fundamentally different products than currently available in the market. Because of their newness they require a lengthy period of time before solid adoption occurs, which further adds to business risk (Green et al. 1995, Veryzer Jr. 1998, Lynn et al. 1996).

Researches have tried to answer the critical question - "What can be done to improve innovation?" (Capon et al. 1992, Cooper and Kleinschmidt 1987). Companies need to harness all their resources and energy to the fullest to result in continuous innovation. Existing literature, however, remains ambiguous on how to do so. Several studies have provided partial solutions. Tushman and O'reilly (1997) suggest creating organizations with separate units pursuing transformational change and incremental change in the existing business model. Browne and Eisenhardt (1998) urge to keep the firms on the "edge of chaos" through, improvisation, co-adaptation, regeneration, experimentation and time pacing. However, they have not elucidated the application of these ideas. In order to create innovations and move them into production, you need three kinds of people. First you need "arrow-shooters" who will direct ideas to previously unexplored parts of the forest, for example, the creation of Photoshop at a time where no one dealt with digital imagery. Then you need a couple of "path finders" – fast programmers who can create a minimum working prototype as an existing proof of the new idea. Finally, you need "road builders" – engineering teams who can model usable and marketable products and know how to establish processes for producing them.

### *Innovation and R&D*

Is innovation merely product development or R&D? Drucker (1998) has defined innovation as a "change that creates a new dimension of performance". Booz and Hamilton (1982) have defined innovation as:

- New to the world, new products to the firm;
- Additions to existing product lines, improvements / revisions in existing product lines;
- Cost reduction in existing products; or
- Repositioning of existing products.

The first one can be seen as radical while the later ones are incremental (Dosi 1988, Tushman and Anderson 1986).

Green et al. (1995) found that radical innovation may be categorized as:

- The extent to which an innovation incorporates technology that is embryonic and rapidly developing within the general scientific community;
- The extent to which an innovation incorporates a technology that is new to a firm, but may be well understood by others;
- The extent to which an innovation represents a departure from the firms existing management or business practices;
- The extent to which an innovation requires a sizeable financial risk.

Research has established degrees of innovation ranging from technology-push or radical to market-pull or incremental (Dosi 1988, Green et al.1995, Ettlie et al. 1994). While most innovations are incremental or market-pull, current thinking suggest that firms need to innovate across

a spectrum of innovation types in order to retain a competitive position in ever changing markets (Freeman and Soete, 1997). McKinsey's definition of innovation is all-pervasive. Newness can come from three sources: consumer, producer and channel. Depending upon the amount of newness and wealth generation different clusters of innovation emerge - incremental innovation, these create products and are basic for survival in the market step, change innovation, these create businesses. It can give significant shifts and competitive advantage and transformation innovation, these create industries.

### The Genesis of Innovation

In an organization, innovation begins with someone being smart enough to sense a new need and then to improvise or create new methods, processes and sources to meet that need. However, it will take place only in a fertile environment that enables an innovator to act on breakthrough ideas. Higgin (1996) has expressed innovation in the form of equation:

***Enterprise systems need to incorporate flexibility as two situations are never identical and there is no common solution for all the situations.***

C + OC = I

When creativity (C) occurs within the right organizational culture (OC), innovation (I) results. Drucker (1985) has gone further and postulated that systematic innovation consists of a purposeful and organized search for changes. In the systematic analysis of opportunities, such changes might offer economic and social innovation. Successful innovators look for change. The change provides the opportunity to create something different and new. Systematic innovation requires monitoring seven sources of innovative opportunity:

1. The unexpected – the unexpected success and failure.
2. The incongruity – the balance between reality as it exists and as it ought to be.
3. Innovation based on process need.
4. Changes in the market and the industry structure.

The other three sources relate to the changes outside the enterprise:

5. Demographic changes.
6. Changes in perception, mood and meaning.
7. New knowledge – both scientific and non-scientific.

Researchers have posed a series of questions to analyse the nature of innovation activity. They ask, for example, whether innovation:

- Is radical or incremental (Freeman, 1974)?
- Is continuous or discontinuous, that is, whether it affects existing ways of doing things (Tushman and Anderson, 1986)?
- Has transience in that it affects existing ways of doing things (Abernathy and Clark, 1985)?
- Changes over life cycles (Abernathy and Utterback, 1978)?
- Is modular? In other words, does it occur in components and subsystems without addressing the system of which they are a part, or architectural, attempts systemic improvements without great attention to its components parts (Henderson and Clark, 1990)?
- Results in the emergence of dominant designs (Abernathy and Utterback, 1978)?
- Is sustaining or disruptive (Christensen, 1997)?

Other approaches consider the sources of innovation. These can be simply classified as:

- The science-push approach. This approach assumes that innovation is a linear process, beginning with scientific discovery, passing through invention, engineering and manufacturing activities and ending with the marketing of a new product or process.
- The demand-pull model. In this model, innovations derive from a perceived demand that then influences the direction and rate of technology development (Kamien and Schwartz, 1975). Von Hippel (1988) shows the importance of users of innovations in their development.
- The coupling model reflects the oversimplification of both these models and integrates both science-push and demand-pull. It recognizes that at an industry wide level the importance of science-push and demand-pull may vary during different phases in the innovation process (Rothwell and Zegveld, 1985).

Yet other approach focuses on analyzing the innovation process. Breakthrough innovation is being viewed more and more as a process than just a sporadic event. This includes, for example:

- The "chain-linked model" of Kline and Rosenberg (1986) which shows the complex iterations, feedback loops and inter-relationships between marketing, R&D, manufacturing and distribution in the innovation process.
- The "innovation journey" approach of Van de Ven et al. (1999) that analyses innovation as a non-linear dynamic system, and incorporates managerial and organizational factors and external collaborative activity.
- Innovation management approaches, which focus on organizational integration, organizational practices and skill balances that enable maximum flexibility and responsiveness to deal with unpredictable and turbulent markets (Whiston, 1994). The ways in which technological activities in firms are directed through increasingly coherent and effective technology strategies (Dussuage et al. 1993, Pavitt 1990) and knowledge management that links between tacit and codified knowledge and individual and organizational learning

(Nonaka and Takeuchi 1995, Leonard-Barton 1995).

A fourth approach focuses on innovation systems:

- These include systems of innovation at a national (Nelson 1993, Edquist 1997), regional (de la Mothe and Paquet, 1998), sectoral (Breschi and Malerba, 1997) and technological (Carlsson, 1994) levels.
- Also included are analyses of the network to which firms belong (Freeman 1991, Hobday 1994, Matthews and Cho 2000), and the integration of complex products and systems (Davies and Brady, 2000).

***Internal flexibility in enterprise systems will keep the company in a better position to cope with the rapid changing environment.***

The implications for management of the use of new electronic tool kit for innovation will be to develop complimentary capabilities to combine the tools with managerial resources, organizational structures, and working practices. Companies need to develop awareness of the new opportunities and threats posted by intensification of innovation.

It is unlikely that any company can initiate and maintain an innovation strategy without a dedicated and well-positioned leadership. Leaders also need to check whether there is a systematic innovation philosophy in place. To structure this complex process A T Kearney (Pethick and Ciacchella, 1998) has developed a model. This model creates a context for managing creativity, for maintaining a customer focus, for portfolio management and for executing program and technology management. It helps the enterprise in the ways that it matches the appropriate desk practices to each of the four parts of the model and it treats innovation as an integrated enterprise wide system. Innovation management can be integrated enterprise wide only through explicit strategic direction and leadership, clear focus, adequate resources and effective execution. Innovation according to the Confederation of British Industry has been defined as, "the exploitation of ideas". In that sense, the total dimension of innovation involves getting people and the organization empowered to think differently, to be willing to take risks, change and challenge traditional practices, customs, processes and the way the business is approached and then to act. Innovation is a mindset. Innovation is multi-functional; a sign that the industry is moving from a one-dimensional, stand alone system to subsystems that handle several related functions.

### Towards the Fifth Generation Innovation Process

The earliest (1950s to mid 1960s) definition of innovation in the business context was synonymous to R&D. During this time, science and technology were seen as dominant forces in solving all problems. The corporate sector believed in 'more R&D in' results in 'more successful products out'. During the 1960s and early 1970s, the market became the source of ideas for R&D with a greater emphasis on marketing and gaining a higher market share. The 'market pull' model of innovation was developed. In the 1970s up to mid 1980s, the oil price hike and a peak in inflation led to demand saturation that in turn led the focus to cost control and cost reduction. Innovation was thought of as a complex net of communication paths, both within the organization and outside, inter-linking various functions with the organization functions and linking the organization to the broader scientific and technological community and to the market place. These factors were grouped as project execution factors and corporate level factors. Project execution factors included – good communication, innovation as company wide task, careful planning, efficient and high quality production providing good technical and after sales services to customers, high quality open minded management and so on. Corporate level factors, on the other hand, were top management commitment and a visible support for innovation, long-term strategy and commitment, corporate flexibility, responsiveness to change, top management acceptance of risk, openness to innovation and an entrepreneurial culture. The fourth generation innovation process (early 1980s – early 1990s) made use of IT-based technology and resulted in global strategies, alliances between leading companies, networking and shorter product life cycle. Global competition led firms to adopt "time based strategies". The major feature of innovation was "integration" and "parallel development".

All that has been the strategy for success in the past continues to draw attention of the management. These include strategic networking, speed to market, quality and performance features. Besides these the "fast innovator" is seen increasingly as an important factor determining the company's competitiveness, more specifically in areas where rates of technological change is high and product cycles are short. The ability to control product development speed can be seen as an important core competence. Rothwell (2002) listed the main characteristics of the fifth generation innovative process as having overall organizational and systems integration, flatter and more flexible organizational structures, developed databases, electronically assisted product development and external linkages. Integration, flexibility, networking and parallel information processing are the main characteristic features.

### Innovation, Organization Systems and Flexibility

Enterprise systems need to incorporate flexibility as two situations are never identical and there is no common solution for all the situations. Flexibility is a multifaceted concept with varied connotations (Sushil, 1999). Flexibility is the ability of a system to respond or react to a change with very little time, effort, cost or performance (Upton, 1994). Sushil (2000) defines, "flexibility as the exercise of freewill or the freedom of choice on the continuum to synthesize the dynamic interplay of thesis and anti-thesis in an interactive and innovative manner, capturing the ambiguity in systems and expanding the continuum in the minimum time, cost and effort." Wadhwa and Browne (1989)

relate flexibility with decision points (places to innovatively chose options) and indicate that decision maker can chose suitable options to evolve the system towards performance improvements. Wadhwa and Rao (2000) show that a flexible system can have several types of flexibility and it is the innovative control system that can determine the benefits of flexibility. Vishwanadhan and Narahari (1992) have differentiated flexibility from a flexible system by stating that a flexible system is the one that is able to respond to change, on the other hand flexibility is the ability of a system to respond effectively to change. Wadhwa et al. (2002) argued how flexibility can help in managing innovations in e-business based supply chain structures. Recently, Wadhwa and Rao (2004) used innovation in multiple relationships to identify several types of flexibility for manufacturing supply chains. This work shows flexibility management and innovation management are inter-related activities. Internal flexibility in enterprise systems will keep the company in a better position to cope with the rapidly changing environment demands of openness, responsiveness, transparency, versatility, adaptation and like, without losing controllability, thus, facilitating innovation management.

***A stable culture and a set of values enhance an individual's capability to innovate.***

To be a leader, the company must be different and to become different it must think differently about three things – competitiveness, strategy and organization. The company must adopt a strategy that gives industrial evolution, a stretching aspiration and an intellectual and emotional commitment (Hamel and Prahalad, 1994). Radical and non-linear innovation is the only way to escape the global competition. Though continued improvement in operation and incremental innovation is critical; future growth and improved financial performance of the company is possible with discovery, development, and commercialization of breakthrough innovations (Hamel 2000, Pethick and Ciacchella 1998). This, however, requires adopting an integrative company wide holistic approach. Unconventional methods of seeking the unmet and unarticulated needs of customers, faster prototyping, new ways of financing, and rewarding and compensating employees are the only ways that will give long-term benefits to companies. This is possible if the company is committed to innovation and the whole company is involved in the "idea management system" (Tucker, 2002).

A number of management actions and attitudes may enhance the likelihood of creative side of individual. The environment thus provided will support in developing, motivating and directing the individual creativity in useful ways (Amabile et al., 1996). However, Hamel (2000) discarded the role of the management altogether and put the onus for innovation on the employees. Strategy for innovation involves flexibility in approach at the three levels of the organizational pyramid:

Highest Level: Big bets about the future.

Middle Level: Promising but not proven experiments – new ventures, stand-alone projects.

Lowest Level: Operational incremental innovation and continual improvements.

Innovation requires drastically different management practices. Indian Management (2002) listed the strategic ideas received from various business leaders for fostering innovation in the company. Each idea is from a different business leader and emphasizes flexible mindset in managing employees:

- Define the problem and then solve it – what do we want, what resources, who is in the team, how to motivate them as well as measuring and rewarding success.
- Re-organise frequently; restructuring stimulates the employee to rethink, set high goals and knock down barriers.
- Take risks and learn from failures; make sure that people are not afraid of failures.
- Pay attention to the 'valleys' your competitors have overlooked.
- Employ people with diverse skills and talents; this helps in challenging status quo.
- Encourage spending time on new ideas; give employees space to do their thing and create an environment that is collaborative.
- To see a situation through their eyes.
- Merge patience and passion.
- Fight negativity; have conviction and hire people who are smarter than you.
- Do not do what the customer wants, do something better.
- Test how the marketplace responds.
- Create a structure and climate that eradicates internal competition.
- Align business objectives with ideals.

### Innovation and Corporate Culture

A number of management actions and attitudes may enhance the creative side of an individual. The environment, the culture, thus provided will support in developing, motivating and directing individual creativity in useful ways (Amabile et al., 1996).

### Corporate Culture Defined

Culture denotes a set of 'mental models' implicitly shared by the members of that organization. "A mental model is nothing more than the beliefs about an issue and are synonymous with rules and regulations, habits, managerial processes, assumptions, mindsets, paradigms, conventional wisdom, industrial recipes, customs, institutional memory, and so on." Organization's mental model is manifested in the culture through routines and unwritten rules of behavior. Behavior in every organization is governed by its 'dominant

mental models' (Spender 1990, Barker 1992, Grinyer and McKiernam 1994). McKinsey & Company has expressed it in a very simple but effective expression, "The way we do things around here".

### Importance of Corporate Culture

Change is constant and it is uncomfortable to the individual. But a stable culture and a set of values enhance an individual's capability to innovate. Culture is vital because it provides a sense of permanence, direction and a marketplace identity and helps in finding natural allies. A strong corporate culture would have system of informal rules spelled out in the form of how people are to behave most of the time. It enables employees to feel better about what they do, so they are likely to work harder. When these needs are nurtured in the corporate environment the employee is more likely to innovate to the best of his ability. Though, very strong mental models can sometime hinder innovative thinking and new ideas. In that case, crisis situations can help escape the mental models. Companies discover new ways of doing things only when they are pushed against a wall. Creating a new strategic intent is one of the ways to make people realize that they have to think differently. To hold existing customers and to increase the customers the company must create an innovative climate throughout the company (Humble and Jones, 1989).

***The challenge before managers is to cultivate an organizational culture that supports innovation.***

### Traits of Innovation Conducive Corporate Cultures

What is it that which will determines the kind of culture a company will have and how will that culture get reflected in the day-to-day life of the company?

Every organization has a unique culture – values, beliefs, ethos, stories, heroes, rites and rituals, a cultural network and a way of doing things idiosyncratic to the organization - that influences it's performance. The culture can be influenced and manipulated by the management by altering the management style and changing the vision statement. Top managers in innovative firms act as role models; they shape the culture through the creation of symbols, ideologies, language, beliefs, rituals, and myths (Pettigrew, 1976). Peters and Waterman (1982) propagated the philosophy of 'respect the individual'. This coupled with lack of a rigid chain of command promotes a feeling of kinship and loyalty–a belonging within the organization. Highly successful companies operate on this philosophy.

Deal and Kennedy (1982) postulated that the company founders share a set of values that emphasize the importance of people. They also suggested that companies with strong cultures, in which everyone knows the goal of the corporation and where the employees are working for these goals, perform better than companies with a weak culture in which employee goals are divergent from those of the management.

Some rules are required to achieve company efficiency. Ohmae (1990) states these as sharing a number of central values. "A company's ability to serve customer around the globe in ways that are truly responsive to their needs as well as to the global character of its industry depends on the ability to strike a new organizational balance…." " The challenge can not be met by simply re-drawing the structural charts, no matter how complex they are. Fundamentally, the question is a psychological one, a question of values."

The essence of organization culture of creativity and excellence consists of (Rastogi, 1986, 1988) a high orientation towards work excellence, a feeling of duty towards the attainment of the goals of the organization and cooperation amongst the employees in the performance of their tasks based on mutual trust and regard. If these are not widely shared by the members of the company, the organization will not be able to move towards sustained high performance based on creativity, excellence and innovation achievement.

To create a culture for innovation, the company should encourage teamwork to turn an idea into a product. Employees placed on the job should have appropriate qualifications (Humble and Jones, 1989). Efforts should be made to make them committed and motivated. Apart from the supportive culture, an innovation-oriented company requires distinctive management style and organizational practices that reinforce creativity in an individual. Kao (1989) has summarized the findings in this area and suggested the following actions for execution:

- Create an open decentralized organization structure.
- Support a culture that provides leverage from creative experimentation.
- Encourage experimental attitude.
- Circulate success stories.
- Emphasize the role of the project/ product champions.
- Failure should not be viewed negatively.
- Stress on effective communication.
- Make resources available for new initiatives.
- Ensure that new ideas cannot be easily killed.
- Remove bureaucracy from resource allocation.
- Provide appropriate reward for success.
- Promote culture-supporting risk taking.
- Minimise administrative interference.
- Provide freedom for surveillance over conduct.
- Loosen deadlines.
- Delegate responsibility for innovative new activity.

Business leaders are very important for creating that culture. Employees should be made to feel that they are

contributing to the larger vision and that they are valued. Also they value the technologists who shape innovative ideas beyond the idea stage.

### Managing Organizational Culture

Organizations continually need to examine the values and beliefs in relation to the changing environment. Failure in this respect may trap the company in its past successes. While examining, the focus should be on the strength and speed of current values and beliefs as well as their nature and relevance in the context of changing competitive conditions and scenarios. This will enable the company to design and change in terms of wider requirements of organizational flexibility and competitiveness.

The challenge before managers is to cultivate an organizational culture that supports innovation (Nakata and Sivakumar, 1996). Managing organizational culture effectively requires clarity in the minds of managers about the type of culture and the specific norms and values that will help the organization reach its strategic objectives. How to promote the norms that are supportive and limit those that are not supportive of the strategic objective? Support for taking risks, change and tolerance for mistakes stimulates creativity. On the other hand, culture emphasizing effective teamwork and group functioning, speed and urgency of decisions promotes the implementation of the ideas. An environment of expectation that promotes flexibility and adaptability and a sense that encourages personal autonomy should be cultivated. To encourage autonomy and provide for flexibility, many companies have left the job design open so that an individual can take initiative and responsibility and modify the way work gets done in that company (Tushman and O'Reilly, 1997). On the contrary, it has also been found that those employees with high job satisfaction exhibited the highest creativity when commitment to company was high and when support for creativity was available from the organization and co-workers (Zhou and George, 2001).

On the macro level, cultural properties of people can facilitate or impede innovation (Shane, 1992). The assignment of innovation duties must be based on cultural profiling (Abdullah et al. 2002). Sutton (2002) suggested that innovation required drastically different management practices. Innovation results from diversity of ideas; it can come from anywhere, therefore, it requires increased variance in the pool of solutions being considered which can be enhanced by brain storming and other idea generation tools. He further enumerated techniques to get companies to start innovating:

- Incite discomfort and dissatisfaction – It helps people break free of ingrained and mindless actions.
- Provoke unpleasant situations in others – It is based on the premises that new ideas provoke discomfort.
- Make yourself uncomfortable – Work on ideas that are unfamiliar or making you uncomfortable.
- Smash the cognitive frame – Treat everything as temporary. Things may work today but may not work tomorrow. Therefore, sustaining innovation requires treating everything namely, the team, organizational procedures and product line as temporary. Ignoring experts will let you see things in a different perspective.
- Identify and reject your dearest beliefs – It is useful to forget preconceptions and pursue the absurd and unacceptable. This may lead to great ideas.
- Explode the composition of organization and teams – Technique includes bringing in some slow learners, disbanding and reforming teams.
- It is a feeling and not cognition by which ideas manifest into reality. Therefore, besides practices it is important to know how employees feel about it. Any effort that brings in new ways or helps the company break away from the past will suffice for this result.

Strong cultured organizations have the following characteristic human resource systems:

- Rigorous selection system
- Intensive period of socialization

  Signal that norms and values are important and that the top management emphasises this.

  Clear, consistent measurement systems and models supplying specific attitudes and behaviours desired and rewarded.

  Role models within the organization who share those values.

  Reinforcement and celebration for a living according to these.

  Opportunity for continued socialising through training and development.
- Comprehensive rewards and recognition that provide immediate feedback for compliance or non-compliance with the organizational norms. Besides performance, these highlight the attitude and behaviour consistent with the norms and values, feedback from peers, bosses and top management, feedback for walking the talk and on tolerance for violation of basic values.

## Research Methodology

### Research Setting, Participant and Procedures

The present study is an empirical study of the impact of organizational culture on performance in terms of innovation in an Indian Software Industry. The company places great emphasis on innovation of its products and processes. The company's strategy is built heavily on its ability to develop a culture of innovation and improve the efficiency of the operations. However, the company could not remain immune to the recent crisis faced by the software industry.

### Method of Data Collection

The data was collected from two sources - the employees

and the Human Resource Department of the company. The method chosen was a pre-distributed structured questionnaire requesting basic data about the employee's personal characteristics and their perception of the cultural dimensions. Internal documentary sources, such as company handbooks, manuals and information brochures were referred.

### Measurement and Scales

*Innovation:* On a four-point scale ranging from 'poor', 'adequate', 'above average' and 'exceptional', supervisors had rated the employees on the 'innovation' dimension of performance as part of the performance appraisal system. Innovation was defined in the company as "aiming towards the development of new technical solutions in product/ service and process technology; the commitment to overcome old models and well established practices and develop new paths which take opportunity in the positive aspects of change". A supervisor and a reviewer rated each employee.

*Organizational Culture:* The focus of the study was to find out the organization context of the company. Organizational culture dimensions were chosen from the literature survey. There were initially twenty-three parameters with seventy-five statements. Through the use of the Delphi technique, five experts examined and rated the questions and assigned parameter. A Human Resource professional confirmed the validity of the questionnaire. The statements where the experts were not in agreement were dropped and some were reworded. Finally, seven dimensions and fifty-nine statements were maintained.

The cultural dimensions were - company commitment towards operating philosophy and applying those principles to day-to-day work in the company, relationship with the manager, reward and recognition systems in terms of pay and benefits, treatment of the employees, teamwork, communication and work environment. These dimensions were chosen on the basis of the literature survey on cultural dimensions that facilitate creative and innovative abilities. Response options ranged from '1 – Not at all' to '5 – To a great extent'. The questionnaire consisted of two sections – Part I listed five demographic questions that seek information about the general background of the respondents. Part II contained questions on the organizational dimensions.

### Sample

Respondents in the present study were chosen on the basis of the rating for them on innovation dimension as part of the performance appraisal system. Data was independently collected on evaluation of individual employee's 'innovation' contribution in the company from the Human Resources department of the company. On a separate form, each employee's supervisor had rated the employee's innovative behaviour as part of the performance appraisal format. The company provided information on the rating in the 'innovation' dimension of eighty employees of the company. On the basis of the rating, the group was divided into two categories – high rating in innovation and low rating in innovation. Out of these fifty were in the higher category – rated as three and four and thirty were rated on the lower side – either one or two. The employees carried various designations including Sr. Manager, Project Coordinator and System Analyst. The respondents were from all functional areas in the company, such as Human Resources, Finance and Product Development. The questionnaire was distributed through the company internal mailing system to potential respondents located in one of the offices. They were requested to put the completed questionnaire in a sealed envelope addressed to the researcher. The respondents were not required to give their names and strict confidentiality was guaranteed. The employees filled out a questionnaire that included items on demographics and the dimensions measuring the culture in the company. Of the eighty questionnaires distributed, fifty-five were received back. The response rate was sixty-nine per cent.

### Demographic Data

Who participated in the survey? The respondents in terms of gender, age group, years at the company, work area and education level have been shown in Tables 1 to 5 (percentages may not total hundred because of rounding or no response on certain items).

Table 1: Gender and Percentage

| Sex | No. of Respondents | Percentage (%) |
|---|---|---|
| Female | 25 | 46 |
| Male | 30 | 54 |

Table 2: Age Group and Percentage

| Age Groups (years) | No. of Respondents | Percentage (%) |
|---|---|---|
| Under 25 | 9 | 16 |
| 26 – 30 | 25 | 46 |
| 31 – 35 | 13 | 24 |
| 36 and above | 7 | 13 |

Table 3: Years at the Company and Percentage

| Years at the company | No. of Respondents | Percentage (%) |
|---|---|---|
| Less than 1 year | 13 | 24 |
| 1 – 2 years | 13 | 24 |
| 2 – 4 years | 17 | 31 |
| More than 4 years | 12 | 21 |

Table 4: Work Area and Percentage

| Work Area | No. of Respondents | Percentage (%) |
|---|---|---|
| Administrative Support | 4 | 8 |
| Executive/Officer - Technical | 18 | 33 |
| Manager/Project Manager | 15 | 27 |
| Project Leader/General Manager | 2 | 4 |

Table 5: Education Level and Percentage

| Education Level | No. of Respondents | Percentage (%) |
|---|---|---|
| Professional Degree | 55 | 100 |

### Practices and Processes in the Company

To understand the practices and the processes in terms of employee management, the company's written documents were scanned and the relevant material was noted. The Senior Executive of the company was interviewed and the

approach to handling the employees was gone through.

## Results and Discussions

The present study focused on innovation at the individual employee level instead of focusing on organizational innovation or the implementation of employees' innovative ideas at the organizational level. Although an employee's ability to innovate may not always lead to the successful implementation of innovative ideas at the organizational level, it often provides a starting point for such innovation. The data collected from the survey was subjected to both quantitative and qualitative analysis. Quantitative analysis utilized weighted averages and qualitative analysis included the practices narrated for employee involvement in the company. This study examined organisational culture conditions under which innovation thrives. Innovation was posited to be a consequence of perceived organizational culture that supports the conception of novel ideas and helps accentuate the levels of innovation. The results from this study are evidence of the fact that the perceived organizational culture has an impact on the employee's performance in the organization in terms of innovation.

To examine the relationship between the perceived characteristics of organizational culture and the innovation dimension of the individual, the weighted average of each of the dimensions of culture was calculated separately for the two groups – high in innovation and low in innovation. The weighted average for each of the dimensions of culture is shown in Appendix I.

Weighted average scores show that almost on all organizational culture dimensions the perception of the less innovative rated employees is lower as compared to those who have been rated high on the innovation dimension. There are a few dimensions where the perception is more positive, though marginally, for the less innovative employees. However, one exception may be noted in the fact that in the factor of 'group to function as a team', the less innovative have a considerably higher weighted average than the more innovative group. It may also be noted that all the perceived higher rating factors in the case of the less innovative employees are seen in the 'relationship with the manager' category. The conditions that stifle the ideas are - be suspicious of every idea from below, insist that people who need your approval must go through several levels of approval, express criticism freely and withhold praise, control everything carefully, make decisions to reorganize in secret, not to give information freely and behave with the concept that you are the leader and you know every thing (Hesselbein et al. 2002).

The present stzudy also supports the fact that more than cognition, it is a 'feeling' that guides the behaviour of the individual. It also provides evidence to show that culture is an important aspect in developing encouraging innovative ability amongst the employees. The perceived congeniality in the working environment, supported by the team and manager's encouragement and acceptance of an idea enhances one's mental freedom for taking bold new steps. This leads to idea generation. It is also seen that innovation may not prosper without appropriate recognition and rewards.

To examine the possible moderators of the influence of culture on innovation in the organization, several characteristics of the employees were checked. The data on demographic variables does not show any relationship between gender and creativity. Similarly, the distribution of sample on the age, years with the company and the work area does not show any concentration in one group or the other. Most of the employees in the study had a professional degree; therefore, the impact of education on the innovation dimension could not be studied. Though the employees placed on the job should have appropriate qualifications (Humble and Jones, 1989). These findings go to support the hypothesis that innovation can come at any time and from anywhere irrespective of age, sex, education and the job designation.

Attempts were also made to study the methods and practices adopted by the management to walk the talk. The company organized the physical space in such a manner that all offices were easily housed in the same building enabling easy communication amongst the staff. They also provided a white board in each of the offices allowing thoughts to be written down as and when they occurred. The office space was open and facilitated interaction among the employees. It was observed that employees in the company often collected outside doorways and kitchens, had a chat and then returned to their offices. Realizing that these conversations can have creative value, the company designed spaces outside the kitchen where people can exchange ideas in greater comfort. The company believed that employees do not readily share ideas and knowledge with each other unless they knew each other quite well. They, therefore, had random talk sessions once a week where any employee could pick a topic to talk on. The Human Resources department chose the groups of people in such a meeting arbitrarily. Quiet space was provided in the office premises for reflection and private study. To create a team and a feeling of fellow being amongst the employees, get-togethers were organized on a regular basis. Existence of the employee handbook and newsletter to inform employees of various policies and issues also played an important role. The company organized seminars and workshops and exposed the managers to the latest thinking in business management. This helped provide useful insights on current issues. The company also had the policy of implementation of best practices; quality decisions through peer advice; cross-pollination of ideas; formalization of interdepartmental interaction and the incentive and reward systems linked to this philosophy. Relevant knowledge facilitates performance. It adds significant values through R&D, process design, product design, and other organizational activities. Knowledge management in this way works as engine that supports transformation of ideas into business value. Knowledge gaining and management is essentially a social process. Hence, organizational culture that encourages free and effective communication, facilitates

idea generation and transforming ideas into business value. The organization turns into a learning organization. The management tried to create an environment that is supportive of the expression of innovative ability of the employee. Physical environment, management practices and processes provided support to the employee's perception of the organizational culture.

The recipe for cultivating innovation in an industry, on the basis of the study, can therefore be to create the culture that is perceived by the employees. Examples of the same are - treat employees fairly, insist on integrity, value diversity, communicate openly and honestly, provide honest feedback on performance, encourage risk taking and innovation, work as a team, motivate to do the best and provide career development, reward equitably and so on. Individuals differ in their creative output but given a fertile environment, creativity can be cultivated and nurtured. This assumption has wider implications. If organizations are able to harbour creativity and innovation amongst its employees, it will equip them to sustain global competition and pressure effectively. A free environment not only gives incremental advantages on the product and processes but can also lead to breakthrough advantages. An informal network – upward, lateral and downward – plays an important role in opportunity recognition (O'Connor and Rice, 2001). Stable culture provides employees with a sense of stability and belongingness. Though the organization's action is a function of not only it's environment but also it's strategy and capability. The organization with an offensive innovation strategy is more likely to be the one to try to shape its environment than the one with defensive strategy. Organization's capability also plays significant role in its ability to shape its environment.

***An environment of expectation that promotes flexibility and adaptability and a sense that encourages personal autonomy should be cultivated.***

Besides where organization structure offers good coordination and integration between R&D and marketing, its ability to create new products gets enhanced. The organisation's capability is shaped through its strategy, structure and systems, and the people who make up the organization. If that were so, now the question is, whether the existence of an R&D is essential to innovation. Although R&D is neither a necessary nor a sufficient condition for innovation (Akerblom et al. 1996, Baldwin 1997), it is an important input into the innovation process. Organizations that have established an effective R&D are more likely to innovate as R&D directly creates new products and processes and these are also more receptive to the technological advances made by others.

However, organizations continually need to examine the values and belief in relation to the changing environment. Failure in this respect may trap the company in the past successes. While examining the focus should be on the strength and the speed as well as nature and relevance in the context of changing competitive conditions and scenarios meeting the requirement of organizational flexibility. An environment of expectation that promotes flexibility and adaptability and a sense that encourages personal autonomy need to be cultivated. In order to do this job design was left to the individual employee to be able to take initiative and responsibility and modify the way the work gets done (Tushman and O'reilly, 1997).

### *Implications for the Industry Management to Promote Innovativeness*

Three things are important for innovation to take place:

1. A pressing business problem (in the present case, the software industry crisis)
2. A wide range of formal influences that enable the individual to look at the problem from a different perspective.
3. An environment in which the individual can think about the problem and make the right links.

Assuming that a pressing situation exists, what interventions can organizations make to provide an atmosphere in which its employees feel inspired? Use diversity as a creative source. Therefore, the first step is to recruit workers with a broad range of backgrounds and perspectives. By valuing different beliefs, experiences, backgrounds and ideas, companies will leap ahead in ways totally new and different than their existing products, processes, customers and markets. Give employees the space, flexibility and climate they require to fully exploit their creative potential. The important thing is how the employee feels about climate and not what actually has been provided. The organization must constantly assess the climate and work on ameliorating its cultural dimensions. Increase the opportunity for chance encounters and casual exchanges, particularly across different departments and locations. A research project at the Massachusetts Institute of Technology (MIT) in the late 1980s found that casual talks and interpersonal interaction over a cup of tea or coffee inspired ninety per cent of the ideas that led to product breakthroughs. Thus, having offices located in separate places and having to move between buildings and sites proves to be a hurdle to innovation. This kind of study has given rise to researches in the area of workspace design so that the 'right' people from different disciplines are easily accessible to each other and are provided with the opportunity to mix freely. Encourage managers to organize for creativity. Ideas that seem absurd and abstruse at first may lay the groundwork for innovation. Reduce work-based stress. It inhibits creativity. Communicate, especially during periods of intense change to avert psychological withdrawal and problems. Ensure that the project leaders respect the viewpoint and ideas of all team members. The Internet and e-mail support the creative exchange of ideas amongst the

employees though it can sometimes be viewed negatively if it disrupts 'work' and invades privacy.

## Limitations of the Study

Cultures are vague and abstract concepts. Subjectivity of all sorts may creep into any empirical exercise. In the present study the sample was limited. Therefore, the study of innovation and organizational culture relationship must be generated involving many different sectors so as to develop a stronger view of the innovation–organization culture nexus. These limitations not withstanding, the present study provides some insight into the dynamics of fostering and managing innovations and culture in the organization.

## Conclusions

Evidence indicates that the perceived organizational culture has a strong influence on the behavio r of the employees in terms of creativity and innovation. These cultural perceptions can either facilitate or inhibit the promotion of innovative ideas, processes and practices. The more innovative group of employees perceived the organizational culture more favourably than the less innovative group in terms of valuing diversity, treating employees fairly, communicating openly and honestly, giving honest feedback on performance, having the freedom to express opinions relating to work, support risk taking and finally paying equitably. On the other hand, the less innovative group was more positive on the dimensions of team functioning. Industry can reap the benefit–recognize the problem, support and implement policies that values diversity and provide flexibility and space for the individual's to operate in an environment of allowing free knowledge sharing.

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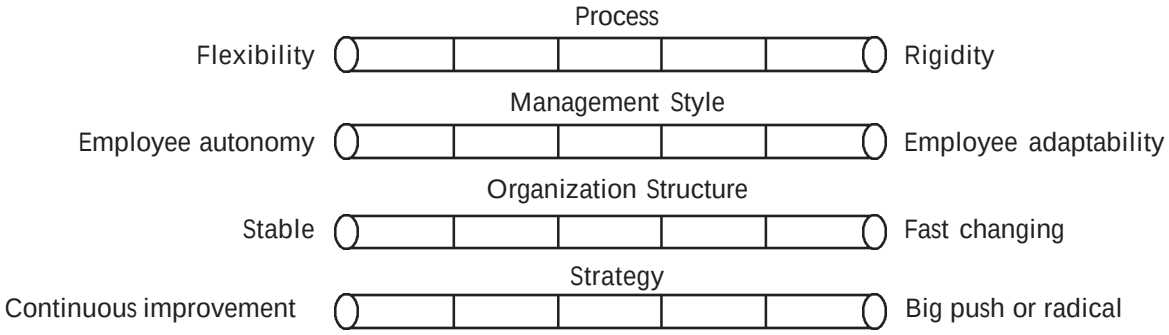
## Appendix I : Culture Dimensions and Employees Perceptions

| Culture Dimensions | N | WeightedAverage | N | Weighted Average |
|---|---|---|---|---|
| | | | | |
| **Operating Principles: Communication** | | **High Innovation** | | **Low Innovation** |
| Commit to excellence* | 40 | 3.40 | 15 | 3.47 |
| Insist on integrity | 40 | 3.20 | 15 | 1.93 |
| Treat people fairly; value diversity | 40 | 3.50 | 15 | 2.60 |
| Communicate openly, honestly | 40 | 3.18 | 15 | 2.47 |
| Listen with an open mind | 40 | 2.98 | 15 | 2.47 |
| Lead by example | 40 | 2.98 | 15 | 2.93 |
| Respect trust and encourage | 40 | 3.30 | 15 | 2.93 |
| Encourage risk taking and innvoation | 40 | 3.43 | 15 | 2.87 |
| Establish purpose before action | 40 | 3.00 | 15 | 2.73 |
| Work as a team | 40 | 3.55 | 15 | 3.00 |
| Have fun | 40 | 3.63 | 15 | 3.00 |
| | | | | |
| **Operating Principles: Practice** | | **High Innovation** | | **Low Innovation** |
| Commit to excellence* | 40 | 3.40 | 15 | 3.47 |
| Insist on integrity | 40 | 3.20 | 15 | 1.93 |
| Treat people fairly; value diversity | 40 | 3.50 | 15 | 2.60 |
| Communicate openly, honestly | 40 | 3.18 | 15 | 2.47 |
| Listen with an open mind | 40 | 2.98 | 15 | 2.47 |
| Lead by example | 40 | 2.98 | 15 | 2.93 |
| Respect trust and encourage | 40 | 3.30 | 15 | 2.93 |
| Encourage risk taking and innvoation | 40 | 3.43 | 15 | 2.87 |
| Establish purpose before action | 40 | 3.00 | 15 | 2.73 |
| Work as a team | 40 | 3.55 | 15 | 3.00 |
| Have fun | 40 | 3.63 | 15 | 3.00 |
| | | | | |
| **Relationship with the Manager** | | **High Innovation** | | **Low Innovation** |
| Communication of performance expectations | 40 | 3.40 | 15 | 2.60 |
| Encourages creativity and innovation | 40 | 3.48 | 15 | 2.67 |
| Use of own judgement and decision | 40 | 2.95 | 15 | 2.33 |
| Listens to my ideas | 40 | 2.65 | 15 | 2.53 |
| Gives meaningful and honest feedback | 40 | 3.48 | 15 | 2.47 |
| Treats all employees fairly | 40 | 3.35 | 15 | 2.60 |
| Taking risks | 40 | 3.23 | 15 | 2.53 |
| Motivating to the best | 40 | 3.60 | 15 | 3.13 |
| Helps resolve conflicts* | 40 | 3.05 | 15 | 3.33 |
| Serves as a role model* | 40 | 3.25 | 15 | 3.60 |
| Group to function as a team*** | 40 | 1.68 | 15 | 3.33 |
| Communicates business goals* | 40 | 3.28 | 15 | 3.53 |
| Ensures time and resources | 40 | 3.35 | 15 | 3.33 |
| | | | | |
| **Pay Benefits and Recognition** | | **High Innovation** | | **Low Innovation** |
| Current pay can attract and retain | 40 | 3.25 | 15 | 2.00 |
| Pay compared to others | 40 | 3.30 | 15 | 1.93 |
| Job perforamnce determines the pay | 40 | 2.90 | 15 | 2.20 |
| Compensation motivates | 40 | 2.63 | 15 | 2.33 |
| | | | | |
| **Fair Treatment** | | **High Innovation** | | **Low Innovation** |
| Policies administered fairly | 40 | 3.95 | 15 | 3.00 |
| Committed to career development | 40 | 3.45 | 15 | 3.20 |
| Respect and obligation to the company | 40 | 3.28 | 15 | 3.00 |
| | | | | |
| **Team Work** | | **High Innovation** | | **Low Innovation** |
| Sense of team work | 40 | 3.55 | 15 | 3.27 |
| Team with other groups | 40 | 3.80 | 15 | 3.07 |
| Inititative to resolve conflicts | 40 | 3.25 | 15 | 3.07 |
| | | | | |
| **Communication** | | **High Innovation** | | **Low Innovation** |
| Receive information needed | 40 | 3.68 | 15 | 3.00 |
| Express work opinions | 40 | 3.48 | 15 | 2.53 |
| Managers willing to listen | 40 | 3.23 | 15 | 2.80 |
| Inform about business priorities | 40 | 2.93 | 15 | 2.53 |
| Inform company's policies and practices | 40 | 2.93 | 15 | 2.93 |
| Inform organizational changes | 40 | 3.25 | 15 | 3.00 |
| Inform standards of ethical behavior | 40 | 2.88 | 15 | 2.87 |
| | | | | |
| **Work Environment** | | **High Innovation** | | **Low Innovation** |
| Training and development opportunities | 40 | 3.48 | 15 | 3.07 |
| Physical work environment pleasant | 40 | 4.00 | 15 | 3.53 |
| Taking risk can improve performance* | 40 | 2.68 | 15 | 3.20 |
| Taking risk can damage your career | 40 | 2.68 | 15 | 2.47 |
| Will be rewarded and recognised | 40 | 3.65 | 15 | 2.40 |
| Focused on quality work | 40 | 3.75 | 15 | 3.33 |
| Encourages new ways and new products | 40 | 3.53 | 15 | 3.27 |

Note: High average score for low innovativeness in comparison with high innovativeness have been marked with (*) in the table.

## Flexibility Mapping : Practitioner's Perspective

1. What types of flexibilities you see in the practical situation of "Innovation" on the following points:
   - Flexibility in terms of "options"
   - Flexibility in terms of "change mechanisms"
   - Flexibility in terms of "freedom of choice" to participating actors.
2. Identify and describe the types of flexibilities that are relevant for your own organizational context? On which dimensions, flexibility should be enhanced?
3. Try to map your own organization on following continua
   (Please tick mark in the appropriate box(es))




4. Develop a SAP-LAP (Situation Actor Process-Learning Action Performance) model of "Innovation" relevant to your organization

## Reflecting Applicability in Real Life

1. How to imbibe the management style that supports "flexibility" in people management as well as emphasizes the "discipline" in processes adherence?
2. How to create an organization culture that supports "idea generation" which gets facilitated by flexibility on the other hand get "idea execution" that is carried out effectively by strict process adherence and disciplined approach?

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Empirical Study

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# Development of Flexible Strategies by Indian SMEs in Electronics Sector in Emerging Economy

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## Abstract

*In this paper, an attempt is made to study nature of pressures and constraints under emerging dynamic market condition and need for flexibility in developing strategies by Indian small and medium enterprise (SMEs) in the electronics sector for improving their performance at the national and international level. Such strategies may be needed for making new investments, development of competencies, reduction of product cost and improvement of quality.*

*For the collection of data, a questionnaire-based survey was conducted. About 44 valid responses were received. Statistical analysis of data acquired from survey is done by reliability test, t test and correlation analysis. It is observed that government support, customer support and poor financial condition are the major constraints whereas quality, cost and delivery time are main pressures for SMEs in the electronics sector. Although SMEs are flexible in developing their strategies but in view of the pressure and constraint findings, it is felt that they should develop their strategies carefully for utilizing their limited resources and improving flexibility in value chain to get supports from customers and suppliers.*

**Keywords :** flexibility, globalization, performance, SMEs, strategy development

## Introduction

Recent developments of the World Trade Organization and other mutual trade agreements among different countries have created a highly complex, turbulent and uncertain market environment. To survive in such a hyper competitive market, all organizations need to develop flexibility in their organization structure, operations and strategy development. Flexibility is defined as ability of organization to meet an increasing variety of customer expectations while keeping costs, delays, organizations disruptions and performance losses at or near zero (Zhang et al., 2002). Although small and medium enterprises (SMEs) are supposed to have flat, flexible structure, innovative potential, informal and dynamic strategies even then SMEs are facing more impact of this changing scenario for their survival and growth. SMEs represent the largest proportion of the manufacturing sector in every country. In India, 95 per cent of the industrial units are in small-scale sector with 40 per cent value addition in the manufacturing sector and 6.29 per cent contribution to the Indian Gross Domestic Product (Times of India, 2002). In India, industries having investment in plant and machinery less than rupees ten million are called small-scale industries (SSI). There is no formal definition for medium scale industries but according to some studies, industries having investment between rupees (Rs) ten million and one thousand million in plant and machinery are termed as medium scale industries (MSI) (Karandikar, 1999).

In the present era of automation, electronics has become integral part of all manufacturing industries. SMEs in the electronics sector are mainly the component manufacturers for various industries such as automobile, machinery, electronics and telecommunication. Components are the building blocks to the electronics industry. For a viable electronics hardware manufacturing activity, the availability of components is a basic requirement. Production of components itself involves two stages - first the design and development and the second the specialized machinery or production equipment. Unfortunately, the production base

of electronics components in India has remained poor and weak due to various factors, including the wrong policies pursued by the government, which discouraged investments in this sector and encouraged imports of end products rather than their manufacture within the country, either in kit form or in semi knocked down form or even in fully assembled shape.

With the growing demand of electronics in the country, which is expected to increase manifold in the coming years, a healthy manufacturing base for hardware electronics needs to be established within the country. The demand for hardware electronics in India during 2002-03 was worth Rs 718 billion (16.32 billion US$) against the supply of only Rs 336 billion (7.74 billion US$). By 2009-10, the demand for hardware electronics in India will be worth Rs 4194 billion (95.32 billion US$) as against supply worth Rs 1000 billion (22.73 billion US$). Thus, there will be a gap of about Rs 3194 billion (72.59 billion US$) in the demand and supply (Times of India, 2005). The huge gap between the demand and supply presents a challenge as well as enormous business opportunity for the Indian electronics Industry.

Many auto components and electronic systems fitted in modern automobiles are provided by electronics sector. Therefore, the Indian automobile industry also provides an enormous business opportunity to the electronics industry. Last couple of years have witnessed a rapid growth in the Indian automobile industry, which is now on fast track. Passenger vehicle sales in the country registered a growth of 32 per cent and touched 1.3 million figure in 2003-04 driving the country into the elite club of nations with over 1 million annual passenger vehicle sales. In addition to various opportunities, Indian SMEs in this sector are facing many challenges due to opening of market for multinationals. Main challenges are fast changing product features, shortening innovation cycles, continuous cost reduction and effective networking. These challenges have forced SMEs management to reassess its ability to change what it does and how it does.

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This paper has tried to analyze different issues of strategy development by SMEs in a globally competitive environment. It has different sections on the need for developing flexible strategies, research propositions and methodology, results and discussions, comparison of SMEs with large organizations and concluding remarks.

## Need for Developing Flexible Strategy

Dangayach and Deshmukh (2000) have observed that Indian manufacturing companies have quite often followed an opportunistic approach and paid very little strategic attention to their shop floors in the last few decades. This approach has resulted in poor quality of products, little awareness about their competitiveness, little integration of various functions such as marketing, sales, production and so on. After economic reforms, Indian SMEs are facing competition from imports and from multinational companies in the domestic market in addition to many uncertainties such as customer uncertainty, supplier uncertainty, technological uncertainty, product uncertainty and competition uncertainty. These uncertainties after the economic reforms, have led to drastic changes in the approach of SMEs in the electronics sector for formulating their strategies and priorities for investments. It also has implications on developing competencies.

In such an uncertain and competitive environment, business success depends on the formulation and implementation of viable strategies (Pun et al., 2000). Strategy formulation is concerned with the definition of company mission and objectives, the assessment of internal and external environments and the determination of strategic choices. Linking of strategy formulation to implementation is major challenge for manufacturing sector in present scenario for getting good results. The strategy should match the organization's resources to the changing environment and in particular its markets and customers in the pursuit of its goals and objectives (Porter, 1998). Halemane and Janszen (2004) have described various effects of operations flexibility on resource based strategy and operational performance.

It is generally believed that SMEs are reluctant for changes due to fear of failure and other constraints but due to uncertain nature of market scenario, SMEs will need flexible strategies. Saleh and Wang (1993) have observed that organizational flexibility should be encouraged and enhanced by adopting entrepreneurial strategies, group based working, proactive approach, commitment and encouragement of risk taking. Sushil (2000) has recommended use of systemic/managerial flexibility, which is characterized by three key aspects: options, change and freedom of choice. Designing for flexibility in either or all of these components requires examination of options on different dimensions in a multi-dimensional reality. For example, Japanese firms from electronics industry use certain degree of flexibility in selection of suppliers, particularly when technology is fast changing and some new technology is under development. According to Verganti (1999), flexibility has to be incorporated in advance through strategic framework to exploit future opportunities. Dangayach and Deshmukh (2001) have observed the need for manufacturing flexibility in all size of organizations, that is, small, medium and large. However, their study shows that large companies invest more in infrastructure flexibility than SMEs. Garg et al. (2003) have also observed that in present

environment of fierce competition, organizations feel that flexibility is vital to achieve competitive edge.

In such a dynamic environment, organizations that are able to continually build new strategic assets faster, cheaper and more flexible than those of their competitors will create long-term competitive advantage. In this process, core competencies have a pivotal role to play. The number of such core competencies that a firm can develop is extremely limited, and the firm has to excel in them in order to be successful. According to Tidd (1997), the main task of corporate strategy is not to describe the current state of art, but to identify and explore core competencies that must be added. Otherwise the current competencies can become obsolete and begin to function as core rigidities. A more natural and fruitful approach is therefore to think of knowledge and skills required by a company in order to maintain or improve its competitiveness. Chaston et al.(2001) have observed that the areas of competence concerned with new product development, human resource management practices, organizational productivity, the management of quality and management of information were extremely crucial in terms of influencing small firm growth rates.

***Smaller firms experience greater market and customer uncertainty. Those who own and manage the smaller business exhibit a vastly greater range of aspirations than owners/ managers of large firms.***

## Research Propositions and Methodology

This paper aims to investigate major factors of various issues such as constraints, pressures, priority for investments, strategies for cost, quality, competencies development and performance of SMEs in comparison to national and international standards. Considering the scope of the study, following propositions are formulated.

***Proposition 1*:** Priority and level of investment in different areas change significantly with time.

***Proposition 2*:** Priority and level of focus for developing competencies change significantly with time.

***Proposition 3*:** Level of various strategies for reducing cost and improving quality differ significantly.

***Proposition 4*:** The degree of emphasis that firms place on different areas of strategy development will be positively correlated with their overall performance.

For collecting information from industries, a structured questionnaire was framed. Extensive visits were made to SMEs to collect first-hand information. The research methodology followed is shown in Figure 1. Identification of issues and development of preliminary framework for study was done after extensive review of literature and discussions with industry professionals. On the basis of interaction with professionals, it was observed that SMEs in the electronics sector are facing tremendous pressures of reducing cost, improving quality and fast changing product features after market globalization. The nature of various pressures and constraints may vary depending upon size and sector. Based on pressures and constraints, organizations will decide their strategies for investments, development of competencies and priorities for reducing cost and improving quality. Formulation of strategies and effective implementation by SMEs will decide their performance in domestic and global market. On the basis of literature review and interactions from experts, attempt is made to develop a preliminary questionnaire for pilot survey. Final questionnaire is framed on the basis of information obtained from pilot survey, visits to organizations, interactions from chief executive officers (CEOs), academicians, leading industrialists and literature review.

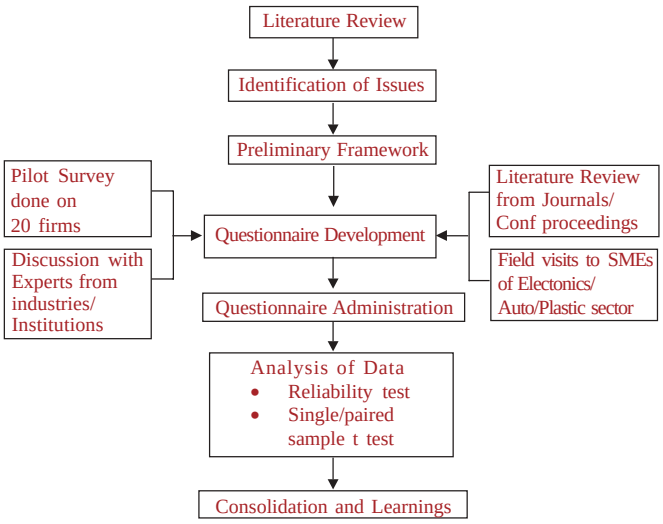


Figure 1:Research Methodology

Table 1: Profile of Responding Electronics Organisations (n=44)

| Turnover (Rs million )* | Respondents Number (%) | Investment (Rs million) | Respondents Number (%) |
|---|---|---|---|
| Up to 100 | 16 (36.36) | Up to 10 | 13 (29.55) |
| 100-1000 | 14 (31.82) | 10 - 250 | 13 (29.55) |
| 1000-5000 | 4 (9.09) | 250-500 | 4 (9.09) |
| More than 5000 | 3 (6.83) | 500-1000 | 8 (18.18) |
| Did not specify | 7 (15.9) | More than 1000 | 6 (13.63) |
| **Product nature** | | **Location** | |
| Product for the end user | 21 (47.72) | Rural | 1 (2.27) |
| Product for the other manufacturer | 14 (31.83) | Semi Urban | 17 (38.63) |
| For end user and other manufacturer | 7 (15.90) | Urban | 22 (50.00) |
| Did not specify | 2 (4.55) | Did not specify | 4 (9.09) |
| **No of total employees** | | **No of professionals** | |
| Up to 100 | 18 (40.90) | Up to 10 | 12 (27.27) |
| 101-500 | 16 (36.36) | 11-50 | 12 (27.27) |
| More than 500 | 8 (18.18) | 51-100 | 7 (15.91) |
| Did not specify | 2 (4.55) | More than 100 | 7 (15.91) |
| Did not specify | 6 (13.64) | | |

*1US$ = 44 Rs

In this study, executives were asked to rate the intensity of each factor for their respective organization on a five point Likert scale (1-Lowest, 5-Highest). These organizations were selected from various directories available at Confederation of Indian Industries (CII), Federation of Indian Chambers of Commerce and Industry (FICCI) and Department of Industries (Government of India). The questionnaire was mailed to 400 organizations from electronics sector. In spite of continuous reminders, phone calls, e-mails, only forty-four valid responses could be obtained. Detail profile of responding organizations is given in Table 1.

## Results and Discussions

To measure the scale reliability and internal consistency of collected data, Cronbach's coefficient alpha was calculated. The summary statistics of the same is given in Table 2. The coefficients of Cronbach's alpha for all constructs were in range from 0.6987 to 0.9044. These values exceed the minimum requirements of 0.5-0.6 for an exploratory study such as this one (Nunnally 1978).

Table 2 : Summary Statistics and Reliability of Constructs

| SN | Variable | Mean | S D | No of items | Cronbach alpha |
|---|---|---|---|---|---|
| i | Constraints | 2.35 | 0.65 | 11 | 0.8257 |
| ii | Pressures | 3.21 | 0.75 | 6 | 0.6987 |
| iii | Investment priorities | 3.02 | 0.62 | 7 | 0.9021 |
| iv | Strategies for cost | 3.52 | 0.63 | 9 | 0.7608 |
| v | Strategies for quality | 3.55 | 0.62 | 9 | 0.7524 |
| vi | Competencies development | 3.46 | 0.67 | 7 | 0.9044 |
| vii | Performance at national level | 3.34 | 0.37 | 12 | 0.8447 |

The data obtained from survey of electronics sector were analysed by statistical tests such as one sample t- test, paired sample t- test (PST), correlation and regression analysis. Although main focus of the study is to analyse strategy development by SMEs and its impact on performance. However, to study impact of globalization, pressures and constraints along with strategy development by SMEs under these circumstances have been also discussed in following sections.

### *Pressures*

In general, smaller firms experience greater market and customer uncertainty. Those who own and manage the smaller business exhibit a vastly greater range of aspirations than owners/ managers of large firms. The smaller firms rationally respond by favouring short over longer-term gains, and flexible over specific investments even where there is some cost penalty (Chen &Hambric, 1995). According to Sharma and Gupta (2004), presently businesses are facing many pressures – pressure to compete in a fast-paced ever-changing climate and pressure to constantly reduce costs to remain competitive. Therefore, becoming flexible is becoming imperative for survival.

The results of this study for various pressures being faced by SMEs in electronics sector on a Likert scale of five are presented in Figure 2. It is being observed that the highest pressure is to improve quality (3.59), which is followed by pressure to reduce cost (3.45) and delivery lead-time (3.43). Pun et al. (2004) have observed that for electronics industry

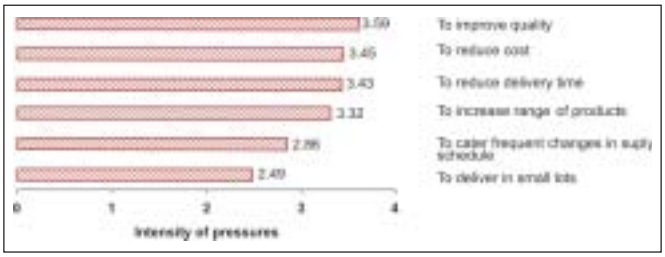


Figure 2 : Pressures on Electronic Sector

in Hong Kong, product/service quality and customer services have emerged as the critical success factors.
Singh et al. (2004) have also observed same findings for Indian auto component sector. According to Boyer (1999), factory of future image will be associated with advanced technologies enabling production of a variety of high quality products at low costs, delivered to the customers without delay.

### *Constraints*

SMEs have commonly been categorized to be component manufacturers for larger companies where they operate in the 'make to order' or rather the 'engineer to order' approach that imposes rigid constraints on meeting changes in requirements at short notice. The main barriers to be competitive for SMEs are inadequate technologies as well as inadequate in house human expertise and poor financial resources (Armstrong and Coyle, 1999). Resource scarcity can impact on the ability of smaller firms to enter export markets and can also limit a smaller firm's ability to reach more advanced stages of internationalization (Moen, 1999).

Reuber and Fisher (1997) have found that owners of smaller firms do not often have specialists and executives to manage their internal operations. In some instances, the shortage of management time in smaller firms can impede internationalization. Financial constraints faced by smaller firms and a reluctance to utilise external funding are strategic obstacles that may deter an entrepreneur from using the latest technology. Consequently smaller firms may be unable to export products or services of superior quality. It is observed that small firms are often constrained by their very limited ability to either acquire adequate information from external sources or utilise such information to evolve new operational practices. Institutional constraints, both governmental and non-governmental can also impede internationalization by smaller firms.

***Inadequate government support (2.56), lack of support from customer (2.56), poor financial position and lack of growth conducive environment (2.48) are observed as most severe constraints.***

Results of various constraints for SMEs to become competitive in the market are shown in Figure.4. Most of the constraints are significantly below moderate level. Inadequate government support (2.56), lack of support from customer (2.56), poor financial position and lack of growth conducive environment (2.48) are observed as most severe

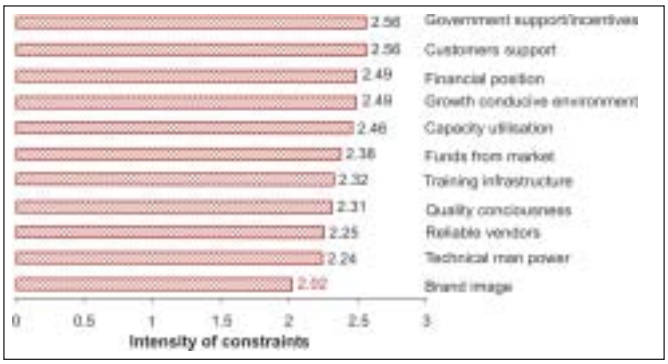


Figure 3 : Constraints on Electronics Sector

constraints. In creating growth conducive environment, government policies play important role. While government policies have played a facilitative role in countries like Japan, South Korea, Taiwan etc (Wang et al., 1995) but in countries like India, poor infrastructure, red tapism and various government policies are still considered as main barriers for the expansion and growth of the industry.

### *Strategies Adopted by Indian SMEs in Electronics Sector*

According to Errin (2004), in order to compete with their competitors, firms have to develop competitive strategies. Competitive strategy is a long-term phenomenon. A firm cannot have a strategy formulated in a month or so. There is a long-term need for stability and short-term need for continual updating and flexibility in response to evolutionary changes in environment. But the concept of long term can vary from sector to sector depending on its internal dynamics. A long-term strategy for the electronics sector may be 2-3 years whereas for chemical sector, it might be 5-8 years or more.

***Information technology, market research and automation of processes were major areas of priority for investment in past three years.***

In the present scenario of global competition, effective strategies for making investments, for developing competencies with time and strategies for reducing cost and improving quality are very important. These issues have been analysed for the electronics sector in the present study.

### *Investments Priorities*

According to Chanaron and Jolly (1999), global competitive strategies are increasingly becoming technology driven in the context of extremely dynamic and turbulent environments. Technology operates on competitiveness in two ways. First, by altering the price structure through the development of more efficient and flexible processes and second by enabling the creation of better products of greater quality, better design, after sales service and short delivery periods and so on (Vinas et al., 2001).

According to a study done by Fletcher and Hardill (1995), stronger orientation of French firms towards human resource management (HRM) practices and investment in new technology was a key reason for their better sales growth as compared to their counterparts in UK. It is also commonly reported that quality and consistency of the manufacturing performance of SMEs can be improved as a consequence of the use of the most appropriate information technology (IT) tools without any major changes in business practices, manufacturing operations or the production facilities (Chan and Tang, 1995). Several studies (Lal 2004, Hodgkinson and Mcphee 2002) have found that users of advanced e-business technology perform better than non-user in the export market. Garsombke and Garsombke (1989) have also highlighted the advantages of adopting IT and Advance manufacturing technology (AMT) in SMEs for improving competitiveness and financial performance.

In this study, research and development, automation of processes, information technology, training of employees, welfare of employees, market research and advertisement were considered as potential areas of investment. Respondents were asked to prioritise. The results of this study regarding investment priorities are shown in Table 3. Information technology, market research and automation of processes were major areas of priority for investment in past three years. In the next three years, information technology will be replaced with market research as a top priority for investment. Market research will be followed by information technology and automation of processes. On the basis of paired sample t test for most of the areas of investment, significant difference between mean values for level of priority in past and next three years is observed**.** It shows that priority as well as level of investment is changing with time thereby supporting first proposition. It also reflects the flexible nature of strategy development by SMEs for sustainable growth.

Table 3 : Investment Priorities for Electronics Sector

| SN | Nature of Investment | During past three Years | | | In next three years | | | Sig. (2 -tailed) |
|---|---|---|---|---|---|---|---|---|
| | | Mean | SD | t | Mean | SD | t | |
| i. | Rese.arch and development | 3.07 | 1.07 | 0.42 | 3.71 | 1.17 | 3.88* | 0.00$^{\mu}$ |
| ii. | Automation of processes | 3.16 | 0.96 | 1.10 | 3.73 | 1.03 | 4.57* | 0.00$^{\mu}$ |
| iii. | Information technology | 3.35 | 1.04 | 2.19* | 3.87 | 1.14 | 4.87* | 0.01$^{\mu}$ |
| iv. | Training of employees | 2.64 | 0.92 | -2.63# | 3.27 | 1.07 | 1.60 | 0.00$^{\mu}$ |
| v. | Welfare of employees | 2.86 | 0.98 | -0.92 | 3.49 | 1.05 | 2.97* | 0.00$^{\mu}$ |
| vi. | Market research | 3.28 | 0.93 | 1.96 | 3.95 | .90 | 6.64* | 0.00$^{\mu}$ |
| vii. | Advertisement | 2.81 | 1.10 | -1.11 | 3.64 | 1.09 | 3.68* | 0.00$^{\mu}$ |

*Significantly above moderate level at 0.05 level, #Significantly below moderate level at 0.05 level (Based on single sample t test), $^{\mu}$ Difference of mean values for past and next three years is significant at 0.01 level (Based on Paired Sample t Test).

From this study it is found that investment in research

and development is still not the top ranking priority for SMEs. A typical industry in India spends less than 0.6 per cent, on average, of its turnover on R&D as against the world average of 2.5 per cent (Garg et al., 2003). As product features and range are changing very fast in this sector, Indian SMEs can develop their brand name through increasing investment in innovation and R&D. Above findings also show that training of employees is also not the top ranking priority for Indian industries. Study made by Oyelaran-Oyeyinka (2004) suggests that internal training opportunities greatly contribute in improving the performance of organization. These strategies also help in making the organization flexible and help in building capabilities over a period of time.

## Priorities for Developing Competencies

***Small firm with limited resources will be expected to perceive its business environment as being different from that of a large firms with perhaps more resources.***

Chaston and Mangles (1997) have found that the areas of competence concerned with new product development, human resource management practices, organizational productivity and the management of quality and so on. Lei et al. (1999) have expressed the view that in tomorrow's business world, success will be critically influenced by the degree to which firms utilise new knowledge to support innovation. The business innovations also promote flexibility in the organization (Halemane and Janszen, 2004).

Results of competencies development by Indian SMEs in the electronics sector are shown in Table 4. SMEs in the electronics sector have given maximum focus for developing competency in area of using information to optimise decisions. In addition to this, introduction of new technology and identification of market changes were other major areas of competencies development in past three years. In the next three years, identification of market changes and introduction of new technology will become the top priority for developing competencies. This change is being observed due to fast changing market for the electronics sector in India. In addition to this, use of information to optimize decisions and use of customer to define quality standards will be other areas of competencies development. Although most of the areas of competency development except identification of niches, have got significantly higher focus than moderate level in past three years but on the basis of paired sample t test, it is observed that level of focus for developing these areas of competency have increased significantly with time as difference between mean values for most of the competencies except development of new product is found significant at 95 per cent confidence level, which supports second proposition. Analysis also shows that present organizations differ from focused organization of the past (Noble, 1997). A possible reason is that to satisfy and retain their customers in present global competition, they have to improve their ability to perform under dynamic and uncertain environment while keeping costs, delays, organizations disruptions at or near zero thus providing operational flexibility.

Table 4: Areas of Competency Development

| SN | Competencies | During past three Years | | | In next three years | | | Sig. (2-tailed) |
|---|---|---|---|---|---|---|---|---|
| | | Mean | SD | t | Mean | SD | t | |
| i. | To identify niches | 3.00 | 1.05 | 0.00 | 3.31 | 1.08 | 1.78 | 0.014$^{\mu}$ |
| ii. | To develop new products | 3.44 | 0.88 | 3.28* | 3.70 | 1.09 | 4.06* | 0.071 |
| iii. | To optimise work environment | 3.34 | 1.06 | 2.06* | 3.54 | 1.02 | 3.23* | 0.031$^{\mu}$ |
| iv. | To use customer to define quality standards | 3.44 | 0.91 | 3.19* | 3.75 | 0.93 | 5.12* | 0.017$^{\mu}$ |
| v. | To introduce new technology | 3.67 | 0.98 | 4.41* | 4.00 | 1.18 | 5.37* | 0.021$^{\mu}$ |
| vi. | To use information to optimise decisions | 3.71 | 1.02 | 4.54* | 3.92 | 0.92 | 6.38* | 0.039$^{\mu}$ |
| vii. | To identify market changes | 3.61 | 0.92 | 4.25* | 4.00 | 0.89 | 7.03* | 0.009$^{\mu}$ |

*Significantly above moderate level at 0.05 level (Based on single sample T test), $^{\mu}$Difference of mean values for past and next three years is significant at 0.05 level (Based on Paired Sample t Test).

## Strategies for Cost and Quality

Firms in industrialized countries that have adopted a quality oriented strategy have achieved improved productivity, greater customer satisfaction, increased employee morale, improved management labour relations and higher overall performance (Mersha, 2000). Mason et al. (2000) have observed that providing right product, at the right price, at the right time to the customer is a key factor for success of the organization.

Lau (2002) has also found higher quality and lower cost as top ranking competitive factors among US electronics and computer industries. In implementing quality programmes, small firms feel many problems. Main reasons for their failure can be lack of specific goals and effective decisional tools for evaluating the most effective investment(s) among a set of potential programmes.

The results of this analysis are shown in Table 5. It is observed that for reducing cost, SMEs in the electronics sector are giving maximum focus on improvement of product design followed by vendor development, research and development. For improving product quality, improvements in product design continue to be a top priority. In addition to this, improvement of process capability and vendor development are other major priorities for improving product quality. On the basis of paired sample t test, it is observed that most of the priorities except reduction of inventory do not differ significantly thereby not supporting third proposition. It means SMEs do not make any significant distinction in terms of strategies adopted for cost and quality.

Table 5: Strategies for Cost and Quality

| SN | Strategies | To reduce cost | | | To improve quality | | | Sig. (2 -tailed) |
|---|---|---|---|---|---|---|---|---|
| | | Mean | SD | t | Mean | SD | t | |
| i. | Reduction of inventory | 3.23 | 0.92 | 1.65 | 2.87 | 1.11 | -0.71 | 0.02[µ] |
| ii. | Reduction of rejection / rework | 3.56 | 1.09 | 3.27* | 3.47 | 1.15 | 2.60* | 0.63 |
| iii. | Automation of operations | 3.37 | 1.07 | 2.28* | 3.40 | 0.90 | 2.81* | 0.90 |
| iv. | Vendor development | 3.58 | 0.96 | 3.98* | 3.55 | 0.81 | 4.27* | 0.90 |
| v. | Improvement of process capability | 3.51 | 0.98 | 3.41* | 3.73 | 0.81 | 5.81* | 0.38 |
| vi. | Improvement of maintenance | 3.57 | 1.06 | 3.48* | 3.66 | 0.76 | 5.53* | 0.48 |
| vii. | Improvements in product design | 3.77 | 1.09 | 4.63* | 3.93 | 0.93 | 6.36* | 0.26 |
| viii. | Research and development | 3.57 | 1.04 | 3.56* | 3.52 | 1.09 | 3.06* | 0.72 |
| ix. | Training of employees | 3.45 | 1.15 | 2.62* | 3.52 | 0.89 | 3.81* | 0.63 |

*Significantly above moderate level and at 0.05 level (Based on single sample t test), [µ] Difference of mean values for past and next three years is significant at 0.05 level (Based on Paired Sample t Test).

## Performance

Performance of an enterprise is often measured as a ratio of output to input. The outputs constitute the products of the enterprise and the inputs are the resources used by the enterprise (Choudhary, 2001). Neely et al. (1994) defined performance measurement as the process of quantifying the efficiency and effectiveness of manufacturing system.

For measuring performance both subjective and objective measures can be considered. Although according to Vickery et al. (1994), use of only subjective measures is also a reliable alternative to actual performance because managerial assessments are consistent with objective internal and external performance.

The performance of responding Indian SMEs in the electronics sector in comparison to national and international standards is given in Table 6. Respondents were asked to mark their performance in comparison to national and international standards on five point Likert scale (1-very inferior, 2-inferior 3-Equal, 4-high, 5-very high) for various measures. Performance of Indian SMEs in the electronics sector in comparison to national standards is significantly higher than moderate level for most of the performance measures except in terms of labour productivity, capacity utilisation and throughput. In comparison to international standards, performance of this sector is significantly less than moderate level except in terms of manufacturing cost, level of inventory, percentage rejection, employee turn over rate and throughput. On the basis of paired sample t test, it is also found that performance of SMEs in the electronics sector at international level is significantly lesser than its performance at national level. Reason for this may be inferior capabilities for design and development of product, more rejection rate due to poor process capability, lack of advanced and flexible technology and R&D facilities in comparison to international competitors. The objective performance is measured in terms of average percentage change on financial parameters in last three years. It is shown in Table 7. For all financial performance measures, change is significantly higher than moderate level.

***SMEs in this sector are adopting multi-faceted strategy rather than depending upon single approach. These findings reflect flexible nature of strategy development by them. It is positive indication for sustainable competitiveness of SMEs.***

Table 6: Performance in Comparison to National and International Standards

| SN | Measures | In comparison to the national standards | | | In comparison to the international standards | | | Sig. (2 -tailed) |
|---|---|---|---|---|---|---|---|---|
| | | Mean | SD | t | Mean | SD | t | |
| i. | Manufacturing cost | 3.26 | 0.73 | 2.31* | 2.56 | 0.90 | -3.14# | 0.000[µ] |
| ii. | Level of inventory | 3.37 | 0.73 | 3.19* | 2.67 | 0.98 | -2.12# | 0.073 |
| iii. | Delivery speed | 3.48 | 0.71 | 4.37* | 2.89 | 1.05 | -0.64 | 0.008[µ] |
| iv. | Flexibility in production | 3.32 | 0.82 | 2.48* | 2.91 | 1.05 | -0.49 | 0.005[µ] |
| v. | Percentage rejection | 3.78 | 0.76 | 6.59* | 2.62 | 0.87 | -2.73# | 0.000[µ] |
| vi. | Labour productivity | 3.10 | 0.76 | 0.81 | 3.00 | 0.98 | 0.00 | 0.454 |
| vii. | Capacity utilisation | 3.22 | 0.96 | 1.46 | 2.73 | 1.10 | -1.43 | 0.007[µ] |
| viii. | Employee turnover rate | 3.33 | 0.82 | 2.65* | 2.65 | 0.86 | -2.56# | 0.000[µ] |
| ix. | Throughput (Rs/hr) | 2.82 | 0.81 | -1.36 | 2.47 | 1.08 | -2.86# | 0.017[µ] |
| x. | Employee satisfaction | 3.35 | 1.02 | 2.24* | 2.80 | 1.16 | -1.02 | 0.003[µ] |
| xi. | Customer satisfaction | 3.44 | 0.91 | 3.19* | 2.97 | 1.23 | -0.13 | 0.046[µ] |
| xii. | Supplier satisfaction | 3.57 | 0.83 | 4.46* | 3.06 | 1.09 | 0.30 | 0.004[µ] |

*Significantly above moderate level at 0.05 level, #Significantly below moderate level at 0.05 level (Based on single sample T test), [µ] Difference of mean values for performance is significant at 0.05 level (Based on Paired Sample t Test).

Table 7: Objective Performance

| SN | Objective performance measures | Mean | SD | t |
|---|---|---|---|---|
| i. | Market share | 3.59 | 0.74 | 4.12 |
| ii. | Sales turn over | 3.70 | 0.65 | 5.88 |
| iii. | Profit after tax | 3.50 | 0.63 | 4.14 |
| iv. | Return on investment | 3.34 | 0.56 | 3.14 |
| v. | Export | 3.26 | 0.60 | 2.27 |

Correlation analysis was done between various strategies adopted and performance. The results are shown in Table.8. Based on discussion with professionals from industries, for measuring

overall performance equal weightage is given to subjective and objective performance.

Table 8: Correlation Analysis

| SN | Strategies | IP | QI | CR | CD | OP |
|---|---|---|---|---|---|---|
| i | Investment priorities | 1.00 | 0.53** | 0.53** | 0.43** | 0.19 |
| ii | Quality improvement | 0.53** | 1.00 | 0.76** | 0.56** | 0.24 |
| iii | Cost reduction | 0.53** | 0.76** | 1.00 | 0.61** | 0.17 |
| iv | Competencies development | 0.43** | 0.56** | 0.61** | 1.00 | 0.15 |
| v | Overall performance | 0.19 | 0.25 | 0.17 | 0.15 | 1.00 |

** Correlation is significant at 0.01 level of significance IP- Investment priorities, QI- Quality improvement, CR- Cost reduction, CD- Competencies development, OP- Overall performance.

Although positive correlation was observed between all strategies adopted and performance but it was not significant therefore supporting fourth proposition partially. Reason for this may be that in addition to above discussed strategies, there may be some other areas such as development of human capital and suppliers, organization culture, IT applications, flexibility in value chain, which can play important role in improving the overall performance of organization.

## Comparison of SMEs with Large Organizations

SMEs differ from large organizations in terms of organization structure, management and resources. Therefore, it is expected that strategy development by SMEs should differ from large organizations. Major findings of this study for SMEs are shown in the form of a model (Figure 4). Some of the observations are as follows:

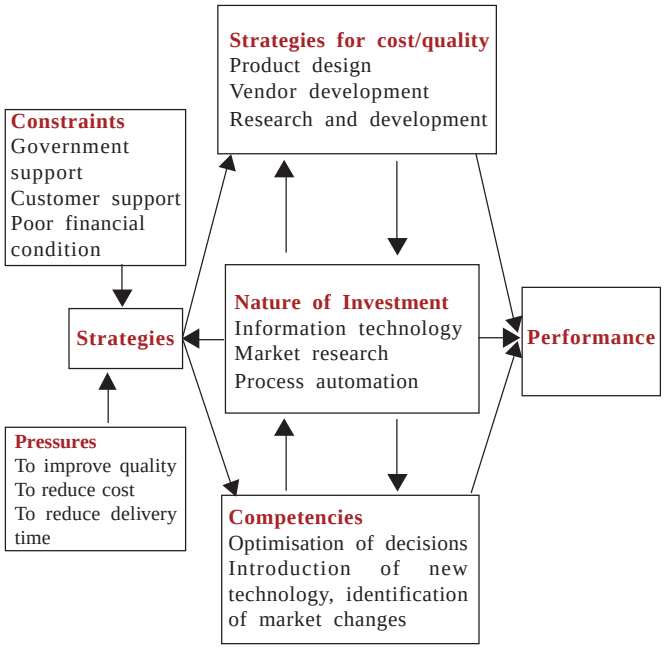


Figure 4. Model Representing Major Findings of the Study

- Quality, cost and delivery time are the main pressures on SMEs in the electronics sector.
- SMEs in this sector are considering inadequate government support/incentives, lack of support from customers and poor financial condition as major constraints.
- Information technology, market research and automation of processes are top ranked areas for making investments.
- Improvements in product design and process capability, vendor development, research and development are the main strategies adopted for cost and quality.
- Use of information to optimize decisions, introduction of new technology and identification of market changes are main areas of competency development.
- Performance of SMEs in the electronics sector in comparison to international standards is significantly poor with respect to national standards in terms of most of the measures.

A exploratory study done by authors indicate that strategies followed by large organizations of India differ from SMEs in spite of same nature of market pressures related with cost, quality and delivery. Main strategies followed by large organizations are automation of process, improvement of process capability and maintenance, identification of market changes and introduction of new technology The reason for this difference may be that small firm with limited resources will be expected to perceive its business environment as being different from that of a large firms with perhaps more resources (Gyampah et al., 2001). In addition to this, large organizations have started reforming themselves for being competitive earlier than SMEs. Comparison of various strategical issues between SMEs and large organizations is given in Table.9.

Table 9: Comparison of SMEs with Large Organisations

| Issues | SMEs | Large organisations |
|---|---|---|
| Pressures | To improve quality<br>To reduce Cost<br>To reduce delivery time | To reduce Cost<br>To improve quality<br>To reduce delivery time |
| Constraints | Government support<br>Customer support<br>Poor financial condition | Government support<br>Quality consciousness<br>Unreliable vendors |
| Investments | Information technology<br>Market research<br>Process automation | Automation of process<br>Information Technology<br>Training of employees |
| Strategies for Cost | Product design<br>Vendor development<br>Maintenance and R&D. | Process capability<br>Maintenance<br>Product design |
| Strategies for Quality | Product design<br>Process Capability<br>Maintenance | Maintenance<br>Automation of employees<br>Process capability |
| Competencies | Optimisation of decisions<br>Introduction of new technology<br>Identification of market changes | Identify market changes<br>Introduce new technology.<br>Define quality standards |

## Concluding Remarks

The objective of this study was to analyse different strategies adopted by Indian SMEs in the electronics sector

in the face of emerging challenges and opportunities of globalized market. From this study it is observed that level and priority of different factors of pressures, constraints, strategies and performance measures differ with each other. It is also observed that to face various situations after globalization, SMEs in this sector are adopting multi-faceted strategy rather than depending upon single approach. These findings reflect flexible nature of strategy development by them. It is positive indication for sustainable competitiveness of SMEs.

Keeping in view the inadequate government support/ incentives, lack of support from customers and poor financial condition as major constraints, effective partnership between government and industry is recommended. In India, at present, partnerships between the government and industry is still lacking. Whereas this is happening to a significant extent in Taiwan, Korea and China. SMEs should also focus on improving the effectiveness and flexibility of value chain from supplier to customer end. The sooner such initiatives emerge in India, the greater the industry would stand to gain.

This paper has contributed significantly in finding major strong and weak areas of strategy development, performance at national and international level and predictors of performance. It will also help to motivate Indian SMEs in reshaping their strategies to improve their performance at international level also. In generalising the above observations, it has to be noted that present study has got some limitations. Majority of responding organizations are from the north and central part of India. All regions have not been represented uniformly so further efforts are required in this direction. Further study is suggested for strengthening above findings by considering other areas of strategy development such as development of human capital and suppliers, organization culture, flexibility at various levels and IT applications.

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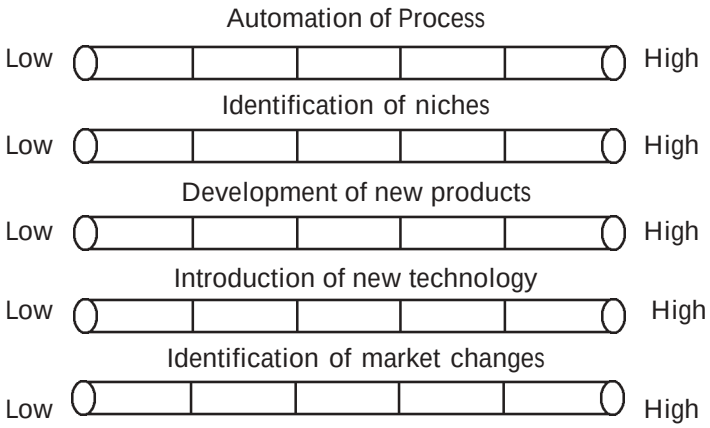
## Flexibility Mapping : Practitioner's Perspective

1. What types of flexibilities you see in the practical situation of "Strategy development under emerging economy" on the following points:
   - Flexibility in terms of "options"
   - Flexibility in terms of "change mechanisms"
   - Flexibility in terms of "freedom of choice" to participating actors.
2. Identify and describe the types of flexibilities that are relevant for improving performance of your organizational in dynamic market? Prioritise areas of flexibility on which focus need to be given.
3. Try to map your own organization on following continua
   (Please tick mark in the appropriate box(es))




## Reflecting Applicability in Real Life

1. Develop a SAP-LAP (Situation Actor Process- Learning Action Performance) model for your organisation taking into account various pressures and constraints.
2. Based on above model, try to make flexible strategies for making investment and developing competencies to make your organization responsive to market changes.

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Research Tool

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# Interpretive Matrix: A Tool to Aid Interpretation of Management and Social Research

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## Abstract

*The analytical rigour of management and social research needs to be complemented with sound interpretation of results. Largely, the results of management and social research are in terms of relationships of elements or research variables. There is a need of interpretative tools along with the developments in analytical tools. This paper presents an interpretive tool in terms of 'interpretive matrix'. The basic principle and the tool is outlined along with its possible variants. The application of 'interpretive matrix' is illustrated in the context of structural modelling as well as empirical research.*

***Keywords*** *:* empirical research, interpretive matrix, management and social research, structural modelling

## Introduction

Management and social research has become highly quantitative and analytical over time. On one hand, it uses tools of empirical analysis, such as correlation, regression and so on where as on the other hand, modelling tools, such as structural modelling, stochastic analysis and optimization algorithms are applied. The data is either based on hard facts or opinion of experts. The analytical rigour of the research, though high, the interpretation of results at times lacks due emphasis. Thus, there is a need for interpretive tools as well along with the developments in analytical tools. The interpretive tools are supposed to aid the researcher in proper interpretation of the research being carried out. Some of the interpretative tools, based on systems theory, are Interpretive Structural Modelling (ISM) (Warfield, 1974), Soft Systems Methodology (Checkland and Sholes, 1990), Strategic Assumptions Surfacing and Testing (Mason and Mitroff, 1981) and so on. However, most of these tools are stand alone and not able to integrate effectively with other quantitative tools of research.

A major requirement of deductive research is to interpret the relationships of variables during the process of hypothesis testing, so as to propose interpretive models that can be effectively implemented. This paper presents a simple matrix based tool to aid the interpretation of management and social research.

## Interpretive Matrix

### *The Need*

This tool would be useful in two types of research methodologies: one, based on structural modelling and the other, using statistical hypothesis testing. The structural modelling is used to portray the system structure in terms of relationships of elements. These relationships may or may not have a direction. The undirected relationships are used, for example, in Program Planning Linkages (Hill and Warfield, 1972) in terms of 'self-interaction matrices' and 'cross-interaction matrices' which are binary in character. It uses paired comparison methodology to compare two elements for a relationship. If there is a relationship an entry of '1' is made in the relevant cell of the matrix, or else a '0' entry is made. The manipulation of matrices is done using binary arithmetic. These matrices can also be used to portray fuzzy relations using fuzzy arithmetic (Saxena et al, 2005). The directed relationships are used in directed graph theory (Harary et al., 1965) and ISM (Warfield, 1974). In this case, the entries in the cells incorporate direction of relationships as well using some symbols and then converted into binary matrices. For example, in ISM first a 'structural self interaction matrix' is prepared using paired comparison methodology, which is then transformed into a binary 'reachability matrix'.

In the empirical research, the hypothesis could incorporate undirected or directed relationships. For example, an undirected relationship is represented as 'variable A is associated with variable B' and a directed relationship is represented as 'variable A is a predictor of variable B'. The hypothesis based on undirected relationship can be tested using correlation analysis and the one using directed relationship can use regression analysis, path analysis and other advanced analytical methods. In either case, the model is finally represented in terms of relationships of variables, whether directed or undirected.

Thus, though the empirically validated and structural

models of research depict relationships between elements/ variables, these relationships need to be properly interpreted. The proposed 'interpretive matrix' is a step in this direction to aid the interpretation of relationships in research models in a given context.

***There is a need for interpretive tools as well along with the developments in analytical tools.***

## The Principle

The interpretive matrix represents interpretation of relationships on pairs of elements in cells which are one of the following - binary, fuzzy or statistically significant. The main question answered in interpreting an undirected relationship is 'why' the relationship exists in between the two elements. In case of directed relationships the interpretation is done in terms of 'how' the relationship works, in a given context. The interpretation may change for different contextual relationships, which may be for example, influences, enhances, precedes, will help achieve, more important than and so on.

## The Tool

The interpretive matrix represents a set of relationships in a matrix form, giving interpretation for each paired relationship in the relevant cell. There could be three basic types of interpretive matrices, namely triangular, square and rectangular.

### Triangular Interpretive Matrix

A triangular matrix depicts undirected relations among a set of elements/variables, for example, self-interaction matrix, correlation matrix. A sample triangular self-interaction matrix depicting relations among actors in a given case is shown in Figure 1. It shows the binary relation and its interpretation in terms of information support, reporting or action.

| | | | | |
|---|---|---|---|---|
| 0 | 0 | 1 | 0 | A1 |
| 0 | 1 | 1 | A2 | |
| 1 | 0 | A3 | | |
| 1 | A4 | | | |
| A5 | | | | |

(a) Binary Matrix

| | | | | |
|---|---|---|---|---|
| – | – | Information Support | – | A1 |
| – | Team work | Team work | A2 | |
| Knowledge sharing | – | A3 | | |
| Reporting | A4 | | | |
| A5 | | | | |

(b) Interpretive Matrix

Figure 1: Sample Triangular Matrix for Undirected Interrelationship of Five Actors

### Square Interpretive Matrix

A square interpretive matrix shows directed relationships among a set of elements/variables. For relationship between a pair of elements *i* and *j*, there are two entries in the matrix; one depicting the directed relation from *i* to *j*; and the other one from *j* to *i*. A sample square matrix is shown in Figure 2 for the same set of actors as given in Figure 1 in terms of binary and interpretive relation in both directions. In the binary matrix, the diagonal entries are '*1*' which represents the reachability of the same element to itself, and thus these are not given any interpretation in the corresponding interpretive matrix.

| | A1 | A2 | A3 | A4 | A5 |
|---|---|---|---|---|---|
| A1 | 1 | 0 | 1 | 0 | 1 |
| A2 | 0 | 1 | 1 | 1 | 0 |
| A3 | 0 | 1 | 1 | 1 | 1 |
| A4 | 0 | 1 | 1 | 1 | 1 |
| A5 | 0 | 0 | 1 | 0 | 1 |

(a) Binary Matrix

| | A1 | A2 | A3 | A4 | A5 |
|---|---|---|---|---|---|
| A1 | — | — | Information Support | — | Reporting |
| A2 | — | — | Teamwork | Teamwork | — |
| A3 | — | Teamwork | — | Teamwork | Knowledge Sharing |
| A4 | — | Teamwork | Teamwork | — | Reporting |
| A5 | — | — | Knowledge Sharing | — | — |

(b) Interpretive Matrix

Figure 2: Sample Square Matrix for Directed Relationship for Five Actors

### Rectangular Interpretive Matrix

A rectangular matrix depicts relations between two sets of elements '*n*' and '*m*', for example, the cross-interaction matrix. If the number of elements in both sets is same, that is, '*n*' is equal to '*m*', it physically appears to be a square matrix, but since the set of elements is different on both dimensions it is a special case of the rectangular matrix. This matrix represents undirected relations. For representing directed relations between two different sets of elements two rectangular matrices are to be prepared; one showing relations from *i* to *j* and the other from *j* to *i*. A sample rectangular matrix for five actors and four situation elements is shown in Figure 3, which can be used in SAP (Situation-Actor-Process) framework (Sushil, 2001).

| | | ***Actors*** | | | | |
|---|---|---|---|---|---|---|
| | | Top Management | Operations | R & D | Suppliers | Financers |
| | | A1 | A2 | A3 | A4 | A5 |
| ***Situation*** | Competition S1 | 1 | 0 | 1 | 0 | 1 |
| | Liberalization S2 | 1 | 0 | 0 | 1 | 1 |
| | Financial Health S3 | 1 | 1 | 1 | 1 | 1 |
| | Technology Change S4 | 1 | 1 | 1 | 1 | 1 |

(a) Binary Matrix

| Situation | Actors: Top Management (A1) | Operations (A2) | R & D (A3) | Suppliers (A4) | Financers (A5) |
|---|---|---|---|---|---|
| Competition S1 | Competive Strategy | _ | Develop New Products | _ | Investment Modernization |
| Liberalization S2 | New Opportunities | _ | _ | Outsourcing | Foreign Direct Investment |
| Financial Health S3 | Financial Control | Cost Saving | More R&D Budget | Payments | Debt Service Coverage |
| Technology Change S4 | Technology Strategy | Technology Absorption | New Technology Development | Technology Transfer | Investment in Technology |

(b) Interpretive Matrix

Figure 3: Sample Rectangular Matrix (Cross-interaction) for Four Situation Elements and Five Actors

## Application of Interpretive Matrix

The application of 'interpretive matrix' is illustrated separately for the two types of researches, namely the structural modelling and empirical research.

### *Structural Modelling*

The interpretive matrix can be directly applied in case of structural modelling to interpret directed and undirected binary or fuzzy relations as shown in Figures 1 to 3. In case of a graphical model, the interpretation of the relation can be shown by the side of the link connecting the pair of elements having the relation. An example in case of ABB India (Sushil, 2001) is shown in Figure 4.

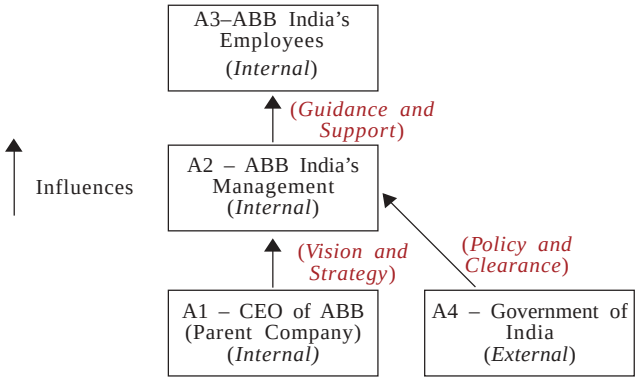


Figure 4: Interpretive Hierarchical Model of Actors (ABB India)

### *Empirical Research*

In case of empirical research, a 'triangular interpretive matrix' can be prepared for the undirected relations tested by correlation analysis. The significant correlations indicate possible association/relation for the respective pairs. The cells having significant correlations can be provided with the interpretation of relation, which will give a clue to the direction of relation in terms of dependent and independent variables. This can be used for developing regression models. After the regression analysis the graphical model can incorporate the interpretation of relations along side the links. A sample example giving correlation matrix, and triangular interpretive matrix in the context of e-business transformation (Dwivedi, 2005) is shown in Figure 5.

| | IT and Strategy Alignment | Knowledge Management | Business Process Automation | E-Business Transformation | Stakeholder Flexibility | Business Performance |
|---|---|---|---|---|---|---|
| IT and Strategy Alignment | 1 | | | | | |
| Knowledge Management | .437** | 1 | | | | |
| Business Process Automation | .323** | .260** | 1 | | | |
| E-Business Transformation | .235* | .708** | .342** | 1 | | |
| Stakeholder Flexibility | .324** | .630** | .470** | .697** | 1 | |
| Business Performance | .125 | .251** | .079 | .369** | .192* | 1 |

** *Correlation is significant at the 0.01 level (2-tailed)*
* *Correlation is significant at the 0.05 level (2-tailed)*

(a) Correlation Matrix

| | IT and Strategy Alignment | Knowledge Management | Business Process Automation | E-Business Transformation | Stakeholder Flexibility | Business Performance |
|---|---|---|---|---|---|---|
| IT and Strategy Alignment | | | | | | |
| Knowledge Management | Use of Hidden Knowledge | | | | | |
| Business Process Automation | Cutting the cost ,time, and quality improvement | Solution of the problems and Knowledge (data base) | | | | |
| E-Business Transformation | Mangaing the change due to IT | Experts support | All processes should be automatic | | | |
| Stakeholder Flexibility | To Provide value to stakeholders | For understanding stakeholders demand | Agility in process and operations | Information communication, and process and operatios flexibility | | |
| Business Performance | _ | Reducing delays and cost | _ | Maintaining cost | Uniqueness | |

(b) Interpretive Matrix

Figure 5: Sample Correlation and Interpretive Matrices for Empirical Research on E-Business Transformation
*Adapted from : Dwivedi (2005)*

***The proposed 'interpretive matrix' is intended to aid the interpretation of relationships in research models in a given context.***

## Conclusion

The paper provides 'interpretive matrix' as a tool to help effective interpretations of results of management and social research in terms of

developing interpretive models. It provides illustrations in case of directed as well as undirected relations. Another possible interpretation could be in terms of conflict in the relations, which can also be shown by developing two 'interpretive matrices' one for alliance and other for conflict. Multiple interpretive matrices can be developed with different perspectives and relevant learning can be synthesized to take meaningful actions. Thus, the proposed research tool will be helpful in creating *flexibility* in the research process by providing more options for the interpretation of research. The flexibility will exist in terms of basic structure, direction of relationship, multiple perspectives of actors involved, conflict or consensus and the nature of application. The utility of the tool would be enhanced by applying it to many researches and innovating it in the context of application.

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### Reflecting Applicability in Real Life

- Find the utility of 'Interpretive Matrix', presented in this paper, as a tool for interpretation of the research work you are carrying out.


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# Environmental Pressures, Culture and Factors Contributing in the Usage of Various Categories of Application Software

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## Abstract

*This research investigates the effect of cultural and environmental pressures on contributing factors in the usage of various categories of application software, based on the experience and perception of chief information officers in India and the U.S. The results show that, in both countries, environmental pressures and cultural factors both have a significant influence on the contributing factors in the usage of various categories of application software. In this study, the contributing factors in the usage of various categories of software were identified as follows: shrinkage in systems life cycle, high cost and high risk-prone tendency of the needed software, desired characteristics of the software solution, administrative motivation, quantum improvements, growth in the usage of off-the-shelf/ERP packages (gross value), and growth in the usage of off-the-shelf/ERP packages (net value). The culture is measured by using variables power distance, uncertainty avoidance, individualism, and masculinity. The environmental pressures are measured using variables frequency of changes in marketing practices, rate of product obsolescence, prediction of competitors' actions, prediction of consumer test/product demand, and frequency of changes in mode of production/ services.*

***Keywords*** : application software, culture, environmental pressure, factors

## Introduction

IT applications are growing in organizations almost everywhere across the globe. Developing countries and newly industrialized economies (NIEs) in Asia are adopting computerized solutions that are then successfully implemented in developed countries (Mody and Dahlman, 1992). In the global economy, where IT is an integral part of the products and services delivered to customers (Henderson and Lentz, 1995/1996, Luftman et al., 2004), it will be very difficult for the organizations to compete and survive without computers and software (Jones, 1994, Luftman et al., 2004). In India, businesses are generally regulated by a government policy (Palvia and Palvia 1992) however, beginning with the New Computer Policy of 1984 (Dhir 1992, Menon 1990) the Government of India has aggressively promoted the increased use of IT in business. Not surprisingly, the United States remains the world leader in IT (Westwood, 1995).

Computer related technology is essentially neutral. The success or failure of IT applications in any organization depends mainly on how it is implemented (Bostrom and Heines, 1977). In developing countries, the local environment plays an important role in adoption of IT applications (Montealegre, 1998). As well, environmental and cultural factors play an important role in developing a positive mindset for successful implementation of IT applications (Agrawal and Haleem, 2003).

In this study, the application packages are categorized as tailor-made (proprietary), customized, and off-the-shelf packages. ERP packages are kept as a separate category due to their size and scope. Agrawal et. al (2001) stated that due to high cost and associated risk, there will be a proportionately higher usage of off-the-shelf/ERP solutions compared to proprietary software.

This study addresses the development of a model for identifying the effect of environmental pressures and cultural factors on the contributing factors in the usage of various categories of application software. More specifically, it

addresses four interrelated questions upon which the entire analysis centered: (1) What are the cultural factors and environmental pressures that facilitate and inhibit the contributing factors in the usage of various categories of application software?, (2) What are the cultural factors and environmental pressures that facilitate and inhibit growth in usage of off-the-shelf/ERP packages?, (3) How can trends in United States organizations help Indian organizations formulate their IT related strategies regarding the usage of various categories of application software?, and (4) Considering that IT projects are costly and risky, how can organizations minimize the risk, yet simultaneously use IT applications to maintain a competitive edge in the business?

The present work is confined to manufacturing, telecommunication (hardware), computer hardware, banking, hotels, computer software, and airlines. The quantitative and qualitative data were collected through a survey of chief information officers in India and the United States.

The next section discusses the theoretical background and the model and hypothesis formulation, followed by discussion of the methodology used and implementation of research methodology. The article then identifies the results obtained, along with the limitations of study and suggestions for future work, before concluding with the author's summary of the findings and final remarks.

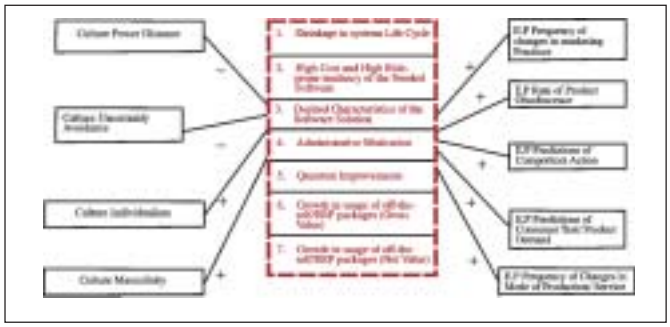
## Background and Development of Research Model

Agrawal et.al., (2001) identified the following factors contributing in the usage of various categories of application software: shrinkage in systems life cycle, high cost and high risk-prone tendency of the needed software, desired characteristics of the software solution, administrative motivation, and quantum improvements. This study is focused on identifying the effect of environmental and cultural factors on those factors that contribute in the usage of various categories of application software. A brief description of these factors is given below:

***Environmental and cultural factors play an important role in developing a positive mindset for successful implementation of it applications***

- *Shrinkage in systems life cycle*: includes time compression (El Sawy et. al., 1999), faster rate of obsolescence of packages, and high rate of upgrades in hardware/software.
- *High cost and high risk-prone tendency of the needed software*: includes high rate of software project failure, cost of development of packages, and complexities in the needed application package.
- *Desired characteristics of the software solution*: comprises reliability, built-in best practices in the packages, ease of training, facilitates implementation of JIT/TQM/BPR in the organization, and low maintenance.
- *Administrative motivation*: contributing parameters include the critical role of IT in operations of the organization, shortages in IT professionals, organizational willingness in changing their processes, availability of IT skilled end-users, and reliable software maintenance support.
- *Quantum improvement*: addresses the organizational need to control the development and operations of the flexible software solution.

The overall conceptual model with the research constructs and proposed relationships is presented in Figure 1. Each of the constructs, along with the expected relationships and hypotheses, are discussed in two parts: environmental pressures and culture/use of computers.



EP: Environmental Pressures

Figure 1: Conceptual Model – Environmental Pressures, Culture and Factors Contributing to the Usage of Various Categories of Application Software

### Environmental Pressures

In the global economy, the numbers of competing organizations and knowledge workers have been increasing. Additionally, the environment changes much faster than organizations (Scott-Morton 1991, Turban et al. 2001). The characteristics of the environment include time compression–amazing short product life cycle, strategic discontinuity–competition in uncertainties, blurring organizational boundaries–increased collaboration, knowledge intensity, increased returns to the scale, and customer focused (El Sawy et al, 1999). There are continuous strains on most of the organization's culture, policies, and people because of new technology, new products, and changing public tastes and values (Schein, 1985). The U.S. industries fought foreign competition in the past decade to regain their position as the global leader using information technology (Sutcliffe, 1997). Thus, for successful implementation of IT applications, environmental pressures play an important role in converting the mindset of the organization's employees (Agrawal et al., 2003).

The environmental pressures also drive organizations to master new technology and adopt new innovation (Luftman et. al., 2004). Furthermore, a delay in adoption can result in a major setback for an organization (Luftman et. al., 2004). Table 1 indicates the devasting consequences for organizations that do not keep pace with the technology.

Table 1: Implications of Not Keeping Pace with Technology (Source: Strategic Information Technology and the CEO Agenda, A.T. Kearney Survey of 213 CEOs and Senior Executives, 1998

| | |
|---|---|
| Loss of Competitive Edge | 58% |
| Increased Cost of Production | 16% |
| Would not be in Business | 13% |
| Lack of Control in Running the Business | 7% |
| Other | 3% |
| Would Not Happen | 3% |

The environmental pressures can be measured by variables: frequency of changes in marketing practices, rate of product obsolescence, difficulties in the prediction of competitors' actions, difficulties in the prediction of consumer test/ product demand, and frequency of changes in mode of production/services (Agrawal et. al. 2003).

- **H1:** The severity in environmental pressures (frequency of changes in marketing practices, rate of product obsolescence, prediction of competitors' actions, prediction of consumer test/product demand, and frequency of changes in mode of production/services) positively correlate with factors contributing in usage of various categories of application software (shrinkage in systems life cycle, high cost and high risk-prone tendency of the needed software, desired characteristics of the software solution, administrative motivation, and quantum improvements).

Agrawal, et. al. (2001) argued that a move from tailor-made (proprietary) to off-the-shelf packages will reduce risk and cost at the expense of flexibility. Therefore, if IT's role is only a strategic necessity and not a source of competitive advantage, then the substantial risks and high investments associated with tailor-made packages are not desirable. However, the environmental pressures causing limited time (shrinkages in systems life cycle) for development and the need for frequent changes (strategic discontinuity) will make the option of tailor-made packages infeasible and unattractive. Hence, it does not seem possible for organizations to develop in a short period the complex and integrated large size packages that can only be used for a short period.

***A move from tailor-made (proprietary) to off-the-shelf packages will reduce risk and cost at the expense of flexibility.***

- **H2:** The severity in environmental pressures (frequency of changes in marketing practices, rate of product obsolescence, prediction of competitors' actions, prediction of consumer test/product demand, and frequency of changes in mode of production/services) is positively correlated with growth in the usage of off-the-shelf/ERP packages (gross value and net value).

### *Culture/Use of Computer*

The output of the work systems depends on the interaction between its technical and social subsystems (Schoderbek, Schoderbek, and Kefalas, 1986). The technical system deals with the processes, tasks, and technology needed to transfer inputs to outputs (Bostrom, 1980), whereas the social system is concerned with attributes of people (e.g., attitudes, skills, and values), the roles they enact, the reward systems, and the authority structure. Since the interaction of both subsystems must be jointly optimized (Huse and Cummings, 1985) to optimize the entire work system, culture heavily influences the work systems and plays an important role in adopting innovation and usage of information technology. Additionally, a theory applicable to one culture does not necessarily apply, in total, to other cultures (Hofstede and Bond, 1988). Haire, Ghiselli, and Porter (1966) stated that national differences make a substantial contribution to the differences in a manager's attitude: two-thirds national and one third individual, while certain socio-cultural conditions have to be in place for innovation to occur (Herbig and Day, 1990).

Hofstede (1984) identified four basic dimensions accounting for variations in organizational culture that we have used in this study for measuring culture: *Individualism versus Collectivism:* The extent to which the individual expects personal freedom versus the acceptance of the responsibility to family, tribal, or national groups. More individualism will result in more innovation. *Power Distance:* The degree of tolerance and inequality in wealth and power indicated by the extent to which centralization and autocratic power are permitted. Higher innovation capacity is more available in societies having less power structure or little difference in power status within organizations. *Risk (Uncertainty) Avoidance:* The extent to which a society avoids risks and creates security by emphasizing technology and buildings, laws and rules, and religion. A high-risk avoidance environment is not conducive to entrepreneurship and hence, dampens innovations. *Masculinity versus Femininity:* The extent to which the society differentiates roles between the sexes and places emphasis on masculine values of performance and visible achievements. Masculinity refers to assertive, competitive, and firm, whereas femininity culture refers to soft, yielding, dependent, intuitive, etc. Radical innovation thrives in more masculine societies.

The cultural factors that facilitate innovation will in turn result in an acutely competitive, turbulent, and dynamic environment.

- **H3:** Power distance and uncertainty avoidance are negatively correlated with factors contributing in usage of various categories of application software (shrinkage in systems life cycle, high cost and high risk-prone tendency of the needed software, desired characteristics of the software solution, administrative motivation, and quantum improvements).
- **H4:** Power distance and uncertainty avoidance are negatively correlated with growth in the usage of off-

the-shelf/ERP packages (gross value and net value).

- **H5:** Individualism and masculinity are positively correlated with factors contributing in usage of various categories of application software (shrinkage in systems life cycle, high cost and high risk-prone tendency of the needed software, desired characteristics of the software solution, administrative motivation, and quantum improvements).
- **H6:** Individualism and Masculinity are positively correlated with growth in the usage of off-the-shelf/ERP packages (gross value and net value).

## Methodology

The scope of this study was limited to manufacturing, telecommunication (hardware), computer hardware, banking, hotels, computer software, and airlines. A "survey" approach is used in order to achieve more generalizability and additional richness. The study is divided into three phases:

***The significance level of 0.01 and 0.05 are very common in a larger sample size. For smaller sample size and generalization of model the significance level of 0.1 is justified.***

### *Phase 1–Exploratory Study*

Initially a literature search was conducted, followed by interviews. The data gathered from a literature search and interviews were analyzed, and a revised version of the problem list and a questionnaire were developed. The list of data items are listed in Appendix II.

### *Phase 2–Survey, Construct Validity, and Data Analyses*

In this phase, a questionnaire survey was used. The data are qualitative and quantitative in nature. The hypotheses were tested using correlation analysis. For testing the construct validity of the questionnaire, Principal component factor analysis along with Varimax rotation was performed.

### *Phase 3–Computation of Discriminant Functions*

Discriminant analysis using stepwise variable selection method has been carried out to determine if statistical differences exist between the average score of manufacturing and service sectors within Indian organizations,. The discriminant analysis was also carried out for manufacturing and service sectors in the United States.

## Implementation of Research Methodology

### *Questionnaire Design*

In the questionnaire the Likert scale was used with nine intervals, and open-ended questions were avoided as there were difficulties in measurement. The questions are mutually exclusive.

### *Questionnaire Validation and Testing*

The questionnaire validation was divided into four parts: face validity, criterion validity, content validity, and construct validity. In construct validity, an eigenvalue greater than one rule was employed. While a loading factor of 0.30 has been suggested as sufficient, only loadings greater than 0.32 in absolute value were used in this study (Churchill, 1979). The questionnaire items were found significantly loaded (Appendix I) and grouped under the variables they ought to measure, while there are variables loaded on more than one factor, but there was no variable found not loaded significantly on any of the factors — possible association of variables is one reason, which could be attributed to the loading of more than one construct on the same factor. Further, due to multiple variations and combinations in each study, a general model as proposed in Figure 1 is considered uniformly to facilitate the needed comparison between organizations in India and the United States. After field-testing, the questionnaires were mailed for survey research. A list of data items included in the questionnaire is placed in Appendix II. In addition, the list of variables, along with the data items used for measurement are placed in Appendix II.

### *Administering the Instrument*

The questionnaire survey was administered following the guidelines suggested by Dillman (1978, and 2000). For the **United States**, stratified sampling was used; whereas in **India,** a judgment sampling was used.

A total of 423 questionnaires in India and 384 in the United States were mailed. After about three weeks a follow up letter was mailed. Out of the questionnaires received, the total usable responses were 112 from India and 89 from the United States, resulting in a response rate of 26.48 percent in India and 23.18 percent in the United States. This response rate compares favorably to mail surveys reported in the IS literature, many of which have less than a 25 percent response rate (Jeong, 1995).

### *Profile of Responding Firms and Respondents*

This section is divided into three parts: industry type, organization size, and respondent profile.

#### *Industry type*

In India, 60.8% of the respondents were from the manufacturing sector, compared to 53.8% from the United States. Respondents from banking and manufacturing industries were relatively higher compared to other industries in both countries.

#### *Organization size*

All the respondents in India were from organizations having annual sales above Rupees 1 Crore; in the United States, more than 87.5% were from organizations having annual sales above $500 million. The respondents were approximately in equal proportion in the organizations above Rupees 1 Crore in India and above $ 500 million in the United States.

#### *Respondent profile*

The perception about issues related to IT seems to have a

fair representation based on the respondent's profile in the organization. 76.5% of the respondents from India and 98.8% from the United States are from information systems departments, as intended for this survey research.

## Data Processing and Results

The significance level of 0.01 and 0.05 are very common in a larger sample size. In our case the sample size is 112 (India) and 89 (U.S.A.); thus, the significance level of 0.1 is considered appropriate. Further, for generalization of model and considering the number of combinations of options in the study, the significance level of 0.1 is justified. Software package SPSS version.12.0 has been used for statistical analysis to validate hypotheses.

***United States organizations exhibited a significant higher value in frequent changes in marketing practices to keep pace with its market and competitors.***

This part is divided into six sub-parts: environmental pressures, culture, descriptive statistics of variables, results and analysis, validation of hypotheses, and comparison of manufacturing sector and service sector (results of stepwise–statistical–discriminant function analysis).

### *Environmental Pressures*

The mean values for both the countries are depicted in Figure 2. In comparison with the values in India, organizations in the United States exhibited a significant difference in frequent changes in marketing practices to keep pace with its market and competitors. Furthermore, within moderate range the organizations in the United States have value for predictions of competitors' actions closer to the upper limit, while in India, it is near the lower end of the range. These environmental pressures in United States organizations seem to be contributing significantly in building an innovative culture in the organizations and acting as enabler (Figure 1) to factors contributing in the use of computers and growth in usage of off-the-shelf/ERP packages.

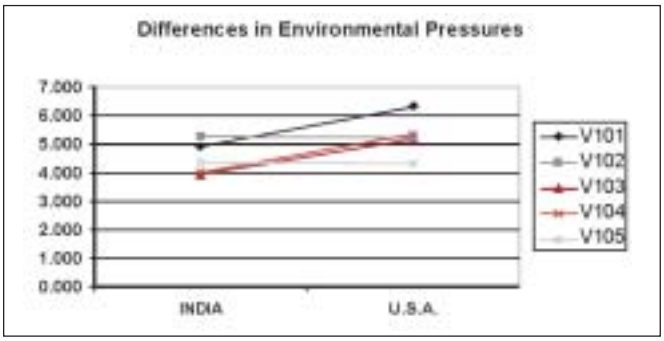



Figure 2: Differences in Environmental Pressures

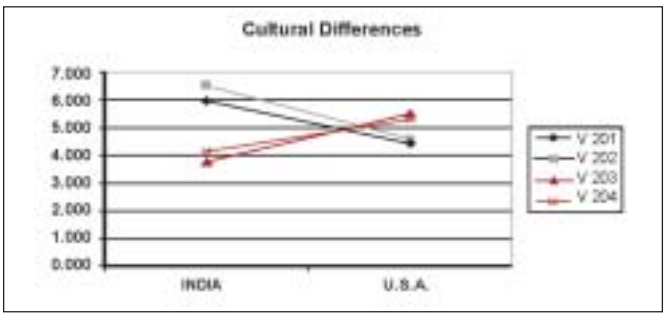



Figure 3: Cultural Difference

### *Culture*

The mean values for both countries are plotted in Figure 3. In comparison with the values in India, organizations in the United States have moderate values for power distance and uncertainty avoidance. Additionally, within moderate range organizations in the United States have values for individualism, and masculinity closer to the upper limit, while in India, it is at the lower end of the range. These attitudes in United States organizations seem to be contributing significantly in building the innovative culture in the organizations and acting as enablers/inhibitors (Figure 1) to factors contributing in the use of computers and growth in usage of off-the-shelf/ERP packages.

### *Descriptive Statistics of Variables*

Table 2 contains the perception of the respondents up to the year 2010, the ranking of variables, and mean values (descriptive statistics of variables). The gross and net values of usage of off-the-shelf/ERP packages are calculated as: gross value (% of off-the-shelf + % of ERP solutions) and net value (% of off-the-shelf + % of ERP solutions + 0.7 * customization), respectively. The results can be argued for the organizations in India and U.S.A. as indicated below:

- **India**: The ranking of variables reveal that the most important factor contributing in the growth in usage of off-the-shelf/ERP packages is high cost and risk-prone

Table 2: Descriptive Statistics of Variables – All Industries

| Sr. No. | Code | Description | INDIA | | USA | |
|---|---|---|---|---|---|---|
| | | | Mean Values | Ranking | Mean Values | Ranking |
| 1 | V301 | Shrinkage in Systems Life Cycle | 7.240 | 2 | 7.004 | 1 |
| 2 | V302 | High-cost and high Risk-prone tendency of the Needed Software | 7.283 | 1 | 6.066 | 3 |
| 3 | V303 | Desired Characte-ristics of the Software Solution | 6.501 | 3 | 6.117 | 2 |
| 4 | V304 | Administrative Motivation | 6.042 | 4 | 5.456 | 4 |
| 5 | V305 | Quantum Impro-vements | 4.908 | 5 | 5.365 | 5 |
| 6 | V306G | Growth in usage of off-the-shelf/ERP packages (Gross Value) | 2.045 | N.A. | 2.170 | N.A. |
| 7 | V306N | Growth in usage of off-the-shelf/ERP packages (Net Value) | 1.171 | N.A. | 1.181 | N.A. |

tendency of the needed software. The Indian organizations are at operational level of IS growth and sophistication (Palvia and Palvia, 1992), therefore, high cost and risk associated, followed by shrinkage in systems life cycle in the development and use of proprietary software, can be justified. Further, due to an opening of the economy, the competitive pressures in India are increasing. The cultural factors and environmental pressures indicate that the values in Indian organizations are getting closer to the value in the United States organizations.

- **U.S.A.**: Because of an open economy, the economic environment in the United States is very competitive compared to India. For the organizations, these competitive pressures have resulted in cutting costs and improving productivity, using automation to a great extent. The environmental factors are expected to continuously drive organizations to higher usage of technology for maintaining a competitive edge. Even though United States organizations are at a higher level of IS growth compared to Indian organizations (Palvia and Palvia, 1992), these competitive pressures are translated in terms of shrinkage in systems life cycle, followed by high cost and risk-prone tendency, as the most important factors resulting in the growth of usage of off-the-shelf/ERP packages.

*The environmental factors are expected to continuously drive organizations to higher usage of technology for maintaining a competitive edge.*

### Results and Analysis

The results of correlations are placed at Appendix II. The interpretation of the results is given below:

### Frequent changes in marketing practice (V101)

**India:** A positive correlation between frequent changes in marketing practice and factors contributing in the usage of various categories of application software (shrinkage in systems life cycle and quantum improvements) support the argument that this variable induces the innovative culture, which will result in a competitive advantage and frequent adoption of new technology/processes in the organizations. The positive correlation can be argued considering the increasing competitive pressures in the country. Further, the negative correlation between frequent changes in marketing practice and growth in usage of off-the-shelf/ERP packages reveal that the vendors of off-the-shelf/ERP packages will not be able to contend with the changing requirements in application software and will not be able to frequently develop/implement upgraded software solutions in the organizations.

**U.S.A.:** There are no statistically significant results obtained.

### Rate of obsolescence of the product (V102)

**India**: There are no statistically significant results obtained.

**U.S.A**.: There are no statistically significant results obtained.

### Prediction of competitors' actions (V103)

**India**: A positive correlation between the prediction of competitors' actions and factors contributing in the usage of various categories of application software (shrinkage in systems life cycle, desired characteristics of software solution, administrative motivation, quantum improvements) support the argument that as the competitors' actions become unpredictable, the need will arise to frequently upgrade technological solutions that contain the best practices in-built, which in turn will result in quantum improvement and regaining/maintaining a competitive advantage for the firm.

**U.S.A**.: A positive correlation between the prediction of competitors' actions and shrinkage in systems life cycle support the argument that as the competitors' actions become unpredictable, the need will arise to frequently upgrade technological solutions to regain/maintain a competitive advantage for the firm.

### Prediction of consumer test/product demand (V104)

**India:** A positive correlation between the prediction of consumer test/product demand and desired characteristics of software solution support the argument that as the consumer test/product demands become unpredictable, the need will arise for more sophisticated technological solutions that can be met by the software containing best practices in-built into its processes. Further, a negative correlation between the prediction of consumer test/product demand and growth in usage of off-the-shelf/ERP solutions (gross value) reveal that such readily available software solutions will be hard to locate in the market, and firms should develop them in-house.

**U.S.A.**: A negative correlation between the prediction of consumer test/product demands and administrative motivation supports the argument that as the prediction of consumer test/product demand becomes difficult, the corporations would rely more on customization, increase their dependencies on human resources, and decrease their dependencies on technological solutions.

### Frequency of changes in mode of production/services (V105)

**India**: There are no statistically significant results obtained.

**U.S.A.**: A negative correlation between the frequency of changes in mode of production/services and factors contributing in the usage of various categories of application software (shrinkage in systems life cycle and desired characteristics of software solution) supports the argument that the rapid changes in mode of production/services will lead corporations to rely more on customization, increase their dependencies on their human resources, and decrease their dependencies on technological solutions.

### Power distance (V201)

**India**: A negative correlation between power distance and

factors contributing in the usage of various categories of application software (shrinkage in systems life cycle, high cost and high risk-prone tendency of the needed software, desired characteristics of the software solution, administrative motivation, and quantum improvements) supports the argument that lower values of power distance will enable organizations to be more innovative, which will result in quantum improvements and growth.

**U.S.A.**: The control of information systems departments on their manpower and IT budget has been decreasing and has shifted to end-users (Edberg and Bowman 1996, He et al. 1998, Lucas 2000). The main reason for this shift is attributed to the availability of knowledgeable end-users and extensive company support to EUC (Turban et al., 1999). The percentage of knowledge and information work constitutes 60% of America's GNP and 55% of their labor force (Laudon and Laudon, 1999). The knowledge workers will extensively use the latest technological solutions while working independently in fulfilling their functional obligations, creating a very limited reliance on higher management. These arguments are supported by the positive correlation between power distance and factors contributing in the usage of various categories of application software (shrinkage in systems life cycle, desired characteristics of the software solution, administrative motivation, and quantum improvements). Additionally, the positive correlation between power distance and growth in usage of off-the-shelf/ERP solutions (gross and net values) supports the argument that the readily available technological solutions can meet their frequently changing, sophisticated requirements.

***Frequent changes in marketing practices induce the innovative culture, which will result in a competitive advantage and frequent adoption of new technology/processes in the organizations.***

### *Uncertainty avoidance (V202)*

**India**: A negative correlation between uncertainty avoidance and factors contributing in the usage of various categories of application software (shrinkage in systems life cycle and desired characteristics of the software solution) supports the argument that lower values of uncertainty avoidance will enable organizations to be more innovative, which will result in the growth of the firms.

**U.S.A.**: There are no statistically significant results obtained.

### *Individualism (V203)*

**India**: The India organizations are at operational level, as classified by the United Nations (Palvia and Palvia, 1992). The growth in knowledge workers and End-users Computing is limited in Indian organizations. Because of the limited exposure of technology they will tend to maintain the status-quo, compared to usage of latest technological solutions. The negative correlation between individualism and shrinkage in systems life cycle supports this argument.

**U.S.A.**: The control of information systems departments on their manpower and IT budget has been decreasing and has shifted to end-users (Edberg and Bowman 1996, He et al. 1998, Lucas 2000). The main reason for this shift is attributed to the availability of knowledgeable end-users and extensive company support to EUC (Turban et al., 1999). The percentage of knowledge and information work constitutes 60% of America's GNP and 55% of their labor force (Laudon and Laudon, 1999). The knowledge workers will extensively use the latest technological solutions while working independently in fulfilling their functional obligations, creating a very limited reliance on higher management. These arguments are supported by the positive correlation between individualism and factors contributing in the usage of various categories of application software (shrinkage in systems life cycle, desired characteristics of the software solution, administrative motivation, and quantum improvements).

### *Masculinity (V204)*

**India**: The India organizations are at operational level, as classified by the United Nations (Palvia and Palvia, 1992). The growth in knowledge workers and End-users Computing is limited in Indian organizations. Because of the limited exposure of technology, they will tend to maintain the status-quo compared to usage of latest technological solutions. These arguments are supported by the negative correlation between masculinity and factors contributing in the usage of various categories of application software (shrinkage in systems life cycle, desired characteristics of the software solution, and administrative motivation).

**U.S.A.**: The control of information systems departments on their manpower and IT budget has been decreasing and has shifted to end-users (Edberg and Bowman 1996, He et al. 1998, Lucas 2000). The main reason for this shift is attributed to the availability of knowledgeable end-users and extensive company support to EUC (Turban et al., 1999). The percentage of knowledge and information work constitutes 60% of America's GNP and 55% of their labor force (Laudon and Laudon, 1999). The knowledge workers will extensively use the latest technological solutions while working independently in fulfilling their functional obligations, creating a very limited reliance on higher management. These arguments are supported by the positive correlation between masculinity and factors contributing in the usage of various categories of application software (shrinkage in systems life cycle and administrative motivation).

### *Validation of Hypotheses*

Based on the results and above interpretation, the hypotheses can be concluded (Appendix III)

## Comparison of Manufacturing Sector and Service Sector (Results of Stepwise – Statistical – Discriminant Function Analysis)

The results of stepwise (statistical) discriminant function

analyses reveal that there are significant differences in the values of the manufacturing sector and service sector in the number of variables, as given in Table 3. The classification procedure, classifying substantially more than the number of cases, should be correct by chance.

Table 3: Results of Discriminant Analysis: Summary of Comparison between Manufacturing and Service Sectors

| Independent Variables (Predictors) | Significant higher values in MS (manufacturing sector) or SS (service sector) as indicated in the applicable columns below | |
|---|---|---|
| | India | U.S.A. |
| V303: Desired characteristics of the software solution | SS | |
| V304: Administrative motivation<br>V305: Quantum improvement | SS | |
| V306G: Gross increase/decrease in relative share of off-the-shelf/ERP packages. | MS | |
| V306N: Net increase/decrease in relative share of off-the-shelf/ERP packages. | | MS |
| V102: The rate of obsolescence of your product. | MS | MS |
| V103: Prediction of competitor's actions (fairly easy to very unpredictable). | SS | |
| V104: Forecast of demand and prediction of consumer test (easy to very difficult). | | |
| V105: The mode of production/services (well established to subject to very much change). | | MS |
| V203: Individualism (degree to which people in a culture prefer to act as individuals rather than members of groups). | | SS |
| V204: Masculinity – degree to which value like assertiveness, performance, success, and competitiveness prevails among people of a culture over gentle values like quality of life, maintaining warm personal relationships, service, care of the weak, etc | SS | |

MS- Manufacturing Sector, SS- Service Sector

• ***India***

o Earlier, the major emphasis was on improving the productivity; hence, the major concentration was in the manufacturing sector. Subsequently, the service sector is also considered by the organizations for further improvements. In the future, usage in a higher percentage of off-the-shelf/ERP packages in the manufacturing sector may be a result of relatively standard processes and availability of reliable and sophisticated packaged solutions for manufacturing operations.

o Because of growth in white collar workers, growth in knowledge workers, and a potential cost savings in support functions in the past, the organizations initiated IT applications in the service sector. In the future, the organizations hope to increase IT applications in the service sector.

o The faster rate of obsolescence of products seems to be causing an excessive pressure on manufacturing sector to create facilities for developing and manufacturing customized products.

o Because of non-standard processes in service sector, it is very difficult to predict competitors' actions. Therefore, the higher amount of masculinity in labor force can help organizations in survival and growth.

• ***U.S.A.***

o The major emphasis in the competitive market is on improving the productivity; therefore, the major concentration seems to be in the manufacturing sector. The availability of user-friendly packages is suited more to blue-collar workers. Further, usage in the higher percentage of off-the-shelf/ERP packages in the manufacturing sector may also be a result of relatively standard processes and availability of reliable and sophisticated packaged solutions for manufacturing operations.

o The faster rate of obsolescence of products seems to be causing an excessive pressure on manufacturing sector to create facilities for developing and manufacturing customized products. The problem of frequent changes in the mode of production/services in manufacturing sector also can be addressed to an extent by manufacturing customized products.

o Considering the job requirements in service sector, the higher amount of individualism in the culture of human resources can have substantial benefits to the organizations.

## Limitations of the Study

As with any other study, this research also has several limitations that need to be discussed. First, the list of variables pertaining to IT related issues might reflect some biases. Although the literature was thoroughly reviewed and additional perspectives were obtained form IS academicians and managers, we do not claim that these are the only variables that could be included. Thus, it must be stressed that any interpretation of the findings be made in light of the selected set of variables, issues, and categories. Availability of literature in the area of information technology in context of developing countries was found to be scarce and limited. Any research that uses data gathered for inferential statistics assumes that the data are collected randomly from the population, which was the case with U.S. organizations, while stratified

***Because of non-standard processes in service sector, it is very difficult to predict competitors' actions. Therefore, the higher amount of masculinity in labor force can help organizations in survival and growth.***

judgment sampling was used in the case of Indian organizations. Since the questionnaire survey involved people from various departments such as information systems, administration, accounting/finance, production, etc., a balance among the number of respondents from each department could not be achieved. Secondly, with organizations in India, multiple samples have been collected because the executives of these firms showed keen interest in this study, and in India there are a limited number of organizations with experience of IT applications for more than five years. As well, the choice of firms for the questionnaire survey in India was restricted to technological hubs located in northern, southern, and western parts of the country. Additionally, there is a base of firms scattered in other parts of the country, which could not be included in the sample. Additionally, samples were collected from the manufacturing sector (telecommunication hardware, computer hardware, and other manufacturing industries) and service sector (banking, hotels, computer software, and airlines). Other types of organizations like insurance, financial institutions, etc. are not included in the sample. Thus, any inferences based on the results might be restricted to the companies listed in the directory.

## Suggestions for Further Work

The findings from this study-in the area of culture, environmental pressures, and factors contributing in the usage of various categories of application software-provide several study opportunities for future research, and the results suggest that it might be useful to develop a number of comprehensive models. Therefore, future research can extend this study to include additional factors such as organizational maturity, IS sophistication, etc, to test a variety of such factors. In studying this, future research is recommended utilizing more rigorous methodologies that employ longitudinal approaches and non-linear relationships. Further, with a broader sample and number of variables, a more generalized model can be developed.

## Concluding Remarks

The main objective of this study was to arrive at a better understanding of the number of issues pertaining to implications of environmental pressures and cultural factors on the factors contributing in the usage of various categories of application software in India and learning from the experience of the United States, the world leader in IT applications. This research has allowed us to investigate a number of issues and identify that in United States organizations: (1) the knowledge workers will extensively use the readily available latest technological solutions while working independently in fulfilling their functional obligations, creating a very limited reliance on higher management, (2) the environmental and cultural factors will lead the corporations to rely more on customization, along with extensive dependencies on their human resources. This in turn may result in a decline in dependencies of their human resources in technological solutions, (3) the growth in usage of off-the-shelf/ERP packages, prediction of competitors' actions, and instability in mode of production/ services were having significant higher values in manufacturing sector, and (4) the variable individualism was having significant higher value in service sector.

However, in case of Indian organizations: (1) the results reveal that the competitive pressures are generating a need for a technological centered, innovative culture, along with changes in organizational structure and attitudes within the firms for survival and growth, (2) the India organizations are at operational level as classified by the United Nations (Palvia and Palvia, 1992). The growth in knowledge workers and End-users Computing is limited in Indian organizations. Because of limited exposure of technology they will tend to maintain the status-quo compared to usage of latest technological solutions, (3) further, it appears that the vendors of off-the-shelf/ERP packages will not be able to contend with the changing requirements in the application software and will not be able to frequently develop/ implement upgraded software solutions in the organizations, (4) in service sector, the significant higher values are found for variables desired characteristics of software solution, quantum improvements, prediction of competitors' actions, and masculinity, and (5) the variables growth in the usage of off-the-shelf/ERP packages and rate of obsolescence of the products had significantly higher values in manufacturing sector.

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## Appendix I: Factor Analysis: Factors and Variables through the Construct of Items Loaded

| ORGANIZATIONS IN **INDIA** | | | | |
|---|---|---|---|---|
| Factor | Eigen Value | % Variances | Cumulative % | Variable Construct Loaded |
| 1 | 2.815 | 15.64 | 15.64 | E3(f, g, i, j, k**, l, n**, o, q**) |
| 2 | 2.014 | 11.189 | 26.828 | E3(a*, b**, c, i**, k**, m**, p**, q) |
| 3 | 1.609 | 8.941 | 35.769 | E3(d**, e, g**, h**, k, p**, r) |
| 4 | 1.515 | 8.418 | 44.187 | E3(c**, d**, h, m, o**) |
| 5 | 1.338 | 7.436 | 51.623 | E3(a, b, f**) |
| 6 | 1.213 | 6.741 | 58.365 | E3(d, n**, p, r**) |
| 7 | 1.111 | 6.175 | 64.539 | E3(a**, f**, i**, n, q**) |
| ORGANIZATIONS OF **USA** | | | | |
| Factor | Eigen Value | % Variances | Cumulative % | Variable Construct Loaded |
| 1 | 4.259 | 23.663 | 23.663 | E3(a, b**, d, e, g, h**, j**, l**) |
| 2 | 3.168 | 17.597 | 41.261 | E3(a**, b, f, i, j, l, q) |
| 3 | 1.959 | 10.886 | 52.146 | E3(a**, b**, h, i**, k, n**, p**, r) |
| 4 | 1.537 | 8.537 | 60.683 | E3(j**, m, n, o, p) |
| 5 | 1.23 | 6.831 | 67.514 | E3(b**, c, d**, h**, m**) |
| ** Items loaded on multiple factors, but having relatively lower significance and are above the cut-off value of 0.32 (absolute value). | | | | |

## Appendix : II

### (a) List of Data Items included in the Questionnaire

| Code | Description |
|---|---|
| E3a | Time compression. |
| E3b | Shorter obsolescence cycle of packages. |
| E3c | High failure rate of packages. |
| E3d | Cost of development of packages. |
| E3e | Complexity of required application packages. |
| E3f | Non-availability of manpower in information technology. |
| E3g | The packages have in-built best practices followed in the industry |
| E3h | Ease of training |
| E3i | Higher rate of upgrades in hardware/software. |
| E3j | Organisations prefer to change their processes due to advantages in using the packages. |
| E3k | The packages can help in implementation of Just-in-Time/Total-Quality-Management/ Business Process Reengineering. |
| E3l | The packages are proven for reliability. |
| E3m | Availability of skilled End User to operate the packages. |
| E3n | Little maintenance problem in the packages. |
| E3o | Availability of reliable software maintenance support. |
| E3p | Flexibility available in the software packages. |
| E3q | Packages are critical to the operation of the organisation. |
| E3r | Control on the entire life cycle of the package. |

### (b) List of Variables along with Corresponding Data Items used for Measurement

| Variable Description | Variable Code | Code Numbers of Data Items |
|---|---|---|
| The changes in Marketing Practices to keep up with its market and competitors ( 1 for rarely to 9 for very frequently i.e. semi-annually) | V101 | *M.V. of data item |
| The rate of obsolescence of your product (1 for very slow to 9 for high) | V102 | *M.V. of data item |
| Predictions of competitors actions (1 for fairly easy to 9 for very unpredictable) | V103 | *M.V. of data item |
| Forecast of demand and prediction of consumer test (1 for easy to 9 for very difficult) | V104 | *M.V. of data item |
| The mode of production/services (1 for well established to 9 for subject to very much change) | V105 | *M.V. of data item |
| Power distance (degree of inequality among people which the population of a culture considers normal) - (1 for low to 9 for high) | V201 | *M.V. of data item |
| Uncertainty avoidance (degree to which people in a culture feel uncomfortable with uncertainty and ambiguity) - (1 for low to 9 for high) | V202 | *M.V. of data item |
| Individualism (degree to which people in a culture prefer to act as individuals rather than members of groups) - (1 for low to 9 for high) | V203 | *M.V. of data item |
| Masculinity (degree to which value like assertiveness, performance, success, and competitiveness prevails among people of a culture over gentle values like quality of life, maintaining warm personal relationships, service, care of the weak, etc.) - (1 for low to 9 for high) | V204 | *M.V. of data item |
| Shrinkage in Systems Life Cycle | V301 | *M.V. of E3a, E3b, and E3i |
| High Cost and High Risk Prone Tendency of the needed Software | V302 | *M.V. of E3c, E3d, and E3e |
| Desired Characteristics of the Software Solution | V303 | *M.V. of E3g, E3h, E3k, E3l, and E3n |
| Administrative Motivation | V304 | *M.V. of E3f, E3j, E3m, E3o, and E3q |
| Quantum Improvement | V305 | *M.V. of E3p, and E3r |
| Gross Increase/decrease in relative share of off-the-shelf/ERP packages. | V306G | Input of Values |
| Net Increase/decrease in relative share of off-the-shelf/ERP packages. | V306N | Input of Values |
| *M.V. – Mean Values | | |

## (c) Results of Statistical Correlation

| INDIA | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | V301 | V302 | V303 | V304 | V305 | V306_G | V306_N |
| V101 | Pearson Correlation | 0.199 | 0.035 | 0.120 | 0.153 | 0.293 | -0.241 | -0.186 |
| | Sig. (2-tailed) | 0.038 | 0.720 | 0.212 | 0.112 | 0.002 | 0.011 | 0.052 |
| | N | 110 | 108 | 110 | 109 | 108 | 110 | 110 |
| V102 | Pearson Correlation | 0.028 | 0.146 | -0.049 | -0.054 | -0.003 | -0.001 | -0.004 |
| | Sig. (2-tailed) | 0.772 | 0.133 | 0.615 | 0.579 | 0.976 | 0.991 | 0.967 |
| | N | 109 | 107 | 109 | 108 | 107 | 109 | 109 |
| V103 | Pearson Correlation | 0.185 | 0.064 | 0.236 | 0.218 | 0.224 | -0.139 | -0.098 |
| | Sig. (2-tailed) | 0.056 | 0.514 | 0.014 | 0.024 | 0.021 | 0.150 | 0.312 |
| | N | 108 | 107 | 108 | 107 | 106 | 108 | 108 |
| V104 | Pearson Correlation | -0.060 | 0.060 | 0.224 | 0.081 | -0.020 | -0.162 | -0.151 |
| | Sig. (2-tailed) | 0.540 | 0.541 | 0.020 | 0.408 | 0.842 | 0.093 | 0.119 |
| | N | 108 | 107 | 108 | 107 | 106 | 108 | 108 |
| V105 | Pearson Correlation | -0.012 | 0.087 | 0.056 | -0.033 | 0.027 | 0.080 | 0.105 |
| | Sig. (2-tailed) | 0.904 | 0.375 | 0.564 | 0.740 | 0.785 | 0.413 | 0.278 |
| | N | 108 | 106 | 108 | 107 | 106 | 108 | 108 |
| V201 | Pearson Correlation | -0.370 | -0.229 | -0.300 | -0.203 | -0.232 | 0.140 | 0.126 |
| | Sig. (2-tailed) | 0.000 | 0.017 | 0.002 | 0.036 | 0.017 | 0.148 | 0.192 |
| | N | 108 | 107 | 108 | 107 | 106 | 108 | 108 |
| V202 | Pearson Correlation | -0.214 | -0.152 | -0.258 | -0.106 | -0.058 | 0.097 | 0.013 |
| | Sig. (2-tailed) | 0.025 | 0.114 | 0.007 | 0.276 | 0.556 | 0.318 | 0.891 |
| | N | 109 | 109 | 109 | 108 | 106 | 109 | 109 |
| V203 | Pearson Correlation | 0.212 | 0.064 | 0.012 | 0.063 | -0.107 | -0.056 | -0.030 |
| | Sig. (2-tailed) | 0.027 | 0.508 | 0.900 | 0.517 | 0.271 | 0.560 | 0.757 |
| | N | 110 | 108 | 110 | 109 | 108 | 110 | 110 |
| V204 | Pearson Correlation | 0.163 | 0.131 | 0.174 | 0.297 | 0.074 | -0.110 | -0.079 |
| | Sig. (2-tailed) | 0.090 | 0.178 | 0.070 | 0.002 | 0.446 | 0.254 | 0.414 |
| | N | 109 | 108 | 109 | 108 | 107 | 109 | 109 |
| USA | | | | | | | | |
| | | V301 | V302 | V303 | V304 | V305 | V306_G | V306_N |
| V101 | Pearson Correlation | 0.019 | 0.165 | 0.017 | 0.148 | -0.172 | -0.118 | -0.153 |
| | Sig. (2-tailed) | 0.861 | 0.128 | 0.877 | 0.170 | 0.111 | 0.281 | 0.158 |
| | N | 85 | 87 | 87 | 87 | 87 | 86 | 86 |
| V102 | Pearson Correlation | 0.082 | 0.031 | 0.059 | 0.126 | 0.022 | 0.091 | -0.045 |
| | Sig. (2-tailed) | 0.458 | 0.776 | 0.592 | 0.249 | 0.840 | 0.411 | 0.683 |
| | N | 85 | 86 | 86 | 86 | 86 | 84 | 84 |
| V103 | Pearson Correlation | 0.277 | 0.040 | 0.159 | 0.165 | -0.055 | 0.032 | 0.081 |
| | Sig. (2-tailed) | 0.010 | 0.710 | 0.139 | 0.124 | 0.610 | 0.770 | 0.461 |
| | N | 86 | 88 | 88 | 88 | 88 | 86 | 86 |
| V104 | Pearson Correlation | -0.095 | 0.058 | -0.095 | -0.273 | -0.071 | 0.120 | 0.166 |
| | Sig. (2-tailed) | 0.383 | 0.593 | 0.381 | 0.010 | 0.513 | 0.267 | 0.124 |
| | N | 86 | 88 | 88 | 88 | 88 | 87 | 87 |
| V105 | Pearson Correlation | -0.228 | 0.128 | -0.288 | 0.132 | -0.007 | -0.086 | -0.015 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Sig. (2-tailed) | 0.036 | 0.239 | 0.007 | 0.222 | 0.952 | 0.435 | 0.891 |
| | N | 85 | 87 | 87 | 87 | 87 | 85 | 85 |
| V201 | Pearson Correlation | 0.243 | 0.142 | 0.383 | 0.193 | 0.098 | 0.257 | 0.225 |
| | Sig. (2-tailed) | 0.024 | 0.194 | 0.000 | 0.076 | 0.368 | 0.018 | 0.038 |
| | N | 86 | 86 | 86 | 86 | 86 | 85 | 85 |
| V202 | Pearson Correlation | 0.125 | -0.007 | 0.154 | -0.073 | 0.152 | 0.118 | 0.140 |
| | Sig. (2-tailed) | 0.251 | 0.947 | 0.157 | 0.506 | 0.164 | 0.283 | 0.201 |
| | N | 86 | 86 | 86 | 86 | 86 | 85 | 85 |
| V203 | Pearson Correlation | 0.386 | 0.086 | 0.310 | 0.286 | 0.212 | 0.110 | -0.043 |
| | Sig. (2-tailed) | 0.000 | 0.429 | 0.003 | 0.007 | 0.049 | 0.313 | 0.692 |
| | N | 85 | 87 | 87 | 87 | 87 | 86 | 86 |
| V204 | Pearson Correlation | 0.211 | -0.010 | 0.144 | 0.244 | -0.015 | -0.078 | -0.061 |
| | Sig. (2-tailed) | 0.054 | 0.925 | 0.185 | 0.024 | 0.893 | 0.482 | 0.583 |
| | N | 84 | 86 | 86 | 86 | 86 | 84 | 84 |

## Appendix III: Conclusion of Hypotheses

**H1: The severity in environmental pressures (frequency of changes in marketing practices, rate of product obsolescence, prediction of competitors' actions, prediction of consumer test/product demand, and frequency of changes in mode of production/services) positively correlate with factors contributing in usage of various categories of application software (shrinkage in systems life cycle, high cost and high risk-prone tendency of the needed software, desired characteristics of the software solution, administrative motivation, and quantum improvements).**

| | INDIA | U.S.A. | COMMENTS |
|---|---|---|---|
| Frequency of changes in marketing practices is positively correlated with shrinkage in systems life cycle. | Accept | | |
| Frequency of changes in marketing practices is positively correlated with quantum improvements. | Accept | | |
| Prediction of competitors' action is positively correlated with shrinkage in systems life cycle. | Accept | Accept | |
| Prediction of competitors' action is positively correlated with desired characteristics of the software solution. | Accept | | |
| Prediction of competitors' action is positively correlated with administrative motivation. | Accept | | |
| Prediction of competitors' action is positively correlated with quantum improvements. | Accept | | |
| Prediction of consumer test/product is positively correlated with desired characteristics of the software solution. | Accept | | |
| Prediction of consumer test/product is positively correlated with administrative motivation. | Do Not Accept** | | ** Significant negative correlation |
| Frequency of changes in mode of production/services is positively correlated with shrinkage in systems life cycle. | Do Not Accept** | | ** Significant negative correlation |
| Frequency of changes in mode of production/services is positively correlated with desired characteristics of the software solution. | Do Not Accept** | | ** Significant negative correlation |

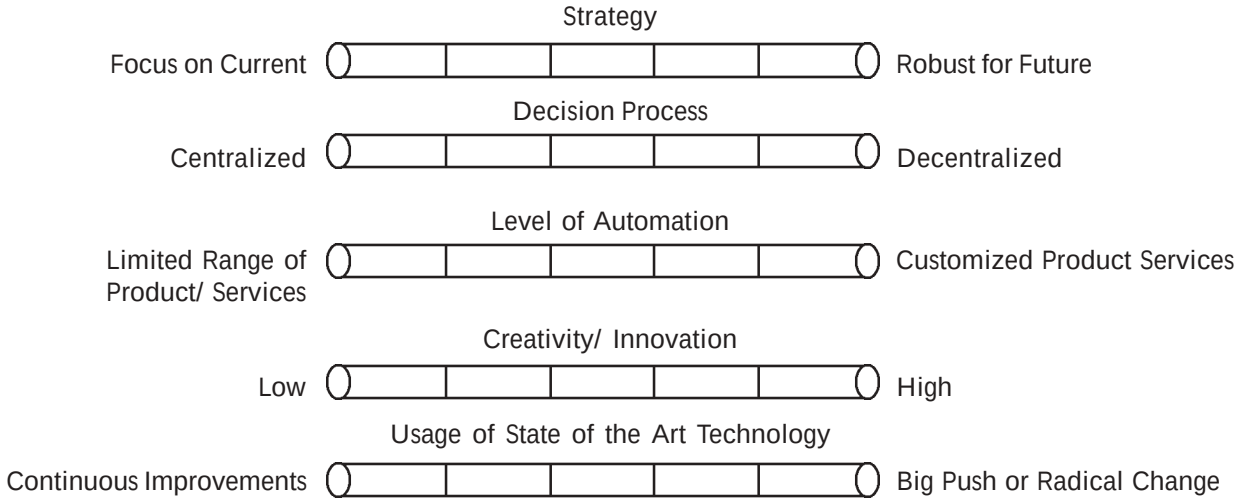
**H2: The severity in environmental pressures (frequency of changes in marketing practices, rate of product obsolescence, prediction of competitors' actions, prediction of consumer test/product demand, and frequency of changes in mode of production/services) is positively correlated with growth in the usage of off-the-shelf/ERP packages (gross value and net value).**

| | INDIA | U.S.A. | COMMENTS |
|---|---|---|---|
| Frequency of changes in marketing practices is positively correlated with growth in usage of off-the-shelf/ERP packages (gross value). | Do Not Accept** | | ** Significant negative correlation |
| Frequency of changes in marketing practices is positively correlated with growth in usage of off-the-shelf/ERP packages (net value) | Do Not Accept** | | ** Significant negative correlation |
| Prediction of consumer test/product is positively correlated with growth in usage of off-the-shelf/ERP packages (gross value). | Do Not Accept** | | ** Significant negative correlation |

| | | | |
|---|---|---|---|
| **H3: Power distance and uncertainty avoidance are negatively correlated with factors contributing in usage of various categories of application software (shrinkage in systems life cycle, high cost and high risk-prone tendency of the needed software, desired characteristics of the software solution, administrative motivation, and quantum improvements).** | | | |
| | **INDIA** | **U.S.A.** | **COMMENTS** |
| Power distance is negatively correlated with shrinkage in systems life cycle. | Accept | Do Not Accept** | ** Significant positive correlation |
| Power distance is negatively correlated with high cost and high risk-prone tendency of the needed software | Accept | | |
| Power distance is negatively correlated with desired characteristics of the software solution. | Accept | Do Not Accept** | ** Significant positive correlation |
| Power distance is negatively correlated with administrative motivation. | Accept | Do Not Accept** | ** Significant positive correlation |
| Power distance is negatively correlated with quantum improvements. | Accept | | |
| Uncertainty avoidance is negatively correlated with shrinkage in systems life cycle. | Accept | | |
| Uncertainty avoidance is negatively correlated with desired characteristics of the software solution. | Accept | | |
| **H4: Power distance and uncertainty avoidance are negatively correlated with growth in the usage of off-the-shelf/ERP packages (gross value and net value).** | | | |
| | **INDIA** | **U.S.A.** | **COMMENTS** |
| Power distance is negatively correlated with growth in usage of off-the-shelf/ERP packages (gross value). | | Do Not Accept** | ** Significant positive correlation |
| Power distance is negatively correlated with growth in usage of off-the-shelf/ERP packages (net value) | | Do Not Accept** | ** Significant positive correlation |
| **H5: Individualism and masculinity are positively correlated with factors contributing in usage of various categories of application software (shrinkage in systems life cycle, high cost and high risk-prone tendency of the needed software, desired characteristics of the software solution, administrative motivation, and quantum improvements).** | | | |
| | **INDIA** | **U.S.A.** | **COMMENTS** |
| Individualism is positively correlated with shrinkage in systems life cycle. | Do Not Accept** | Accept | ** Significant negative correlation |
| Individualism is positively correlated with desired | | Accept | |
| characteristics of the software solution. | | | |
| Individualism is positively correlated with administrative motivation. | | Accept | |
| Individualism is positively correlated with quantum improvements. | | Accept | |
| Masculinity is positively correlated with shrinkage in systems life cycle. | Do Not Accept** | Accept | ** Significant negative correlation |
| Masculinity is positively correlated with desired characteristics of the software solution. | Do Not Accept** | | ** Significant negative correlation |
| Masculinity is positively correlated with administrative motivation. | Do Not Accept** | Accept | ** Significant negative correlation |
| **H6: Individualism and Masculinity are positively correlated with growth in the usage of off-the-shelf/ERP packages (gross value and net value).** | | | |
| | **INDIA** | **U.S.A.** | **COMMENTS** |
| Individualism is positively correlated with growth in usage of off-the-shelf/ERP packages (gross value). | | | |
| **NOTE : In all remaining blank cells : Do Not Accept because of insignificant statistical results.** | | | |

## Flexibility Mapping : Practitioner's Perspective

1. What types of flexibilities you see in the practical situation of "IT- enabled business transformation" on the following points:
   - Flexibility in terms of "options"
   - Flexibility in terms of "change mechanisms"
   - Flexibility in terms of "freedom of choice" to participating actors.
2. Identify and describe the types of flexibilities that are relevant for your own organizational decisions on development and usage of various categories of application software? On which dimensions,flexibility should be enhanced?
3. Try to map your own organization on following continua of issues related to usage of various categories of application software (Please tick mark in the appropriate box(es))




4. Develop a SAP-LAP (Situation Actor Process-Learning Action performance) model for "Factors influencing the usage of various categories of application software" relevant to your organization.

## Reflecting Applicability in Real Life:

1. In terms of usage of integrated applications like ERP solutions, at what level is your organization?
2. In your organization, identify the cultural and environmental factors which enables and inhibits the usage of various categories of application software.

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# About GIFT

**GIFT** (Global Institute of Flexible Systems Management) is a professional society to enhance *"flexibility"* in business and management.

## Mission

To evolve and enrich the flexible systems management paradigm for the new millennium.

## Vision

Evolving as a global forum for interaction of all interested professionals and organisations in a truly flexible mode so as to help them create more options, faster change mechanisms and greater freedom of choice in their own settings.

## Schools

The Institute comprises of various schools, which are autonomous bodies, dealing with contemporary areas at the cutting edge contributing to the flexible systems management paradigm. At any point of time, each member can opt for an association with any two of the following schools in the respective thrust areas:

* GIFT School of Global Management
* GIFT School of Technology and Innovation Management
* GIFT School of Information Technology & Knowledge Management
* GIFT School of Learning Organization and Strategic Transformation
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* GIFT School of Environment Management and Sustainable Development
* GIFT School of Human Values and Management Ethos
* GIFT School of Social Change
* GIFT School of Entrepreneurship
* GIFT School of Services Management
* International Congress of E-Government (ICEG)

## Publications

– Book Series on Flexible Systems Management
– Quarterly Journal - *"Global Journal of Flexible Systems Management"* ***giftjourn@l***
– Newsletter - *"Flexibility"*

## Membership

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