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Genesis, Launch and Innovative Features

Almost five decades back, there was a pressing need to look for a synthesis of knowledge which was not well organized. This, at that time, resulted into a movement in the form of ‘General Systems Thinking’, which led to significant developments in the areas of General Systems Theory, Systems Engineering, Cybernetics and System Dynamics.

Parallely, the developments in management have evolved from the traditional school to behavioural school and ultimately to an integrative school, which took shape in the form of socio-technical systems, open systems thinking and contingency theory of management.

In the last two decades, particularly in the 90s, an explosion of knowledge has taken place and many new management approaches have evolved having roots in systems thinking. Some of the these developments have taken shape in the form of Total Quality Management, Business Process Reengineering, Learning Organisation, World Class Organisation, Network Organisation, Knowledge Management, e-Business, Paradox Management, Complexity and Chaos Theory, Change Management, and so on. With this explosion of knowledge, we are entering into a new management jungle.

This effort on ‘Flexible Systems Management’ is a movement towards a new synthesis of knowledge in the disciplines of systems and management, where the bottom line is ‘flexibility’. It has been noted that in most of the evolving managerial approaches, having emphasis on different issues, at least one thing is common and that is ‘flexibility’. It is perceptible that we are heading towards a ‘flexible school of management’.

On the other hand, if we see in actual practice, the business environment is changing rapidly with added acceleration and thereby generating turbulence, uncertainty, ambiguity, complexity and chaos. This points towards the need for a new business paradigm which has high degree of adaptiveness, openness, responsiveness, and agility. These and many more connotations of flexibility are reflected in new management approaches. Isolated efforts are being made to deal with various types of flexibilities in business and management, such as strategic flexibility, organisational flexibility, financial flexibility, marketing flexibility, information systems flexibility, manufacturing flexibility, operational flexibility, innovation flexibility, and so on.

A plethora of new concepts have been developed, such as empowerment, flexi-time, flexi-place, fluid and flexible organisation, flexible business models, flexible strategies, strategic change, flexible budgets, mass customization, and many more. However, despite this growing interest in the area of flexibility in management, a synthesis of new knowledge is lacking and one gets lost in the new jungle of management thought.

This journal is a modest attempt to bridge this gap by coalescing these isolated and scattered developments in the form of an evolving paradigm of management, which will generate a clearer perspective of flexibility in business and management. Flexibility is a multi-dimensional concept and a simple tool of continuum is used to synthesize the multiple perspectives. The Journal is starting a series on ‘Learning Lessons on Flexible Systems Management’ to understand this new paradigm, its methodology, models and tools. The first lesson defines the concept of ‘systemic flexibility’ rooted in the concept of continuum and paradox.

To clarify the concepts of flexibility in real life, another learning series on ‘Benchmark Flexibility Practices’ is initiated which will report flexibility practices followed by leading organisations to help them steer effectively in the sea of turbulent business.
Editorial

In order to enhance practical utility of the research and experiential knowledge reported in various papers, an innovative framework is provided to the readers to help them relate it with the real life situation in their own context. At the end of each paper, a section is provided on ‘Flexibility Mapping: Practitioner’s Perspective’ to help the reader in reflecting the flexibility issues dealt with in the paper in their own context so as to enhance the flexibility of the related dimensions. Another section on ‘Reflecting Applicability in Real Life’ is provided to give lead questions for examining the applicability of issues raised in the paper in a real life situation. This innovative approach will make the papers reported here more meaningful and relevant for practical use. Further, this will also aid the teaching-learning process in a formal setting.

It is hoped that the GIFT journal would provide a good learning platform to share research findings and experience by interested professionals and would help the readers to consolidate and synthesize the new management paradigm with a focus on flexibility.

The publication effort of GIFT journal is supported by and aligned with many other activities and publications by GIFT, inter alia, Global Conference GLOGIFT, Case Competition GIFTCASE, Seminars and Workshops, and Book series on Flexible Systems Management. All these put together would support the movement on Flexible Systems Management.

I take this opportunity to thank all the members of the Editorial Board, and Managing Committee, referees, authors and supporting staff for their significant contributions in making this initiative a reality. I would be extremely grateful to all the readers for their constructive feedback and suggestions to improve the relevance, utility and quality of the GIFT presentations.

Sushil

Editor-in-Chief

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Balancing External and Internal Flexibilities – Emerging Strategy Paradigms for Indian Organisations

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Abstract
A successful organisation in the turbulent Indian market today, must continue to compete efficiently in its current core business and at the same time the organisation must innovate ahead of the competition to create new value streams. Each organisation is thus faced with its own paradox of dynamically balancing ‘Focus on Current’ versus ‘Robust for Future’ strategies. In Technology based businesses, ideas are currency of the future. Success thus depends on managing for internal flexibilities to generate external flexibilities for a ‘serial entrepreneurial’ mode. 146 Indian managers from 54 organisations and 12 industry segments responded to 62 questions in this research. The results have been statistically analysed and final results after factor analysis have been used to develop a two axes model for managing knowledge strategies at turbulent times through internal and external flexibilities. The final topology of strategy postures of the Indian organisations studied have been compared with models proposed by other researchers. The concluding section discusses the evolving models for managing knowledge in the Indian context.

Keywords: balancing, external flexibility, internal flexibility, paradox, strategy paradigm

Introduction
The world of business is changing today at an ever accelerating rate. Product, technology, organisational life cycles are continuously crunched. Successful business strategy, therefore, is dynamic, real-time and must be designed to cope with uncertainties and surprises. Organisational equilibrium is challenged due to disruptive technologies like the world wide web or due to convergence. Such turbulence makes it difficult for rigidly structured organisations to survive for long periods ‘like rigid buildings in an earthquake’ (Collins and Porras, 1994). Unpredictable and often intense turbulence demands strategic flexibility from the very foundation of the organisation.

For an existing company to survive and prosper in such times, it must evolve faster than the market. This leads to a paradoxical situation. Because, a successful organisation of today must continue to compete effectively in its current core business and at the same time the organisation must create new capabilities for e-commerce, m-commerce or the global market and innovate ahead of competition. This introduces conflicting new themes and strategic alternatives for the organisation exhibiting classic signs of uncertainty (like incompleteness, indeterminacy, irrelevance of past knowledge, and in-commensurability).

Relevance of the Research
Technology Based Organisations in India (TBIOS) find in addition to these dilemmas the simultaneous new pressures on price, quality, design and complexity of global logistics. There are still very few empirical studies available on strategic trajectories that Indian organisations followed during the 1990s or can follow in the coming decade to successfully transform for the new paradigm.

International research studies (Kosnik and Moriarty, 1989) showed the challenges of TBOs coming not only from the disturbance due to rising competitive intensity of “freshness” adoption but also due to “steadily and dramatically decreasing life span of products, markets and entire industries”. They noted that “resulting frequent threats to survival have been increasingly forcing some firms into continual entrepreneurial behaviour”. Some defined this strategic mode as “Perpetual Renaissance” (Glinow and Moehrman, 1990). When the context for strategy evolves rapidly, the process of changing becomes as important to study as change itself. At the beginning of this research it was also observed that:

- Textbooks on strategy or corporate policy and planning recommend a fairly straight forward linear process for success.

- The belief in unique generic strategies and integrated strategic position based on the discipline of long-term thinking (Hax and Kajluf, 1984) constituted the framework of strategic thinking in Indian corporates.

But a number of research articles are also available on the experience of global companies during the restructuring of last ten years and about their dissatisfaction with conventional strategies. Many have re-emphasised concepts of “emergent strategy”, “adaptive
mode” and “chaos” (Quinn 1985, Mintzberg 1994). A number of new studies brought out the impact of ‘flexibility’ on strategy (Argyris, 1991). These findings are relevant in the ‘surprising’ and ‘discontinuous’ impact of current developments in India.

One important strategic dimension under turbulence is concerned with externally positioning the organisation in a way to participate in emerging opportunities or altered competitive games as well as protect it from the impact of reversals of the current income stream. There is another dimension that deals with internal capabilities and competences for efficient repositioning. Important constituent of both is the ability of managers and people at multiple levels to have awareness of the environment, psychological readiness to face unpleasant and unfamiliar events, and creativity to find opportunities during disruption. Another element is the ‘frame breaking’ behaviour pattern in the gene (Hamel and Prahalad, 1994) of the organisation system to permit exploratory response to change. The other important element is the programmable inter-connections of the subsystems—resource liquidity, multiskilling, networking, outsourcing, modular capacities and so forth.

Research Objective and Proposition

The specific objective of this study, therefore, is to understand strategic themes, alternatives and practices of Technology Based Indian Organisations (TBIOs); cluster them in different trajectories to understand how strategy transforms under turbulence; and understand the interplay of different contradictory factors. A sub-objective is to evolve an exploratory methodology to study dynamic aspects of strategic transformation over time.

Methodology of the Study

The methodology for this research has been influenced by two contextual leads. The first is the principle of flexible systems methodology (Sushil, 1994) applied in two complementary research projects to this study (Ramarr 1996, Neeraj 1997). The second is the MIT Sloan School of Management’s research programme entitled “Management in the 1990s” (Scott Morton, 1991).

Times of turbulence instigate change and sustained turbulence encourages second order change, transformational frame breaking behaviour. But behavioural studies are often not universal. When this research was taken up, there was hardly any published data on how Indian organisations were coping with paradigm shifts because the global World Trade Organisation (WTO) and national economic restructuring. How Indian organisations were coming out of seclusion and how they planned to cope with transformational urges could be hypothesised on the basis of similar research projects in other countries but no empirical Indian study was available. Many of the drivers of change could be identified but the response pattern of the target population (TBIOs) was yet to be studied.

The first step in the study, therefore, was a quasi-experimental exploratory study on the challenges posed by frame breaking environmental shift in the Indian context, conducted at Allen-Bradley India Ltd. (ABIL) where this researcher was then the CEO. This was followed by a macro study conducted through interviews, mini case studies and study of secondary material to characterise the Situation - Actor - Provocation framework in the context of this research for the target population (TBIOs). For this macro study, several Management Workshops and CEO conclaves of Indian Machine Tool Manufacturers Association (IMTMA), Confederation of Indian Industries (CII), Indian Electrical & Electronics Manufacturers Association (IEEMA) on topics like ‘Effect of Liberalisation’, ‘Competitive Advantage’, ‘India Inc.’, ‘Challenges of 21st Century’ and ‘Which way to Globalisation’ provided extensive opportunities to improve and add to the set of hypotheses formed during the ABIL experiment. Thus following the Flexible Systems Methodology the longitudinal first study was enriched by the findings of the series of cross sectional studies of the target groups.

A set of hypotheses about correlation among paradigm shift, organisation level transformation, manifested strategy process, restructuring, renewal and revitalisation in the Indian context for this period (1992-97) could be postulated at this stage. But the view was not yet crisp; it was more of a wide angle vision.

A series of synectics exercises in laboratory situations with postgraduate management students, which were designed as interactive creative problem solving experiments, was the next step to build a framework of organising for success that could encompass different patterns of strategic behaviour under uncertainty. The model that came out was robust to fit the macro studies and the initial longitudinal organisation development experiments at ABIL.

However, to improve the rigor of this research, following the MIT model, the distinguishing attributes of the framework were used to design questionnaire instruments for two surveys. The graphical questionnaire for the second survey on ‘Strategy Paradoxes’ and characteristics of revolutionary strategists was deeply influenced by the Henley College, UK study of British Industries (McKenzie, 1996). The construct of this British study was an appropriate tool to use the Dialectic Inquiry System to comprehend Multiple Realities (Arnorn and Bjerke, 1997).

In the Inductive-Consensual Inquiry System or the Analytic-Deductive Inquiry System, one assumes that there

Each organisation is faced with its own paradox of dynamically balancing ‘Focus on Current’ versus ‘Robust for Future’ strategies.
is one best way to comprehend important problems like strategy or transformation. In the Multiple Realities and Dialectic IS, the self-study and isolated meaning of data is inconsequential. One has to use some model / theory view of the world to gather data in the first place, and, potentially, some other model / theory / view of the world to interpret it or make sense of it. In the Multiple Reality IS, quite extensively adopted in this study, the decision maker is the operator in the system that is he or she is subjected to the acutely opposing views on the strategic issues where both may be valid options (paradox) so that the synthesised new position is a current but transient position of a changing continuum of Thesis → Anti-thesis → Synthesis → New Thesis.

Exploring the Two Flexibility Axes

In field-oriented theory for motor control, popularly known as vector control, number of control parameters like speed, impedance, torque, voltage, current, load, etc., are all interpreted in terms of two major orthogonalities—the field magnetic flux vector and the armature current vector. In a fast-paced turbulent environment, when an organisation also is in a state of constant flux internally due to technology complexity and externally due to macro economic changes, transformation can be conceptualized in terms of two orthogonal axes. All other strategy vectors / strategy drivers can be resolved along these two axes. Figure 1 points to these two key factors—‘growth flexibility’ and ‘change flexibility’.

One relates to the external dimensions of strategy that ensure the ability of an organisation to grow inspite of turbulence seeking out most of the random or emerging opportunities while maintaining a keen focus on existing customers and suppliers.


![Growth flexibility relates to the external dimensions of strategy that ensure the ability of an organisation to grow inspite of turbulence seeking out most of the random or emerging opportunities while maintaining a keen focus on existing customers and suppliers.](image)

Figure 1 : Managing for Internal and External Flexibility
Adapted from: Maira and Scott-Morgan, 1997

The other flexibility axis relates to the internal dimensions of strategy. The creative, innovative capabilities, the capabilities for quickly recombining and redeploying resources and competencies. The flexibility that enables nimble organisations to ensure on one hand that the different organisational sub-units and linkages continue to work together efficiently even while the organisation renews itself for the new positions.

The two factors ensure that while the organisation continues to maximise its Economic Value Addition (EVA) ability with an eye to the future it also optimises the financial value addition from the excellence of the current operation.

The first questionnaire of the study had sixty two questions. These questions were formulated using the ‘thesis - anti-thesis’ — dialectical inquiry system. All these questions under the categories of Anticipated Future, Thematic, Alternatives and Practices could be placed on the two axes of growth-flexibility or external flexibility and change-flexibility or internal flexibility. Figure 2 presents the two axes and the strategy views at each end of the two axes.

Appendix I shows the regrouping of the original sixty questions under these four clusters — Entrepreneurial Factors or External Flexibility (EF) / Reducing EF (NEF) / Innovativeness Factors or Internal Flexibility (IF) / Reducing IF (NIF) and the mean scores of TBIos vs. other

![Figure 2 : The Two Axes of Flexibility for Managing at Turbulent Times](image)

traditional, stable technology industries against each variable or strategy component. Under each cluster, the mean of means for each group is also shown in Appendix I. This mean of means can be taken as a composite indicator of the affinity of the overall strategy of each group towards one particular end of the two flexibilities. If these four values are now plotted on
In the next analysis to sharpen the focus of distinction, only those twenty-seven factors were chosen where the statistical differences between the two groups were found to be significant not only by the central tendency analysis but also by the ‘t’ and ‘p’ values.

To sharpen the focus from another perspective, the TBIO group was split into two clusters.

Appendix II presents a central tendency analysis of the TBIOs split in two cluster groups— one called ESIO representing respondents from electronic, telecom, software and IT service companies and the other called EBIO, i.e., Engineering Based Indian Organisations from automobile/auto-component/machine tool etc.

Appendix III presents the tabulation of mean scores and mean of means between TBIO and ‘others’ on the 27 differential factors. These values are also tabulated for the ESIO and EBIO groups on these twenty-seven factors. Individual scores were not of so much significance as were the differences between opposing values of the same group.

Table 1 presents the differential EF and IF values of the four groups calculated as \((x_{EFM} - x_{NEFM})\) and \((x_{IFM} - x_{NIFM})\), where \(x\) represents TBIO or ‘others’ or ESIO or EBIO.

Figure 4 presents a graphical plot of these four sets of coordinates in the four quadrants representing the four types of strategic postures.

Figure 5 presents the Duncan and Perrow models of environmental and technology differentiation and its impact on organisations strategic behaviour (Stacey, 1993). The empirical findings from this study show the trend of Indian organisations towards the typologies in these two classical models.

The first figure (Duncan’s approach) (Stacey, 1993) shows that dynamic external environment and complex internal environment produce organisations which demand more organic systems to survive. Flexible, intuitive, people oriented modes dominate strategy and decision making. The TBIOs, particularly the ESIOs show a trend towards this organic form as per Figure 5
technologies — one expects them in the first quadrant. EBIOs should also be there but they are further down along the line perhaps because borrowed or purchased technology becomes more of a routine and process gets more attention than Research and Development. Though this study arrived at Figure 4 from a different perspective, its connotations are similar to those in the two propositions in Figure 5.

**Satisfaction Level with Strategizing and Trend for Programic Panacea**

The survey against first questionnaire presented distinct attraction for prescriptive and programmatic responses to change like BPR, ERP etc. The bigger thrust for such programmes in ‘other’ industries as opposed to ESIOs in particular is also understandable as per the Perrow model (Figure 5). ESIOs are in constant need of experienced people because for software or electronic business knowledgeable people is the fundamental resource. ‘Process engineering to reduce headcount’ will not be their priority. However, in the second survey, a set of questions were included to specifically investigate the penchant for packaged solution and satisfaction level with current strategizing process. These results have been presented in the Table 2. The respondents to the second questionnaire are mostly from top management. While a large number of them expressed dissatisfaction with current process of strategizing, almost equally strong percentage of these top managers voted for BPR/ERP/TQM and other programmatic packages whereas training in the fundamentals of strategic thinking or learning had a few takers.

**Strategy Revolution—Quo Vadis**

At the time of great change, when frame-breaking initiatives are required to tackle the punctured equilibrium, organisations need ‘focused innovation’ (Drucker, 1985). As discussed earlier, innovation in an organisation usually need ‘the law of requisite variety’ at play and flourish when the organisation structures itself as an open system. Both depend on intense networking and communication inside and outside the organisation. Such transformational flow of information (provocation) creates Action only when the organisation has “flexible linkages” and “permeable boundaries” to allow the energizing, envisioning, enabling (Tushman, Newman, and Romanelli, 1986) of transformation to progress. This research had shown that because transformational strategy must balance needs of current growth with the need for change and transformation — it is very seldom ‘neat, sequential and go as planned’. Most often there are ‘multiple transitions’, ‘incomplete transition’ and therefore
abandoned transitions' because true transitions happen over a long period of time and is paradoxical at every critical juncture. "Everything looks like a failure in the middle. In nearly every change project, doubt is cast on the original vision because problems are mounting and the end is nowhere in sight" (Kanter, 1991).

During last ten years TBIOS have been proposing numerous change programmes, this was the situational backdrop against which this study took place. By 1997 most EBIOS were back to 'pleading for protection' against global competition. But on the other hand, electronic

This research had shown that because transformational strategy must balance needs of current growth with the need for change and transformation - it is very seldom 'neat, sequential and go as planned'.
and software industries (ESIOs) operating mostly in the global arena are seldom present at such lobbying rallies and continue to be successful. The last part of the Paradox questionnaire in the second survey as part of this study contained a ten-point profile of desirable characteristics of a strategy revolution.

Figure 6 presents a comparative visual of ESIOs, EBIos and ‘Others’ on these ten points. It is consistent with the other findings discussed in this paper. A large-scale adoption of Programmatic solutions for strategy transformation without attending to the fundamental measures for enhancing the inner flexibility of the organisation will cause more ‘midway frustrations’ and ‘too little too late’.

Concluding Remarks

When the differential internal and external flexibilities of the three categories of respondents in this study are plotted, their characteristics validate the strategy typologies proposed by Miles and Snow, 1978.

Table 2 shows the matching of the empirical findings with the Miles and Snow proposition.

If strategy transformation is considered as a three act drama (Tichy and Cohen, 1997), then may be we have seen by Year 2000 the end of Act I which is ‘energizing’ the organisations for radical change. Act II which is ‘envisioning’ of the future state shows contradiction between public posture and what Indian managers is most organisations actually think and do. The Act III which is ‘enabling’ inner flexibility is yet to become a driving force for the state of perpetual renaissance. It appears that while Indian organisations state a keen wish to change for the new century, the many carryovers from the past hold the Indian managers back from plunging ahead. There is still a strong yearning for reducing the turbulence rather than riding it or adapting to it.

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Hax F. and Majluf M (1984), Strategic Management: An Integrative Perspective, Prentice Hall, NJ
Kosnik and Moriarty (1989), High Technology Marketing; Sloan Management Review, Summer, 30(4)
Sushil (1994), Flexible Systems Methodology, Systems Practice, 7(6); 633-652
### Appendix I: Internal and External Flexibilities

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<th>Variable Type</th>
<th>Factor/Response</th>
<th>TBOs</th>
<th>Others</th>
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<td><strong>Respondent Group</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>EF1</strong></td>
<td>Customers choice, demand Quality</td>
<td>0.717</td>
<td>0.841</td>
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<td><strong>EF2</strong></td>
<td>Broad product range for success</td>
<td>0.418</td>
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<td><strong>EF3</strong></td>
<td>Flexibility, agile start ups gain</td>
<td>0.550</td>
<td>0.607</td>
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<td><strong>EF4</strong></td>
<td>Survival is key challenge</td>
<td>0.535</td>
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<td><strong>EF5</strong></td>
<td>Customers pay for value, quality</td>
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<td><strong>EF6</strong></td>
<td>Volume flexibility/outsourcing</td>
<td>0.478</td>
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<td><strong>EF7</strong></td>
<td>Maximise channels to market</td>
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<td><strong>EF8</strong></td>
<td>Customer value - external focus</td>
<td>0.675</td>
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<td><strong>EF9</strong></td>
<td>Reduce transaction cost</td>
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<td><strong>EF10</strong></td>
<td>Satisfying need innovatively</td>
<td>0.673</td>
<td>0.621</td>
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<td><strong>EF11</strong></td>
<td>Flexibly extend customer credit</td>
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<td><strong>EF12</strong></td>
<td>Adaptable response-customer needs</td>
<td>0.633</td>
<td>0.531</td>
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<td><strong>EF13</strong></td>
<td>Planning reduces strategic flexibility</td>
<td>0.514</td>
<td>0.440</td>
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<tr>
<td><strong>EF14</strong></td>
<td>Go beyond current core competence</td>
<td>0.402</td>
<td>0.567</td>
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<td><strong>EF15</strong></td>
<td>Be the first</td>
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<td>0.606</td>
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<tr>
<td><strong>EF16</strong></td>
<td>Reverse engineer successful products</td>
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<td><strong>AEFM</strong></td>
<td>0.541</td>
<td><strong>B EfM</strong></td>
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<th>Variable Type</th>
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<td><strong>Respondent Group</strong></td>
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<td><strong>IF9</strong></td>
<td>Flexible teams improvise</td>
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<td><strong>IF10</strong></td>
<td>Focus on constraints</td>
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<td><strong>IF11</strong></td>
<td>Concentrate on social architecture</td>
<td>0.602</td>
<td>0.567</td>
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<td><strong>IF12</strong></td>
<td>Fast, Flexible &amp; friendly organisation</td>
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<td><strong>IF13</strong></td>
<td>Adhoc deployment of people/resource</td>
<td>0.533</td>
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<td><strong>IF14</strong></td>
<td>Fusion of strategists/implements</td>
<td>0.534</td>
<td>0.604</td>
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<td><strong>IF15</strong></td>
<td>Clear competitive differentiation</td>
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<td>0.584</td>
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<td><strong>IF16</strong></td>
<td>Open book policy</td>
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<td><strong>IF17</strong></td>
<td>Manager's style flexible</td>
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<td>Healthy paranoia/sense of urgency</td>
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<td><strong>IF19</strong></td>
<td>New products/higher margin</td>
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<td>Change commitment/customisation</td>
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<td>Focus on long range technology</td>
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<td><strong>IF22</strong></td>
<td>Quick action/Flexible organisation</td>
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<td><strong>IF23</strong></td>
<td>Best brains no weightage</td>
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<td><strong>IF24</strong></td>
<td>Mistakes is better than procrastination</td>
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<td><strong>BIFM</strong></td>
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<th>Variable Type</th>
<th>Factor/Response</th>
<th>TBOs</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NEF1</strong></td>
<td>Deep pocket important</td>
<td>0.453</td>
<td>0.399</td>
</tr>
<tr>
<td><strong>NEF2</strong></td>
<td>Narrowly focussed leadership</td>
<td>0.525</td>
<td>0.414</td>
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<tr>
<td><strong>NEF3</strong></td>
<td>Economy of scale as entry barrier</td>
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<td>0.689</td>
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<td>Wait until a new market is proven</td>
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### Appendix I: Internal and External Flexibilities

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Appendix II: ESIO/EBIO Subgroups of TBIOS

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</table>

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### Appendix II: ESIO/EBIO Subgroups of TBIOs

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<td>0.340</td>
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Key:
- ESIO = Electronics & Software based Indian Organisations
- EBIO = Engineering based Indian Organisations (Capital goods industry sector)
- U1 = Upper management of ESIO
- U2 = Upper management of EBIO
- U11 = Junior management of ESIO
- U22 = Junior management of EBIO

### Appendix III: The Flexibilities on 27 Factors - Comparing the Four Groups

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Appendix - III: The Flexibilities on 27 Factors - Comparing the Four Groups

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TBIO = Technology Based Indian Organisations
ESIO = Electronic & Software Based Indian Organisation
EIIO = Engineering Based Indian Organisation
U1 = Upper management of ESIO
U11 = Junior management of ESIO
U2 = Upper management of EIIO

Flexibility Mapping: Practitioner’s Perspective

1. What types of flexibilities you see in the practical situation of “Strategy Formulation and Implementation” 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 strategic flexibilities that are relevant for your own organisational context? On which dimensions, flexibility should be enhanced?

3. Try to map your own organisation on following continua. (Please tick mark in the appropriate box(es))

   - Focus on current
   - Planned
   - Growth flexibility
   - Programmatic solutions
   - Continuous improvement

   - Strategy
   - Transformation

   - Robust for future
   - Emergent
   - Change flexibility
   - Fundamental measures
   - Big push or radical

4. Develop a SAP-LAP (Situation Actor Process-Learning Action Performance) model of “Strategy Formulation and Implementation” relevant to your organisation.

Reflecting Applicability in Real Life

1. What is the status of ‘growth’ and ‘change’ flexibilities in your organisation? How will you utilise the findings of this study to enhance them?

2. Design a strategic transformation package for your organisation that captures the strategic paradoxes mentioned in this paper.
Empirically Testing the Relationship between
MIS Flexibility and MIS Success

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Abstract

This paper presents empirical findings for relationship between MIS flexibility and MIS success. User information satisfaction, information usage, and MIS usage are considered for MIS success at operational level. At strategic level, MIS enablement for organisational change, for competitive advantage, and for organisational learning are considered. Measures for MIS flexibility were developed by Idea engineering data collection tool. Hypotheses are formulated to test the relationship between MIS flexibility and MIS success variables. Empirical data have been collected by a questionnaire survey to test the hypotheses. MIS users and planners were approached for the survey. The sample size is 296 and the survey covered 42 organisations from eight different sectors. Respondents' relevance for the survey was ensured by a set of predefined criteria. Scale tables describing the dimensions of flexibility and MIS success were used to synthesise the responses. The scale tables were constructed by idea engineering exercise.

The multivariate results for research variables are presented in optimistic, most likely, and pessimistic scenarios. The dimension-wise values of a variable are given to gain more insight into the status of MIS flexibility and MIS success in the surveyed organisations. The results of statistical testing on the research hypotheses show that MIS flexibility and MIS success variables are related.

Keywords: MIS enabled competitive advantage, MIS enabled organisational learning, MIS flexibility, MIS usage, user satisfaction

Introduction

Much of the research on MIS success factors have been focused on issues related to user, planner, and top management (Barki and Hartwick 1989, Baronas and Louis 1988), management support (Lee 1986, Leitheiser and Wetherbe, 1986), end-user's expectation and attitude (Ginzberg, 1981), politics (Markus, 1988), communication between developers and end users (DeBrabander and Thiers, 1984), task structure (Guimaraes et al., 1992), and end-user's training and experience (Fuerst and Cheney 1982, Nelson and Cheney, 1987), but the impact of MIS flexibility on MIS success has not been exhaustively addressed in the past. Importance of MIS Flexibility has been emphasised (Tozer 1986a, Certo and Peter 1988, Drucker 1994) but rarely empirical studies are available by considering it as a "means" to success. Multidimensional definitions for organisational flexibilities are available (Bahrami 1992, Leeuw and Volberda 1996), but its benefits have not been convincingly demonstrated. How to incorporate flexibility in MIS is left unanswered.

Based on conceptual inputs, a group of twenty participants in a workshop on information systems planning, gave their feedback for importance and utility of MIS flexibility in organisations. The participants were all senior level managers with more than ten years of information system usage experience. According to the participants, flexibility in information systems facilitates effective, fast, efficient, user friendly, and open communication system to meet the user's needs. It helps to sense the changing needs and prepares organisation to face those changes. The user gets freedom of choice to utilize relevant information for decision-making. Integrated information systems, an attribute of MIS flexibility, facilitates a coordinated endeavour to exchange valuable information by assimilating, synthesising, and applying data bases in a dynamic mode. MIS flexibility multiplies the ability to respond to environmental changes and business conditions both within and outside the organisation.

MIS flexibility is required for better performance of people and organisation by getting a purposeful feedback from various managerial activities; organisational enablement to take quick and rational decisions is increased. The flexible flow of information engender creativity in performance by inhaling outside changes and increases managerial effectiveness. Cost-effective processes without compromising on quality are facilitated by MIS flexibility. For better customer relationship, for gaining competitive edge, and for quick capitalisation of operating and environmental changes MIS flexibility becomes an essential component in the organisational system.

Ein-Dor and Segev (1981) give five criteria to measure MIS success: profitability, applicability to major

Some studies assumed user information satisfaction as the ‘means’ variable to achieve MIS success and significant association between them has been reported (Montazemi 1988, Raymond 1985, 1987, 1990). Yap et al. (1992) give MIS success by actual use, decision effectiveness, cost benefit, the accomplishment of original objectives and pay-off to organisation from the system.

Besides the user information satisfaction and MIS usage, strategic level success can also be considered. Organisational level success such as MIS enablement for organisational change, MIS enablement for competitive advantage and MIS enablement for organisational learning are worth considering. The measures for strategic success variables can be field generated.

A Model for MIS Flexibility and MIS Success

Figure 1 shows the research model proposing the influence of MIS flexibility on MIS success at operational and strategic levels. The MIS success has been considered at two levels: operational success and strategic success. At operational level, user information satisfaction, MIS success variables are proposed as dependent variables (outcomes) and MIS flexibility is proposed as antecedent variable, the ‘means’ to achieve MIS success. In other words, MIS flexibility is necessary before MIS success can be achieved. Qualitative nature of the research variables cause to propose the dimensions of them. Accordingly, dimensions of MIS flexibility and MIS success are defined. The dimensions of MIS flexibility are antecedents to MIS success.

MIS Flexibility

In general the term “flexibility” has a positive connotation: flexible organisations are the better ones (Leeuw and Volberda, 1996). Flexibility has been historically used to refer to the blend of capabilities and attributes that facilitates adjustments to change according to the situational context (Evans, 1991). Upton (1994) defines flexibility as “the ability to change or react with little penalty in time, effort, cost or performance”. According to Easton and Rothschild (1988), “flexibility is the ability of a system to take different forms”. According to Bahrami (1992), “flexibility is a multidimensional concept demanding agility and versatility; associated with change, innovation and novelty; coupled with robustness and resilience, implying stability, sustainable advantage and capabilities that may evolve over time”. Sushil (1997) defines flexibility as follows: “Flexibility is the exercise of free will or freedom of choice on the continuum to synthesize the dynamic interplay of thesis and antithesis in an interactive and innovative manner, capturing the ambiguity in systems and expanding the continuum with minimum time and efforts”.

With changing environmental conditions “hybrid” and flexible organisations need speedier flow of information (Powell, 1987). Mensah (1989) defines MIS flexibility as “the ability to respond and adapt to changing business conditions both within and outside the organisation”. MIS flexibility handles special situations in organisational functions or industry needs (Diebold, 1965) and adapt to regulatory or other environmental changes (Bruns and McFarlan, 1987) especially quick and accurate responses to crises. The better adapted the degree of integration to the governing technological and economic variables and to the level of integration of the organisation itself, the greater the likelihood of MIS success (Ein-Dor and Segev, 1978). However, MIS objectives must be flexible enough (Sethi and Levi, 1977) to permit adaptation to the changing directions and circumstances of the organisation. MIS flexibility in the dimension of innovative and effectiveness will be an important contributing component (Morden, 1985) to increase the MIS capacity. MIS planning should have the built-in flexibility (Raghunathan and Raghunathan, 1991), to allow adaptation of MIS processes to new opportunities as they present themselves, and thus foster creativity. The change in customer specific product requirements, demands a high degree of flexibility in planning (Hohn, 1986).
Author has developed an operational definition for MIS flexibility as follows: "the capacity of the information system to change or to adapt and adjust in response to new conditions, demands, or circumstances". The change in information requirements from organisation and environment should be encountered successfully without exorbitant changes in the system. The flexibility in MIS has to be provided with multiple objectives of satisfying information requirements, decision support, futuristic applications, operational support, and response to organisational strategies.

**MIS Success**

Successful use of information systems enables the organisations to transform business processes to gain competitive advantage. Information systems success in organisations can be realized at operational and strategic levels. Operational level success supports managers to keep track of the routine business transactions and activities in the organisation. Availability of relevant, current, and accurate information on routine business transactions motivates the managers for frequent usage of information systems. Operational level success can be better described by user information satisfaction, MIS usage, and information waste. Strategic level success depends on the ability of information systems to tackle and address strategic issues; both in the firm and in the external environment. The primary concern is the ability of information systems to increase the organisational capability to match with changes in the external environment. Strategic level success for information systems can be explained by MIS ability to facilitate the organisational changes, MIS capability to gain competitive advantage, and MIS enablement for organisational learning.

**MIS Operational Success**

User information satisfaction and MIS usage variables are well researched with an established association with MIS success. The review of past work on the measures is addressed in the following sections. In the information contents point of view, absence of relevant, current, and accurate information is denoted as information waste. The process of evolving an operational definition for information waste is also dealt with.

**User Information Satisfaction**

User information satisfaction is the extent to which users believe that the information system is available to meet their information requirements (Ives et al., 1983). Bailey and Pearson (1983) say "user satisfaction in a given situation is the sum of one's feelings or attitude toward a variety of factors affecting that situation". User satisfaction is an attitude toward the information system while system usage is a behaviour (Baroudi et al. 1986). Ajzen (1988) elaborates on definition of attitude as a predisposition to respond favourably or unfavourably to an object, person, institution or event.

**Measures of user satisfaction:** The literature contains a number of attempts at measuring user satisfaction (Ives and Olson 1984, Straub 1989, Melone 1990, Delone and Mclean 1992). The measures for satisfaction are accuracy, content, frequency, and recency of reports (Neumann and Segev, 1989). Debons et al. (1978) give 10 items for satisfaction: accuracy, reliability, timeliness, assistance, adequacy, accommodation, communication, access, cost, and environment. Swanson (1974) gives “appreciation” as surrogate measure of satisfaction. Pearson (1983) evolves out 39 distinct factors, out of which “flexibility” or “easy to change and adapt” has been rated as the most important factor. Input, procedures, systems, processing, report content, report form and report value constitute user satisfaction (Jenkins and Ricketts, 1979). According to Ives et al. (1983) efficiency and effectiveness of information system are given as measures for satisfaction.

**MIS Usage**

MIS usage has been studied as a phenomenon of interest as a key dependent variable for MIS success (Davis 1989, Davis et al. 1992, Thompson et al. 1991, Moore and Benbasat 1991, Adams et al. 1992, Hartwick and Barki 1994). When the information system is unreliable or its data inaccurate, the usage may come down (Ives et al., 1983). System usage is an alternate measure of system satisfaction (Baroudi et al., 1986) and also considered as a meaningful indicator of system success (Olson and Ives 1981, Ives et al. 1983).

**Measures of MIS usage:** The indicators of system usage are: (i) daily length of MIS usage (Igbaria and Guimaraes, 1994); (ii) the frequency of MIS use (Raymond, 1985) and (iii) the number of business tasks for which MIS is used (Lee 1986, Delone 1988, Igbaria et al. 1989, Guimaraes et al. 1992). Torkzadeh and Dover (1994) developed seven items scale to measure system usage. The items are the extent to which computers are used in the business, in the job, the extent of personal direct interaction with computers, to produce report for management and others.

**Determinants of MIS usage:** User behaviour, user attitudes and perceptions, technical quality of system, performance, situational and personal factors, and decision style are the main determinants of MIS usage (Lucas, 1975). Lucas (1976) gives another set of determinants: management support for modeling effort, rating of in-house computer output, involvement in developing and designing, and potential of computer based planning systems. Other
determinants are user's individual capabilities (Bandura, 1982), usefulness and perceived ease of use (Davis et al., 1989), attitude towards MIS (Ajzen, 1988), belief regarding access to resources and opportunities (Ajzen and Driver, 1992), the internal and external factors (Taylor and Todd, 1995), facilitating conditions (Triandis, 1979), and organisation's familiarity and experience with MIS technology (McFarlan et al., 1983).

**Information Waste**

Among the dozens of reports every month, very few may be relevant for managing a company (Rockart, 1979). This is because each subordinate feeds wanted and unwanted information to the superior and as a result massive information flow occurs. These data impediments cause invalid data, unreliable data, outdated data, missing data, irrelevant data, poor format, and single point estimate (Gordon and Schick, 1990). A poorly performing information system sends many signals, some of which may not be detected by IS personnel. For instance, users may receive reports in more detail than is appropriate to their positions and may misinterpret them (Kristi and Scott, 1998), also strong technical performance is necessary for information systems acceptance and use (Powers and Dickson, 1973). Pertinent data should then be segregated from irrelevant information in problem solving (Raz, 1985).

**Information waste in MIS prioritization:** Different perspectives were found in prioritizing the information systems initiated by the users, planners, top management, and external consultants (Alter 1980, Moynihan 1990). Users are more concerned about what Information Systems (IS) department is not doing than what it is doing. The usual complaint is that IS staff members are having no sense of urgency for user's business priorities (Curtid, 1992). Undue weightage is often given to tangible financial benefits only in determining the order in which projects were funded and evaluated (Davenport, 1989). Applying financial criteria alone may result into omission of some critical IS. For instance, the development of specialized software to improve computer security, may have few financial benefits and may have commendable intangible benefits. This implies a need to have right “balance” of utilizing both quantitative and qualitative criteria for evaluating IS projects (Bacon, 1992).

**Obsolescence and ineffective IS:** A survey reported in Management Accounting (1998) says 51% of respondents gave “lack of information” as a key marketing problem, while 49% gave “ineffective information systems” as the key problem. Research on failure of IS projects indicated the reasons as lack of setting effective project goals (Gluck, 1996), slow and cumbersome IS development methodology. Information systems may gradually outlive their usefulness because of rapid organisational changes and may contribute to IS obsolescence (Kristi and Scott, 1998). The cycle of information generation, information dissemination in the organisation have to ensure positive reinforcing cycle which will result in continuous learning, effective organisation, on the other hand, a negatively reinforcing cycle will result ineffective IS and organisation (Ramanarasa and Rai, 1996). So an organisation is a cause as well as a consequence of obsolete and ineffective information generation and dissemination.

Author has developed operational definition for information waste as follows: “In an information system, getting undesired output, unnecessary or incorrect input for processing, and/or any unutilized effort or potential lead to information waste”. Some activities that are exercised or not exercised by the user, planner, and top management on the system development may also indicate waste.

**MIS Strategic Success**

MIS strategic success has been considered in the literature as the ability to capitalize the MIS potential at the strategic level. MIS enablement for organisational change, competitive advantage, and organisational learning are considered for MIS success at the strategic level.

**MIS Enablement for Organisational Change**

Three common organisation change methods are given by Thach and Woodman (1994). Firstly, top management vests the responsibility to MIS department as change agent; secondly, management is having a systems approach to change the structure and people; and thirdly, management set a vision for the future and determine to achieve it. Developing flexible information technologies are converging to create an impetus for major changes in structure, function, and process of business organisations (Grover et al., 1993).

**Structural change:** IT innovations changed the nature of work, forcing old organisational structures into new configurations (Cascio, 1993). Bureaucratic hierarchy for used by most organisations became obsolete (Nolan, 1988) and IT enabled “network” organisation is suited for managing complexity and speed. Already organisations started having distributed processing platforms in the network architecture (Applegate, 1993).

**Process change:** Information Technology (IT) is used to ‘informate’ employees rather than ‘automate’ the processes (Shoshana, 1988). IT is informing the business by communicating mission, objectives, and market philosophy, combined into a unifying focus world wide leading to common processes and systems. Most process innovations are enabled by IT (Davenport, 1993), and IT has been viewed as catalyst for change (Senn, 1992). It became embedded in firm’s core business processes,
contributing to the firm’s high performance (Yetten et al., 1994). The analysis and design of work flows and processes within and between organisations are indicated by Davenport and Short (1990). For achieving the business goals, radically overhauling the business by using IT as a central lever is suggested (Venkatraman, 1991). The fundamental analysis and radical redesign of business processes to achieve dramatic improvements is dealt by Hammer (1990).

In change processes, sometimes MIS technology leads the change in organisation called as “technological imperative” and in some occasions organisational objectives lead to MIS design called as “organisational imperative” (George and King, 1991). IT initiates major changes and support the subsequent changes (Grover et al., 1993) thereby IT lays foundation for new business processes (Goodhue et al., 1992).

**MIS Enablement for Competitive Advantage**

The studies in the past demonstrate that information systems offer a unique opportunity for competitive advantage in the new business climate (Parsons 1983, McFarlan 1986, Porter and Miller 1984, Johnson and Carroll 1988). Porter (1979) identified five major competitive forces: the threat of new entrants, the intensity of rivalry among existing competitors, pressure from substitute products, the bargaining power of buyers, and the bargaining power of suppliers.


- Can IST be used to build barriers against new entrants?
- Can IST change the basis of competition?
- Can IST be used to generate new products?
- Can IST be used to build in switching costs?
- Can IST change the balance of power in supplier relationships?

The strategic implications of IST in the industry, the firm, and at the strategy level are discussed by Parson (1983). At the industry level, the information system changes the products and services, markets and production economics; at the firm level IT affects key competitive forces; and at the strategy level IT enables for low cost leadership, product differentiation and concentration of product or product niche (Ives and Learmonth, 1984).

Modern day organisations use information technology to gain competitive advantage (Parsons 1983, McFarlan 1984, Porter and Miller 1985, Jhoneston and Carrico 1988). Tavakolian (1989) indicates that IT structure is strongly related to competitive strategy. Jackson (1989) explains the way of combining IT and competitive advantage. According to him, either the industry structure changes in favour of the organisation or that steps have to be taken to reduce the effects of it moving against the organisation. Computer aided calculations supply important data for the assessment of risks in different states of competition (Hohn, 1986).

Benjamin et al. (1984) argue that the gap between the opportunities created by MIS and the effective utilization of information technology must be narrowed. Ghoshal and Kim (1986) give the term *business intelligence* as the collection and analysis of information on markets, new technologies, customers, competitors and broad social trends, which is becoming an essential competitive tool.

**MIS Enablement for Organisational Learning**

Organisational learning was addressed by Cyert and March (1963) as a process by which organisations learn collectively through interaction with environment. Increasing adaptiveness is the first stage in moving toward learning organisation (Senge, 1990). The leading organisations are focusing on generative learning, which is about creative as well as adaptive learning (Argyris and Schon, 1978).

Individuals learn by updating their beliefs about the response for a particular action and this cycle continues. The other members also feel a similar experience and the information has been shared creating organisational memory in the form of shared beliefs, assumptions and norms (Argyris and Schon, 1978). The whole organisational memory gain a momentum leading into organisational actions in the form of strategy implementation. As individuals gain new knowledge and insights and thereby modify their behaviour and actions, organisations also gain new insights and modified behaviour (Levitt and March 1988, Dixon 1992).

So organisational learning is the development of new knowledge or insights that have the potential to influence the behaviour (Huber 1991, Sinkula 1994). Presumably learning facilitates behaviour change that leads to improved performance (Senge 1990, Garvin 1993, Sinkula 1994).

**Constructs of information system** : Constructs from organisational learning are information acquisition, distribution, interpretation and organisational memory (Sinkula, 1994) by which the organisation’s activities are information driven (Goldstein and Zack, 1989). Though experience and organisational learning go hand in hand (Dixon, 1992), aged organisations are not necessarily collectively wise in their processing of information.

**IT enablement**: MIS transform data into information and then help managers to transform information into knowledge and knowledge into action (Stata, 1989). IT holds out the prospect of increasing the efficiency and
scope of information processing within organisations (Child, 1987) by increasing speed and cohesion of response (Kanter, 1989). Organisational learning is facilitated by information dissemination and accomplishing a shared interpretation of information. The quality of the information sharing process between organisations has been found critical to the success of partnerships and alliances (Kanter 1989, Mohr and Spekman 1994, Webster, 1992).

Research Hypotheses

Following hypotheses on MIS flexibility and MIS success variables are evolved from the research model:

H1. More flexibility in MIS indicates a higher possibility of user satisfaction.

H2. More flexibility in MIS decreases the possibility for information waste.

H3. More flexibility in MIS increases the possibility of system usage.

H4. More flexibility in MIS enables more possibility for MIS enabled organisational change.

H5. More flexibility in MIS increases the possibility to have more MIS enabled competitive advantage.

H6. More flexibility in MIS increases the possibility to have more MIS enabled organisational learning.

Methodology

The research problem was described by its attributes such as nature of systems, problem behavior, people involved, nature of variables, organisation levels and data availability. The nature of systems in the problem are complex interplay of MIS flexibility and MIS success; non-predictable influence of antecedent variable MIS flexibility on MIS success; the issue of incorporating MIS flexibility is concerning to MIS users, planners, and top management; the research variables are qualitative; MIS flexibility is making an impact on the entire organisation viz. operational, tactical, and strategic; and primary data to validate the relationship between MIS flexibility and MIS success is not available. Matching the problem attributes with the set of research technique, the following techniques are selected: Empirical Study (Questionnaire), Idea Generation Techniques, and Fuzzy Logic.

Data Collection Methods

Data collection for testing the research hypotheses has been done by Questionnaire method. The measures for MIS flexibility and MIS success variables are shown in Appendix I. The respondents for the questionnaire survey were chosen from the population of MIS users and planners. The sectors included are service, information technology, engineering, automobile, consumer goods, high technology, and Government. From these sectors, 42 public and private organisations were selected at random. The research inputs were obtained in a structured questionnaire which has been personally administered.

Table 1: Respondent’s Profile

<table>
<thead>
<tr>
<th>Industry/Organisation</th>
<th>No. of Respondents</th>
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<tbody>
<tr>
<td>Service</td>
<td>70</td>
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<tr>
<td>NCDC</td>
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<tr>
<td>NCUI</td>
<td></td>
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<tr>
<td>State Bank of India</td>
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<td>Indian Airlines</td>
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<td>ICICI</td>
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<td>Citicorp</td>
<td></td>
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<tr>
<td>ABC Consultants (Pvt.)</td>
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<tr>
<td>Information Consultancy</td>
<td>86</td>
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<tr>
<td>NIC</td>
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<tr>
<td>Ergo Software Ltd.</td>
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<td>TCS</td>
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<tr>
<td>Rameco Systems</td>
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<td>Pentagon Inno. Sys.</td>
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<td>TSL</td>
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<tr>
<td>Tata Unisys</td>
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<td>UB Inf. Consul.</td>
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<td>Microland</td>
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<td>Paradise Software (P)</td>
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<td>Tata IBM</td>
<td></td>
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<tr>
<td>Soft Solutions (P) Ltd</td>
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<tr>
<td>Dun &amp; Bradley SS(P)Ltd</td>
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<tr>
<td>Engineering</td>
<td>35</td>
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<tr>
<td>L&amp;T</td>
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<td>API Engg Works(P) Ltd.</td>
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<tr>
<td>Vickers India Ltd.</td>
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<tr>
<td>Automobile</td>
<td>22</td>
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<tr>
<td>Manuti Udyog</td>
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<tr>
<td>Consumer Goods</td>
<td>23</td>
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<tr>
<td>ITC</td>
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<td>Liquid Engrs India (P)</td>
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<td>Mas Energy India (P)</td>
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<td>Savourite Limited</td>
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<td>Adfast Polymers</td>
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<td>Wipro GE</td>
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<tr>
<td>Consumer Durables</td>
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<td>J.K. Indus. Ltd.</td>
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<td>Network</td>
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<tr>
<td>High Technology</td>
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<td>ABB</td>
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<td>CMC</td>
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<tr>
<td>Mastek India Ltd.</td>
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<tr>
<td>Government</td>
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<tr>
<td>Planning Commission</td>
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<tr>
<td>Total : 42 Organisations Respondents: 296</td>
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with each respondent. For diminishing the skewness based on geographical region, and to get views from widely scattered population, the survey has been conducted in three major cities. The 28 items questionnaire was administered to 296 respondents from 42 organisations located in major cities: New Delhi, Chennai, and Bangalore. Respondent’s profile with number of respondents in each sector, organisations participated are given in Table 1.

**Respondent’s Relevance**

Respondents are drawn from strategic, tactical, and operational levels. The managerial level of respondents and distribution of organisations are given in Table 2. For demographic details about the respondent the following information has been obtained and used as the criteria for the respondent’s relevance to the survey.

**Functional expertise of the user:** When the user is specialising the same function, constructing information architecture for that function will be much more easier. Defining information inputs, outputs, and the interfaces for the functional area become more clear as the user gains expertise in the same function.

**Managerial level of user:** The strategic level people work with environmental forces and formulate strategies to resonate with the environmental changes. So in the organisational hierarchy strategic level people have more exposure to organisation’s business horizon. Operational level people play an indirect role in organisational strategy formulation. Tactical people focus more on management control applications, and their concern may be for control applications.

**Table 2: Managerial Level of Respondents and Distribution of Organisations**

<table>
<thead>
<tr>
<th>Respondents by Position</th>
<th>No. of Respondents</th>
<th>Distribution of Organisations</th>
<th>No. of Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Managerial Level</strong></td>
<td></td>
<td><strong>Annual Turnover (Rs. in Crores)</strong></td>
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<tr>
<td>Strategic</td>
<td>38</td>
<td>Less than 100</td>
<td>115</td>
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<td></td>
<td></td>
<td>100-200</td>
<td>39</td>
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<td>201-300</td>
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<td>501-1000</td>
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</tbody>
</table>

**MIS flexibility is positively related to user information satisfaction and MIS usage; MIS flexibility is negatively related to information waste; MIS flexibility is positively related to strategic success variables.**

**Experience in MIS:** MIS usage experience bring about the users to have more exposure to various MIS activities. The meaningful development of critical applications for the organisation can be better facilitated by user’s experience in MIS.

**Relevance Score for the Sample**

The relevance scores of 296 respondents in the filtered sample ranges from 0.4 to 1, and these scores were aggregated to obtain the composite score for the sample. The most likely aggregated score for the sample comes to be 0.76 which indicates a high relevance of the sample. The optimistic and pessimistic scores for the sample were found to be 0.95 and 0.45 respectively, and 95% of the respondents’ scores fall between this range.

**Scale Matrix**

The measures for MIS flexibility and strategic success variables are collected by idea engineering. Twenty two senior managers from public and private sector organisations have participated in this exercise. The measures are given in Appendix 1. The different dimensions of flexibility and MIS success variables are considered for constructing a scale table, in order to facilitate the thinking process of the respondent.

**Dimensions of Flexibility**

The dimensions of flexibility (Sushil, 1994) are innovative, integrative, interactive, and intelligence. “Innovation” dimension in information systems is useful for creative problem solving and decision-making. Innovation helps to gain an edge over the competitors and to make effective organisational change. Information systems have to be more interactive to get the user’s inputs in a more user friendly way.

Usually, organisations automate the operational information applications, whereas strategic management is not implemented to a greater extent. A balance between operational and strategic management applications have to be made in automating the information flow. All the islands of application information systems are to be integrated in a more holistic manner and total solutions are to be provided. So, ‘integration’ is another important dimension in MIS flexibility.

Organisational knowledge is driving problem solving and decision-making processes. Knowledge base creation is to be initiated from external and internal sources. Usage of artificial intelligence to incorporate management expertise in the organisational activities has become very common. Intelligence driven management application is another dimension for MIS flexibility.

Dimensions of MIS Success

The dimensions of MIS success are evolved in a workshop: organisational enhancement, decision effectiveness, improved productivity, and cost reduction.

Organisational Enhancement

The information systems enable the organisation to gain competitive advantage and explore new opportunities from environment. Futuristic strategies are to be supported by MIS, and its enablement for organisational learning and change lead to organisational enhancement.

Decision Effectiveness

Effective MIS enable to recognise organisational problems, intervention points, and to make decisions. MIS has to provide information to assess and analyse alternatives for decisions. In implementing decisions, feedback about the extent to which decisions have been accepted by people is to be instantaneously reported by a good MIS.

Improved Productivity

Formal MIS reduces the time spent in informal channels of communication and the searching process, so productivity increases. Electronic mail and formal private systems like DSS (Decision Support System), ESS (Executive Support Systems) produces the knowledge outputs like diagnosis, descriptions, instructions, schedules, plans, memorandum position powers, decisions etc.

Cost Reduction

Application packages for operational management will reduce the cost by curtailing paper work and manual processing of information. Office automation applications reduce the cost of information processing. Concepts like 'paperless office' is based on cost saving mechanism in automating the information systems.

Developing a Scale Matrix

To answer a question, respondent may recollect only a limited knowledge base and give a qualitative judgement in little time. Another respondent may take a lot of time to recollect a larger part of their mental data base, to analyze, and to synthesise the responses finally. It is convenient if the dimensions and quantitative conversions of qualitative judgements are given in advance. For instance, if the dimensions of MIS success are given, the recollection of application systems on each dimension to get a synthesised answer for MIS success will become easy. Also the respondents can think on a standardised scale.

Quantitative Conversion of Qualitative Judgement

When the respondent is giving the qualitative judgement about an item in the questionnaire, he/she is required to think in two steps. In the first step, the various dimensions of that issue are to be kept in mind. In the second step, the response on each dimension the responses are to be synthesised to arrive final qualitative judgement.

Ranking the Dimensions

A field based study was administered to obtain weights for the dimensions of flexibility and MIS success. Fourteen senior level managers participated in a workshop on “Flexibility in information systems for competitive advantage” and were asked to prioritise the dimensions of flexibility and MIS success on a scale of ‘most important’ to‘least important’.

Weightage for the Dimensions

The weightage for the dimensions of MIS success in a scale of 0–1 are given below:

Organisational Enhancement - 0.3
Decision Effectiveness - 0.4
Improved Productivity - 0.2
Cost Reduction - 0.1

The weightage for the dimensions of flexibility in a scale of 0–1 are obtained as follows:

Innovation - 0.3
Intelligence - 0.3
Interactiveness - 0.2
Integration - 0.2

Field Generated Fuzzy Sets

The input for the scale tables were obtained from a group of nine respondents from public and private sector organisations. The dimensions of the variables were explained to them, and their opinion was solicited on the qualitative scale of very High to almost Nil.

Fuzzy Sets for Flexibility

The fuzzy sets corresponding to qualitative judgements for flexibility are given in Appendix IIa. This scale table was used by the respondents to synthesise their answers to the questions on MIS flexibility.

Fuzzy Sets for MIS Success

The fuzzy sets corresponding to qualitative judgements for MIS success are given in Appendix IIb. The scale table was used by the respondents to synthesise their answers for questions on MIS success.

Results of Pilot Testing

The content validity of the questionnaire items were tested with thirty five MIS practitioners from field and academia. Their suggestions were incorporated to refine
the questionnaire items. Some questions were rephrased and some complex ones were removed. The order of questions were changed and the instructions for filling the questionnaire were also modified. Technical words were replaced by simple words and missing key words were added. Duplicate and double barreled questions were removed.

Validation Scheme

The validation scheme has been given in three phases: structure, behaviour, and policy implications. The structure validation is testing for the objective; behaviour validation is for testing the behaviour (results) generated by the survey, and policy implications validating the recommendations made by the survey (Sushil, 1993).

Structure Validation

Questionnaire construction: Questionnaire items for MIS flexibility, and MIS success variables were validated by field experts. For MIS flexibility, the different planes of measures were identified by idea engineering. Twenty two senior managers with more than five years of MIS usage experience from public and private sector organisations participated. The measures for MIS strategic success variables were obtained from the field. The field generated questionnaire adds confidence to the questionnaire items.

Pretesting the questionnaire: Twenty eight items instrument was pilot tested with thirty respondents from field and academia. The respondents at the time of pilot testing were having more than five years experience in MIS usage. The construction of the scale tables including the dimensions of the research variables and fuzzy sets have been validated during pilot testing.

Respondent’s relevance: The respondent’s relevance has been ensured by a set of predefined criteria. Ensuring the respondent’s relevance for the survey gives higher confidence in obtaining data from them.

Confirmatory factor analysis: The construct validity of the questionnaire items has been confirmed by principal component factor analysis. The extracted factors were explaining 71% of the variance in the 28 questionnaire instrument.

Behaviour Validation

Validity of state-of-the-art analysis: The optimistic, most likely, and pessimistic values of the research variables have been reported. To obtain the extreme values of the variables, the distribution of data values has been considered and 1.5% on either side of the distribution were omitted to avoid the most extreme cases. This gives more confidence in the results.

Hypotheses testing: The hypotheses are validated by chi-square values which are significant at 0.001 level. The degree of association between the pair of variables was obtained by Pearson’s correlation coefficients with 1 tailed significance at 0.01 and 0.001 level. The extreme values of data viz. optimistic, and pessimistic were also used to confirm the hypotheses by chi-square and correlation values.

Data Collection and State-of-the-Art Analysis

Data was collected using the pilot tested questionnaire from MIS users and planners. Scale tables, explaining the dimensions of flexibility and MIS success were used by the respondents to synthesise the answers. These tables were clarified to the respondents in-person before obtaining the responses.

Construct Validity by Confirmatory Factor Analysis

A principal component factor analysis was first performed on the 28 items covering the measures of MIS flexibility and MIS success. The quartimax rotation method was used in order to ensure that the derived factors were orthogonal.

Results and Discussion

The quartimax rotated factor analysis yielded 7 factors which collectively explain 71% of the variance in the 28 questionnaire items. The factors were arranged in order of decreasing percentage of variance and were retained since their eigen values were greater than 1 (Dillon and Goldstein, 1984).

The first factor deals with MIS enablement for competitive advantage. The items showing significant loading are extent of MIS capability to build barriers to rivals, to prevent the customers from switching to competitors, to change the basis of competition, and to faster delivery with cheaper cost. The eigen value for the factor 1 is 14.55 and 20.2% variance in the total items has been explained by this factor.

The second factor is significantly loaded on items related to MIS enabled organisational learning. The items showing significant loading are MIS enablement to indicate the forthcoming changes, to support the change process, to yield systemic models of the organisation, and to understand the impact of process delays. The eigen value for the factor 2 is 10.17 and 17% variance in the total items has been explained by this factor.

The variable MIS flexibility has been described by factor three. The significantly loaded items are MIS support for operational as well as strategic management, passive and active support for strategic changes, MIS development for individual as well as group, and the balance between proactive and reactive support for strategies. The eigen value for the factor 3 is 6.05 and 12.4% variance in the total items has been explained by this factor.

The fourth factor is for user information satisfaction. The items related are user information satisfaction on: MIS policies for critical applications, integration of MIS
strategies with new technology, the prioritization of application systems, and MIS ability to communicate across functions. The eigen value for the factor 4 is 5.078 and 10.7% variance in the total items have been explained by this factor.

The fifth factor is for MIS usage. The significant loadings are on: frequency of MIS usage for business processes, appreciation of technical quality of MIS, usage for making decisions, and commitment to use MIS for day-to-day activities. The eigen value for the factor 5 is 4.178 and 8.7% variance in the total items have been explained by this factor.

Factor six accounts for information waste. The significantly loaded items in this factor are deviation of MIS plan with business plan, ignoring the priority for critical applications, omission of present and potential information, and unrelateedness of MIS with functional systems. The eigen value for the factor 6 is 3.8378 and 5.3% variance in the total items has been explained by this factor.

MIS enableness for organisational change is shown by factor seven. The significantly loaded items are MIS enableness for: reducing the multiplicity of inputs/outputs, collaborating by frequent information exchange across functions, initiating and supporting process changes, and creation of opportunities for change. The eigen value for the factor 7 is 2.39 and 3.21% variance in the total items has been explained by this factor.

The questionnaire items were found to be significantly loaded and grouped under variables ought to be measured. The items which were loaded separately on later factors were significant but do not show high loadings.

Univariate Analysis

The optimistic, most likely, and pessimistic values of each questionnaire item is given in Appendix III.

Conversion of Responses to Fuzzy Sets

The sample responses were obtained in a qualitative manner in a scale of ‘Very High’ to ‘Almost Nil’ for flexibility, and MIS success. The respondent arrives the qualitative judgement for a question after synthesizing the four dimensions of a variable in the question. To get back the possibility values for each of these synthesized dimensions, the qualitative response were reconverted into fuzzy sets using the scale table. These fuzzy sets were retained for dimension-wise analysis.

Dimension-wise Values

( Optimistic, Most Likely, and Pessimistic)

Among optimistic, most likely, and pessimistic values for the four dimensions of a variable, the ‘most likely’ values were retained for further analysis. From the retained most likely values for each dimension of the variable, the ‘pessimistic’ (minimum) and the ‘optimistic’ (maximum) values for the entire sample are chosen. For this purpose, a cutoff point of 2.5% on both sides of the frequency distribution were omitted since they were representing the extreme cases.

The average value for each dimension and the standard deviation were computed for the sample. The dimension wise values for innovation, intelligence, integration, and interactive for MIS flexibility variables are shown in Figure 2 (a). The dimension wise values for decision effectiveness, organisational enhancement, improved productivity, and cost reduction for MIS operational and strategic success variables are shown in Figures 2 (b), 2 (c), 2 (d), 2 (e), 2 (f), and 2 (g).
Overall Values for the Variables

To aggregate the four dimensions of a variable into a single overall value, the weights of the respective dimensions are used. The overall standard deviation was computed on the weighted average values. The overall value for each variable in optimistic, most likely, and pessimistic scenarios are reported in Table 3. The implications of the Table 3 gives observations in state-of-the-art situation of the research variables. It can be seen that not very high MIS success has been achieved in the surveyed organisations.

Table 3. Overall Values for the Variables

<table>
<thead>
<tr>
<th>No.</th>
<th>Variable Name</th>
<th>O</th>
<th>M</th>
<th>P</th>
<th>S.D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>MIS Flexibility</td>
<td>7.6</td>
<td>4.55</td>
<td>1.4</td>
<td>1.7</td>
</tr>
<tr>
<td>2.</td>
<td>User Information Satisfaction</td>
<td>7.89</td>
<td>5.0</td>
<td>1.11</td>
<td>1.79</td>
</tr>
<tr>
<td>3.</td>
<td>Information Waste</td>
<td>7.25</td>
<td>4.17</td>
<td>1.14</td>
<td>1.85</td>
</tr>
<tr>
<td>4.</td>
<td>IS Enabled Organisational Change</td>
<td>7.76</td>
<td>5.11</td>
<td>1.75</td>
<td>1.6</td>
</tr>
<tr>
<td>5.</td>
<td>MIS Usage</td>
<td>8.16</td>
<td>5.74</td>
<td>2.64</td>
<td>1.45</td>
</tr>
<tr>
<td>6.</td>
<td>IS Enabled Competitive Advantage</td>
<td>7.57</td>
<td>4.64</td>
<td>0.91</td>
<td>1.93</td>
</tr>
<tr>
<td>7.</td>
<td>IS Enabled Organisational Learning</td>
<td>7.57</td>
<td>5.0</td>
<td>1.6</td>
<td>1.74</td>
</tr>
</tbody>
</table>

O - Optimistic Values, M - Most Likely Values, P - Pessimistic Values, SD - Standard Deviation

Hypotheses Testing and Multivariate Analysis

To determine if relations or dependencies exist among variables in each hypothesis, chi-square, a non parametric statistic has been used. To find the degree of association between related pair of variables in the hypothesis, Pearson correlation coefficient was computed. Since the research data was in interval scale, correlation has been found to be a more appropriate statistic to measure the degree of proportion. SPSS package was used for statistical computation. The individual hypothesis was tested by chi-square values. The results of hypotheses testing between MIS flexibility and MIS success are given in Appendix IV. The chi-square and correlation coefficient for each pair of variables in a hypothesis are also shown.

The results in Appendix IV supports the following hypotheses at 0.001 level of significance:

H1. More flexibility in MIS indicates a higher possibility of user satisfaction.

H3. More flexibility in MIS increases the possibility of system usage.

H4. More flexibility in MIS enables more possibility for MIS enabled organisational change.
H5. More flexibility in MIS increases the possibility to have more MIS enabled competitive advantage.

H6. More flexibility in MIS increases the possibility to have more MIS enabled organisational learning.

The results in Appendix IV support the following hypotheses at 0.01 level of significance:

H1. More flexibility in MIS decreases the possibility for information waste.

The chi-square and correlation analysis validates that MIS flexibility and MIS success variables are related and significantly correlated.

**MIS Flexibility with MIS Operational Success Variables**

The results in Appendix IV show that MIS flexibility and user information satisfaction are not independent and showing a positive association ($r = 0.2856$), at 0.001 level of significance. The chi-square value with 0.05 significance level supports MIS flexibility and information waste are related and shows negative association ($r = -0.15$). The results provide the chi-square value for MIS flexibility and MIS usage at 0.0001 significant level and confirm the relationship between the two, even in extreme values of data. The correlation between the two reveals a positive relationship ($r = 0.3347$) which implies that more the flexibility in MIS, more will be its usage. On the contrary, lack of flexibility in MIS is unlikely to improve MIS usage.

**MIS Flexibility with MIS Strategic Success Variables**

Appendix IV indicates the chi-square value with 0.001 significance level between MIS flexibility and MIS enabled organisational change. The relationship between the two has been verified on the extreme values of data. The association is positive ($r = 0.3704$) at 0.001 level of significance. So the enablement for organisational change is more with MIS flexibility.

Appendix IV indicates chi-square values with 0.001 level of significance for the pairs: MIS flexibility and MIS enabled competitive advantage, and MIS flexibility and MIS enabled organisational learning. The last column of Appendix IV confirms the association in optimistic and pessimistic data values. MIS flexibility is having a positive correlation ($r = 0.2774$) with MIS enabled competitive advantage; and having a positive correlation ($r = 0.4045$) with MIS enabled organisational learning.

**Discussion**

This empirical study has examined the relationship between MIS flexibility and MIS success variables. The main findings are: MIS flexibility is positively related to user information satisfaction and MIS usage; MIS flexibility is negatively related to information waste; MIS flexibility is positively related to strategic success variables viz. MIS enablement organisational change, MIS enablement for competitive advantage, and MIS enablement for organisational learning. These empirical findings deduce that MIS flexibility is related to MIS success at operational and strategic levels.

When MIS supports critical applications in both operational and strategic management, satisfaction increases for users at both levels. MIS communicates strategic changes in the organisation to the various functional areas thereby playing the role of a change agent. Aligning IT strategies with state-of-the-art technology facilitates MIS to have proactive and reactive support for strategic changes. MIS provides support to the individual as well as group decision-making, thereby users are able to take effective decisions.

The unrelatedness of information systems with other functional systems generate information waste. When MIS supports only the operational management functions, and strategic level applications are not available, information waste occurs at strategic level. The present and future information requirements are to be provided for the individual as well as group. When MIS provides reports for understanding the managerial situations and for decision-making, the frequency to use MIS for business tasks and processes will increase. When information reports are used for creative and conservative thinking of managerial processes, users will appreciate the technical quality of existing information systems.

The Internet is forcing companies to transform themselves with a rethinking of their business models and strategies. Flexibility in information systems has to be a driving force to facilitate such strategic changes in a more proactive and reactive way. For example, frequently indicating the opportunities for change and managing the change process should be a built-in attribute with a flexible information system.

Besides the new competitors, traditional competitors are exploiting the Internet to become much more innovative and efficient. So flexibility in information systems for competitive advantage should be retained in planning, design, and implementation phases (Spence and Carey, 1991). To have a leading edge over competitors, MIS planning has to be done in an integrated and intelligent way so that the information doesn’t have to be processed just because it is there (Simon, 1968).

After assessing the existing flexibility in MIS and the extent of matching with the business needs, the gaps are to be identified. This can be achieved by critically questioning the extent of information fulfillment, using the following questions:

- Which of the needs for competitive advantage are met by the current systems?
- Which of the needs will be met by work now in hand?
- Which high priority needs are not addressed by current systems/plans?
- Is the work in hand directed in the best way at meeting those needs? (Hohn, 1986).

MIS indicates the forthcoming changes in operational and strategic management environment. MIS provides active support to implement the change at the strategic level. To facilitate organisational changes, MIS prepares a new set of inputs and outputs. In this process, the multiplicity of inputs and outputs are substantially reduced. The systemic models provided by MIS enable to identify leverage points so that opportunities created for dramatic change to improve the business are more.

Criteria for assigning priorities in MIS selection should be given as a balance between quantitative and qualitative norms. The information systems can be initiated and innovated by user, or by top management, or it may be an effort of the R&D department, or by an outside consultancy, or by all. Balancing the view points from all resources, stabilising the goal for operational as well as strategic success becomes an important ingredient for success. The flexibility is emphasised in presentation of quantitative and qualitative information outputs, verbal and pictorial mode of representation, information supply at micro and macro level, brief and detailed reports.

Centralised data storage to draw different pictures out of data banks facilitated by a flexible access mechanism are to be laid down. The modules are to be independent and homogeneous and at the same time should be capable of being utilised in the future. The output reports are to be designed in such a way that users should get the benefit of utilising the reports for scenario building rather than simple menu driven ones.

New software design technologies like object oriented programming, data base management techniques are to be applied for greater flexibility. The sophisticated packages like RDBMS, client server models, and usage of SQL also make the system more flexible. Networking the distantly located offices and keeping the centralised data banks allow the user to enter the data from any node point which is distantly located. At the same time the user can access the pooled data for firing any query from any place. Continuous reengineering and revamping of both the hardware and software becomes necessary to avoid any failure in the centralised data processing machine and for better and meaningful information.

Concluding Remarks

When there is a flexibility without any intent then it will loose its identity. Some outline is required within which flexibility could be there. The information systems are to be initiated with a reference to the organisation goals and objectives. The further development and expansion of applications can be done within this boundary.

MIS flexibility is a promising area with ample scope for further research. How to incorporate MIS flexibility at the conceptual design, and development stages need to be considered. Case study approach for this purpose is worthwhile to attempt. Flexibility is a resource and it is achieved by cost-benefit analysis. When the benefits are multiplied, it is worth while to spend additional efforts to acquire more flexibility. Organisational context variables such as organisation culture, MIS maturity in the organisation need to be considered to measure MIS success in a specific context.

Decentralised information systems development in the organisation should be encouraged. This helps the user to incorporate flexibility by their self imposed choices. Identifying people who are directly related to the system development and involving them as stake holders become an important task. Top management commitment for MIS development will accelerate the process. The various MIS planning methodologies need to be integrated by overcoming the limitations of each methodology.

References


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Triandis Harry C. (1979) Beliefs, Attitudes, and Values University of Nebraska Press, NF.


Appendix I: Measures for MIS Flexibility and MIS Success Variables

MIS Flexibility
Information Systems provide support for
Operational/Strategic management
Information systems support for organisation’s strategic changes
Passive/Active
Information Systems application development is for
Individual/Group
Nature of information available for strategic changes
Proactive/Reactive

User Satisfaction
Effectiveness of the policies for developing critical application systems
Adequate integration of information systems strategies with state-of-the-art technology
Accuracy of the procedures for determining the priorities for the application systems development
Timeliness of the information systems to communicate data between different functional areas

Information Waste
Deviation of MIS plan from the organisation’s strategic plan
Ignoring the priority for critical applications
Omission of present and potential information systems
Lack of integrated information systems with other functional systems

MIS Usage
Frequency of using information systems for the business processes and tasks
Appreciation of technical quality of existing information systems
MIS usage rate for making decisions
User commitment rate for information systems usage in day-to-day activities

MIS enablement for Organisational Change
Information support to reduce the multiplicity of inputs and outputs in the business processes
Degree of collaboration by exchanging information between the functions
Information support to initiate and support major changes in the business processes
MIS created opportunities for radically improving the business processes

MIS enablement for Competitive Advantage
MIS capability for customer service so building barriers to new entries
MIS competence to attract and interact with customers so to retain them
MIS support to change the basis of competition such as cost based, product differentiation, and market niche
MIS support to the process of faster delivery with cheaper cost

MIS enablement for Organisational Learning
MIS indication level for the impending changes in the environment
Information systems support to prepare a new set of inputs/outputs to face the threatening changes
Providing systemic models for organisational functioning to identify the influential points of change
MIS support to understand the impact of delays in the organisational processes

Appendix II
(a) Fuzzy Sets for Scaling MIS Flexibility

<table>
<thead>
<tr>
<th>Qualitative</th>
<th>Innovation</th>
<th>Intelligence</th>
<th>Interaction</th>
<th>Integration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very High</td>
<td>0.8</td>
<td>0.9</td>
<td>0.9</td>
<td>0.8</td>
</tr>
<tr>
<td>High</td>
<td>0.8</td>
<td>0.7</td>
<td>0.6</td>
<td>0.6</td>
</tr>
<tr>
<td>Moderate</td>
<td>0.6</td>
<td>0.5</td>
<td>0.5</td>
<td>0.4</td>
</tr>
<tr>
<td>Low</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>Very Low</td>
<td>0.1</td>
<td>0.1</td>
<td>0.2</td>
<td>0.2</td>
</tr>
<tr>
<td>Almost Nil</td>
<td>0</td>
<td>0</td>
<td>0.1</td>
<td>0.1</td>
</tr>
</tbody>
</table>

(b) Fuzzy Sets for Scaling MIS Success

<table>
<thead>
<tr>
<th>Qualitative</th>
<th>Decision Effectiveness</th>
<th>Organisational Enhancement</th>
<th>Improved Productivity</th>
<th>Cost Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very High</td>
<td>0.9</td>
<td>0.9</td>
<td>0.8</td>
<td>0.9</td>
</tr>
<tr>
<td>High</td>
<td>0.8</td>
<td>0.6</td>
<td>0.7</td>
<td>0.6</td>
</tr>
<tr>
<td>Moderate</td>
<td>0.5</td>
<td>0.5</td>
<td>0.6</td>
<td>0.6</td>
</tr>
<tr>
<td>Low</td>
<td>0.3</td>
<td>0.3</td>
<td>0.2</td>
<td>0.5</td>
</tr>
<tr>
<td>Very Low</td>
<td>0.1</td>
<td>0.1</td>
<td>0.2</td>
<td>0.4</td>
</tr>
<tr>
<td>Almost Nil</td>
<td>0</td>
<td>0</td>
<td>0.1</td>
<td>0.1</td>
</tr>
</tbody>
</table>

Appendix III: Item-wise Analysis (Question-wise analysis)

<table>
<thead>
<tr>
<th>Item Name (Qn. No.)</th>
<th>Optimistic</th>
<th>Most Likely</th>
<th>Pessimistic</th>
<th>S.D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1. MIS support for operational and strategic management</td>
<td>8.3</td>
<td>5.07</td>
<td>1.4</td>
<td>2.37</td>
</tr>
<tr>
<td>Q2. Support for strategic changes</td>
<td>8.3</td>
<td>4.34</td>
<td>1</td>
<td>2.3</td>
</tr>
<tr>
<td>Q3. MIS development for individual and group</td>
<td>8.3</td>
<td>4.58</td>
<td>0.4</td>
<td>2.45</td>
</tr>
<tr>
<td>Q4. Support for strategies</td>
<td>8.3</td>
<td>4.49</td>
<td>0.4</td>
<td>2.39</td>
</tr>
<tr>
<td>Q5. User satisfaction in policies</td>
<td>8.5</td>
<td>4.72</td>
<td>0.3</td>
<td>2.02</td>
</tr>
<tr>
<td>Q6. MIS integration with new technology</td>
<td>8.5</td>
<td>5.13</td>
<td>1.5</td>
<td>2.13</td>
</tr>
<tr>
<td>Q7. MIS prioritisation</td>
<td>8.5</td>
<td>4.9</td>
<td>0.3</td>
<td>2.18</td>
</tr>
<tr>
<td>Q8. Communicating across the functions</td>
<td>8.5</td>
<td>5.26</td>
<td>0.3</td>
<td>2.33</td>
</tr>
<tr>
<td>Q9. Deviation of MIS plan with business plan</td>
<td>8.5</td>
<td>4.37</td>
<td>0.3</td>
<td>2.3</td>
</tr>
<tr>
<td>Q10. Ignoring the priority for critical applications</td>
<td>8.5</td>
<td>4.3</td>
<td>0.3</td>
<td>2.26</td>
</tr>
<tr>
<td>Q11. Omission of present and potential information</td>
<td>8.5</td>
<td>4.38</td>
<td>0.3</td>
<td>2.27</td>
</tr>
<tr>
<td>Q12. Unrelatedness with other functions</td>
<td>8.5</td>
<td>4.14</td>
<td>0.3</td>
<td>2.37</td>
</tr>
<tr>
<td>Q13. Reducing the multiplicity of inputs and outputs</td>
<td>8.5</td>
<td>5.03</td>
<td>1.5</td>
<td>2.3</td>
</tr>
<tr>
<td>Q14. Frequent information exchange</td>
<td>8.5</td>
<td>5.28</td>
<td>1.5</td>
<td>2.29</td>
</tr>
<tr>
<td>Q15. Initiating and supporting process changes</td>
<td>8.5</td>
<td>5.04</td>
<td>1.5</td>
<td>2.19</td>
</tr>
</tbody>
</table>

Cont'd...
### Appendix III: Item-wise Analysis (Question-wise analysis)

<table>
<thead>
<tr>
<th>Item Name (Qn. No.)</th>
<th>Optimistic</th>
<th>Most Likely</th>
<th>Pessimistic</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q16. Creation of opportunities for change</td>
<td>8.5</td>
<td>5.22</td>
<td>0.3</td>
<td>2.39</td>
</tr>
<tr>
<td>Q17. Frequency of MIS usage</td>
<td>8.5</td>
<td>5.95</td>
<td>1.5</td>
<td>2.03</td>
</tr>
<tr>
<td>Q18. Appreciation of technical quality</td>
<td>8.5</td>
<td>5.42</td>
<td>1.5</td>
<td>1.99</td>
</tr>
<tr>
<td>Q19. MIS usage for making decisions</td>
<td>8.5</td>
<td>5.45</td>
<td>0.3</td>
<td>2.21</td>
</tr>
<tr>
<td>Q20. MIS commitment for day-to-day activities</td>
<td>8.5</td>
<td>6.25</td>
<td>1.5</td>
<td>1.94</td>
</tr>
<tr>
<td>Q21. Building barriers to rivals</td>
<td>8.5</td>
<td>4.64</td>
<td>0.3</td>
<td>2.55</td>
</tr>
<tr>
<td>Q22. Preventing the customer from switching</td>
<td>8.5</td>
<td>4.44</td>
<td>0.3</td>
<td>2.56</td>
</tr>
<tr>
<td>Q23. Changing the basis of competition</td>
<td>8.5</td>
<td>4.85</td>
<td>0.3</td>
<td>2.61</td>
</tr>
<tr>
<td>Q24. For cheaper and quality products</td>
<td>8.5</td>
<td>5.35</td>
<td>0.3</td>
<td>2.33</td>
</tr>
<tr>
<td>Q25. Indication of forth coming changes</td>
<td>8.5</td>
<td>4.82</td>
<td>0.3</td>
<td>2.36</td>
</tr>
<tr>
<td>Q26. Support for the change process</td>
<td>8.5</td>
<td>5.09</td>
<td>1.5</td>
<td>2.23</td>
</tr>
<tr>
<td>Q27. Yielding systemic models of organisation</td>
<td>8.5</td>
<td>4.98</td>
<td>1.5</td>
<td>2.39</td>
</tr>
<tr>
<td>Q28. Facility to understand the process delays</td>
<td>8.5</td>
<td>5.55</td>
<td>0.3</td>
<td>2.3</td>
</tr>
</tbody>
</table>

### Appendix IV: Results of Hypothesis Testing Related to MIS Flexibility and MIS Success

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Variable</th>
<th>MIS Flexibility (Most Likely)</th>
<th>Association (Optimistic Most Likely &amp; Pessimistic)</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1</td>
<td>User Information Satisfaction</td>
<td>73.46a</td>
<td>R^n</td>
</tr>
<tr>
<td></td>
<td>25b</td>
<td>.0000c</td>
<td>R^n</td>
</tr>
<tr>
<td></td>
<td></td>
<td>.2856**</td>
<td>R^n</td>
</tr>
<tr>
<td>H2</td>
<td>Information Waste</td>
<td>33.26a</td>
<td>R^n</td>
</tr>
<tr>
<td></td>
<td>20b</td>
<td>.0316c</td>
<td>R^n</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-1.520*</td>
<td>R^n</td>
</tr>
<tr>
<td>H3</td>
<td>MIS Usage</td>
<td>47.52a</td>
<td>R^n</td>
</tr>
<tr>
<td></td>
<td>20b</td>
<td>.0005c</td>
<td>R^n</td>
</tr>
<tr>
<td></td>
<td></td>
<td>.3347**</td>
<td>R^n</td>
</tr>
<tr>
<td>H4</td>
<td>MIS Enabled Organisational Change</td>
<td>55.95a</td>
<td>R^n</td>
</tr>
<tr>
<td></td>
<td>25b</td>
<td>.00037c</td>
<td>R^n</td>
</tr>
<tr>
<td></td>
<td></td>
<td>.3704**</td>
<td>R^n</td>
</tr>
<tr>
<td>H5</td>
<td>MIS Enabled Competitive Advantage</td>
<td>56.56a</td>
<td>R^n</td>
</tr>
<tr>
<td></td>
<td>25b</td>
<td>.0003c</td>
<td>R^n</td>
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<tr>
<td></td>
<td></td>
<td>.2774**</td>
<td>R^n</td>
</tr>
<tr>
<td>H6</td>
<td>MIS Enabled Organisational Learning</td>
<td>70.71a</td>
<td>R^n</td>
</tr>
<tr>
<td></td>
<td>25b</td>
<td>.0000c</td>
<td>R^n</td>
</tr>
<tr>
<td></td>
<td></td>
<td>.4045**</td>
<td>R^n</td>
</tr>
</tbody>
</table>

*Pearson's Chi-square Value, *Degrees of Freedom, *Significance level

*Pearson's Correlation coefficient 1 tailed significance (p<.01)

**Pearson's Correlation coefficient 1 tailed significance (p<.001)

Optimistic, Most Likely, Pessimistic, Related I - Independent

---

### Flexibility Mapping: Practitioner’s Perspective

1. What types of flexibilities you see in the practical situation of “MIS Planning” 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 in MIS planning that are relevant for your own organisational context? On which dimensions, flexibility should be enhanced?

3. Try to map your own organisation on following continua. [Please tick mark in the appropriate box(es)]

   - Operational
   - Operational Management
   - Reactive
   - Low
   - Strategic
   - Strategic Management
   - Information for Strategic Changes
   - MIS Integration
   - Intelligence in MIS
   - Proactive
   - High

4. Develop a SAP-LAP (Situation Actor Process-Learning Action Performance) model of “MIS Planning” relevant to your organisation.

---

### Reflecting Applicability in Real Life

1. How will you assess operational and strategic success of MIS in your organisation? Make use of the model proposed here to develop suitable measures of MIS success.

2. How will you enhance MIS flexibility in your organisation? Generate ideas for implementation using the areas proposed in this paper.

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Strategic Information Systems Planning Practices in Select Banks - A Flexible Systems Study

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Abstract

A study is conducted to analyze the prevailing practices of Strategic Information System Planning (SISP) in three banks operating in India. Banks are selected one from each sector i.e. private sector (HDFC Bank), foreign sector (ABN AMRO Bank) and public sector (Oriental Bank of Commerce). The aim is to carry out a comparative study and identify reasons for differences, if any, in the SISP practices adopted by them. The Flexible System Methodology i.e. Situation -Actor -Process (SAP) and flexsys (Flexible Systems) tools were used to analyze the cases. The main focus of this study is to examine the issues such as centralization of planning, freedom of choice to decision makers, nature of planning, extent of internal and external focus, participation of key stakeholders in planning process, documentation vs empowerment and organisation learning for setting the goals. After analyzing the three cases, a synthesis is performed on situational factors, roles of actors and processes adopted for IS planning. Learning issues derived through the synthesis has helped to identify actions to improve situation, actor and process for all the three banks. Impacts of the suggested actions on the performance are also highlighted.

Keywords: exible system methodology, flexsys tools, Indian banks, strategic information system planning

Introduction

Strategic Information System Planning (SISP) has become an increasingly important issue for both researchers and practitioners (Sass and Keefe 1988, Earl 1993). It is important to note that in supply of key issues over the past ten years, SISP has consistently remained among the top ten issues (Caudle et. al, 1991, Palvia and Plavick 1992, Teo et. al, 1997). One main reason is that many organisations are currently looking for new ways to leverage IT to streamline internal operations, lower cost and differentiate products/services in order to compete more effectively in the global environment.

SISP has been defined (Lederer and Sethi, 1992) as a combination of two simultaneously performed approaches. On one hand, SISP helps organisation use IS in innovative ways to build barriers against new entrants, change the basis of competition, generate new products, build in switching cost (Porter, 1985). As such SISP promotes innovation and creativity.

On the other hand, SISP is a process of identifying a portfolio of computer based applications to assist an organisation in executing its current business plans and thus realizing its exiting business goals. The distinction between the two approaches results in the former being referred to as attempting to impact organisational strategies and the latter as attempting to align MIS objectives with organisational goals (Lederer and Sethi, 1992).

Information system planning should have the built in flexibility to allow adoption of Information System process of new opportunities as they present themselves, and thus foster creativity (Raghunathan and Raghunathan, 1991). At the same time, it should try to balance such creativity through the use of adequate control mechanisms so that frequent adaptations on the grounds of creativity do not lead to loss of control. Flexibility is the ability to change or react with little penalty in time, effort, cost or performance. It implies openness in thinking, adaptiveness to the environment, responsiveness to change, versatility of action, non-rigidity, multiplicity of process setting, freedom, liberalization, informal attitude, autonomy of function, agility in actions, customized or tailor made solutions (Sushil, 1997). Flexibility in IS planning is the ability of the planning systems to anticipate crises, identify opportunities and adapt to unanticipated changes (Ansoff, 1975). The use of strategic system as strategic weapon requires planned and effective organisational responses to environmental changes. These changes impinge directly on the organisational information system and can be considered to be important inputs to IS planning because of the need to recognise and respond to them, such as customer's and user's changing preferences and demands and technological developments. Development of technologies like Internet, Smart cards etc. must be responded quickly by the banks to get strategic advantage of Information Systems. The degree to which these factors are emphasised in the development of the IS plan have
a direct impact on the effectiveness of the IS plan. Effective planning requires foreseeing problems and opportunities within a turbulent, complex and rapidly changing business environment (Brancheu and Wetherbe, 1987). The organisation has to respond quickly with the business environment by making strategic changes like technology absorption, organisation skill up-gradation, changing Organisation’s structure and culture to promote innovations and creativity and so on. IS has to be planned for flexibility to support these changes. Top management believes that IS flexibility enables strategic success and thereby leads to organisational success (Sushil, 2000).

For obtaining flexible information systems, users should take the responsibility of planning and suggesting the strategic uses of IS in their functional areas. Business managers should translate business strategies into IS strategies. Top management should promote innovative culture. For obtaining the flexible IS, which is the outcome of strategic planning process, the process itself has to be flexible enough. IS planning has to be enriched with integrative, innovative and interactive applications. Various flexibility issues in the context of SISP are presented here:

**Planning Focus - Internal vs External**

Internal focus refers to the development of back office systems such as accounting, budgeting and other systems to handle voluminous day to day transactions. External focus means concentrating on the needs of the customers and other environmental factors. In IS literature researchers (Lederer and Sethi 1996, Sabherwal and King 1995) describe this as innovation and integration. The innovative orientation nurtures creativity. Its purpose is to help planners systematically look for opportunities and threats in the environment and then generate novel solutions for competitive survival. Integrative orientation focuses more on control.

There is a need of interplay between internal and external focus. Only organizing the back office internally will not suffice. It is essential to know the latent needs of customers and evolve strategy accordingly.

**Participation of Key Stakeholders in IS Planning**

Participation and involvement of Top management in IS planning has been repeatedly found to be an important facilitator for effective IS planning (Premkumar and King 1991). Their inputs provide the general direction for IS planning and also communicates a positive signal to other members in the organisation and helps in getting greater commitment and involvement from user (Premkumar, 1992). An equally important issue is the involvement of users in the planning process. Systems are developed for the users, therefore their involvement in the planning and development phase facilitates in implementation of plans (Premkumar, 1992). Visualizing the future provisions for incorporating flexibility is another role of the user.

Top management involvement is concerned with psychological state of top managers, reflecting the degree of importance placed by them on IS planning. Involvement refers to their attitude and perceptions concerning IS planning. To be involved, top management need not to spend their personal time. Rather the involved top management only needs to view IT as contributing to the firm’s success (Jarvenpaa and Ives, 1991).

Top management participation is used to refer to top management activities or substantive personal interventions in IS planning. Participation requires investment of some of top manager’s time and energy on IS planning matters. Dutta (1996) concluded that active participation and involvement of business users and managers in IT planning process helps to align IT with business.

In India, where IS implementation is not so mature, top management prefer to outsource IT probably because of unavailability of necessary expertise. But it should be clearly understood that managers can outsource IT but cannot outsource management of IT. Top management participation will result in development of innovative IS applications by capturing broad Organisation’s vision.

IS planners have freedom of choice to involve or not the users in planning exercise. If at all they are involved, when and how they should be involved is another choice of the IS planners.

**Documentation of IS Planning Process**

Documentation refers to the existence of written guidelines and procedures for planning process and also output of planning process. A highly documented and formalized planning process is more rationalized for constructing strategic plans (Sabharwal and King 1995, Premkumar and King 1994). Ideally, documented procedure produces efficiency gains by systematic identification of strategic issues. However, gains in efficiency accruing from documented procedure must be balanced against reduction in flexibility. Documented formalized procedure retards prompt and efficient elimination of strategic issues, once they become unimportant (Lederer and Sethi, 1996).

Therefore a balance between documentation and empowerment is to be maintained so as to improve the flexibility of the system and at the same time helps for efficient collection and dissemination of information.

**Organisational Learning for Setting Goals**

Strategic Information System Planning is carried out with certain goals. Fulfillment of the goals indicates effectiveness of planning systems. After examining the literature within IS and strategic management, Segars and Grover (1998) concluded four distinct approaches for assessing the effectiveness of strategic planning: Goal centered judgement, Comparative judgement, Normative judgement and Improvement judgement. Goal centered
Judgement seeks to assess the degree of attainment in relation to targets. Extent of attainment of multiple objectives of planning is used to assess the effectiveness. Comparative judgement deals with comparison of a particular system with other similar systems. Gathering accurate and timely information regarding comparable system is difficult. In normative judgement the systems are compared to “standard of the fields” rather than unique planning goals of the organisation. Improvement judgement focuses on assessing how the planning system has evolved or adapted over time in supporting organisational planning needs. This approach is particularly useful in cases where the system is in its initial stage and has yet to reach steady state. The top management have freedom of choice to use IS for organisational learning and hence organisational change.

In Indian banking, where the information systems are still in the initial stage, improvement judgement best suits the need to find the effectiveness of planning. In other words, organisation learning must be the base of setting future goals. Instead of only to optimise the outcome of SISP, it is better to gain insight from learning. So, need is to have combination of optimisation and learning.

Banking is no longer a business confined to money transactions but now it is perceived as business related to information on financial transactions. In Indian Banking Sector, IT evolved during a period when communications infrastructure was expensive to acquire. This led to automation of selective functions and departments, instead of business process end to end. This, in turn, resulted in islands of data achieving limited benefits. Now, with the entry of new banks, the competition for customers is intensifying. Against this background, the use of computers and allied technologies by banks has become inevitable to achieve satisfactory level of customer service. With the increased level of IT infusion and diffusion and in the competitive environment in Indian banking sector, there is a need to pay proper attention to SISP keeping in view its flexibility aspects. Therefore, three banks, one from each sector, i.e., private, foreign and public sector, are selected for this study. HDFC bank (private sector bank) is a technology savvy bank and is one of the leaders in offering many IT based products and services such as internet banking, mobile banking, international debit cards etc. ABN AMRO bank (foreign sector bank) is among the top ten banks in the world in size and strength and is the only foreign bank in India to report an increase in net profit during the year 1998-99. Oriental Bank of Commerce (public sector bank) is a customer friendly bank as per evaluation study of National Institute of Bank Management (NIBM). It has highest profit per employee among public sector banks and lowest non-performing assets (NPA) in banking industry. Hence, these three banks are selected for the study.

**Methodology**

The case studies have been prepared by collecting data both from primary and secondary sources. Structured interviews of VP (IT), DGM (IT) and other experienced senior key personnel of the selected banks were arranged. The focus of interview was to unearth SISP practices followed by the banks. To supplement the findings, data were also collected from annual reports, printed documents, press release and web sites of the banks. The cases were then analyzed applying flexible system methodology, i.e. Situation - Actor - Process, Learning - Action - Performance (Sushil, 1994,1997,1999) and flexsy tools to bring about the finer issues of flexibility in the context under consideration. Sushil (1994,1997) discusses SAP analysis and LAP synthesis as a method of analysing case study. In SAP analysis, case is described through three basic components that define the dynamic interplay of reality. These components are situation, actors and process. These are definable within a context and interact flexibly on multiple planes in the ambiguous reality and help in the understanding of it.

*Situation is the present status, potential for growth or decay, present and future state of the art etc. The participants who influence the situation and alter it by their actions or inaction are termed as actors. The procedural steps taken by the actors who alter the situation are termed as the process. Some processes may be explicitly identifiable while some others would be implicit. Any dynamic behaviour that alters the situation has the potential of being a process.*

![Figure 1: SAP-LAP Paradigm](image)
SAP analysis leads to the second phase of the analysis, which is called LAP synthesis, having three components i.e., learning issues, actions and performance. Learning issues emphasize the typicality of the situation as well as some features of its uniqueness. Learning issues also lead to action, which when taken would lead to improved performance. This should result in positive growth and enhance productivity and profitability. Improved performance is the sum total of the SAP analysis and LAP synthesis.

In each case, prevalent situation in the context of SISP has been identified. The current scenario of the bank and operating environment has been discussed. The roles played by all stakeholders have also been described. The process part deals with practices adopted by the banks to carry out SISP, keeping in view the issues mentioned earlier. The cases were synthesized with respect to context, situational factors, roles of actors and SISP practices to highlight the learning issues. This led to key actions to improve the situation, actor and process. Finally, the impacts of these actions on the performance of situation, actor and process are explored and indicated at the end of each case. Figure 1 shows interactions of situation, actor, process, learning issues, desired action and effect on performance on SAP-LAP paradigm.

Case Studies

Case studies for three banks i.e., HDFC Bank (Private Bank), ABN AMRO Bank (Foreign Bank) and Oriental Bank of Commerce (Public Sector Bank) and their SAP-LAP analysis are presented in this section.

HDFC Bank

Background of the Bank

The Housing Development Finance Corporation Limited (HDFC) was amongst the first to receive an ‘in principle’ approval from the Reserve Bank of India (RBI) to set up a bank in the private sector, as part of the RBI’s liberalisation of the Indian banking industry. It was incorporated in August, 1994 in the name of ‘HDFC Bank Limited’, with registered office in Mumbai. The Bank began operations as a Scheduled Commercial Bank in January 1995. Growth of the bank in terms of number of branches since its incorporation is indicated in Figure 2.

The Bank, headquartered in Mumbai, recently merged with Times Bank, a rival private sector bank. The merged entity will create the largest new private sector bank in the country with assets aggregating to around Rs. seventy-five billion. The merger of Times Bank nearly doubled HDFC bank’s balance sheet size over Rs. 7600 crore at one go and its ATM population increased from 57 to 97 and number of branches from 70 to 107.

Bank’s expansion plans is to have a presence in all major industrial and commercial centres where their corporate customers are located, as well as to build a strong retail customer base.

The Bank’s mission is to be a World Class Indian Bank. This would imply a bank that would meet various financial needs of its customers in a convenient and cost-effective manner at international standards of service.

They aim to build a position of market leadership in each of their businesses in certain niche customer segments. They seek to achieve the status of a ‘preferred Organisation’ among their major constituents – customers, shareholders, regulators, employees, suppliers, etc. – while maintaining the highest levels of integrity and corporate governance. The Bank’s site highlights that their business philosophy is based on four core values: Operational Excellence, Customer Focus, Product Leadership and People.

Information Technology in HDFC Bank – Current Scenario

The Bank started its operation in computerized environment and they have all their branches fully computerized. They do not want to open a branch without adequate IT infrastructure. This spirit was explicit in the statement of S.R. Balasubramaniam, VP (IT).

"IT infrastructure needs to be up and ready before the branch is opened so that services are available to customers from the very first day."

The Bank has Centralised network with its central processing unit located at bank’s Chandivali office at Mumbai and performs all the data processing required by the bank and its branches. Each region has a regional hub to which are connected all the bank’s branches in that region. For instance, there is a hub in Ahmedabad to which are connected its branches in Baroda, Surat, Rajkot etc. All regional hubs, Ahmedabad, Delhi, Hyderabad, Calcutta etc., are connected to Mumbai. The regional hubs function as ‘Spokes’ for the bank’s national operations. The flow of information is therefore from regional spokes to the regional hubs and finally to the central hubs as shown in Figure 3. All data is stored centrally in Mumbai. Hub and spoke model is selected so as to provide flexibility of introduction of integration of new applications as the banks operation increases and diversified.

There exists a high degree of connectivity between the regional branches and central hub through leased lines, radio modems and ISDN lines. There is also a back up links that is always available in case the main link goes down. The selection of communication links depends upon its availability, performance and costing. All communications are currently based on TCP/IP protocol.

Flexible approach of IT department is reflected in the statement of Ram, Head (IT) given for selecting Hub and Spoke model-

"We were looking for a network that allowed us to change systems step by step, without always being
confronted by endless interdependencies”.

Following are the main communication technology based services offered by the bank:
- Internet banking
- Phone banking
- Mobile banking
- Visa Electron International Debit Card etc.

<table>
<thead>
<tr>
<th>Year</th>
<th>Branches</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995-96</td>
<td>10</td>
</tr>
<tr>
<td>1996-97</td>
<td>20</td>
</tr>
<tr>
<td>1997-98</td>
<td>37</td>
</tr>
<tr>
<td>1998-99</td>
<td>57</td>
</tr>
</tbody>
</table>

![Bar chart showing number of branches by year](image)

**Figure 2: Number of Branches**

Internet Banking services was started from September'99, using a 128 kbps leased lines and a Sun Solaris iBanking server. Customer can use Internet banking services to get up-to-date information on bank’s products and services, round the clock. Services offered through Net banking include Account Balance Inquiry, Account Statement Inquiry, Cheque Status Inquiry, Stop Payment Request, Demand Draft/Bankers Cheque Request, Funds Transfer, Cheque Book Request, FD Inquiry, New FD Requests etc. Customer can also find out the balance in their savings or current account. One can also pay bills through the Internet. This facility allows to pay utility & cellular phone bills on the net from anywhere in the world, anytime.

**Phone Banking** is available at present to the customers in Mumbai, Delhi, Chennai and Calcutta.

HDFC bank and Max Touch have launched a product offered in Delhi and Mumbai where customers who have account with HDFC bank and are subscribers to Max Touch will be able to carry out certain bank transactions on mobile phone. Mobile banking customers of the bank can access their accounts at any time over the cell phone from 25 cities in India and 60 countries across the world. **HDFC Bank International Debit Card** is introduced in association with Visa International. The Debit card is just like an ATM card, with the advantage that customer can also use it to shop or pay for just about anything, all over India as well as abroad. The card is part of the Visa Electron Global Debit program, which puts a network of more than 5000 merchant outlets and 235 ATM locations in India, as well as over 4 million merchant outlets and 530,000 ATMs worldwide at customer’s disposal.

**IS Planning Practices in HDFC Bank**

**Centralised IS Planning:** Bank has a very small IT department having 41 people of which 23 are in data centres, while the rest form the bank’s support services staff. Organisation Chart of IT department is as shown in Figure 4. Structure is comparatively flatter with functional divisions along with effective coordination. This promotes innovations and improves communications.

**Case studies for three banks** i.e. HDFC Bank (Private Bank), ABN AMRO Bank (Foreign Bank) and Oriental Bank of Commerce (Public Sector Bank) and their SAP-LAP analysis are presented.

IS Planning is a totally Centralised at IT department at Mumbai and is 100% in-house, whereas most of their required IT support is outsourced to Citicorp Information Technology Industry Limited (CITIL). According to C.N. Ram, Head (IT) -

“We realised that our core competence lay in the field of banking and not IT.”

The Bank has an ongoing contract with Wipro for fault management. LAN, WAN and other facility management. Software used by banks are mostly developed by Citicorp Information Technology. Micro Banker is used for corporate banking; Money Maker is used for Treasury Management. Finware used for retail banking, which uses a Unix server and a Sybase database management system. Ram outlined the bank policy on this -

“We buy only those products that have an international presence, but offer locally available support.”

The outsourcing policy of the bank can be represented as thinking globally but acting locally as shown below. With this bank can enjoy the benefit of
both international brand value and local services of vendor.

Objectives of IT department:

- 100% availability of all systems to end-users.
- 100% adherence to established procedures.
- Ensuring the success of the facility management process for the bank.

Participate style and freedom of choice in planning: Head (IT) and three VP (IT) are playing a critical role in planning. They believe that bank drives IT and IT drives Bank. Strategic planning exercise is carried out keeping this philosophy in mind. For the purpose, IT meeting is conducted regularly. The VPs do not work in isolation but they work as a team. Options and suggestions are invited from business managers regarding business products and IT executives try to deliver the demanded product and services using IT. In other words, business plans are translated into IS plans. After developing a product, it is tested by the user department before launching it commercially. This helps to find hidden problems in implementation, if any.

Business managers participate in the business planning process and have freedom to suggest innovative ideas. For achieving a targeted level of business, they have to have certain level of transactions, resources etc. These requirements of resources are translated into IS requirements and finally into IS plans. Product development team (PDT), consisting of business managers, applies creative applications to develop new products. The new products are developed by the team based on customer’s requirements and existing trend. IS requirements for the new product are chalked out by IT project team. Individual ideas are discussed in-groups to finalize the projects, which can be represented as -

Individual  O ————> O Groups

HDFC Bank may work with outside agencies if need arises. For instance, recently, bank worked with ‘Orange’ to make mobile bank project successful. Orange is one of the world’s largest digital cellular network operating in Mumbai under the name of ‘MaxTouch’. By working together as a team the mobile banking plan was converted into reality quickly.

IT department have a service level agreement with the users regarding uptime of systems, level of service etc. This reflects the performance level of IT department and is also important from point of view of user’s satisfaction. Bank pays moderate attention to user’s satisfaction because they believe that only satisfied users can satisfy the customers.

IS planning exercise is part and parcel of IS managers responsibility. There is no full time staff looking into only IS planning. Approach adopted for planning is very structured creative and is top down approach. The approach is a combination of Procedural and Innovative approach as shown.

Procedural Planning Approach Innovative

Focus – internal vs external: Business managers meet their corporate customers regularly and obtain their views/requirements. Feed backs obtained from customers are considered in business planning, which will be finally reflected in IS planning.

While prioritizing IT projects, the criterion is business needs, which is basically customer driven. This can be represented as oscillating between internal and external focus.

Internal O ————> Focus O External

Documentation vs empowerment: It was found that there is little emphasis on formal documentation of planning documents. They have prepared only technology manual containing structured methodology for day to day IT related operations. But other things like IS mission, policy for communication network, hardware and software plan, personnel recruitment and training plan etc. form implicit parts of plans but are not explicitly developed. The need for the formal documentation has not been very much realized by IT managers. They argue that bank has strength of experienced key personnel, who are empowered to take suitable actions in their role space.

Establishing directions with learning: There is some attention to organisational learning from evaluation of the effects of plans but there is little evidence of conscious development or exploitation of experiences. For instance, the UPS’s frequently crashed in one of the bank branches and failed to deliver the required performance. After investigation it was found due to voltage problem. The voltage was 7 volts, much higher than tolerance limit of 0-2 volts. In future bank started taking due precautions to avoid such happening. This approach can be represented by-

Optimisation O ————> O Learning
Critical success factors: Internal people, customer focus and hence IT strength are the critical success factors for the bank's business where as people and service delivery are the critical success factors for IT.

IT applications are done for internal efficiency improvements as well as for obtaining competitive advantage. S.R.Balasubramanium says - "For obtaining competitive advantage, internal efficiency improvement is equally important so that we can always maintain or rather increase the gap between competitors and us".

Top management's flexible attitude: Top management clearly consider IT as number one critical success factor for bank's performance and view IT investment as a strategic investments. They provide clear support to all IT investments, if they are convinced that project is ultimately going to improve quality of service delivery to customers. Management is not only interested in managing day to day issues but also have inclination to identify opportunities to use IT for competitive advantage. This is reflected in their recent aggressive initiatives in Internet Banking and Mobile Banking. These examples also indicate clearly that management is capable to respond to opportunities and challenges of fast changing environment.

Being a private bank, there is no worker's union. As far as recruitment in IT department is concerned, they usually take persons, having experience of both banking and software development. Little attention is paid towards formal regular training of IT personnel.

The interviewees consider most of the foreign banks, new private banks like ICICI and public sector banks like Corporation bank as major competitors.

The management believe that due to flexible IS planning, bank's operational efficiency, speed of handling per customer per service have increased. It has also helped in controlling NPA and bank's fraud. The ratio of operating cost to total income has decreased a little over the last 3 years as shown in Figure 5. Management find it difficult to correlate this with IT investment alone, but at the same time they agree that timely taken IT initiatives with strategic planning is one of the factors responsible for such reduction.

SAP-LAP Analysis

The case is analyzed applying Situation - Actor - Process, Learning - Action - Performance (SAP - LAP) paradigm (Sushil, 1999), to find the finer issues. Prevalent situation in the context of SISP, key actors and their roles and silent features of SISP process has been identified. Learning issues are explored and actions are suggested. Finally, effect of suggested actions on Situation, Actor and Process is highlighted.

Users must also be actively involved in IS planning process. Suggestions, comments alternatives etc. must be invited from users and listened carefully because ultimately, the systems are being developed for them.

<table>
<thead>
<tr>
<th>Total Income</th>
<th>Operating Cost to Total Income</th>
</tr>
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<tbody>
<tr>
<td>444.2</td>
<td>-20%</td>
</tr>
<tr>
<td>302.8</td>
<td>20.7%</td>
</tr>
<tr>
<td>193.3</td>
<td>17.7%</td>
</tr>
<tr>
<td>126.1</td>
<td>21.8%</td>
</tr>
<tr>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

Figure 5: Operating Cost to Total Income

Situation
- Bank's mission is to be a world class Indian bank.
- Centralised Networking approach is opted.
- No employee's union.
- Strategic Information System Planning is totally Centralised at Mumbai.
- All branches and all functions of the bank are fully computerized.
- IT is one of the Critical Success Factors for bank's success.
- Customer focus, operational excellence, product leadership and people - these four are core values.
- Bank offers services in metro, urban and few semi-urban cities. It does not have any rural branch.
- Bank offers services to both individual and corporate customers.

Actor
- CEO of bank as a motivating force.
- IT head and three VP (IT) as team members of SISP process.
- Employees of IT department in putting united effort.
- Foreign banks, ICICI bank and Corporation bank as major competitors.
- CITIL and Wipro being main IT support and facility management consultant.

Process
- Main focus of IT applications is business needs.
- Business plans are translated into IS plans.
- Strategic Information System Planning is done in-house and significant part of related IT support is outsourced.
- Poor explicit documentation of plans.

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- Service level agreement with users as a measure of user satisfaction.
- Continuous monitoring to learn from past.

**Learning Issues**

- **Strength**: Employees with wisdom i.e. putting gained knowledge into use is the strength of IT department.
- **Core competence**: Bank's core competence is in the field of banking and not in IT. Therefore, all IT support is outsourced.
- **Formal documentation**: Explicit documentation is poor. This may create difficulty to novice in understanding bank's philosophy of IT applications in the long run when bank will be mushrooming into a giant.
- **Customer focus**: Utmost customer care. No compromise with quality of service.
- **Centralised network**: Hub and Spoke model is applied. Security and site collapses are the major threats.
- **Business manager and user's involvement**: Business managers are involved to translate business plan into IS plans but users are rarely involved.

**Desired Actions**

- IT is part and parcel for the bank's business. Therefore, there is a need to gradually establishing own IT support team at least for software development and hardware maintenance.
- Because of Centralised database, there is a need of much more tight security and to have a disaster recovery plan that can be put in place in case of site collapses.
- Users must also be actively involved in IS planning process. Suggestions, comments, alternatives etc must be invited from users and listened carefully because ultimately, the systems are being developed for them.

**Performance**

Suggested action will have impact on situation, process and actor as detailed below and ultimately helping the bank to achieve their mission.
- Dependency on outside agency for IT support will be reduced.
- Reliability of the Centralised network will be improved.
- User's participation in SISP will lead to development of more flexible, realistic, easy to implement plan that will also have better integration of Information Systems with business.

**ABN Amro Bank**

**Background of the Bank**

The second case of this paper is on ABN AMRO Bank, which is a long-established, solid, multi-faceted and prominent bank of international reputation and standing. The Bank ranks among the top 10 banks in the world in size and strength. Its international network comprises 3,568 branches and offices in over 320 cities and 74 countries and territories, with over 100,000 highly qualified staff. Established in 1824 as Nederlandsche Handel-Maatschappij it acquired its current name ABN AMRO Bank NV in 1991 with the merger of Algemene Bank Nederland (ABN Bank) and Amsterdam-Rotterdam Bank (AMRO Bank). The bank is in India since 1920. ABN AMRO (India) has branches in Mumbai, Delhi, Chennai, Calcutta, Pune and Baroda, with each branch servicing multi-product relationships. ABN AMRO Bank in India enjoys a strong image as a corporate bank with a base of more than 500 corporate clients. "Bank had an unfocused business approach till 1990 with just two branches. But in 1991, after merger of ABN with AMRO, bank identified India as an opportunity and for the first time brought in Indian Management and that's when the growth commenced" says Ramesh Sobti, Chief executive-India, ABN AMRO Bank. ABN AMRO Bank has its head quarters at Netherlands and operations outside The Netherlands comes under International Division of the bank. The International Division is responsible for the bank's international corporate and commercial banking activities. For the operations in India, bank has a regional office in Singapore. According to bank's site, mission of the International Division of the bank is-

"To reinforce bank's position as one of the leading universal network banks operating worldwide".

Bank's strategy in the words of Sanjeev Vohra, its Corporate Group Head is-

"Our strategy is to select the right customer and provide every thing that he needs. Today, no foreign bank has the breadth of the products that we can offer"

Prior to 1990, with only two branches, bank's strategy was inside-out strategy. Now it has moved towards outside-in strategy as shown below:

Inside out O inside in

Inside out strategy means system is exploited as and when opportunity arises. In case of outside in strategy, systems are developed that provide new ways to compete. Opportunities are explored to gain competitive advantage.

The Bank's core business include Consumer Banking, Corporate Banking, Global Transaction services, Treasury Services and Structured Finance. ABN AMRO was amongst the first foreign banks to identify infrastructure financing as a thrust area.

During 1998-99, ABN AMRO was the only foreign bank in India to report an increase in net profits; they grew by over 30% from Rs. 65 crore in 1997-98 to Rs. 87.5 crore in 1998-99. All other foreign bank operating
in India have reported either a dip in profits or posted a loss during the same period.

In May 1999, ABN AMRO Bank acquired Bank of America’s Retail Banking business in India, Taiwan and Singapore as well as its credit card business in Taiwan. This decision is in line with bank’s strategy to grow and consolidate consumer Banking business in Asia. With the acquisition of Bank of America’s India operations, the number of branches increased from 6 to 8 and off site ATM from 7 to 17.

Information Technology in ABN AMRO Bank – Current Scenario

Information technology (IT) is indispensable tool for the bank to maintain and strengthen its position. The opportunities offered by IT are bringing about radical changes in the way the bank works.

In India, Bank is providing nationwide connectivity to its customers. This is the facility of accessing their accounts from any of the Bank’s branches. Thus customers of Delhi branch can walk in and conduct their transactions in Mumbai or any other branch of bank’s network in India, for that matter.

ABN AMRO Bank (India) brings the latest in banking technology, with its multimedia service - Touch-screen Banking. Located at Pune, Delhi and Mumbai off-site ATM centres, this service allows the customers to carry out all those transactions that an ATM cannot. Some of these facilities are:
- Order a demand draft or pay order, request a bank executive to come over to customer’s house or office to open accounts, latest updates on bank’s products, services and interest rates, balance inquiry, details of term deposits, renewal of term deposits etc. Those who are not the customers of the banks can also enjoy the facility of Touch-screen banking to know more about the products and services offered by the bank.

ABN AMRO Bank’s (India) ATM cards are now available not just for individuals, but also for all proprietorships, partnerships and private limited companies. Moreover, one can use ATM services across the country - at any of the ABN AMRO Bank (India) ATM centres. That’s nationwide banking for the customers.

Another service offered to the clients is Global Transaction Services (GTS). GTS enables the clients, wherever they are in the world, to carry out their business transactions. GTS is a new, client-oriented, worldwide infrastructure, which provides optimum service to clients in cash management, payment services, documentary transactions and trade support.

GTS supplies an integrated service to support clients’ business activities in all regions and in the majority of countries around the world. Comprehensive implementation of the GTS concept is crucial to ABN AMRO’s goal to become a global network bank.

The Transaction Banking Group at ABN AMRO Bank (India) offers cash management, trade finance, securities, correspondent bank services, to their corporate clients in the Asia Pacific region.

Through its electronic delivery service, ‘BankStation’, bank can provide an array of solutions to meet strategic goals of customer’s company, while optimizing the value of customer’s funds and minimising risks.

BankStation is an electronic delivery system, brings an integrated trade services and cash management system to customer’s desktop. This Windows-based system delivers continuously updated information on customer’s trade and cash account transactions.

BankStation brings trade services to customer’s desktop, with solutions to maximise the efficiency of their trade activities.

IS Planning Practices in ABN AMRO Bank

Centralised IS planning: IS planning for India is centralised at bank’s country office at Mumbai. They may seek guidance from, their regional office at Singapore. Bank has Directorate General (IT) at Netherlands. An important task of DG (IT) is to ensure that by using global strategies, architecture and systems the bank will be better able to utilize its IT resources. In order to realize the mission statement, close collaboration between DG (IT) and the other divisions of the bank is necessary. DG (IT) acts here as a ‘solution integrator’, incorporating into a banking process the IT products that has been developed or purchased. For this reason it is essential that the IT strategies of the commercial divisions are brought into line with the Corporate IT Strategy.

Bank has a separate unit called ‘Corporate IT Strategy & Architecture’, the primary responsibility of which is to
formulate the IT strategy and the information and application architecture for the entire ABN AMRO organisation. It is supported by strategy units within the commercial divisions. A special task of this company unit is to research the new possibilities of IT and to promote the use of the promising IT developments within the bank. Another responsibility of this division is to select companies with whom partnerships can be entered into for the mutual benefit of both parties.

IS planning in India is done keeping in view the need of local customers and global presence of the bank.

Organisational structure of IT department in India is shown in Figure 6. Structure is relatively flatter with functional divisions and effective co-ordination. This promotes innovations and improves communication.

![Organisational Structure of IT Department](image)

Bank is using various software like ‘SCORE’ for corporate banking developed in-house, and ‘ICBS’ for retail banking, developed by an American company ‘FISERU’.

Bank is following a Centralised database system. For corporate customers, database is maintained at Chennai and for retail customers at Mumbai. For system security, an internal audit team is continuously working. In addition, external review of the systems is also done.

Mission of IT department: Mission Statement as stated by DG (IT) is as follows: “Giving form to the Network bank by delivering competitive IT products and services which should enable the bank to operate successfully on the worldwide market, which will become increasingly digitized and information-based”.

Andrea, Head (IT Corporate) says -

“IT is our business partner and hence an integral part of our banking business”. Spirit of the mission is visible in her statement.

Participate style and freedom of choice in planning: In India, before doing any IS planning exercise, requirements of business are obtained by respective IT heads, which are then translated into IS plans. Key business managers do participate in the meetings held to discuss strategic IS issues. End users are not directly involved in IS planning but bank takes care of their satisfaction. Once in every six months, survey of users is conducted to get their feedback. In the survey users of all level participate. Bank has a steering committee consisting of CEO, Chief Financial Officer, Head (IT) from all divisions and internal system auditors. Job of the steering committee is review and guide IS implementations. Teamwork is one of the core values of the bank.

Planning horizon is usually 3 years, but it is reviewed after every 3 months. ‘SWOT’ analysis is a common tool applied to arrive at the bank’s IS strategy.

Focus - internal vs external: While doing IS planning customer requirements are taken care. Feedback from the customers are obtained through the bank’s web sites. In addition, business heads meet every fortnightly with corporate customers to discuss their requirements and problems, which are conveyed to IT (Head-Corporate). This indicates that bank is equally focusing on customers in addition to internal working environment.

Major criteria for prioritising any IT projects are business need and competitive advantage. Before implementing any IT project, it is tested to assure of its quality and then implemented.

Bank is focusing more on corporate customers as witnessed by value added services offered by them for corporate customers such as ‘Global transaction services’ and ‘Bank station’. With the acquisition of retail banking of Bank of America, they have to focus toward retail banking as well to maintain retail customer base.

Documentation vs empowerment: It is found that output of SISP is completely documented, covering all the issues like role and responsibility of individuals, general direction in which IS development should proceed, hardware and software plan, financial plan personnel recruitment plan etc. In addition to this IT executives are empowered to take suitable decisions in their role space considering the requirements of Indian customers.

Establishing directions with learning: In the beginning of every year, IT conference is organised, in which head (IT) from all divisions and IT regional head from Singapore participate and have deliberations. The purpose is to discuss, review the implemented plans and learn from previous planning. Bank is not only adapt to change, but also learn from change.

Top management’s flexible attitude: Top management considers IT as business partner and indispensable tool. It is considered as one of the critical success factor for bank’s success. This is witnessed by the following statement of a senior manager of the bank-
"Information Technology is essential for the bank in maintaining or improving its position in the midst of existing and new competition."

This indicates that top management's attitude is changing with changing environment.

They consider all foreign banks, private banks and public sector banks as their competitors.

Bank usually recruit core IT personnel and train them in banking. However, there is no planned schedule for training of existing IT personnel.

**SAP-LAP Analysis**

The case is analyzed applying Situation - Actor - Process, Learning - Action - Performance (SAP - LAP) paradigm, to find the finer issues. Prevalent situation in the context of SISP, key actors and their roles and silent features of SISP process has been identified. Learning issues are explored and actions are suggested. Finally, effect of suggested actions on Situation, Actor and Process is highlighted.

**Situation**

- Mission of the bank is to reinforce its position as one of the leading universal network banks operating worldwide.
- Bank has a separate unit called 'Corporate IT Strategy & Architecture', the primary responsibility of which is to formulate the IT strategy for ABN AMRO group at global level.
- Centralised Networking approach is adopted.
- Strategic Information System Planning is totally Centralised at Mumbai, under the guidance from regional office at Singapore.
- All branches and all functions of the bank are fully computerised.
- IT is one of the Critical Success Factors for bank's success.
- Integrity, Teamwork, Respect of individual and Professionalism- these four are core values. Bank believes in Needs based banking and shared long term commitment.
- Bank concentrates on niche segment in India, having only 8 branches after acquisition of Bank of America.
- Bank offers services to both individual and corporate customers.
- Recently acquired retail banking of Bank of America.

**Actor**

- Corporate IT Strategy & Architecture unit - as a formulator of IT strategy for entire ABN AMRO group.
- IT heads from all divisions as team members of SISP process.

- Employees of IT department in putting united effort.
- Foreign banks, private banks and public sector banks as competitors.
- TCS and other IT consultant for providing IT solutions.

**Process**

- Main focus of IT applications is business needs.
- Business plans are translated into IS plans.
- Business managers are involved in planning and user's satisfaction and their views are reviewed before planning.
- Strategic Information System Planning is done in-house and moderate part of related IT support is outsourced.
- Documentation of plans is perfect.
- IT conferences are arranged every year to learn from past.

**Learning Issues**

- **Strength**: Cost effectiveness and global information network.
- **Ambition**: Bank is ambitious in being a frontrunner in value added banking, both on a local and worldwide level.
- **Core competence**: Bank's core competence is in the delivery of quality service to the customer as per their requirements.
- **Formal Documentation**: IS planning documentation is fair.
- **Customer focus**: Provide every thing whatever customers want. More concentration on corporate customers.
- **Centralised database**: Database for corporate customer is maintained at Chennai and that of retail customers at Mumbai. Security and site collapses are the major threats.
- **Business manager and user's involvement**: Business managers are involved to translate business plan into IS plans and users feedback is obtained after implementation.

**Desired Actions**

- Bank's IT is treated as business partner. Therefore, there is a need to formulate suitable training/orientation program for the existing personnel to give them continuous exposure to changing technology.
- Because of Centralised database, there is a need of much more tight security and to have a disaster recovery plan that can be put in place in case of site collapses.
- Users must also be actively involved in IS planning process. Suggestions, comments alternatives etc must
be invited from users and listened carefully before implementation because ultimately, the systems are being developed for them.

- Need to increase concentration on retail banking after acquiring Bank of America.
- Need to integrate information technology with communication technologies in service delivery channels by offering Net banking, Mobile banking etc.

Performance

Suggested actions will have impact on situation, process and actor as detailed below and ultimately helping the bank to achieve their mission.

- Reputation and tradition of high quality, expertise of highly motivated and qualified professional staff will be maintained.
- Reliability of the centralised database will be improved.
- User’s involvement in SISP will lead to development of more realistic, easy to implement plan that will also have better integration of IS plan and business plan.
- Retail customer base will improve and possibility of their switch over will be reduced.
- Customers will have a flexibility of selecting banking products as per their convenience.

Oriental Bank of Commerce

Background of the Bank

The third case of this paper is of Oriental Bank of Commerce (OBC), which was established in Lahore on 19th February, 1943 by making modest beginning under its Founding Father, Late Rai Bahadur Lala Sohan Lal, the first Chairman of the Bank. Within four years of coming into existence, the Bank had to face the holocaust of partition. Branches in the newly formed Pakistan had to be closed down and the Registered Office had to be shifted from Lahore to Amritsar.

On 15th April 1980, the date when nationalisation of the Bank was announced, the bank had 307 branches, with Rs. 282.61 crores as deposits and Rs. 152.69 crores as advances. Thereafter, the Bank registered phenomenal growth and noticeable improvement was observed under all performance parameters.

Bank at present has 21 regional offices and 899 branches operating in India.

The new vision set by the Bank has two goals - one to work for superior shareholder value and the other to focus on customers. Last year, the Bank has rewarded the shareholders with 35% dividend and the same dividend is declared this year also subject to approval by RBI. The earning per share has increased to Rs. 14.5 in March 2000 and book value has also gone up to Rs. 74.00. To achieve the second goal, the Bank is introducing various products for the benefit of the customers.

Corporate goals have been setup to achieve productivity of Rs.3.14 crores/employee and net Non Performing Assets (NPA) of 2.5% by March, 2002.

Following are some of the achievements of the banks.

- Strongest public sector bank: Capital & Reserves of the Bank stood at Rs. 1236 crores - Placing OBC in one among the strongest Public Sector banks in India.
- High capital adequacy ratio: Capital adequacy ratio of the Bank stood at 12.72% as On 31st March’2000 as against the norm of 9% prescribed by Reserve Bank of India.
- Consistent profit-making bank: The Bank has consistently made profits for over two decades. For the year 1999-2000, the gross profit of the Bank is Rs. 505.91crores - one of the best among the public sector banks.
- Customer-friendly bank: National Institute of Bank Management (NIBM), Pune, in an evaluation study on customer service in OBC, rated the Bank as a “Customer Friendly Bank”, Reserve Bank of India, on the basis of the NIBM findings, rated customer service in Oriental Bank as “Good”.
- The highest productivity per employee: The productivity per employee stood at Rs. 1.70 crores for the 1998-99, one of the highest among the Public Sector Banks.
- NPA - One of the lowest: Non-performing assets for the year ended March’2000 have come down to 3.50%, one of the lowest in the banking industry.

Information Technology in Oriental Bank of Commerce - Present Scenario

Out of 899 branches, only 100 branches are fully computerised and 250 are partially computerized (as on 6.12.99), covering most of the counter services being rendered to the customers. The progress of computerisation of bank branches is shown in Figure 7. With a view to fulfilling the guidelines of Central Vigilance Commissioner of routing 70% banking business through computerised branches by January 1, 2001, the bank has already achieved a figure of 55% business being handled through computerised branches. Bank is planning to achieve the target of 70% by June’2000, much ahead of time schedule given by the CVC.

Oriental Bank of Commerce (OBC), has linked its New Delhi and Chennai offices through the Reserve Bank of India’s INFINET network on 6.12.99. With this facility, the customers of New Delhi will be able to transact major banking business deposit/withdrawals, view the screen for any transactional queries and debit/credit transfer etc. at Chennai and vice versa.
Software for Credit Management System, Accounts Department, Investment and International Banking functions at the Central office level has already been developed and is at the testing stage. The Bank has commenced development of software for all other remaining departments of administrative office such as Planning and Development, Recovery and Law, Personnel functions and Rural Development Department etc. which will be expected to be completed by the end of year 2000. To streamline the information system, various statements and returns are being collated and compiled in such a way that master data created with the help of above computerised projects shall form the database for the bank as a whole and in due course will become the raw material for ‘Data Warehousing’.

The Bank plans to link the computerised branches, all 21 regional offices and various departments at head office with the help of lease lines and VSATs under the project “Metro Area Network”. Simultaneously, the connectivity amongst four metros through VSATs route is already in progress. This will enable the customers in four metropolitan cities to avail ‘Anywhere Banking Services’ in a very short span. The bank is planning to spend Rs.42 crore for computerisation and connecting the branches.

**IS Planning Practices in Oriental Bank of Commerce**

Centralised IS planning: Bank has a small IT department having a total strength of 26 people including programmers. Organisational structure of department is shown in Figure 8.

The structure is relatively tall and divisions are based on hardware and software and not functions. Bank is using ISBS software developed by TCS for their Total Branch Automation (TBA) and software from NELITO, ONWARD TECH., EIKO etc. are used in Partial branch automation (PBA). In head office and regional office, software called Integrated Software Technology Plan (ISTP), developed by TCS is in use.

Every security measures like password, encryption etc. are taken care. Bank has one specially trained person at senior manager level, who has been trained in ‘Security in Computerised Environment’ through Indian Bank’s Association (IBA) and RBI and obtained training at Singapore.

**Objectives of IT department:** Objectives of IT department are in line with corporate mission and goals i.e. to improve customer service and computerize the maximum possible functions so as to achieve targeted productivity per employee.

Mr. T.M. Bhasin, AGM (IT) has stressed the bank’s near future goal of setting up and connecting ATM at various commercial centres and highlighted the objective of IT department -

“In the year 2000, OBC shall carve out a ‘High Tech. Bank’ within the bank to cater the requirements of its clientele in the metro and urban centres with service at a speed of thought”.

IS Planning is Centralised at IT department at New Delhi. At regional office levels, EDP cells look into implementation planning.

**Participate style and freedom of choice in planning:** A committee called ‘Technology Committee’, consisting of all G.M. (including G.M. from business operations), meets every fortnightly to make and review IS plans. This provides a good platform for interactions of IS managers with business managers.

In addition to this, there is a committee, consisting of all regional heads. They meet every quarterly to review progress and implementation of IS plans. Feed back of this committee is forwarded to technology committee.

Usually planning horizon is 3 years, but every year review and monitoring is done and plan for next three
years is prepared. No separate staff is assigned with the duty of planning. IS planning is part and parcel of IS managers responsibility.

SWOT analysis, feasibility study and cost benefit analysis etc. are the common tools applied to arrive at IS strategy.

Focus - internal vs external: While doing IS planning, customer’s requirements are taken care. Customer’s requirements are derived from business obtained from customers. They identify customer’s preferences looking to existing business trend. To meet these preferences and hence to obtain desired business, IS plans are chalked out.

For prioritising IT projects, customer’s expectations and cost/benefit analysis are the major criteria. Partially computerised branches are upgraded to fully computerised branches and manual branches to partially computerised branches considering the business derived from the concerned branch. The focus is more towards the ‘Internal Focus’.

Documentation vs empowerment: All planning related matters including strategy, task responsibility etc. is explicitly documented. Even at lower level, for implementation purpose, duty sheets are prepared. This indicates more documentation with little empowerment.

Organisational learning: To learn from past experiences, studies including user’s satisfaction, customer’s satisfaction etc. are carried out by third party like National Institute of Bank Management (NIBM) and suitable steps are taken accordingly.

Better performance at minimum cost is the critical success factor for bank’s business. Therefore, all efforts are put keeping price at prime importance. This indicates little emphasis on organisational learning as far as IT is concerned. Goals are set keeping social commitment and wide spread of the bank.

Industrial relations: Though, the bank is a public sector bank, but unlike others, they have only one worker’s union named ‘All India Oriental Bank Employees Federation’ affiliated to All India Bankers’ Employees Association. Management holds industrial relations meetings every year. IT managers also have a meeting with union leaders before implementing any IT project. In the meeting, union leaders are convinced about the need and benefits of the projects so as to avoid future resistance. Harmonious industrial relations are described by Bhasin, AGM (IT).

“There was not a single strike of workers during last 25 years.”

For recruiting personnel in IT department, usual procedure is through Banking Service Recruitment Board (BSRB). From 11.11.97 onwards, bank has been given autonomy for recruitment based on its past 3 years performance (NPA, Profitability etc.). But bank’s past experience reveals that selected cream IT technocrats do not continue with the bank for a long time because of their high demand.

Top management’s flexible attitude: The top management are supporting all IT initiatives and they consider IS as one of the vital component to achieve competitive advantage. Such messages are conveyed in the internal meetings also. In the press release dated 6.12.99, Dr. Dalbir Singh, Chairman and Managing Director clearly indicated management’s inclination to boost the use of plastic money (need of the day) and to carve out the bank as high tech. bank.

It is found that management considers foreign banks and new private sector banks as their competitors. Looking to bank’s strength in its lowest non-performing assets (NPA) and highest capital adequacy ratio (CAR), other public sector banks are not thought of as major competitors.

SAP-LAP Analysis

The case is analysed applying Situation - Actor - Process, Learning - Action - Performance (SAP - LAP) paradigm, to find the finer issues. Prevalent situation in the context of SISP, key actors and their roles and silent features of SISP process has been identified. Learning issues are explored and actions are suggested. Finally, effect of suggested actions on Situation, Actor and Process is highlighted.

Situation

- Bank’s mission is to work for superior shareholder’s value and focus on customers.
- New Delhi and Chennai offices of the bank are already connected and other metros will be connected through INFINET in phased manner.
- Only one worker’s union and harmonious industrial relations.
- Information System Planning is Centralised at New Delhi.
- Only about 11% of branches are fully computerised and 30% are partially computerised. 55% of the business is obtained through computerised branches.
- Best bank among public sector bank on many operating parameters.
- Bank is offering services to both individual and corporate customers in rural, semi-urban, urban and metros.

Actor

- Board of Directors as motivating force.
- GM from business and IT.
- Employees of IT department in putting united effort.
- Foreign banks and new private banks as major competitors.
- Tata Consultancy Services as main service provider for IT

**Process**
- Focus of IT application is to survive in competitive world.
- Business managers and IS planners interact before finalising IS plans.
- IS planning is done in-house and significant part of all other related IT support is outsourced.
- Fair documentation practices for IS plans.
- Evaluation studies are conducted by outside agency and help to learn from past.

**Learning Issues**
- **Strength**: Individual Commitment and Industrial relations.
- **High ambition**: Productivity per employee to raise from Rs.1.7 crore to Rs.3.14 crores and reduction in NPA from 4.5% to 2.5% by March 2002.
- **User's involvement in planning**: User's involvement is rare. Business managers are actively involved.
- **Computerisation level**: Computerisation level is low even at RO and HO. Only three departments viz. Credit, Central accounting and international banking division are computerised in first phase during 1999-2000.

**Action**
- Speed up computerisation process particularly of those branches having more business potential.
- To achieve set goals, there is a need to increase level of computerisation at RO and HO.
- More focus on strategic applications of IT is required.
- Users must also be actively involved in IS planning process. Suggestions, comments alternatives etc. must be invited from users and listened carefully because ultimately, the systems are being developed for them.
- Looking to present trend and demand of customers, it is necessary to go for strategy of multi channel service delivery, at least in metros.
- Strategic alliance with firms having experience of IT based service delivery channel may be a good option.

**Performance**
Suggested actions will have impact on situation, process and actor as detailed below and ultimately helping the bank to achieve their mission.

- Controlling of NPA and increasing productivity will become easier.
- User's involvement in SISP will lead to development of more realistic; easy to implement plan that will also have better integration of IS plan and business plan.
- Customers will get multiple options to bank with and hence less chances of switchover.
- Help to maintain bank's position as number one bank atleast among public sector banks.

**Comparison of Selected Banks**
After analysing the cases using SAP-LAP paradigm, the selected three banks are now compared on critical parameters as discussed below:

**Role of IT**
Role of IT in three banks are compared on 'Strategic Grid' (McFarlan et. al., 1983). Strategic Grid is a 2X2 matrix formed by representing Strategic impact of present information system on one axis and impact of future information system on the other axis. The identified four roles of information system are Strategic, Turnaround, Factory and Support. Based on present and future impact of IT, the three banks are located on Strategic Grid as shown in Figure 9. ABN AMRO Bank and HDFC Bank are found to lie on 'Strategic' category. This indicates that these two banks are both critically dependent on smooth functioning of IS activity for their daily operations and have applications under development that are vital to their competitive success. These banks need to do a considerable amount of planning and organisational distance between IS and senior management is very short. Oriental Bank of Commerce (OBC) is on 'Turnaround' category. This

![Figure 9: Role of Information Systems](image-url)
indicates that at present OBC is not exploiting IT for gaining strategic advantage, but they have applications under development to exploit IT strategically in future.

Computerisation

The level of computerisation is compared by computing the percentage of branches computerised and percentage of business derived from computerised branches and is shown in Figure 10. All branches of HDFC bank and ABN AMRO bank are computerised and hence 100% business is derived through computerised branches. In case of OBC only 11% of branches are computerised and they derive about 55% of total business through computerised branches. This indicates that the priority for computerisation is the business derived from the concerned branch.

Perceptual Mapping of Relevant Issues

Perceptions of key personnel on various flexibility issues are obtained and plotted on 1-5 scale as shown in Figure 11.

IS planning: IS planning may be Reactive or Pro-active. Reactive planning is an outcome of the passive response of the bank to its environmental forces. This is persuaded by the organisations where strategic orientation of information system is very low and operational focus is very high. In the case of proactive planning, banks take risk and level of innovation is quite high. Strategic orientation of information system is also very high. The banks are located on Reactive-Proactive continuum. It is observed that HDFC bank is lying on the proactive side. HDFC bank is the leader in Internet banking and pioneer in Mobile banking in India. Such initiatives support our findings that bank is adopting proactive approach.

IS strategy: IS strategy of the banks are mapped on Inside out - Outside in continuum. Inside out strategy means the focus of the IT is shaped more by internal factors than external. Here systems are developed basically for cost reduction and efficiency improvement. System is exploited as and when opportunity arises. In the case of outside in strategy, systems are developed that provide new ways to compete. Opportunities are explored for using IT to gain competitive advantage. On locating the banks in this continuum, it is found that HDFC bank is again lying on outside in side. Bank's attitude looking for new product/services like net banking & mobile banking etc., development and using IT for competitive advantage supports our findings. OBC has ambitious plan of improving productivity of the employee. IT projects are prioritised considering cost as a major factor. The same is reflected in their location towards inside-out strategy.

Planning methodology: Formalised planning refers to the existence of structures, techniques, written procedures and policies to guide planning process. A highly formalised planning system is more rationalised system. Ideally, formalisation produces efficiency gains for receipt and processing of information. However, gains in efficiency must be balanced against reduction in flexibility. In other words, a formalised process may retard prompt and efficient elimination of strategic issues once they become unimportant or resolved. In case of planning process, balance between the formalisation and flexibility is to be maintained to achieve desired results. Three banks are mapped on the planning methodology continuum and it is found that HDFC bank is more towards informal side, whereas OBC is more towards formal side. In all the three cases mix of the formalisation and flexibility has been observed.

Planning style: Strategic planning requires information inputs from various stakeholders. Therefore, in planning process co-operation and participation of all functional heads and IT head is desired. Users should also be involved because they are the ultimate users of the systems. This will result in more realistic plan that is easy to implement. Strategic planning is neither the authority nor the responsibility of an individual. Planning style for the banks is mapped on Individual vs Group continuum. It is found that in HDFC bank, planning exercise is totally group exercise.

Banking offered: With the entry of Internet banking in India, now banks have combination of delivery channels for delivering their products and services. Three banks are located on the continuum indicating extent of virtual services and products offered by them. OBC bank is
offering almost all banking through their physical branches. Web site of the bank is simply an information kiosk.

Database maintenance: Database can be a centralised database or decentralised one. Both have advantages and disadvantages. Centralised database allows true anywhere banking but security and site collapse are the main threats. Decentralised database is more reliable and cost effective but Internet banking is impossible. Banks are located on this continuum depending upon extent of centralised databases. In HDFC databases are more centralised and they are using hub & spoke model of networking. ABN AMRO bank has database at two places whereas in case of OBC, databases are mostly decentralised.

Future plan of three banks is obtained and order of priority of IT applications is also indicated in Figure 11 which highlights the inclination of focus of banks. Customer service delivery is the main agenda for planning for HDFC bank and ABN AMRO bank whereas Network connectivity is the main agenda for OBC.

Stages of Growth of IT

The six different stages of growth of IT in any organisation as identified by Nolan (1979) are initiation, contagion, control, integration, data administration and maturity. Kanungo (1999) suggested a modified model suited to Indian organisations. The five stages suggested by him are inception, extension, stagnation/consolidation, expansion and integration. An organisation can be mapped on any of these stages considering the factors like infrastructure, application portfolio, top management attitude, IT management and user's awareness & involvement. Stages of growth of IT in three selected banks are identified and tabulated in Appendix I. This indicates that HDFC and ABN AMRO Bank are in the 'Expansion' & 'Integration' stage on most of the factors whereas OBC is in 'Extension' & 'Stagnation' stage.

Comparison of SISP Practices

Appendix II presents a comparison of various relevant issues such as centralisation of planning, participation of business managers and users in planning, organisational learning, outsourcing, top management’s attitude, IT strategy, business plan - information system plan (BP-ISP) integration, planning methodology, time horizon of planning, documentation practices, measurement of user & customer’s satisfaction etc. BP-ISP integration has been classified in four groups by Teo and King (1996). These are separate planning with administrative integration, one way linked planning with sequential integration- when ISP is guided by BP and has no opportunity to influence BP, two way linked planning with reciprocal integration where ISP is not only guided by BP but also influences it and lastly full integration in which there is little distinction between BP and ISP. The remaining issues are self-explanatory and are presented in the table.

Discussion and Conclusion

Three cases, one from each sector, i.e. HDFC Bank (Private Sector), ABN AMRO Bank (Foreign Sector) and Oriental Bank of Commerce (Public Sector) are developed and analyzed using SAP - LAP paradigm. It is found that there are differences in the customers and market segment covered by the three banks. HDFC bank and ABN AMRO bank have limited number of branches spread mostly in metros and urban cities, therefore, possible to achieve 100%
computerisation. In case of OBC, having branches in rural areas and responsibility of social commitment, full computerisation is a dream. But looking to changed competitive scenario; it would be appropriate for OBC to develop suitable strategy matching with their culture and network of branches. Strategic alliance with firms having experience of IT based service delivery channel may be a good option.

It is revealed from Strategic Grid that present strategic application is low in OBC as compared to their rivals. IS planning is also more towards 'Reactive' side on 'Reactive - Pro-active continuum'.

It is a fact common to all banks that users' involvement in IS planning has not been very much appreciated. But satisfied users can only satisfy customers. Therefore, banks in India must pay due attention to this reality.

Procedure adopted for planning is more informal in nature, obtaining information from external and internal environment. Bank mangers must, now, appreciate the combination of formal and informal procedure to achieve benefit of flexibility resulting in full integration of business plan with information system plan. Therefore a balance between documentation and empowerment is to be maintained so as to improve the flexibility of the system.

Though all banks spend significant efforts in IS planning but usually they neither have a formal procedure to evaluate it, nor they try to seriously learn from previous experiences. The reason for this might be that managers are not used to evaluate IS planning exercise and do not expect to gain useful insights. Periodical measurement of IS planning effectiveness criteria e.g. user's satisfaction and customer satisfaction will lead to significant learning. Therefore, this should be made part of planning process.

We have used in-depth case studies of three banks – one from each sector i.e. private, foreign and public. A comparative analysis has also been carried out. This offers the banks a new way of looking at the SISP process. With the help of T-A-P analysis, desired actions and effects on them on performance of the banks are also highlighted. This will help the practitioners to consider the offered suggestions in the light of changing scenario. Location of banks on Strategic Grid and mapping the development of IT on Nolan's model will force the practitioners to develop a new strategic thinking for obtaining competitive advantage. Such an analysis will help them to separate out the areas of IS in their banks which require due consideration and improvement.

We have analysed the critical dimensions of flexibility in context to IS planning e.g. Formal vs Informal, Reactive vs Pro-active, Individual vs Group, Top Management attitude etc. This will create an opportunity for senior IS executives and top management of the banks to realize the importance and outcome of flexibility in planning, an important management activity.

This study is carried out by interviewing the executives of IT department of the respective banks at a particular point of time. Other stakeholders involved in IS planning and implementation are business bank managers, users and IT consultants. Therefore, there are two interesting ways to look for future research.

First, data may be collected from these stakeholders, analyzed and looked for the differences, if any. This may result in a different insight to the issues under consideration. Second, dynamic nature of planning process may be considered and data may be collected over a period of time. This will unearth time varying relationships among the issues and would also explore the flexibility dimensions in depth.

It is well clear from this study that strategy formation is a complex social and political process which is not adequately captured by formal rational process. This is particularly true in less developed countries, like India, where decision-making procedures are rarely well established and where they are often not adhered to even when they do exist. Therefore, there is a need to link IS strategy formation process to important context such as business strategy, organisational culture and structure, people's perceptions and expectations and technical infrastructure including the availability of technical skills. Strategic planning process is dynamic in nature because it is subjected to constant modification as the perceptions and interests of key actors and groups change.

Therefore, there is a need to apply a flexible methodology to view present situations in the Indian banking sector and take into considerations perceptions and expectations of key stakeholders. Based on LAP analysis of the three cases, suitable flexible methodology may be developed for individual banks so that improvement in Situation, Actor and Process specific to each bank can be achieved, which would result in sustainable growth of the banks in changing competitive environment.

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Web site : http://www.abnamroindia.com

Web site : http://www.obcindia.com

Acknowledgement:

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Appendix I: Stages of Growth of Information Technology in the
Nolan’s Model (Modified as per Indian conditions)

I HDFC Bank:

<table>
<thead>
<tr>
<th>Issues</th>
<th>Stages</th>
<th>Stages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infrastructure</td>
<td></td>
<td>Data base integration, Hub &amp; Spoke network connectivity, regional branches &amp; central hub connected through leased lines and ISDN lines.</td>
</tr>
<tr>
<td>Application</td>
<td>Strategic Applications, full fledged TPSs and DSS.</td>
<td>IT based products &amp; services</td>
</tr>
<tr>
<td>Top Management and IT Management</td>
<td></td>
<td>IS/IT planning, IS security, information privacy, data quality</td>
</tr>
<tr>
<td>Users</td>
<td>Sophisticated &amp; aware, pro-active participation</td>
<td></td>
</tr>
</tbody>
</table>

Stages ➔ Inception Extension Stagnation Expansion Integration

II ABN AMRO Bank:

<table>
<thead>
<tr>
<th>Issues</th>
<th>Stages</th>
<th>Stages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infrastructure</td>
<td></td>
<td>Data base integration, GTS application utilises global network bank concept.</td>
</tr>
<tr>
<td>Application</td>
<td>Strategic Applications, full fledged TPSs and DSS.</td>
<td>IT based products &amp; services</td>
</tr>
<tr>
<td>Top Management and IT Management</td>
<td></td>
<td>IS/IT planning, IS security, information privacy, data quality</td>
</tr>
<tr>
<td>Users</td>
<td>Sophisticated &amp; aware, pro-active participation</td>
<td></td>
</tr>
</tbody>
</table>

Stages ➔ Inception Extension Stagnation Expansion Integration

III Oriental Bank of Commerce:

<table>
<thead>
<tr>
<th>Issues</th>
<th>Stages</th>
<th>Stages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infrastructure</td>
<td>More stand alone PCs i.e. Advanced Ledger Posting Machines (ALPM)</td>
<td>Few LAN, leased lines between only two cities</td>
</tr>
<tr>
<td>Application</td>
<td>Transaction entries, Investment &amp; International banking at central office is developed</td>
<td>IS for main banking business, moving towards integrated databases.</td>
</tr>
<tr>
<td>Top Management and IT Management</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Users</td>
<td>User training is the priority</td>
<td></td>
</tr>
</tbody>
</table>

Stages ➔ Inception Extension Stagnation Expansion Integration
## Appendix II: Summary of SISP Practices Adopted by the Banks

<table>
<thead>
<tr>
<th>Issues</th>
<th>HDFC</th>
<th>ABN AMRO</th>
<th>Oriental Bank of Commerce</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Level of Computerisation:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% of branches</td>
<td>100%</td>
<td>100%</td>
<td>11% fully computerized</td>
</tr>
<tr>
<td>% of Business</td>
<td>100%</td>
<td>100%</td>
<td>55%</td>
</tr>
<tr>
<td>Role of IT</td>
<td>Strategic</td>
<td>Strategic</td>
<td>Turn Around</td>
</tr>
<tr>
<td>Data Storage</td>
<td>Centralised, Hub &amp;</td>
<td>Centralised at Chennai &amp;</td>
<td>Distributed, only Delhi &amp;</td>
</tr>
<tr>
<td></td>
<td>Spoke Model</td>
<td>Mumbai</td>
<td>Chennai are connected</td>
</tr>
<tr>
<td>Phase of IT evolution</td>
<td>Transformate</td>
<td>Transformate</td>
<td>Switching from automate</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>to informate</td>
</tr>
<tr>
<td><strong>Planning Practices</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Centralisation</td>
<td>Totally centralised</td>
<td>Centralised at Mumbai</td>
<td>Centralised at Delhi</td>
</tr>
<tr>
<td></td>
<td></td>
<td>under the guidance of RO &amp; HO</td>
<td></td>
</tr>
<tr>
<td>Participation of Business Managers</td>
<td>Indirect</td>
<td>Direct, Active</td>
<td>Direct</td>
</tr>
<tr>
<td>Participation of Users</td>
<td>Rare</td>
<td>Feedback obtained after implementation</td>
<td>Rare</td>
</tr>
<tr>
<td>Organisational Learning</td>
<td>Little</td>
<td>Fair, Formal Procedure</td>
<td>From occasional studies carried out by NIBM</td>
</tr>
<tr>
<td>Outsourcing</td>
<td>Almost all support except IS planning</td>
<td>Moderate</td>
<td>Almost all support except IS planning</td>
</tr>
<tr>
<td>Top Management Attitude</td>
<td>Views IT as one of C.S.F.</td>
<td>IT as business partner &amp; indispensable tool</td>
<td>IT as vital component, but cost/performance more important</td>
</tr>
<tr>
<td>IT Strategy</td>
<td>Implicit, Objectives defined</td>
<td>Explicit, Separate unit to define Strategy for the group</td>
<td>Implicit</td>
</tr>
<tr>
<td>BP-ISP Integration</td>
<td>Reciprocal (Relationship between BP &amp; ISP)</td>
<td>Reciprocal (Relationship between BP &amp; ISP)</td>
<td>Sequential (Unidirectional i.e. BP Provides direction to ISP)</td>
</tr>
<tr>
<td>Planning Methodology</td>
<td>SWOT &amp; other informal methods</td>
<td>SWOT &amp; other informal methods</td>
<td>SWOT, Feasibility study etc.</td>
</tr>
<tr>
<td>Time Horizon</td>
<td>3 Years with periodical review</td>
<td>3 years with review every quarterly</td>
<td>3 years with review every year</td>
</tr>
<tr>
<td>Documentation</td>
<td>Little, mostly implicit</td>
<td>Fair</td>
<td>More explicit on implementation issues</td>
</tr>
<tr>
<td>User Satisfaction</td>
<td>Service level agreement with users</td>
<td>Formally measured once in every six months</td>
<td>No internal formal procedure</td>
</tr>
<tr>
<td>Customer Satisfaction</td>
<td>Informally measured</td>
<td>Business head meet fortnightly with corporate customers &amp; also obtained through web site</td>
<td>Occasionally measured by third party NIBM, Pune</td>
</tr>
</tbody>
</table>
Flexibility Mapping: Practitioner's Perspective

1. What types of flexibilities you see in the practical situation of "Strategic Information Systems Planning" 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 in Information Systems Planning that are relevant for your own organisational context? On which dimensions, flexibility should be enhanced?

3. Try to map your own organisation on following continua.
   [Please tick mark in the appropriate box(es)]

<table>
<thead>
<tr>
<th>IS Strategy</th>
<th>Outside in</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planning Methodology</td>
<td>Informal</td>
</tr>
<tr>
<td>Planning Style</td>
<td>Group</td>
</tr>
<tr>
<td>Database Maintenance</td>
<td>Decentralised</td>
</tr>
<tr>
<td>Service Offered</td>
<td>Virtual</td>
</tr>
</tbody>
</table>

4. Develop a SAP-LAP (Situation Actor Process-Learning Action Performance) model of "Strategic Information Systems Planning" relevant to your organisation.

Reflecting Applicability in Real Life

1. Identify IS planning practices in your organisation. How can you make use of the case studies presented in this paper to improve these practices in your organisation?

2. Develop a model for flexible IS planning in your organisation and test it with user involvement in IS planning.
A System Dynamics Based Flexible Decision Support System for Enrolment Management

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Abstract
A declining trend in enrolments observed at the College of Engineering of an urban University in the US has led to a keen examination of the enrolment process from a wider perspective. The concept of System Dynamics was used to develop a decision support system that could be used as a flexible tool while designing policies to improve the enrolments. A model was developed considering various interactions amongst the variables influencing enrolment. The objective is to understand and analyse the dynamics of enrolments and study the impact various policies have on the resource requirements.

Keywords: enrolment management, flexible decision support system, system dynamics

Introduction
With the fast pace of technological changes affecting every known aspect of business, more so often in the service industry, the universities cannot remain aloof from the impact of such changes. One might expect, for such technological changes to occur and be sustained, the requirement for engineering professionals also should show an increase. Contrary to expectations, engineering enrolments has been showing a declining trend in the US over the last few years. This puts additional pressure on the engineering schools to manage their enrolment process effectively in order to remain competitive. The tuition fee from undergraduate program is a vital means of financial resource for the engineering schools. Any fall in enrolments affect the health of the school adversely by enforcing resource constraints. There is a need to have proactive actions before this decline could become detrimental. In this paper, we have examined the enrolments scenario at an engineering school with an objective of understanding the enrolment system structure in order to develop a flexible decision support system capable of assisting school administrators to design and analyse alternate policies for enrolment management.

Problem Definition
Schools across United States have observed a declining trend in the engineering enrolments. However, the extent of drop at the Engineering School considered in this study stood at 16% as against the national average of 12% in the period 1992-97. This sparked off our interest in analysing the problem using analytical models and suggesting remedial measures and has led to a detailed examination of the controllable and uncontrollable factors affecting enrolment. The controllable factors are within the purview of the University system. The economical, social, and demographic factors, which are outside the University’s control, too impact upon the School’s performance in many ways. Through proper design of policies the School’s performance can be made insensitive to changes in such variables in its external environment.

Quite often the exact relationships the variables have on the impact are difficult to visualise. As the number of variables grows, the human mind is unable to capture and analyse the impact objectively. Intuition plays a significant role under such situations. The obvious disadvantage of this approach is that one has to wait for the results/consequences of the decisions to analyse...
the effectiveness of the decision and therefore no corrective action is possible to remedy the situation. The objective of this paper is to suggest a framework, for modelling the enrolment process considering both the exogenous and endogenous variables and to develop a flexible decision support system for policy design and experimentation.

Literature Survey

Enrolment management in any university is a very critical task as its effectiveness determines the survival and growth of the university. Declining enrolments symbolises the deteriorating health of the university. Thus the enrolment management depends not only on the efficiency of the enrolment/admissions office functions, but also on the various other interfacing functional areas. Education in general and engineering education in particular has been the object of extensive research. But such research has quite often concentrated on the knowledge delivery issues such as instructional methods, curriculum, use of computers and simulation in teaching. Others have come up with Total Quality Management models for the education system with the objective of improving quality and effectiveness of education. Some researchers have addressed various issues that impact on the enrolment.

Weed (1991) examined the various ways by which college instructors might be able to reach down to inspire young students to follow a path to engineering schools and ultimately to engineering profession. He demonstrated how one could make that path visible and exciting by providing means by which youngsters can have a measure of success with 'hands on' activity. Dulski (1991) presents a methodology for identifying and evaluating school students' attitudinal relationships between six selected science related areas. The procedure suggested may be used to formulate a path analytic model with affective domain for informational reference during current classroom instruction and future science curriculum development efforts. Consideration of this attitudinal dimension, the author hopes, will assist in reversing the current trend toward decreasing science course enrolments.

Fisher (1997) pointed out that as the resources at the federal and state levels become increasingly constrained, accountability is becoming a major theme for public educational institutions. In response to this emphasis in accountability, colleges across the US are developing performance-based measurement system. Most of these are initiated by the regulatory or accreditation agency requirements. The author defines institutional effectiveness as a combination of the following four things: (i) Public satisfaction with tax dollar supported educational institution; (ii) employee satisfaction with graduates; (iii) the Institution's internal quality, harmony and efficiency and (iv) student achievement and satisfaction. The paper described one institution's innovative approach to developing a plan for assessing student achievement and satisfaction.

Sharples et. al. (1996) discussed how TQM can be applied in a school district by way of new strategic plan. The paper examines the philosophical as well as societal aspects involved in implementing such a plan. Berg and Collins (1995) examined the relative imbalance between the demanded pace of economical and technological change for students and faculty compared to that in the curriculum and institutions of higher education. The paper suggests that the technology needs to become as interwoven in institutional delivery as it is in society to become an integral part of teaching and learning throughout student's life long learning environment. Watson (1995) proposed the formulation of a strategic plan for an engineering department as academic institutions are under increasing pressure to improve engineering education while faced with decreasing budgets. He identifies the entrenched practices and bureaucracy as the formidable opponents to change. Liang (1991) addressed the quality problems in American higher education and advocated the application of Total Quality Control philosophy in higher education in order to achieve changes from a more individualised control to a more systemised control. Bemowski (1991) raised the issue threatening the pillars of higher education and advocated the practices of TQM to improve carrying out the two major functions viz. education and generate knowledge.

Beaufait (1991) pointed out that while enrolments in engineering have been declining over the past several years, the percentage of first year students not staying on for the second year has also been on the rise. The paper discussed the changes required in the curriculum to reduce the shock of transmission from high school to college. Okyere et. al. (1991) described a pilot student retention program device at electrical technology department of the college of States Island to improve retention through course work design aimed at correcting student deficiencies and improving their academic maturity by changing some of their habits. Jones (1991) made specific suggestions for overcoming the resistance to change within the educational establishment and advancing the frontiers of engineering education by improving its design component.

While researchers have looked into the issues of enrolment and retention from different perspectives, a methodology that considers the problem in totality is missing. Our attempt is to provide a comprehensive flexible systems approach in planning and managing the engineering enrolments by examining the issues from a wider variety of perspectives as well as by capturing the dynamic interactions among key variables which ultimately affect the enrolment scenario. The policies and their economic implications can be clearly visualised by means of dynamic simulation of the entire process using System Dynamics approach.
The Modelling Approach

The modelling approach used here is based on System Dynamics. System Dynamics is the application of feedback control system principles and techniques to organisational problems. The basic principles of System Dynamics modelling are (Forrester, 1961):

1. The use of information feedback systems to understand and model system structure
2. The use of computer simulation to understand system behaviour.

This approach enables integration of several areas and provides a conceptual and quantitative basis for designing more effective and flexible organisational policies.

There is a myriad of interactions between different variables responsible for the depicted behaviour in any corporate problem. Often, these interactions have a greater impact than the variables themselves. In a complex situation like the enrolments at any university, it would be impossible for the human mind to understand such interactions and predict the behaviour. Therefore, in order to capture the dynamic behaviour of the enrolment system, an appropriate software tool (I-THINK) has been used for simulation.

The tuition fee from undergraduate program is a vital means of financial resource for the school. The proposed model is developed to address only the undergraduate enrolment issues faced by the engineering school. The model, however, can be extended to include graduate enrolments too.

A modular modelling approach has been followed to develop the model which is flexible for adaptation/enhancement as per requirement. For instance, the process from receipt of applications till the enrolments has been analysed as one module called Enrolled Students. Other modules include Public Image, School Attractiveness, Security, Financials, Facilities etc. As a next step, the interaction between each of these modules is established and the resulting behaviour traced out. Comparing the resulting behaviour with the real data can do validation of the model. The scope of the model is limited in the sense that only those variables that can be controlled by the School to a varying degree, to formulate policies, have been analysed. However, there are certain factors that are exogenous to the system (like the demography, population growth, changes in the national educational system etc.) that have been assumed to remain constant over the indicated time frame. It can be comprehended that these factors do influence the growth of the School as a whole, but what is significantly important is the relative behaviour (growth/decline) compared to the other universities/

Schools across United States have observed a declining trend in the engineering enrolments.

Schools. This has been essentially focussed during model development. However, the model provides a flexible framework that can be used to extend the work to any level of complexity, incorporating additional variables.

System Structure Modelling

An in-depth analysis of the problem brought out the variables affecting the process and how they interact. The causal loop diagram includes a number of positive and negative feedback loops and forms the backbone of model development. The causal loop diagram is shown in Figure 1. It shows how the structure of the system affects the enrolments by capturing the cause and effect relationships among all the major interacting variables. As the School Attractiveness increases, the number of enrolled students increases. The school attractiveness is influenced by many variables, some of which positively influence the attractiveness while others have a negative impact. The first feedback loop is Enrolled students - Student-faculty ratio - Quality of education - School attractiveness - Enrolled students. As the enrolled students increases the student-faculty ratio goes up for the same number of faculty.

Higher the student-Faculty ratio less is the quality of education. More the quality of education more is the school attractiveness and more the enrolled students. This loop is a negative feedback loop. Another loop, Enrolled Students - Funds Available - Facilities - Quality of Education - School Attractiveness - Enrolled Students, is a positive feedback loop. Enrolled Students - Funds Available - Security - Campus Safety - Public Image - School Attractiveness - Enrolled Students, and Enrolled students - Word of Mouth - Public Image - School attractiveness - Enrolled Students are examples of other positive feedback loops.

The enrolment system under consideration has been divided into different modules for model development. This provides a better understanding of the causal relationships between the variables. As a first step, the reference behaviour is captured through the base model presented here and policies are incorporated later on.

Enrolled Students

This module shows the sequence of stages from the receipt of applications to the time of graduation, along with the influencing parameters and policy variables. Essentially, three level variables have been identified here, viz.

Applicants - This indicates the number of applications received at the School. The level of applicants is increased by the 'Application Rate' and depletes by the 'Selection Rate'. The 'Rejection Rate' is the difference in the applicants level and the selection rate.

The School follows certain criteria to offer admission to an applicant. The criteria may be different for different
programs. Based on the real data collected, it has been found that 80-90% of the applicants are offered admission. Hence, the selection index has been formulated as a ratio of the selection rate and the applicants level. This index along with the student faculty ratio is considered to be a surrogate measure of the quality of education. The rate at which applications would be received depends upon the 'Attractiveness Index (AI)'. This index is defined as a composite effect of different factors that are considered by an applicant before deciding to apply for any chosen program. AI being a complex factor comprising of different sub-elements, it has been taken as an output of a different module called 'School Attractiveness'. Demography represents the population that would be influenced by this index. The next level variable is 'Admitted Students', increased by the rate at which admissions are offered and depleted by the enrollment rate. Certain applicants may decline the admission offer. Once an applicant accepts an admission offer, he/she has some time to enrol. Therefore, there is a delay in the enrollment rate. The model also considers third issues like declining the admission offer, transfers, dropouts and students leaving at regular interval after graduation. Number of 'Enrolled students' is the total number of students in the system at any point of time who are at various stages of completion of the four-year programme.

**School Attractiveness**

This is a very critical module towards model development. The purpose of this module is to quantitatively define and generate a parameter termed 'Attractiveness Index'. This parameter shall represent the sum total of various qualitative influencing variables that would be considered by a student prior to applying at a School.

'School Attractiveness' can be considered to represent the actual attractiveness that can be attributed to the School. This is a result of various measures taken by the School to improve the parameter(s) of interest for any student. The rate affecting this level is defined as 'Attractiveness Change'. A bi-directional flow has been associated with this rate in the model because the same variables can contribute to either an increase or a decrease in the level. These auxiliary variables include:

(a) Quality of Education which is a relation based on student-faculty ratio derived in the faculty module,

(b) Facility Index, a measure of the facilities available to students such as libraries, computer labs, on campus housing, parking, sports etc.,

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**The model provides a framework that can be used to extend the work to any level of complexity, incorporating additional variables.**

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![Figure 1: Causal Loop Diagram](image-url)
(c) Tuition Index to represent tuition fee in dollars per credit hour.

(d) Financial aid that indicates the chances of financial assistance available to students in terms of research grants, scholarships, fellowships, part time jobs on campus etc.

(e) Job Placements to represent the ease of obtaining a job on successful completion of the program.

(f) Location to consider the presence of industries in close proximity, availability of public transport system connecting the School, safety etc.

(g) Extra Activities such as physical education centres, recreation facilities etc.

(h) School Rating to include the ranking provided by certain Federal and / or private institutions based on one or more of the above parameters.

These variables are represented as table functions with the valid values ranging from -1 to 1, against the respective levelling ranges from 0 to 10. An average level of 5 corresponds to a zero value of the variable, meaning that the level lies at par with the average of different universities. When the level changes to a value below 5, the auxiliary variable would take a proportional value below zero indicating that the school is lagging behind the average performance of other schools, for the same variable and does it is doing better for a positive value. Many other factors are implicitly considered within one or more of the above terms.

However, in spite of the efforts by the school to maintain a high level of attractiveness, what the public or community perceives is based on the image that the school carries. Thus, the ‘Attractiveness Index (AI)’ that actually affects the application rates is defined as the product of School Attractiveness and Public Image. The ‘Public Image’ is yet another composite variable that provides an amplification effect to AI (both positive and negative, as the case may be). This is explained in the next module.

Public Image

‘Public Image’ is a very sensitive level variable that directly influences the attractiveness index. It is a composite variable that can be controlled to a certain extent by policy design. Publicity Funds, allocated among the four advertising media considered by us such as TV, Radio, News Paper and Promotional activities, can be used to positively impact the public image. Promotional activities include the effort by the School to attract students through specially designed programs at high schools, on site registration programs, organizing campus visits etc. The model converts the dollar investment in the media into an effectiveness or impact it has on the target population.

There are two parameters that increase the level of public image: (i) cumulative effect of the publicity program mix and (ii) ‘Word of Mouth’ from the enrolled students. Word of mouth is defined as the effect that can be caused by an individual on his or her sphere of influence. Hence, the word of mouth about the School is assumed as a function of the Enrolled Students. The level of public image gets reduced through the crime rate prevalent in the local community.

Campus Safety

This module depicts the relationship between the crime scenario and the security level required to ensuring adequate level of campus safety. The extent of crime prevalent in the community has a substantial impact on the public image, which directly affects enrolments. Considering the gravity of the influence it can have on the overall attractiveness index, modelling has been done under a separate module. The ‘Security Level’ can be increased through a rate termed as ‘Security Change’. There is a certain amount of crime that can be associated based on the location of the School that is inherent and can be defined as a ‘Crime Scenario’. The ‘Crime Rate’ can be affected either by the security level or by crime scenario or both. This method of modelling the security system can help evaluate the security budget requirements. The ‘Security Expense’ is the calculated amount of expenditure incurred to maintain one security person including overheads.

Facilities

This module represents the relationships between various factors that influence the ‘Facilities Level’ of the School. The level of facilities can be increased by the rate of ‘Facilities adding’ and reduced by the rate of ‘Facilities Obsolescence’. It is assumed that approximately 10% of the existing facilities become obsolete at the end of one year. The facility index has been defined as a table function with respect to facilities level. The former shall vary on a scale of -1 to 1 corresponding to the variation in facilities level from 0 to 10. By defining the ‘Facility Expenses’ to be the amount spent to procure one unit of the facility, the facility budget requirement can be obtained from the simulation model.

Faculty and Quality

Just like the student body, faculty is the other major strength for any educational institution. The faculty is the driver for the quality of education and thus affect the attractiveness index. Hence the faculty and quality has been merged here. A bi-directional ‘Faculty Growth Rate’ can be considered to affect the level of Faculty. It would be worthwhile to mention that increase in the
level of faculty is achieved through recruitment of high quality faculty personnel. It is assumed that when the student faculty ratio is greater than 10, the School would consider to increase faculty strength. In such a case, four variables are identified to cause an effect on the faculty growth rate. These variables are defined using table functions. The model defines Salary Index as a measure of the pay scale relative to the other Schools; Student Quality as the quality of students enrolled that can be governed by the selection index. The School can certainly attract faculty not only because of its urban location but also being close to many industries. This enables the faculty to have access to many industrial projects, explore research areas and provide a course work that offers a right blend of topics covering the latest technology. When the student faculty ratio becomes less than 10, the School may freeze the recruitment policy to strike a proper balance between various resources. This ratio is instrumental in defining the ‘Quality of Education’ as a table function ranging from -1 to 1 which is an auxiliary variable that influences the attractiveness index. The faculty funds requirement can be computed from the level of faculty and average salary.

Financials

Financials form the backbone for the functioning of any organisation or enterprise. All policy efforts are to maintain a healthy financial condition to enable short term and long-term investments. The main source of income for the School is the tuition fee paid by the students. The additional requirement of funds to meet the budget requirement is assumed to be generated from other sources defined under the variable ‘Grants’. This amount can also serve to represent the total financial budget available that is the sum of Grants and Income from Enrolled Students.

The model described above captures the reference behaviour correctly as shown in Figure 2. While applicants represent the number of students applying for admission each year, the enrolled students represent the total number of students enrolled, at different levels of the program, at a point of time. The trend in Figure 2 (from -10 to 0 years) matches with the enrolment data from 1989 to 1998 for the School. The graphs indicate declining trends in enrolled students and applicants and warn that if no suitable action is taken at this stage, with the demography showing a downward trend, the decline shall continue further. At this stage the model is further modified by incorporating goals to enable the formulation of various policies.

Enrolment Policy Design Analysis

Having established the structure of relationships between different variables that influence the enrolments at the school and having captured the reference behaviour, the next step would be to identify policy variables, try different test inputs for these variables and study the behaviour. The closeness of the depicted behaviour to the desired behaviour shall not only help in gaining confidence at the completeness of the model developed but also permit to choose amongst the various alternative policies available. A few sample policies have been explained here.

Do Nothing Policy

As one of the management strategies, the trend can be allowed to continue with little corrective action. This shall prove harmful in the years to come as the competition in this service sector is constantly increasing and the model depicts a further decline. The year 1998 has been used as the reference point (0 year). In Figure 2, Enrolled students have continuously declined from 1650, in 1989 (10 years before), to 1105 in 1998. The enrolled students are expected to decline further to 336 in 2008 (after 10 years). The corresponding number of applicants in 2008 would be 302.

This shows the extent of the impact of the performance deterioration. Left to it, the school could eventually become non-existent. Figure 3 shows the behaviour of funds required and funds available during the period of 20 years.

Enrolments Goal Oriented Policy

Since the objective is to increase the enrolments, a simple policy would be to have a goal for the enrolments with all other factors remaining unchanged. Based on the difference between the goal and the level, the selection criteria can be varied by redefining the selection rate. Students UG module has been modified to incorporate the goal.
the number of students enrolled and the resource requirements for achieving the goals over the years could be obtained.

Figure 9 shows 2498 enrolled students and 4614 applicants with a maximum goal of 10 each for security and facilities, enrolment goal of 3000 and with a time to attain goal 5 years. Figures 10 and 11 give the corresponding resource requirements.

Thus the decision-maker has a great number of options (policies) available before him which otherwise would have been impossible to conceptualise and evaluate. This will provide the necessary freedom of choice to the decision-makers so that they can make suitable changes to turnaround the declining trend. The available policies can further be classified as aggressive, moderate or slow policy (Lyneis, 1980) based on the goals and the time frame set for achieving those goals.

Reengineering Publicity

Since the public image directly has a multiplicative effect on the School Attractiveness, a different policy would be to target this critical variable. The public image can again be affected by aggressive, moderate or slow marketing strategies that would decide the amount of financial resources to be allocated in each case. This policy is expected to show an immediate improvement on the enrolments as a whole. In addition to the above, by varying the allocation of funds to different publicity media their impacts could be studied. Figure 12 shows the impact of allocating the total publicity budget 10% on TV, 70% on Promotional activities and 10% each on Radio and Newspaper. This allocation mix increases the total enrolled students to 2427 from 2415 for equal allocation among all four media types.

Multiple Goals Policy

Setting an enrolment goal made little difference to the dynamic behaviour of the model. However, this provides an insight that by having a target for each module, the expected behaviour can be clearly understood. Moreover, it defines a direction for the variability of the parameters and hence a control can be established. Goals are set for enrolments, facilities and security and the model is modified. With an enrolment goal of 3000, security and facility goals of 7 each and the time to attain goal as 5 years, Figure 6 shows that the enrolled students in 2008 would be 2415 and the number of applicants would be 2474. This shows a very favourable policy impact.

The resource requirements for the above policy can also be evaluated using the model. Figures 7 and 8 give the resource requirements for the above policy. For any combination of the goals and the time to achieve the goals
Though this increase is not significant, the model gives the ability to test a large number of feasible allocation mix to determine effective allocation of publicity funds among the four publicity media to maximise the number of applicants. The resource requirements are the same as for the multiple goals policy; only the publicity allocation has been changed.

**Conclusions**

A basic framework has been developed to establish the relationships between enrolment influencing variables for the School. The reference behaviour could be successfully captured through a model developed in I-THINK. Different policy variables have been identified viz. Enrolments Goal, Facilities Goal, and Security Goal. Time to attain each Goal and Publicity expenses that can be allocated. Different combinations of these policy variables shall result in aggressive, moderate and slow policies. A large number of feasible policies can be formulated and tested to come up with a coherent set of robust policies. As decision-makers start to use the model the predictions and actual results could be validated and the model can be customized. This will provide a flexible decision support system to examine various scenarios enriched with multiple goals for adaptive enrolment management.

**Scope For Enhancement**

The model can be extended and refined to use as a comprehensive policy design tool at the University level. The different parameters influencing Attractiveness Index can be explored and represented through table functions. This shall require extensive data collection. The model can be refined to include quality of research and quality of teaching as separate modules to focus the university as a Research University.

Teaching University and/or an Urban University. Classification can be done as full-time students and part time students, residents, non-residents and internationals, minorities, women and others. Similar model can be developed for graduate students. The changes in application trends can be captured to further improve it.

Our objective has been to suggest a tested flexible methodology to aid in decision making for University administrators and management. The gut feelings can be verified through the model and impacts can be analysed. Such analytical models are required to be used to support intuition if not eliminating it completely to increase the effectiveness of policies. Education Management is an area where the application of such models has been quite limited. As education is becoming more competitive better resource management policies are called for. This makes the application of such models a proactive step.
Figure 8: Resource Requirement Details with Multiple Goals

Figure 9: Student Enrolments with Multiple Goals

Figure 10: Resource Requirements with Maximum Multiple Goals

Figure 11: Resource Requirement Details with Maximum Multiple Goals

Figure 12: Enrolled Students with a Different Allocation Mix of Publicity Funds
Flexibility Mapping: Practitioner’s Perspective

1. What types of flexibilities you see in the practical situation of “Enrolment Management” 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 organisational context? On which dimensions, flexibility should be enhanced?

3. Try to map your own organisation on following continua.
   [Please tick mark in the appropriate box(es)]

Factors Affecting Attractiveness

- **Negative**
  - Image Promotion
  - Publicity programme
  - Obsolete
  - Low

- **Positive**
  - Word of mouth
  - Facilities
  - Quality of Service
  - Financial Health

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

Reflecting Applicability in Real Life

1. How will you adapt the model proposed here to recruitment management in your organisation? Identify critical changes in the model.

2. Can you develop a flexible decision support system for recruitment management in your organisation utilizing the ideas proposed in this paper?
Exchange Rate Movement -
A Flexible System of Causal Explanations and Synthesis

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Abstract

The theories and empirical evidences from a host of studies reported in the literature indicate that fundamentals-based models are useful in explaining long-term trends, but they have not met with much success in forecasting the short- and medium-term path of the exchange rates. The relative successes of technical analysis-based trend-following models have led market participants to adopt it in the short-run. However, a total reliance on a technical analysis model without any fundamental base may not yield satisfactory results. Thus, one can say that the available theories of exchange rate movement, considered separately, tend to take partial views. In this paper, we explain the basic exchange rate models with the help of causal-loop diagrams and bring out the commonalities and differences among them. We then synthesise these features and develop the flexible framework of an integrated causal model that explains the behaviour of the exchange rates for various time horizons.

Keywords: exchange rate, flexible system, monetary models, portfolio balance models, systems approach, technical analysis approach

Introduction

This paper tries to discuss the various exchange rate models and bring out the commonalities and differences among them. It then tries to synthesize the commonalities and the differences and develops a framework of an integrated flexible causal model that explains the behaviour of the exchange rate for various time horizons.

A model is a representation of the reality of a system or process. The model, to be true representation, should be flexible enough to permit expansion or modification of the model so as to include additional information (parameters and relationships) as they are received. The model should also be robust enough to permit testing of policies, independently and in combination, to depict the behavior in transient and final states. Models have built-in implicit assumptions into them and hence co-exist and remain manageable as long as there is much common ground among them. The commonness can emerge from the parameters, their interrelationships, dynamism etc.

Prior to the 1970's, when the Bretton Woods system was adopted throughout the world, some form of pegged exchange rate management was prevalent in almost all countries. Under this system, importers knew what they would pay for goods in their domestic currency, and exporters knew how much they would receive in their local currency. But, with the breakdown of the Bretton Woods system, the rules changed, and major currencies started floating. The volatile exchange rates increased the exchange rate risk. Although the exchange rates of major currencies have started floating for more than two decades, the understanding of exchange rate movements has still remained far from complete (Rosenberg, 1996).

The wide and sudden exchange rate movements have baffled economists and policy planners.

The exchange rate affect and get affected by a wide variety of factors including the strength of a country’s economy vis-a-vis the rest of the world. It also gets affected by short-term psychological and political factors. The various theories explaining the movement of exchange rate are as old and rich as the theory of money. However, surveys by Meese (1990) and MacDonald and Taylor (1992) reveal that the present exchange rate models have not fared well. They attribute the marginal success of these models to the partial view of the problem that each model has taken. For example, the monetary models assume that the exchange rates move in relation to only the monetary shocks, i.e., to the demand and supply of a country’s money, and that other economic variables like income and interest rates affect the exchange rates by altering the money demand function only. The portfolio balance models, on the other hand, are stock models which assume that the exchange rates move in relation to the stock adjustment of supplies of a nation’s money and bond vis-a-vis the rest of the world. One of the major limitations of these fundamentals-based models is the assumption of departure of short-term exchange rate behaviour from its long-run equilibrium value. The funds managers, who
are generally being evaluated in the short-run, rely on the technical analysis models. In the technical analysis models, the funds managers analyse the past price trend and compare the trend with the present exchange rate price to arrive at an estimate of the expected future price. Since the foreign exchange transactions by the short-term traders are large in comparison to those by the fundamental investors, exchange rate models without this in-built component can provide poor results.

This paper analyzes the fundamental assumptions underlying each of the basic exchange rate models, incorporate them as cause-effect relationships, and build causal-loop diagrams in order to explain the model. These diagrams help us to bring out the commonalities and differences among the models. We then synthesise the individual features of the models and develop the framework of an integrated causal model. We are of the opinion that based on this flexible framework, a full-fledged system dynamics model can be built that should be capable enough of explaining and generating behaviour over varying time horizons (Sahu, Mohapatra, and Srinivasan, 1996).

Causal Loop Diagramming Tool for Depicting and Explaining Exchange Rate Models

Over the past few years system dynamics has emerged as a practical methodology of systems approach (Forrester, 1961, Richardson and Pugh, 1981, Mohapatra et al., 1994). One of the tools which is used very extensively in this methodology and which has drawn attention from a large section of social scientists is ‘causal-loop diagramming’. The causal-loop diagrams provide an easy understanding of the complex process in a very simple way. They provide visual representation of cause effect relationships among elements of a system forming structures of feedback loops; additionally they help to easily conceptualise a real-life problem.

Causal-Link

Cause-effect relationships are shown by arrows (links), each of which indicates the direction of causality between two variables – the causal variable appearing at the tail of a link and the affected variable appearing at the head of the link. A link can be either positive or negative. A link is positive if starting from an equilibrium condition (a condition which refers to constant, stable values of the causal and the affected variable), a rise in the value of the causal variable causes a rise in the value of the affected variable, or a fall in the causal variable causes a fall in the value of the affected variable. A link is negative if a rise (fall) in the causal variable causes a fall (rise) in the affected variable.

A succession of causation of variables indicates a causal chain. An unending causal chain is termed as a causal-loop. In such loops each variable not only affects (causal variable) but also gets affected (affected variable) by other variables of the chain. In these causal-loops, an initial disturbance in any of its constituent variables, through a chain of reactions, ultimately reaffects the variable (feedback). As we shall see, depicting the underlying relationships in the form of causal-loop, diagrams helps in unearthing

- implicit links among variables considered in an exchange rate model,
- links among variables that are missing or not considered in a model,
- interacting circular causalities that capture the real-life complexities while explaining the dynamics of exchange rate movement,
- the differences between the competing theories of exchange rate movement, and
- the totality of the model structure.

To start with, we depict an example of the commonly used domestic variables of the monetary model (Figure 1). Here nominal money supply and income are assumed exogenous to the model. A rise in nominal money supply reinforces expectations about its future growth and about future inflation, and raises the long-term interest rates. The cause-effect relations do not, however, constitute any feedback loop. We have already seen that a rise in nominal money supply raises expectations about future inflation and long-term interest rates. If we proceed further along the cause-effect chains, we come across one negative feedback loop. A rise in long-term interest

\[ \text{Expectation of Future Inflation} \]
\[ + \]
\[ \text{Long Term Interest Rates} \]
\[ + \]
\[ \text{Money Demand} \]
\[ + \]
\[ \text{Income} \]
\[ - \]
\[ \text{Price Level} \]
\[ + \]
\[ \text{Nominal Money Supply} \]
\[ + \]

Figure 1: An Example of a Simplified Monetary Model of an Economy

rates reduces demand for money that, in turn, lowers the long-term interest rates, thus forming a negative feedback loop (Loop-1) that tries to resist any change from the steady state equilibrium.
A Brief Note on the Theories of Exchange Rate Movement

The theories of exchange rate movement can be classified as follows:

I. Fundamental Analysis Approach
   A. Monetary Models
      1. Flexible-Price Monetary Model
      2. Sticky-Price Monetary Model
      3. Real Interest Rate Differential Monetary Model
   B. Portfolio Balance Models
II. Technical Analysis Approach

Fundamental analysis is the most common approach to study exchange rate behaviour. It relies on detailed examination of macro-economic variables of a country vis-a-vis another country. It rests on the assumption that the exchange rate is related to the performance of the underlying economy, relative to other countries. In addition, measurable changes in specific macro-economic variables are assumed to lead or precede the changes in exchange rates. The variables, commonly examined, include relative inflation and interest rates, national income growth, and changes in money supply.

Technical analysis is the antithesis of fundamental analysis. It does not deal with the actual causes of exchange rate movement. Rather, it views all the relevant information about the future price movement to be embodied in the current price, and so it considers nothing but the price and volume movements.

The Monetary Models

According to the monetarists, any imbalance – internal or external – is caused through the monetary channel (Rosenberg, 1996). There are two schools of thought among the monetarists. Those belonging to the first school assume that the exchange rate is determined as a ratio of the long-run price indices of two countries (Flexible-price Models). The protagonists of the sticky-price model, on the other hand, assume that the short-run price index responds to monetary shocks after a considerable delay, thus deviating from its long-run equilibrium value. The real interest differential monetary model attempts to combine the features of both the schools of thought. A summary of the considerations made in the monetary models is provided in Appendix I.

Causal Explanation of the Flexible Price Model

Figure 2 shows the relationships among the different causal variables of the flexible-price model. This figure depicts the interaction of the domestic monetary forces with the foreign monetary forces.

We observe from this figure that the causal structure for both the domestic and the foreign economies in the monetary models are similar. Further, we observe that many links, like export, import, etc., that connect price level to exchange rate are not explicitly specified; but without these links the process is incomplete. We therefore simplify these models by considering the causal determinants of price level of the domestic economy which, in turn, interact with the foreign (rest of the world’s) price level, through the exports and imports to determine the exchange rate. Figure 3 presents the simplified version of the flexible-price model.

Figure 3 depicts the cause-effect relationships among the variables of the flexible-price model. We note from Figure 3 that an increase in the exports leads to an increase in the trade balance; similarly, a decrease in the exports leads to a decrease in the trade balance. Therefore the link from exports to the trade balance is positive. An increase in the trade balance, however, increases (appreciates) the exchange rate, and a decrease in the trade balance decreases the exchange rate. Therefore the link from the trade balance to the exchange rate is positive. We can also argue that an increase...
in the exchange rate results in a decrease in exports; thus, the link from the exchange rate to exports is negative. We find that trade balance, exchange rate, and exports form a circular feedback loop. Going around the loop, we observe that the property of the loop is to negate any change from the steady state. For example, a rise in trade balance raises the exchange rate which reduces the exports thereby resisting any rise in the trade balance. Thus the loop is a balancing loop (also called a negative loop) which is characterised by a − (minus) sign.

An increase in the nominal money supply raises the demand for goods (Walras’ Law) and hence the domestic price level. The raised domestic price level makes home goods comparatively costlier than the foreign goods, and thereby reduces exports and increases the imports. The country’s balance of trade deteriorates and the exchange rate falls. The lowered value of the exchange rate makes the home goods cheaper abroad, stimulate their demand, and raises exports. Similarly, the lower exchange rate makes the foreign goods cost more in domestic currency, reduces their demand, and lowers the imports. The raised exports and lowered imports enlarge the trade balance and raise the exchange rate. Exports, trade balance, and spot exchange rate form the Loop 2, while imports, trade balance and spot exchange rate form the Loop 3.

The Causal Explanation of the Sticky-Price Model

The best known explanation of short-run departure of exchange rate from its long-run equilibrium value is provided by the sticky-price model of Dornbusch (1976). This model shares the features of the flexible-price monetary model, but relaxes the assumption that PPP holds in the short run. In the flexible-price models PPP is assumed to hold continuously, i.e., it assumes instantaneous adjustment in all markets and hence the exchange rate always remains at its long run equilibrium value. The sticky-price model, however, sees PPP as only a long run phenomenon, and assumes the exchange rate to depart from its long-run equilibrium value in the short run.

Figure 4 shows the causal relationships of the sticky-price model. It has all the variables and their cause-effects relationships as in Figure 3 (for the flexible-price model). We see in Figure 4 that, the exogenous variables remain same as in the flexible-price model. The model endogenously defines new variables such as real money supply, short-term interest rates, net capital flows, long-run equilibrium exchange rate and the expected rise in their values. The thick lines in Figure 4 depict new causal relations not present in the flexible-price models. New Variables and new causal relations in the sticky-price model give rise to a new negative feedback loop (Loop 4) formed by spot exchange rate, expected rise in exchange rate and net capital flows. A rise in net capital flows causes a rise in spot exchange rate that reduces the expected rise in the exchange rate thereby reducing the net capital flows.

In the sticky-price model, as in the flexible-price monetary model, an increase in the domestic money supply raises the price level and the exchange rate falls. But due to slow adjustment of goods market to monetary shocks compared to the asset market, the price level in the short run rises less (represented as a delay, ‘D’, in the causal link between nominal money supply and price level) than proportionately compared to the rise in nominal money supply. This raises the real money supply and lowers the short-term interest rates. The lowered interest rates reduce the net capital inflows and the exchange rate falls further. This additional impact from liquidity-induced short-term interest rates leads to the exchange rate departing further in the short run from its long-run equilibrium level. However, in the long run the domestic price level adjusts to the rise in the nominal money supply and the long-run equilibrium exchange rate starts to fall. This lowered value of long-run equilibrium exchange rate along with the already raised exchange rate lowers the expected rise of the exchange rate and the exchange rate starts moving (falling) to its long run equilibrium value.
The Causal Explanation of the Real Interest Rate Differential Model

The real interest rate differential model (Figure 5) shares similar views as those of the sticky-price models by assuming that exchange rates depart from their long-run equilibrium values in the short run i.e., the PPP does not hold in the short-run though it is valid in the long-run. However, the two models differ in the factors that affect the expected change in the spot exchange rates (i.e., "expected rise in the exchange rate" in the Figures 4 and 5) and the net capital flows that actuate the spot rate. The difference seems to stem from the components of the nominal (short-run) interest rate - the real interest rate and the expected inflation.

In the sticky-price model both the components with their foreign counterparts are assumed to drive the net capital flows. In the real interest rate differential model only the real interest rate component of nominal interest rate of both the nations are assumed to drive the net capital flows directly. The expected inflation differential is assumed to affect the net capital flows but indirectly through the expected changes in the exchange rates. Again, in sticky-price models the expected change in the spot exchange rates are assumed to be driven solely by the difference between the spot (short-run) and the long-run equilibrium exchange rates. And when the gap between the two values becomes zero the expected change in the spot rate is also assumed to become zero. However, in real interest rate models the expected change in the spot rates are assumed to be driven both by the difference in spot and the long-run equilibrium exchange rate values, as in sticky-price models, and additionally by the expected long-term inflation differential between the two nations.

Figure 5 shows the cause-effect relationships of the real interest rate monetary model. The thick lines in the figure identify the new causal links that are not present in the sticky-price models (Figure 4).

The Causal Explanation of the Portfolio Balance Models

In the monetary models problems of risk and uncertainty are ignored, and domestic and foreign assets are viewed as perfect substitutes (Krueger, 1985) of each other. The monetary models are narrowly focused, in that the exchange rates are determined only by the supply of and demand for money stocks. But in portfolio balance models, domestic and foreign financial assets are viewed as imperfect substitutes in financial portfolios because of the unequal uncertainty and risk perceived with these assets. The portfolio balance models, thus, broaden the menu of financial assets that influence the exchange rates.

In portfolio balance models, the residents of a single country are assumed to allocate their wealth among alternative competing financial assets, domestic and foreign money, and among domestic and foreign securities (Allen, 1973, Boyer, 1977, Branson, 1977, Dornbusch, 1975). The choice of allocation of wealth between the competing assets depends on their level of risk-return relationship. And any change in the risk-return relationship of the financial assets causes a shift in the proportion of the financial assets held by the individuals. Hence, the demand for a country's asset is primarily influenced by its risk-return pattern on investment and the wealth of its residents. The return on a financial asset depends on domestic and foreign interest rates. The demand for domestic money is assumed to decrease with increase in either the domestic or foreign interest rate whereas the demand for domestic bonds increases with the domestic interest rate and falls with the foreign interest rate. The amount of risk perceived is associated with the nation's political and economic stability. Hence, according to this theory, a country's recent changes in interest rate and in the level of risk lead to stock adjustments of financial assets.
among investors leading to large capital flows and changes in exchange rates in the short run. The simple one-country portfolio balance model (where individuals cannot hold foreign currency) is given in Appendix II.

In simple words, the portfolio-balance models assume exchange rate as the price at which individuals wilfully hold the stocks of domestic and foreign assets, and any change in exchange rate alters the composition of the individual portfolio. Figure 6 shows the causal analysis of the portfolio-balance models.

For simplicity of understanding the cause-effect relationships of the portfolio-balance model are represented in two parts: Figures 7 and 8.

In this model money supply and domestic bond supply are considered exogenous to the models. As is observed from Figure 7, an increase in the share of any particular asset in the portfolio diversification decreases its demand. It also reduces the share of other assets held in the portfolio composition and increases their demand. For example, an increase in the money supply increases the share of wealth held as reserve money. The increased share of the reserve money reduces the demand for money and raises the demand for bonds, domestic and foreign (Walras' Law) (Figure 7). Similarly, a in domestic bond supply increases the share of wealth held as domestic bond, lowers its demand, and increases the demand for domestic money and foreign bonds (Figure 7). In Figure 8 we don't show the details of Figure 7. We discuss five negative feedback loops and one positive loop in Figure 8.

As discussed, a rise in domestic bond supply that increases the share of wealth held as domestic bond increases the demand for domestic money and foreign bonds. The increase in demand for domestic bonds lowers the domestic interest rates that makes domestic bonds less attractive compared to the foreign bonds, thus lowering the demand for domestic bonds (Loop 1). Further, the lower demand for domestic bond that increases the domestic interest rates makes the foreign bonds attractive. The demand for the foreign bonds decreases the exchange rate and increases the share of wealth held as foreign bond. The raised share of foreign bonds increases the demand for domestic bonds (Loop 2). The raised demand for foreign bonds that lowers the exchange rate and raises the share of wealth held as foreign bond reduces the demand for the foreign bonds (Loop 3). Further, the raised share of foreign bonds increases the demand for domestic money. The domestic interest rate rises and lowers the demand for foreign bonds (Loop 6).
The Causal Explanation of the Technical Analysis Approach

Technical analysis involves analysing historical price movements to determine recurring trends and price patterns. They are compared with current price movement to determine buy-or-sell strategies.

Technical analysis is, therefore, based on three fundamental premises:

1. Market action discounts everything.

   Technical analysis acknowledges that there are a large number of factors that determine exchange rate – fundamental, political, psychological or otherwise, but that they are not tractable. However, the collective impact of all these factors is known via the price mechanism.

2. Prices move in trends.

3. History repeats itself time and again.

   Technical analysis takes into account the historical price movements to determine the trends of exchange rate movements. They are then compared with the current exchange rate movement to determine the rate of rise (or fall) of the trend and which drives the expectations about the continuance (or the reversal) of the present trend. This expectation of the continuance of the present trend of exchange rate finally determines the speculator’s buying and selling strategy, thereby actuating a movement in the exchange rate.

Figure 9 shows the causal loop diagram for the technical analysis models. From this figure we note that a sudden rise in the spot exchange rate increases the average exchange rate. If this rise is along the direction of average past movement in the exchange rate, the trend of exchange rate movement rises. And if the rise in the recent trend is along with the past trend, the speculators look at the rate of rise in the trend. If the rate of rise in the trend is more than that in the recent trend, the expectation of the continuance of the trend in the direction of the present movement of exchange rate increases, and thus the speculators’ demand for the home currency increases and hence the exchange rate raises. But when the rate of rise in trend is decreasing, as shown in Figure 9, the speculative buying rate also falls.

The expectation of continuance of trend in exchange rate is also affected by the valuation of the currency. If the currency is highly overvalued, due to already raised spot exchange rate, it lowers the expectation of a rise in the exchange rate, i.e., the rate of rise of future spot exchange rate may be less, or even the spot exchange rate may fall in near future. The reverse happens when the currency is undervalued.

There are two distinct balancing loops (negative feedback loop) in the model. A rise in the spot exchange rate increases the currency overvaluation that lowers the expectations of the rise in the trend and reduces the speculators buying rate. The spot exchange rate drops (Loop 1). Again, the fall in the expectations of continuance of the trend due to a rise in spot exchange rate increases the speculators selling rate thereby lowering the rise of spot exchange rate (Loop 2). It is to be noted here that
Figure 9 has many other feedback loops apart from the two loops that we have discussed above. These loops are created if we trace all the causal pathways from the spot exchange rate, through the ratio of actual to average exchange rate, back to spot exchange rate.

A Critical Analysis of the Theories of Exchange Rate Movement

The vast body of literature on exchange rate models indicates that the pure structural models have not met with much success particularly for medium and short-run forecasting. To quote Dornbusch (1988): “after 20 to 30 years of exchange rate modelling, from the work of Meade and Mundell to the New Classical Economics, we are left with an uncomfortable recognition that our understanding of the exchange rate movement is less than satisfactory”. Frakel and Rose (1994) also express similar views. This is also evident from our discussion in the last section on the performance of structural models, which have not outperformed the naive random-walk models both for the in-sample and the post-sample data.

The failure of the pure structural models has influenced the researchers to include additional variables in explaining exchange rate movements. The Hooper-Morton models (Hooper and Morton, 1982) appear to be an attempt in the direction of building a grand model. Again, the forecasting performances of these models were mostly compared with those of the RW models. The results seem quite mixed. While for some exchange rates these models performed better compared to the RW model they fared poorly with other exchange rates.

The failure of the fundamental models can be attributed to incomplete synthesis (Boothe and Glassman, 1987), inability to incorporate circular causalities and assumption of static relationships among the interacting variables (Isard, 1987), when evidences clearly suggest otherwise MacDonald, 1995. In this respect the system thinkers have a different view. They think that a weak relationship built into a model is better than no relationship, because in a dynamic setting, an apparent weak relationship may become stronger due to dynamic interactions with other variables (Mohapatra et al., 1994).

The poor performance of the fundamental models is attributed to the fact that exchange rates exhibit variability far grater than the changes in relative money supplies, interest rates and in inflation rates, particularly for the short and medium time horizons (Abdullah and Yusop. 1996). However, recent works suggest that exchange rate, money supply, price level, and interest rates are cointegrated in the long run (MacDonald and Taylor, 1993, MacDonald, 1995).

There seems to be a lot of confusion over the direction of causality and in the channels of transmission (causal chain) affecting the exchange rate, particularly when we consider different time horizons (Abdullah and Yusop. 1996). In these models the direction of causality is normally from price level to exchange rate, but the reverse could also happen. Consider, for example, that a sudden increase in money supply causes the exchange rate to fall in the short-run. The exchange rate tries to return to its equilibrium value over time. How does this happen? This happens due to a reverse causation and a joint endogeneity of the exchange rate and the price level. The price level, being sticky in the short-run, does not rise in proportion to the money supply. The relatively lower price, in turn, improves the trade balance, and hence corrects the short-term departure of exchange rate from its long-run equilibrium value.

The foreign exchange market is a forward-looking market and responds to the short-term disturbances which deviate the exchange rate from its long-run equilibrium value. The fundamentals-based models, however, study the long-run steady-state equilibrium factors, but neither captures the short-term disturbances that affect the exchange rate nor depict the short-term transient behaviour. Hence, these models lack the ability to capture the timing or the magnitude of attacks on currency that lead to sudden and/or wide capital flows and large market moves. The fundamentals-based models also fail to capture the real disturbances, such as change in the terms-of-trade, resource discoveries, etc., which influence an exchange rate without significantly affecting the price level and the money supply on which the steady-state behaviour of exchange rate depends.

The widely used monetary models are often data-and coefficient-biased, particularly when the sample size is small. Therefore the predictive power of these models is limited when out-of-sample data is used for

![Figure 9: The Causal Loop Diagram for the Technical Analysis Approach](image-url)
Exchange Rate Movement – A Flexible System

predicting the exchange rate (Meese and Rogoff, 1983a, 1983b). These models do not consider various delays, physical or psychological, associated in the process of the transmission and mostly make the unrealistic assumption of instantaneous adjustments in all markets (Abdullah and Yusop, 1996). Though such assumptions have negligible effect on the long-run behaviour, they can have significant effect on the exchange rate behaviour in the short run.

From the discussion of the different existing exchange rate models it becomes quite clear that any one of these existing models attempts to capture only a partial view of the problem and is therefore unable to provide a complete picture of the exchange rate movement. In summary, the major limitations of the existing fundamentals-based models are the following:

- The models of exchange rate behaviour generally focus on the long-run behaviour of exchange rates.
- The short-term behaviour of exchange rate movement is mostly explained in a descriptive manner (MacDonald and Taylor, 1993, 1994).
- Thus, although these models attempt to depict the factor-relationships dynamically, they ultimately provide unidirectional, long-term, steady-state relationships between the exchange rate and a very small number of significant factors of the economy. In the process, effects of interactions of many intermediate variables on the transient dynamics of exchange rate are ignored.
- Quite often, in the absence of diagramming tools depicting causalities, the model structures are not transparent and therefore not easily comprehensible. Thus the relationships among factors are not easily understood, and missing links go unnoticed.
- We know that the exchange rate movement is an outcome of complex interactions among a large number of factors, which are social, economical, political, psychological and international. The complexity stems not only from the variety of the factors and the largeness of their number, but also from their interrelationships that are mostly non-linear and dynamic.
- The short-term policies may have counter-intuitive, long-term effects.

The failure of the fundamentals-based models in the short-run have led market participants, particularly the funds managers who are evaluated in the short span, to adopt the technical-based, trend-following models in the short run. However, as the investment returns spread over medium- and long-term horizons, total reliance on technical model without any fundamental base can be extremely ineffective.

A Synthesis

The discussion so far leads us not only to rethink on various limitations of the available models but also to design a composite flexible model that combines their various features which could help explain the exchange rate movement for various time horizons of analysis: short, medium, and long. The model should exhibit the interrelationships of various financial, socio-economic, political forces of a nation with the corresponding forces of the outside world. It should be capable enough to capture the different monetary and economic factors in an economy, exhibit their interrelationships, and generate the exchange rate dynamics for various time horizons. Further, it should clearly depict the mechanism of how these factors interact dynamically to produce various important indicators of an economy such as national income, inflation, and interest rate and with similar factors of the outside world to shift the demand for and supply of a nation’s currency, and hence alter the exchange rates. The flexible systems model should depict the sources of changes in income and interest rates which can shift the money demand function that is typical to all the fundamentals-based models and be capable enough to generate the behaviour of short-term traders who use to dominate the international currency transactions.

Figure 10: Interactions Among the Three Monetary Models

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Before we build the structure of such a model we first note the following relationships among the various types of models:

1. There are overlaps among the three monetary models with the flexible-price monetary model as the core model. The sticky-price model considers all the factors and their interactions considered in this core model. Additionally, it considers factors such as real money supply, short-term interest rates, net capital flows, long-run equilibrium exchange rates, and the expected rise in the exchange rate. The real interest rate differential model considers all the factors and their interactions present in the sticky price model; additionally, it considers factors such as expected future foreign inflation, and real interest rates and their differential. Figure 10 shows the overlaps among the three monetary models discussed above.

2. The portfolio-balance model considers such new factors as demand for domestic and foreign bonds, but discounts many other factors such as price level and expected inflation which are considered in the monetary models.

3. The technical analysis model, on the other hand, has the least overlap with the other models, being based on a time-series analysis of exchange rate and on the buying and selling rate of speculators.

To develop a flexible system by synthesis among the three model sets, we consider the sectoral overview diagram (Figure 11). We depict the three models as three separate sectors, each defined in the form of rectangles in the Figure 11. Exchange rate is central to all the model sectors and is shown as a circle.

The broken lines indicate the flow of information from one model sector to another. For example, the arrow labeled ‘trade balance’ originates at the monetary model sector and ends at the portfolio model sector and indicates that ‘trade balance’ is defined endogenously in the monetary model sector and information on this variable is passed on to the portfolio-balance sector. Thus, trade balance is exogenous to the portfolio-balance sector and endogenous to the monetary model sector. Information on exchange rate is used in the technical analysis model sector and in the monetary model sector, and is indicated as a dotted arrow without any label. The major variables that are endogenously defined in each model sector are also indicated in Figure 11.

Figure 12 depicts the cause–effect relationships of such a synthesized model.

The model synthesizes the causalities depicted in different theories of exchange rate. It shows the different factors and their interactions that produce the exchange rate dynamics. The various factors of the existing models are circumscribed by respective rectangles with bold boundaries. The rectangle for the flexible price model contains the factors that produce the exchange rate as specified in these models. The additional factors specific to thesticky-price and real interest rate models are shown in their respective rectangles. Similarly, the additional factors of portfolio balance and technical analysis are also shown in their specific rectangles. This diagram provides
insights into the different factors of the various available exchange rate models as well as their interactions to generate the exchange rate dynamics.

The grand flexible model (Figure 12) considers both the short-term and the long-term features of exchange rate determination. Thus the model can be used to generate short-term and long-term exchange rate dynamics, both separately and in combination. To generate the short-term dynamics the model builder has to de-emphasise the long-term features of the fundamental models, whereas to generate the long-term exchange rate behaviour the short-term features contingent to the technical analysis model have to be de-emphasised.

The flexible systems model has, of course, the ability to generate simultaneously the short-term and long-term behaviour of exchange rate. It may be noted here that the grand model envisaged here generates macro behaviour from microstructures. We would like to caution here that when the model is simulated, sometimes the high frequency short-term factors may interact in complex ways with the low-frequency, long-term factors to generate dynamics that may be baffling to the model builder. But such unexpected, counterintuitive results are not uncommon; in fact the recent South-East Asian currency debacle appears to be the result of a complex set of interactions among a host of short-term and long-term factors operating in the currency movement (Colaco, 1997).

![Figure 12: The Causal Loop Diagram for the Synthesised Flexible Systems Model](image-url)
Concluding Remarks

The paper studies the characteristics of different available exchange rate models and represents them in easily understandable causal-loop diagrams that are frequently used by the system analysts. Such representation helps in unearthing implicit links, missing links, and interacting circular causalities and helps in qualitatively explaining the exchange rate dynamics.

The paper further explores the commonalities among various foreign exchange models. This has helped in understanding the extent of overlap and interactions among the various models. Such understanding has led the authors towards developing an integrated flexible systems model that synthesises the features of the monetary, portfolio, and technical analysis models. The sectoral overview diagram for such a model depicts how different individual model sectors interacts with one another in generating the exchange rate dynamics. Finally, the causal-loop diagram of the integrated model is presented in the paper. In this diagram, the boundaries of the individual sectors are shown that helps to identify variables that are endogenously defined within a sector and also to identify variables on which information are passed across the boundaries on to other sectors.

An integrated flexible systems model of this type has many advantages over the individual models available in the current literature. As discussed in the paper, such a model includes all the factors and their interaction contained in the individual models and thus goes beyond the previous attempts at developing such synthesised exchange rate models. In so doing the grand model captures the dynamic, nonlinear, circular interrelationships among a very large number of variables.

This model has also the advantage of generating exchange rate dynamics for various time horizons. As stated earlier, deemphasising speculator’s activities in the technical analysis sector will help to eliminate short-run effects while trying to generate medium and long-run dynamics. Similarly, deemphasising the long-term features of the fundamental models enables to generate short-run exchange rate dynamics.

Such a flexible system model is, however, not without problems. Inclusion of a large number of factor interactions makes the task of estimating the strength of individual relationships extremely difficult. The simultaneous equation modelling approach of parameter estimation, appropriate here, is extremely difficult to apply in this case. Further, data on each and every variable may not be available to use this approach for parameter estimation. We propose that such a flexible causal model be transformed into a full-fledged system dynamics model that can be simulated rather easily. We have developed such a system dynamics model (Sahu et al., 1996) for explaining Indian Rupee - U.S. Dollar exchange rate dynamics.

References


Appendix I: The Monetary Models

Assuming a two-country model, a domestic versus a foreign country (representing the rest of the world), the money supplies in the two countries, \( M^d \) and \( M^* \), are assumed to be determined exogenously and controlled completely by the respective central banks. 

The real demands for money, \((M^d/P) \) and \((M^*/P^*) \) are positively related to domestic incomes \( Y \) and \( Y^* \) (the transaction demand for money) and negatively related to the cost of holding money, i.e., the interest rates, \( i \) and \( i^* \). Here \( M^d \) and \( P \) represent nominal money demand and price level respectively, and the asterisk, \( * \), indicates the foreign variables.

At the equilibrium, the following relations hold for the domestic country:

\[
(M^d/P) = K(Y, i) \quad (1)
\]

\[
M^d = M^* \quad (2)
\]

where \( K \) indicates the functional dependence of \( (M^d/P) \) on \( Y \) and \( i \).

Similarly, for the foreign country, the following relations hold:

\[
(M^d*/P^*) = K(Y^*, i^*) \quad (3)
\]

\[
M^d* = M^* \quad (4)
\]

The flexible-price models assume instantaneous adjustments in all markets to monetary shocks and assume the law of one price, the purchasing power parity (PPP), to hold at all times, i.e.,

\[
E = P/P^* \quad (5)
\]

where \( E \) and \( P \) are equilibrium exchange rate and price level respectively.

The equilibrium exchange rate can be expressed by solving equations (1) through (5), as

\[
E = [MK(Y^*, i^*)]/[M^*K(Y, i)] \quad (6)
\]

Assuming that the income and interest rate elasticities of the demand for money (\( b_1 \) and \( b_2 \) respectively) are same for both the countries, the functional form of \( K \) can be given as:

\[
K(Y, i) = (Y)^{b_1}, \quad (i)^{b_2}, \quad b_1, b_2 > 0
\]

and

\[
K(Y^*, i^*) = (Y^*)^{b_1}*, (i^*)^{b_2} \quad b_1, b_2 > 0
\]

One obtains, in logarithmic terms, the following:

\[
e = (m - m^*) - b_1(y - y^*) + b_2(i - i^*) \quad (7)
\]

(Here \( b_i \)'s represent the constants and the other small letters represent the logarithmic values of their corresponding capital letters.)

In these models bonds of both the countries are viewed as perfect substitutes and are assumed to carry equal risks. Hence, for the investors to willfully hold on to the bonds, the return on domestic and foreign bonds should also remain equal. In other words, the interest rate on domestic bond \((i^d) \) must equal the interest rate on foreign bonds \((i^*) \), adjusted for the expected rate of appreciation or depreciation of the foreign currency, \( e \), i.e., \( i = i^d + e \). As PPP holds, the expected change in interest rate equals the expected change in the differential inflation rates, i.e., \( i - i^d = p - p^* \) (where \( p \) and \( p^* \) represent the expected domestic and foreign inflation rates respectively). Further, as price levels are determined by the supply of and demand for money, the relative expectations in inflation are influenced by differences in future monetary growth rates, i.e., \( p^* - p = m^* - m^* \) (where \( m^* \) and \( m^* \) represent the expected domestic and foreign money growth rates respectively). Therefore, \( e^* = i - i^d = p - p^* = m^* - m^* \)

Hence, equation (7) can be alternatively written as

\[
e = (m - m^*) - b_1(y - y^*) + b_2(m^* - m^*) \quad (8)
\]

Appendix II: Portfolio Balance Models

\[
M = a \ (i, i^*) \ W \quad (1)
\]

\[
B = b \ (i, i^*) \ W \quad (2)
\]

\[
E.F = g \ (i, i^*) \ W \quad (3)
\]

\[
W = M + B + E.F \quad (4)
\]

Here, \( M \) is the domestic money supply, \( B \) is the supply of domestic assets, \( F \) is the net holdings of foreign assets, \( E \) is the price of foreign exchange, \( i \) and \( i^* \) are domestic and foreign nominal interest rates respectively, and \( W \) is the initial wealth. Obviously, from (4), the sum of the constants \( a, b \) and \( g \) must be unity so that (1), (2), and (3) are not independent. \( F \) can be either positive or negative, depending on whether a country is a net creditor or a net debtor.

Portfolio balance models assume that the demand for domestic money decreases with the increase in either the domestic or the foreign interest rate, whereas the demand for domestic bonds increases with the increase in domestic interest rate and falls with the foreign interest rate. The demand for foreign bonds increases with an increase in the foreign interest rate and with a decrease in the domestic interest rate. From equation (4), it can be observed that a change in the exchange rate, \( E \), leads to a change in the total wealth, and alters the demand for foreign securities.

The equilibrium condition for the market for foreign assets can be represented as

\[
E.F = (1 - a - b) \ W = g(i, i^*) \ W \quad (5)
\]

or,

\[
E = g(i, i^*) \ (W/F) \quad (6)
\]
Flexibility Mapping: Practitioner’s Perspective

1. What types of flexibilities you see in the practical situation of “Exchange Rate Movement” 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. Try to map your own context on following continua.
   [Please tick mark in the appropriate box(es)]

   Analysis
   - Fundamental
   - Time Frame
   - Short-term
   - Monetary Model
   - Sticky-price
   - Technical
   - Long-term
   - Flexible-price

3. Develop a SAP-LAP (Situation Actor Process-Learning Action Performance) model of “Exchange Rate Movement” relevant to your context.

Reflecting Applicability in Real Life

1. Attempt of model the exchange rate movement in your context. To which one of the two schools of thought does it correspond?
2. What utility you foresee of a flexible system model of exchange rate movement proposed in this paper? How can it be made implementable in your context?
Concept of Systemic Flexibility

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Introduction

Flexibility has multiple connotations as per the situation, some of the important ones are: adaptiveness to the changes in the environment; adjustment to situation; agility in action; amiability in relationships; autonomy in functioning; balance in competing opposites; broadening of mind; compromising for betterment; contingency in planning; customizing solutions; elasticity under tension; freedom of thought and expression; informal attitude; liberalization from controls; localness in organisation; openness in thinking; resilience in implementation; responsiveness to customers requirements; variability in parameters and specifications; mobility in transactions; and versatility in solutions and operations. This is only a representative list and many more connotations of flexibility can be identified and added to it.

Further, there are various types of flexibilities in an enterprise, such as strategic flexibility, organisational flexibility, financial flexibility, manufacturing flexibility, information systems flexibility, marketing flexibility, operational flexibility, technology management flexibility, and so on. Under each category, there are further many types of flexibilities. For example, the manufacturing flexibility encompasses product flexibility, process flexibility, volume flexibility, routing flexibility, tooling flexibility, labour flexibility, static flexibility, dynamic flexibility and so on.

Thus, the concept of flexibility is multi-dimensional in nature.

Concept

To grasp and explain such a multi-dimensional concept, the concept of paradox/continuum is used. A paradox is in the form of a pair of polar opposites: a thesis and an antithesis, forming a continuum from thesis to the antithesis, for example, above-below, light-dark, male-female, etc.

In the organisational context, some leading paradoxes or dichotomies are centralisation-decentralisation, continuity-change, stability-dynamism, and so on.

If we treat the thesis as rigidity then can we say that the antithesis is flexibility? Is flexibility the opposite of rigidity? These are the basic questions that would clarify the concept of systemic flexibility.

Example

Let us take the classic example of a parent. Let the thesis parent be a rigid parent, totally dominating and leaving no freedom for the child. His/her plank is “do as I say”. Then the antithesis parent would be one who gives total freedom to the child. His/her plank would be “do as you like”. Thus, if the thesis parent is “rigid”, can we say the antithesis parent is “flexible”?

No! the antithesis parent is also “rigid”. The thesis parent was having only one option i.e. “do as I say”, whereas the antithesis parent also has only one option i.e. “do as you like”, whatsoever is the situation or issue under consideration.

Further, it can be said that the antithesis parent ceases to be a parent. As the parenthood means caring and nurturing, and the antithesis parent is unconcerned about the child, she is no more a parent.

A flexible parent would be the one who has a range of options, who is simultaneously stern and loving. The flexible parent may give total freedom on certain things, partial on some other, and may be very rigid on a few areas, such as discipline or value system. She may utilize the learning and freedom of choice to dynamically change the level of freedom on various issues.
Thus, it can be inferred from the above example, that by simply moving from the thesis to the antithesis, we need not necessarily bring flexibility; rather the system may lose its identity if pushed to extreme antithesis. For example, if an organisation with high degree of centralisation opts for the antithesis, i.e. extreme decentralisation, it may lead to disintegration or fragmentation of the organisation as was experienced by HP and Motorola who ultimately opted for recentralisation.

A flexible organisation would be a “collective”, bimodal or multimodal organisation having centralisation and decentralisation at the same time and changing their degree over time as per the requirement.

**Definition**

Thus, the concept of systemic flexibility can be defined as shown in Figure 1:

*Flexibility is the exercise of free will or freedom of choice on the continuum to synthesise the dynamic interplay of thesis and antithesis in an interactive and innovative manner, capturing the ambiguity in systems and expanding the continuum with minimum time and efforts.*

![Figure 1: Concept of Systemic Flexibility](image)

This definition of systemic flexibility involves three keywords:

i. Options

ii. Change

iii. Freedom of choice

Hence, in order to define flexibility in any area we can identify the following:

- What are the range of “options” created in the process or systems?
  These can be mapped on the continuum ranging from the thesis to the antithesis.

- What type of “change mechanisms” or dynamic synthesis are created for continuous renewal and adaptation?
  These can be listed down according to the process or system under consideration.

- What are the domains of “freedom of choice” of participating actors?
  These can be identified in terms of various actors involved in the problem context.
Illustrative Example

Let us take the example of a flexible organisation on the following continuum.

Centralisation o o Decentralisation

**Options**: A rigid organisation would choose the extremes, whereas a flexible organisation will have a range of options from centralisation to decentralisation at the same time.

It may have:
* Highly centralised financial control systems
* Highly localised cross-functional teams to respond to customer requirements.

**Change**: The flexible organisation may create organisational architectures to learn, renew and adapt overtime such as:
* Cross-functional teams with distributors and customers
* Dialogue projects
* Quality circles
* Suggestion schemes
* Knowledge management systems.

**Freedom of choice**: The flexible organisation creates a set-up to provide more external freedom to managers and releases their internal freedom (from biases) by creating a learning organisation. They may have freedom to choose their projects, teams, approach and tools.

Caselets

**ABB**

* The president and chief executive officer of ABB moved aggressively to build a new organisational model for tomorrow; an exemplary model for companies both Indian and foreign. Here, a brief analysis of this model is provided in terms of the factors which led to its development as a flexible organisation. It deals with the restructuring of top level management at ABB from a slow, inflexible, bureaucratic structure towards a flexible, dynamic and open system.

* Percy Barnevik (Ex. CEO and President ABB) created a structural foundation of small frontline units. Reconstructed ABB as 13,000 little companies that operate individual businesses, acting as the company’s profit centres and building blocks of organisation. ABB’s matrix requires the managers of each frontline unit to report to both a regional manager and a worldwide business head.

* Project teams consisting of an entrepreneur with an idea and a small team that believes in it, grow into departments. They control their own balance-sheets, borrow money independently and retain a substantial portion of their savings.

The three paradoxes that have been synthesised in this restructuring matrix are:

Centralisation o o Decentralisation

The new structure gives high degree of autonomy to project teams on the one hand, and gives control in the hands of top management to shake up operating units that have become stagnant or unprofitable on the other.

Global o o Local
The company is having a global strategy and local delivery mechanism through operating units.

Vertical o o Horizontal
The organisation is having a matrix structure comprising of vertical integration with business areas and horizontal integration with regional units.
Nokia

Nokia made the major strategic decision to divest its non-core operations and focus on telecommunications. The keywords of systemic flexibility, i.e. options, change and freedom of choice are illustrated in this caselet.

Options

* The Roll-out Management Package: has been created for the customer if he desires independence from his system supplier, has sufficient in-house competence, and would like to take advantage of Nokia’s Project Management expertise.

* The Time-to-Market Package: is designed for the customer if a quick entry into the market is a main priority, but he would still like to maintain responsibility over Network Planning. With the Time-to-Market Package, he has a secured launch date, a single interface with his system supplier, can focus on his core business and has lower fixed costs.

* The Turnkey Responsibility Package: can be opted by one who may select a total system supplier and will not be actively involved in the roll-out of his network. Instead, one can keep focus on his customers. The benefits can be manifold: lower risk for the cost schedule and network performance, one-stop shopping, and focus on core business.

* The Telecom or Datacom Deployment Package: This package could be the right choice for the person if he desires independence from the system supplier, has the technical competence in-house and would like to maintain the responsibility and decisions regarding partners and subcontractors to himself.

The other opportunities available are:
- Opportunities for making the most out of the new technologies.
- More modularity for plugging in new applications.
- More openness for easier integration of new applications.
- More flexibility for managing combined second generation (2G) and third generation (3G) networks.
- More scalability for making a smooth migration to 3G.
- More efficiency for handling 3G complexity.

Change

* Equal opportunity is a key part of the Nokia way. Nokia invests in the personal and professional learning of all its employees. Its target is to learn something every day and to secure the continuous learning of the entire team. Nokia also considers the balance of the personal and professional lives of its employees to be important.

* As one of the fastest growing telecommunications companies in the world today, much of Nokia’s growth can be attributed to its strength and presence in the world’s fastest growing economies, the emerging markets. Capturing the lead in these markets, Nokia has advanced on competition with innovative technologies such as the introduction of the first Asian language interface in mobile phones and with the erection of new production facilities in Brazil, Hungary and China.

Freedom of Choice

* Freedom of peaceful assembly and association as well as freedom of thought, conscience and religion are respected in everyone’s actions at Nokia. Freedom of opinion and expression are very much in line with Nokia’s open and straightforward way of working and its corporate value, “Respect for the Individual.”

* To remain successful, Nokia provides and encourages teamwork, and the strength that comes from diversity. Working in a multicultural environment is considered to be an advantage and privilege.

Self Assessment and Reflection with Reality

- What are different connotations of flexibility? Explain with relevant examples.
- What are major types of flexibilities in an enterprise? Illustrate with suitable examples.
- Discuss the concept of systemic flexibility with a real life example.
- Take a real life case situation and identify the keywords of flexibility i.e. options, change and freedom of choice in it.
LG Electronics: Towards Openness

Y. V. Verma
Vice President-HRD
LG Electronics India Limited
Plot No. 51, Udyog Vihar, Surajpur Kasna Road, Greater Noida

Introduction
LG Electronics is creating a very open, flexible and responsive set up. It uses innovative business practices that generate flexibility on different fronts. A synoptic view of some important flexibility practices is given here in terms of strategy, concept, aim, specific goals and frequency.

KPI Review Meetings
- **Strategy**: Information systems flexibility and Organisational flexibility
- **Concept**: Key Performance Index (KPI) review
- **Aim**: To review performance as per KPI every month and to reframe the targets if necessary.
- **Specific goals**: Spirit of competition (Inter/Intra Dept.), Stretched goal attainment, Increase self-belief and target resetting
- **Frequency**: First week of every month

PSI Plan and RSP Review
- **Strategy**: Information systems flexibility and Marketing/ Manufacturing flexibility
- **Concept**: Production, Sales and Inventory (PSI) Plan / Rolling Sales Plan (RSP) Review.
- **Aim**: To increase accuracy in the planning activities of Sales and Production while maintaining Speed and Quality.
- **Specific goals**: Inventory control and accuracy
- **Frequency**: Daily followed by weekly and monthly basis

OEM’S
- **Strategy**: Manufacturing flexibility and Organisational Flexibility
- **Concept**: To increase production capability
- **Aim**: To increase production capability
- **Specific goals**: Production capacity increase to meet market demand without increasing overhead cost. To maintain same standards of quality levels.
- **Frequency**: Existing Two OEM’s with Dixon and Voltas

Happy Calls
- **Strategy**: Innovation flexibility
- **Concept**: Customer first
- **Aim**: To provide the customers a feeling that “The Company Cares”
- **Specific goals**: Cater to any defects or problems being faced by the customers by acting proactively.
- **Frequency**: After one month and one year of purchase

Auto Call Register
- **Strategy**: Innovation flexibility and Information System flexibility
- **Concept**: 24 Hrs complaint registering service
- **Aim**: To provide utmost customer satisfaction through prompt response
Specific goals: To keep response time below 48 Hours and to reduce waiting time for the customers.

1+ Service
Strategy: Innovation and Operational flexibility
Concept: We care for customers.
Aim: To provide extra service (household) free of cost to the customers.
Specific goals: Customer satisfaction
Frequency: Every visit

ABC System for Vendors
Strategy: Manufacturing / Operational flexibility
Concept: Grading of vendors according to Quality of service.
Aim: To review the performance of vendors as per the specification limits of LGEIL and to take constant review of the same. A Grade is excellent, B Grade - OK, C Grade - needs improvement and if doesn’t improve then to call off the deal.
Specific goals: To have Quality standards of LGEIL and constant review for vendors.
Frequency: In system

Quality Movement
Strategy: Innovation / manufacturing/ organisational flexibility
Concept: 100 PPM and 6 Sigma Quality level
Aim: To reduce defects through modification in process through small project with SMART targets.
Specific goals: Customer satisfaction, Global standards, and Reduce defects.
Frequency: In system

Innovation Week
Strategy: Innovation/Information System flexibility
Concept: Education through sports and games
Aim: To propagate the core values of Speed, Quality, Teamwork, Innovation and Openness.
Specific goals: Stress reliever, Spirit of competition (inter line), Stretched goals attainment, and Increase self-belief
Frequency: Once every month continues for one week

Standing Meeting
Strategy: Information System flexibility
Concept: Openness in communication (MD chairs this meeting)
Aim: Open communication, motivate the workers through rewards and open discussion
Specific goals: Pat on the back for the workers, To increase commitment and ownership towards organisation through continuous reward, Direct interaction with the Top Management for the workers.
Frequency: At the beginning of every month there is a meeting, which is attended by all the employees of the company. Managing Director shares information about various aspects of the company. In the Standing Meeting Prizes like best employee, best employee of the department/line of the month and best suggestions for the month are given away

Pizza Lunch
Strategy: Information System flexibility
Concept: Open communication
Aim: Platform for the employees to discuss work related issues with the MD
Specific goals: To increase the sense of ownership of the employees, provide solution for the work related problems, forum for suggestions and grievances
**Frequency** : Once every week this meeting is organized where six to eight people of a department meet Managing Director over lunch

**Natural Working Teams**

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Innovation/ Manufacturing flexibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concept</td>
<td>Continuous improvement through employee involvement</td>
</tr>
<tr>
<td>Aim</td>
<td>Development of potential leaders</td>
</tr>
<tr>
<td>Specific goals</td>
<td>Increase teamwork and ownership, Respect for fellow workers, Healthy competition through team competition on work, Stretched goals based on TPI 50 concept</td>
</tr>
<tr>
<td>Frequency</td>
<td>Inbuilt in the system</td>
</tr>
</tbody>
</table>

**TDR**

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Organisational Flexibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concept</td>
<td>To optimise the resources</td>
</tr>
<tr>
<td>Aim</td>
<td>To increase the productivity through loss minimisation</td>
</tr>
<tr>
<td>Specific goals</td>
<td>Loss minimisation, Increase production capacity by removing bottle-necks in different processes, Increase the overall margin on which the organisation is functioning</td>
</tr>
<tr>
<td>Frequency</td>
<td>Inbuilt in systems</td>
</tr>
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</table>

**TPI 50**

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Innovation/Operational flexibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concept</td>
<td>Stretched goals</td>
</tr>
<tr>
<td>Aim</td>
<td>To increase the organisation performance by 50% every year</td>
</tr>
<tr>
<td>Specific goals</td>
<td>To increase turnover, production capacity and manpower productivity</td>
</tr>
<tr>
<td>Frequency</td>
<td>Inbuilt in system more specifically used during the target setting for the New Year</td>
</tr>
</tbody>
</table>

**Help Desk**

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Information System flexibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concept</td>
<td>One point communication for workers</td>
</tr>
<tr>
<td>Aim</td>
<td>To solve their problems and queries within 24 hrs</td>
</tr>
<tr>
<td>Specific goals</td>
<td>Solve problem before they become grievances, Open communication point, Channel for communication with management.</td>
</tr>
<tr>
<td>Frequency</td>
<td>For half an hour everyday</td>
</tr>
<tr>
<td>Achievement</td>
<td>Approximately 95% problem solved before 24 hrs</td>
</tr>
</tbody>
</table>

**Dosti Tour**

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Innovation/ Manufacturing flexibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concept</td>
<td>Friendship through continuous improvement</td>
</tr>
<tr>
<td>Aim</td>
<td>Motivate workers for innovations</td>
</tr>
<tr>
<td>Specific Goals</td>
<td>Forum wherein operators show the improvements done on weekly basis to senior management to get acknowledgement and token rewards on the spot for motivating them</td>
</tr>
<tr>
<td>Frequency</td>
<td>Weekly</td>
</tr>
</tbody>
</table>

**LAP Reflections**

<table>
<thead>
<tr>
<th>Learning</th>
<th>Which of the above listed practices you find most relevant in the context of your organisation?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Action</td>
<td>How will you adapt the identified critical practices to enhance flexibility of your processes/actors? Prepare an action plan.</td>
</tr>
<tr>
<td>Performance</td>
<td>Which performance indicators will be affected by implementing these critical practices and in what way?</td>
</tr>
</tbody>
</table>

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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 E-Commerce and E-Governance
* GIFT School of Learning Organisation and Strategic Transformation
* GIFT School of Quality, Productivity and Wastivity Management
* GIFT School of Environment Management
* GIFT School of Human Values and Management Ethos

Publications
– Book Series on Flexible Systems Management
– Newsletter - “Flexibility”

Membership
The membership fees for different types of members, unless changed/revised by the Governing Council from time to time, will be as given under:

<table>
<thead>
<tr>
<th>Membership</th>
<th>With in India</th>
<th>Overseas</th>
</tr>
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<tbody>
<tr>
<td>Student (Annual)</td>
<td>Rs. 500.00</td>
<td>US$ 25.00</td>
</tr>
<tr>
<td>Annual</td>
<td>Rs. 1,000.00</td>
<td>US$ 50.00</td>
</tr>
<tr>
<td>Life</td>
<td>Rs. 10,000.00</td>
<td>US$ 500.00</td>
</tr>
<tr>
<td>Corporate/ Institutional (a) for corporate bodies having turnover has less than Rs 20 Crore and for non-business/non-profit making organisations/institutions:</td>
<td>Rs. 50,000.00</td>
<td>US$ 5,000.00</td>
</tr>
<tr>
<td>(b) for corporate bodies having turnover more than Rs 20 Crore:</td>
<td>Rs. 1,000,000.00</td>
<td>US$ 5,000.00</td>
</tr>
</tbody>
</table>

• All individual members will get one complimentary copy of the giftjournal.
• All corporate/institutional members will get three complimentary copies of the giftjournal, one for library and two for nominees.

Correspondence:
All correspondence and membership applications may be addressed to the President of the institute at the following address:

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Global Journal of Flexible Systems Management

Guidelines for Authors

Aim
The journal is intended to share concepts, researches and practical experiences enabling the organisations to become more flexible (adaptive, responsive, and agile) at the level of strategy, structure, systems, people, and culture. Flexibility relates to providing more options, quicker change mechanisms, and enhanced freedom-of-choice so as to respond to the changing situation with minimum time and efforts. It is aimed to make the contributions in this direction to both the world of work and the world of knowledge so as to continuously evolve and enrich the flexible systems management paradigm at a generic level as well as specifically testing and innovating the use of SAP-LAP (Situation-Actor -Process-Learning-Action-Performance) framework in varied managerial situations to cope with the challenges of the new business models and frameworks.

Scope
The journal will include the papers relating to: conceptual frameworks, empirical studies, case experiences, insights, strategies, organisational frameworks, applications and systems, methodologies and models, tools and techniques, innovations, comparative practices, scenarios, and reviews.

The papers may be covering one or many of the following areas: Dimensions of enterprise flexibility, Connotations of flexibility, and Emerging managerial issues/ approaches generating and demanding flexibility (details can be seen on the website: www.giftsociety.org).

Coverage
The journal will be organised into various sections to include following types of contributions: Research papers, Short notes/correspondence, Applications and case studies, Book reviews, Book summaries, Interviews and round tables, Information about relevant conferences and seminars, Educational and learning experiments, and any other relevant information related with the theme of the Journal.

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Four copies of manuscript should be submitted to the Editor-in-Chief at this address: Prof. Sushil, Department of Management Studies, Indian Institute of Technology, Hauz Khas, New Delhi - 110 016, Ph: 91-11-6591167, 91-11-6857787, Fax: 91-11-6591167, 91-11-6862620.

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Each paper is reviewed by the editor and if it is judged relevant for publication, it is sent to referees for double blind peer review. The papers are reviewed for relevance, focus on flexibility, innovation, practical considerations, quality of evidence, contribution, methodology, readability, and organisation. Based on the recommendations of the referees, the editor then decides whether the paper should be accepted as it is, to be revised or rejected. The reviewing time will normally be 10-12 weeks.

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Length: No maximum length for a paper is prescribed, however, authors should write concisely.
Title: The title should be brief and typed on a separate sheet.
Format: The paper should have a cover page giving title, author’s name, complete address, telephone number, fax number, and email of the author. In case of co-authors, these details should also be provided for each co-author. Correspondence will be sent to the first named author unless otherwise indicated.

The second page should contain the title and an abstract of 100-150 words. It should also include up to eight keywords about the paper. The authors may attach the category sheet to define the relevant categories to which the paper belongs (available on the website: www.giftsociety.org.). The second page should not include the authors name. The paper should begin from the third page.

Headings: should be short clearly defined, and numbered.
Footnotes: should be used only when absolutely necessary and must be identified in the text by consecutive numbers placed as superscript.
Text: The main text should be more readable and mathematical models, if any, should be provided in Appendix.

The ideas proposed should preferably be supported by real life case examples from business situations.

Tables and Figures: All tables and figures should be kept to a minimum and numbered consecutively using arabic numerals. Each table should have a brief title written on the top of the table, and each figure should have a brief caption written on the bottom of the figure.

Photos and Illustrations: must be supplied as good quality black and white original with captions. Their position should be shown in the text by typing on a separate line the words "take in Plate n".

References: to other publications must be in standard style. That is shown within the text as the author’s name followed by a comma and year of publication, all in round brackets, e.g. (Volberda, 1997). At the end of the paper a reference list in alphabetical order must be given as follows: For books: Surname, initials, (year), title publisher, place of publication. e.g. McKenzie J. (1996) Paradigm: The New Strategic Dimension, McGraw-Hill, Berkshire.

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