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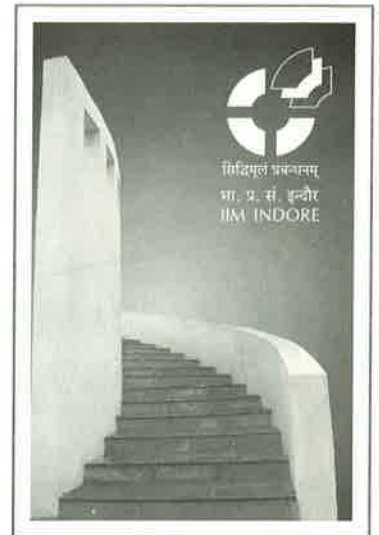
IMPACT

Indian Institute of Management Indore

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Editor
Dr Tapan K Panda

Editorial

I am happy to present herewith the inaugural issue of *International Journal of Management Practices and Contemporary Thought,* published by **Indian Institute of Management Indore.** This was one of our long cherished dream to publish a journal of true International quality with research papers comparable to any International journal in the area of business and management. The challenge for the journal is to address needs of both industry and academia. It aims to bridge the division between academic research and industry practice. The idea behind IMPACT is to record and chronicle the contemporary management practices through case studies, CEO interviews and discussion round tables. On the other hand it also focuses on hardcore research in the area of business and management. There is a popular saying, "Excellent practice comes out of robust conceptual modeling and rigor of conceptual learning, lies in its application in management practice".

International Journal of Management Practices and Contemporary Thought (IMPACT) is positioned as a strategic platform to record the emergence of both the ideas in management education at an interesting time of our civilization. I call this as interesting time because the world has wakened up to realize the fact that India is resurging as an economic and knowledge powerhouse. The taxonomy of Indian market is changing from a developing to an emerging market. So we are going to experience interesting changes in the coming period of time in the way business was managed in the past, and being a knowledge powerhouse, Indian academia and management are going to lead this emergence.

We have included nine research articles in the inaugural issue. All of them have come from leading business and management schools of the country and abroad and carry flair of hardcore research. I am thankful to all the authors for responding positively to my request for research papers. Since we planned to do a rigorous double blind review, it took a while for us to confirm them about their papers. As we go ahead and repeat the process of review, authors will find our system to be faster responsive to author queries.

The first paper, *'Development of A Tool to Measure Competencies of Software Project Managers: A Confirmatory Factor Analytic Study'* by **Neera Katwal, L. S. Ganesh** and **T. J. Kamalanabhan** of **Indian Institute of Technology Madras** looks into a process of developing a mechanism to measure the performance of software project managers. Contribution of Information technology in emergence of new and vibrant India is immense and it is necessary to develop modified methods for measuring performance of these professionals. The probability of the success of the project and project performance in the field of computer software production and the efficiency of the software depend on the competent skill of the project manager. A set criterion is required to evaluate the competence, efficiency and effectiveness of a project manager.

The second paper, *'A Framework for Measuring ICT Adoption in The Travel and Tourism Sector'* by **Sunil Sahadev** of **University of Sheffield** and **Nazrul Islam** of **Asian Institute of Technology** is a conceptual model for adoption of ICT in travel and tourism industry. The model has three components; determinants, pattern and the outcomes of adoption, which influence the use of diffusion in this industry. These intervening variables are associated with geographic location, internal characteristics and the market condition in which the firm operates.

The third paper, *'Validation of Power Distance Scale in Indian Context and It's Policy Implications on Consumer Behavior Research'* by **Satya Bhusan Dash** of **Indian Institute of Management Lucknow and Kalyan Kumar Guin** of **Indian Institute of Technology Kharagapur** analyzes different types of power distance scaled used at measuring consumer

behavior. Though some of these scales are developed in western literature, their validity and application needs to be modified to Indian consumer behavior. The validation of power distance scale is an assessment at the individual level, which can be applied in consumer behavior research to evaluate service quality and customer relationship. The limitations of the scales should not reduce effectiveness of the measures for customer relationship as they have long-term financial implications.

The fourth paper, *'R&D Expenditure in Network Industries: Could It Be a Social Waste?'* by **Sumit Sarkar** of **Indian Institute of Technology Kanpur** is an example of re-looking at effectiveness of research and development expenses in the network industries and its contribution towards forming social capital. When the installed base advantage is not sufficient to deter the entry, research and development expenditure can be used as a strategic signal. But, this entry deterrence is welfare reducing, and important in the context of anti trust laws.

The fifth paper, *'Interdependence in Imports, Production, Exports and Terms of Trade in India An Empirical Study'* by **Justin Paul** of **Indian Institute of Management Indore** and **Dr. A. Ramanathan** of **Indian Institute of Technology Bombay** evaluates the linkage between imports, production ad terms of trade in India in developing a strong export base for Indian industries. The promotion of liberalization of imports has a significant role in grooming the exports and imports of Indian industries. As a result external sectors have become more integrated and dependent on the domestic production without leaving any negative effect on the terms of trade.

The sixth paper, *'Packaging, Marketing and Selling The Three Imperatives of Indian R&D'* by **Pramod Pathak and Saumya Singh of Indian School of Mines** addresses issues of how packaging, marketing and selling need to augment the Indian research and development sector. Though we have the technical manpower and strong fundamentals as input of good research and development efforts, but, there is a greater need to integrate them with available market forces. To prove their existence internationally, the research and development organization needs to develop marketing skill, and a killer instinct to be familiar with marketing processes and practices for a long-term sustainability and commercialization of the research and development output.

The seventh paper, *'Positioning Retail Brands'* by **G.P. Sudhakar** of **Welingker Institute of Management Development and Research** analyzes positioning options for various retail brands in India. Indian retailing industry is changing very fast, and new players are emerging with newer formats and positioning options in the market place to capture customer's mind share. When the virtual position of the retail store is identical to the imaginary position on various dimensions in the mind of the customer, surely this will lead to the customer loyalty towards the retail store. The author proposes customer loyalty towards a retail store as a direct function of positioning strategies followed by firms.

The eighth paper, *'Is the Free Market Appropriate for Education?'* by **Arundhati Sarkar Bose** of **Jawaharlal University** analyzes the reasons for growth of private higher education model in India. The policy planners have identified a private participation in higher education has helped in strengthening the quality of higher education in India. The main reason of the influence of the privatization on the education sector is free trade, which is implied on the revenue earning basis. It is also noticeable that implication of privatization is often overlapped by internationalization. The paper analyzes the policy implications of provisions in general agreement on trade in services and trade in education on higher education in Indian system.

The final paper, *'Role of Institutional Investors in Indian Stock Market'* by **S S S Kumar of Indian Institute** of **Management Kozhikode** looks into the contribution of Indian institutional investors in strengthening of Indian capital market. The Mutual fund companies and foreign institutional investors actions have significant effect on the market direction.

Institutional investors are dominating the Indian capital market, and their influence in price setting is believed to be quite strong. It is also a robust proposition to have strong institutional investors in the stock market so that retail investors interest can be protected through institutional investing and mutual funds. The policy makers and regulators should develop adequate transparency measures for strengthening Indian capital market.

The journal plans to have interesting sections in its future issues. We are planning to include a case study of an Indian company described in first person by the CEO of the company. The reader will get a first hand view of the strategy followed by the company and the CEO, and will also understand how and why they followed such a strategy. We are also inviting interesting case studies in our 'Case Study' section in future issues. The editorial team is working on developing 'Discussion Round Tables' on various emerging and contemporary issues, which will find a place in our subsequent issues. We also welcome management and business book reviews for inclusion in the journal. The reviewer should send a copy of the book and his review note for publication. Abstracting and Referencing will be a regular feature in subsequent issues. I am sure, in subsequent issues we will be able to build a strong reader base for IMPACT by combining research papers, interviews, discussion forums, first person case studies, case based research notes and cases, book reviews; and reader corner with valuable comments of the readers of this issue. I invite authors to submit their research papers, case studies, and interest notes to undertake discussion forums and interviews of CEOs. These will help us to make this journal a true combination of conceptual learning and management practice to showcase excellence in business and management.

I put on record my sincere thanks to all the members of the editorial advisory board, Dr. S. P. Parashar, Director of IIM Indore and members of Research and Publications Committee for their support and help in making this journal see the light. I also thank Dr. Ranjana Singh, Mrs. Sofia Sadique, Mr. Mukesh Choudhary at Research and Publications office for their contribution in publication of this journal.

Please send your comments and suggestions to undersigned at **tapan@iimidr.ac.in**

Dr. Tapan K. Panda

Contents

Development of a Tool to Measure Competencies of Software Project Managers : A Confirmatory Factor Analytic Study

Neera Katwal*   L. S. Ganesh**   T. J. Kamalanabhan***

Abstract

The production of high quality computer software and the efficiency of the software development process are key issues facing academics and practitioners today. With the importance placed on the successful accomplishments of software projects, stakeholders and customers have looked to project managers for leadership. Consequently, many studies have been conducted to determine the characteristics or skills associated with competent and effective project managers. This study presents the steps involved in construction and validation of an instrument for evaluating competencies required for software project managers.

Key Words : Competencies, Unidimensionality, Convergent Validity, Reliability.

Competitive Global Environment and the Software Industry

The growing global economy for software products and services has forced many organizations to redefine the very standards by which they operate. The customer base to which they serve is becoming much larger and more demanding and there is a necessity for reduced cycle time. Coupled with this, the growing complexity, and the increased mission-critical status of these software systems are pressurizing organizations to deliver higher quality and more complex software products.

Researchers have examined the software development problem and concluded that management is the most important factor determining the success or failure of a project (Dale 1973, Hertel, 1977). Researchers and practitioners suspect that a great majority of project managers are weak on certain required skills, and their weakness contributes to the problems encountered on many projects (Drucker, 1980; Peters, 1987, 1992).

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Recruitment and selection have been long-running problems in the Information Technology (IT) industry. Project managers are rarely selected because they have been nurtured and developed for the role. It is common for technical specialists in the organization to be promoted to the rank of project managers. Once promoted, they are expected to carry out their new roles without formal training. The only immediate support the PMs receive for their new role is a literature of project management procedures ranging in their complexity plus some software tools ranging from the simple to very complex. The importance of active skills such as vendor management and public relations are often completely overlooked.

Some companies prefer to recruit rather than develop their own project managers. In a tight labour market, this leads to rapid turnover with project managers often not seeing projects through to completion before accepting a better offer. This results in weak identification of IT project managers with their projects (sauer et al, 2001).

It is therefore important for IT management to understand the characteristics and behaviours of high performing IT project managers in order to identify them as early as possible and to create an environment conducive to their development and retention (Wynekoop and Walz, 2000).

Previous Research

Competence is a term which is widely used but which has come to mean different things to different people. It is generally accepted, however, as encompassing knowledge, skils, attitudes, and behaviors that are causally related to superior job performance (Boyatzis 1982).

This paper first presents a review and analysis of research based literature concerning the knowledge, skills and personal attributes of project managers that are expected to lead to achievement of successful project outcomes. Then it reviews the instruments that have been used to assess these competencies. Finally, it discusses the steps involved in the development and validation of the scale to evaluate Software project managers' competencies.

Research based literature on the aspects of project management competence draws primarily upon the opinions of project managers and others concerning the knowledge, skills and personal attributes required by an effective project personnel (Posner 1987a; Thamhain1991; Turner1993, Meredith et al., 1995; Wateridge1996; Zimmerer and Yasin1998).

Posner (1987), was among the first authors to publish an empirically grounded study listing the characteristics of an above-average project manager. His research used an open-ended questionnaire, and identified six core skill areas, which he linked to critical project problem areas. He concluded that the training requirements for project managers were mostly interpersonal as opposed to technical in nature. He recommended that project managers should improve their ability to communicate, organize, build teams, provide leadership and deal comfortably with change (Posner, 1987). Zimmerer & Yasin (1998), and Jiang, Klein & Margulis (1998), arrived at similar conclusions.

Thamhain (1991), conducted a study using personal interviews, and identified three principal competency groups for project managers interpersonal, technical and administrative. He concluded that a project manager's effectiveness depends on the ability to understand the people, the tools and the organization.

Turner (1993), has proposed six traits for effective project managers: problem solving ability and results orientation, energetic and initiative, self assured leadership, broad perspective, communicating and negotiating abilities. Knowledge and learned skills also make important contributions.

Meredith et al. (1995), have categorized the skills needed for a project manager into six skill areas: communication, organizational, team building, leadership, coping, and technological skills. Katz[1991], suggested that effective administration rests on three basic developable skills. These are human skill, conceptual skill and technical skill. Although these skills are interrelated, they can be developed independently. There is surprisingly little agreement among educators and training program directors of many leading universities and institutions on what makes a good project manager (El Sabaa, 2001).

Some researchers focused on project manager job characteristics and attempted to generate a list of recommended activities for IS project managers (Nadler & Tushman, 1990; Pinto & Kharbanda, 1995a). Such studies found that the critical project management tasks include recognizing project team conflict, understanding who the stakeholders are and what they want, determining project implementation policy and leading from the front.

According to a survey of HR directors of Fortune 1000 firms, the top ten skills needed for managers to achieve organizational success are as follows: interpersonal, listening, persuasion and motivation, presentation, small-group communication, advising, interviewing, conflict management, writing, and reading.

Birkhead, Sutherland and Maxwell's (2000), survey of

128 PMs from the sectors of IT, Construction and Engineering Projects in South Africa resulted in a rank ordered list of competencies based on 28 constructs derived from the literature. The 7 factors of competencies that emerged from the ranking were: (1) Planning and controlling (2) Personal Influence (3) Goal Focus (4) Problem Solving (5) Team Leadership (6) Project Team Development and (7) Project Context.

Wateridge (1997), from an analysis of Advertisements for project managers in the trade and national press drew the conclusion that a competent project manager must have administrative, technical, inter-personal, business and political skills. However, not all of the skills will be necessary on every project.

What emerges from the work of all the specialists in terms of the requirements of Project Managers? First, they all seem to agree on the importance of wider management skills: Planning, Organization, Follow-up, Decision Making, Team Supervision and Human Aspects. Many of them also emphasized the need for a global vision of the project, or a multidisciplinary orientation that could embrace the technical, managerial, political, legal and environmental aspects. Finally, a certain number of personal characteristics were also identified among which, analytical ability, creativity, decisiveness, the ability to adapt, stability, energy and persistence recurred most frequently.

A review of above literature shows that the studies on project manager competencies have considered opinions of project managers from different industry and project types. These competencies are generic in nature and not industry specific. Then, there exists considerable literature on the subject but most of it is still qualitative in nature (Anderson, 1992).

Artto (2000), argues that more research and development would be needed to define competence profiles that would be appropriate for different organizational positions in different environments. Kooyman & Sargent (1998) have also raised the need to address the differences between project managers operating in different cultural environments. It has also been suggested by Pettersen (1991), that additional competencies would be required by a project manager working in a developing country. Although limited research has been done within particular organizations to identify the competencies required for project managers in India, no publicly available research has been conducted.

This research studies the role of the project manager in software service firms and identifies the skills, knowledge, attributes, and behaviours,(collectively termed as competencies) these are particularly important for software project managers to manage their projects successfully. The paper then presents the steps involved in construction and validation of a scale/instrument based on these competencies. It then suggests the uses of the instrument for developing software project managers, and gauging training requirements for those managing all types of software projects.

Methodology

The investigator began by reviewing questionnaires and list of skills used in other studies. Most of the studies reviewed, had generated a list of characteristics, that the ideal project manager should have and had asked respondents managing various types projects to rate or rank those skills according to their importance. A comprehensive instrument that could systematically measure the level of importance and the extent of competencies present among the software project managers could not be found in literature.

Of the studies reviewed, the most comprehensive analysis of behavioral skills based on extensive pilot research was Green's (1989), work involving 18 behavioral skills (Table 1). These skills, not related to any particular type of system development, apply to any project development, environment (Frame, 1994).

The international project manager's competence research of Crawford(1997, 1998, 2000), had investigated project managers in different industries and project types. The project manager's competencies are measured by a questionnaire that subdivides competencies into four component parts: Knowledge, qualifications and experience (measured by curriculum vitae); core personality; and demonstrable performance (indicated by actual actions and doings of the project manager).

Software-engineering books and Project management books were read in order to understand the models and process of software development, and the various activities performed by the project managers. A list of Items comprising of the competencies used in other studies was made. It included the various project management activities and tasks. Further, items were identified from advertisements placed in job classifieds on web and dailies for the appointment of project managers. These specified the level of knowledge, the qualifications, and experience, skills and personality characteristics that software companies sought for in the project managers they wished to hire. The HR departments of a reputed company provided their metrics/parameters that they used to evaluate their personnel' eligibity for promotion as a project manager.

A list of 141 constructs was derived from the literature

and personal interviews of project personnels. These were then grouped under the broad categories of Project Management Business Skills, Technical Expertise, Managerial and Administrative Skills/Tasks, Human Resource Management Skills, Client Management Skills and Personality Characteristics and Attributes, as these covered all aspects of project management. (Table 1)

Using these 141 items, a questionnaire was prepared that also included the 18 behavioral skills validated previously by Green (1989). A 5- point Likert scale was provided each on either side of the items. The aim was to simultaneously elicit from the respondent, his/her opinion on importance as well as evidence of project manager competencies. The Likert scale on the left hand side of the items, required the respondents to indicate how strongly they believed each listed competency was important for project managers during software project development. The Likert scale on the right hand side of the items required the respondents to indicate the extent to which they believed that the project managers possessed those competencies.

This questionnaire was then given to 2 project managers and 2 senior managerial personnel (a director and a vice-president of different software firms) for their judgement on the appropriateness of the items. The collective items, which were declared as unfit by more than three judges, were discarded. Therefore 8 items, which were seen either, redundant or not falling under the category of project manager's responsibility, were removed. Two new items were added on their suggestion.

This reviewed questionnaire was then shown to 3 academicians in the filed of research and behavioral psychology for further refinement in terms of sentence construction, language, clarity of meaning of the items. On their advice, a few items were re-framed and modified in language and style. One item, which represented two different but similar aspects, was split into two in order to remove its ambiguity. Hence, the questionnaire with 136 items was administered to a group of 5 project personnel in the level of project leaders for a mock response to see if items conveyed their intended purpose and to check for any further ambiguity. The purpose was also to check the amount of time required completing the questionnaire. Four items belonging under the head of personality characteristics received low rating in terms of their importance and so were dropped from the questionnaire. The final questionnaire retained only 132 items.

Questionnaires were administered through personal interviews and through soft copies attached to e-mails.

Although 540 respondents were contacted, only 250 usable responses were obtained.

Respondents' Profile

The respondents' profile was as follows
- 40% were Project Leaders, 40% were Project Managers and 20% were Business Managers
- 50% were in the age group of 30-40 years, 50% were above 31 years of age.
- 81% were male.
- 57% were engineering graduates.
- 49% have undergone training in private institutes that offer training related to software development

Table I : Competencies and Their Explanation

Competencies	Explanation of Competencies
Business Skills	• Understanding of business environment of own organization and client's organization. • Knowledge of own organization's business goals, and the project's business objectives. • Knowledge of the client organization's functional or business processes and ability to conceptualize necessary technology solutions related to clients, business needs. • Expertise with financial tools and techniques for project estimates.
Technical Expertise	• Technical expertise or knowledge, and skills in managing technology include understanding of the technologies involved, the engineering tools and techniques employed, product applications, knowledge of programming languages and understanding the relationship among supporting technologies.
Managerial and Administrative Skills	• Skills required in coordination resources for various project tasks and activities in project management. • Understanding own and client's organizational processes, practies, procedures and governing regulations. • Delegating work among project personnel and ensuring that they adhere to the rules and standards.
Human Resources Management Skills	• These include the competencies required to manage a software project team. • Ability to delegate work among team members. • Empowering project team members, building their morale, encouraging them to accomplish project goals. • Recognizing the need for, and implementing suitable training programmes for the project team, and developing members.
Client Management Skills	• These include the competencies that are required by the project manager in managing clients. • Ensuring clients' cooperation from the beginning of the project. • Ability to elicit information from clients, etc.
Personality Characteristics and Attributes	• These include the behavioral, emotional and temperamental traits, the distinctive qualities that distinguish a person from others. • Includes competencies such as 'Ability to work hard' 'Critical reasoning' 'Assertiveness' 'Adaptability' 'Problem-solving ability' etc.

and personality development.

- The most frequent type of projects had worked in, were Application Development Projects, followed by Maintenance Projects and Product Development Projects.

Scale Refinement and Validation

A critical aspect in the evolution of a fundamental theory in any management concept is the development of good measures to obtain valid and reliable estimates of the constructs of interest. Without establishing the reliability and validity, it is difficult to standardize the measurement scales, and hard to know whether they truly measure what they intend to measure.

Conventionally, exploratory factor analysis (EFA) is used for the situation, where the relationships between the observed and latent (factors) variables are unknown or uncertain. The approach proceeds in an exploratory manner to unearth the underlying factors, thereby illustrating the relationship between the latent factors and the observed variables. The purpose is to come out with the minimum number of factors that will explain the co-variation among the observed variables. Nonetheless, this approach suffers from certain limitations. The primary limitation of this approach is that in EFA, it is assumed that the correlations between the variables are due to one or several underlying hidden factors that generate the raw data. But, the researcher may have only an imprecise but not an explicit idea about these correlations or factors. Moreover, even if he/she is fairly sure about the presence of a particular factor, he/she may not know which variable influences the factor (Byrne, 1994). Therefore, the investigator may lack any sound evidence on which to make his/her interpretations. Furthermore, items are assigned to those factors on which they load to a significant extent.

Therefore, it is possible for an item to load substantially on more than one factors and hence, the distinctiveness of the factors is affected. Besides, in pure EFA, items are loaded only on a statistical basis, and not any theoretical justification, thereby affecting the valid identity of the items. And, at last the concept of unidimensionality (i.e. the extent to which items on a factor measure one single construct) has not been taken care of in EFA approach (Ahire et al., 1996). Essentially EFA is particularly useful only in the absence of a sufficiently detailed theory about the relationships of the observed variables to the latent constructs (i.e. only for the constructs that are at a very nascent stage of research).

On the contrary, the CFA approach, to a very great extent, overcomes the above mentioned limitations, and addresses the situation, wherein, the researcher specifies a model, a priori, and tests the conjecture that a relationship between the observed and latent variables does in fact exist. In short, the hypotheses that form the constraints are an integral part of the CFA technique. This is due to the fact that the researcher has reasonably good knowledge of the factors that are required to explain the intercorrelations among the measured variables. In addition, he/she knows which factors account for the co-variation among the observed variables. The proposed model is built on logic, research and theoretical findings, and if the researcher has a reasonably good idea about the observed variables that are likely to be the reliable indicators of a particular factor, CFA is more appropriate than EFA (Bentler, 1995). The present work chosen to adopt the factor analysis (for scale refinement and validation) in a confirmatory fashion.

Unidimensionality Analysis

A highly mandatory condition for construct validity and reliability and checking, is the unidimensionality of the measure (Anderson and Gerbing, 1991). It refers to the existence of a single construct/trait underlying a set of measures. The usefulness of the items within a measure depends on the extent to which they share a common core (Nunnally, 1988). The concept of unidimensionality enables us to represent the value of a scale by a solitary number (Venkatraman, 1989). In order to check for unidimensionality, a measurement model is specified for each construct (Ahire etal., 1996). A comparative fit index (CFI) of 0.90 or above for the model, has been said to imply that there is a strong evidence of unidimensionality (Byrne, 1994). However, this value has often been disputed and so disregarded. (Bollen 1989, Marsh, Balla and McDonald 1988, Tanak 1993, Hoyle and Panter 1995). The values below 0.90 have been accepted as appropriate fit. Cohen 1988, for example, suggested a minimum of 0.80. Bollen (1989), observed that cutoffs are arbitrary and stated that a more salient criteria may be to compare the fit of one model to the fit of another, prior model of the same phenomenon. For example, a CFI of 0.85 may represent progress in a field where the best prior model had a fit of 0.70. As the literature points out that there is no such thing as "good fit" (Bentler & Bonnett 1980, Hoyle & Panter 1995). The aim is to find a meaningful pattern of loadings (and Paths) to best produce the original co-variances. The emphasis thus is on the meaningfulness. A model with a fit index of 0.8 may be the very best that can be achieved-given the status of the theory, given the adequacy of the measures, and

given the representativeness of the sample. On the other hand you can bet a fit index of 0.95 simply by over-factoring the data. The aim of fit indices is to assist in the development of meaningful theory. The CFI indices for all the six competency constructs are shown in Table 1. All the CFI values are above the suggested minimum fit (0.80) of Cohen 1988, implying that there is strong evidence of unidimensionality for the scales.

Reliability Analysis

Unidimensionality alone, although a prerequisite, is not sufficient per se to establish the usefulness of a scale. Once unidimensionality of a scale is established, its statistical reliability should be assessed before it is subjected to any further validation analysis (Ahire et al., 1996). Reliability of a measure is the ability to yield consistent results (Nunnally, 1988). Even a highly unidimensional scale will be of very little use if the resultant aggregate score is ascertained basically by measurement error, with the values of the score broadly fluctuating over repeated measures (Gerbing and Anderson, 1988).

Several measures of reliability can be ascertained in order to establish the reliability of a measuring instrument. These include test-retest method, equivalent forms, split-halves method and internal consistency method. Of all the above methods, the internal consistency method requires only one administration and consequently is supposed to be the most effective, especially in field studies. Moreover, this method is considered to be the most general form of reliability estimation (Nunnally, 1978). In this method reliability is operationalized as internal consistency, which is the degree of intercorrelations among the items that constitute a scale (Nunnally, 1988). Internal consistency is estimated using a reliability coefficient called Cronbach's alpha (Cronbach, 1951). An alpha value of 0.60 and 0.70 or above is considered to be the criteria for demonstrating internal consistency of new scales and established scales respectively (Nunnally, 1988). The Cronbach's alpha values for all the six scales are shown in Table 2. All the values exceed the minimum requirements, thereby demonstrating, that all the six scales are internally consistent and have acceptable reliable values in their original form.

Validity Analysis

Confusion appears to prevail in the methodological literature with respect to the extensive variety of labels/tags, and the way they are organized to describe the validity of scales and measures. Different validity terms are used to illustrate various aspects of construct validity. A comprehensive list of validity types that are typically mentioned in texts and research works includes face, content, convergent, discriminant and criterion-related validity.

Face Validity

Face validity is the mere appearance that a measure is valid (Kalpan and Sucuzzo, 1993). In face validity, one looks at the measure and sees whether "on its face" it seems a good reflection of the construct. Although face validity is probably the weakest way of demonstrating the construct validity, it does not in any way mean it is wrong, as the researcher on most occasions relies on subjective judgment throughout the research process. As the six competency constructs are identified from the literature, their selection is justified, thereby ensuring the face validity of the instrument.

Content Validity

Content validity is the degree to which the instrument provides an adequate representation of the conceptual domain that it is designed to cover. Apart from face validity, content validity is the only type of validity for which the evidence is subjective and logical rather than statistical (Kalpan and Sucuzzo, 1993). If the items representing the various constructs of an instrument are substantiated by a comprehensive review of the relevant literature, content validity can be ensured (Bohrnstedt, 1983). The present instrument has been developed, based on a detailed analysis of the prescriptive, conceptual, practitioner and empirical literature. Moreover, the content validity of the instrument was also ensured through a thorough review by experts (both academia and practitioners) in the field.

Convergent Validity

Convergent validity refers to the degree to which the different approaches to construct measurement are similar to (converges on) other approaches that it theoretically should be similar too. When there is high co-relation between a measure and other measures that are believed to measure the same construct, convergent evidence for validity is obtained. (Kaplan and Sucuzzo, 1993). Convergent validity is based on the co-relation between responses obtained by maximally different methods of measuring the same construct (Ahire etal., 1996). By this method, the convergent validity can be established using a coefficient called Bentler Bonett coefficient1980. A scale with values of 0.80 or above is an evidence of strong convergent validity (Bentler and Bonnet, 1980). The values of convergent validity for all the scales are summarized in Table 2. All the scales have a value of more than 0.80, thereby demonstrating strong convergent validity.

Criterion-related Validity

The basic idea of criterion related validity is to check the performance of the measure against some criterion. In the present study, a five-point Likert scale at the end of the questionnaire asked the respondents to rate the impact of each competency on performance of the project. This served as a criterion for measuring the importance of competencies. The criterion-related validity is established by co-relating the 'importance'-scales scores with this criterion. The co-relations are shown in Table II. All the scales show significant positive co-relations.

Table II

Convergent Validity, Unidimensionality and Reliability Indices for the Six Competency Scales.

Competencies	Bentler Bonett Coeficient	Confirmatory Fix Index (CFI)	Cronbach Alpha (α)
Business Skills	0.853	0.873	0.913
Technical Expertise	0.822	0.840	0.943
Managerial and Administrative Skills	0.802	0.814	0.968
Human Resources Management Skills	0.804	0.824	0.940
Client Management Skills	0.929	0.953	0.870
Personality Characteristics and Attributes	0.835	0.845	0.962

Inferences

To sum up, all the six factors of competencies have shown strong evidence of unidimensionality, reliability, convergent, and criterion-related validities. Furthermore, the overall model CFI and the Bentler-Bonett coefficient (4) have exceeded the obligatory requirements. Therefore, it can be stated that competencies of software project managers can be considered a six-factor structure consisting of the above identified six structures.

Uses of the Scale

This scale to measure the software project manager's competencies could aid the human resource personnel in the selection, recruitment and development of Project Managers. Software service firms could assess their Project Manager's level of competence and employ the ones with the right mix of skills on important projects. It could be used for the regular performance evaluation in the organization. Since the scale items are framed in impersonal statement form, they can be administered to the Project Manager's subordinates, self/peers and superiors, thereby enabling a 360-degree evaluation of the Project Manager in focus. It would help in identifying the skills considered most crucial. The results can then help in determining the training needed to develop those skills. Improving project manager's competence would improve project performance and the probability of project success.

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A Framework for Measuring ICT Adoption in the Travel and Tourism Sector

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Abstract

The travel and tourism sector has been an initial as well as major adopter of Information and Communication Technologies (ICTs). However, after several decades of ICT adoption, the degree of adoption as well as use of ICTs among travel and tourism related enterprises have been quite uneven. There exists large variation among these enterprises in their use of ICTs in their service delivery activities. The paper puts forward a conceptual model to explain the ICT adoption process in travel and tourism sector. The model incorporates the usage diffusion model instead of the adoption diffusion model for explaining the adoption process. The model also presents a framework for measuring the usage pattern of ICTs among the enterprises using the service delivery approach.

Key Words : Competencies, ICT, Travel and Tourism Industry, Usage-diffusion

Introduction

The travel and tourism sector has been witnessing a surge in terms of the adoption of Information and Communication Technology (ICT). Whether it is the rapid penetration of the online booking systems, the Global Distribution Systems or the compilation of loyalty programs through the effective use of Customer Relationship Management systems, the variety and intensity of use of ICT in the travel and tourism sector is increasing by leaps and bounds. As Poon (1993), has stated, "a whole system of information technologies is being rapidly diffused throughout the tourism industry and no player will escape information technologies impacts". While the penetration process is quite rapid by industry standards, it is quite interesting to understand the dynamics of the diffusion process, analyze the drivers of the adoption process and develop an effective measure for describing the whole phenomena. The travel and tourism sector is characterized by the existence of a plethora of operators with varying functions and responsibilities. These operators extend

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from the actual service providers like hotels that are generally located far away from the customers to information providers like tour package marketers who are located near to the customers. Though interlinked, the level of autonomy enjoyed by most of these operators from each other is quite high, unlike in other sectors like manufacturing, which probably impede a uniform adoption process. From a customer perspective, the consumption process with regard to the tourism product can be described in terms of passing through distinct stages that extend from information search about the destination and the transportation mode to the actual service encounter to post-service experience activities like subscribing to a loyalty program offered etc. after the service encounter. This diversity in the activity profile of the supply side enterprises coupled with the high levels of autonomy enjoyed by them and the distinct stages through which the customer passes to experience the tourism product infuse high complexity in the diffusion process of ICT among the travel and tourism related enterprises. This is because different entities with multiplicity of responsibilities in delivering the product would have diverse orientations both in terms of attitude and in terms of the belief about the ICT to achieve their primary and secondary goals leading to a situation where the level of ICT adoption by entities at one stage of the value chain are not matched by the level of ICT utilization at another stage. Further, there could be differences in the capabilities of entities in terms of adoption of ICTs in the value chain. Another factor to be considered is the multitude of ICTs being developed and offered to the tourism sector. Buhalis and Licata (2002) list down some recent technological advances like the Interactive Digital Television, mobile commerce, that are increasingly being lapped up by the industry. The abundance of ICT based innovations with respect to travel and tourism sector also result in greater complexities with regard to tracing the adoption process in the travel and tourism industry. The paper presents a framework for conceptualizing and measuring the adoption of ICT in the travel and tourism industry by looking at the factors that propel the adoption process as well as the unique characteristics of the industry.

ICT in the Tourism Sector

The wide use of the information and communication technologies has transformed the tourism industry beyond recognition. While the level of adoption and use of the ICTs vary within the different players, the scale and scope of the adoption have been expanding in a consistent manner over the last two decades. According to Forrester research (1999), the number of online reservation for holiday travel is expected to touch 65 million in the year 2003 from a value of just 8 million in the year 1998. Marcussen (2004), estimated that the online travel sale in the Europe itself had increased by about 43% from 2002 to 2003. According to his study the on-line travel market presently constitutes about 11% of the total travel market in Europe and this is going to reach 20% of the overall market by 2006. The opportunity to market one's hotel or airline 24 hours a day 7 days a week to the entire world has provided enormous opportunities for the tourism industry. As they say "if you are not on-line you are not on-sale". According to OECD (2000), the advent of the internet-based e-commerce has offered considerable opportunities for firms to expand their customer base, enter new product markets and rationalize their business Cooper et. al. (1998), feel that the new technologies have had a major effect on the operation, structure and strategy of tourism organizations throughout the world. The new technologies have enabled a reduction in the communication and operational costs and have paved the way for a significant enhancement in the flexibility, interactivity, efficiency, productivity and competitiveness. According to Connolly and Olsen (2000), technology is going to be the most important competitive weapon for any hospitable company. They feel that information technology is the single greatest force affecting change in the hospitable industry.

An issue that assumes great significance in this context is the rate of adoption of ICT in the travel and tourism sector. While the adoption is considered to be steadily improving, the rate of adoption is not considered to be very satisfactory among the conventional travel and tourism related enterprises. Most of the ICT adoption is in fact assumed to be made by new players in the travel and tourism sector. The perceived reluctance of conventional travel intermediaries and service providers to embrace the World Wide Web and other ICT enabled technologies at a rapid pace have raised serious concern among observers of the travel trade. Sensing this slow rate of adoption, Reinders and Baker (1997), predicted that the high street retail travel agents will be reduced by 15% to 20% in the next few years. While this has not yet happened, the potential of e-intermediaries to substantially affect the market shares of conventional intermediaries remain high unless there is a surge in the adoption of ICTs among the latter. It is observed that many of the e-intermediaries who have come to the trade happen to be new players or players who were earlier in the information technology field indirectly associated with the travel industry. The adoption rate is also found to be quite uneven across the

travel and tourism sector with wide variations observed across geographical regions.

The adoption process for ICTs among travel and tourism related enterprises is difficult to be measured in a structured manner since the user firms adopt ICT and e-commerce for different purposes with different levels of intensity. For instance, Standing and Vasudevan (1999), in their study on the diffusion of the world wide web among travel agents in Australia found that although 50% of the respondents use electronic mail, almost 60% do not have a web-site on their own and do not have immediate plans to do so; thus, indicating a variation in use of the available ICT. Even among tourism sector players with web-sites, the extent of use of the web-site varies considerably. Suh and Kim (2002), in their study of the web-sites of the Destination Marketing Organisations of 20 APEC member countries, found significant divergence among them in their customization, connection and commerce functions. The conventional model of adoption process may not therefore be completely appropriate to describe the adoption process of ICTs in the travel and tourism sector since the conventional models measure adoption as a dichotomous concept where the population is divided in terms of either adopters or non-adopters (certain adoption diffusion models portray the adopters into three categories: adopters, non-adopters and those who adopted but later rejected the technology). In the specific context of the tourism industry, this dichotomous classification may not always be valid. This is because, in practice it is difficult to visualize a travel and tourism related enterprise procuring and using all possible ICTs in one sweep, rather, the enterprise may gradually start utilizing the components provided by ICTs and begin to utilize its full potential over a period of time. Technically, the enterprise has adopted ICT from the day it has started using any of its applications, but in practice unless the full potential is achieved, it is difficult to consider the adoption process to be complete. The adoption process in practice therefore, advances by degrees and not in a dichotomous manner. Thus, the Use-Diffusion model, an alternative to the adoption-diffusion model, seems to be more valid in explaining the phenomenon of ICT adoption.

The Use-Diffusion Model

The use diffusion (UD) model unlike the adoption diffusion (AD) model focusses more on the extent of use rather than on the act of adoption. The main difference in conceptualization is that in the AD model, the variable of interest is the rate or time of adoption while in the UD model the variable of interest is use, or more specifically the rate of use and the variety of use. The use diffusion model is hence, considered to be more appropriate for consumer technologies for which the inherent complexities and the nature of evolution tend to prolong the trajectory and time-scale of diffusion (Shih and Venkatesh, 2004). In the UD model applied here to conceptualize the adoption of ICTs in the travel and tourism industry, adopters are categorized in terms of the variety of use of ICTs as well as the rate of use of ICTs. The usage is thus conceptualized as comprising of two distinct dimensions. The variety of use dimension refers to the different application of ICTs that are being tried out by the firm while the intensity or usage rate dimension considers the extent to which each of these applications are being used.

The Conceptual Model for Adoption of ICTs in the Travel and Tourism Industry

The figure.1 shows the basic model of the adoption process for ICT in the travel and tourism sector. The model has three basic components: the determinants of adoption, the adoption pattern and the outcomes of adoption. The usage diffusion pattern of ICTs is determined by certain operational domain related and environment related factors and the perceived outcomes that emerge out of the use of ICTs influence the rate of continuation of the adoption process. The conceptual model is analogues to the models proposed with regard to the adoption of e-commerce or the internet in households (Shih and Venkatesh, 2004), and in business organizations (Zhu, Kraemer and Xu, 2002), which in turn bases its assumptions from the Net Enabled Business Innovation Cycle (NEBIC) paradigm introduced by Wheeler (2002). The model also derives broad support from some of the empirical studies done in the past in this sector.

The Determinants of Use Diffusion

The model proposes three main categories of determinants that are expected to influence the use diffusion in travel and tourism firms. These determinants are associated with the (i) geographic location of the firm, (ii) the internal characteristics of the firm as well as (iii) the market conditions in which the firm operates. This is a modification of the Tornatzky and Fleisher's (1990), technology-organization-environment framework, which identifies three aspects of a firm's context that influence the process by which it adopts and implements technological implementation: the technological context, the organizational context and the environmental context. This modification is made to suit the context of the travel and tourism industry

Technological Environment and Use Diffusion

The technological environment is defined in terms of the state of the ICT infrastructure available in the geographical location of operation of the travel and tourism related enterprise. The ICT infrastructure would consist of such factors like the ICT technologies available in the country, the prevalence of ICTs in the country including telecommunication access paths, broad band penetration rates, internet hosts, number of web-sites, internet access price etc. A travel and tourism enterprise located in a country with high levels of ICT development will find it much easier to adopt and use ICTs than an enterprise located in a country with low levels of ICT development. Suh and Kim (2002), report that among countries in the APEC region with low ICT development, the main barriers for ICT adoption were limited knowledge of available technology cost of system maintenance, insufficient e-commerce infrastructure, cost of securing skilled human resources for e-commerce maintenance etc. These factors are all directly linked to the inadequacy of ICT technology infrastructure. Lack or high cost of IT infrastructure prevents even the innovative travel and tourism enterprises from trying out the latest ICTs available in the world market, thereby smothering adoption. If the infrastructure is very unreliable, the fear of loosing or disappointing customers will make the enterprises reluctant of utilizing the available technology. Since the travel and tourism sector is very sensitive to the customer satisfaction, until the technology available is totally reliable and convenient, the enterprises will consider it a risky proposition to rely on the ICT during the service encounter.

Firm Context and Use Diffusion

The four variables that comprise this determinant are: firm size, firm scope, internal environment of the firm and the newness of the firm. Firms with large resources can be expected to invest more on ICT technologies. One reason for this is of course the ability to generate enough revenue from the costly investments is more for large firms than for small firms. The cost incurred comprises of both the initial cost as well as the maintenance cost. Thus, hotel chains or large Airlines with big fleets are more capable of investing in ICT technologies and use them widely than firms with stand alone hotels. In the context of the adoption of Electronic Data Interchange, Ahlin (1991), Banerjee and Golhar (1994), and Smith (1990), have found empirical evidence to show that small firms are generally reluctant to adopt technology. Further, Wei et. al. (2001), in their study among hotel managers found that in large hotels,

e-mail facility is used by managers to contact with outside organizations like suppliers and travel intermediaries more in comparison to small hotels. In the same study they found that large hotels used professionals and experts to build their home page which indicates the importance attached by large hotels for the variety of services that can be provided through the World Wide Web.

Firm scope relates to the different activities that a firm is involved in. A hotel for instance, could provide just rooms to stay or think of providing additional facilities like a convention center, conducted tours, taxi service etc. As the firm scope increases the likelihood of adoption, and use of ICT is expected to be great. While empirical support to this proposition from the extant literature is scant, a few studies indirectly hint at this relationship. Wei et al (2001), in their empirical study found that Conference conventional hotels are more probable to have room availability data on their websites, while resorts have more probability of using the web-site to offer a virtual tour of the rooms. This is explained by the fact that convention/ conference hotels being more interested in business and repeat customers feel room availability information being a more important information that would help their customers, while resorts which target new customers looking for a leisure are more attracted by the virtual tours. This suggests the use of the web for specific purposes based on characteristics of the hotel. Also, this points towards the web-site being used as a positioning tool to attract specific segments of customers. Hence, if the travel and tour firm has more characteristics to promote or attempts to target more segments, the e-commerce effort which is a component of the ICT use will reflect that. Dewan et. al. (1998), from their empirical study have found that diversified firms are generally more keen on IT investment than firms which are not diverse in their scope. Thus, they attribute to the greater need for coordinating the resources in diversified firms. The internal environment of the firm is also a strong determinant of the use adoption of ICT. The internal environment encompasses a multi-dimensional factor, which includes the level of perception about the benefits derived from the use of ICT among the members of the organization as well as the general innovative tendency of the firm. When the perceived benefit is stronger, the firm will naturally achieve a high level of user adoption level. This proposition has been supported by Iacovou et. al. (1995), in their study of the adoption of EDI among small retailers. Firm innovativeness as a determinant of use-diffusion of ICT in travel and tourism based enterprises is consistent with the dynamic capability theory for assessing net enablement proposed by

Wheeler (2002).

The newness of the firm affects the usage diffusion state of the firms, since firms which are relatively new to the sector are devoid of legacy systems and hence, can leapfrog to adopt new technologies. The instance of low-cost airlines illustrates this point. In these airline companies, ticketing is almost totally online without relying on the established travel agencies. New concepts like e-ticketing are widely used by these airline companies. The new companies generally would face very few hindrances in adopting new ICT based technologies. In fact many new firms will try and use path-breaking ICTs as their competitive advantage.

Market Environment and Use Diffusion

The market environment determinant comprises of two variables customer readiness and the competitor's level of adoption. The customer readiness concept, introduced by Zhu, Kraemer and Xu (2002), indicates the extent of willingness of the customers to accept the new technology as part of the service offering. If the firm's customers are well accustomed to the new technologies and are willing to use them at various stages of the service encounter, then the travel and tourism based enterprises will be more motivated to adopt and use it very widely in their service offerings. De Kare Silver (1999), in his book on e-shopping uses this as a criteria to assess whether a particular product can be successfully retailed through the World Wide Web. The competitor level of adoption is a significant variable that influences use diffusion. Many studies have empirically proved that the competitive pressure has been a major driver of innovation (eg. Crook and Kumar, 1998; Grower, 1993; Iacovou et. al., 1995; Premkumar et. al., 1997).

Use Diffusion Patterns in Travel and Tourism Based Enterprises

The usage patterns which effectively capture the stage of adoption of the firm, are measured in terms of two dimensions: variety of use and rate or intensity of use. Variety of use refers to the different ways in which ICT can be put to use in the firm. For example, a hotel web-site can be used for a range of purposes from giving general information about the hotel to allow customers to book rooms on-line to create an on-line community of customers. A hotel may actually be using all or a few of these facilities that are available. Rate, or intensity of use on the other hand refers to the extent to which a facility is being used. The rate of use of the web-site can be measured in terms of the percentage of rooms being booked through the web-site or the extent of reliance on the on-line community by the hotel for various

promotional programs. Although, it is possible that variety and rate of use may be correlated, it need not always be so. It is quite possible that a hotel may have a good web-site with all the attendant facilities, but, still rely heavily on conventional intermediaries for its operations due to various environmental and contextual reasons. For use diffusion to be effective, both the variety and rate of use have to be high.

Based on these two dimensions the adopters can be categorized into four groups. Intense users are defined are firms which use ICT to a variety of purposes and to a significant degree while non-specialized users are just dabbling with the technology without extracting the maximum from all the possibilities. They may have adopted a variety of possibilities, but their use of these patterns remains very minimal. Specialized users have adopted a few technological possibilities but are using these to a very high degree, and limited users are firms which are neither adopting ICT to a reasonably good level nor are they utilizing the few technologies that they have adopted. These for typologies capture the various types of travel and tourism based firms in terms of their adoption and use of ICTs. At any given time the typology represents four sets of user segments. However, user identities need not be fixed over time. For instance, a specialized user may realize the advantages of using the technologies more intensely, and hence, graduate to an intense user.

Measuring the Usage- Diffusion in Travel and Tourism Based Enterprises

While the topology of usage pattern effectively captures the various categories of firms on the basis of their level of adoption, measurement of the variety and rate of use still remains quite difficult in travel and tourism based enterprises. This is because the plethora of uses that ICT can find in these enterprises and also the difficulty in adopting a framework for measuring the rate of use. This difficulty can be reduced by using the consumption process in the travel and tourism sector. A modification of a model proposed by Mathieson and Wall (1982), gives insights in this regard. Mathieson and Wall's model considers travel buying behavior as comprising of five stages: (i) felt need/travel desire (ii) Information search and evaluation (iii) travel decision (iv) travel preparation and (v) Travel satisfaction evaluation. While this model suits perfectly to describe a normal travel process, for the purpose of measuring the ICT adoption in the travel and tourism product a modified model is suggested. While capturing the essence of the earlier model, a new modified model consisting of similar stages is proposed. In this model, the stages are described as: (i) felt need/ travel desire (ii) Information

search and evaluation (iii) confirmation of transaction (iv) Actual service experience (v) Post-experience behavior. The first and second stages of this model are similar to the stages in Mathieson and Wall's model. The third stage involves the decision on transacting with a particular service provider. The simplest act that typifies this stage is the act of booking a room in hotel or a seat in an Airline. This stage is very important from the part of the ICT use perspective since several technologies are presently applied at this stage of the travel process. The fourth stage involves the actual service experience, when the customer actually experiences the service provided by the service provider. The fifth stage involves the various Post consumption activities that the consumer might indulge in after the service encounter like signing up a loyalty program or being involved in word of mouth promotion.

The ICT usage by any travel and tourism based intermediary can be looked at from the point of contributing to the customer experience in each of these five stages. For instance, the firm can use Internet marketing strategies using search-engine optimization techniques or mobile commerce in the first stage to generate a desire for a destination. In the second stage, the web-site content can be used very creatively to aid the customer during the information search phase, where in streaming video or other methods of interactive on-line promotion using the latest multi-media technology can be used. In the third stage there are ICT enabled facilities like on-line real time booking, e-ticketing etc. that are used to facilitate transactions. At the fourth stage, the various ICT based facilities that are being adopted include wireless internet in rooms, e-check in, e-check out etc. that can directly improve the quality of the service encounter. Also, the service provider can improve its operations by deploying ERP systems in its organisation which can indirectly improve the service for the customer. During the post-experience phase the firm can extensively use CRM based modules to bind the customer to a mutually profitable relationship so that it can facilitate one-to-one marketing in the future. The ICT deployment possibilities in the travel and tourism industry are therefore, numerous and hold the potential for substantively transforming the service delivery of the travel and tourism industry. The examples quoted above are just illustrative of the range of ICT based facilities that can be deployed to enrich the customer experience at each stage in the service encounter. Figure.2 presents a diagrammatic representation of this process.

As the figure shows, the essence of measuring the use-diffusion stage of an enterprise is finding answers to the three questions given on the right with regard to the five stages for the enterprise. The answers to these questions will make it possible to place the firm in any of the four categories of the use diffusion model. While the answer to the second question addresses the variety dimension the answer to the third question is concerned with the rate of usage dimension.

Outcomes

The use-diffusion process could lead to a positive or negative perception of the impact of the use of ICT. This perception is an outcome of the adoption of the ICT in the enterprise. This could in turn determine the degree of the use-diffusion that the firm is going to witness in the future. The feedback arrow represents this relation. A firm which was using a variety of technologies at a minimal rate could, after getting convinced about the positive impact of ICTs may start using all these technologies at a greater rate, thus, moving itself from a non-specialized user status to an intense user status. Conversely, a firm which was using a few technologies in an intense manner could procure more technologies after getting convinced about the utility of the technologies and pass from a specialized use status to an intense use or non-specialized use status based on the rate of use of the new technologies. The degree of use-diffusion in the organization could also directly motivate the future level of use-diffusion to be adopted by the firm. This is mostly because of the increase in the familiarity level of the firm with the technology.

Conclusion

Tourism industry was one of the first sectors to be benefitted by the IT revolution. The earlier CRS and GDS have given way to new on-line intermediaries and customer relations management. It is also estimated that out of all the on-line transactions involving end-consumers, the maximum occurs with regard to the tourism sector. The unique nature of the tourism sector with a lengthy service delivery chain and the multifarious activities that go towards completing the service delivery makes the adoption possibilities of ICT immense. At the same time due to the high degree of autonomy enjoyed by most of the enterprises, and the wide variation in the enterprise size and scope make the ICT adoption a very complex process. The model described above provides a framework for analyzing the adoption process of ICT in travel and tourism related enterprises. The model tries to capture all the complexities in the travel and tourism sector. The usage diffusion framework proposed by the model enables a more realistic and practical categorization of the adopting firms. This is because of the multifaceted, varied and complex nature of the activities that comprise the task environment of any travel and tourism related

enterprise make it difficult for a one-dimensional framework for explaining the adoption process. Also the evolving nature of the ICT provides a multitude of options for the enterprise to try out. The framework for measuring the usage pattern tries to look at the whole process from the service delivery perspective. The measuring framework thus, tries to bring clarity in the identification and measuring the rate of use of different ICTs. The model can be put to a variety of uses especially in policy making. The model can be used to compare service providers at the same stage in the tourism value chain across different countries to generate a status report of the ICT adoption among tourism enterprises. This will provide valuable inputs for policy development in terms of encouraging the ICT adoption process. Also it could give insights into the evolution of the tourism industry and the trends in the value creation. This framework can also be used to
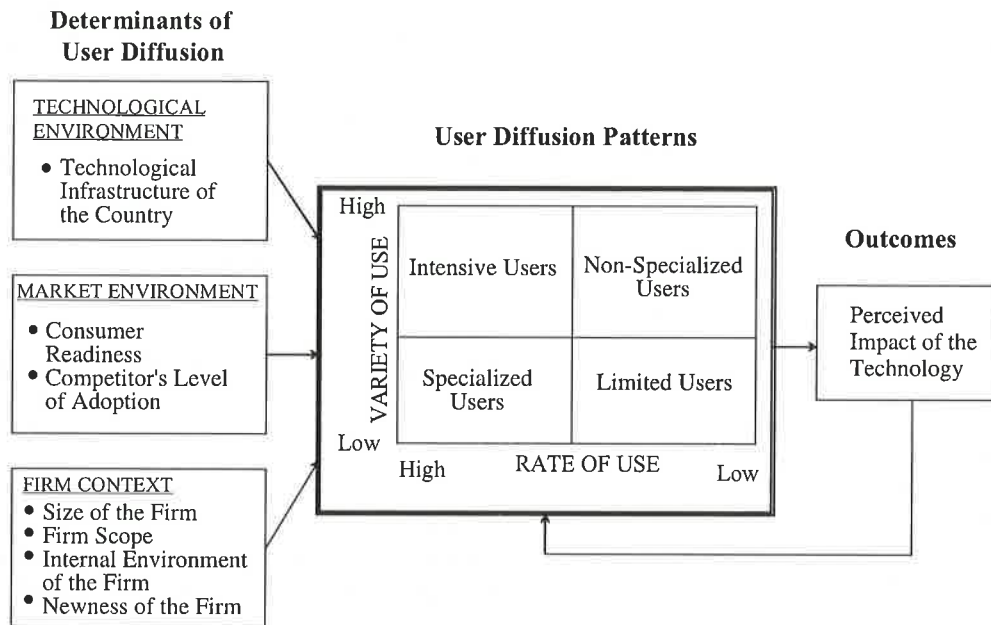

Figure I The Usage adoption model for ICT adoption in the Travel and Tourism sector
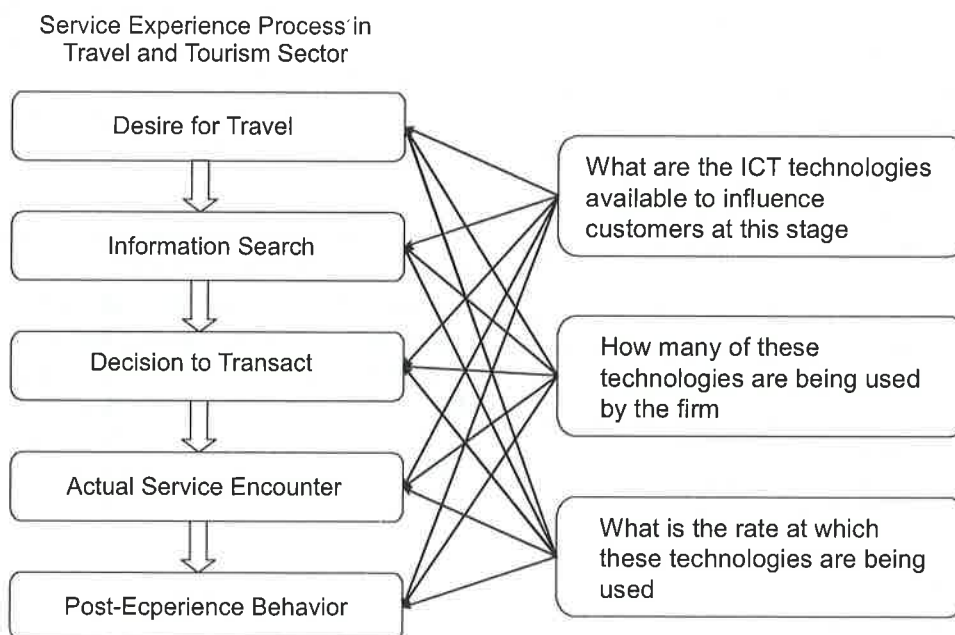

Figure II A framework for measuring the ICT adoption in the travel and tourism sector.

measure the level of ICT adoption of enterprises that operate at several stages of the value chain in the same country. This type of analysis will able to understand the internal dynamics of ICT adoption in the tourism sector of a region. For instance, if the level of ICT adoption is very high at a particular stage and is very low at a preceding stage, then there exists a major disparity in the ICT adoption process of that region which needs to be immediately bridged.

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Validation of Power Distance Scale in Indian Context and Its Policy Implications on Consumer Behavior Research

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Abstract

The paper outlines the validation of power distance scale in Indian context. The scale was originally developed and validated by Yoo, Donthu and Lenartowicz (2001). Data from USA, South Korea, Poland and Brazil were used for the original scale development. The advantage of this scale over Hofstede's (1980,1991 and 2001) scale is that, the instrument is also applicable to general consumer situations and not limited to work related situations. Results indicate that the items assessing power distance cultural value have adequate psychometric properties in Indian context. Further, after extensive review of research work the authors proposed several research hypotheses linking power distance, cultural value and consumer behavior.

Key Words : Power distance scale, Cultural value, Unidimensionality, Convergent, Validity

Introduction

The globalization of the world economy has made it increasingly important for today's marketing managers to realize how to accomplish business objectives in different cultural framework. Given the increasing importance of conducting business across national and cultural boundaries, cross-cultural research becomes more and more relevant to marketing academics and practitioners. Marketing researchers consider culture an important determinant of consumer behavior (e.g., Aaker and lee 2001; Despande, Hoyer, and Donthu 1986; Gurhan-Canli and Maheswaran 2000; Han and Shavitt 1994; Henry 1976; Howard and Sheth 1969; Klein, Ettenson, and Morris 1998; ter Hofstede, Steenkamp, and Wedel 1999). As antecedents of personal behaviors, different value orientations exhibit different patterns of behavior (Rokeach 1973). Hence, marketing efforts would be most efficient when cultural value differences are considered and would accomplish better results when they match the cultural values of target consumers (Farley and Lehmann 1994). Taking this in view several authors (e.g. Donthu and Yoo

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(1998), Matila (1999), Frazier, Gill, and Kale (1989), Furrier et. al. (2000), proposed and empirically tested the link between power distance and consumer behavior. But, what is power distance? And how is it linked to consumer behavior? We address these two questions in this paper. First we test the validity of an individual level power distance scale in Indian context which was developed and validated by Yoo, Booghee and Donthu (2001). Data from USA, South Korea, Poland and Brazil were used for the original scale development. This cultural value scale has already been used in various research publications for assessing cultural value (e.g. Yoo and Donthu, 2002, Yoo and Donthu 2001, Yoo and Donthu, 1998). In addition to validation of the power distance scale at the individual level, we propose a research framework linking power distance cultural value with consumer behavior.

This paper is divided into four parts. After introductory section, we introduce a discussion about concept of culture and assessment of cultural value. then the scale validation process in Indian context is presented. A brief review and research propositions are formulated linking power distance and consumer behavior. Finally, discussion and conclusions follow.

Concept of Culture and Assessment of Cultural Value

The concept of culture is widely interpreted in the academic literature. Kroeber and Kluckhohn (1952), identified more than 160 ways in which culture can be defined. Kluckhohn (1962), defines culture as the part of human makeup "which is learned by people as the result of belonging to a particular group, and is that part of learned behavior that is shared by others. It is our social legacy, as contrasted to our organic heredity"(p-25).

Hofstede (1980, and 1991), defined culture as the "collective programming of the mind which distinguishes the members of one group or category of people from those of another" (p 5, 1991). Hofstede's typology of culture is one of the more important and popular theories of culture types. A study of social science citation index listings found 1036 quotations from Hofstede's cultural consequences in journals during the period 1980 to 1993 (Sondergaard, 1994). In the most exhaustive cross-cultural study to date, based on questionnaire data from 117,000 IBM employees in 66 countries across seven occupations, Hofstede (1980 and 1991), established five dimensions of national culture: power distance, individualism, masculinity, uncertainty avoidance, and long-term orientation. Although these dimensions initially were developed from employees of just one firm, they have been found to be "generalizable" outside IBM and to represent well the differences between cultures. Hofstede argues that countries can be placed differentially on these dimensions according to their core values and

institutions, including their work related values.

According to Hofstede, individualism pertains to characteristics of people of a society in which the ties between individuals are loose; everyone is expected to look after himself and his or her immediate family. Collectivism, as individualism's opposite, pertains to societies in which people from birth are integrated into strong, cohesive in-groups, which throughout people's lifetime continues to protect them in exchange for unquestionable loyalty. Power distance refers to the extent to which the less powerful members of institutions and organizations within a country expect and accept that power is distributed unequally. Masculinity is defined as the degree to which achievement, competition, assertiveness, and performance are emphasized. Thus, low masculinity cultures emphasize cooperation and interpersonal relationships. Uncertain avoidance is a tolerance to risk. Cultures with high uncertain avoidance tend to shun risk and seek ways to add structure and control to their organization. Finally, Confucian/Dynamism (long term orientation) basically refers to the time orientation of a culture; that is, whether that culture tends to operate in a long-term or short-term context. Cultures high in Confucian/ Dynamism tend to emphasize long-term horizons.

Even though Hofstede's measure of culture has been widely acknowledged as a dominant metric for measuring cultural values, it's measure does not appear to be suitable, primarily, in assessing cultural value at individual consumer level in consumer behavior research. There are several rationales for failure of the typology at this level. First, Hofstede's (1980,1991, and 2001), cultural metric was not intended to measure an individual's cultural values. Although Hofstede administered his instrument to individuals, he performed all the data analysis and index calculations at the country level. Second, several researchers stated methodological problems of Hofstede's measures at the individual level, due to poor psychometric assessments (see Robinson 1983; Sondergaard 1994; Trandis 1982). Third, although nations have a tendency to show stability in their national level culture because the national culture merely represents the arithmetic mean score of a measure, there still exists a huge diversity of cultural values among members of any nation and within same national cultural context. Fourth, Hofstede's cultural metric was developed for work-related situations and organizational studies. From consumer research perspective it may be more useful to measure cultural values for general or consumer situations. That way cultural values may be better links to Individual or consumer attitudes and behaviors (Yoo, Donthu and Lenartowicz, 2001). Taking these in view we rely on the scale developed by Yoo, Donthu and Lenartowicz, (2001), to assess cultural value at general consumer level. This study intends to validate power distance scale and its policy implications in consumer behavior

research so we will test applicability of Yoo et al's power distance metric in Indian context.

Measure of Power Distance Construct in Indian Context

Sample:

The survey was designed for a cross-cultural buyer-seller relationship study. Power distance scale was included in the survey to assess individual level cultural value of respondents. About 1000 companies across India were contacted to participate in the survey. The survey was distributed either as a postal mail or as a web survey. Total responses received were 176, which constitutes a response rate of 17.6%. After deleting the responses, which could not fulfill minimum competency, total responses retained were 156. Table-1 shows detail demographic profile of respondents participated in the survey.

Table I: Demographic Profile of Sample
Total sample=156

Category	India
Gender Male Female	149(95.51) 7(4.49)
Position Executive/Manager Top level executive (Director/V.P./Controller/GM)	95(60.90) 61(39.10)
Age Groups Under 30 30-40 41-50 >50	28(17.95) 66(42.31) 47(30.12) 15(9.62)
Nature of Business Manufacturing Trading Servicing	62(39.74) 49(31.41) 45(28.85)
Sales Turnover Under $ 10 million $10 million-100 million >$100 million	91(58.33) 54(34.62) 11(7.05)
Business Headquarter	Bhubaneswar, Calcutta, New Delhi, Mumbai, Hyderabad, Bangalore

Figures in parenthesis show the %age to the total

Method

A critical aspect in the evolution of a fundamental theory in any management concept is the development of good measures to obtain valid and reliable estimate of the constructs of interest. Without establishing the reliability and validity, it is difficult to standardize the measurement scales, and hard to know whether they truly measure what they intend to measure. Conventionally, exploratory factor analysis (EFA) is used for the situation where the relationships between the observed and latent (factor) variables are unknown and uncertain. However, if the researcher has reasonably good idea about the observed variables that are likely to be reliable indicators of particular factor, CFA is more reliable than EFA (Bentler1995). The power distance scale items were already developed and validated by Yoo, Donthu and Lenartowicz (1998). Data from USA, South Korea, Poland and Brazil were used for the original scale development. The five items used for assessing power distance can be seen from Table 3.

We have a reasonably good knowledge of the scale's reliability and validity. Here in this study we intend to test the validity of the scale in Indian context. So following Bentler (1995), the present work chose to adopt the factor analysis (for scale validation) in confirmatory fashion.

Results

Testing of Unidimensionality, Reliability and Validity of Power Distance Scale

In order to provide an assessment of the unidimensionality, reliability and convergent validity of the power distance scale, confirmatory factor analysis (CFA) were done by using AMOS 4. As reported in table 2 in appendix, the fit of the one-factor measurement model of power distance construct on 5 measures was acceptable. 2 = 42.025(p<.001), GFI=0.90, CFI=0.89, IFI-.89, NFI-.87. Although the 2 statistics is significant (p<.05), the other goodness-of-fit indices indicated a good fit. The GFI and CFI approaching.90 for both the models, the recommended cut-off criterion. (Bentler, 1980; Bollen, 1989).

A highly mandatory condition for construct validity and reliability checking is the unidimensionality of the measure (Anderson and Gerbing, 1991). It refers to the existence of a single construct/trait underlying a set of measures. The usefulness of items within a measure depends on the extent to which they share common core (Nunnally, 1988). The concept of unidimensionality enables us to represent the value of a scale by a solitary number (Venkatratnam, 1989). In order to check for unidimensionality, individual items in the model are examined to see how closely they represent the same construct (Ahire, Landeros and Golhar, 1996). A comparative fit index (CFI) of 0.90 or above for the model implies that there is a strong evidence of unidimensionality (Byrne, 1994). The CFI for power Distance scale comes 0.89, which approaches the recommended cut-off criterion 0.90, implying that; there is strong evidence of unidimensionality.

Table II : Confirmatory Factor Analysis (CFA) Results of the Indicator Variables of Power Distance Cultural Value

Indicator variables (Scale items)	Factor loadings (λ)	Mean (S.D.)
People in higher position should make most decisions without consulting people in lower positions	0.79	3.94(1.86)
People in higher position should not ask the opinions of people in lower position	0.87	4.12(1.74)
People in higher position should avoid social interaction with people in lower position.	0.56	3.43(1.89)
People in lower position should not disagree with decision by people in higher position.	0.73	3.90(1.76)
People in higher position should not delegate important task to people in lower position.	0.68	3.71(1.88)

Model fit statistics of power distance scale: ^{2} = 42.025(p<.001), GFI=0.90, CFI=0.89, IFI-.89, NFI-.87, Composite reliability =.85, Average variance extracted=.54.

Table III: Comparison of Yoo et. al.'s (2001), and Hofstede's (2001), Power Distance Scale.

Yoo et. al.(2001)	Hofstede, G. (2001)
The anchors used included: 1=strongly disagree , 5=strongly agree.	The anchors used included: 1=very frequently, 5=very seldom (For Question a)
1. People in higher position should make most decisions without consulting people in lower positions	a-Nonmanagerial employees' perception that employees are afraid to disagree with their managers
2. People in higher position should not ask the opinions of people in lower position	
3. People in higher position should avoid social interaction with people in lower position.	b-Subordinates' perception that their boss tends to take decisions in an autocratic (1) or persuasive/paternalistic(2) way
4. People in lower position should not disagree with decision by people in higher position.	
5. People in higher position should not delegate important task to people in lower position	c-Subordinates' preference for anything but a consultative (3) style of decision making in their boss; that is, for an autocratic (1), a persuasive (2), or a democratic style (4)
Power Distance = mean (1+2+3+4+5)	Power Distance index=135-25 (mean score of the 5 point measure item " Employees being afraid to disagree with their managers")+ (Percentage perceived manager 1 or 2 in question b) (percentage preferred manager 3 in question c)

In assessing measurement reliability, Fornell and Larcker (1981), stressed the importance of reliability of each measure (individual item), and the internal consistency of composite reliability of each construct. The reliability of a measure is simply its square loading, when the variables are standardized. Composite reliability is calculated as the squared sum of the individual item loadings divided by the squared sum of loadings plus the sum of error variances for the measures. This measure of internal consistency is similar to Croncbach's alpha (Cronbach, 1951), expects Cronbach's alpha assumes a priori that each measure of a construct contributes equally to construct. Bagozzi

and Yi(1988), suggest that composite reliabilities of .6 or greater are desirable and that the individual item reliabilities will be usually lower than composites. As shown in Table 2 in appendix, requirements for measurement reliability were met with composite reliability and reliability of each item in the scale reached the recommended cut-off criterion of 0.60 and 0.30 respectively.

Convergent Validity: Convergent validity refers to the degree to which the different approaches to construct measurement are similar to (converges on) other approaches that it theoretically should be similar

Table IV Comparison Power Distance Score

Cultural Dimension	Hofstede's indices					Yoo et al's mean score				Dash and Guin's Indian mean score
	U[1]	K[2]	P[3]	B[1]	I[1]	U	K	P	B	I*
Power Distance	40	60	72	69	77	2.10	2.00	2.34	1.97	3.83

U= The United States; K= Korea; P= Poland; B=Brazil and I=India
[1]Hofstede (1980, 1991); [2]Hofstede (1991); and [3]Nasierowski and Mikula (1998).
* By utilizing Yoo et al's power Distance scale we assess power distance cultural value in Indian context.

to. When there is high correlation between a measure and other measures that are believed to measure the same construct, convergent evidence for validity is obtained (Kaplan and Sacuzzo, 1993). Convergent validity is based on the correlation between responses obtained by maximally different methods of measuring the same construct.

Confirmatory factor analysis also offers a considerable support for validity of the relationship development measure. First, support for convergent validity is offered through the highly significant loading estimated for each individual items (Anderson and, Gerbing 1988). Convergent validity is also suggested by the substantial .85 estimate of composite reliability. Further evidence that five items are converging on the common construct is demonstrated through 54 percent of variance being extracted (Babin et al., 1994; Narver and slater, 1990)

Comparison of Power Distance Score

To cross check validity of our scale, we compare the mean scores of Indian responses with Hofstede's (1980, 1991 and 2001), national level indices and Yoo, Donthu and Lenartowicz's (2001), mean scores. For Hofstede's indices, we referred Hofstede's (1980, 1991) work for the U.S. and Brazil, Hofstede's (1991), work for Korea , and Nasierowski and Mikula's (1998), work for Poland. Table-4 summarizes a country's higher and lower score compared to her counter part .As reported in table-4, the mean power distance score (3.83) of India is comparatively higher than other countries. This result is consistent with the India's highest power distance index score (77) in comparison with other countries as calculated by Hofstede (1980, 1991 and 2001). This consistency demonstrates the convergent validity of power distance scale in Indian context.

Inferences from the Scale Validation

To sum up, the power distance construct developed and validated by Yoo et. al.(2001), has shown strong evidence of unidimensionality, reliability, convergent validity in Indian context. Further more, the mean score of power distance scale is higher than other countries studied by Hofstede (1980,1991 and 2001), and Yoo et al. (2001). This indicates that after 30 years of survey, Hofstede's old cultural indices still fit in Indian context.

This is one of the major findings of this study.

Power Distance and Consumer Behavior

The following section presents the results of past review of literature that addresses aspects of the linkage between consumer behavior and power distance.

Moderating Role of Power Distance on Service Quality-Satisfaction-Trust-Commitment Link:

Parasuraman, Zeithaml, and Berry's (1985, 1988, 1991b, 1993), work has identified five dimensions of service quality. These dimensions are: reliability, responsiveness, assurance, tangibles, and empathy. Reliability is the ability to perform the promised service dependably and accurately. Responsiveness is the willingness to help customers and provide prompt service. Assurance is the knowledge and courtesy of employees and their ability to convey trust and confidence. Empathy is the caring, individualized attention provided to customers; and tangibles are the appearance of physical facilities, equipment, personnel, and communication materials. Based on these dimensions, researchers measured perceptions of service quality in service and retailing organizations.

Service quality has been argued to play a central role in understanding customer satisfaction and retention (Parasuraman, Zeithaml, and Berry 1985). Service quality has been identified as a potential antecedent of both satisfaction and customer retention. (Cronin and Taylor, 1992). The contribution of service quality as an antecedent in establishing and maintaining long-term relationships and customer loyalty is well established. Wetzels, Martin, et. al., (2000), state that service quality characteristics are a decisive factor in determining customer trust and commitment. Mackenzie (1992) provides evidence demonstrating that customer trust in the office equipment market is influenced positively by customer perceptions of service offerings. Similarly, Venetis (1997), reports empirical evidence for a positive relationship between service quality and relationship commitment in advertising agency-client relationships.

The customer's perception of quality is a construct quite similar to satisfaction and has been discussed extensively, particularly in the context of service relationships (Persuraman, Zeithaml and Berry 1988; Cronin and Taylor 1992; Tees 1994; and Rust and Oliver 1994). For the most part, the aforementioned authors stress that service quality leads to customer satisfaction, trust, commitment, relationship longevity, and to customer relationship profitability.

Several studies have contributed towards linking service quality and power distance cultural value. Furrier et. al., (2000), tested a conceptual link between all five cultural dimensions developed by Hofstede (1980, 1991), and variations in the relative performance of the five service quality dimensions developed by Parsuraman, Zethamal, and Berry (1985). They also developed a cultural service quality index (CSQI) that evaluated the relative importance of each SERVQUAL dimension as a function of Hofstede's five cultural dimensions. The purpose was to determine if the index could segment multicultural markets. They found that in cultures with high power distance, powerful customers attached greater importance to responsiveness, reliability, empathy and tangibles. Weak customers, on the other hand, attached importance to assurance and tangibles. In cultures with small power distance, all customers indicated a similar pattern of importance to all service quality dimensions as the difference between powerful and weak customers were small.

Matila (1999), studied the relationship between powerful customers and weak service providers in a luxury hotel. She found that Asian-Indian travelers demonstrated higher importance on personalized service than their westerner counterparts. She argued this difference was due to the power distance dimension of culture. Western travelers, being individualistic in nature, gave higher importance to physical environment features compared to their Asian counterparts.

Donthu and Yoo (1998), argued that service providers have more power over their consumers in some service activities (e.g. insurance, banking, consulting). In these situations, the power of the service provider comes from her expertise, professional knowledge, or skills. They develop hypotheses and test whether customers in high power distance cultures have lower service quality expectations than low power distance oriented cultures. The results of the empirical data supported their initial hypotheses: buyers in high power distance cultures are more tolerant of service shortcomings compared to buyers in low power distance cultures.

Frazier, Gill, and Kale (1989), stated that compared to western markets, many Indian marketing channels possess an asymmetrical balance of power, whereby sellers (suppliers) are more powerful than buyers (dealers). India falls into the category of a high power distance culture. Cultures with large power distance measures are characterized by important differences between more powerful and less powerful people. These differences are visible in terms of social class, education level, and occupation. Donthu and Yoo (1998), argue that customers of high power distance cultures would tend to respect and defer to service providers. As a result of their tolerance in accepting inequalities in power, they are likely to have lower service quality expectations compared to customers of low power distance cultures. Consequently, buyer from high power distance culture would tolerate poor service delivery due to service provider's expertise or power.

From the above discussion we can conclude that buyers from low power distance, societies will have higher over all service quality expectations than similar type of buyers from high power distance societies. Further, the assurance dimension of service quality will be given higher importance by high power distance buyers than low power distance buyers. We propose the following propositions:

P1 Service quality will be an antecedent of satisfaction, trust and commitment for all buyers regardless of Power distance contexts.

P2 Buyers low power distance will have comparatively higher service quality expectation than similar type of buyers of high power distance.

P3 The assurance dimension of service quality will be given higher importance by weak buyers in high power distance societies than with similar types of

buyers in low power distance societies.

Moderating Role of Power Distance in Buyer Seller Relationships

Dependence, or the extent to which it is necessary to maintain specific channel relationships to achieve desired goals, is arguably the most important construct in understanding distributor channel relationship, because channel members are dependent on each other (Stern, El-Ansary, and Coughlan, 1996). The interdependence structure of a dyadic buyer-seller relationship encompasses each party's relative dependence. Recently, the concept of dependence has been elevated to the dyadic level-interdependence-with the recognition that a firm's dependence on another firm is relative to the other firm's dependence on it (Buchanan 1992; Kumar, Scheer, and Steenkamp 1995). Total interdependence is the sum of both party's dependence, where as interdependence asymmetry is the difference between firm's dependence on its partner, and partner's dependence on the firm (Emerson 1962). Symmetric interdependence exists when the firm and it's partner are equally dependent on each other. Because one firm's dependence on a partner is a source of power for that partner (Emerson 1962), total interdependence and interdependence asymmetry are equivalent to the total power and power asymmetry derived from the firms' dependence. Ties of total interdependence provide each party in the relationship with the opportunity to facilitate the other's goal attainment. Several researchers in their empirical study demonstrated that greater interdependence leads to higher relationship commitment. (e.g., Geysken et al,1996; Kumar et al,1995).

In high power distance cultures, an asymmetric balance of power exists between the relatively powerful and relatively weak partners. So in high power distance culture, as a result of their tolerance in accepting inequalities in power, buyer's expectation of symmetric dependence relationship with the seller will be comparatively lower than similar type of buyers in low power distance society.

Trust is a fundamental relationship building block and is included in many relationship-marketing models (Wilson, 1995).The centrality of trust in developing long-term relationships has been emphasized repeatedly in the marketing channels literature (e.g., Anderson and Weitz, 1989; Dwyer et. al., 1987; Morgan and Hunt, 1994). Even though a number of factors have been proposed, three characteristics of trust appear often in the literature: ability, benevolence, and integrity. As a set, the three characteristics appear to explain a major portion of trustworthiness (Mayer et. al., 1995). Ganeson (1994), found that the long-term orientation towards partners is a function of the amount of trust embedded in the relationship. Trust has been reported to be an important precondition for increased commitment (Miettila and Moler, 1990).

Interestingly, Kale and Barnes (1992), have argued that high power-distance societies typically view outsiders as threats and, as a result, show less inclination towards an initial trusting relationship. People in such societies will discuss business only after developing trust in the person. Conversely, people in low power distance societies feel less threatened by outsiders and tend to trust them more. Thus, high power distance cultures consider trust as a more important factor for commitment and long term relationships compared to low power distance cultures.

Taking above review of literature in view, we propose the following propositions on moderating role of power distance in buyer-seller relationships:

P4   Interdependence will be an antecedent of commitment for all buyers regardless of Power distance contexts.

P5   Mutual and symmetric interdependence as an antecedent of relationship commitment will be given higher importance by buyers from low power distance society than similar type of buyers of high power distance.

P6   Trust in the seller will be an antecedent to relationship commitment regardless of Power distance contexts

P7   Trust in the seller as an antecedent of relationship

commitment will be given higher importance by buyers from high power distance culture than similar kind of buyers in low power distance society.

Discussion and Conclusion

In classic cross-cultural consumer research, Hofstede's (1980, 1991, and 2001) cultural indices are used to illustrate individual cultural values based on their national distinctiveness. Examples in this regard include cross cultural marketing studies exploring brand positioning (Alden, Steenkamp, and Batra 1999), word of-mouth referral behavior (Money, Gilly and Graham 1999), market segmentation (kale 1995), consumer tipping behavior (Lynn, Zinkhan, and Harris 1993), and relational bonding (Williams et.al.,1998). In these studies, it has been assumed that all of the individual members of a nation are similar in cultural values and Hofstede's cultural indices of the nation equally. For example, Williams et al., (1998), in their study grouped all individual members of USA as individualists and all Chinese individual members as collectivists. They assign Hofstede's national cultural indices to them to examine the effect of cultural value. There are several reasons for the failure of assigning the national level cultural value at Individual level. Hofstede (2001), clearly warned his cultural metric is not valid to compute cultural scores for individuals. Several authors also argue that like Inter cultural variation there may be also Intra cultural variation across within same country. In every society there are members who are counter cultural (Trandis,1995). Samiee and Jeong (1994), argue that sub-cultures may be present within the geographic boundaries of different countries, and that variations in relationship expectations between sub-cultures in the same country may exist as well. Donthu and Yoo (1998), discovered individual level variations in service quality expectations within several countries.Panda and Gupta (2004), proposed to adopt an evolutionary emic approach along with an etic approach to explore regional variation of culture within India. Countries like India are multicultural societies where there exists an enormous diversity of cultural values among members. In cases of assessing an individual's cultural value in consumer research, Hofstede's work related metric may not be appropriate to apply.

This study contributes to theory development by developing further validation of a new scale for measuring power distance cultural value at individual level in Indian context. Taking these in view, we encourage researchers in the field of consumer behavior to use scale developed by, Yoo et. al., (2001), for assessing individual level cultural value and apply that in consumer behavior research. Future studies should validate the other dimensions of the scale proposed by Yoo et. al., (2001), at individual level using

larger samples. Further, while evaluating service quality and customer relationships, we suggest researchers for examining moderating role of power distance cultural value by using our research proposition.

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R&D Expenditure in Network Industries: Could It Be a Social Waste?

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Abstract

The existing literature suggests that an incumbent monopolist supplier of network goods can successfully deter entry by increasing its installed base, which plays a role similar to that of the commitment value of investment in capacity. In this paper we consider a market with network externality, where the consumers' utility not only depends on the network size but also on the technological quality of the product. We show that when the installed base of the incumbent fails to play its pre-emptive role to deter entry, the monopolist can deter entry, strategically by revealing its R&D expenditure on upgrading the product. The result is independent of whether the R&D project is, ex-post, successful or not. Such entry deterrence is welfare reducing.

Key Words : Network Externality, Entry Deterrence, Compatibility, Installed Base, Limit Pricing, R&D.

Introduction

Casual empiricism suggests that R&D expenditure to sales ratio is much higher in network industries, as compared to non-network industries. In computer industry the rate of R&D investment to sales has been well above 10% for many years. Major firms (e.g., Microsoft, SUN, IBM etc.) maintain huge labs and though they are extremely secretive about the R&D projects, they issue statements about their R&D expenditures in their annual reports. Firms undertake R&D either to reduce production cost or to innovate new products. In the present paper, the focus is on the type of R&D that is undertaken in order to innovate a product, which is qualitatively better than the existing products. We motivate this paper by examples of *systems*, in general, and PC operating systems, in particular. In such a context, the technological features of the

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product, which we will often refer to as the technological quality, characterize the quality of a product. So, R&D undertaken by an incumbent firm to improve the technological quality of a product is synonymous to R&D undertaken to innovate upgrades. Henceforth, we use the term R&D in this sense only.

Ellison and Fudenberg (2000), examine why a monopolist supplier of software may introduce more upgrades than is *socially optimal*. They suggest that in a market with heterogeneous consumers, excessive upgradation might take place if the upgraded versions are *backward compatible* to the earlier versions. On the other hand, Farrell and Katz (2000), suggest that in a systems market an integrated monopolist may conduct 'more' R&D than its non-integrated rivals to put 'greater' competitive pressure on the rivals. In the present paper, we suggest that a monopoly supplier of a component of a system can strategically deter entry by using R&D expenditure as a signal.

The famous anti-trust case of the *United States of America vs. Microsoft Corporation* instigated a major theoretical debate regarding *anti-competitive* behaviours in markets for network goods. The strategy, widely discussed in the literature of entry deterrence in markets with network externalities, is creation of a large installed base and keeping the product incompatible with that of the entrant. [E.g., Katz and Shapiro (1986a, b, 1992), Farrell and Saloner (1986, 1992), Klemperer (1987a, b), and Matutes and Regibeau (1989).]. The basic argument can be elaborated with the help of an example. Two competing operating systems are compatible to each other if all the programs that run on one of them and run on the other as well. In order to make the operating systems compatible to each other the firms sponsoring them will have to share source codes. So, the firms can, indeed, strategically decide whether to share the codes or to keep its product incompatible with that of the rival by *blocking* the codes. In general, when two systems are based on two incompatible technological platforms, compatibility can be achieved by the provision of a *two-way converter* and any firm can strategically keep its product incompatible to the rival's product by unilaterally blocking the converter. A one-way converter enables some network benefit for the user but does not make the products compatible and hence, does not generate externality. When the products are compatible, the entire market is the common network of the competing firms. So an incumbent can prevent the potential entrant from using its installed base by blocking the converter, and this reduces the attractiveness of the entrant's product. This, in turn, can create a pre-emptive condition for the incumbent to deter entry. The basic argument is in line

with the literature on entry deterrence by investment in *capacity*, as discussed in Schelling (1960), Dixit (1979, 1980), Spence (1977, 1979) etc.

Such a mechanism may fail to deter entry, in presence of *technological progress*, if the entrant's technological edge offsets the incumbent's installed base advantage. Katz and Shapiro (1992), show that post-entry price competition can lead the entrant to capture the entire market. Fudenberg and Tirole (2000), however, emphasize on the pre-emptive role of the incumbent's installed base in entry deterrence. They show that there exists a *limit pricing Markov perfect equilibrium*, even when the entrant has a technological edge that outweighs the installed base advantage of the incumbent.

In this paper we use a static model, where post-entry the firms simultaneously choose prices. Therefore, the possibility of entry deterrence by limit pricing is ruled out. Moreover, the potential entrant is threatening to enter with a qualitatively better product. In such a context we show that strategic signalling, by publishing data on R&D expenditure, can deter entry in a world of incomplete information. We also suggest that such entry deterrence is welfare reducing. Kristiansen (1996), also considers the possibility of entry deterrence by investment in R&D. He solves a two-stage game where an incumbent and a potential entrant simultaneously choose their R&D projects in stage 1 and competes in prices in stage 2. In Kristiansen (1996), an R&D project can have two outcomes 'success' and 'failure'. A *risky* project (having a low probability of 'success'), if it 'succeeds', it will lead to a larger technological improvement than a *safe* project (having a high probability of 'success'). He shows that the incumbent chooses a *risky* R&D project and the entrant, in contrast, chooses a *safe* project. In presence of network externality, the incumbent's installed base discourages the entrant to choose a sufficiently risky project. If the incumbent's as well as the entrant's R&D are 'successful' or if the entrant's project is 'unsuccessful', entry is deterred. If, however, the entrant's project is 'successful' but the incumbent's one is not, then entry occurs. In contrast to Kristiansen (1996), in the present paper we show that entry is deterred irrespective of the outcome of the incumbent's R&D.

In section 2 we introduce the basic model. In section 3 we show that entry occurs in absence of R&D. In section 4 we analyse the role of R&D expenditure in entry deterrence. In section 5 we extend the analysis by endogenising the R&D expenditure. In section 6 we analyse the welfare effects of entry deterrence. Finally, in section 7, we conclude with a note on antitrust implications of the model.

The Model

The market for a network good, in period 0, is supplied by an incumbent monopolist (I). A potential entrant (E) threatens to enter the market. The technological quality of the entrant's product is better than that of the incumbent and is protected by a patent.

Confronted with the threat of entry, in the stage I of period 1, the incumbent decides whether to undertake R&D, or not. If it undertakes R&D, it will publish a statement of R&D expenditure. We assume that the incumbent cannot improve upon the technological quality of its product without undertaking R&D. We also assume that the incumbent cannot publish fraud data on R&D expenditure without actually incurring it. The incumbent's R&D project is said to be *'successful'* if it innovates an upgrade, such that the technological quality of the upgrade is better than the entrant's product. Observing the incumbent's action, the potential entrant decides whether to enter or not.

The incumbent can be either a 'high' type or of a 'low' type. Ex-ante it is uncertain whether the incumbent's R&D is successful or not. The probability of success of a 'high' type incumbent is more than that of a 'low' type. The entrant knows the probability of success for a 'high' type incumbent and that for a 'low' type incumbent. If it knows that the incumbent is a 'high' type, the *risk neutral* entrant will not enter and if it knows that the incumbent is a 'low' type, it will enter. But in a world of *incomplete information*, the entrant does not know the type of the incumbent.

If entry occurs in stage II, the firms will decide on the provision of a two-way converter. The products can be made compatible with each other if and only if both the firms agree on the provision of a two-way converter. For simplicity, we assume that the firms do not incur any cost to provide the converter. It is important to note that any one firm can unilaterally *'block'* the converter.

Finally, in stage III, the firms simultaneously choose prices.

For simplicity we assume *zero cost of production*. Only the entrant incurs a fixed entry cost F (> 0), which is exogenous. Since the technological quality of the entrant's product is better than that of the incumbent, the entry cost F can be interpreted as the cost of acquiring (or innovating) the technology.

We consider a two-period overlapping generations model where in each period a continuum of consumers, distributed uniformly in the interval [0, 1] according to their type , arrives in the market. The period 0 consumers are alive in period 1 and hence the incumbent's sales in period 0 determine its installed base. However, the period 0 consumers make their purchase decision and get utility from consumption in period 0 only.

The type of a consumer reflects his willingness to pay for the product that is relatively better, in terms of technological quality, between two available products. If at period t, two products are available in the market and the technological quality of product i is better than that of the product j (j ≠ i), each period t consumer, purchasing i, gets an additional benefit according to its type. The consumers get this additional benefit from relatively better technological quality only when they can compare two contemporary products and perceive that one of the products is better than the other product available in that period. If, at period t, only the product i is available in the market, or among two available products, the technological quality of product of j is better than that of the product i, the consumers of the product i do not get this additional benefit. In a sense we are considering a utility function in which the utility is derived, not from the absolute quality of the product, but from the product differential. When only one product is available, at any particular period, the consumers do not have any 'reference frame' and hence cannot perceive the product differentiation. One important underlying assumption is that the consumers do not compare between products available in the market at two different periods but compare between products of the same 'generation'. For example, if a monopolist offers an upgrade in period 1, which embodies a better technological quality, compared to the technological quality of the previous version, offered in period 0, a period 1 consumer gets the same utility as a period 0 consumer.

Each consumer has a perfectly inelastic demand, i.e., either they consume one unit of the good or they do not consume it. So, at any period the potential market size is unity. The indirect utility to a consumer of type θ, at any period t (t = 0, 1), from consumption of one unit of the product of the firm i (i = I, E), is given by,

$$V_{It} = \alpha N_{It} + \theta - P_{It}$$

if two products are available in the market, at period t, and the technological quality of i is better than that of j (≠i).

$$= \alpha N_{It} - P_{It}$$

otherwise.   (1)

N_{It} is the expected network size of the firm i in period t and we assume that the expectations are fulfilled in equilibrium. a is the *coefficient of network externality*, which is a measure of the network effect. Larger the a, stronger is the network effect. Since we are considering positive network externality, a is strictly positive. P_{It} is the

price charged by firm i in period t. So, aN_{it} is the network benefit to the period t consumers purchasing from the firm i.

In period 0 only the incumbent is in the market. Therefore, the indirect utility to any period 0 consumer from consuming one unit of the good is given by,

$$V_{I0} = \alpha N_{I0} - P_{I0}, \qquad N_{I0} = q_{I0}, \qquad (2)$$

where q_{I0} is the sales of the incumbent in period 0. Since each of the consumers is getting the same indirect utility, in equilibrium either all the consumers purchase from the incumbent or none of them purchase the good. The incumbent can exist in the market only if all the period 0 consumers purchase from it. Therefore, q_{I0} and hence, N_{I0} is 1. In equilibrium the consumers must get non-negative indirect utility. Therefore, $P_{I0} \leq \alpha$. So, in period 0, the entire market will be covered if the incumbent charges a price $P_{I0} = \alpha$. It is irrational to charge a price less than α. Given the assumption of cost less production the period 0 profit of the incumbent is also α.

The installed base of the incumbent is thus, fixed at 1. Therefore, even when the incumbent is confronted with a threat of entry; it cannot increase the installed base by reducing the price in period 0. Since the payoff to the incumbent, in period 0, is always α, we can treat the period 1 game independently[vi].

In period 1 a continuum of 'new' consumers arrive in the market who are also distributed uniformly in the interval [0, 1] according to their type . In absence of any threat of entry the indirect utility to the period 1 consumers from consuming one unit of the product of the incumbent is given by,

$$V_{I1} = aN_{I1} - P_{I1}, \qquad N_{I1} = 1 + q_{I1} \qquad (3)$$

where q_{I1} is the sales of I in period 1. Therefore, in equilibrium, full market is covered in period 1 as well. The equilibrium price and profit are 2.

Before we proceed to analyse the period 1 game, for expositional purpose we make two assumptions.

Assumption 1: (1/6, 1/2).

Assumption 2: .

$$F \in \left(0, \min\left\{\frac{4}{9}(1 - 2\alpha), \frac{1}{9}\right\}\right)$$

These two assumptions ensure the existence of interior solution, post entry, except for the case where the incumbent's R&D is 'successful' and the incumbent 'blocks' the converter. Given assumption (2), it is not possible for the incumbent to deter entry, simply by blocking the converter.

Entry Occurs in Absence of R&D

In this section we consider the case where the incumbent does not undertake R&D. Since the incumbent does not undertake R&D, in period 1 it continues to sell the same product which it was selling in period 0. In stage I the entrant decides to enter or not. If it does not enter the incumbent earns a profit of 2α. entry occurs, the firms decide on the provision of the converter in stage II. Finally, in stage III, the firms simultaneously choose prices. The extensive form game is presented in figure 1.
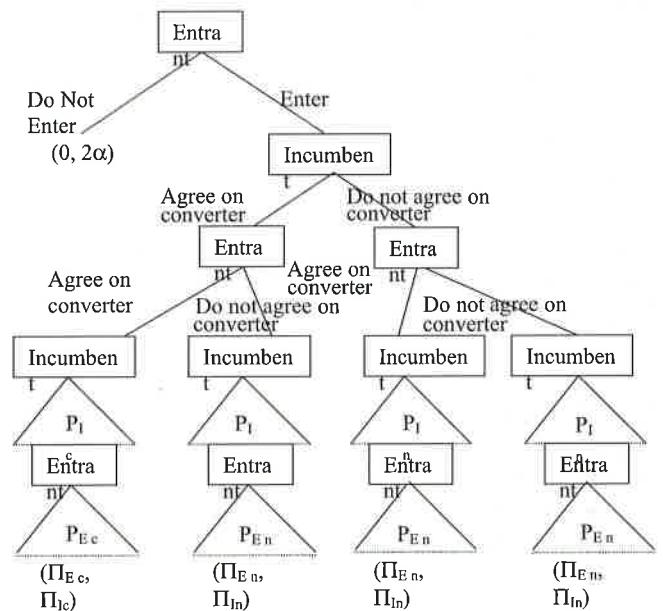
Figure I

Here P_{ic} and Π_{ic} are the price and profit of the firm i (i = E, I) when the products are compatible (i.e., both firms agree on the converter) and P_{in} and Π_{in} are the price and profit of the firm i when the products are not compatible (i.e., at least one of the firms disagrees on the converter). Since we can independently analyse the period 1 game, we are no more using any subscript to indicate time.

Proposition 1: *When the incumbent does not undertake R&D, in equilibrium, entry occurs and post-entry the firms agree on the provision of the converter.*

Proof: First let us analyse the pricing game where *both the firms agree on the provision of the converter* and hence, the products are perfectly compatible.

The effective network size is same for both the firms. Let us define a θ_c, such that the consumer of type θ_c is indifferent between the available products. By continuity of θ, there exists a θ_c. The consumers of type $\theta \geq \theta_c$;

purchase from the entrant and those of type $\theta < \theta_c$; either purchase from the incumbent or do not purchase the good. By definition, $\theta_c = P_{Ec} - P_{Ic}$. From our indirect utility function given in (1) it is apparent that all the consumers of type $\theta < \theta_c$ get the same indirect utility from consuming the product of the incumbent. Therefore, in equilibrium, either all of them purchase from the incumbent or they do not purchase the good at all. The entire market is covered if all of these consumers purchase from the incumbent. In that case the network size is 2. The fact that the consumers should get non-negative surplus in equilibrium implies that $P_{Ic} \leq 2\alpha$. Therefore, the demand function for the entrant and the incumbent are respectively given by,

$$q_{Ec} = 1 - P_{Ec} + P_{Ic} \qquad \text{if, } 0 \leq P_{Ec} < (1 + P_{Ic}),$$
$$= 0 \qquad\qquad \text{otherwise.} \qquad (4)$$

and, $\quad q_{Ic} = P_{Ec} + P_{Ic} \qquad \text{if, } 0 \leq P_{Ic} < P_{Ec} \text{ and } 0 \leq P_{Ic} \leq 2\alpha,$
$$= 0 \qquad\qquad \text{otherwise.} \qquad (5)$$

The profit functions are given by,

$$\Pi_{Ec} = (1 - P_{Ec} + P_{Ic})P_{Ec} - F \quad \text{if, } 0 \leq P_{Ec} < (1 + P_{Ic}),$$
$$= -F \qquad\qquad \text{otherwise.} \qquad (6)$$

and, $\quad \Pi_{Ic} = (1 - P_{Ec} - P_{Ic})P_{Ic} \quad \text{if, } 0 \leq P_{Ic} < P_{Ec} \text{ and } 0 \leq P_{Ic} \leq 2\alpha,$
$$= 0 \qquad\qquad \text{otherwise.} \qquad (7)$$

From the first order conditions of profit maximization we get the price reaction functions as,

$$P_{Ec} = \frac{1 + P_{Ic}}{2} \qquad \text{if, } P_{Ic} \geq 0, \qquad (8)$$

and, $\qquad P_{Ic} = \frac{1 + P_{Ec}}{2} \qquad \text{if, } 0 \leq P_{Ec} \leq 4\alpha, \qquad (9)$

Solving (8) and (9) we get the equilibrium prices as $P^*_{EC} = 2/3$ and $P^*_{Ic} = 1/3$, the equilibrium profits are Π^*_{Ec} (4/9)-F and $\Pi^*_{Ic} = 1/9$. Given our assumption (1), the boundary conditions, $P_{Ic} \geq 0$ and $0 \leq P_{Ec} \leq 4\alpha$, are trivially satisfied, in equilibrium. By assumptions (2) and (1), $F < (4/9)(1-2\alpha) < (4/9)$, and hence, both the firms earn positive profits in equilibrium. So, when the incumbent does not undertake R&D and agrees to the provision of the converter, entry occurs, in equilibrium.

Now, let us analyse the pricing games where *at least one of the firms disagrees on the provision of the converter* and hence, the products are perfectly incompatible.

The effective network size of the incumbent is determined by its installed base and its period 1 sales. The entrant's network size is simply its period 1 sales. As in the previous case, let us define θ_n, such that the consumer of type θ_n is indifferent between purchasing from the entrant and purchasing from the incumbent. By definition,

$$\theta_n = \frac{P_{En} - P_{In}}{1 - 2\alpha}$$. All the consumers of type $\theta < \theta_n$

purchase from the incumbent, in equilibrium, only if they get non-negative surplus. Given that the network size of the incumbent, in period 1, is $(1 + \theta_n)$ the consumers of type $\theta < \theta_n$ get non-negative surplus only if

$$P_{In} \leq \frac{\alpha(1 - 2\alpha) + \alpha P_{En}}{(1 - \alpha)}.$$ Therefore, the demand

function for the entrant and the incumbent are respectively given by,

$$q_{En} = \frac{1 - 2\alpha P_{En} + P_{In}}{1 - 2\alpha} \qquad \text{if, } 0 \leq P_{En} < (1 - 2\alpha + P_{In}),$$
$$= 0 \qquad\qquad \text{otherwise.} \qquad (10)$$

and, $q_{in} = \dfrac{P_{En} - P_{In}}{1 - 2\alpha}$ if, $0 \leq P_{In} < P_{En}$ and $0 \leq P_{In} \leq \dfrac{\alpha(1 - 2\alpha) + \alpha P_{En}}{(1 - \alpha)}$,

$$= 0 \qquad\qquad \text{otherwise.} \qquad (11)$$

The profit functions are given by,

$$\Pi_{En} = \frac{(1 - 2\alpha - P_{En} + P_{In})P_{En}}{1 - 2\alpha} - F \qquad \text{if, } 0 \leq P_{En} < (1 - 2\alpha + P_{In}),$$
$$= -F \qquad\qquad \text{otherwise.} \qquad (12)$$

and, $\Pi_{In} = \dfrac{(P_{En} - P_{In})P_{In}}{1 - 2\alpha}$ if, $0 \leq P_{In} < P_{En}$ and $0 \leq P_{In} \leq \dfrac{\alpha(1 - 2\alpha) + \alpha P_{En}}{(1 - \alpha)}$

$$= 0 \qquad\qquad \text{otherwise.} \qquad (13)$$

From the first order conditions of profit maximization we get the price reaction functions as,

$$P_{En} = \frac{1 - 2\alpha + P_{In}}{2} \qquad \text{if, } P_{Ic} \geq 0, \qquad (14)$$

and, $\qquad P_{In} = \dfrac{P_{En}}{2} \qquad \text{if, } \quad 0 \leq P_{En} \leq \dfrac{2\alpha(1 - 2\alpha)}{(1 - 3\alpha)} \qquad (15)$

Solving (14) and (15) we get the equilibrium prices as

$P^*_{En} = \dfrac{2}{3}(1 - 2\alpha) \qquad$ and, $P^*_{In} = \dfrac{1}{3}(1 - 2\alpha), \qquad$ and the

equilibrium profits are

$$\Pi^*_{Ec} = \frac{4}{9}(1-2\alpha) - F \quad \text{and} \quad \Pi^*_{Ic} = \frac{1}{9}(1-2\alpha).^{vii}$$

Given

our assumption (1), the boundary conditions $P_{Ic} \geq 0$ and

$$0 \leq P_{En} \leq \frac{2\alpha(1-2\alpha)}{(1-3\alpha)}$$ are trivially satisfied, in equilibrium.

By assumption (2) $F \leq \frac{4}{9}(1-2\alpha)$, and hence, both the firms earn positive profits in equilibrium. So, even when the incumbent disagrees to the provision of the converter, entry occurs in equilibrium, if it does not undertake R&D.

Once the installed base fails to deter entry, there is no incentive for the incumbent to disagree on the converter since it earns a larger profit when the products are compatible. Similarly, the entrant also earns a larger profit when the products are compatible and will agree on the converter.

It is apparent that the revenue of the entrant is smaller when the converter is blocked and hence, it becomes difficult for the entrant to enter. Suppose, $\frac{4}{9}(1-2\alpha) < F < \frac{4}{9}$. The incumbent can deter entry by threatening to disagree on the provision of the converter. When the products are incompatible the installed base of the incumbent plays a pre-emptive role in entry deterrence. By agreeing on the converter the incumbent looses its installed base advantage. But given assumption (2), the installed base of the incumbent fails to play its pre-emptive role in entry deterrence.

Role of R&D Expenditure in Entry Deterrence

In this section we consider the case where the incumbent undertakes R&D before the entrant enters, and issues a public statement about its R&D expenditure. Let R be the exogenously determined R&D expenditure.

Assumption 3: $R \in (0, 1/9]$.

This assumption allows the incumbent to earn a non-negative profit, in equilibrium, even when its R&D is 'unsuccessful'.

Proposition 2: *If the entrant knows that the incumbent's R&D project is 'unsuccessful', entry occurs and the firms agree on the provision of the converter. In equilibrium the incumbent charges a price $P^*_{Ic}=1/3$ and earns a profit $\Pi^*_{Ec}=(1/9)-R$. The equilibrium price and profit of the entrant are $P^*_{Ec}=2/3$ and $\Pi^*_{Ec} = (4/9)-F$ respectively.*

Proof: When the R&D of the incumbent is 'unsuccessful' the technological quality of the entrant's product is better than that of the incumbent and the analysis is similar to that of proposition 1. When the firms agree on the provision of the converter, the equilibrium prices are $P^*_{Ec}=2/3$ and $P^*_{Ic}=1/3$, and the equilibrium profits are $\Pi^*_{Ec}=(4/9)-F$ and $\Pi^*_{Ic}=(1/9)-R$ respectively for the entrant and the incumbent.

When the firms disagree on the provision of the converter, the equilibrium prices are $P^*_{En} = \frac{2}{3}(1-2\alpha)$ and $P^*_{In} = \frac{1}{3}(1-2\alpha)$, and the equilibrium profits are $\Pi^*_{Ec} = \frac{4}{9}(1-2\alpha) - F$ and $\Pi^*_{Ic} = \frac{1}{9}(1-2\alpha) - R$ respectively for the entrant and the incumbent.

If $\frac{1}{9}(1-2\alpha) < R \leq \frac{1}{9}$, the incumbent earns a non-negative profit when the converter is provided, and a negative profit when the entrant blocks the converter. However, when the converter is not provided the incumbent will not leave the market. The R&D expenditure is already *sunk* and by leaving the market the incumbent will incur a larger loss. The entrant earns only $\Pi^*_{Ec} = \frac{4}{9}(1-2\alpha) - F$ by blocking the converter whereas by agreeing on the converter it earns a larger profit, $\Pi^*_{Ec}=(4/9)-F$. So, the threat of blocking the converter is not credible on part of the entrant. Therefore, when the incumbent's R&D is 'unsuccessful', in a world of complete and perfect information, entry occurs; and post-entry, both the firms gain from provision of the converter. Hence, in equilibrium, they will agree on the converter. Both the firms earn non-negative profits since $R \leq 1/9$.

Proposition 3: *If $\alpha \geq (2/9)$ and the entrant knows that the incumbent's R&D project is 'successful', the incumbent's credible threat to disagree on the converter deters entry. The equilibrium profit of the incumbent is 2α - R. However, if $\alpha < (2/9)$ entry occurs and post-entry the firms agree on the provision of the converter. In equilibrium the incumbent charges a price $P^*_{Ic}=2/3$ and earns a profit $\Pi^*_{Ic}=(4/9)-R$. The equilibrium price and profit of the entrant are $P^*_{Ec}=1/3$ and $\Pi^*_{Ec}=(1/9)-F$ respectively.*

Proof: *When the incumbent's R&D is 'successful', the technological quality of the incumbent's product is better than that of the entrant. The upgrade is perfectly compatible with its previous version and hence, the*

incumbent does not lose its installed base advantage.

First, let us consider the case where the firms agree on the provision of the converter. We can solve this pricing sub-game in a manner similar to that done in proposition 1. Here, the technological quality of the incumbent's upgrade is better than that of the entrant's product and hence, the consumers of type $\theta \geq \theta_c$ will purchase from the incumbent and those of type $\theta < \theta_c$ will purchase from the entrant. The equilibrium prices of the entrant and the incumbent are, $P^*_{Ec}=1/3$ and $P^*_{Ic}=2/3$ respectively, and the respective profits are $\Pi^*_{Ec}=(1/9)-F$

and $\Pi^*_{Ic}=(4/9)-R$. Since, $R \leq \dfrac{1}{9}$ and

$F \leq \min\left\{\dfrac{4}{9}(1-2\alpha),\dfrac{1}{9}\right\}$, entry will occur and both the firms will earn a positive profit.

Now, let us solve the pricing sub-games, where the firms disagree on the provision of the converter. Here, we define, θ'_n, such that the consumer of type θ'_n is indifferent between the two products. By definition,

$\theta'_n = \dfrac{P_{In} - P_{En} - 2\alpha}{1 - 2\alpha}$. All the consumers of type $\theta < \theta'_n$ purchase from the entrant, in equilibrium, only if they get non-negative surplus. The consumers of type $\theta < \theta'_n$ get

non-negative surplus only if $P_{En} \leq \dfrac{\alpha(P_{In} - 2\alpha)}{(1-\alpha)}$.

Therefore, the demand function for the entrant and the incumbent are respectively given by,

$q_{En} = \dfrac{P_{In} - P_{En} - 2\alpha}{1 - 2\alpha}$ if $0 \leq P_{En} < (P_{In}-2\alpha)$ and $0 \leq P_{En} \leq \dfrac{\alpha(P_{In}-2\alpha)}{(1-\alpha)}$

$\quad = 0$ otherwise   (16)

and, $q_{In} = \dfrac{1 + P_{En} - P_{In}}{1 - 2\alpha}$ if $0 \leq P_{In} < 1 + P_{En}$

$\quad = 0$ otherwise.   (17)

In section 2, we found that in absence of any threat of entry, the incumbent can charge a price of 2α, in period 1. It is apparent from the demand function (16), that there does not exist a non-negative P_{En} for which $q_{En}>0$, if $P_{In} = 2\alpha$. Therefore, if the incumbent blocks the converter and charges its monopoly price 2α, entry will not occur. In equilibrium, the full market is covered and the incumbent earns a profit of 2α. The intuition is simple. In this case, the technological quality of incumbent's product is better than the entrant's product and also, given its installed base, the incumbent's

network is larger. Hence, there exist no incentive for any consumer to purchase the product of the entrant.

So, by disagreeing to the converter the incumbent can deter entry, when its R&D is 'successful'. In equilibrium, the incumbent's profit is $2\alpha - R$. On the other hand if the incumbent accommodates entry by agreeing to the converter, its profit is (4/9)-R. Therefore, the threat to disagree on the converter is *credible* only if $\alpha \geq (2/9)$.

By allowing entry the incumbent can provide the consumers a 'reference frame' to compare the products. This increases the consumer's willingness to pay for the incumbent's upgrade, according to their type, and in turn allows the incumbent to charge a higher price. Let us call this effect, the *product differential effect*. On the other hand, when the incumbent allows entry by agreeing to the converter, it looses its *installed base advantage*. When $\alpha < (2/9)$, the network effect is 'weak'. Therefore, the *product differential effect* offsets the *installed base advantage* and the incumbent is better off by allowing entry. However, when $\alpha \geq (2/9)$, the network effect is 'strong' and the *installed base advantage* dominates over the *product differential effect*. Therefore, in the latter case, the incumbent will deter entry by credibly threatening to block the converter.

In view of proposition 3, we modify our assumption (1) as follows:

Assumption 1.a: $\alpha \in [2/9, 1/2)$.

Since we are interested in the issue of entry deterrence, we restrict ourselves to the interval of for which it is worthwhile to deter entry.

Proposition 2 and 3 show that the entrant will not enter if it knows that the incumbent's R&D is 'successful', and will enter if it knows that the R&D is 'unsuccessful'. However, ex-ante the outcome of the R&D is uncertain. We assume that there can be two types of incumbent. The probability of 'success' for type H incumbent is p_H and that for type L is p_L where, $p_H > p_L$. The entrant knows these probabilities. We assume that the entrant's expected payoff from entering is positive if the incumbent is a type L firm and is negative if the incumbent is type H.

Assumption 4: $\dfrac{4}{9}(1-p_L) > F > \dfrac{4}{9}(1-p_H)$

This assumption implies that the entrant will enter if it knows that the incumbent is of type L and will not enter if the incumbent is of type H. However, in a world of incomplete information, the entrant does not know the type of the incumbent.

First, *Nature* draws a type of the incumbent. Let Nature draw the type H with probability x, i.e., the prior *belief* of the entrant is that the incumbent is of type H with probability x. After Nature draws the type of the incumbent, the incumbent decides whether to undertake R&D or not. The incumbent's action gives a signal about its type. Observing the signal the entrant updates its belief by Bayes' rule and then decides to enter or not. Post-entry the game is same as that described in section 2. The extensive form representation of the reduced signalling game is shown in figure 2.
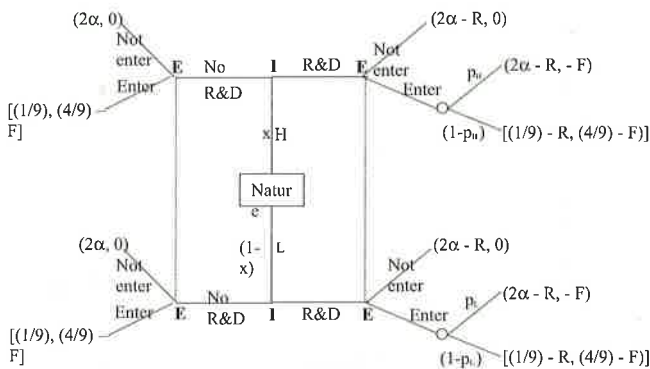

Figure II

Lemma 1: There exists a *pooling* equilibrium where the incumbent's strategy is (R&D, R&D) and the entrant's response is (Enter, Not Enter)[viii], if and only if the entrant's *p*

rior belief is given by

$$x \geq \frac{1 - p_L - (9/4)F}{P_H - P_L}$$

[Proof given in the appendix.]

Lemma 2: There does not exist an equilibrium, where the incumbent adopts the *pooling* strategy (No R&D, No R&D).

[Proof given in the appendix.]

Lemma 3: There does not exist any *separating* equilibrium for the above signalling game

[Proof given in the appendix.]

Applying lemma 1 – 3 we can write the following proposition.

Proposition 4: *If* $x \geq \frac{1 - p_L - (9/4)F}{p_H - p_L}$ *there exists a unique pure-strategy perfect Bayesian equilibrium of this signalling game where both types of incumbent invest in R&D and the entrant does not enter.*

Corollary to proposition 4: *If* $x < \frac{1 - p_L - (9/4)F}{p_H - p_L}$ *and*

$p_L > \frac{R}{2\alpha - (1/9)}$ *there exists a unique pure-strategy perfect Bayesian equilibrium of this signalling game where the incumbent adopts the pooling strategy (R&D, R&D) and the entrant's response is (Enter, Enter).*

[*Proof of this corollary is given in the appendix.*]
So, irrespective of whether the incumbent's R&D is ex-post 'successful' or not, the incumbent can deter entry by undertaking R&D and publishing data on R&D

expenditure if, $x \geq \frac{1 - p_L - (9/4)F}{p_H - p_L}$.

An Extension: Endogenising R&D Expenditure

In our analysis in section 4 we kept the R&D expenditure exogenous. In this section we extend our analysis to endogenise it.

Assumption 5: $p_H = p_H(R)$ if $R < \overline{R}$,

     $= 1$ if $R \geq \overline{R}$,   where, $\overline{R} = 1/9$

$p'_H(R) > 0$ and $p''_H(R) < 0$, for all $R < \overline{R}$ and $\lim_{R \to \overline{R}^-} p_H(R) = 1$

Assumption 6: $p_L = p_L(R)$ if $R < \overline{R}$,

     $= \overline{p}_L$ if $R \geq \overline{R}$, where, $\overline{R} = 1/9$ and $\overline{p}_L < 3/4$

$p'_L(R) > 0$ and $p''_L(R) < 0$, for all $R < \overline{R}$ and $\lim_{R \to \overline{R}^-} p_L(R) = \overline{p}_L$

$p_H(R) > p_L(R)$ for all $0 < R < \overline{R}$.

We further assume the differential to be increasing in R, i.e.,

$p'_H(R) > p'_L(R)$ for all $0 < R < \overline{R}$.

Assumptions (5) and (6) imply that there is no incentive for either type of the incumbent to spend more than (1/9) in R&D.
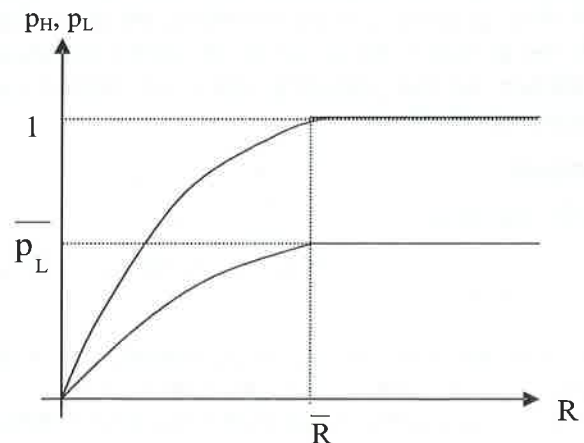

Figure III

Therefore, when entry occurs, the expected profit of the type H incumbent is given by,

$$E(\Pi_H) = p_H(R)2\alpha + (1 - p_H(R))\frac{1}{9} - R \qquad \text{if } R < \overline{R}$$

$$= 2\alpha - R \qquad \text{if } R \geq \overline{R} \quad (18)$$

The expected profit of the type L incumbent is given by,

$$E(\Pi_L) = p_L(R)2\alpha + (1 - p_L(R))\frac{1}{9} - R \qquad \text{if } R < \overline{R}$$

$$= (2\alpha - \frac{1}{9})\overline{p}_L - (R - \frac{1}{9}) \qquad \text{if } R \geq \overline{R} \quad (19)$$

Since, $p_H(R) > p_L(R)$ for all $0 < R \leq \overline{R}$, $E(\Pi_H) < E(\Pi_L)$. Also, since p_H and p_L are strictly concave, it can be easily shown that the expected profit functions are also concave, for $0 < R \leq \overline{R}$.
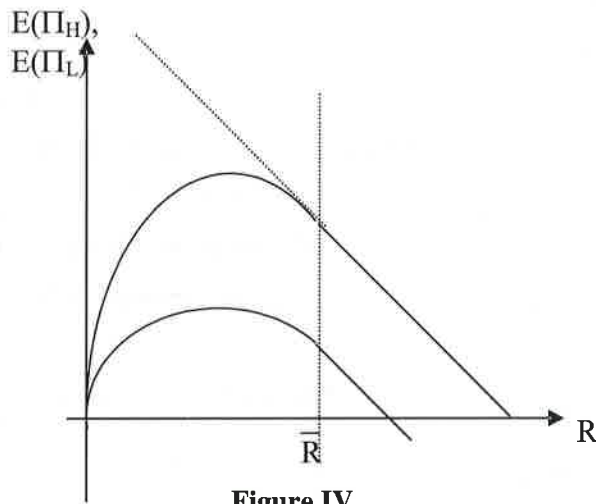
Figure IV

Given the above specifications, neither type of incumbent will spend more than $\overline{R}$ on R&D, since, for all $R > \overline{R}$, the expected profits are monotonically decreasing in R. So to check the existence of perfect Bayesian equilibrium for the signalling game we restrict our analysis to $0 < R \leq \overline{R}$.

Lemma 4:

$\exists$ a $\widehat{R} \in (0, \overline{R}]$, such that $x = \dfrac{1 - p_L(\widehat{R}) - (9/4)F}{p_H(\widehat{R}) - p_L(\widehat{R})}$ if,

$x \geq \dfrac{1 - p_L(\overline{R}) - (9/4)F}{p_H(\overline{R}) - p_L(\overline{R})}$. [Proof given in the appendix.]

If the incumbent adopts a pooling strategy, i.e., both types choose the same R, given the entrant's prior belief x, from lemma 1 we know that it will not enter if and only

if, $x \geq \dfrac{1 - p_L(R) - (9/4)F}{p_H(R) - p_L(R)}$ Now if there exists a R, for all R<R,

$x < \dfrac{1 - p_L(R) - (9/4)F}{p_H(R) - p_L(R)}$ and for all R≥R, $x \geq \dfrac{1 - p_L(R) - (9/4)F}{p_H(R) - p_L(R)}$.

Therefore, if the incumbent adopts a pooling strategy, the entrant will enter only if $R < \widehat{R}$.
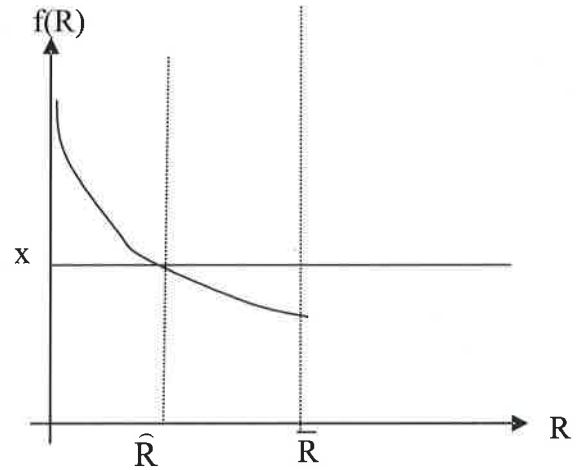
Figure V

Lemma 5: $\exists\, 0 < \widetilde{R}_H < \overline{R}$ such that $\dfrac{4}{9}(1 - p_H(\widetilde{R}_H)) = F$.

[Proof given in the appendix.]

If the incumbent adopts a separating strategy, i.e., different types choose different R, the entrant's belief is updated and it can correctly infer the type of the incumbent. From our analysis in the previous section, we know that the entrant, confronting a type H incumbent, does not enter only if $F \geq 4/9(1 - p_H(R))$. Since, there exist $0 < \widetilde{R}_H < \overline{R}$, the entrant, confronting a type H incumbent, does not enter if $R \geq \widetilde{R}_H$.

Lemma 6: Since $\overline{p}_L < 3/4$, for all $0 < R \leq \overline{R}$ and for all

$F \leq \min\{\dfrac{25}{81}(1 - 2\alpha), \dfrac{1}{9}\}, \quad F < \dfrac{1}{9}(1 - p_L(R))$

[Proof given in the appendix.]

From our analysis in the previous section, we know that in a separating equilibrium, the entrant, confronting a

type L incumbent, does not enter only if $F \geq \dfrac{1}{9}(1 - p_L(R))$.

From lemma 6 we conclude that the entrant confronting a type L incumbent will always enter since, $\overline{p}_L < 3/4$.

$g(R),$
$h(R)$

F

$\tilde{R}_H$ $\overline{R}$ R

Figure VI

Lemma 7: If there exists a $\hat{R} \in (0,\overline{R}]$, then $\tilde{R}_H < \hat{R}$.

[Proof given in the appendix.]

If $x \ge \dfrac{1 - p_L(\overline{R}) - (9/4)F}{p_H(\overline{R}) - p_L(\overline{R})}$, $\tilde{R}_H < \hat{R} \le \overline{R}$. Clearly the entrant's strategy is to enter if $R < \hat{R}$ and not to enter otherwise. For all $0 < R \le \overline{R}$, $E(\Pi_i) \le (2\alpha - R)$, $i = \{H, L\}$. Therefore, spending $R < \hat{R}$ becomes a dominated strategy for the incumbent. Again, $(2\alpha - R)$ is monotonically decreasing in R. Therefo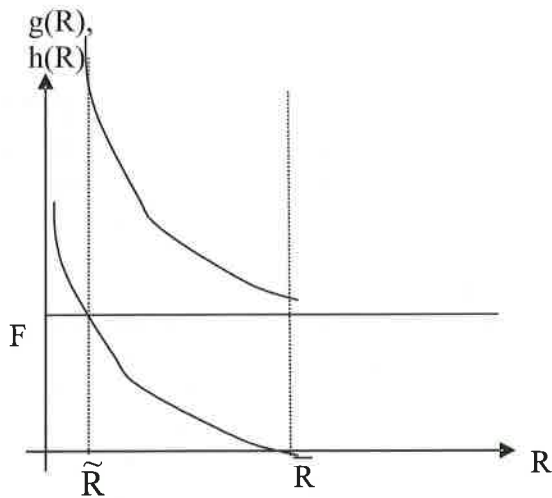re, the best response for the incumbent of both types is to spend $\hat{R}$. Now we can write the following proposition.

Proposition 5: If, $x \ge \dfrac{1 - p_L(\overline{R}) - (9/4)F}{p_H(\overline{R}) - p_L(\overline{R})}$ there exists a unique pure strategy perfect Bayesian equilibrium where the incumbent chooses the pooling strategy $(\hat{R}, \hat{R})$ and the strategy of the entrant is (Enter if $R < \hat{R}$, Not Enter otherwise).

It is apparent from the above discussion that there does not exist a separating equilibrium.

An Example: Let $\alpha = 4/9$, $F = 2/81$ and $x = 5/6$. Therefore, $\alpha \in (2/9, 1/2)$, $F \le \min\{4/9(1-2\alpha), 1/9\}$.

Let, $p_H = \left(\dfrac{R}{\overline{R}}\right)^{\frac{1}{2}}$ if $R < \overline{R}$,

$= 1$ if, $R \ge \overline{R}$ where, $\overline{R} = 1/9$

and, $p_L = \overline{p}_L \left(\dfrac{R}{\overline{R}}\right)^{\frac{1}{2}}$ if $R < \overline{R}$,

$= \overline{p}_L$ if $R \ge \overline{R}$, where $\overline{R} = 1/9$, and $\overline{p}_L = 11/16$

Clearly, p_H and p_L are monotonically increasing and strictly concave in R, for $0 < R \le \overline{R}$. Also, for the given

values, $x \ge \dfrac{1 - p_L(\overline{R}) - (9/4)F}{p_H(\overline{R}) - p_L(\overline{R})}$. Therefore, there exists a $\hat{R} \in$ $(0, \overline{R}]$, such that $x = \dfrac{1 - p_L(\hat{R}) - (9/4)F}{p_H(\hat{R}) - p_L(\hat{R})}$. Solving for $\hat{R}$, we get $\hat{R} = 0.1102$. In equilibrium, both types of incumbent spend $\hat{R} = 0.1102$ and the entrant does not enter. In the following section, we analyse the welfare implications of entry deterrence by R&D investment.

Welfare Implications:

When the incumbent does not undertake R&D it accommodates entry and, in equilibrium, agrees to the converter. The equilibrium profits are $\Pi^*_{Ec} = (4/9) - F$ and $\Pi^*_{Ic} = 1/9$. The consumers of type $\theta \ge \theta_c$ purchase from the entrant and those of type $\theta < \theta_c$ purchase from the incumbent. In equilibrium, $\theta_c = P_{Ec} - P_{Ic} = (1/3)$. The aggregate consumers' surplus is given by,

$$CS = \int_0^{(1/3)} \left(2\alpha - \frac{1}{3}\right)d\theta + \int_{(1/3)}^1 \left(2\alpha + \theta - \frac{2}{3}\right)d\theta = \left(2\alpha - \frac{1}{9}\right).$$

Therefore, the aggregate welfare under entry accommodation is given by,

$$W_A = 2\alpha + \frac{4}{9} - F \qquad (20)$$

When the incumbent deters entry by strategically spending on R&D it earns a monopoly profit given by $(2\alpha - R)$. Since, the monopoly price 2 is exactly equal to the network benefit to the consumers, there is no consumer's surplus. Therefore(,) the aggregate welfare under entry deterrence is given by,

$$W_D = 2\alpha - R \qquad (21)$$

Since, $F \le \min\{\frac{4}{9}(1 - 2\alpha), \frac{1}{9}\}$ comparing (20) and (21), we conclude that entry deterrence is welfare reducing.

Conclusion:

The majority of the existing literature, on entry deterrence in network markets, suggests that an incumbent can deter entry simply by keeping its product incompatible with the product of the entrant. The installed base of the incumbent plays a pre-emptive role in such entry deterrence. However, it is possible that the installed base advantage of the incumbent is not enough to deter entry, simply by keeping the product incompatible with the product of the entrant. In such a circumstance, it is possible for the entrant to deter entry by using R&D expenditure as a strategic signal. The result is independent of the outcome of the R&D project. We also show that such entry deterrence is welfare reducing. The implication of this result is very important in the context of anti-trust laws. A monopolist can spend

on R&D with the sole motivation of entry deterrence. In that case the outcome of the R&D project is immaterial to the firm conducting the R&D. Such behaviour is certainly anti-competitive and should be taken into account while designing the anti-trust laws.

Appendix

- *Proof of Lemma 1:* Given the prior belief x and the incumbent's strategy (R&D, R&D), the entrant's best response is (Enter, Not Enter) if and only if

$$\{x(1-p_H)+(1-x)(1-p_L)\}(4/9)-F<0 \Rightarrow x \geq \frac{1-pL-(9/4)F}{p_H-p_L}.$$

Both types of incumbent gains from investing in R&D if $(2\alpha - R) > (1/9)$. Given that $R \leq 1/9$, $(2\alpha - R) > (1/9)$ is trivially true.

- *Proof of Lemma 2:* Consider the incumbent's strategy (No R&D, No R&D). From lemma 1 we know that the entrant's response is (Enter, Not Enter) if $x \geq \frac{1-p_L-(9/4)F}{p_H-p_L}$ and (Enter, Enter) otherwise. In the former case both types gain from deviation. In the later case type H incumbent gains by deviating if the expected payoff to the type H from investing in R&D is larger that the payoff from not investing in R&D, i.e., if $\{p_H(2\alpha)+(1-p_H)(1/9)-R>(1/9)$. Given our assumptions this is always true.

- *Proof of Lemma 3:* First let us consider the separating strategy (No R&D, R&D). Since the entrant's belief is determined by Bayes' rule, the entrant's response is (Enter, Enter). Type H gains from deviation if $\{p_H(2\alpha)+(1-p_H)(1/9)-R>(1/9)$ which is always true.

Now let us consider the separating strategy (R&D, No R&D). The entrant's belief is determined by Bayes' rule and its response is (Enter, Not Enter). Therefore, type L incumbent gains from deviation if $(2\alpha - R) > (1/9)$ which is trivially true.

- *Proof of the corollary to proposition 4:* First let us consider the pooling strategy (R&D, R&D). Given the entrant's prior belief $x < \frac{1-p_L-(9/4)F}{p_H-p_L}$, the entrant's response is (Enter, Enter). Type H incumbent does not gain by deviating if the expected payoff to the type H from investing in R&D is larger that the payoff from not investing in R&D, i.e., if $\{p_H(2\alpha)+(1-p_H)(1/9)\}-R>(1/9)$, which is always true. Type L also does not gain from deviation if

$\{p_L(2\alpha)+(1-p_L)(1/9)-R>(1/9)$, i.e., if $p_L > \frac{R}{2\alpha - (1/9)}$, .
Therefore, there exists a pooling equilibrium where both types of the incumbent invest in R&D and the entrant enters. Now let us consider the pooling strategy (No R&D, No R&D). The entrant's response is (Enter, Enter). Since, $p_L > \frac{R}{2\alpha - (1/9)}$, both types of incumbent gain from deviation. Now let us consider the separating strategy (No R&D, R&D). Entrant's response is (Enter, Enter). It follows from lemma 3 that the type H gains from deviation. Finally, let us consider the separating strategy (R&D, No R&D). Type L incumbent gains from deviation since,

$$p_L > \frac{R}{2\alpha - (1/9)},$$

- *Proof of Lemma 4:* Let $f(R)=\frac{1-p_L(R)-(9/4)F}{p_H(R)-p_L(R)}$. Since $p'_L(R)>0$ and $p_H(R)-p_L(R)$ is increasing in R, f(R) is defined for all $0<R\leq\overline{R}$ and is monotonically decreasing in R. By continuity of f(R) there exists a $\widehat{R} \leq \overline{R}$ only if, $x \geq \frac{1-p_L(\overline{R})-(9/4)F}{p_H(\overline{R})-p_L(\overline{R})}$

- *Proof of Lemma 5:* Let, $h(R)=4/9(1-p_H(R))$. Since, and $p'_H(R)>0$, h(R) is monotonically decreasing in R. $p_H(\overline{R})=1$ implies $h(\overline{R})=0$. Now, since $F > 0$, by continuity of h(R) there exists $\widetilde{R}_H<\overline{R}$.

- *Proof of Lemma 6:* Let $g(R)=4/9(1-p_L(R))$. Now, $g(\overline{R})=4/9(1-\overline{p}_L)$. Given that $F\leq\min\{4/9(1-2\alpha),1/9\}$ and $\overline{p}_L<3/4$, for all $0<R\leq\overline{R}$, $F<g(\overline{R})$. Since, $p'_L(R)>0$, g(R) is monotonically decreasing in R and hence min. $g(R)=g(\overline{R})>F$. Therefore, $g(R)>F$ for all $0<R\leq\overline{R}$.

- *Proof of Lemma 7:* If, $x \geq \frac{1-p_L(\overline{R})-(9/4)F}{p_H(\overline{R})-p_L(\overline{R})}$ there exists a $\widehat{R} \in (0, \overline{R}]$, by definition of $\widehat{R}$, $x = \frac{1-p_L(\widehat{R})-(9/4)F}{p_H(\widehat{R})-p_L(\widehat{R})}$. By definition of $\widetilde{R}$, $4/9(1-P_H(\widetilde{R}_H))=F$. Therefore, $(1-P_H(\widetilde{R}_H))=9/4F$ and hence,

$$x = \frac{p_H(\widetilde{R}_H)-p_L(\widehat{R})}{p_H(\widehat{R})-p_L(\widehat{R})}$$

Since, $x < 1$, $p_H(\widetilde{R}_H)<p_H(\widehat{R})$ and hence, $\widetilde{R}_H<\widehat{R}$.
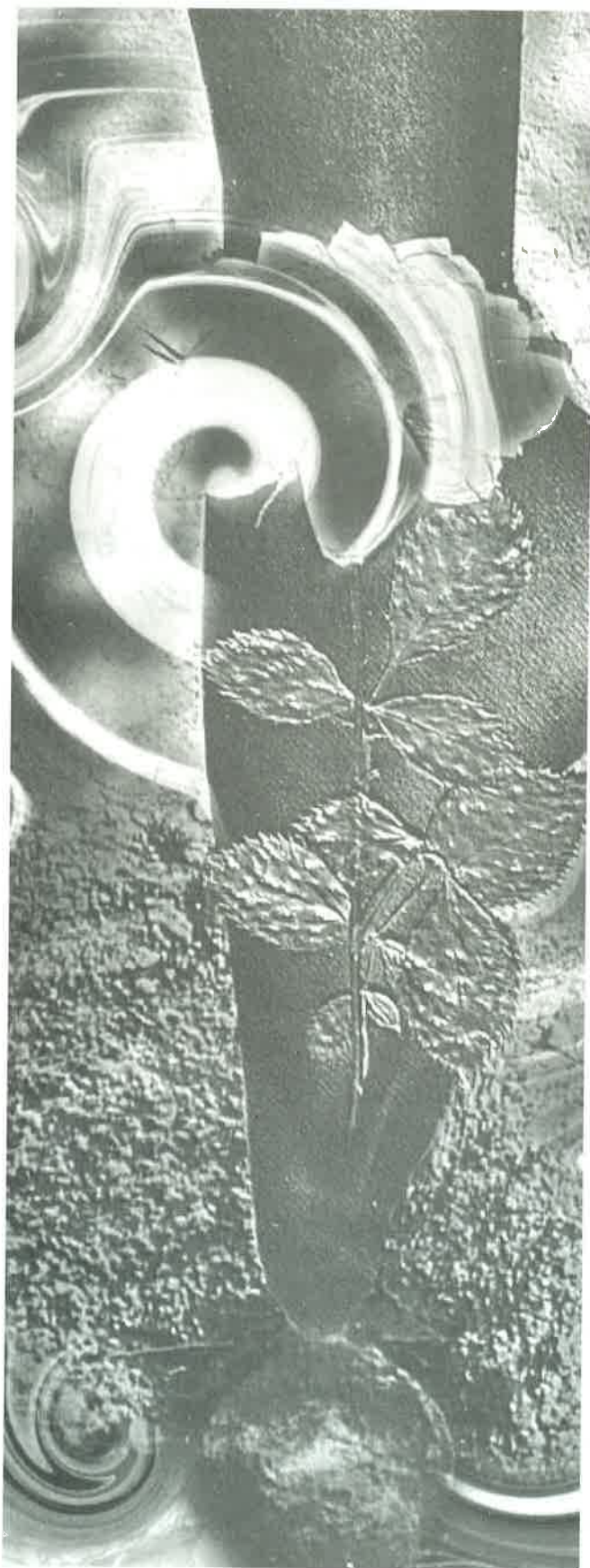
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Interdependence in Imports, Production, Exports and Terms of Trade in India - An Empirical Study

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Abstract

Emphasis has been laid down on liberalisation of imports as part of transformation process, and globalisation programme in India. Accordingly, many policy initiatives have been taken, which brought down the applicable customs duty rate to less than 20 percent on an average. Further, the licensing requirements on 95 percent of India's imports have been removed. Trade liberalisation, to a significant extent, is aimed at facilitating the availability of imported raw materials and capital goods at a lower cost to the Indian producers. With this background, this paper aims to analyse the trends in import of industrial sector and interdependence of imports, production and exports, based on the available data, with a focus on post-liberalisation period. The hypothesis is that the import of finished goods, raw materials and capital goods are expected to increase, even though the terms of trade have not been deteriorated significantly.

Key Words : Imports, Terms of Trade, Trend Growth Rate, Causality

Introduction

Upto the seventies, the focus on trade policy in India, were quota restrictions on imports. This implied licensing of all categories of imports. The policy also confirmed with the objectives of the import substitution and protection of domestic industry. But the industrial stagnation that marked the period from the mid-sixties to the late seventies led to some re-thinking, which resulted a gradual liberalisation in the eighties and structural adjustment programs in 1991. At the same time, imports have become necessity in the process of industrialisation in the developing countries. The programmes of industrilisation make a heavy demand for capital goods, machinery and raw materials, which have to be imported from advanced industrialised countries (Armstrong and Read, 1998).

The implications of trade liberalization can be analysed in two phases (Bhagawati and Srinivasan, 1984). The first, intermediate liberalisation, that promotes free trade in raw materials and machineries. As a result, the notional price of imported input falls. The availability of imported intermediate goods and of technology whether licensed or embodied in imported capital goods, is an important

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source of gain in shedding a restrictive trade system. The second phase; full liberalization, that permits free trade in finished goods, including non-competitive consumer goods. Two effects of protection of domestic final goods markets are captured on the demand side (Banik, 2001). First, demand switches to domestic goods when foreign goods are not available. Second, when the demand for imports is not satisfied, part of the income can be set as savings.

Bhattacharyya and De (2001), have empirically examined whether the import-dependence of the Indian Corporate Sector has increased in the post liberalization period for most of the industry groups/sub groups. They have found that the corporate sector in India is increasingly becoming import oriented, though the relationship between trade liberalization and export growth is not so solid. Further, a positive impact of import liberalization on exports is also found in 10 industry groups/ sub-groups out of 18 industry groups/sub-groups, included in the sample.

Panchamukhi (1987), has presented a broad review of the structural changes in trade and trade policies of India between the period 1960-61 and 1984-85. The share of exports and imports in GDP, shares in the world trade, balance of trade, quantity and unit value index numbers, terms of trade, geographical pattern and commodity composition have been analysed in the study. The findings show the deteriorating and fluctuating trend in terms of trade in India during the period of analysis.

Banerji (2000), showed that a reduction in import tariff of a commodity might lead to an increase in the imports of the commodity, however, the increase in the imports of intermediate goods used in the production should lead to increase in exports by shifting the cost curves downwards.

It has been amply revealed that import liberalisation is an integral part of the transformation and globalisation process (Nayyar, 1997). It has varied implications to the industrial performance of an economy. However, detailed studies on the impact of trade liberalisation on imports, import intensity of production and terms of trade in India are not many. The present research is an attempt to bridge this gap in the literature by analysing the said three parameters for different sub-sectors in the industrial sector.

Growth in industrial production serves as the base for expansion of exports, and thereby terms of trade of a country. As the increase in import intensity, especial intensity of capital goods might lead to increase in the production and exports in many sectors, changing import intensity in some sectors would have direct impact on terms of trade in those sectors.

Imports - Commodity Group-Wise Trends

This section attempts to analyse the trends in imports of goods belonging to industrial sector in India. For this purpose, yearly data has been compiled from Handbook of Statistics on Indian economy for the period to 2000 and reported periodically for five time points in table1. From the table, ratio of the sector-wise imports to total imports in India have been calculated and given in table 2.

It is quite evident from the table 2 that except in the case of crude petroleum products and electronics goods, the percentage shares of imports of finished goods in the industrial sector have shown a tendency to come down. The Compound Annual Growth Rate (CAGR) presented in table 1, indicates that imports of these products have increased, except in the case of electrical machinery and project goods. However, the growth rates applicable to important sectors like fertilisers (3.98 percent), capital goods (4.89 percent), medicinal and pharmaceutical goods (3.64 percent) and the chemical products (0.35 percent) are far less than the growth rate of total imports (8.38 percent). Thus, in general, as compared to overall growth of imports in the country, growth of imports of finished products in the industrial sector is noticeably lower.

Table I : Imports of Principal Commodity Groups in Industrial Sector
(Million US$)

Sector / Year	1987-88	1990-91	1993-94	1996-97	1999-2000	CAGR (%)
Petroleum, crude and products	3118	6028	5754	10036	12611	8.54
Fertilisers	392	984	826	911	1399	3.98
Capital Goods	5064	5835	6243	9922	8965	4.89
Machine tools	163	263	155	525	262	0.00
Electronic Goods	NA	NA	912	1424	2796	20.52
Computer Goods	NA	NA	18	84	197	49.00
Machinery except electrical & electronics	2016	2100	1881	3644	2745	3.02
Electrical machinery except electronic	843	949	204	325	438	-8.23
Transport equipment	586	931	1270	1484	1136	2.24
Project Goods	1331	1425	1623	2118	986	-4.00
Mainly Export Related Items	2585	3680	4387	6138	9117	10.61
Medicinal and Pharma products	129	261	258	306	360	3.64
Chemical materials and products	148	159	167	264	164	0.35
Total Imports	**17156**	24072	23306	39132	49670	8.38

NA= Not Available

**Table II: Contribution of Imports of Principal
Commodity Groups of Industrial Sector to Total Imports (%)**

Sector / Year	1987-88	1990-91	1993-94	1996-97	1999-2000
Petroleum, Crude & Products	18.17	25.04	24.69	25.65	25.39
Fertilisers	2.28	4.09	3.54	2.33	2.82
Capital Goods	29.52	24.24	26.79	25.36	18.05
Machine Tools	0.95	1.09	0.67	1.34	0.53
Machinery Except Electrical & Electronic	11.75	8.72	8.07	9.31	5.53
Electronic Goods	0.00	0.00	3.91	3.64	5.63
Electrical Machinery Except Electronic	4.91	3.94	0.88	0.83	0.88
Transport Equipment	3.42	3.87	5.45	3.79	2.29
Project Goods	7.76	5.92	6.96	5.41	1.99
Mainly Export Related Items	15.07	15.29	18.82	15.69	18.36
Medicinal & Pharma products	0.75	1.08	1.11	0.78	0.72
Chemical Materials and Products	0.86	0.66	0.72	0.67	0.33

* Computed based on the Table 1

Interdependence between Imports, Production and Exports

The Problem and Econometric Model

It has been seen that, although, many aspects of globalisation viz., capital flows, labour standards, environmental concerns have captured worldwide attention, the driving force behind the global integration has been liberalisation of trade in goods and services. The link between the trade liberalisation and industrial production has been theoretically viewed as: Firstly, when tariffs are lowered, relative prices change and resources are reallocated to production activities that raise industrial output. Secondly, production may get a substantial boost, as economies of scale adjust to technological innovation, new production structures and changing pattern of competition. In turn, increased industrial production accentuates exports, as growth in the production is an important base for export expansion. Any stagnation in the production is likely to influence the capacity to increase exports. The sluggish industrial growth creates supply bottlenecks and, thereby fuels domestic inflation. This, in turn, encourages domestic sales over exports. Exports play dual role in a developing country like India. Firstly, exports are related to income through foreign trade multiplier. Secondly, foreign exchange earnings obtained from exports, facilitate expansion of imports. On the other hand, imports have become most essential in the process of industrialisation in developing countries. The programme of industrialisation makes a heavy demand for capital goods, equipments, machinery and raw materials, which have to be imported from advanced industrialized countries.

It has been further seen earlier, that trade liberalisation measures as part of economic reforms and opening up process, on the one hand, and the birth of WTO in 1995, on the other, has reduced the tariff level substantially. QRs on imports have also been removed to the extent of 95% of items. Further, Foreign Investment Promotion Board (FIPB) was set up to attract foreign investment from other countries and multinationals.

Based on the above theoretical points, the following seven hypotheses are postulated as part of the empirical verification of the interdependence among Industrial Production (IP), Exports (EXP) and Imports (IMP) in India. They are :

(i)   Growth in IP leads to growth in EXP and IMP

(ii)   Growth in EXP leads to growth in IP and IMP

(iii)   Growth in IMP leads to growth in IP and EXP

(iv)   Growth in IP and IMP leads to growth in EXP

(v)   Growth in EXP and IMP leads to growth in IP

(vi)   Growth in IP and EXP leads growth in IMP

(vii) Growth in IMP leads to growth in IPAll the seven hypotheses are tested for four time periods i.e. on the one hand, pre and post trade liberalisation periods; and pre and post WTO periods, on the other. Therefore, the tests are put forth to verify whether there are differences in the pattern of causal relationships implicit in the interdependence of production, export and import in the industrial sector over pre and post trade

liberalisation and pre-WTO and post-WTO eras.

Block Granger Non-Causality Test

Block Granger non-causality test (Pesaran and Bahram, 1997), is based on the following general form of Vector Auto Regression, VAR (p):

$$z_t = a_0 + a_1 t + \sum_{i=1}^{p} \phi_i z_{t-i} + \Psi w_t + u_t \qquad (1)$$

Where, z_t is an m 1 vector of jointly determined (endogenous) variable, t is a linear time trend, w_t is a q1 vector of exogenous variables, and u_t is an m1 vector unobserved disturbances. Based on the estimated VAR equations, log-likelihood ratio statistic for testing the null hypothesis that the coefficients of a subset of jointly determined variables are equal to zero. This is known as block Granger non-causality test and provides a statistical measure of the extent to which lagged values of a set of variables, say z_{2t}, are important in predicting another set of variables, say z_{1t}, once lagged values of the latter set are included in the model. For example, in equation 1, let $z_t = (z'_{1t}, z'_{2t})'$, where z_{1t} and z_{2t} are m11 and m21 subsets of z_t. Consider now the following equations :

$$z_{1t} = a_{10} + a_{11} t + \sum_{i=1}^{p} \phi_{i,11} z_{1,t-i} + \sum_{i=1}^{p} \phi_{i,12} z_{2,t-i} + \Psi_1 w_t + u_{1t} \qquad (2)$$

$$z_{2t} = a_{20} + a_{21} t + \sum_{i=1}^{p} \phi_{i,21} z_{1t-i} + \sum_{i=1}^{p} \phi_{i,22} z_{2,t-i} + \Psi_2 w_t + u_{2t} \qquad (3)$$

The hypothesis that the subset z_{2t} does not 'Granger-cause' z_{1t} is defined by :

$$H_0 : \phi_{12} = 0 \text{ where } \phi_{12} = (\phi_{1,12}, \phi_{2,12}, \ldots \ldots \phi_{p,12})$$

The maximized log-likelihood values for the restricted and unrestricted equations will be computed and the likelihood ratio (LR) test in the form of chi-square will be applied to test the $H_0 : \phi_{12} = 0$ against $H_1 : \phi_{12} \neq 0$, as per the model.

The above described Block exogeneity test was originally proposed by Sims (1980), as a multi-variate version of the Granger causality test, and tests whether omitting a particular variable from a system lead to any loss of information. The non-causality test is, therefore, truly a systems' test and more robust than the traditional bi-variate testing.

Data and Estimation

Monthly data has been used in the analysis. The data source has been International Financial Statistics of the IMF. The estimation of likelihood ratios has been carried out using Micro fit software. The software captures the lag automatically (as per the model) when the values of variables are keyed in the VAR framework. Index numbers were computed using the data on exports, imports and industrial production with same base; for the estimation purpose. The values of variables were entered in their log forms for the computation procedure.

Results of Causality Test

Pre and Post - Trade Liberalisation Periods

The results of the Likelihood Ratio (LR) test of Block

Table III: Results of LR Test of Block Granger Non-Causality in the VAR Framework (Pre-Liberalisation (1982-90) and Post-Liberalisation (1991-99) Periods)

Sr. No.	Null Hypotheses	Ch-Square (1982 to 1990)	Chi-Square (1991 to 1999)
1	IP≠>EXP and IMP	4.78	9.81**
2	EXP≠>IP and IMP	11.22**	10.74**
3	IMP≠>IP & EXP	6.24	5.75
4	IP and IMP≠>EXP	5.70	9.85**
5	EXP and IMP≠>IP	7.01	10.25**
6	IP & EXP≠>IMP	4.95	9.72**
7	IMP≠>IP	4.59	4.86

** Indicates the value of Chi-square is significant at 5% level.

Granger non-causality in the VAR framework is presented in table 3

The table III reveals the following points:

(i) According to the estimated values of Chi-square, all the null hypotheses, except the 2nd hypothesis (EXP ≠> IP and IMP), pertaining to the pre-trade liberalisation period, are found to be statistically insignificant.

(ii) On the other hand, in case of the post-liberalisation period, five of the null hypotheses are found to be statistically significant, based on the values of Chi-square (at 5% level). Alternatively, the 3rd hypothesis (IMP ≠> IP and EXP) and the 6th hypothesis (IMP ≠> IP) are insignificant.

The above results indicate that over the period of trade liberalisation, the production, exports and imports in the industrial sector have shown tendency for being interdependent. The bi-directional causal linkage between exports and production is well evidenced according to the results. In fact, even before the era of trade liberalisation, the causality running from export variable to production is noticeable. However, export causes production and as well imports in both the periods. Production causes exports as well as imports in the post liberalisation period. It is salient to note that, in both the periods, imports variable has not been a causal variable.

Pre and Post WTO Period

The relevant results are presented in table 4.

From the results, it can be observed that:

Table IV : Results of the LR Test of Block Granger Non-Causality in the VAR Framework for Pre-WTO (1990-95) and Post-WTO Period (1995-2000)

Sr. No.	Null Hypotheses	Chi-square (1990 to 95)	Ch-Square (1995 to 2000)
1	IP ≠> EXP and IMP	0.59	18.29*
2	EXPs ≠> IP and IMP	0.58	12.54**
3	IMP ≠> IP and EXP	5.80	12.11**
4	IP and IMP ≠> EXP	6.92	21.09*
5	EXP and IMP ≠> IP	4.83	9.82**
6	IP and EXP ≠> IMP	4.66	11.21**
7	IMP ≠> IP	4.71	6.93

* Indicates the value of Chi-square is significant at 1% level
** Indicates the value of Chi-square is significant at 5% level

(i)   None of the seven null hypotheses is statistically significant for the pre-WTO period.

(ii)   At the same time, all the null hypotheses (excepting the one IMP IP) are significant (at least at 5% level of significance) during the post-WTO period.

The results thus, convey that during the post-WTO period, the economy has got integrated in terms of the bi-directional causal links between industrial production, exports and imports. However, production does not show causal link with imports, if it (imports variable) is taken in isolation. The analysis, thus, has vindicated that even during the trade liberalisation period, which started in early 1990s, WTO era has been found as the critical period that has made the economy more integrated with the external sector. In fact, the effect of policies of the period 1990 to 1995 aimed at opening up process has not been captured at all in the results.   This implies that import liberalisation can be considered to be the most vital policy tool for integrating the economy globally.

Analysis of Terms of Trade

Terms of Trade of India

Net Terms of trade of a country, denotes whether the exports of a country as a ratio of imports have increased over a given period. It is based on both Unit Value Index of Exports and Unit Value Index of Imports. The former is a measure of degree of price realisation while exporting and the latter signifies the degree of price

burden while importing.   There are two important measures of terms of trade i.e., (i) net terms of trade given by Unit Value Index of Exports expressed as percentage of Unit Value Index of Imports and (ii) gross terms of trade given by Volume Index of Imports expressed as percentage of Volume Index of Exports. The net terms of trade has been considered for the present analysis as it is a measure of price realisation of exports and imports.

The hypothesis here is there could be substantial difference in trend growth rate between pre and post liberalisation period. The data on net terms of trade of India during the pre-liberalisation (1983 to 1991), and post-liberalisation (1992 to 2000), are reported in Table 5 and 6. The trend growth rate of net terms of trade also has been estimated to test the hypothesis and given in the same tables. The results show that the trend growth rates are statistically not significant even at 10 percent level of significance.   This is mainly because of the fluctuations in the Terms of Trade performance of India. In other words, there has not been any improvement in terms of trade, as revealed by the insignificant values of estimated growth rates.   This point applies to both periods of analysis. i.e., pre and post liberalisation periods. The respective graphs are depicted in figure 1 and 2. The inter-year fluctuations (indicating absence of a clear trend) can be easily gauged from these two figures.

Despite wide inter-year variations and absence of a statistically significant trend, one important point emerging from the tables is that overall terms of trade for the country has been favourable during both the periods of analysis. It is important, in this context, to report that, terms of trade value increased from 105 (1983-84), to 109 (1990-91), in the pre-liberalisation period. During the post-liberalisation period, the value increased from 127 (1992-93), to 151 (1999-00).   Thus, in absolute sense, India enjoyed a favourable position according to the value of overall terms of trade. Also, over the whole

Table V: Net Terms of Trade in India (1984 to 1991)

1983-84	84-85	85-86	86-87	87-88	88-89	89-90	90-91	Trend Growth
105	105	108	129	122	125	121	109	1.10*

*Computed and Trend Growth insignificant even @10% level.

Table VI: Net Terms of Trade in India (1992 to 2000)

1992-93	93-94	94-95	95-96	96-97	97-98	98-99	99-00	Trend Growth
127	145	152	138	126	146	150	151	1.16*

*Computed and Trend Growth insignificant even @10% level.

Figure I: Net Terms of Trade of India Trend Graph (1983-1991 Period)

TERMS

TIME

Observed
Growth
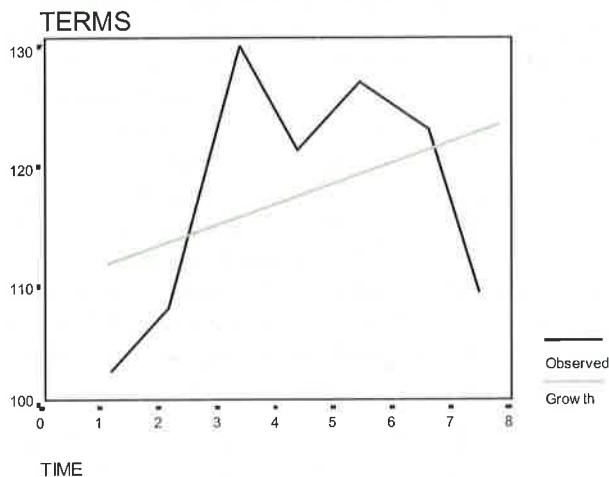
Figure II: Net Terms of Trade Trend Graph (1992-2000 Period)

TERMS

TIME

Observed
Growth
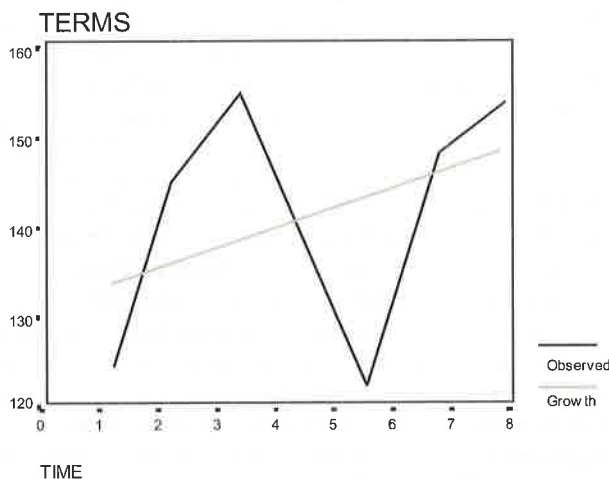
Terms of Trade for Industrial Sector in India

An attempt has been made in this section to make a comparative analysis of the trends in net terms of trade of important commodity groups of industrial sector, pertaining to the two periods of pre and post trade liberalisation. The net terms of trade for the commodity groups have been computed using yearly data on Unit Value Indices of exports and imports and reported in table 7 (The basic data used in this respect are appended).

Table 7 indicates that in case of beverage & tobacco and crude materials, India continues to have adverse net terms of trade. Mineral and chemical sectors have been characterised by changing scenario as far as the favourable and adverse patterns of movements in the terms of trade over the years. At the same time,

manufactured goods and machinery & transport sectors (as per the classification in the basic data) show favourable values for most of the years of the period of analysis, which implies that export competitiveness and performance of these sectors have improved.

Further, the analysis of the trend in net terms of trade has been carried out and presented in table 8. Here, the trend rates of growth have been estimated using linear trend equations. It is seen, from the table, that majority of the trend growth estimates are statistically insignificant. This reveals that the export competitiveness has not improved in Indian industries, in comparison to imports. It was seen earlier that trend growth of overall net terms of trade also was statistically insignificant. It is to be noted that significant negative values are obtained in case of beverage and tobacco and crude materials sectors in the pre-liberalisation period. In case of post-liberalisation period, significant positive values are obtained in case of crude materials and minerals sectors. However, for these two sectors, net terms of trade are yet adverse (excepting for 1998-99, in case of crude materials). However, it can be seen from a close observation of the table that there is a tendency for reversal in the trend in the values of the terms of trade during the post-liberalisation period.

Table VII : Net Terms of Trade of Commodity Groups in the Industrial Sector*

Year	Beverages & Tobacco	Crude materials	Mineral	Chemical	Manu Goods	Machine & Transport
83-84	77	87	78	104	132	130
84-85	78	87	80	107	134	133
85-86	86	104	218	93	139	113
86-87	84	92	76	113	164	100
87-88	50	84	82	124	141	87
88-89	49	85	72	96	132	104
89-90	56	73	92	50	127	122
90-91	42	74	60	83	122	107
92-93	42	73	128	111	93	170
93-94	33	92	139	127	124	158
94-95	42	94	139	113	114	274
95-96	39	91	143	81	94	126
96-97	35	87	138	91	91	145
97-98	39	98	153	97	118	134
98-99	47	125	180	106	142	135
99-00	48	126	180	110	146	140

·Computed from tables given in Appendix

Table VIII : Trend Growth Rates of Terms of Trade

Sectors / Commodity Groups	1983 to 1991	1992 to 2000
Beverage & Tobacco	-11.6**	1.7
Crude Materials, Inedible, except Fuels	-4.5**	5.9**
Mineral Fuels, Lubricants	-9.4	4.3*
Chemicals	-7.7	-3.2
Manufactured Goods (leather, textile yarn, iron & steel)	-2.4	3.4
Machinery & Transport Equipment	-1.6	-5.9
Net Terms of Trade of India	1.10 #	1.16 #

@ Computed based on table 8., # indicates as given in table 6 and 7.
* Indicates significance at 1 % level of significance
** indicates significance at 5 % level of significance.

Trend Analysis of Unit Value Indices of Exports and Imports in 1990s

The commodity-wise unit value index numbers of exports and imports for different industry groups (as classified in the Handbook of Statistics of Indian Economy, Reserve Bank of India) have been given in tables 9, 10, 11 and 12 . As given in table 10, the general unit vale index of exports was 422 in the year 1992-93 (Base value of index number = 100 in 1978-79) and it increased to 474 and 495 in 1993-94 and 1994-95 respectively. However, the index value declined to 484 in 1995-96, but picked up again to 505 next year and touched 589 in 1997-98 followed by 617 in 1999-2000. The trend on the basis of Unit Value Index numbers reveals that the export performance of Indian industry has been reasonably good during the post-liberalisation period. The Unit Value Index of exports of chemicals and related products was 410 in 1992-93, 428 in 1993-94, but increased to 457 in 1994-95 and 469 in 1995-96. This index value also showed gradual improvement in exports in the subsequent years. The export performance of other sectors given in the table is more exemplary than chemical products because they seem to have achieved higher growth in terms of unit value index. .

The unit value index numbers of imports, of different major commodity groups given in table 12 has shown consistent increase in value throughout post-liberalisation period. All commodity groups mentioned in the table, except miscellaneous manufactured articles have shown overall increase in the unit value of imports. This trend clearly substantiates the increasing import dependence of Indian industries.

The slope coefficients and trend growth rates have been estimated using the Ordinary Least square regression estimation method for the commodity industry groups, as given in tables 10 and 12 to compare the performance of each industry groups. The Unit Value Index numbers have been taken as dependent variable against time. The estimated slope coefficients of yearly data on unit value index of exports, 't' values with the statistics of level of significance are given in table 13. The estimated value of trend growth rate coefficient for beverage and tobacco exports is obtained as 5.87 percent, imports as 6.18 percent which clearly indicate that the extent of increase of imports has been high compared to that of exports during the post-liberalisation period 1990. The values of slope coefficients of exports for industries such as crude materials (inedible, except fuels. Raw cotton, iron ore etc), mineral fuels, chemicals and manufactured goods (put together) and general index are found to be

statistically significant at 1 percent level of significance with positive 't' values that indicate increase in unit value index of exports without much ups and downs in exports from India. The slope coefficients for exports of machinery and transport equipments and miscellaneous manufactured articles are statistically not significant even at 10 percent level of significance, which implies that exports have fluctuated much on an year-to-year basis. i.e., there would have been positive growth one year, next year negative and so on. The trend growth rates of exports for the period 1992-2000 (in percentage) are 5.87 (beverages and tobacco), 9.42 (Crude minerals, inedible except fuel), 7.47 (mineral fuels and lubricants), 3.56(Chemicals and related products), 8.98 (Manufactured items) and 5.76 (General index of exports from industrial sector).

The estimated slope coefficients, t values, level of significance and trend growth rates of imports of different industry groups for the post-liberalisation period 1992-99 are reported in table 14. The slope coefficients are statistically not significant even at 10 percent level of significance in the case of imports of crude materials, mineral fuels and lubricants. This could be due to heavy fluctuations in year-to-year imports. Hence, trend growth rates for these two sectors assume no significance. The trend growth rates of imports for the period 1992-2000 (in percentage) are 6.18 (Beverages and Tobacco), 6.82 (Chemicals and related products), 5.44 (Manufactured products), 11.85 (Machinery and transport equipments), -14.36 (Miscellaneous manufactured articles) and 4.50 (General Import Index). The above reported trend growth rates of imports clearly point out that the machinery and transport equipment industry has witnessed higher import growth (11.85 percent), compared to other major industries. The trend growth rate of general import index shows that the trend annual increase in imports in the industrial sector in India during 1992-2000 has been 4.50 percent, which is slightly lower than the trend annual increase in exports i.e., 5.76 percent.

Conclusion

The present analysis has demonstrated that, in general, there is no noticeable trend in the net terms of trade in case of the commodity groups considered as part of industrial sector as a result of trade liberalisation. It is quite clear that there are inter-year fluctuations in the values of net terms of trade for the commodity groups under reference, which could be the reason for statistical insignificance. The important observations can be summarised as follows.

i.   Interdependence between the variables in external sector (imports and exports), and production has increased during the post-WTO period because of the transformation taken place in foreign trade

policy in India.

ii. Overall net terms of trade, which has continued to be favourable, has increased during 1990s as compared to 1980s. However, the trend is not statistically significant. This observation is true of most of the commodity groups belonging to the industrial sector. These results show that the export competitiveness of Indian industries have not increased significantlly, in comparison to the imports.

iii. The estimated results show that the average increase in terms of unit value of exports has been marginally higher than the unit value of imports. Above all, trend growth rates of general unit value index numbers when looked upon give clear picture that the exports and imports have increased in the post-liberalisation period from which the former one showing higher growth compared to latter. Thus, on the suffix, the conclusion is that the globalisation and trade liberalisation policies have contributed for the increase in exports and imports of Indian industries in India.

Appendix

Table IX : Unit Value Index of Exports of Commodity Groups in the Industrial Sector (Pre-Liberalisation Period) (Base 1978-79 =100)

Commodity	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90	1990-91
Beverage & Tobacco	152	154	160	163	156	195	226	228
Crude Materials, Inedible, except Fuels	161	162	183	163	156	195	220	228
Mineral Fuels, Lubricants, etc.	221	227	229	153	158	176	354	246
Chemicals & Related Products	166	168	157	158	205	217	260	232
Manufactured Goods Classified by Material (leather, textile yarn, iron & steel etc)	169	172	182	193	221	275	346	378
Machinery & Transport Equipment	140	145	134	149	130	162	175	201
General Index	104	105	108	179	195	232	277	293

Table X : Unit Value Index of Exports of Commodity Groups in the Industrial Sector (Post-Liberalisation Period) (Base: 1978-79 =100)

Commodity	1992-93	1993-94	1994-95	1995-96	1996-97	1997-98	1998-99	1999-2000
Beverage & Tobacco	371	338	372	372	398	428	528	530
Crude Materials, Inedible, except Fuels	418	369	452	520	565	550	690	698
Mineral Fuels, Lubricants, etc.	563	603	620	730	896	826	794	799
Chemicals & Related Products	410	428	457	469	476	468	530	545
Manufactured Goods Classified by Material (leather, textile yarn, iron & steel etc)	457	537	538	586	554	707	848	860
Machinery & Transport Equipment	309	337	310	241	327	394	450	466
General Index	422	474	495	484	505	589	612	617

Table XI : Unit Value Index Number of Imports of Commodity Groups in the Industrial Sector Pre-Liberalisation Period (Base 1978-79=100)

Commodity	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90	1990-91
Beverage & Tobacco	190	196	185	193	314	399	407	536
Crude Materials, Inedible, except Fuels	176	186	176	177	186	228	302	308
Mineral Fuels, Lubricants, etc.	277	284	105	201	193	244	383	407
Chemicals & Related Products	150	157	168	140	165	225	515	280
Manufactured Goods Classified by Material (leather, textile yarn, iron & steel etc)	121	128	131	118	157	209	273	311
Machinery & Transport Equipment	101	109	119	148	150	155	143	188
General Index	153	162	159	139	160	186	228	268

Table XII: Unit Value Index Numbers of Imports of Commodity Groups in the Industrial Sector Post Liberalisation Period (Base: 1978-79 =100)

Commodity	1992-93	1993-94	1994-95	1995-96	1996-97	1997-98	1998-99	1999-2000
Beverage & Tobacco	878	1002	885	939	1131	1433	1121	1140
Crude Materials, Inedible, except Fuels	571	402	478	570	532	560	552	560
Mineral Fuels, Lubricants, etc.	441	435	447	511	649	540	439	448
Chemicals & Related Products	369	337	406	579	522	484	498	505
Manufactured Goods Classified by Material (leather, textile yarn, iron & steel etc)	489	432	472	626	612	595	596	612
Machinery & Transport Equipment	181	213	113	191	226	293	333	351
Misc. Manufactured Articles	292	368	224	201	170	127	152	161
General Index	331	327	325	351	400	404	408	415

Table XIII : Slope Coefficients and Trend Growth Rates of Exports of Industry Groups in India (1992-2000)

Commodity	Slope	Standard Error	t-value	Significance value	Significance Level (%)	Trend Growth (%)
Beverage & Tobacco	.057	.016	3.63	.015	5	
Crude Materials, Inedible, except Fuels	.090	.016	5.61	.0025	1	9.42
Mineral Fuels, Lubricants, etc.	.072	.017	4.18	.0087	1	7.47
Chemicals & Related Products	.035	.006	5.71	.0023	1	3.56
Manuf Goods (leather, textile yarn, iron & steel)	.086	.016	5.19	.0035	1	8.98
Machinery & Transport	.053	.033	1.60	.1698	Insignificant	5.44
Mis.Manuf items	.021	.021	1.02	.3552	Insignificant	2.12
General Index	.056	.008	6.37	.0014	1	5.76

Table XIV : Slope Coefficients and Trend Growth Rates of Imports of Industry Groups in India

Commodity	Slope	Standard Error	t-value	Significance value	Significance Level (%)	Trend Growth (%)
Beverage & Tobacco	.060	.023	2.54	.052	10	6.18
Crude Materials, Inedible, except Fuels	.023	.023	.245	.974	Insignificant	2.33
Mineral Fuels, Lubricants, etc.	.028	.028	.993	.366	Insignificant	2.84
Chemicals & Related Products	.066	.028	2.38	.0618	10	6.82
Manuf Goods (leather, textile yarn, iron & steel)	.053	.019	2.69	.0428	5	5.44
Machinery & Transport	.112	.052	2.14	.084	8.4	11.85
Mis.Manuf items	-.155	-.155	.032	-4.76	1	-14.36
General Index	.044	.008	5.13	.0037	1	4.5

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Packaging, Marketing and Selling -
The Three Imperatives of Indian R&D

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Abstract

The conventional axiom of research 'Publish or Perish' needs to be changed. The new rule is 'Market or Perish'. Increased competition, technological advancement and the changing sophistication of customer need have forced the India R&D organisations to reorient their approach. And rightly so, because if you are not market savvy you are out of the market.

Despite world class technology on drugs, vaccines, catalysts and polymers Indian R&D organizations have failed to make their presence felt internationally on a scale they deserve. Indian R&D organisations have the scientific expertise, technology and potential for knowledge creation. They need orientation for competitiveness and market savvy in order to excel.

The present paper attempts to highlight this vital aspect through a study of premier CSIR labs situated in Eastern part of the country with special reference to a Dhanbad based one. It is based on observation, personal interviews as well as literature survey.

Key Words : Customerization, Brand-mania, Proactive, Research & Development, Paradigmatic, CMRI.

Prologue

The Indian Government's success some years ago in the revocation of a 1995 patent on turmeric in US was significant for more than one reason. Though it did not accomplish something extraordinary, it definitely pointed out to a major weakness of the Indian R&D organizations considered to be the repositories of knowledge. Time and again, it has been established that the weakness of Indian R&D lies not so much in its quality and sophistication as in its marketability and what is now called customerization-customer focused communication.

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In these days of intense and cut throat competition, packaging and marketing hold the key to salability of an idea, product or service. Customers are so obsessed with brands these days that they suffer from kind of 'brand-mania' (a coinage indicating an extra sensitivity for brands). The interesting instance given below sums this up very succinctly. Sunday Times, the famous England newspaper carried an exercise with Booker prize winning novel 'In a free state' written by V.S.Naipaul, the Nobel Prize winning author. The opening chapters of this book were resent to the big publishers under a pseudo name with a request for its publication. They rejected the request unanimously. The book that was worthy of Booker was considered not fit for the publication because the author was a nobody. The ultimate lesson to be learnt here is 'build a brand and sell trash'. Such is the power of a brand.

The Indian R&D organizations have not yet been successful in creating a high brand equity in the global market. As knowledge process outsourcing (KPO) flourishes; it is important for the Indian R&D organizations to realize that even the best of the ideas have to be packaged and sold a la G.B. Shaw. Little wonder, Knowledge Management is emerging as a key area in the knowledge economy that has dawned. If Indian R&D organizations have to arrive on the global scene, they need to understand that creation of knowledge is not enough. Knowledge marketing is equally important.

The Present Scene

What the market forces have done today is that they have changed the role of R&D from a relatively isolated function in a linear process to a much more integrated one in a parallel technology and product development process. This transition shifts the emphasis from technology push to market pull and makes R&D a strategic issue in its own right that must be aligned with all other components of corporate strategy.

Post liberalization India has witnessed free entry of foreign enterprises and investments resulting in high quality consumer products for consumers. Automobiles and electronics were the most noticeable among them. To remain in competition the Indian industries as well as industrial R&D have to gear up for the challenge. Scarcity of funds with the government makes the problem more acute and government funding of R&D will become more stringent in days to come. R&D institutions will have to arrange funds for themselves. And herein lies the role of effective marketing practices. R&D organizations have to be proactive in order to be competitive. The age old adage Necessity is the mother of invention- is no longer valid. Rather, it has been made

to turn on its head. Invent first and create necessity through marketing. Remember Kerry Packer, the man who gave one day cricket. And cricket will never be the same again. The gentleman's game became a gladiator sport. Ironically, Kerry Packer was not from a Board of Cricket Control of any nation nor even a cricketer. He was a marketer. From mobile phones to mineral water, ideas came first and became necessity later. Indian R&D organizations need to be proactive.

In such a highly competitive era, it is unrealistic to expect user industry to wait for development of indigenous technology when the same is available across the table from foreign sources. At the same time, it is also true that Indian industrialist will accept indigenous technology if it has an edge over the competition, costs less and is available on time. However, the perception of the Indian R&D, in the minds of the consumer, also needs to change and the R&D organizations need to come out of the 'also ran category.'

Major changes in the policies relating to collaborations and technology transfers have altered the scenario. Import is facilitative and collaborators can now invest up to 51% of equity and are allowed to use foreign brand names. These changes have resulted in an increase in foreign direct investments and import of technology. Naturally, marketing and brand building is needed in a big way.

The purpose of R&D management is to promote innovation as well as wealth creation. In the last few years R&D activities have seen several changes in approach and several new management methods have been adopted by industrial houses. In today's scenario, global monitoring agencies such as WTO have added a new dimension to competitiveness. Against this backdrop, managing R&D has a special significance since wealth creation and innovation need to go together.

Increased competition, technological advancement and the changing sophistication of consumer needs have led to organizations seeking fresh approaches to the traditional challenges of operations and production management. It is imperative, therefore, that R&D activities be reoriented to meet the demands of the market that have become highly competitive. The focus must shift to managing and marketing the R&D to the potential customers. The conventional axiom of research today is "Market or Perish".

Statement of the Problem

In India, scientific and technological research is primarily concentrated in public- funded institutions like the Council of Scientific and Industrial Research (CSIR)

where the demand for profit, growth and accounting respectively require that research activity is directed, at least in the long run and more often in the short run, towards the solutions of practical problems. These external tasks provide, to a great extent, the stimuli, growth and justification of scientific work.

India needs technology for competitiveness and going by a report prepared back by PHD Chamber of Commerce and Industry, around 90 percent of our industrial production is based on the imported technology and just the remaining on indigenous efforts. However, it will not be fair to state that Indian R&D efforts are worthless. The problem lies not in creation of R&D knowledge but in their marketing. This is the reason why even hundred percent Indian knowledge comes back to us under foreign patents. The legend goes that Sir J.C. Bose lost to Marconi because he failed to market his invention first. Moreover, our inventions have been found to be less acceptable to the user industry. More due to the perceived than real quality. The same weakness continues to plague our R&D efforts even today.

This perhaps is the reason why despite world-class technology on drugs, vaccines, catalysts and polymers, Council of Scientific and Industrial Research (CSIR) fails to make its presence felt internationally. Indian R&D organizations have the scientific expertise, technology and potential for knowledge creation. They need orientation for competitiveness and marketing savvy in order to excel.

The R&D personnel are required to understand the market very carefully, and need to develop marketing skills. In these days of Social Darwinism, consumer friendly response is critical for any organization engaged in selling services or products. The R&D organizations do both. They need to convince the customers that their prescription is the most effective and efficient proposition. Since selling is key to survival, R&D personnel must be effective marketers and thoroughly familiar with the marketing processes and practices.

The globalization process has intensified competition. Only superior quality of knowledge will provide the competitive edge. But making this knowledge accessible to all is important for a developing country like India. Another imperative is to identify strength areas and create a niche through them. This requires effective marketing strategies. When competition is world class marketing becomes crucial.

Interfacing Research and Development (R&D) and marketing is an issue that is largely seen as being related to the issue of transfer of technology from the

R&D organizations to the industry. Technology transfer is the process by which technological innovation efforts initiated in the R&D laboratories fructify, get commercialized and contribute to the national economy. However, Management of Research and Development (R&D) projects are an increasingly complex task. Technology transfer is one vital link in the innovation chain. For public sector R&D laboratory system like that of CSIR in India, the issue of technology transfer cannot be looked in isolation. It is a part and parcel of the overall management of the research and development projects taken up in these laboratories.

From the early focus on the development of technologies for self reliance and of import substitution products, CSIR in the recent era needs to confront the threats of liberalization and globalization. This calls for Commercialization of CSIR Knowledgebase and customization is an important strategy.

The strategic purpose of R&D is to -

a) Defend, support and expand existing business,

b) To drive new business and

c) Broaden /deepen technological capability.

The methodologies adopted to achieve these goals might vary in their details from one organisation to another, but in principle they agree to a large extent across a wide cross- section of companies.

The present trend towards globalization and international competition implies that a major reorientation of research strategy towards process and product development must take place. This strategy can be pursued in a single laboratory or in a consortium of laboratories and can involve basic research, applied research, and incremental/ engineering research including quality improvement. This is more so because transfer of technology is not an isolated occurrence that can be tackled by only looking at the final stage of the transfer of the technology from the public funded R&D laboratory to the industry. It encompasses the entire gamut of technological innovation management and therefore, can be considered only in its totality. Thus, it becomes imperative to appreciate the paradigmatic shift towards strategy innovation for survival, maintenance and growth of CSIR. The corporate character of CSIR is almost entirely built upon the performances and functioning of the laboratories functioning under CSIR. In light of the above, the present research was carried out with the objective of studying, existing and required marketing practices.

The CSIR laboratories of Jharkhand region namely National Metallurgical Laboratory (NML), Jamshedpur, Central Fuel Research Institute ((CFRI) Dhanbad

comprised the sampling frame and the authors' acquaintance, familiarity and interaction formed the basis of this study. Observations thus made are authentic. However, empirical data was also collected and the Dhanbad based Central Mining Research Institute (CMRI), the premier research lab was chosen as the representative.

With the liberalization of economy in 1991, the technology policy was given a new thrust in 1993. The focus included environmental aspects, use of safer technologies, special technological support to export oriented sectors, greater role for R&D, improving management of R&D institutions and providing them with special incentives with lesser government control. New opportunities were thus created. But to take advantage of these opportunities, organisations engaged in R&D need to change their ways of functioning.

In the new free market economy, the old style of going through import statistics to find out, what product is being purchased from abroad in substantial quantities and then developing it locally is no longer valid. Formerly any Research and Development (R&D) product that involved import substitution could be sold. Today R&D must be market oriented if it has to succeed commercially. In fact R&D itself can and should be marketted to external clients by CSIR, IIT and university laboratories. Even R&D laboratories of commercial firms have to market their technology to internal clients: production and marketing departments and top management. Marketing has been defined as the satisfaction of customers' need at a profit in line with the marketing institutions' overall objectives.

Research Methodology

Objective

In the changed economic scenario, every organization in India needs to be self sufficient, and provide for its existence and growth. For that they have to reach to the customers and fulfil their needs. Earning revenue by the organization is highly dependent on the customer satisfaction. Also, customer satisfaction leads to good image of the organization or in other words, brand value of the organization increases with satisfaction of the customers. This is true for both product/ manufacturing and service organizations. R & D organizations that largely come under the service sector have to realize the importance of brand building.

The problem at present is not with the knowledge required for R & D but in their marketing. We are poor at brand building, and this perhaps is the reason why we

do not have many takers. Apropos to the above, the basic objectives of the present research were:

a) To carry out SWOT analysis of the R&D labs,

b) To identify the reasons for weaknesses in marketing of R & D,

c) To suggest measures to improve it.

Methodology

To achieve the above mentioned objectives, a few aspects of marketing pertinent to the R&D organizations were analyzed. Views of existing and potential customers were taken through a structured questionnaire.

Some senior and middle level scientists of CMRI were interviewed. The information thus gathered was supplemented with secondary sources comprising available literature and knowledgeable people. On the basis of this information a detailed strength- weakness- opportunities- threats analysis was carried out to study the market potential and thus, find out the possibility of increasing the competitiveness of the organization. Emphasis was given to understand the core areas of the organization and possible diversification needed.

Major Findings

Strengths

CMRI is one of the national laboratories funded by the government of India. However, it renders its expertise and services in the form of sponsors/ consultancy projects testing and evaluation services and earn about 70% of its budget. It has created a name in the mining field and is widely recognized as a major consultancy services provider.

Goodwill

CMRI carries strong goodwill among its public in general and professional peers in particular. CMRI gives due importance for its image building. For image building CMRI takes care of stakeholders, e.g. Government, CAG, parliamentarians. Media is one of the important tools from publicity and image building point of view. CMRI maintains its good image among the public through news release and display advertisement in the newspapers. It also organizes seminars/ symposium/ R&D get together to keep its good rapport with its professional peer.

Intellectual Input

CMRI records its intellectual input in the form of IPR, copyrights, registration of its development and disseminates its result through research articles and

journals in India and abroad. The organization also sends scientists to participate in seminars and symposia both in India and abroad to increase its visibility.

Manpower

R&D work of the institute depends on the contribution of the scientists and researchers. CMRI is having about 120 scientists, 170 technical staff and 110 in the administration.

Infrastructure

CMRI is well equipped with the latest instruments and facilities for undertaking R&D projects in the areas of mining and allied sciences. Some of the instruments and facilities of the institute are best in India.

Customer Satisfaction

Satisfied customers are the biggest assets an institute can posses. CMRI maintains a feedback file to know the customers response and is fortunate to have many satisfied customers. It takes active interests in seeking customer responses to its products and services.

Weaknesses

Government Rules

CMRI being a part of central government has to follow bureaucratic rules laid by the government. These at times become handicap for the institute. Rules may delay project, as all the paper movement is through proper channel. Many a times valuable opportunities are lost in procedural wrangles. Further, being still not fully independent on the finances from the organization, many a times has to forego opportunities which call for a bit of risk.

Job Security

Considerable security of service acts as a dampener to entrepreneurial spirit. Moreover, administrators are unable to act against employees who do not maintain their work standard etc. Further, individual initiative is not rewarded commensurately as rules come in the way.

Though there are reward systems for incentives and innovative scientists these are used sparingly. As there is no penalty system for scientist who do not maintain the work standard of the institute. Even the good workers are demotivated and individual initiative wears out. The percentage of effective contributors to R&D creation is still low and rate of patent filing as well as registration is not up to international standards.

Opportunities

Liberalization

Liberalization has opened up the market. Now the institute can work for any friendly country with least governmental interference. Considering the vast market, CMRI has lot of scope. All that is needed is to explore the market and carve a niche.

Privatization

With the ongoing process of disinvestments and privatization a new work culture is setting in with lot of modern technology and effective management system. This is viewed as an excellent opportunity. As new entrepreneurs with modern outlook enter the scene CMRI can take advantage by aggressively marketing itself.

Threats

Open Markets and Competition

A pessimistic but a more realistic way is to view liberalization as a threat as even the domestic market has been exposed to the outside world. Now cheap and better technologies are flooding Indian markets. This has become a matter of great concern and the institute has to face capable competitors.

CMRI faces competition from other governmental institute like ISM. CMPDI and private parties that are also engaged in R&D work.

Rigid Costing Structure

Industrial problems referred by clients are solved by CMRI on cost basis. This, however, is rigid and many a times customers are lost due to this. Cost is based on input that has two components: actual physical input, and intellectual input. Other costs include overheads and institutional charges. Physical input includes man days spent by scientist and other staff, consumables, raw materials, equipments, external payments, contingencies, travel expenses etc. Man day rates may vary according to grade and are fixed as

Scientists E II and above	Rs.3000 per day
Scientist B to Scientist E I	Rs. 2000 per day
Others	RS. 1000 per day

Consumables, contingencies, external payments and travel expenses are according to actual estimate. Estimating utility and equipment charge is subjective. Intellectual fee is estimated according to projected intellectual input.

Analysis and Interpretation

CMRI, as the name implies, is primarily carrying out research and development activity for mining industry. Specialisations are already there with CMRI in various disciplines of mining, which include Mining methods, Rock Mechanics and Ground control, Roof support system, Mine subsidence, drilling and blasting, Mine ventilation, stowing, Miner's health and safety, Mine mechanization, Explosive testing, Flame proof and Intrinsic safety apparatus, Miner's helmet and shoe testing, Mine water and mine air analysis, Preparation of mining plan, Mine surveying and subsidence control, etc. In each department, persons with long experience are retiring and it is must that they should share their experience with young entrants to make further progress. Simultaneously, CMRI should get apprised with modern microprocessor and sensor based instruments to perform the fieldwork more efficiently.

Presently, CMRI is in collaboration with Defence Research and Development Organisation (DRDO) to work in the areas of sub-zero mining and underground space technology of remote parts of India, especially in Kashmir. The institute is working on some new methods of mining like wide stall method of mining. Nitrogen-infusion to control fire is the area in which ventilation department of CMRI is making good progress. Recently, under Save Jharia Project, the institute has worked on war footing in controlling sub-surface fire in coal in Jharia Coalfield. All these activities are adding to the core competence of the institute and make the backbone of CMRI stronger day by day. Unless this core competence is refined and updated with time, CMRI will loose its standing in the areas of mining research. This will lead to loss of marketability of the institute not only in mining fraternity but also among its collaborators.

Strategies and Suggestions

Satisfaction of Customers' Needs

If customers' needs are to be satisfied, a close interaction between R&D and its potential clients is indispensable. No R&D laboratory can afford to exist in an ivory tower insulated from the commercial activity taking place around it. It is sometimes argued that since the scientist has to provide the intellectual output, he should not be burdened with commercial problems. In this case he has to rely on the marketing department to tell him what the customer requires. Or, in government laboratories, a separate administrative department is set up to interact with existing and potential clients for the transfer of technology. Neither of these systems is satisfactory since in both of them the R&D person gets only second-hand information. A more direct interaction of R&D with the market is highly desirable to get a better appreciation of the real needs of the customer. In order to do this successfully, the scientists who are otherwise capable need to hone their skills in the following areas-

Marketing and Public Relations.

Communications

Customer Relationship Management

It is these skills that will help the scientists to enhance the marketing capabilities of their R&D institution.

Diversification

In the present circumstances, development only in core area is not enough as far as credibility and self sufficiency of the institute are concerned. The institute has to take timely decision to diversify its activities in allied areas as per the needs of the customers. In past CMRI has also done it. After the Promulgation of Environmental (Protection) Act 1986, environmental consciousness in India grew exponentially and CMRI did not loose the opportunity to have its contribution in this area. By 1992, CMRI had well established Environmental Management Group with twenty scientists and fifteen technical assistants and supporting staffs. Different areas in which the work is on progress are air pollution and control, water pollution and control, noise pollution and control, Environmental Impact Assessment and Environmental Management plan, Soil quality testing Green belt design, etc. Good number of Environmental problems from mining and other allied industries are referred to the institute annually. At present Environmental Management Group is among the prime earning division of CMRI with largest technical and overall manpower. Thus, timely diversification of CMRI in the field of Environment started paying its dividend right from 1994 and has substantially contributed to the external cash flow of the institute.

A similar major diversification has been undertaken by CMRI in the IT sector. Role of information technology in mining sector is gaining momentum and accordingly CMRI has created a new department of information technology. Qualified persons have been recruited for it. However, it is still premature to judge its efficiency and its influence on mining industry. Modern mining communication system and early warning system are in development stage, and it is expected to be in market within two years from now. In a nutshell CMRI is keeping pace with time to make tactical diversification decision to maintain and to further improve its marketability.

Creation of R&D Need

Industry in general is always involved with day to day work. There are set procedures for almost majority of the work, wherein, an operator does the routine work under the supervision of some higher authority. In mining production and safety are the two key parameters of working efficiently. If a mine goes on continuously improving its production rate and meet the target set by the organization, then it is considered to be running on the right track. Similar, is the case with safety. A mine's working atmosphere and safety record are taken into consideration to evaluate its efficiency and its care for its employees.

Through R&D, the effort should be made to devise the ways and methods to increase productivity. CMRI has developed a number of new ground methods for extraction of coal in difficult deposits like fiery seams in Jharia. Similarly, new technologies have been developed by the institute for the extraction of mineral under difficult terrain conditions like that of the Himalayas. Mining at sub-zero condition is a prime research subject of Roorkee Unit of CMRI. The unit is making continuous progress in this direction.

Role of CMRI in Promoting Indian R&D

As a national laboratory, CMRI is engaged in development of mining methods with greater safety with economy and conservation and is one of the premier laboratories engaged in such work. CMRI is dedicated to the mining industry, so it has promoted Indian R&D in mining field by working on underground support system, explosives for open-cast and underground mines, methods of mining in coal and non coal mines and mine ventilation, to name a few.

Increasing Marketing of Indian R&D

With liberalization not only Chinese product but also technology has flooded Indian markets. Hence, there is an urgent need to take more initiative and also increase its brand value of Indian R&D institutions. Scientists should make wider use of Information and Technology, create a proper website and modernize the technology itself, which will help increase the marketing of Indian R&D. One step in this direction has been the acquisition of ISO certification by the CMRI. The CMRI is a premier R&D institution in the field of mining and allied technology, and acquiring ISO certification is certainly going to help the organization to enhance its brand

equity.

Given the existing infrastructure and goodwill, CMRI can make a strong market position in terms of mining technology. The institute is currently working for Ukraine and Nepal and many projects are on in the domestic market. CMRI has its patent filed with USA, UK, France, Germany and South Africa. ISO will help CMRI in competing internationally.

Considering the monopoly of US technology and bulk entry of cheap Chinese technology, India needs to redefine technology. We have been at a disadvantageous position because of governmental neglect and shortsightedness. After 50 years of independence we are still struggling to arrive. Our technologies need to be modified and overall R&D setup needs to be changes given a fresh impetus.

Liberalization has effected adversely in India's technology market. The country has limited R&D infrastructure as compared to other developed nations, and thus only limited technology goes abroad. But other developed nations have flooded Indian market with their technology.

In the era of globalization the survival of the fittest is the rule of thumb. Efforts must be made to increase market share in the present competitive market. Every aspect needs to be looked from quality point of view. Marketing has to be more aggressive and clients must be reassured of technical sophistication of Indian R&D and its capacity to deliver.

Conclusion

Due to development of scientific institution of higher learning India has been credited as being a store house of intellectual capital. Its contribution to intellectual output does not match its reputation. Individual genius fails to reflect as R&D output. And the reason is just one - weak marketing. Despite strong presence in NASA and even world renowned companies like IBM and Microsoft the country continues to lag behind in the field of inventions. We lack what is commonly called the killer instinct- the trait that gives the cutting edge. For making an invention knowledge alone is not enough. It has to be cultivated and put to use.

We all know that India has abundant technical manpower, high level of intelligence and scientific talent, great technology institution, large industrial infrastructure, natural resources and good value system. We have already made many accomplishments in agriculture through the Green Revolution, milk production through Operation Flood, telecommunication, satellite launch vehicles, nuclear power generation, guided missiles, super computers and advanced materials. Software engineering has become our core competence. Despite all the accomplishments, we have not been able to develop creative and imaginative thinking in our country. Creativity is not only the most important factor but a pre-requisite for making scientific inventions and innovations.

Thomas Alva Edison, who was granted 1,093 patents for inventions ranging from light bulb, typewriter and electric pen to his phonograph, motion-picture camera and alkaline storage battery had a career that illustrates how creativity can be cultivated. His methods reveal that the real keys to unlocking creativity are acquired traits- namely, perseverance and open-minded approach to learning. Edison used his creativity not only for developing new inventions but also for bringing them to the market and winning out financially over competitors.

In this context it needs to be seen why this sub continent has not been able to make many successful scientific inventions and most of the inventions from steam engine to super computers in the last two centuries were made in the West. Although there were people who innovated but there was no adequate acknowledgement or recognition of the work. Knowledge needs to be treated as an intellectual property or a marketable product and it has to be marketed. The R&D organisations must not only invent but market it.

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Positioning Retail Brands

G.P.Sudhakar*

Abstract

The primacy of 'positioning' retail brands for success is well established. The customer's image of a store is his perception of the store on various dimensions; and many of these dimensions are definite and specific to retailing. The article examines various studies relating to the dimensions, which consumers consider to position stores in their minds. This understanding helps in developing a differentiation strategy, and, adopting an integrated retail marketing communications strategy. An operational model that helps communicate the various aspects that are considered in positioning a retail stores, to students and executives, is proposed.

Key Words : Dimensions, Positioning, Attributes, Retailing, Tangible, Multi-Channel.

The customer's image of a store is his perception of the store on various dimensions; and many of these dimensions are definite and specific to retailing. The article examines various studies relating to the dimensions, which consumers consider to position stores in their minds. This understanding helps in developing a differentiated strategy, and, adopting an integrated retail marketing communications strategy.

What Is Store Positioning?

Positioning is about creating an image or identity for the Store. A stores position is, how potential buyers see the store. Positioning is expressed relative to the position of competitors. Martineau defined store image as "the way in which the store is defined in the shopper's mind, partly by its functional qualities and partly by an aura of psychological attributes." 6 "Positioning & Image: A third market determinant is the positioning & Image either consciously established or historically evolved for various outlets." The perceptual position a potential

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customer has about various stores, he/she can choose from, are the "Positions" those stores have in his mind. The customer's image of a store is his perception of the store on various dimensions, and many of these dimensions are definite and specific to retailing as indicated by various studies.

Immutable Attributes in Store Positioning

Martineau argued that retail organizations projecting an image close to the targeted customer's self image would, as a consequence, increase loyalty towards the store. An Indian study tells us how customers look at grocery shops differently from garment stores. Based on previous studies, and looking at retail brands as services brands we can come up with attributes for positioning a retail store. A model integrating the various attributes on which customers' base their 'positioning' of the store, is presented.

Other Aspects Discussed in the Paper Are:

Developing the Positioning for a Store

What is the positioning expressed by competing stores, and how do customers perceive them?

Positioning for a Consistent Multi-Channel Experience

Understanding the various attributes involved in positioning a store, will help retail brand builders take a holistic view of positioning. The relevance of every touch point in a retailing, in communicating to prospects/existing customers about the store is brought forward.

Need for Integrated Retail Communications

Every retail store enjoys a "Position" in the minds of its customer whether such positioning is a deliberate and planned effort or not. The advantages of well thought out and customer focused positioning has been well established. Retail success will need identifying the best position to occupy and integrating the various dimensions of store positioning, to create the desired position in the minds of customers/ prospects.

Further research needs to actually examine the "Position" occupied by the individual retailer in the minds of customers/prospects, and the likely multiplier effect of integrating the communication from various dimensions of store positioning.

According to Al Ries & Jack Trout (1986) :

"Marketing battles are not fought in the supermarkets, marketing battles are fought inside the mind. A mean and ugly place where the terrain is tricky and difficult to understand. Mapping the mental battleground can give you an enormous advantage."

What Is Store Positioning ?

Store Positioning is creating an image or identity for the Store. It is the 'place' a store occupies in a given market as perceived by the target market. Positioning is something that is done in the minds of the target market. A stores position is, how potential buyers see the store. Positioning is expressed relative to the position of the competitors.

Martineau P (1958), defined store image as, " the way in which the store is defined in the shopper's mind, partly by its functional qualities and partly by an aura of psychological attributes".

Prof. Jagdish N. Sheth Stated :

"Positioning & Image: A third market determinant is the positioning & Image, either consciously established or historically evolved for various outlets. Positioning refers to the specific merchandise price-performance combination offered by a retail outlet, to encourage certain target segments, and discourage others from shopping at that outlet".

The important role of positioning in marketing is well established. It is essential to think about positioning before the promotion, place, price, product, people and processes strategies are charted. The process of positioning starts soon as a target segment is established, and before resources are committed to merchandise selection, atmospherics, and communications.

Geoffrey Randell said :

"Think of some well known retailers: Marks & Spencer, Boots, Sainsbury's, IKEA, The Body Shop, Next and, Benetton. These are clearly all brands in the sense we have been using the word, some of them international brands. They have a very strong identity in their customers' minds; when we go to one, we have a precise expectation of what we shall find; what level of quality and what value proposition. They have their core values, expressed in everything they do: their range and assortment of goods, the design and layout of their stores, the quality and training of their staff in a phrase, the total service they deliver."

The perceptual position a potential customer has about various stores, he/she can choose from, are the "Positions" those stores have in his mind. The task of the marketer in positioning is aligning the "image" and "experience" to target customer needs. The customer's image of a store is his perception of the store on various dimensions, and many of these dimensions are definite

and specific to retailing as indicated by various studies.

Immutable Attributes in Store Positioning

"In Martineau's (1958) paper, it was suggested that retail outlets had, so far as customers were concerned, a 'personality' composed of functional and psychological attributes. Martineau argued that retail organizations projecting an image close to the targeted customer's self image would, as a consequence, increase loyalty towards the store. This assertion was later extended by Arons (1961), who proposed that there is a connection between a store, which is 'agreeable' from the customer point of view, and the number of times they will visit the store within a given period. Early work on the images of department stores in Arizona, USA, defined retail store image as 'the total conceptualized or expected reinforcement that a person associates with shopping at a particular store' (Kunkel and Berry, 1968, p.22); the authors also attempted to separate the overall image into twelve image components. A review of similar studies by Lindquist (1974), served to reduce these to nine key attribute groups (see Table 1). He concluded that store image is a complex concept, which is difficult to explore and manage; it is created by a combination of both tangible (functional) and intangible (psychological) factors.

Table I : Attributes of Store Image Derived from Early Research Work (pre-1974)

Most Frequently Cited Attributes	Other Attribute
Merchandise:	Service
Selection	Clientele
Quality	Physical Facilities
Price	Convenience
Styling	Promotion Store Atmosphere Institutional Post-transaction

In the view of David Mazursky and Jacob Jacoby,

"Lindquist (1974), summarized the results of 21 studies and identified 35 different aspects supposedly operating in store image formation. These were grouped into the following nine independent sets: merchandise, service, clientele, physical facilities, convenience, promotion, store atmosphere, institutional attributes, and post transaction satisfaction."

In India, in an interesting study by K. K. Taimni, first published in Economic and Political weekly "5" May10,

Table II :Consumer Preferences for Shops Selling Dry Groceries and Other Household Articles

Reasons for preferences in percentage	Monthly income of the household		
	Rs.300-500	Rs.500-800	Rs.800-above
Credit	24.6	9.9	8.3
Unadultrated goods	15.1	23.4	19.6
Fair Prices	29.6	16.3	13.6
Courteous and quick service	6.5	8.5	17.5
Nearer home	12.7	11.5	9.8
All goods available (No stock out)	3.1	12.6	7.2
Honesty and truthfulness	2.1	6.1	6.8
Just habitual	1.3	2.2	3.1
Neat and clean	2.5	5.9	4.5
Uncertain	2.5	3.6	9.6
	100	100	100

Table III : Consumer Preferences for Shops Selling Cloth and Readymade Garments

Reasons for preferences in percentage	Monthly income of the household		
	Rs.300-500	Rs.500-800	Rs.800-above
Credit	7.9	10.2	2.9
Fair prices	22.2	7.5	9.6
Courteous and quick service	1.7	3.1	9.2
Nearer home	12.3	4.5	4.9
Variety of goods	28.6	32.5	37.9
Honesty and truthfulness	3.2	8.6	2.5
Just habitual	3.7	4.2	2.5
Up with times	4.8	12.2	15.7
Patient staff	6.2	7.5	4.4
Willingness to exchange goods	1.2	4.5	
Congenial atmosphere	-	1.5	5.3
Uncertain	8.2	3.7	5.1
	100	100	100

1969, (35 years ago) 500 + customers were asked about their reasons for preferring a particular retailer. The following tables from the study indicate the dimensions and their ranking in those days. It also tells us how customers look at grocery shops differently from garment stores.

The comparison between the two tables primarily in terms of dimensions chosen, and then relative percentages is interesting and self explanatory. Variety of goods was rated as very important attribute in cloth

and ready-mades, whereas for grocery unadulterated goods (Quality of products) and fair prices were the most important attributes. Interestingly, credit was sought more for buying groceries than clothing; the possible reason could be that credit is more sought for repetitive purchases than irregular buying, especially for occasions. One expected finding is that people are willing to travel a greater distance for shopping goods than they are for convenience goods.

In recent years KSA (Kurt Salmon Associates) Technopark, a consulting organization has in India been tracking the retail sector "6". The table below shows

Table IV

Desperately Seeking Perfection
What Does the Consumer Look for?

| 1998	2000	2001	
• Value for money	• Quality of products	• Quality of products	HYGIENE
• Quality of products	• Value for money	• Value for money	FACTORS
• Saleman politeness	• Wide variety of products	• Wide variety of products	
• Exchange & return policy	& brand	& brand	EMERGING
• ESalesman non-	• Stock products of latest	• Stock products of latest	HYGIENE
interference	style/fashion	style/fashion	FACTORS
	• Salesman poiteness		
• Wide variety of products	• Exchange return	• I vave trust in the outlet	
& brands	Policy	• Products are marketed and	MOTIVATION
		displayed for my convenience	FACTORS

what customers are seeking from retailers.

Quality of Products and Value for Money have been essential requirements over the years. Time scarcity for shopping is another issue that is manifested as the need for products being marked and displayed for customer convenience.

The customers need, for feeling that the retailer offers a wide variety of products, have grown in importance over the last few years as per the KSA tracking studies. This factor, however, is dependent on products/category of outlet as per the study of K. K. Taimni. Many attributes listed in 1969 and 2001 are interestingly similar, though there are shifts in rank. This goes to show that attributes and their ranking change and new attributes come in as what customers look for. Retailers will need to keep track of demographic and sociological changes and tweak their positioning while retailing the essence of the brand.

Based on previous studies and looking at retail brands as services brands, we can come up with attributes for positioning a retail store.

Store Positioning - The Immutable Attributes

The relative weight ascribed to each attribute, obviously changes based on Product category/Type of Store (for
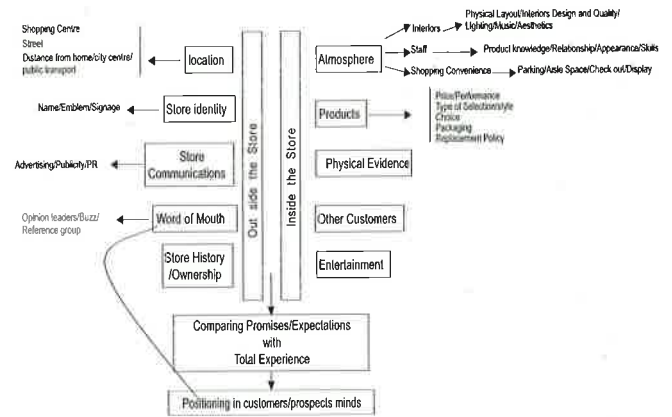
Figure

e.g.: entertainment may not be expected at discounters)/Purchase occasion and such factors.

Developing the Positioning

Having chosen a target market, understood competition, made an internal assesment one needs to identify "differentiators" to be able to develop positioning that ensures a unique place for the store in the minds of the customers/potential customers.

As positioning is always relative to competition; understanding how competition is perceived, is essential to determine desired positioning. The format of the store as perceived by the customer is the first attribute the customer forms an opinion about in comparison to competition. This also influences how the store is perceived on other dimensions. For example a while; a creche or food-court may not be expected at a discounter, but is a hygiene factor at a hyper-market. Similarly, the sales person at a discounter may not be expected to have as much product knowledge as a speciality store sales person.

Differentiation

The purpose of understanding the attributes, a customer considers to make a mental ranking of stores helps us in developing a differentiation strategy. In what aspects can the store be perceived more different/better than its competitors? What needs to be observed about competition? What is the positioning expressed by competing stores and how do customers perceive them?

Positioning for a Consistent Multi-Channel Experience

JC Penny has been in the news in India for having chosen India as one of the countries they will source products from. The positioning objective of this very large retailer is "We seek to provide our target customers with timely and competitive selections of fashionable, quality merchandise with unquestionable

day-in, day-out value. Within this positioning framework, we will begin with our target customers' point of view in developing merchandise offerings, quality standards, branding and pricing strategies, visual merchandising, and service levels. We will position JC Penny uniquely in a niche of our own by exceeding the fashion, quality, selection and service components of the discounter; equaling the merchandise intensity of the speciality store; and providing the selection and "under one roof" shopping convenience of the department store." This is a good example of positioning as expressed by the retail giant. It appears that JC Penny has been very successful in being able to position their e-commerce initiative in such a way that customers feel that the "Virtual" store is one more JC Penny store, and are responding very positively making JC Penny one of the top e-tailers in the world.

Understanding the various attributes involved in positioning a store will help retail brand builders take a holistic view of positioning.

Integration

Another purpose of understanding the various elements of positioning a retail store; is to be able to build consistency across the various dimensions to give customers a consistent image of the store\ The same as in the integrated marketing communications, where the various elements of the promotion mix, are integrated to communicate one message/brand personality. Every touch point in a retailing communicates to prospects/existing customers about the store.

Tom Peters has said, "In an increasingly crowded marketplace, fools will compete on price. Winners will find a way to create lasting value in the customer's mind." The benefits of creating brand equity are well known and researched. Brand equity is built on the foundation of "Positioning"; which Indian retailers will be forced to consider in building strategies in an increasingly competitive environment, where the Multi-National retailers are coming in with copious resources for building brands.

Every retail store enjoys a "Position" in the minds of its customer whether such positioning is a deliberate and planned effort or not. The advantages of well thought out and customer focused positioning have been well established. How a store is perceived and positioned, is based on numerous touch points, about each of which the customer can form an opinion and the composite view of all the touch points experienced about/at a store is likely to result in the "Positioning" of the store. Retail success will need identifying the best position to occupy and integrating the various dimensions of store positioning to create the desired position in the minds of customers/prospects.

Further research needs to actually examine the "Position" occupied by individual retailers in the minds of customers/prospects, and the likely multiplier effect of integrating the communication from various dimensions of store positioning. While the various attributes have been listed, further research is needed to understand the weight age or relative importance of each of the attributes. One hypothesis could be to consider 'value' as the most critical dimension.

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Is the Free Market Appropriate for Education?

Arundhati Sarkar Bose*

Abstract

In view of the fact that public endeavors are being replaced by private enterprises in almost all markets, and traditionally protected markets are being rapidly exposed to international competition, a look into sectors that were traditionally catered by public sector seems timely. Education is one such sector. This article looks into characteristics of the education service that are dissimilar to traits of other goods and services and attempts to find out the implications of privatization of education sector. Since privatization of this sector comes hand in hand with the free trade in education, and as free trade in education services essentially implies supply of education on a revenue earning basis, the implications of privatization and that of internationalization often overlap.

Key Words : Revenue earning, Distance learning, Virtual education institute, Educational software, Impediments, Collateral.

Introduction

Education, as many of us see it, is a service that holds a position of high honour in our hearts in relation to most of the other services; and so much so that we tend to doubt the ability of the market as a mechanism to distribute education in an ideal way (even though 'an ideal way' remains to be specified). But it is time now to question our belief. What is it about the 'market' that a service like education cannot be left to it for distribution, when the same can be done for many of the other services? Is our suspicion justified?

This is a time of change. This is a time when not only market is replacing the state as a way of distributing almost all goods and services, but also protected domestic markets are being replaced by markets with internationally competitive suppliers all over the world.

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Privatisation of education has taken steps from being a mere idea towards execution in many countries. The General Agreement on Trade in Services under the WTO has given opportunities for policy makers to open even services like education and health to the international markets. It is under this altering state of affairs that we make an attempt to explore the implications of provision of education through markets.

We present the debate and policy issues as connected to privatisation and trade in educational services. The debate focuses primarily on three connected issues, namely access to and quality of education that private vis-à-vis public education providers are expected to provide under a liberalised trade regime and the impact of privatisation on distribution of income. Education, being an instructional service, has not traditionally been thought of as tradable. However, with the General Agreement on Trade in Services in place, and Education being one of the many services proposed to be tradable, the issues related to trade in education also call for an examination. Trade in education essentially takes place with revenue earning / profit making as one of its objectives. Freely traded education is essentially not subsidised and rather runs on a revenue-earning basis. So the debate on traded education closely associate with the debate on publicly provided education, or those provided under a non-profit basis, vis-à-vis privately provided education for profit earning. The following sections of this paper attempt to trace the arguments, as obtained from theoretical literature on economics of education, with respect to provision of education on a profit-earning basis. Section 2 presents the development in the international agreement under WTO that is supposed to govern trade in education services and consequently influence the provision of education. Section 3 delineates the factors that dictates individual decisions /choices with respect to education services. Section 4 discusses how suppliers of education decide the price and quality of education to offer. Section 5 outlines the arguments on both sides of the debate on education provided with a profit earning and a non-profit basis with particular reference to the issues of quality of and access to education. Section 6 addresses equity and efficiency issues.

General Agreement on Trade in Services (GATS) and Trade in Education:

GATS specifies four ways in which service can be traded, known as the 'modes of supply', applicable to all service sectors including education. These modes are (mode 1) cross border supply, (mode 2) consumption abroad, (mode 3) commercial presence and (mode 4) presence of natural persons.

Cross Border Supply (mode 1) refers to the provision of a service where the service crosses the border but does not require the physical movement of consumer or producer. This mode involves provision of service from one country to another via telecommunication or mail. Distance learning, virtual educational institutions, educational software, corporate training through information and communication technology (ICT) are examples of trade in education services under mode 1 or cross border supply. Consumption Abroad (mode 2) refers to provision of a service involving the movement of consumer to the country of the supplier. This mode includes the exchange of foreign students and students travelling abroad to study. Commercial Presence (mode 3) refers to the supply of services, where the service provider establishes or has a presence of commercial facilities in another country in order to render service. Affiliated universities, satellite or branch campuses etc. are examples of commercial presence (Sauve, P. 2002) Presence of Natural Persons (mode 4) refers to provision of services by persons travelling to another country on a temporary basis. As for education services, professors, teachers and researchers working abroad on a temporary basis would be considered under this mode of supply.

The market for education services supplied under mode 1 (Cross Border Supply) is currently relatively small as compared to that under the other three modes, but is potentially growing due to the increasing use of ICT. Mode 2 (Consumption Abroad) till now has been the most used mode of supply, especially in the post-secondary education level. As for mode 3 (Commercial Presence) and mode 4 (Presence of Natural Persons), strong potential for future growth is predicted. Comprehensive information on the presence of natural persons and cross border supply is lacking. Mode 2 is by far the oldest mode of supply of educational services. Trade in education services under this mode (consumption abroad) has been increasing in the last few years for most of these countries. Japan, Macao China, Malaysia, New Zealand and Russian Federation show a strong rising trend in this mode. Export of educational services via mode 3 (commercial presence) takes place through affiliated universities or branch campuses, located in the country of consumption. Comprehensive information on the size and number of affiliated universities is unavailable.

Five WTO Member countries Australia, Japan, New Zealand, Sweden and the United States have tabled negotiating proposals, to date, on education services

under GATS. With a closer reading of the proposals, two broad observations can be made.

Firstly, all five countries consider trade liberalisation in education to be beneficial both for importing and exporting countries. These proposals view liberalisation in trade in education services as a means of enhancing access to a wide range of educational options and improving quality of existing programmes through a 'competitive stimulus'. Australia and New Zealand identify some of the possible benefits accruing from internationalisation of education. Such benefits include; (i) fostering knowledge and appreciation of language, culture and societies of other countries that benefit students both culturally and professionally; (ii) facilitating exchange of ideas, experience and people that add a richness of diversity at national and international levels and contribute to international cross facilitation of academic knowledge; (iii) networking relationships among individuals, groups and institutions that can facilitate future economic, political and socio-cultural alliances; (iv) facilitating transfer of technology and (v) generating revenue for both private and public sector institutions. Japan recognises the possibility of collaboration in research between universities in different countries.

Secondly, all four proposals recognise government as the supplier of fund for and administrator of education services and as a regulator of educational policies. The proposal made by Australia emphasises that governments must retain their sovereign right to determine their own domestic funding and regulatory policies / measures. Japan's proposal recognises that many WTO Members reserve responsibility on primary and secondary education to the State, and in the course of liberalising trade in this sector government policy objectives should not be ignored. New Zealand emphasises the need to strike a balance between domestic education priorities and finding ways to liberalise education. United States proposal recognises that education, to a large extent, is a government function and addresses itself to countries that permit private education to supplement public education.

The Other Concerns Expressed in the Proposals Are as follows

Australia identifies barriers to trade in education restricting further liberalisation in this sector under all four modes of supply. In the 'consumption abroad' mode of supply, three sources of impediments have been identified (i) visa requirement and (ii) foreign exchange requirement, regulating the free flow of international students and (iii) qualification recognition issues that deter students from joining overseas institutions. In the 'commercial presence' mode of supply, the impediments identified are (i) limits on ownership of foreign equity, (ii) lack of transparency in government regulatory policies and funding frameworks, and (iii) rules on twinning arrangements, which restrict the arrangement between institutions. Three impediments have been identified for the 'presence of natural persons' mode of supply. These are (i) visa issues and (ii) employment rules regulating the free flow of academics and (iii) restriction on the use / import of educational materials. The two impediments identified under 'cross border' mode of supply are (i) erection of new barriers as governments respond to growing use of Internet and (ii) restriction on the use / import of educational materials.

Australia further asserts that there are significant linkages between the regulatory frameworks governing the international trade in education services and those in other service sectors. Australia proposes that education services negotiations should be viewed within the context of a comprehensive 'service round'.

While Australia urges for removal of trade barriers under different modes of supply, it nevertheless proposes that the Member countries should be allowed to continue to determine their right to screen for temporary entry immigration purposes.

Japan's is the only proposal to express concern about the quality of education that is expected to be available in a liberalised trade regime. Japan emphasises that for any measure in the education service sector, the primary interest should be in maintaining and improving the quality of the service. This proposal makes three distinct points concerning quality of education services and accreditation. These are

1.   Due consideration is required to formulate measures to ensure protection of consumers (learners) from low quality service.

2.   Measures should be formulated to ensure international equivalence of degrees and diplomas offered by universities of different countries, of the same university in different countries and of the same university, but supplied under different modes of supply.

3.   Because of differences in social background and the way education systems have been developed in different countries, educational systems and their administrative structures vary from country to country. Liberalising steps of trade in education should be coherent with structures of educational system in each country.

The proposal tabled by New Zealand recognises that education is a 'less committed' compared to other

service sectors because of the 'public good' element and the 'high degree' of government involvement. This proposal invites commitments in sub-sectors that may be less subject to sensitivities relating to the division between public policy and commercial activity than others. New Zealand suggests that an improvement or alteration in the classification of education services would facilitate identification of such services. The definition of 'adult education services' not elsewhere classified, and 'other education services' as classified in the Central Product Classification (adopted in GATS education services) is residual in nature. The present definition of these categories offers little guidance as to the range of services it is intended to encompass, and does not acknowledge the changes in the delivery of some education services. New Zealand proposes that these shortcomings might be addressed through the addition of an illustrative list to the present categorisation. This proposal identifies another source of ambiguity in the coverage of education agency services like student recruitment and placement services. New Zealand proposes the addition of 'agency services' into the present categorisation.

The United States proposal is restricted to concerns related to 'higher education', 'adult education' and 'training'. The use of information technology in educational services has expanded the scope of higher and adult education and training services as well as testing services. Such services constitute a growing international business supplementing the public education system. This proposal emphasises the importance of these services in enhancing productive efficiency of workforce. Like New Zealand, the United States expresses dissatisfaction with the present system of categorisation of education services adopted by the Council for Trade in Services. It proposes that coverage should clearly indicate that the two types of services; training services; and educational testing services, are included as part of the concept of education.

India's Commitments to the WTO Member Countries on Education:

As far as Education Services are concerned, India has made commitments of providing **Market Access** to foreign suppliers of Higher education only. Till now no commitment has been made with respect to primary, secondary, adult or any other levels of education. Even in Higher education, where commitments to market access have been made, are not unconditional. It is asserted that foreign higher education service providers under mode 1 (cross border supply) would be subjected to regulations as they are subjected to in their country of

origin. No condition has been imposed by India on foreign universities accepting Indian students, as India is an old participant in import of higher education through the "consumption abroad" mode. As far as the supply of education services under mode 3 (Commercial Presence) is concerned, India has promised to provide market assess to foreign suppliers if the fees that they would charge are fixed by an appropriate authority and if such fees do not lead to charging capitation fees or to profiteering. Market access that India provides to the suppliers of foreign education under mode 4, that is, through temporary movement of professionals, is very limited and subject to 'unbound' limitations. Commitments with unbound limitations imply that conditions could be formulated any time in future and practically constitute "no commitment".

Apart from commitments related to market access to foreign service providers, member countries of the WTO also have to make commitments related to **National Treatment,** that is whether foreign service suppliers would be treated as favourably as the domestic suppliers of services, as in the case of market access commitments, India has made national treatment commitments only for higher education services. India has made commitments that foreign education suppliers through mode 1, 2 and 3 would be treated at par with domestic education providers. But GATS does not require member countries to treat foreign service providers as favourably as the domestic service providers through public service units. Therefore, India's national treatment commitment for education services supplied under mode 1, 2 and 3 implies that foreign education suppliers under these modes have to be treated as favourably as the private higher education suppliers and not as the public suppliers of higher education. Similar to the market access commitments, India has left options for 'unbound limitations' on national treatment to the foreign higher education suppliers through mode 4.

Implications of the GATS &, India's Commitments on Education Services Under WTO on Privatisation of the Education Sector:

We have seen above that as a member country of the WTO, India has made commitments to provide market access to foreign suppliers of education and also to provide national treatment to them. Such commitments have been made, though not unconditional, to education providers who would consider supplying education to the Indian market through the web, by accepting Indian students while being on their own soil

and / or by setting up an affiliated campus on Indian soil. Given the assumption that these service exporters will look for revenue while exporting education, it is easy to see that in the near future Indian higher education sector will see some new unsubsidised affiliated campuses coming up or new education providers operating on the internet on a revenue earning basis. These trends reinforce the present trend towards privately provided education in place of publicly provided education in many of the sub-sectors in education sector.

Individual Educational Choices

An individual or his family on his behalf, at different stages in life has to make decisions with respect to different educational options. The options are with respect to:

1.   Whether to pursue a particular stage of education;

2.   Which educational programme to choose; and

3.   Which educational institute to join.

Education, from the point of view of a student, is an investment and consumption at the same time. In terms of the first and the second option, that is in order to decide whether to pursue a particular stage of education or a particular programme, a rational individual will decide positively if the present value of the associated benefits, discounted at an appropriate rate, are at least equal to the sum of present discounted value of the direct and the opportunity cost of doing so. The present value of benefits can be divided into two basic components; the expected value of stream of increased earnings that accrue form education, and the value of direct psychic consumption benefit from undertaking this activity either during consumption or in the future. The direct costs include charges such as tuition fee etc. The opportunity cost in turn will be the wage that could be earned at the best alternative job during the time spent in attendance at school or college.

With respect to the question on which educational institute to join, an individual is rationally concerned about the quality of the various institutes that he can get admitted to, given to his abilities and the tuition charges that he will have to pay. This quality of institutes that the prospective students are concerned about is purely a matter of perception of the student, and may not adhere to government's perception of quality of educational service. For example, a student might consider an institute as provider of good quality of education if the student quality of the institute is good, as a good peer group is conducive to better learning. Such perceptions can exist only for someone who is involved in the transaction of the service. But from the point of view of the government or any third party involved in the transaction of the service, a good quality of education would imply a sizeable collection of books in the library, decent computational and informational facilities or a competent set of teachers. It is not that these latter facilities are any less important to the students; rather it is the third party (or government), which might ignore the importance of good peer group as a contributor to good learning. Even though, most of the time we find that institutes that have good facilities also teach a more able set of students, it is useful to distinguish between the different factors that affect the quality of education and relative importance of each of them conferred by different groups of individuals.

It is sometimes alleged Henry Hansman (1980), that consumers of educational services may be uninformed about the quality of education they are buying, at least prior to the transaction. So, some features of the institution serve as a proxy for institutional quality from the point of view of students. Some of the most common such features are academic / intellectual abilities of other students in the institute and the educational facilities provided in the institute Rogerson and Farnandez (1996). Empirical findings, Brewer, Edie, Ehreuberg (1999), Summers and Wolfe (1977) in fact, support the claim that resource and peer quality of institutions have positive correlation with the future earnings of students, given their own abilities. In case, the objective of obtaining education for a student is to enhance future earning prospects, the student may perceive the attributes of an institution that can be positively associated with higher future earning of students as contributing to the quality of the institution itself.

The Decision of the Supplier of Education Services

In this section we will focus on the price, quantity and quality choices of universities or educational institutions. How universities behave in these regards depends primarily on whether the educational services are provided by the university concerned with motive of earning profit or not. Profit earning may be a usual motive for private firms in other industries, but a large section of the educational institutes are exceptions to this phenomenon.

Let us elaborate on how non-profit educational institutes make price, quantity and quality choices. It is not claimed that non-profit organizations do not ever earn revenue larger than their total cost of production. Rather they satisfy a "Non-distribution constraint" Henry

Hansman (1980), Winston (1999). That is to say that there is no outsider to whom the enterprises can legally distribute those profits, like firms distribute profits to its owners. A non-profit organisation has no owners — it owns itself. Of course, the behaviour of a non-profit organisation must respect the fact that its total costs cannot long exceed its revenues. Winston (1999), attempted to explain the reason behind such dominance of non-profit 'firms' in the education 'industry'. In a market where customers are little informed about what they are buying, they might feel that they are vulnerable to poor quality education by organisations running on profit motive. The non-profit structure of suppliers is expected to reduce suppliers' incentives for the opportunistic behaviour. Hence, consumers grow preference for non-profit suppliers.

There are two broad categories of sources of revenue for non-profit institutes. Donated revenues or contributions from charities (or subsidies) and commercial revenues. Donated revenues are the result of various charitable motives of their donors. Such motives include a dedication to equal opportunities under the belief that education is a human capital investment, access to which should not be restricted, an appreciation of the externalities of educated citizenry, an alum's sense of obligation to repay past subsidies, a desire to improve the reputation of ones own institution and to "bathe in the reflected glory of an improving alma mater" Winston (1999), commercial revenues, on the other hand, are primarily earned in the form of tuition receipts and research contracts.

In contrast to profit firms, non-profit education suppliers can and often do sell their product at a price below the average cost of its production. This has been a defining characteristic of non-profit organisations in education sector all over the world.

Lets us now turn to the quality and quantity choices of non-profit educational suppliers. Any educational institute that has access to revenue either in the form of charitable revenue or subsidies can charge a price below average cost, but it will do so only if this sort of pricing serves towards fulfilling at least one of the institutes objectives. The objective of profit maximising institutes is obvious. It is difficult to say, what objective non-profit organizations serve. But, improvement or maintenance of reputation surely is a driving force behind many non-profit educational institutes and determines their choices with respect to price, quantity and quality.

Any supplier interested in its reputation among prospective students is likely to act on enhancing what students perceive as quality of education. The 'technology of production' of instructional educational services, is such that customers are used as inputs. Better is the quality of customers, better is the quality of production, given the quality and quantity of other inputs. Different customers bring in different measures of students quality. This is why institutes have strong incentives to care about the identity of those whom they sell their services to. Institutes are able to do this through creating an excess demand and selecting those who possess higher measures of the desired qualities. This is possible if the tuition fee that non-profit supplier charges is less than the market-clearing price. Tuition fees of these institutions are thus not market clearing prices of educational service, in the sense that they do not indicate scarcity of a product and willingness to pay to the consumers.

Below-cost-pricing, in fact, is observed to be the pricing behaviour of many reputed institutes of higher education in the United States. Winston (1999), shows that there is, in fact, a negative correlation between the rank of a university in the US and the price / cost ratio, and a positive correlation between average student quality (measured by mean SAT score), and the average student subsidy that these institutes receive.

As far as the pricing of education service is concerned, discrimination of price among students is also a practice worth mentioning among educational institutions, public or private, for profit or not for profit. Transferring part or all the tuition charge, living costs of some students in the form of scholarships, cash grants, providing industry sponsorship and tax relief on certain kind of educational expenditure are various forms of price discrimination. It is to be noted that the price discrimination is different from the way a profit-maximising firm would discriminate prices between consumers with differing elasticity of demand. As we have mentioned, production of education services involves technology that uses customers as inputs, and the presence of some students may be especially desirable to the school / university over others. Larger the proportion of students of a higher quality present in the class, better would be the quality of education as perceived by the consumers. Therefore, any educational institutions, with some concern about the quality of its service or its reputation would like to draw higher quality students or more able students by asking a lower tuition from them.

Quality of Education Provided by For-Profit and Non-Profit Providers of Education

The previous section indicates that non-profit educational institutes / suppliers are able to, and often

do offer education service at a price lower than that of the market clearing price, thereby creating excess demand for their services so as to select higher ability students and provide a peer quality that would enhance the overall quality of service, given qualities and quantities of other inputs. Does this imply that for profit education suppliers provide poor quality of service than non-profit suppliers? Before we attempt to find an answer to this question, let us explore the meaning of educational quality and the ways to compare the qualities of the educational services offered by the suppliers.

Quality of a product is judged by its "fitness for purpose" i.e., by deciding if the product fits some predefined purpose. This definition of quality is commonly applied to products of the manufacturing industry. There are some problems in applying this definition directly to education. To adjust the "fitness of purpose" definition to the needs of education, one needs to specify the variety and purpose of education. Agreement on what purpose of education should serve is probably not possible. The consumers, the 'industry' that employs the graduates, and the government may have different notions of the purpose of education. The industry's view about purpose of education is possibly to produce graduates who can "communicate and cooperate" with others, "solve problems", "contribute to the organization's output" and have the social skills to perform well as a member of the team" Montmore and Stone (1990). In consumer's perception, the purpose of education is possibly to enhance their future earning and provide psychic benefits both during and after acquiring education. The government's perspective about purpose of education may be to enhance aggregate student achievement. Purpose of higher education also includes acquisition of knowledge on which to base professional judgments, building of a value system against which to make personal, social and moral judgments etc. Wicks (1992). Whether achievements of these purposes are difficult to observe and whether they are measurable or not, is questionable. Even if they are, the measure is more likely to be accurate the later in life that it is taken, and the whole effect is probably most accurately measured in retrospect.

This discussion suggests that if it is necessary to use such a term, as quality for educational services, it has to be done with caution. Educationists Montmore and Stone (1990), suggest that there is no uni-dimensional measure of quality and it is possible to discuss the quality of different components of education. Some of these components can be measured and their quality assessed. Montmore and Stone (1990), suggest four of such measurable components:

1. Pedagogy or Quality of teaching,

2. Resources available to the institute,

3. Achievement or outcomes measured by the results of tests taken by the students,

4. Subsequent achievement of students measured by employment status investigated after some years of leaving the institution.

The literature on economics of education, while debating about the possible quality of education offered by educational institutes running on a profit motive vis-à-vis a non-profit one refers sometimes to teaching quality, sometimes on students or peer quality and in other instances to students' achievements.

Adam Smith was probably the foremost of all economists to analyse quality of performance of educational institutes. Smith primarily referred to teaching quality as the quality of education and in this connection compared the educational systems of Scotland and England. Scotland's educational system was relatively market dependent where teachers' income depended on the number of students they could attract, while English schools were supported with endowments. Smith believed that the quality of teaching in a market oriented education system would be better than that offered in a non market oriented system, because the former would produce attributes required by the students and the latter attributes decided by the donors. Smith's notion of educational quality adheres to consumers' perception of quality. His argument is based on the assumption that consumers possess perfect information about, and can judge the quality of education, and donor's perception of quality differs from that of the consumers. This argument was contested by J.S. Mill, who pointed out that consumers of educational services are often not aware about the quality of the service they are buying and hence, cannot influence the teaching quality through their preferences. Even if consumers are well informed and are in a position to judge teaching quality, whether teaching quality in institutions with endowments (private donor grants) is higher than in those without endowment, depends on the extent of donations that depend on teaching quality. In case donations respond positively to teaching quality, endowments do not insulate teachers from market forces.

Brown (2001), has noted that for institutions of higher education, which are jointly involved in research activities and teaching, a very common criticism of provision of endowments is that increased research activities divert attention away from undergraduate

teaching. This argument holds only to the extent to which teaching quality and research activities are substitute. Comparison between research activities and teaching quality would reverse the argument in favour of endowed institutions.

This discussion suggests that whether endowments (public subsidy or private donations) raise teaching quality or not, depends on the extent to which they are connected to the consumer preferences and the extent to which consumers make informed choices.

Quality of education, as we have noted above, can also be measured by the resources available to an institute. For a given level of earning from tuition charges, endowments raise the amount of resources available to an institute. In that case, subsidised institutes would be expected to deliver a better quality of education, as measured by the amount of resources available. In case, tuition levels are lowered as a response to increased endowment, quality of education is not necessarily be expected to be higher in endowed institutes. In institutions appropriated by the state, subsidy is used to set tuition levels below average cost of production. In order to satisfy the preferences of the median voter, state legislators have an incentive to make education available to as many of their constituents as possible. In that case, while subsidies may successfully increase educational access, they are likely to decrease the average quality of education measured in terms of resources per student. For institutions, receiving government funds, but not under direct appropriation of the state, the pressure to increase the number of students and satisfy the preferences of the median voter is less intense.

We have noted above that another way of assessing quality of education, offered by an institution, is to assess the achievement of its students either in the examination at the end of the curriculum or after some years of leaving the school. Economic theory, in this area, views student achievement also as achievement in the labour market, measured by future earnings. It is assumed in economic theory that achievement of a student in the labour market has a bearing on the years of education and quality of education. How far this assertion is true is a matter of debate, which will be briefly discussed later in this paper. For now, let us stick to the assumption that student's achievement is positively related to school quality. Epple and Romano (1998), and Basu (1989), formulated models supposing peer quality as the quality of school, and that quality of school affecting 'student's achievement' positively. Thus, a better peer quality implies superior quality as measured by 'students' achievements in their models.

Basu (1989), explains how a profit maximising behaviour determines the quality of a school as assessed by its peer quality. Epple and Romano (1998), explored a school's quality choices under a competitive market structure with an alternative choice of a free public school for the students.

A profit maximising school chooses the quality of students, so as to maximise profit. Consumers should be willing to pay a higher price if a school is offering a better quality. When the quality of school is assessed by peer quality a better quality of a school can be obtained by choosing a set of students of ability above a certain level. A profit seeking school then, would like to choose to admit the best available student, charge whatever that student is willing to pay, and thereby, making the private school sector consisting of large number of schools with one student each. But, given that building and operating a school requires fixed costs, the size of schools are either fixed by capacity constraints or determined by the minimum average cost of production. A school would then like to fill in as many seats as possible so long as the number is less than or equal to the 'size' of the school. To explain the behaviour of a profit seeking school in simple terms, let us assume that students are divided into two categories 'clever' and 'mediocre'. To offer a high peer quality of the school, only clever students should be admitted. In that case, a high price can be charged. But, in a class divided society all clever students may not be willing to pay the same price. Let us further divide the students into rich and poor classes so that we have effectively four categories of students The clever rich (cr), the clever poor (cp), mediocre rich (mr) and mediocre poor (mp). The high-income families are likely to be willing to pay a higher price than the poor, either because the rich have access to 'cheaper' money, Basu K, (1989), or they may be able to utilise education to achieve more than the poor of same ability Epple and Romano (1998). Thus, a profit seeking school would like to fill in all its seats with students who are both clever and rich. In case, the number of clever-rich students willing to join the school are not large enough to fill in all the seats then the school admits all the rich clever students. The rest of the seats can be filled in either (a) by some clever-poor students or, (b) by some mediocre rich students or, (c) by admitting some of both. Option (a) will result in a higher peer quality and induce students to pay more. Option (c) will pull down the student quality. In absence of price discrimination, the presence of poor students (in case option (a) or (c) is chosen) will pull the price down to the level that the poor students are willing to pay. Option (b) will result in a lower peer quality but presence of only rich students will push the price up given that peer quality.

Which peer quality the school will offer depends on the disparity between the 'willingness to pay' of the rich and the poor and the responsiveness of price to quality enhancement. Note that mediocre poor students will not be admitted since they reduce the peer quality and are willing to pay lower price than their rich counterpart. If schools are allowed to discriminate price, they will then stick to option (c) and charge discriminatory fees from rich and poor students. The presence of clever - rich and clever - poor students will enhance quality, thereby, raising the willingness to pay by all students and hence the profit. The price that the mediocre are willing to pay rich will compensate for the lower price that the clever yet poor students pay. This kind of price discrimination internalises the externality that clever - poor and mediocre - rich students create within the school, Rothschild and White (1995).

Basu's exposition suggests that if schools cannot engage in price discrimination, profit seeking activity leads to lower peer quality schools, if disparity between the rich and the poor in terms of their willingness to pay is large. In this circumstance, if price discrimination is allowed, profit seeking behaviour of schools can lead to a better peer quality than under uniform pricing.

It should be noted that the possibility of price discrimination arises only if number of clever-rich students in the society is less than the total number of students that the school can admit. This assumption is unlikely to hold, especially in populated countries. Moreover, whether an applicant is considered to be 'clever' or 'mediocre' might also depend upon the economic background of the applicant. In case the merit of a student is assessed from his performance in examinations taken prior to admission in an institute, a student with a favourable economic background may appear to be 'clever', whereas a student with a poor economic background may appear to be 'mediocre'. In societies where education is obtained for a price and economic background of families have any bearing on the time and effort the child puts into education, it is likely that a large proportion of rich students are 'clever' than that of the 'mediocre' and the converse is true for poor students.

Now, the question is, will a for-profit institute provide a better quality of peers than a non-profit public school? The answer would depend on the objectives government serves through the education system. Epple and Romano (1998), postulate that public schools are meant to provide education to all students irrespective of their family income levels or ability. To that end, public schools offer free education and all students can be admitted to the collective of public schools. Thus, in absence of any other school, quality of public school, as measured by peer quality, is the average quality of all students. With this sort of a public school system, if private profit-maximising schools are allowed, such a school will provide a better peer quality than the public school, by choosing to admit students with high abilities to fill in its seats. It might seem surprising that students with an alternative choice of free education will choose to join the private school where they will have to pay a price. This is feasible as the private school chooses to offer a better peer quality than the public school.

As soon as a private school selects students from the top of the ranking of students according to ability, the peer quality in the public schools is expected to fall further below compared to what it was in the absence of the private school. Such a market allows new private schools to enter the market. As long as they can result in a peer quality that is better than the public schools, there will be some willing students to take admission and pay a price. Epple and Romano's proposition supports the concern that private schools will operate to the detriment of public schools by siphoning off higher ability students from the prospective pool of applicants. Epple and Romano also show that if privatisation of schools are allowed, it will result in a school system with private schools, arranged in a hierarchy of quality. Each school will choose students with different income ability combinations rather than the other schools and no two schools will offer the same peer quality. If there are two schools sharing students from the same income ability combination, one will gain by moving to a group with a lower income but the same ability or with a lower ability but of the same income level.

This assertion of Epple and Romano that profit-maximising schools will be of a better quality, has a bearing on the assumptions that public schools admit all students, since the government is not concerned about the quality of public schools as long as they provide education. It is not obvious why public schools cannot sort students according to their ability as the private schools do.

Issues of Equity, Access and Efficiency

The market mechanism distributes commodities on the basis of a market price. The market price indicates the degree of scarcity in the supply of the commodity and the consumers' willingness to pay. Any individual with a willingness to pay less than the market price, is unable to access the commodity, whereas any producer of the commodity who cannot produce it at an average cost

less than or equal to the market price ceases to be a part of that market. International trade in any commodity, including education, occurs with a purpose of earning revenue. Implementing free trade, with no intervention of the government, leads to the adoption of the market mechanism. This is true for any sector including education. The normative concern about applying the market mechanism is whether such mechanism results in an efficient allocation and equitable distribution of educational services. There are some features of educational services that compel economists to reconsider the efficiency and equitability aspects of the market mechanism for this particular sector. This section delineates the efficiency and equity effects of application of the market mechanism to the education sector vis-à-vis system of below-cost-pricing.

Application of the market mechanism to the educational sector would mean that educational services would be allocated to consumers according to their willingness to pay. An individual's willingness to pay for education is determined, among other factors, by his ability to pay and the consumption benefits and investment returns he expects by receiving education. In that sense any positive price of education, would eliminate those consumers (students) from the market, who are not able to pay that price. A reduction in the price (tuition) of education makes it accessible to a greater number of aspiring students. A profit-seeking supplier of education, who does not discriminate price, would not charge a price below the average cost of production. As we have discussed in the previous section, a profit-seeking supplier of education may discriminate price, if such price discrimination improves the peer quality and thereby, allows the supplier to raise prices charged from students with better economic background, or with lower ability. It was pointed out that such pricing behaviour is possible only if the number of 'able' applicants with favourable economic background, in the society, is less than what a school can accommodate. Hence, if education is supplied only by profit seeking suppliers and the number of 'able' students who can pay for average cost are larger than what schools can accommodate, access to education would be limited by the average cost of production. It is more likely than not that number of 'able' students with favourable economic background in the society is larger than what an institute can accommodate. Therefore, price discrimination by profit earning institutes can be considered to be less likely. *Even if a profit maximising institute admits some students at a price lower than the average cost, access

will be limited to only a few financially poor students with ability higher than the average peer quality of the institution. In such a situation, state financed and subsidised universities, or those with donated endowment, can charge a price below cost from all students and thereby, make education accessible to students who cannot pay the market price but can pay the subsidised price. The extent that this price can decrease below cost, is limited by the subsidy or endowment available to the university. In countries, where government aims to provide access of higher education to all qualified students, the adverse impact of limitations on subsidy is mainly on quality (measured by resources available to institutes) of state financed institutes (for example, in USA). In countries where qualified students are selected for higher education so that a high quality system could be maintained (for example, in UK), the subsidy constraint affects access for students with lower ability, Barr (1993).

Thus, a market price for education is likely to limit access on the basis of parental income, and a below-cost-pricing system with limited subsidy or endowment, either limits access on the basis of performance at the end of the previous level of education or limits the quality of education (measured by resources used on each student). Both systems can limit access to education and governments have to make a choice between the two. This choice should be based on the objective that the government would like to cater to. The objectives of equity and efficiency are two most common concerns of economic theory. We take up these issues in the following subsections.

Equity in Distribution of Educational Opportunity and Income

Inequality in opportunity for education can result from differences in material inheritance, differences in genetically determined ability as well as from differences in family background. Education system with a market determined price is certainly less effective than the system with below-cost-pricing, in correcting inequality of opportunity arising from differences in material inheritance. Very few would argue either for the equalisation of opportunities across genetically determined abilities, (or for the means to do so), as far as opportunities for education are concerned. To the extent, unfavourable family background for educational performance and lower family income can be correlated, the market determined pricing system is less effective than the below-cost-pricing system in

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* Though provisions of scholarships etc. are not unusual in education at all levels, how much of that is a consequence of profit maximising behaviour is doubtful. Building or enhancing reputation is an important consideration among educational institutes. Grant of scholarships etc. act as instruments towards that end.

correcting inequality of opportunity arising due to differences in family background. Differences in family income can cause inequality in educational opportunity, if capital market for education loans function imperfectly. To the extent that they do, equality of opportunity can be achieved not by pricing below cost but by directly addressing the capital market, even without a system of below-cost-pricing.

As for the distribution of income, it can be argued that the market mechanism is an inferior choice than the subsidised or below cost pricing system, to the extent to which higher education causes higher earnings.

Whether education causes higher earnings is a debatable issue. Correlation between higher personal earnings and more years in schooling are frequently observed, though may not be a universal claim. The proponents of the "Screening hypothesis", Bowles and Gintis argue Mark Blaug (1985), "effective performance in most jobs depends very little on directly usable cognitive skills acquired in schools and much more on certain non-cognitive personality traits. Moreover, these personality traits are also rewarded in the class room and hence, are systematically encouraged by the educational system". It cannot be denied though that many professional qualifications do involve elements of cognitive knowledge that is indispensable to the job. The "screening hypothesis" asserts that employees face considerable information costs in recruiting workers and assigning them appropriately to different tasks; educational qualification acts as a signal to prospective employers about the applicants productivity. Thus, according to this hypothesis, higher education can be associated with higher productivity and higher earning but does not cause it. The 'human capital theory' Becker (1964), in contrast, envisages education as a cause of enhanced productivity, and hence, higher income.

To the extent, acquisition of education causes increased earning of those who acquire it, subsidising the results in an increase in earning of the individual, who would not have been accessed education with a market determined tuition fee, relative to what it would have been in the absence of the subsidy, although not necessarily in relation to others. In this sense, the below-cost-pricing system vis-à-vis the market determined tuition fee, results in lesser inequality in future income.

There are several counter arguments to this. Consider a tax financed subsidised education system, where subsidies are financed by tax collected from all income strata. Such a system, would distribute income from low-income groups to some future high-income groups,

if higher education were associated with increased future earning for those who have acquired it. It is advocated that a 'graduate tax' system would improve distribution of income Garcia Penalosa and Walde (2000). A 'graduate tax' system can be characterised by a subsidised education system, where high earning university graduates pay a proportional income tax, and more than compensate for the subsidy they received.

Efficiency Issues Connected to Market Mechanism in Education

This section attempts to outline some of the features of the 'educational services' that explain why the market determined price for education may fail to generate socially optimal outcomes. It also identifies the factors that prevent the subsidised pricing of education from achieving certain social objectives.

If households and firms act perfectly competitively, the market mechanism generates Pareto efficient outcomes in absence of externalities and uncertainties. Literature on economics of education identifies chief characteristics of the education sector that may cause the market mechanism to yield socially (Pareto) inefficient results. These characteristics are:

1. Presence of externalities

2. Uncertainty in human capital investment and

3. Intergenerational welfare comparisons that may not be adequately made in current generation markets.

Production and consumption of education involve external benefits, arising in two ways. Firstly, the society as a whole gets benefit from what can be called an 'improved citizenship' of the 'educated'. Secondly, assuming education enhances productivity, and hence future earnings of the educated, the future generations benefit from their increased tax payments. Given that parts of these benefits do not accrue to those who invest in education (that is the students), under a free market, demand for education may be less than the social optimal level.

Another reason that demand for education is deficient, compared to socially optimal level, is that there are a number of uncertainties involved in investing in human capital, arising from the nature of educational production and lack of information about the aggregate demand, and its composition, for educated labour in the future. In the absence of these uncertainties, students would be willing to invest more than what they invest in their presence. From the perspective of students, uncertainties arise from two sources. One source is the instructional nature of the educational production. In such a system of production, the student remains

unsure about whether he has the abilities to get benefit from a particular curriculum or not, and if at all, how much benefit he can get. The second source of uncertainty is lack of information about future demand for labour graduating from a particular curriculum / programme. In absence of this information the student remains uncertain about his future earning and employment prospects.

The risks associated with the above mentioned uncertainties, call for some market intervention if such risks cannot be exchanged for a market price, i.e., if the market fails to provide insurance to the holders of those risks, or when it provides insurance, it does in a limited way. Nerlove (1972), points at the asymmetry of information between the student and the prospective insurance company, as a reason for the existence of this failure. There is a 'moral hazard' problem associated with the insurance contract. This arises, due to the possibility that the insured might not take up a job that is monetarily remunerative. This problem arises because, the event of not obtaining a remunerative job may be the result of some 'unavoidable risk' against which the student is willing to insure herself, and / or the 'decision' to take up a job with higher non-pecuniary psychic benefits compensating pecuniary losses.

The market mechanism, in presence of uncertainties, for the above-mentioned reasons generates a deficient demand for education as compared to the socially optimal level, unless the high risk involved in educational investment is accompanied with high return. Lower uniform tuition charges is a traditionally prescribed policy that is claimed to raise students demand for education by reducing the cost of education, and thereby raising the net return on educational investment. Merit scholarships have similar incentive effects on educational investment of students with superior academic records. Since, admissions with uniformly subsidised tuition fees and merit scholarships are based on past academic performances, certain other kinds of 'moral hazard' problems can be associated with such form of government intervention. Students have the choice of putting different levels of effort on education, once the 'contract' of scholarship or subsidised tuition charges is granted. In that case educational production would be unable to raise the productivity of educated labourers for the labour market, to the extent that they do, in absence of the moral hazard problem associated with below-cost-pricing.

The moral hazard problem of subsidised tuition charges and scholarships exist as long as the students are not made liable to a repayment of the subsidy. A 'graduate tax' imposed on those who acquire higher education is expected to put the required liability on the student paying subsidised tuition charges, (Garcia Penalosa and Walde 2000).

The government intervention, in the form of a subsidy or a combination of subsidy and graduate tax, would not be required to overcome the deficiency in demand as compared to the socially optimal level, if capital markets (those for student loans) operated perfectly. But such a market does not operate perfectly due to problems arising from uncertainties mentioned above. Lack of information about future job market, and / or about one's own abilities to benefit from what education sector provides, inability to trade the 'degree' in case of a failure to succeed in the job market, are some of the factors that restrict students from borrowing when repayments are independent of 'success' in the job market. On the part of lenders, lending for investments in education, involves risk, as student borrowers are unable to provide a security or collateral. The 'degree' in many cases is not considered to be a good collateral, due to uncertainties about the pecuniary income the 'degree' will fetch for a particular borrower. Thus, to the extent repayments are independent of earning or 'success' in the job market, the market for a mortgage or a bank overdraft loan for human capital investment does not work perfectly.

Friedman (1962), identified that a loan system that made payments conditional on 'success' in the job market would induce students to borrow for investment in human capital. Friedman (1962), Barr (1991) etc. prescribed an 'income contingent loan system' under which governments would grant loans on condition that the student would pay the lender a specified portion of his future earning, in excess of the principle amount, if his earning exceeded a threshold value, whereas low earners make low or no payments. Barr (2004), pointed to some of the advantages that 'income contingent loans' have over other forms of funding. Under this loan system, borrowers with low lifetime earning may not make full repayment. Thus, borrowers are protected from excessive risk. Lenders are protected from loosing, if they expect to get back more than their initial investment from relatively 'successful' individuals, which compensate for the failure to recoup his original investment from the 'unsuccessful' (Friedman 1962).

Nerlove (1972), identified that income contingent loans, though can address the problems of moral hazard faced by the insurance company, it cannot take care of the adverse selection problem the insurance company might face. Since repayments on income contingent loans are proportional to earnings, it does not reduce the incentive of the student to take up a remunerative job.
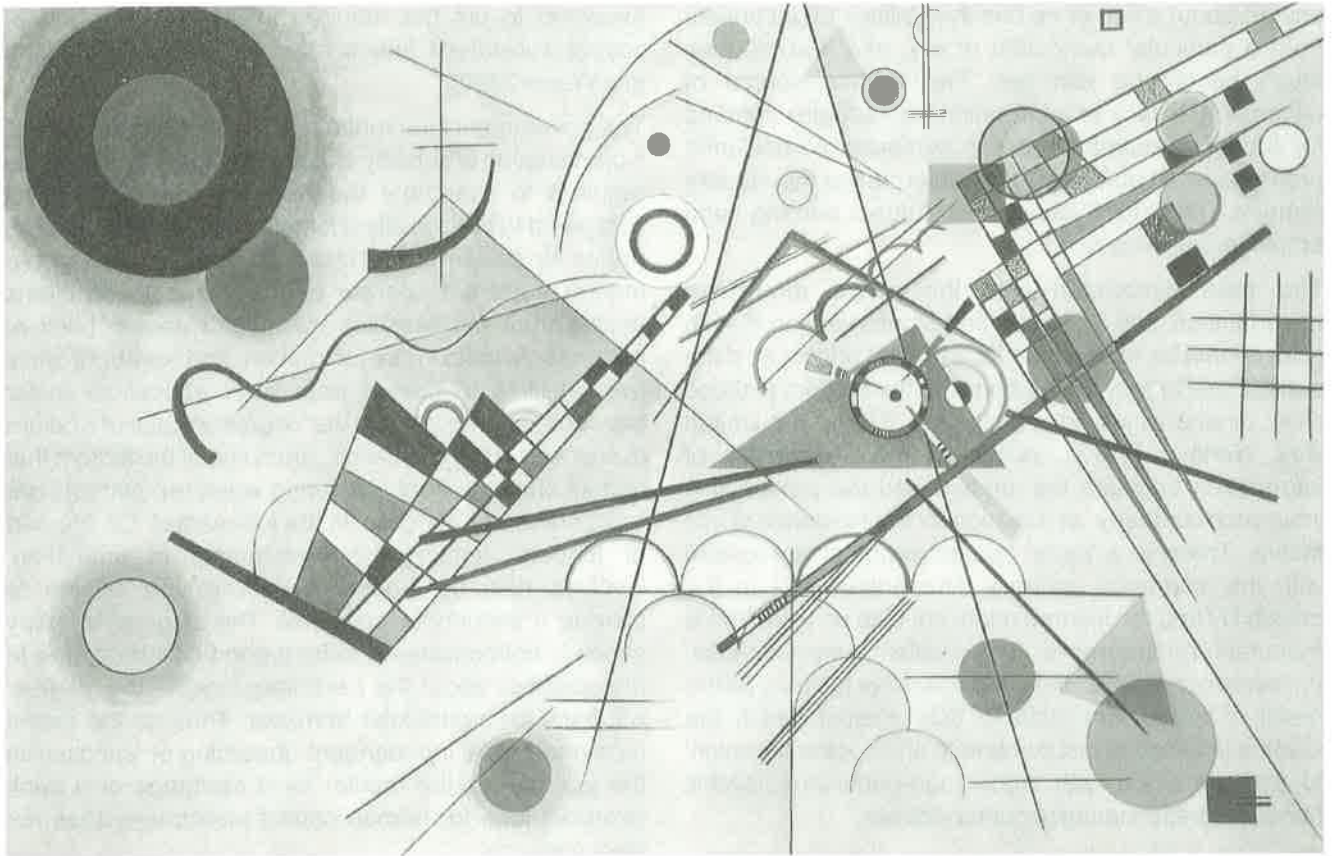
Thus, any deliberate decision to take up a less remunerative job (with more psychic benefits) is less likely from the insured student after the insurance contract has been signed. Hence, the moral hazard problem of the insurance company can be partially taken care of by income contingent loan repayment system. Some students may have a poor prospect of earning, either because of self recognised lack of ability, or because they feel likely to choose low paying occupations on account of the value they place on the non-pecuniary benefits associated with such occupations. Students with these characteristics are more likely to borrow under an income contingent loan repayment scheme than those with a high-income prospect. This is the 'adverse selection problem' that income contingent loan repayment schemes involve.

The discussion, so far, points to some of the problems of charging a tuition fee, determined by the market mechanism. Presence of positive externalities and uncertainties in educational investment that cannot be completely covered by insurances (even of the forms of an income contingent loan repayment system) are the chief sources of inefficiency of market determined tuition fee.

On the flip side, there are inefficiencies originating from not allowing the tuition fee to be determined by the forces of demand and supply. Nerlove (1972), argued that a tuition charge that leaves an excess demand for education may restrict the variety of services offered by the sector. Essentially, the argument is that the decision of what is to be produced is confined to a narrower group (the providers of education) with more homogenous preferences than the society at large if tuition charges are not market determined. Under a market mechanism, the preferences of the consumers for the product are expressed through their effects on prices. With subsidised tuition fees students are less able to do so. According to Nerlove, it is plausible that product diversity will be diminished in at least some dimensions as a result of this subsidised pricing system. As it is, there exists some asymmetry of information about the value of what is produced in the education sector and what could have been produced, but not produced, by particular institutions, between students and suppliers of education. In presence of this informational asymmetry, it is reasonable to believe that suppliers of subsidised education provide a narrower set of options for the students to choose from, even when prices are market determined. This can lead some students to combine their own input to the inputs provided by the institutions less inefficient and make 'educational

prediction' of a lower value. This problem of diminished product diversity is aggravated if tuitions are below their market-determined levels. One of the most commonly used non-market responses to this uncertainty, on the part of student, is 'accreditation', which is a quality control designed to compensate for the lack of market mechanism for shifting the risks and uncertainties associated with the purchase of an informational commodity. It is worth mentioning that there are separate 'moral hazard' problems, associated to the working of the 'accreditation' system.

It is apparent from the above discussion, that tuition fees determined as a market price, and subsidised tuition could both cause inefficiencies in their own ways.

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Role of Institutional Investors in Indian Stock Market

S S S Kumar*

Abstract

An important feature of the development of stock market in India in the last 15 years has been the growing participation of Institutional Investors, both foreign institutional investors and the Indian mutual funds combined together, the total assets under their management amounts to almost 18% of the entire market capitalization. This paper examines the role of these investors in Indian stock markets and finds that the market movement can be explained using the direction of the funds flow from these investors.

Key Words : Stock Markets, Clout, Augment, Cumulative, Demat accounts.

The Indian stock market has come of age and has substantially aligned itself with the international order. Over the last fifteen years the following developments have made the Indian stock markets almost on par with the global markets:

● Screen based trading systems replaced the conventional open outcry system of trading and everyone acclaims the contribution of the screen based trading in developing the culture of equity investing.

● The replacement of the fourteen-day account period settlement system give way to rolling settlements on T+2 basis has brought down the settlement risk substantially.

● Dematerialization of securities

● Demutualization of exchanges

● Derivatives trading

Infact, today we have one of the most modern securities

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market among all the countries in the world. Along with these changes the market has also witnessed a growing trend of 'institutionalization' that may be considered as a consequence of globalization. More precisely the growing might of the institutional investors entities whose primary purpose is to invest their own assets or those entrusted to them by others and the most common among them are the mutual funds and portfolio investors. Today, giant institutions control huge sums of money which they move continuously. In European and Japanese markets, institutions dominate virtually all trading. In the US, retail investors still remain active participants.

An important feature of the development of stock market in India in the last 15 years has been the growing participation of Institutional Investors, both foreign institutional investors and the Indian mutual funds (since the pension funds are still restricted to fully participate in the stock market otherwise pension funds are big investors all world over). With the accelerating trends of reforms Indian stock market will witness more and more of institutionalization and the increasing size of money under the control, this set of investors will play a major role in Indian equity markets. The importance of institutional investors particularly foreign investors is very much evident as one of the routine reasons offered by market Pundits whenever the market rises it is attributed to foreign investors' money, no wonder we see headlines like "FIIs Fuel Rally" etc., in the business press. This is not unusual with India alone as most developed economies of today might have seen a similar trend in the past. The increasing role of institutional investors has brought both quantitative and qualitative developments in the stock market viz., expansion of securities business, increased depth and breadth of the market, and above all their dominant investment philosophy of emphasizing the fundamentals has rendered efficient pricing of the stocks. This paper sets out with the objective of examining whether the institutional investors, with their war chests of money, set the direction to the market. The next section briefly outlines the growth of institutional investors' presence in Indian stock market followed by an explanation of the data and methodology employed by the study and finally we present the results and discussions.

Growing Clout of Institutional Investors on Indian Markets:

Foreign Institutional Investors (FIIs)

A Grave Balance of Payments situation forced the policymakers to take a relook at allowing foreign capital

into the country and the year of 1991 marked the announcement of some fiscal disciplinary measures along with reforms on the external sector made it possible for the foreign capital to reach the shores of the country. As on 31st March 2005 there were 685 (ISMR 2004-05 NSE, Mumbai) registered foreign institutional investors in the Indian stock market. As on that date the net cumulative investments made by FIIs are around USD 35.9 billion representing around 6.55% of India's market capitalization. Ever since they were permitted to invest in India the investments made by them showed a gradual increase except in the 1998-99. The net inflows averaged around 1.1 bn per year and large net outflows are rare barring the year of 1998-99 where most South Asian countries were out of favour for a while. Foreign portfolio investment carries a sense of notoriety of its own because at the first sign of trouble this flows in reverse direction. The notoriety emanates from the very nature of FII investment - portfolio managers tend to restructure and rebalance their portfolios dynamically across the countries, their primary concern being their portfolio. Owing to their magnitude of flows, the direction of FII investment flows tends to make or break the fortunes of a market. FII flows to India are less

Table I

Year	Net Investments by FIIs (Rs Cr.)
1992-93	4.27
1993-94	5444.60
1994-95	4776.60
1995-96	6720.90
1996-97	7386.20
1997-98	5908.45
1998-99	-729.11
1999-00	9765.13
2000-01	9682.52
2001-02	8272.90
2002-03	2668.90
2003-04	44000.03
2004-05	41416.45

Since it is not statutorily binding on FIIs to make public, the companies in which they are investing in, there is no publicly available information on this aspect. However, the overall investment that can be made by all FIIs in any company's equity is monitored by Reserve Bank of India, it gives a caution notice, when the overall FII investment level reaches 22 percent in a company. Subsequently, all purchases have to be done by prior approval of Reserve Bank of India. From such monitoring reports it can be gauged that the FIIs are

taking a positive view on select sectors, like technology (including media) drawing the major interest. A perusal of the FII favorite companies shows that FIIs attach considerable importance to transparency. The number of companies embracing higher degree of transparency and US GAAP is growing by the day. Globally, the appetite for information is high among the institutional investors, this requirement of information goes much beyond the scope of what the legislative framework calls for. Typically, they are interested in seeing a host of issues ranging from cost information to the projections, vision and strategies of the management, which are not in the ambit of the statutory framework. Increasing clout of institutional investors is compelling companies to embrace transparency.

Mutual Funds

Unlike FIIs, Mutual Funds in India have a long history dating back to 1963 with the formation of Unit Trust of India. For a long period of time this industry was confined only to UTI and other funds floated by Indian banks and financial institutions like LIC. The industry got a real shot with the entry of private sector funds both Indian as well as foreign fund houses commenced their operations in India from 1993, and the first private sector fund was Kothari Pioneer (it was subsequently merged with Franklin Templeton). There were around 592 mututal fund schemes at the end of March 2006, and the total assets under the management of mutual funds have grown from Rs 1,13,005 Cr as at the end of March 2000 to Rs. 2,31,862 Cr as at the end of March 2006. The following Table shows the growth of mutual funds industry in India.

Table II

Year	Gross mobilization	Redemption	Net inflows	Assets at the end of period
1999-00	61,241	42,271	18,970	1,07,946
2000-01	92,957	83,829	9,128	90,587
2001-02	1,64,523	1,57,348	7,175	1,00,594
2002-03	3,14,706	3,10,510	4,196	1,09,299
2003-04	5,90,190	5,43,381	46,808	1,39,616
2004-05	8,39,708	8,37,508	2,200	1,49,600
2005-06	10,98,149	10,45,370	52,779	2,31,862

Along with the FIIs the total amount of assets under the management of the institutional investors amounts to Rs. 2,94,917.84 Cr at the end of March 2005, and this amounts to 18.59% of the market capitalization. So it is natural to assume that the Indian stock market is dominated by institutions. The importance of individual investors in Indian stock market is considered to be

high, and their influence in price setting is believed to be quite strong. The Economic Survey 2004-05 puts in the following numbers in support of this argument "Individual investors are dominating the Indian markets", and to prove the point they give two measures :

1. The number of demat accounts opened with NSDL that grew to roughly 6 million by the end of 2004.

2. The decreasing average trade size on both the exchanges.

Table III

	2001	2002	2003	2004
NSE	40,509	26,703	26,993	27,715
BSE	35,783	22,485	22,782	23,984

However, this conclusion is flawed because transactions done by institutional investors are governed by the Regulations of SEBI under which these investors are not permitted to invest more than 10% of the paid up capital of the firm, and importantly they are permitted to do only delivery based trades. So, it is unreasonable to conclude that the markets are dominated by retail investors as it ignores the fact that both the classes of investors are not on an even footing.

Objectives:

In this paper we attempt to examine the following:

• Does the stock market rise or fall due to institutional activities?

• Do both categories of investors viz., domestic funds and FIIs move in the same direction?

Data: The study covers the period from June 2001 to June 2006 using the daily data on MFs/FIIs purchases and sales data and the Advances and Declines data of NSE.

Methodology:

This paper uses a linear regression analysis and Granger causality test to examine the issue of institutional activity on Indian stock market. The first issue that has to be addressed in this kind of study is what variables reflect the activities of institutional activity and the stock market movements. Most often the market index will be considered as a better proxy for market activity. But, in this study we rather use the advances decline ratio as the proxy for market activity. By doing so we do not want to rage a debate on whether indices are better representation of market or not, but, what we are trying to analyse is whether their activity move the entire

market or not. Here, one has to note that most stocks that figure in institutional investors' portfolios are more or less those securities that comprise the nifty or sensex indices hence, co-movements between index and the institutional investments is likely. But, when we use Advances and Declines ratio (ADR hereafter) it captures the direction of entire market in unambiguous terms. Generally advances to declines ratio indicate the breadth of the market. Hence, we use ADR instead of Nifty or Sensex returns. In reality, it is not possible to isolate the actions of mutual funds and FIIs on the stock market, since both the category of investors are acting simultaneously hence, the institutional activity is captured by taking the ratio of combined purchases of mutual funds and FIIs to combined sales of mutual funds and FIIs so if the ratio is >1 means institutions have pumped in money i.e., the market witnessed a net inflow of money while a ratio of <1 indicates there is an outflow of money from the market.

Results and Discussions:

Our first question is whether institutional activity has an influence on the market or not and this is examined by running a simple regression with the advances to decline ratio as the dependent variable and the institutional purchases to sales as the independent variable. But, before we attempt to do the regression we have to investigate whether the data is stationary or not and for this we used Augmented Dickey Fuller tests Hamilton, J. (1994). The unit root test results on the individual data series is given below in Table.

Table IV

Variable	Test statistic	P Value
ADR	14.3039	0.0000
FII	14.2312	0.0000
MF	9.9388	0.0000
INSTI	12.8703	0.0000

McKinnon critical values at 1% level of significance is 3.4385

The inferences about the stationarity of the data series remain unchanged even when we used the Phillips-Perron tests. Since the data series is found to be stationary, the results from the standard OLS regression can not be refuted. Now, we present the results of the linear regression in the following Table.

Table V

Variable	Coefficient	Std error	t-statistic	P value
INSTI	0.925420	0.03056	30.28240	0.0000

We have also conducted another regression with FII and MF as the independent variables separately and the ADR as the dependent variable and the results are similar to the above regression these are presented below:

Table VI

Variable	Coefficient	Std error	t-statistic	P value
FII	0.252056	0.031955	7.88774	0.0000
MF	0.753414	0.04279	17.60712	0.0000

So, it is clear that the institutional activity has an influence on the stock market and both mutual funds as well as FIIs actions have significant impact on the market's direction. Does this imply that institutional activity cause the stock market to rise/fall? This question is addressed by using Granger (1969) causality test assuming a one period lag we obtained the following results:

Table VII

Null hypothesis	F-Statistic	P-value
INSTI does not Granger Cause ADR	3.15491	0.07595
ADR does not Granger cause INSTI	0.65358	0.41899

The F statistics indicate that the null hypothesis ADR does not Granger Cause INSTI cannot be rejected and the null hypothesis INSTI does not Granger Cause ADR can be rejected. In other words there is statistical evidence that the forecasts about market direction can be improved by using the institutional activity as an independent variable. Then we examined whether the institutional activity is one sided meaning. Whether the FII actions and mutual fund actions are correlated. Since both these type of investors are driven by teams of trained analysts; we can premise that their actions may be positively correlated. The correlation results indicate that there is a weak negative correlation over this period and the correlation coefficient is -0.06439. To further augment our analysis we conducted a Granger Causality test as to whether the direction of FII investments can be predicted using previous day's information on mutual fund activity. The causality test results are shown below:

Table VIII

Null hypothesis	F-Statistic	P-value
MF does not Granger Cause FII	4.36575	0.03687
FII does not Granger cause MF	0.06531	0.79834
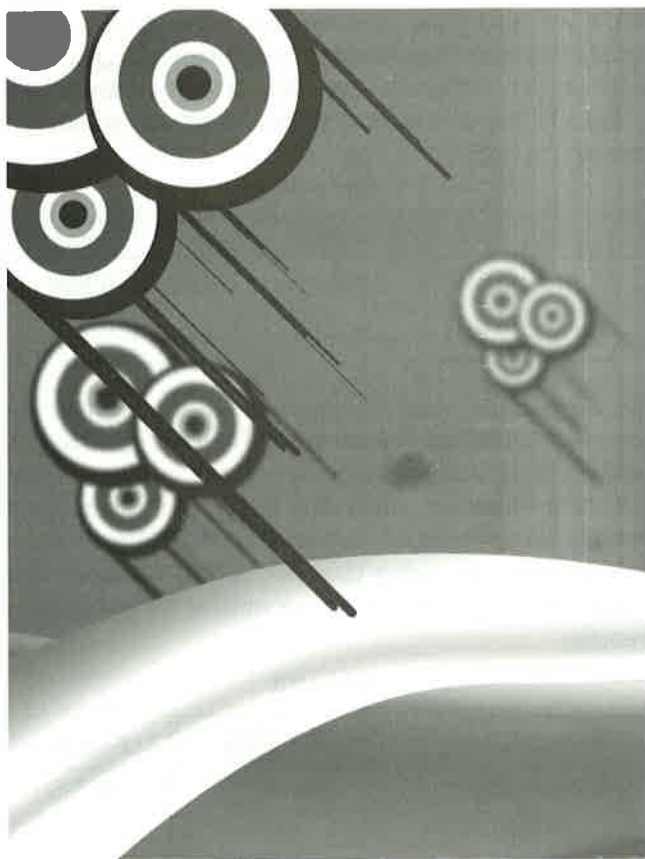
From the above results we can infer that the null hypothesis MF does not Granger cause FII can be rejected but the hypothesis FII does not Granger cause MF cannot be rejected. In other words, the forecasts of FII activity using mutual fund activity can be improved where as the reverse is not possible. This is a little bit surprising as well as interesting to note that the Indian mutual funds are leading the pack and are giving direction to the market and even FIIs are following their direction, probably, because of the larger size of the funds under the management of the mutual funds and hence the statistics are showing accordingly. The growth of institutional investors in the market is having its own advantages as well as its own share of problems on the brighter side almost always purchase stocks on the basis of fundamentals. And this means that it is essential to have information to evaluate, so research becomes important and this leads to increasing demands on companies to become more transparent and more disclosures. This will lead to reduction in information asymmetries that plagued the Indian markets for quite a while. Also, the increasing presence of this class of investors leads to reform of securities trading and transaction systems, nurturing of securities brokers, and liquid markets. On the flip side the increase of foreign investors in particular will bring a very welcome inflow of foreign capital, but there are always some dangers if certain limits are exceeded. Firstly, the foreign capital is free and unpredictable and is always on the look out of profits FIIs frequently move investments, and those swings can be expected to bring severe price fluctuations resulting in increasing volatility. Also, increased investment from overseas may shift control of domestic firms to foreign hands. But, in India there were limits to foreign ownership of shares in firms. If foreign investors reach the ownership limits, shares in those firms are restricted to trading by FIIs.

Conclusion:

The Indian stock markets have really come of age there were so many developments in the last 15 years that make the markets on par with the developed markets. The important feature of developed markets is the growing clout of institutional investors and this paper sets out to find whether our markets have also being dominated by institutional investors. The regression results show that the combined might of the FIIs and mutual funds are a potent force, and they infact direction can forecast market direction using the direction of the flow of funds from FIIs and mutual funds, the Granger causality test has showed that the mutual funds in fact lead the market rise or fall and FIIs follow suit. This may actually raise questions on the market efficiency but on the contrary, markets become more efficient with the growing presence of institutional investors who predominantly go by fundamentals. Noise trading on the part of institutional investors will be less in Indian context since all their trades are delivery based only.

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(b) Journal article: Saravnan, T (2005). "Cyber Laws in India: A Case of the Information Technology", SRELS Journal of Information Management, 42(3), 281-284.

(c) Books: Moore, David S. et. al. (2003). Practice of Business Statistics, New York: W H Freeman.

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