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Productivity Paradigms for the e-Age

N. Vittal

In the emerging e-age, the powers of Information Technology can be successfully harnessed to provide a new paradigm shift to governance. The article details a comprehensive plan to root out corruption and augment productivity in all spheres of government by the use of I.T.

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Productivity, at a very elementary level can be defined as output by input. But mere increase in output is of no value unless the output also has a bearing on the objectives of the organisation or the environment under which the transaction takes place. If a productivity expert looking at an orchestra questions why there should be a large number of players playing the same instrument when one can make do with lesser number, the essence behind the culture of orchestra is lost. While considering the functioning and productivity of government and its organisations in the context of the electronic age, it is essential to focus on the fact that productivity in government ultimately is about conducting the basic function of governance. Along with the current policies of economic liberalization with emphasis on globalisation and privatization, Government will have to perform the functions of maintenance of law and order; education; public health; and providing at least basic infrastructure for economic development. What should be the new productivity paradigms and strategies in the e-age?

Mere increase in output is of no value unless it has a bearing on the objectives of the organisation.

Scope of IT for Governance

Government handles a mass of information. It has to be fair to all the citizens and therefore precedents are important, requiring retrieval of data. It is in order to maintain fairness that government has to operate under a huge set of rules, regulations, procedures and systems which go by the derisive name of red tape. The red tape has been designed to ensure fairness but the path to hell is paved with good intentions and red tape ultimately results in corruption. Corruption is anti poor and anti national. There cannot be any productivity in governance if corruption flourishes. Governments today function mainly by using paper. This is definitely time

consuming. There is also drudgery and boredom, which may be the cause of delay about which everybody complains. It is this delay which is at the root of corruption. Secondly, another cause of corruption in government is lack of transparency or the prevailing culture of secrecy. Access to information if made easier and wider by IT will reduce corruption.

Finally, government must be able to get the best out of the human capital it has. The broad goal of government functioning in the 21st century should be to be SMART—simple, moral, accountable, responsive and transparent. This would not only be simple but also highly productive. IT in a machine or weapon, makes them smart machines/smart weapons. In the e-age IT can be used to produce smart government in all senses. Specific areas to focus while designing strategies for achieving a smart government are:

- Eliminating corruption
- Improving transparency in services to the citizen
- Improving productivity in human capital used by government
- Improving productivity specifically in the sub-sectors of—law and order, education, public health and infrastructure.

India is a corrupt country being ranked 67 out of 90 in the Corruption Perception Index of Transparency International, an NGO based in Berlin. Every day the Indian citizen encounters cases of corruption in practically every walk of life. In fact, in Tamil Nadu, bribe has become so common that it is called "mamool" which means routine.

In the midst of this bleak scenario, an issue to rejoice about is the fact that India is able to do well in Information Technology (IT). Information technology (IT) which is the synthesis of computers and communication and government are made for each other. IT helps to process vast amount of data very fast. IT also has the characteristic of making services cheaper because of the operation of Moore's Law[1]. Another important aspect of IT is that retrieval of processed data is also very fast. Dotcom companies had caught the imagination of people in the recent past not only for job opportunities but also as opportunities for creating wealth. Investors had flocked to dotcom companies. The hype for dotcom companies has undergone a correction now, especially after the action contemplated against Microsoft by the US Justice Department and its impact on Nasdaq as well as on our own stock exchanges. Nevertheless, it is a fact that IT represents the brighter face of what has been called the new economy.

1. Moore's law says that the number crunching capacity of the computer doubles every eighteen months and the cost comes down by half.

Corruption in India

Corruption, of course, is the familiar face of the old economy which in India was also dominated for a long time by the permit license raj. If we consider good governance as a fundamental human right then it is obvious that corruption-free service also should be a human right—the fundamental right of every Indian to have a corruption-free service. An appeal has been made in this regard to Justice Venkatachalaiah, Chairman of the Constitutional Review Committee to make corruption-free public service a fundamental right of the Indian citizen.

Corruption, according to the World Bank, is the use of public office for private profit. Corruption should be fought because of three reasons. The first reason is that corruption is anti-poor. 31 per cent of food grains and 36 per cent of sugar in the Public Distribution System (PDS) find their way into black market. Secondly, corruption is anti economic development. According to UNDP's Human Development Report 1999 on South Asia, if the corruption level in India can be brought down to that of Scandinavian countries, GDP will go up by 1.5 per cent and foreign direct investment will go up by 12 per cent. Corruption is anti-national. 300 people died in Bombay blast in 1993 because RDX could be smuggled by bribing certain custom officials. It is obvious that we have to fight corruption because it is anit-poor, anti-economic development and above all anti-national. The Hawala case brought out how corruption can be anti-national because of the linkages between the vicious cycle of corrupt politicians, bureaucrats, businessmen, criminals and even the NGO. The criminalisation of politics was highlighted by the Vohra Committee Report.

Corruption, is the use of public office for private profit.

A small effort has been made, especially in the late 90s to make the Government departments realise that they have to provide services. 60 departments of the Government of India have come under Citizens' Charter. The CVC has written to the departments to say that in addition to the services mentioned in the Citizens' Charter, the services will also be available corruption

free. The CVC was forced to take this initiative because otherwise it appeared that all these exercises would result in institutionalised hypocrisy. The Committee may consider adding a specific provision, by way of a new article in the Chapter on Fundamental Rights to the effect that every citizen is entitled to corruption free service from every organisation of the State which will include not only the Government departments of the Centre and the States but also public sector enterprises and other organisations controlled by the Government.

The basic structure of our Constitution is that the legislature enacts the law, the judiciary interprets it and the bureaucracy or the executive implements it. The executive in our country has become corruption ridden and it is necessary to make a provision in the constitution to see that the executive implements the law without being corroded by corruption.

Role of IT in checking Corruption

Can corruption, the disease of the old economy, be tackled by the technology of the new economy, namely IT? Yes, IT can be used to check corruption; as Oscar Wilde said "the thief is the artist and the policeman is only a critic". Corrupt people can use IT itself to indulge in nefarious practices. Some years ago, an IT graduate employed by the erstwhile DESU to look after the electronic data processing for electricity bills used his knowledge to ensure that the amount that has to be rounded off went to his personal account and made a profit anywhere between Rs. 3 to 7 crores. This was a case where IT was used to open a new chapter in corruption and fraud.

As Alexis De Toeville said, the inevitable becomes intolerable the moment it is perceived to be no more inevitable. In our country corruption is taken to be an inevitable fact of life. If our people realise that IT can be used to check corruption, then corruption will be perceived to be no more inevitable. Hopefully, then corruption will become intolerable for all citizens. Once public awareness grows it should be possible to tackle the issue of corruption in our country.

The two main factors in our system which encourage corruption are lack of transparency or secrecy and delay. Government operates under a cloud of secrecy. There is generally a tendency not to share information. Shri C.K. Daftary, a legal luminary once borrowed a book from the Mumbai Municipal Corporation Library. He found that in the last 20 years, only one person other than him had borrowed that book. Shri Daftary was curious to know, who was that kindred soul who had interest in the same subject. When asked for the information, the clerk told him to come the next week, because he had to ask his Bada Badu. When he went after a week, he met the Bada Babu who told him that the information about who borrows books from the library was confidential and could not be conveyed! If this is our general attitude, it is not surprising that in our system bureaucrats use secrecy as a weapon for wielding power. Ultimately information is power. Knowledge is power, said Francis Bacon. During the permit license raj, a whole lot of middlemen and liaison men grew. One source of corruption is the prevailing culture of secrecy in government departments.

Two main factors which encourage corruption are lack of transparency and delay.

Freedom of Information Act is necessary to fight corruption. Nevertheless, there is a criticism that when Acts are passed by State Governments, there are so many exceptions provided that the discretion is with the bureaucrat to deny access to information. Fortunately, so far as Government of India is concerned, the Central Vigilance Commissioner today enjoys the power of superintendence over the vigilance administration of Government of India organisations. At least, so far as issues relating to corruption are concerned, if facts are brought to the notice of the CVC, it can give directive to ensure that information which has a bearing on corruption should be made public.

The experience of the CVC in publishing the names of the charged officers who are facing departmental action for major penalty or prosecution in courts was highly revealing and an experience in serendipity[2]. When the news broke out that the CVC had published the names of charged officers in the web site cvc.nic.in, the first reaction was an overwhelming positive welcome by the public at large—93 per cent of the people who were polled by the Hindustan Times welcomed it. 70 per cent of the persons who responded to the Pioneer poll said that it is a good anti-corruption measure. Some persons whose names are on the web site complained that they had not even received the charge sheet which is a part of the departmental inquiry. This immediately highlighted the fact that even delay in taking follow up action is crucial. It is possible that a person who has been involved in the departmental inquiry is innocent. In such cases, if inquires are delayed, his career is ruined. On the other hand, it is also possible that the person who is

2. Serendipity means the faculty of making happy and unexpected discoveries by accident. Horace Walpole coined this word in 1754 after the fairy tale "The Three Princes of Serendip (Sri Lanka)".

charge sheeted is really corrupt. If inquires are delayed, to that extent he gets the benefit of doubt and can have a smooth career. Delay in our system is a great benefactor for the corrupt. Looking at this reaction, it was decided by the CVC to update information published on the web site and further computerise the information of cases already available. The departmental inquires will now be systematically pursued by issuing monthly reminders to the disciplinary authorities so that delay in inquiry cases can be brought down to the minimum.

There was another revealing experience from the web site. The Economic times conducted a poll which showed that 83 per cent of persons who responded felt that publishing of names will have a deterrent effect. Publishing of names does not amount to condemning or defaming the persons concerned. Nevertheless, the society at large cares to know the names of people who are facing vigilance charge. The News Week, called it e-shame. Persons who are facing departmental action in vigilance matters should not be placed in sensitive posts. By publishing the names on web site a situation was created by which such persons could be weeded out under public pressure. Publication of names on the web site thus had a deterrent effect and was helpful in checking corruption.

Corruption flourishes in our system due to the following factors:

- Scarcity of goods and services
- Lack of transparency
- Delay and red tape
- Legal cushions of safety which have been created under the very healthy principle that a person is innocent till proved guilty. Corrupt people, therefore, take advantage of the legal system so that they can use their ill-gotten wealth to engage the best legal brains to quibble all the way to the highest court of the land and laugh all the way to the bank; and
- The spirit of tribalism or biradiri between the corrupt. After all we talk about people being thick as thieves, not thick as honest men.

IT can be used to tackle each of these factors and thereby fight corruption. The first factor is scarcity of goods and services. 31 per cent of food grains and 36 per cent of sugar in the Public Distribution System (PDS) find their way into black market. Rs. 15000 crores is the subsidy of GOI in PDS. How can IT help in bringing down corruption in PDS? Everybody is aware of the fact that essential commodities are subsidised and are meant only for those below poverty line and who are eligible to get a ration card. If we are able to computerise the whole system, then it should be possible to keep the information upto date and ensure that there is no corruption in issue of ration cards.

In fact, the cause of corruption in the normal paper oriented manual system in government is the enormous delay in the system. Computers are characterized by speed and their capacity to process masses of data. Equally important is the fast information retrieval system which computers provide. In an activity like issuing of ration cards in PDS, IT is ideally suitable. The system can also be made transparent by publicising the quantities which individuals or shops or districts are entitled and how much has actually been delivered. Once this information is in the public domain through the web site of the civil supplies department, it is possible for any member of the public to check whether the quantity as alleged has actually reached the particular shop and whether the shop keeper is indulging in black marketing. We will be able to use IT to check corruption in the PDS, only, if firstly, we are able use IT fully for performing the activities of the departments concerned and secondly the public at large has access to the web site. In this context, the initiative taken by people like Sam Pitroda for Cyber-Dhabas or Community Internet Centres is a very welcome measure. So we can visualise a situation where, every activity of the Government which impinges on the public can be in public domain with easy access to information which can also be verified. Greater the transparency, greater will be fairness of the system. After all when there is a scarcity situation and corruption arises because of this, a fair PDS or rationing system is the best method to fight corruption. IT can play a very significant role in this context.

Every activity of the Government which impinges on the public can be in public domain with easy access to information which can also be verified.

The second cause of corruption is lack of transparency. We have seen in the earlier example how the very availability of information can make for better control over corruption. If the government also passes the Freedom of Information Act, people will have, as a matter of right, the access to information. Even if they do not have information as a matter of right, if there are institutions like the CVC which can direct the concerned department to make certain information public, transparency can be brought into the system.

The third important cause of corruption is red tape

rules and procedures. It is here that IT can play an important role. Rules themselves need to be simplified. There is need for constant weeding out so that obsolete rules do not come in the way. If all the rules are made public, as for example the Andhra government has done so far as the government orders are concerned, then it is open for any interested citizen or concerned group or organisations to make studies and see how rules can be simplified. In fact many a time when rules are made, bureaucrats may not be aware of the consequences to the consumer. If information is in public domain, thanks to IT, it is possible for suggestions to be made for modifications and thus eliminate the scope for corruption. The experience of Andhra Pradesh Government in its Registration Department has dramatically highlighted the fact that entire operations involving transfer of property and registration of property can be done within the period of an hour or so. This speed itself has brought about greater transparency and has significantly eliminated the scope for corruption.

At this stage an important point that has to be taken note of is the fact that Government organisations are based on paper. The entire operations are manual. If from operating on paper, we have to go to the use of IT, we have to create the appropriate legal framework. For example, GOI has to set up the Stock Holding Corporation of India because the financial institutions of GOI interested in shares found they had to tackle the paper demon. Under the Companies Act only a share which is on paper is recognised as a share. Only recently the government has been able to modify and begin the concept of dematerialisation or d-mat share. The government has already got an IT bill before the Parliament and once this bill is introduced and appropriate amendments are made in the various acts like the Companies Act., Evidence Act, IP, Criminal Procedure Act and so on, manual system delays can be eliminated by increasingly using IT.

IT in Banking

In the area of banking, IT can be of immense value not only in improving customer services but also in fighting frauds and corruption. The Bank of Abroad in a communication brought out the following benefits about how computerisation can help check frauds.

IT can be of immense value not only in improving customer services but also in fighting frauds and corruption.

As regards the question whether computerization would help banks in prevention and early detection of frauds, frauds can broadly classified as frauds in non-credit areas and frauds in credit areas. In non credit areas frauds mainly relate to fraudulent enactment of checks, withdrawal slips, refund orders, demand drafts, bankers checks, misappropriation as also fraudulent transactions in the books of branches put through by the bank's own staff. Existing computerized system and upgradation thereof will help in prevention as also early detection of frauds which will save bank's precious funds as also protect the long term interest of bank employees who unwillingly become prey to the design of unscrupulous elements.

Following are the areas where full-fledged computerisation will have salutary effect in prevention and early detection of frauds.

- Fraudulent enactment of cheques bearing forged signatures occur because the passing officials do not find it convenient to verify the signature stored in signature card cabinets requiring manual location. If specimen signatures are captured in the computer, it will facilitate easy verification and provide security against tampering.
- Stop payment instructions received from account holders with regard to lost cheques can be put in computer so that a caution signal would be available whenever a lost cheque is presented for payment.
- Manipulation of books by unscrupulous staff inter alia casting of wrong balance and making wrong credit entries can be either prevented or detected promptly because computerisation would enable tallying/balancing of books on daily basis.
- The reconciliation of transactions relating to drafts issued and paid through computerised system would help in early detection of fraudulent payments.
- Frauds relating to local clearing operations may be minimized through prompt reconciliation of number and amount of cheques through computerised system.
- Attempts of unscrupulous staff to perpetrate frauds by raising fake credits through inter branch accounts may be thwarted through computerised system for reconciliation of entries between originating branches and responding branches.
- By introduction of passbook writing machines, frauds relating to misappropriation of cash

receipts by cash department staff can be prevented/detected early.

- There is increasing trend in payment of lost/fake DDs presented by fraudulent means. Computerisation and continuous updating of data related to stolen/lost drafts on the system can help in reducing this. Officers signatures captured in the computer can be used to verify whether the DDs are signed by the concerned officer.
- As per guidelines of RBI, MICR clearing and electronic clearance system have been introduced at metro centres to take care of corporate clients. The service branch or the main branch does the work of intermediary between the local branches of the bank and clearing house. Lack of proper reconciliation of number and amount of cheques sent by branches to the service branch/main branch and vice versa on a daily basis has facilitated perpetration of massive frauds. A software system for daily reconciliation, if introduced can be used to avert or detect such frauds.
- As regards advances, in credit related frauds, it would help banks if computerised data base of parties enjoying credit facilities from different banks in the same centre is available to avoid double financing, to know the state of affairs of the existing account, and to ensure that the same persons do not enjoy facilities under different names or firms.
- Database of information of fraudsters, willful defaulters with photographs of the proprietors/ partners/directors etc will help the banking system.
- Quick exchange of information relating to transactions in corporate accounts, remittances, clearance of instruments, payment of dividend warrants, interest warrants, refund orders and reconciliation thereof, etc. will enhance customer service and help prevent frauds.

IT in Judiciary Process

The fourth reason why corruption flourishes is due to the legal cushions of safety which have been created. Legal procedures have to be expedited. 154th Report of the Law Commission on Cr. P.C. has made a number of suggestions out of which the following may be incorporated in the Prevention of Corruption Act 1988.

- No adjournments shall be granted at the request of a party, except where the circumstances are beyond the control of that party.
- The fact that the pleader of a party is engaged in another court, shall not be a ground for adjournment.
- Where illness of a pleader or his inability to conduct the case for any reason, other than he being engaged in another court, is put forward as a ground for adjournment, the court shall not grant the adjournment unless it is satisfied that the party applying the adjournment could not have engaged another pleader in time.
- Where the court is of the opinion that the trial of the case is being delayed or adjourned on account of any official belonging to the prosecuting agency or associated with it the court shall make an order holding the person responsible for such act and communicate the order to the concerned official as well as recommend suitable criminal and disciplinary action against him.
- Every criminal court shall send a return in the prescribed Performa to the Chief Justice of the High Court stating the particulars of the cases in which adjournments were granted by them during the trial of cases with detailed reasons thereof.
    - A system of annual co-ordination meeting by the Administrative Judge of the High Court to be attended by the District Judges and the Special Director/Joint Director, DIG and ALA/DLA of CBI may be instituted. A half-yearly meeting with the District Judges and the Special Judges with the DIG, CBI and DLA may also be established.
    - A system of units assigned to the various cases for monthly disposal may be introduced for the Special Courts of CBI also, wherever it does not exist. While assigning these units, a higher weightage for non-trap cases may be fixed.
    - The existing provision in the Prevention of Corruption Act of day-to-day hearing may be reiterated to the High Courts. In Maharashtra, trial in anti-corruption case proceeds on day to day basis once the case is taken up for trial like Sessions court proceedings.
    - The modifications effected to the C.R.P.C. in relation to the proceedings under P.C. Act introduced in Section 22 of the Prevention of Corruption Act, 1988 are not being followed. These have to be reiterated.

- Heavy costs may be imposed on the party seeking repeated adjournments on flimsy grounds with a view to delay the proceedings.
- The exclusive CBI courts may be requested not to take up state government cases.

When Justice Venkatachalaiah was the Chief Justice of the Supreme Court, he showed greater transparency can be brought about by applying IT. Also more importantly, pendency was brought down to 20,000 cases (from 1,60,000) by systematically applying IT in SC. This could be done in all courts. IT can help speed up the judicial process and combined with this if the recommendations of the 153rd report of the Law Commission are implemented, there will be substantial progress. So far as departmental action is concerned, if retired people could be employed and enquiries are completed within six months, there will be greater check on corruption.

IT can help speed up the judicial process.

Government Initiatives in IT

We now come to the second aspect of governance namely improving transparency. The Freedom of Information Act is already before the government and IT can be very useful in making available to the public information about their rights, the various government schemes, and so on. The government has already started applying the concept of information kiosks, but the problem is that these have been designed by only government officials without finding out from the citizens what information they want. Government servants are always like to fall into the trap of the "Aristotle Syndrome". Aristotle, the great philosopher thought that women had less teeth than men. Bertrand Russell points out in an article that if only Aristotle had asked a woman to open her mouth and counted the teeth, he would not have made that mistake. In the new paradigm of transparent government in the e-age, government officials will have to contact the public and find out what exactly is the information that is needed. The Ministry of Information Technology (MIT) recently appointed a working group to go into IT for the masses and this group has come up with the following new paradigm.

The recommendations of the Working Group to realise the dream of taking the benefits of IT to the masses, is developed around the concept of "Enabling the Empowering of people". Government has to set in motion the processes which will enable anyone to set up IT-based services. The current practice built around the concept of controlled supply of services and resources through licensing and regulations should be completely done away with in the field. This could be the only way to develop IT enabled services in all sectors and facilitate establishment of IT infrastructure in a large country like India in a reasonable time frame. As a business model, the Working Group believes that more the government frees the controls in Telecom and Internet sector, more revenues it will earn.

For a common man to be able to access IT services, the Working Group recommends a two-pronged strategy. All middle class homes, businesses and shops must have Internet connection by 2008. A target of at least 100 million Internet connections must be set for this. However, in the interim, the Working Group would like around one million Internet enabled IT kiosks to be established covering the entire length and breadth of the country in a manner that anyone requiring access to Internet will be able to have it with in a cycling distance of 4-5 kms. IT kiosks will enable even illiterate people to benefit from the IT revolution in the country. For kiosks to be set up on such a scale in the shortest possible time, we need to launch a scheme, in collaboration with industry and financial institutions, to financially and technically support large number of self-employed people, particularly the educated unemployed youth in unorganized sector. The model of growth evolved by cable operators for spread of Cable TV networking the country to 25 million homes in just about 6-7 years could be adopted for quick growth in IT services sector. One of the significant characteristics of the cable operators' model is the concept of neighborhood service provider developing close relationship with the customers. On the pattern of programming by cable channels, for IT services to be relevant to common man, IT services provided in the language of the people must be the integral component of these services.

Having enabled people to enter the field of providing IT services, it is essential that government empowers its citizens to demand a high quality of service, not only from government but from all service providers in general. Government has to play a significant role in this area and in fact should focus on ensuring people get empowered to demand and get the best of services. Empowerment will require complete transparency in procedures to be followed by service providers in government as well as in private sector. These service providers should, by adequate laws, be asked to make information about their rules and procedures available to public. As a first step, and to set an example and create a role model, government has to get into a massive exercise of re-engineering of its own procedures by making extensive use of

Electronic Governance. Common man in the country, in spite of the massive potential of IT in his day-to-day life, continues to be largely unaware of the benefits of this revolutionary technology. Massive awareness campaign is therefore required to be launched to educate people about what IT can mean for improving their quality of life. Information regarding government rules, regulations, programmes and services is an essential aspect. Working Group recommends launch of IT yatras (journeys) and other forms of awareness campaign across the country to be launched in collaboration with NGOs, educational institutions and corporate sector.

Massive awareness campaign is required to be launched to educate people about what IT can mean for improving their quality of life.

Some of the concepts recommended by the working group on electronic governance are also worth taking note of. The recommendation of the Working Group may be seen Table 1.

When it comes to education, public health, Infrastructure and law and order, IT can be used to achieve the following goals:

- Reducing the drudgery of public servants who do routine work in paper based government systems. One of the reasons why computerization in railway passenger reservation succeeded is because it improved the working conditions of employees who could save 1-2 hours a day for settling accounts. Productivity was also enhanced. Today the railways is operating with probably the same staff they had ten years ago, under at least twice if not thrice the work load. So, ultimately the challenge for government in the e-age is to improve the productivity of the human capital by making the work environment better, reducing the soul killing drudgery, boredom and routine and also improving productivity.
- Application of IT in government processes would go a long way to improve the productivity of the human capital. In computerization or application of IT, there is a tendency to first think in the mode of the present manual paper based system and then try to replicate it in the computerised system. A strategy point of view is to eliminate certain processes which were necessary in the paper based system.

Table 1: Working Group recommends the following steps to be taken by the government at different levels for speeding up the use of Electronic Governance in the country.

Five Year IT Plan

Central and state governments should prepare Five Year IT Plans (2000-2005) to re-engineer their services in a manner that by 2005, a common man in the country will not be required to visit government offices for normal day-to-day work and will be able to have all such interactions through Internet from homes as well as from IT kiosks and CICs across the country.

All Government departments/ministries must set up a Task Force to prepare a short term as well as long term IT Induction Plan for their internal working as well as developing citizen services based on IT. The Task Force must be empowered to get the plans implemented.

IT Sensitization of decision makers

Special training programmes/seminars should be organised with a time bound action plan to sensitize Ministers, MPs/MLAs and senior government officials on the benefits and applications of IT in governance.

5 per cent of the budget for IT induction in government

Every department of the government should earmark up to 5 per cent of its budget (Plan as well as Non-Plan) to implement citizen-oriented IT services with requisite back-office computerization. This will enable government departments to implement the IT induction plans for citizen friendly and transparent governance as well as effectively monitor the utilization of the remaining 95 per cent of their budget.

IT infrastructure to working level staff in government by 2003

For IT services to be developed and sustained in the government, it is necessary that access to IT infrastructure is made available to working level staff. This requires government to establish IT infrastructure up to this level. While considerable progress has been made over the years towards this, all departments of central and state governments must prepare a time bound plan to establish government intranets with connectivity to each other and to Intranet. These plans must be implemented by 2003.

Compulsory IT literacy, for government recruitment by 2002

IT literacy, as per a well defined foundation course module, should be made compulsory for recruitment to government service at all levels by 2002. In case a person has to be recruited without IT literacy, he/she should compulsorily acquire it within one year. All the existing staff of the government must be asked to attain IT literacy in next 2 years. A panel of recognized training institutions, in private as well as public sector may be prepared and updated from time to time at central/state government level for this purpose.

At least one citizen oriented service by every government department by January 2001

Every Government ministry/department must implement at least at least one Citizen-oriented service to be completely made IT enabled by January 26, 2001. All such IT enabled services must be made web-centric so that public can access them through Internet.

Annual E-Governance Reports by government departments

Each ministry/department of Central/State governments must submit an Annual E-Governance Report of the Parliament/State legislatures each year as a part of annual Report being currently submitted.

Sharing of experience and best practices amongst states

A Standing form of State IT Secretaries must be set up for sharing of experiences and best practices amongst various states and facilitate horizontal transfer of IT applications and services

Table 1 contd.

Table 1 contd.

amongst states. This will also facilitate standardization of services across the states.

Internet portal for one point government information and services

An internet portal for government information and services must be set up with links to central and state government departments and services to provide single window access to government from anywhere in the country. For a common man to be able to use government services over Internet, content and services should be available in local languages on this portal.

State portals to help rural artisans and handicrafts

State government portals should help rural artisans and entrepreneurs in publicizing and market development for products of rural artisans and handicrafts.

Set up Administration re-engineering Commission at national level

Most of the efforts of inducting IT in the government are made to map existing procedures followed in the government on to IT based systems. With the availability IT based solutions, most of the procedures of the government need a thorough revision. This requires a massive re-engineering of processes being followed in the government at all levels. Both Central and State Governments must set up an Administrative Re-engineering Commission/Committee to review all procedures in the government in view of facilities available through IT.

Standardize formats procedures for common services across the country

Large number of services offered by the government on the nationwide basis use different formats and procedure for similar functions in different states and regions. There is an urgent need to standardize these formats and procedures across the country. The concerned ministries of Central Government dealing with various sectors must establish a Task Force to standardize the forms and procedures in such services across the country as well as facilitate early induction of IT in respective areas.

Data capture at the print of origination

The current practice of first using conventional manual method and then doing data entry to bring that information on network should be completely discontinued in the government. All IT services must capture data at the point of origination itself.

Prime Minister's Annual award for best E-governance

Introduction of Prime Minister's Annual Award to the best E-governed state government, central government department and services

Some of the applications/projects which should be taken up on priority basis by the government are as follows:

All Government information on Internet by April 2001

All Government regulations, schemes and forms should be put on Internet by every Ministry/Department of Central as well State Governments latest by April, 2001

All Tenders on Internet by August 2001

All tenders of the government should be put on Internet by August 15, 2001 and submission of tenders should also be introduced through Internet

On-line booking by January 2002

All bookings related to services provided by government such as payment of bills/dues, taxes etc. should be made available through Internet by December 2003. Concerned agencies must prepare a time bound action plan for establishing infrastructure and services for electronic payments.

All government payments on Internet for by 2003

All forms of payments to government such as payment of bills/dues, taxes etc. should be made available through Internet

Table 1 contd.

by December 2003. Concerned agencies must prepare a time bound action plan for establishing infrastructure and services for electronic payment

Results of Public examinations on Internet by June 2001

Results of all Public Examinations and information related to admission to engineering, medical and other professional colleges should be put on Internet by June 2001

Internet enabled Employment Exchanges

Employment Exchanges across the country must provide information and registration related to various job opportunities and status of applications filed by the candidates through Internet

Land Records computerization by 2005

Computerization of land records all over the country with computerized land/property documents should be made available to the public at all levels including in villages by 2005

Extensive use of IT in Judiciary

Computerization of information related to court cases particularly the ones related to land/property disputed and extensive use of computers in courts at all levels in the country for office automation and judicial applications

File tracking system at District Collectorates by 2002

District Collectorates must implement File Tracking System to provide Internet based information or applications submitted to them by public for various purposes by December 2002

IT Kiosks for single point delivery of government information services

Single point delivery of government information and services including all forms of payments should be allowed to offer such services on chargeable basis to public with revenue sharing formula with respective government agencies.

There are six Cs which are important for bringing in IT in Indian government in the e-age. These are computer density, connectivity, content, cyber laws, cost and common sense. Government of India has already enacted the IT Act 2000 which is an important step in ensuring that proper cyber laws are available. Recent policy changes particularly in telecommunication have also laid the ground for improving the connectivity and building the national backbone. The very competition that has been introduced in telecom sector will help in coming up with requisite services. The cost aspect will be taken care of by the competition. First report of the National Task Force on Information Technology (NTFIT) appointed by the government in 1998 has recommended a 3 per cent reservation of the budget for bringing IT to the masses.

IT: Scope & Prospects

Information Technology (IT) which is the synthesis of computers and telecommunications has emerged as India's new boom sector. As the Prime Minister, Shri Atal Behari Vajpayee designates it, IT is India's Tomorrow. The impact of IT is increasingly visible in the international front. Computers, telecom and Internet have become all the rage in India today spawning instant millionaires and generating a lot of enthusiasm. India's software

exports which were only $100 million in 1990 went up to @5-7 billion last year growing at a rate of 40-50 per cent a year. This year the exports may go upto $5-7 billion. A report by McKinsey, a management consultancy estimates that India's IT revenue would be of the order of $87 billion consisting of $50 billion exports and $37 billion in the domestic market. The industry will employ around 2.2 million people in 2008. Electronic exports of which IT forms the lion's share already constitutes 10 per cent of India's exports. The market capitalization of the well established industries of the non-IT sector, which is now called the old economy also will improve. Of course, as Jack Welch says, to make a distinction between old economy and new economy may not be right because it is the old economy which is using the new technology of IT.

The secret of India's success in IT has to be first appreciated. As Prof. C.K. Prahland says, the IT sector does not have the baggage of the traditional old industries. The industries are driven by young, bright technocrats, most of whom are first generation entrepreneurs. They are prepared to slog 18-20 hours a day. It is this intense commitment which is one of the key factors behind India's success in IT. With a large base of English speaking technical manpower, India has a competitive edge in the global IT market. It is therefore not surprising that in addition to the United States where most of the Indian technocrats migrate to, other countries like Germany and Japan are also trying to attract Indian technocrats. Merit definitely is the primary factor for success of the IT industry. The third important factor is that there has been a synergetic alliance between government and the IT industry. The Ministry of Information Technology (MIT) in its earlier avatar as the Department of Electronics (DOE) has over the last decade established a high degree of synergy with the industry with the result that critical infrastructure like earth stations was put up in 1991-93, the DOE making a departure from the traditional distribution of work in the Government of India, where Department of Telecommunication (DOT) would have been expected normally to provide this infrastructure. The policy package evolved, like the ten year tax holiday from income tax, concession in capital goods scheme and other relaxations helped the industry to quickly emerge as a global player on the IT scene.

The Government of India recognised the importance of IT and constituted the National Task Force on Information Technology in 1998. The task Force submitted three reports. The first report was accepted by the government within a remarkably short period of 20 days and the recommendations implemented. The government has continued its thrust on IT in successive budgets; this sector has been given the requisite support, so that the growth can continue. One of the latest measures taken by the government is the enactment of the Information Technology Act (ITA) 2000. India is one of the select 12 countries which have cyber law in the form of the ITA and only the second country in Asia after Singapore, to have cyber laws.

In addition to the stunning performance on the export front, systematic efforts are also being made to spread the use of IT in the traditional sector of Industry. One of the most successful applications of IT has been in the computerisation of the passenger reservation system in India Railways. This has also brought immense benefit to the traveling public. The banks are now engaged in reaching the target of computerising 70 per cent of their business by 1.1.2001 after the directive of the Central Vigilance Commission. The commission's interest behind the need for IT in banking sector is that while it increases services to the customer, it also provides a better check over possible sources of corruption and fraud in the banking sector. The government has been keen to see that application of IT is made available to the masses in areas like education, rural empowerment, health and so on. A committee has recently submitted a report on application of IT for the masses. In fact, for the poor artisans in rural areas, the Internet has become a boon to reach a wider market. For example a rural lady artisan in Kutch in Gujarat who does mirror work embroidery has got orders to supply 7000 ties to the US Company Tierack at the rate of Rs. 7000 per tie. She was located by the US company thanks to enterprising marketing using the Internet.

Not only the Government of India but many state governments have also focussed attention on this sector which has emerged as a potential generator of employment and a possible instrument for achieving balanced regional development. Some states like Andhra Pradesh, Tamilnadu, Kerala, Karnataka, Gujarat, Maharashtra etc., have come up with IT policies designed to improve not only services to the public but also efficiency in government. In fact the goal is to achieve SMART – Simple, Moral, Accountable, Responsible and Transparent – government. This will be possible by systematic application of IT in different areas of government functioning; Andhra Pradesh is providing a lead for the rest of the country so far as the SMART government concept is concerned. In the capital market also the IT stocks are becoming attractive and new modes of financing like venture capitals and angel funds are also getting established in India. Here, the NRIs are playing an important role. The Indus Entrepreneurs, one of the venture capital funds set up by the NRIs has been particularly looking for young people with ideas so that they can be financially supported to set up their own dot.com companies and other new ventures in IT. Many

states have also set up the Indian Institute of Information Technology in collaboration with the industry so that the courses are fine-tuned to meet the industry's requirement. The application of IT in other areas of governance is also being encouraged.

The liberalization policies of government in the telecom sector also had a very significant impact in the growth of IT sector in India. Today in the age of Internet, the most important factor is connectivity and bandwidth. The Government of India has announced the National Telecom Policy 1999 with focus on convergence. A bill covering Information, Communication & Entertainment (ICE) is under consideration of the Ministry of Information broadcasting. The government has fully recognised the significance of IT and is coming up with systematic policies and initiatives to ensure that India is able to build on the track record it has had in this sector in the last decade. The object of government is to ensure that IT is utilised not only for earning foreign exchange but is also made available to bring a better life to the people of this country. Ultimately, of course, the success of IT will depend upon the extent to which we are able to utilise the human capital. □

The idea flow from the human spirit is absolutely unlimited. All you have to do is tap into that well.

– Jack Welch

Focus

Productivity in the e-Age—The American Experience

Robert McGuckin

The article focuses on a central issue: the impact of ICT (Information & Communications Technology) on productivity growth. This issue is far from settled, but there is growing evidence of the importance of ICT to productivity growth, both at the level of individual firms and economy-wide, states the author.

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The American experience with the e-age is not very long and it is far from over. Although the computer was first used in the 1950s and developed and extended in the 1960s and 1970s, it was well into the 1980s before the personal computer was widely adopted. As epitomized by the surge of entrants and subsequent failures that typically characterize the creative destruction phase of new technologies, the Internet is still in its infancy. Even in manufacturing, fewer than 25 per cent of U.S. plants used advanced computer technology as late as 1993. While business-to-business applications have grown exponentially in the past ten years and consumer oriented products like ATMs and Internet shopping are becoming more commonplace, the U.S. telephone network is yet to be converted completely from analogue to digital transmission and high definition digital TV is a dream to most consumers.

Productivity Impacts of E-age Technologies

The productivity impacts of e-age technologies also were slow to emerge: Beginning as a barely perceptible ripple 10-15 years ago, information and communications technology (ICT) now is driving a broad wave of productivity gains. Productivity growth in the U.S. was so slow at first that much of the economic and business debate focused around the 1987 quip by Nobel Laureate Robert Solow, "You can see computers everywhere but in the productivity statistics". But the rising importance of the e-age and the 'new' or 'knowledge' economy is now widely acknowledged in the media and academic research.

The most recent work suggests an increasing role for ICT and attributes a large fraction of the recent surge (1995-1999) in U.S. productivity growth to it (Jorgensen & Stiroh 2000; Oliner & Sichel 2000). We are finally seeing at the aggregate level the impacts of ICT that were observed in the disaggregated data much earlier (Brynjolfsson and Hitt (1996) and (2000), McGuckin and

Stiroh, (1999)). Of key importance, is the fact that from a half to two-thirds of the measured increase in labor productivity growth in the second half of the 1990s (approximately 1 per cent) can be traced to ICT.

From a half to two-thirds of the measured increase in labour productivity growth in the second half of the 1990s can be traced to ICT.

Today the question is not whether ICT has raised productivity growth. The issue is whether the U.S. productivity boom is sustainable and whether Europe and the rest of the world join the party[1]. Predictions about the progress of technological innovation and diffusion are hazardous, particularly when there is continuing controversy over the historical record and data quality. There is, however, some room for optimism regarding the future of productivity growth in the e-age.

The computer-producing sector, the engine for much of the improved economic performance in the U.S. in the late 1990s, should continue to generate productivity gains. Rapid cost reductions by producers of ICT equipment has driven much of the U.S. productivity improvements. The key part of this story is the rapid fall in computer prices. These price declines have been the result of massive technological change, especially in semiconductors. Moore's law, which characterizes the gains in semiconductors, appears still operable and new chip technology may effectively extend its life.

There is also some evidence of productivity growth acceleration by users of ICT and the services that support them. While the using sectors of the U.S. economy have shown meager productivity improvements in the past, measurement errors were a major factor in the failure to observe gains. Most of the computer capital has been concentrated in a few "service" industries; banking, finance, insurance, business services and wholesale trade that have shown virtually no productivity gains. These sectors are all part of the hard-to-measure sectors identified by Griliches (1994).

It is difficult to make strong predictions because they depend in large part on the future course of technological change and the investment patterns it generates. Moreover, until the results of new measurement initiatives and the data revisions associated with them are complete, data at detailed industrial levels are seriously deficient. Detailed industry data for the second half of the 1990s have not yet been released. This makes it impossible to differentiate some key hypothesis about the impact of the e- age. In particular, it is not possible to identify whether ICT users are gaining more from ICT than non-users or to quantify the role of ICT in multifactor productivity growth. However, some estimates based on patched together data show acceleration in productivity growth in the mid-90s in several of the heavy computer using sectors that also have been subject to measurement problems.

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In the light of its currently uneven diffusion across the world, ICT is likely to become an important source of productivity growth outside the U.S. Globalized markets make it possible for users to obtain ICT through trade in ICT capital and products and services incorporating it. Foreign direct investment (FDI) also offers a channel for diffusion of e-age tools so that ICT should be of great importance to patterns of economic growth. Structural reforms and supportive governmental policy are key factors in assessing the future expansion of ICT. One aspect of this is openness to trade and FDI so that ICT equipment is available in the global marketplace at the lowest prices. This point has been much discussed in the wake of the Asian crisis. However, the importance of minimizing regulatory impediments, including restrictive merger policies is often overlooked in discussions of the development of the e-age in the United States. Structural reforms in the 1970s and 1980s in telecommunications, transportation, finance, and banking set the stage for the rapid development and diffusion of information technology. These markets are heavy users of ICT because their products place a premium on storage, retrieval, and combination of information, precisely the functions that ICT technologies facilitate. Without structural reforms it is unlikely that opportunities for extending markets, generating employment opportunities and enhancing growth offered by ICT technologies would have been fully exploited. Similar reforms will be required in developed and developing economies for the computer revolution to be fully exploited.

1. What work is available from Europe and Asia (e.g. van Ark (2000), Daveri (2000), Daveri (2000), Bassanini, Scarpetta, and Visco (2000), and Schreyer, (2000)) suggests ICT capital increased productivity growth. But, the performance of most of these economies has lagged behind the U.S.

ICT & Productivity Growth

The performance of the U.S. economy has been extraordinary over the past decade, especially when compared to Europe and Japan. This unusually strong performance has featured high growth in productivity and strong growth in service sector employment. In contrast, in many developed countries, employment and productivity growth has stagnated. Between 1995 and 1999, labor productivity growth in the US was about 2.25 per cent per year, with increases in employment of 1.6 per cent per year. Productivity in Europe and Japan grew at a much slower rate and employment was either static or declining.

Some observers argue that information technology is the causal factor behind the performance of the U.S. economy. In this view, ICT technology is profoundly altering the nature of business and is leading to permanently higher productivity growth throughout the economy. Many see the knowledge economy-the e-age- as a possible third industrial revolution, of similar magnitude and significance as the first (steam) and the second (electricity) revolutions. In this view information technology is a new general purpose technology that lowers costs of computation, complements other technology, has widespread use, and takes time to evolve and diffuse.

The productivity paradox dominated early ICT impact debates. Until recently there was little evidence that ICT innovations had profound impacts economy-wide. Even while computers were becoming widely used throughout the economy, substantive productivity increases were not observed. This empirical generalization became known as the Solow computer productivity paradox and much of the literature focused on explaining it. One class of explanations argued that the paradox was not really a paradox at all. David (1990) argued that ICT was an evolving technology and it would take time for its full productivity effects to manifest themselves. He analogized the computer to electric power, which took over 50 years to develop. With the recent observed increases in productivity, the David explanation is at least consistent with the current data. Recent work by Gordon (1999) also suggests that there isn't really a paradox, but for a different reason. Essentially he attributes recent gains in productivity to three sources, changes in price deflators, normal procyclical productivity gains, and productivity growth in the production of computers. His results imply that the observed productivity gains came in spite of poor performance in the sectors that use computers most heavily and that ICT capital is much less important than new economy and e-age enthusiasts believe. This small payoff means the Solow Paradox "survives intact for most of the economy" (Gordon, 2000) and the productivity surge represents more of a cyclical event than any structural shift in productivity growth. An important explanation came from work by Oliner and Sichel (1994) and Sichel (1997). They emphasized that even though there were substantial numbers of computers in use, computers represented a relatively small portion of economy-wide capital. Since computer capital is very small fraction of total capital input, it was not surprising that it did not have a large impact on productivity. While this explanation was certainly true in a growth accounting framework, it doesn't explain the widespread disparity in findings at lower levels of aggregation. For example, a TCB (The Conference Board) study by McGuckin and Stiroh (1999) found that heavy computer using industries in manufacturing experienced sharply increased productivity growth in the 1990-96 period. Productivity growth, however, remained sluggish in the most computer intensive services sectors.

Studies of individual firms and business units generally support the proposition that ICT technology improves performance (Brynjolfsson & Hitt, 1996 & 2000). While this literature provides a strong case for ICT as a productivity enhancing technology, it does not have much to say about whether ICT is accelerating economy-wide productivity growth. Academic studies and an extensive body of evidence developed by The Conference Board (TCB) support the idea that ICT offers business large payoffs, but that successful ICT implementation and payback takes time ((Cooke & Peterson (1998); Hackett (2000); Michaels (2000)). ICT implementation takes time because successful adoption changes the way business operates, the way workers and machines interact on assembly lines, the way business handles inventory controls, and how management and related information is generated and disseminated within organisations. This requires major organisational and operational changes and employee training (Bresnahan, Brynjolfsson & Hitt, 2000).

Successful ICT implementation and payback takes time.

Deliberations and presentations from TCB council meetings and conferences buttress this view. E-age issues and experiences dominate the agendas of TCB council programs—forums for sharing information by business executives at similar functional levels. From human resource managers to CFOs, the consensus is that ICT implementation has payback and takes time.

Measurement Issues

Measurement issues complicate the debate. Many of the differences in findings can be traced to measurement errors and data problems. In fact, the U.S. statistical system has adopted many new methodologies and revised many of its output and price series in the past 5 years. These changes reflect wide-ranging concerns about data quality, price index methodologies, as well as new classification systems. Many of these changes can be traced in part to e-age realities. For examples, there is now an information industry in the North American Classification System and much of the impetus for the use of new hedonic techniques as a basis for constant quality price deflators came from the rapid improvements and proliferation of e-age products and services. These changes are welcome, but they are new and systematic updates of many earlier studies are often difficult.

Challenges arise in the measurement of output, particularly a problem in service sectors, and in the creation of price deflators. These challenges cover a broad swath of issues and in many cases involve technical considerations. Since these same issues arise in countries outside the U.S., they will need to be reckoned with if we hope to evaluate the spread of ICT throughout the world. Therefore it is worth briefly touching on them here.

Constant Quality Price Deflators

The e-age encompasses rapid progress in ICT, the rising importance of knowledge generating activities such as research and development, and the increasing use of highly skilled labor (scientists and engineers - in particular information technology specialists). These elements of the e-age generate improved ICT capital, new products and services across the industrial spectrum, and new ways of doing things. In this they are not unlike other goods and services. But the dramatic improvements in the quality of ICT capital stretched the limits of existing procedures for price deflators. While the U.S. has used hedonic price indexes since the mid-1980s and is expanding the range of deflators taking advantage of hedonic methods, the need for such techniques has not had universal acceptance. A key issue for evaluation of e-age impacts on productivity is the differences in price deflators for high-tech equipment across countries. With high-tech equipment prices falling at exponential levels, this source of error is also very important in comparisons across countries. For example, whether or not one concludes that the impact of computers in retail trade in the Netherlands is an important factor depends on whether the traditional or the new hedonic based deflator is used. (Bourens & McGuckin, 1999). The use of hedonic methods to derive price deflators is only one of many important issues in price measurement that has come to the fore in recent years (Boskin Commission Report, 1998). For both business and government, the importance of support for initiatives to improve price measurement cannot be overemphasized. A recent report from TCB makes a strong case for changes and underscores the importance of the issue to business (TCB, 2000).

Output Measurement

Although it is difficult to generalize about the source of output measurement, errors across industries (Triplett and Bosworth (2000a)), the banking industry gives some flavor for the issue. Until recently, banking output has been measured by banking inputs. Such a procedure leaves little possibility for productivity gains that, by definition, involve more output from the same inputs. As a result of new measurement initiatives, including the introduction of ATM transactions into the banking output measure, the banking sector is now showing productivity improvements. Sichel (1997) estimated the extent of such problems by focusing on the increase in the share of the hard to measure service sectors[2] (including banking) in U.S. GDP. This work is particularly relevant to the issue of the impact of ICT on productivity because of the concentration of ICT users in these hard to measure service sectors. Sichel's estimate suggested that the increased share of the hard to measure sectors led to an understatement of output growth of about .25 percentage points. Relying on earlier work by Baily and Gordon (1988) he restricted his analysis to the effect of the increased share of poorly measured sectors. Is this valid? Does the adoption of ICT contribute directly to measurement error? This is hard to prove, but there is a plausible case. ICT leads to reallocations of inputs across market and non-market boundaries. Since statistical measurement systems measure only market-based transactions, the shift of output to and from the market sector can distort comparisons across time. For ex-

ICT leads to reallocations of inputs across market and non-market boundaries. Since statistical measurement systems measure only market-based transactions, the shift of output to and from the market sector can distort comparisons across time.

2. Service sector output has been increasing as a proportion of economy-wide output in most developed countries.

ample, if a homemaker enters the job market and contracts out for his home based services, they are now included in GDP. Similar changes appear part of the e-age[3]. Moreover, the negative productivity growth rates observed for many industries are implausible (Gullickson & Harper, 1999; Corrado & Silfman 1999).

McGuckin and Stiroh (2000) provide an estimate of the magnitude of the measurement error associated with increasing measurement error for 13 key computer-using sectors. Including both the share and increased measurement sources of error suggests that measurement error is about 20 per cent of the measured growth rate. In terms of the early 1990s, measured productivity growth would have been about 1.7 per cent rather than the 1.4 per cent actually reported. For the later half of the period, this analysis suggests that productivity growth would have been around 2.7 per cent rather than the 2.4 per cent actually recorded. In this regard, Triplett and Bosworth (2000b) calculate the productivity acceleration in several computer-using sectors, communications, wholesale trade, banking, and insurance, using both newly revised and older data. The data only cover the 1994-97 period and are less than ideal, but they do show substantial productivity acceleration over the 1973-97 period.

Does ICT Accelerate Productivity Growth?

There are still many gaps in our information and understanding; however, a consistent picture of an economy characterized by accelerating productivity growth linked to ICT is emerging. Two recent papers, while differing somewhat in the details, offer very similar bottom lines. Both Jorgenson and Stiroh (2000) and Oliner and Sichel (2000) find that there has been a dramatic increase in labor productivity growth in the second half of the 1990s and that both capital deepening (more capital per worker-hour) and multifactor productivity[4] growth play key roles.

Both studies assign a slightly bigger share—55-60 per cent of the productivity acceleration to MFP growth.[5] This is in itself a remarkable turnaround since MFP growth has been anaemic since the early 1970s. ICT accounts for at least half, and maybe more, of the acceleration of labor productivity growth in the second half of the 1990s. Jorgenson-Stiroh attribute about 45 per cent to ICT, about 25 per cent from capital deepening and nearly 20 per cent from the MFP associated with the production of ICT. Oliner and Sichel assign around 40 per cent to capital deepening and 25 per cent to ICT production. This gives a total for ICT of about 2/3 of the productivity acceleration in the second half of the 1990s. Given the differences in the details and the data issues involved, the similarity of their conclusions is remarkable.

The fraction of total labor productivity growth assigned to ICT is probably underestimated in both studies. The estimates only account for MFP gains in the production of computers, not elsewhere in the economy. With currently available data, it is not possible to measure ICT contributions to MFP growth in other sectors. This is a key area for future work since this is where the majority of computer ICT capital is used. Moreover, if as is at least plausible, measurement errors are underestimating productivity growth in these ICT using sectors, then the contribution of ICT could be even higher.

Is the Higher Productivity Growth Sustainable?

At this juncture it would be presumptuous to think that the e-age represents a permanent shift in the trend growth of productivity and output. It is relatively easy to see a trend shift in both labor productivity and GDP growth in the data for the last five years. But, the short period of time, the long list of data problems outlined, and the long history of forecast failures cautions us about making too much of the latest findings. On the other hand, measured ICT impacts are very large (especially in view of the potentially large underestimates of output in heavy computer using industries in the services), the productivity diffusion pattern appears to fit the slow evolution model typical of general purpose technologies. General-purpose technologies are important new ideas and techniques that have large impacts, a broad range of applications in production processes, and strong complementarities with other technologies. They also are evolutionary in nature in the sense that

3. In addition some argue that ICT has increased the rate of new product and services creation, an area where statistical systems have great difficulty (Diewert 1998). For a dissenting view see Tripplett (1999).

4. Multifactor productivity (MFP) represents the amount of productivity growth not explained by inputs. It is calculated as a residual and includes effects of economies of scale, technological change not associated with inputs, managerial skill not captured in labor quality measures, changes in organisational structure, as well as measurement error. As example, consider a department store that shifts around its display areas, leaving the display materials and the sales force the same. Increased labor productivity due to this kind of technical change is what is captured in MFP. Thus, multifactor productivity can be thought of as measure of the decline in costs not associated with changes in the mix of raw materials, capital, and labor used.

5. Based on reworking a chart prepared by Sichel (2000b, Table 1) to compare the findings of the two studies. The figures assume that labor quality declines are added back into to labor productivity growth. If this is not done then, both papers report a one-percent productivity growth.

their applications and cost reductions are realized on a continuous basis over long periods of time (Bresnahan and Trajtenberg (1995)).

ICT generally and, more specifically semiconductors, seem to conform to the properties of such technologies. The computer impacts many areas in the U.S. and is spreading worldwide. But even in the U.S. diffusion has a long way to go. For example, the telephone network is yet to be digitized, e-commerce is in its infancy, and business is still introducing ICT systems like SAP, and transforming their operations and expanding business-to-business applications. ICT has a wide range of uses—trucking dispatch, ATMs, check clearing, health and biological research, trading systems, and manufacturing processes to name a few. And these examples also illustrate that ICT meshes well with other technologies from assembly lines to scientific research in biotechnology.

ICT has a wide range of uses—trucking dispatch, ATMs, check clearing, health and biological research, trading systems, and manufacturing processes to name a few.

A casual glance tells us that the organisation and pace of economic life is very different today than it was 30 or 40 years ago when the computer began to emerge. Of course things always change and one must be careful not to make too much of the fact that the "times they are a changing." The times are always changing. There are at least two approaches to exploring sustainable impacts. One approach exploits the historical record of major or epoch changing innovations like electricity to assess the importance and expected course of the e-age (David, 1990). Is the computer a new fundamental force or an extension of something fundamental? Or, to use a phrase coined by Bradford De Long, one tries to determine whether the computer is a tool or a gadget. Arguably, the record appears consistent with the fundamental force hypothesis. An alternative approach focuses on the basic neoclassical growth accounting model that guided the earlier discussion. It exploits the fact that productivity growth can be decomposed into growth in MFP and share weighted changes in capital deepening. Predictions about the course of productivity are then based on predictions about future movements in MFP and capital deepening. The approaches are not mutually exclusive. Indeed, they are complementary. If ICT is a new fundamental force, its impacts will manifest themselves in growth accounting exercises.

As has been pointed out by many commentators, capital deepening has been the major feature of the e-age so far. Price declines in IC equipment have driven massive increases in investment spending and widespread substitution of capital for labor in industries using computers. The source of the cost reductions that led to the price declines in IC equipment is MFP growth in the computing producing sectors. Whether these price declines can continue depends on technological progress in ICT production.

A key issue is whether Moore's law, which states that capacity of computer chips doubles every year or two, will continue to hold. Reports by specialists suggest that it should remain operable in the near term, but beyond that, new technologies based on biotech advancements will be required for continued progress. The growth in MFP in the late 1990s was huge in comparison to the last twenty-five years. A substantial fraction of these MFP gains came from the production of computers. If MFP gains in computer production slow, this will reduce investments in computers and capital deepening. Arguably, there are substantial possibilities for ICT investment worldwide based on the limited diffusion we now observe, even if computer prices don't continue to fall. But whether continued capital deepening is observed depends on many factors, including the status of labor markets. Sectors other than those producing IC equipment accounted for a half to two thirds of the total MFG acceleration in the last half of the 1990s. Are these substantial MFP gains to users an e-age or "new economy" dividend? It is not possible to tell without new data, and some resolution to the output measurement issues. Nonetheless, the prospects for breakthroughs in health and biotech seem limitless. The recent mapping of human genes offers many possibilities for research spillovers. Moreover, this achievement is an example of the faster pace of innovation that is associated with the capabilities of ICT to process information. Research and development is the area that arguably generates the greatest spillovers.

ICT & Markets

The role of ICT in reducing information and communication costs is often cited as an important factor for improving the operations of markets. The lower information costs support more efficient search by consumers, including businesses. This réduces monopoly distortions and enhances incentives for efficient operations. These general arguments are applicable to all markets, product, capital, and labor. While they deal principally with one-time gains in output, they have widespread applicability. In addition, ICT may improve labor participation rates engendering a permanent upward shift in the sustainable growth rate. In

labor markets ICT helps to ensure that the qualifications of worker and employer needs are more closely aligned. ICT enhances possibilities for flexible workforce arrangements – telecommuting, temporary jobs, outsourcing, for examples – that contribute to achieving better worker/ employer matches. This will tend to improve labor productivity. It may also raise participation rates by making it simpler for workers to reallocate to new jobs. ICT also provides new ways to deliver training and education. Both factors will improve participation rates and productivity[6]. These aspects of the e-age are difficult to quantify. However, it may be one of the most important ways in which ICT affects economic performance.

Exploiting ICT potential requires supportive environment

Development of ICT technology was centered in US for the following reasons:

- University structure to support technology
- Legal and governmental infrastructure facilitating development of technology and its diffusion
- Common law rules; corporate governance principles; accounting standards and openness
- Product market restrictions and zoning limits weak
- Venture capital markets and breaking banking constraints
- Entrepreneurial possibilities and ease of entry of new business
- Antitrust restrict monopoly combinations and price fixing (reformed in 1970's)
- Labor market relatively flexible
- Structural reforms of 1970s and 1980s were key factor which enabled technology to develop and provided possibilities for its use in a wide variety of applications
- Energy crisis helped foster change

Conclusions

- ICT is and will continue to transform the way business and government operates:
- Changing the nature of transactions business to business and business to consumers (this is the key part of measurement issue),
- Generating increased competition for business,
- Making it difficult for governments (business) to remain isolated (in control),
- Creating more winners and losers,
- And generating increased political pressures as well. To exploit ICT potential supportive economic and political structures are required.

□

6. It is now well established that the speed limit for economic growth is set by the growth rates of labour productivity and labor input. Effective labour input can be increased through skill upgrading. Growth in labour input is primarily determined by growth in working age populations (from birth and immigration) and labour participation rates. Many factors influence labour participation rates. For example, tax and social policies can have large effects on incentives to work. It is possible that ICT could improve labour participation rates independent of its effects on productivity.

Strategic Thinking for the Era of Knowledge Economy

Casper Shih

With the global shift from market economy to knowledge era, the tenets of business have changed. The author elucidates the strategies to be adopted to be successful in the present context.

Casper Shih is with Global Chinese Competitive Foundation, Taiwan.
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We are in the era of Knowledge Economy. In 90's United State recaptured the leadership of world economy, with the use of Knowledge based information in all economic activity especially through the powerful Internet.

Knowledge Economy

As the author of Digital Economy, Don Tapscott, says, "The new economy is a knowledge economy based on the application of human know-how to everything we produce and how we produce it. In the new economy, more and more of economy's added value will be created by brain rather than brawn, many agricultural and industrial jobs are becoming knowledge work." Knowledge is used to produce products as well as for making them smart. The knowledge content of dumb products is increasing. In the new economy, adding ideas to products and turning new ideas into new products is what the future is all about; whether people act as consumers or producers, adding ideas will be central to wealth creation. The rise of the four Asian dragons in the 1980's led to a situation where other developing countries began to copy what they were doing practically wholesale. As a result, countries began to produce similar products, creating a situation of chronic over supply. Given the existence of limited global markets this reduced competition to a matter of price competition. Many countries developed in a way that left them with no product considered uniquely their own, and enterprises found themselves with no core competence but only blindly copying others with a lack of innovation.

Paradigm Shift – a Necessity

The world today is in the midst of a period of explosive change. This change is so fast and furious that the future is at once both indistinct and unpredictable. Japan's Economic News has likened Japanese banks

(The Japanese Central Bank) to a boat in the middle of a vast ocean. It continues to move but has no charts to show where it's going. In such a climate whether we can safely reach the harbor of financial stability remains an open question. If even the Japanese Central Bank with all the experts and resources at its command cannot escape such difficulties, then the problem faced by small and medium businesses is manifold. These problems faced today are in fact a direct product of the success the countries of Asia experienced earlier. It has been said that: "Experience does not always make us smart. Experience can also make us dumb." Success is sometimes the mother of failure. Hence we urgently need a paradigm shift.

There is a need to change past ways of thinking and doing things. It is essential not to be mesmerized by "market economy" fever. Looking to see what sells well in the market place and following suit may well have been good market economics in the past during the industrial age, where following others could be equally profitable. However, things are different today in the era of knowledge economy where the economy is customer oriented. Only by knowing precisely who the customers are, what they want, how many they are and what sort of prices they can afford can a model firm manufacture the products they expect, that they want to buy and that will perhaps pleasantly surprise them, with a value others cannot provide. In mainland China enterprises are unable to sell the high quality, high price, TVs, air conditioners and refrigerators they are producing. They still persist in producing such high quality, high priced products, as they feel they have to conform to the trend of all market economies. This mistake is similar to that made by the three big US automobile manufacturers in the 70's-80's. Despite slight differences in approach, the US public wanted cars with low fuel consumption and GM, Ford and Chrysler fought with each other to develop bigs cars. As a result, one third of the domestic car market was captured by Japanese manufacturers, who produced low-fuel consumption cars.

Knowledge economy is customer oriented.

If the home appliances sector in mainland China maintains its current way of producing high price TVs, air conditioners and refrigerators etc. their future is bleak. This is so for the simple reason that everyone who can afford to purchase such appliances has already done so. Nevertheless there remains billions of people of mainland China who still have not purchased TVs or other appliances, it would be better to create a new market locating a new customer base. This implies a need to find ways of developing cheaper models, to halve current costs. This will ensure that billions of families currently unable to afford televisions are bought into the market. This is one way of creating a new and much larger market.

Every system has its own growth limits and this is equally true for any paradigm. There are different interpretations for the term paradigm. Marilyn Ferguson describes it thus: "A paradigm is a framework of thought --- a scheme for understanding and explaining certain aspects of reality." Stephen R. Covey describes it as the way we "see" the world – not in terms of our sense of vision, but in the way we perceive, understand and interpret the world in which we live. A simple way to understand the concept of the paradigm is as a map. Thus, reading the wrong map would never help one arrive at the destination, regardless of the effort you put in. On this basis, it is essential that we set about revolutionising the way we think of as well as do business.

Customer Oriented Product Development

The most important in changing 1990's industrial management trends has been demand. A number of important factors must be cultivated to foster the creation of new business and products:

Speed Revolution: What changes have there been in demand? The first point to note is the "Speed Revolution", that is all products have come to highlight speed. Computers are perhaps the best example. Chairman of the Acer Group, Stan Shih, argues that the computer industry must turn itself into a fast food industry, like MacDonalds, where the product is sold as soon as it is produced. This allows the transfer of the freshest technologies into the hands of the customer and there is absolutely no need for inventories. At present one of the most important reasons for losses is not because of not making money on what they sell, it is that the life cycle of this product has disappeared, that it can't be sold. Inventories are in fact the most important factor causing losses.

Pursuit of Convenience

Value for Money: In the past, good quality gave one a competitive advantage. This is no longer true, because good quality is already a basic market condition. Right now "good prices" are what attract consumers.

Multiplicity of Choice: Needed to meet the increasing diversity of consumer demand.

Ecological Considerations: Before purchasing a

product these days consumers first consider the level of harm it causes to the environment. Hence firms are obliged to manufacture environment friendly products.

The concepts discussed can be broadly included under the rubric of customer orientation, that is a market which takes the wants and needs of the customer as its primary consideration. In other words, a market where there are no competitors is the one truly competitive market. But what exactly do we mean by customer orientation. First we must understand who our customers are and find out what their real demands are, and from that how to design and provide products and services that go beyond the real needs of customers. This is the best way to achieve customer satisfaction. If a company can manage this, then products they develop will definitely sell and make money.

Establishment of Core Competence

The key to a successful business is not to do the same things as someone else or to compete with others. Success comes from doing things differently and avoiding competition. This allows one to provide a unique or integrated value to customers. An enterprise able to achieve this is more likely to be successful. If a company wants only to survive, then it will have to compete with others, because competition is the route to survival. However, enterprises seeking sustainable development need to look further than merely competing with others. They need to go beyond competition, to providing unique value, that is the provision of a core competence. In simple terms core competence refers to providing customers with special value, something that no one else has the ability to provide. One good example is the Japanese company Sony. For the last 30-40 years, Sony's core business has been audio-visual products and miniaturization which was its core competence. However, when other companies develop the same skills one's core competence disappears. As such, companies must be relentless in the development of their core competence.

Core competence refers to providing customers with special value, something that no one else has the ability to provide.

Concept R&D – Listening to Customers

People involved in the field of technological research often express the concern: Even with numerous researches and having invented new technology and patented them, it is impossible to turn the research into valuable products. Each year there are tens of thousands of patents handed out for new inventions, but the number of these that are ultimately developed into products is probably less than 1 per cent. What then is technology? After fully grasping the concept of "customer orientated" product development, how is it to be implemented? The answer is Concept R&D particularly for small and medium businesses. Concept R&D was introduced in Taiwan 7-8 years ago. This is an extremely important area and one where it is extremely easy to benefit. It is a form of work absolutely anyone can do, that applies to all sectors of the economy and that requires no educational background. As long as one is willing to believe in it, it can create opportunities and value. It is the combination of a group of things (information) that gives "concept" aim and advantages. Many industries have developed out of concepts such as banks, freeway tollbooths and overnight delivery etc. In this sense, innovation or creativity involves bringing forth things that currently do not exist – be it ideas, or approaches. Thus, other than technical R&D, it is necessary to create an environment where all employees can become involved in concept R&D. Only then can we have genuine creation of value. Although the technical level of products such as the Sony Walkman, 3 M's Postits, Fuji's instant camera and VCR Plus was not particularly high, concept innovation ensured that the value they created attracted the attention of the public. In addition, products such as the computer, facsimile machine, the video recorder and the PPC were technically more advanced, but coupled with market innovations they created amazing value. In contrast, because application technology has yet to be found for other high tech products such as superfine fibers or rotary engines, the value they have been able to create has been relatively low. The best way for small and medium enterprises to develop products is concept R&D. In fact the area of most importance at present is not R&D into new technology but new product concepts. Once we have a product concept we can then look for existing technology to meet needs. The problem with products that cannot at present be developed lies not with technology but the lack of new product concepts.

Development Innovative Corporate Culture

Environment is the most important factor influencing individual performance. The way in which individuals think is closely influenced by organisational culture. Although organisational culture is an intangible management resource, many entrepreneurs are

well aware of its importance and regard it as a key element in management strategy. As such, any organisational reform must start with corporate culture, with the aim of creating an environment where individuals dare to speak their mind. That is the only way to create professionals who can both do and create. How do we go about establishing such a work environment? First it is necessary to breakout of old ways of thinking and remove habitual barriers, establishing a research environment based on new rules. In response to the new century, enterprise management thinking has already changed considerably. For example, company interest first has given way to customer interest, investor satisfaction has been replaced by customer satisfaction. It is better to attract customers than to sell well, it is better to work out ways to satisfy customers than to think about how to make greater profits. Put simply, the move has been from things to people, from "controlling orientation" to "mission orientation", developing a corporate culture that attaches sufficient importance to Concept R&D, Innovation, Quality and Organisational Learning. This is necessary to turn everyone into a habitual innovator and allow everyone to develop his or her unconscious competence, creativity and innovation.

It is necessary to breakout of old ways of thinking and remove habitual barriers, establishing a research environment based on new rules.

Establishment of PROVICE[1] Business

Today it is necessary to integrate products and services in order to expand the profit zone. There are many good examples that emulate in this respect. GE medical company produces not only CT scanners, but has created a global CT scanner network, connecting scanners installed in hospitals around the world. As such, GE can monitor each scanner's condition, ensuring each is in prime operational condition. This has helped increase the company's profits by 30 per cent and has pleased hospitals very much. The OTIS Elevator Company started to do the same thing and has seen profits and customer satisfaction improve as a result.

Information Technology & eCommerce

It is vital to understand the speed revolution brought about by information technology and how this is changing our way of life and the workplace. As we race into the future, with new technology is being introduced at an unprecedented rate, it has served to dramatically enhance our means of communication, in a way that everyone on the planet can create their own digital business, functioning at the speed of light. Several examples serve to highlight this point: Cisco Systems first started its web commerce in July 1996 and in two and a half years achieved US$ 8 billion in revenue, now processing over US$ 1 billion on-line orders each month. Cisco is one of the major success stories of web commerce. Digitoe is a footwear company that takes personal measurements and will make a customized pair of shoes in 3-4 weeks. A Canadian Company, PETtrack allows pet owners to implant microchips in their pets so that they can track them down if they get lost. At present, something in excess of 4 million dogs and cats have had implants. Coca Cola in Japan has a network of vending machines that automatically contact the central distribution facility when they are running low on a particular soft drink. LoJack in the United States is an anti car theft device, that allows the police to pinpoint the location of any stolen device. Four years ago the China Productivity Center in Taiwan was transformed into a virtual office. As a result staff is encouraged not to go to office, unless it is absolutely necessary. It should be possible to work almost anywhere as long as it is convenient and productive. Both intranets and Internet are used for communication. It is now absolutely vital that processes are digitized and as much business is conducted on line as possible. Failure to utilize information technology to its full potential is to deny the future. It must be borne in mind that the future is today–it is now.

Conclusion

The key to future success is to reinvent business on the web, and live in the state of Knowledge Economy as soon as possible, therefore cultivating a knowledge based corporate culture is a must. Most of us think : "I'll believe it when I see it." But changes are already too quick to maintain such an attitude, because once you see it, it's already too late to do anything about it. Clearly the way forward is to change the way we think if we are to succeed. We must say "I'll see it when I believe it." □

1. PROVICES is a new word coined by the author, to mean PROducts plus serVICES).

Reinventing the Organisation for the e-Age

Yoshihide Ishiyama

The author reviews the business opportunities being created (and possibly destroyed) by IT. In actual practice, how Japanese corporations are absorbing IT and transforming their lines of business is also dealt with. The article offers an argument as to how IT is and should be reinventing corporate organisations.

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In 1998 the Japanese economy was in severe recession, with negative growth of 2.5 per cent and unemployment rate of 4.1 per cent. Since 1999 the economy has started to revive albeit slowly. Amidst this stagnant economy the only ray of hope is the IT Revolution and the re-birth of corporations. Excess capacity and balance-sheet weaknesses still remain in many industries, but innovation-driven corporations, many of which are small and new, are gradually taking roots. Corporations that have already absorbed IT well and are thriving are still a tiny minority, but the majority of them have at least recognized its importance.

The Japanese economy has always been characterized by highly efficient manufacturing industry and, in sharp contrast, highly inefficient finance, distribution, telecommunications, services, and construction industries. Even in the manufacturing industry inefficiencies are visible in such areas as corporate control, marketing, procurement, logistics, and distribution. Novel management techniques made possible by IT are expected to enable corporations to make a significant progress in solving these problems. The task ahead is not simply adopting IT-based management techniques; rather, it is re-defining corporate strategy and making changes in corporate organisations in an environment of the unfolding IT Revolution.

The Japanese economy has always been characterized by highly efficient manufacturing industry and, highly inefficient finance, distribution, telecommunications, services, and construction industries.

IT: Enabling & Disruptive Aspects

The model of Japanese corporate success has, as many have argued, centred on the notion that high quality and low cost can simultaneously be achieved by

continuous improvement (Kaizen). The practice of continuous improvement in Japan was initially applied to the product, but has subsequently spread to manufacturing process and to business process in general. In past decades, this practice in the workplace, which is by no means easy, has enabled corporations to constantly raise the quality and variety of products. In an age of stable technology and relatively homogeneous consumers, such an incremental approach and homogeneous competition among corporations have proved surprisingly rewarding for Japanese consumers and corporations.

However, this Japanese model had run out of its useful life by the mid-1980s. Incrementalism had increasingly degenerated into attachment of frivolous functions or "over-quality" that few consumers want, only adding to price but no value for money. No wonder, consumers began to refuse expensive but indistinct products or services. Incrementalism had also induced corporations to make competitive capital investments without regard to profitability calculations which eventually resulted in massive excess capacity and low rates of return on equity and assets. Capital productivity, or real value added per unit of capital assets, continued to deteriorate. Labour productivity, or real value added per manhour, has been at par with those in the United States, at least in the manufacturing industry, but the improvement thus far has been achieved by increase in capital stock per worker almost entirely and not by increase in organisational efficiency or in genuine technical progress. Recent weaknesses of Japanese firms have been described vividly by Porter and Takeuchi (1999).

In the late 1990s, Japanese corporations did arrive at the realization that incrementalism may not be the right approach to run their businesses, satisfy better-informed and more price- conscious customers, and achieve high levels of labour productivity as well as capital productivity. They do feel the need to break free from the pack. Fundamental reform of the business process has thus become an imperative for virtually all corporations, regardless of the spread of IT. However, the influence of IT on conducting business is increasingly pervasive, and nobody can afford to ignore it.

Incrementalism may not be the right approach to run businesses and satisfy better-informed and more price-conscious customers.

Enabling as well as disruptive aspects of IT are being observed in the evolving digital economy. It is often the case that those two aspects show up as the two sides of the same coin, and therefore the introduction of IT into business requires careful planning and prior assessment of its outcome. Let us now review what IT is enabling corporations to do in general.

Firstly, in the area of product innovation, IT is enabling firms to develop entirely new products and services that cannot possibly emerge without IT. To give a few examples, there already exist such IT-embodying products as the personal computer, the car navigation system and the video game machine. In the near future we shall see such products as the telephone with a TV screen, the automatic interpreter machine, the intelligent cleaner, the home server for entertainment, the nursing robot, and the like. There also already exist newspapers and magazines, games, and music, all distributed on-line. Secondly, in the area of customization, IT is enabling corporations to offer products and services that are made to specific orders from individual customers at prices only slightly higher than those of mass- produced products and services. Examples are personal computers made by Dell Computer, blue jeans by Levi's, cosmetics products by Proctor & Gamble and wrist watches by Citizen. GM and Ford are about to offer automobiles with more options, although they are still a long way from full customization. Customization of manufacturing is, of course, not easy (GM is now building a factory that can operate with direct orders from consumers). Moreover, customization is not limited to manufacturers. Even with mass-produced products, it is possible to tailor some aspects of the services or delivery surrounding the product. For example, the way the product is packaged can be changed according to a specific circumstance of a customer. Customization with reasonable price will not be attainable without the support of IT.

Thirdly, in the area of standard products, IT is enabling retailers and manufacturers to market their merchandise on-line through Web sites. Retailers may be virtual or real, and even real retailers with bricks-and-mortar stores can run on-line stores. Manufacturers are also expanding their direct sales to consumers through Web sites. In case retailers do not have enough resources to maintain a Web site on their own, they can depend on on-line shopping malls, and some such malls have already achieved big success. Fourthly, IT is creating new types of intermediaries. When large manufacturers expand on-line procurement of materials and components, they do it on their own, but also increasingly through intermediaries. ANX (the Automotive Network Exchange) with the Big Three, Renault and Nissan is one such example. In Japan, many large manufacturers are opening up open e-marketplaces,

where sellers and buyers can freely enter for transactions in materials and components. For consumer products, on-line shopping malls, auctions and automobile information providers are also newly born intermediaries (infomediaries).

Though IT is beneficial to emerging new businesses, at the same time it is disruptive or destructive to traditional businesses. For example, the expansion of e-procurement and e-marketplaces will destroy, at least in part, the traditional assembler-supplier relationship. The expansion of direct B to C marketing by the manufacturer will have the same effect. In general, small suppliers, small retailers and small wholesalers will have to face the danger of losing traditional business. A more subtle aspect of this whole process is that the enabling aspect and the disruptive aspect of IT can co-exist within the same firm as well as across firms. In theory, it should be possible for any firm to integrate the on-line businesses so that they do not conflict with each other. One way out is to establish a subsidiary company, which deals with products not marketed by the parent company, but there will be other ways. For any firm facing the risk of losing business in competition with on-line companies, the way traditional business is conducted can be altered in such a way that the remaining competitive advantages, such as intimate personal service, the sense of security from the physical facility, instant provision of the merchandise, and possibly the reliable brand name, will have to be polished. Fortunately for traditional businesses, some products (mainly luxuries) and many services would not easily go on-line.

Though IT is beneficial to emerging new businesses, it is disruptive or destructive to traditional businesses.

IT-Based Businesses in Japan: Current Status

The IT Revolution would not be so revolutionary if brand new products and services did not emerge with its support. How do Japanese firms fare on this count? The answer would be "Not bad, but not excellent." The traditional strength in consumer electronics, automobiles and robotics is today turning out interesting products such as video game machines, digital cameras and digital video cameras. Video game machines can never be ignored because they are a surprisingly big business. Sony Computer Entertainment could sell 380 thousand units of Play Station 2 in only three days on the Web site when it was launched in February 2000. The company plans to sell 10 million units of this high-performance machine over a year worldwide, at the price of about $400. Development of this machine was done in collaboration with Toshiba, and cost more than $1 billion. Digital cameras are becoming popular now worldwide, and Japanese electronics firms dominate the worldwide annual production of a little over 5 million units.

Personal computers present a mixed picture. They are certainly produced on a massive scale (11.7 million units in 1999), but the lucrative parts (the OS and the CPU) have to come from the United States. There are about 27 million users of the Internet now, mainly via personal computers. They will have to be made more user-friendly, however. A number of interesting new products will be turned out in the near future. Matsushita Electric Industrial is completing its R&D on the home server, which will be like an integration of a computer and a VTR. Honda Motors and some other companies are experimenting with the nurse robot. With the progress of IT, it is expected that Japanese electronics firms will soon turn out many digitized household appliances.

In mobile telephony, Japan has been catching up with other more advanced countries. As of March 2000, there are 51.1 million users of wireless, hand-held telephones, whose number increased by 9.6 million in fiscal 1999. Among the users of mobile telephones there are 12.7 million who subscribe to Internet access. This service, introduced by NTT DoCoMo in February 1999, has grown explosively. Unfortunately, however, the telecom industry, as an integral part of the IT infrastructure, still charges high rates and the transmission speed is still slow in Japan.

On the front of manufacturing customization, the only serious case is the one practiced by Citizen Watch. At reasonable price this company offers customization of wrist watches. It is puzzling why automotive and electronics companies, with their enormous capacities and flexibility, are not showing much interest in customization. In production of software and contents, the Japanese have shown a sharp contrast of weakness in operating and application software and strength in game software. For the personal computer, operating and application software have been dominated by U.S.

Japanese have shown a sharp contrast of weakness in operating and application software and strength in game software. The explanation lies in the Japanese talent for visual illustration.

products such as Microsoft's Windows, Excel and Word and Lotus'-Lotus 1-2-3 and Lotus Notes groupware. Such a dominant position of the U.S. software products has been achieved by a long history of computer science and a large number of computer users in the United States. In Japan, the number of computer scientists is small and the importance of software has long been neglected. Although it is difficult, if not impossible, to close this gap with the United States, it is not that the Japanese totally lack the talent for developing original software. For example, in mobile telephones and car navigation systems, Japanese-made software called TRON is used. Japanese strength is more apparent in game software such as Final Fantasy from the software house called Square. Game software is exported on a large scale. There are some 70 game software developers in Japan. The explanation of this strength in game software perhaps lies in the Japanese talent of visual illustration, which goes back of ancient times. In the area of digital household appliances, it is expected that the Japanese will produce many interesting software based on technologies of logic LSI chips and application software directed towards appliances.

New products and services certainly contribute to higher productivity. There are two ways to raise productivity—one to create new demands with new products and services and the other is to adopt more efficient means in the operation of existing businesses. Let us move to the changes in the operation of existing businesses that are taking place now. Almost all large corporations are undertaking IT investment in order to raise operational efficiency. Clearly, R&D is one area where the cost cutting effort is being directed. Automotive companies are raising the level of CAD and trying to bypass the building of the mockup model. Toyota Motors says that about 40 per cent of collision tests are now conducted on the computer and there has been substantial cost savings. Given the increasing complexity of technology development and the shorter product cycle, corporations are stepping up their R&D collaboration with other corporations. Sony has started such collaboration in designing and developing parts and components with its suppliers. Japanese corporations have yet to build a more effective way to collaborate with universities.

In manufacturing, the application of computers is continuing. In addition, the use of modules and standard components is spreading. Achieving lower cost and yet maintaining quality and character are the goals. On the front of selling more, corporations in consumer electronics and automobile industries, banks and brokerages, and large retailers are launching Web sites and trying to market their products directly to customers. Obviously the aim is to expand sales without the high costs of traditional ways. Sony (January 2000) and Matsushita Electric (October 2000) have set up subsidiaries to sell their products to consumers on-line. Hitachi will follow suit in January 2001. To be precise, Sony runs a direct sales company, whereas Matsushita and Hitachi run portals to invite consumers to retailers in the group. Kao, a cosmetics company, began in April 1999 to equip some 2,000 store advisers of its sales subsidiary with notebook PCs, which can be used to access the internet for merchandise information and information about successful sales cases. These store advisers visit retailers and discuss business plans with them. One of the most successful cases of on-line sales is a company called Askul (meaning come tomorrow), which sells mainly stationery goods to other companies. It used to be a business unit of a manufacturer called Plus, but became a subsidiary company in 1997. In 1998, its sales reached Y22.6 billion and its pre-tax profit Y0.8 billion. Its headcount is only about 120, but it deals with some 800 thousand customers across Japan. Prices are lower than in regular retail stores, but the greater customer value is the convenience of the delivery of an assortment of stationery goods to the company office.

At the moment, the announced plan of Seven Dream dot-com is attracting a great attention. In Japan convenience stores have been a big success in retail industry, with their great variety of merchandise and just-in-time, small volume delivery by wholesalers. Seven-Eleven Japan, a subsidiary of the giant general merchandise store Ito Yokado, is the most successful convenience store chain; it set up Seven Dream dot-com as a subsidiary in October 2000. The business plan is to put up terminals in 8,400 Seven-Eleven stores across Japan and sell PCs, books, household goods, tickets, etc. that stores do not sell. Merchandise can be delivered either on the store front or by the home delivery company. This is a model of click-and-mortar, which seems to hold a good prospect. On the front of on-line procurement, many large manufacturers have already set up open systems. For example, Sony's procurement of components, now running at about Y1.5 trillion, is expected to be 90 per cent on-line by 2001. Fujitsu, NEC, and Matsushita Electric, whose procurements are even larger, are moving in the same direction. Their systems are not entirely open, however. Sony maintains the system with 500 suppliers out of 3,000 it deals with. Sony's production plan is disclosed for a period up to 7 months real time to these suppliers so that they can also plan their production and deliver components just in time.

Organisation Follows Strategy

Professor of management history (Harvard) Alfred Chandler has propounded a widely known dictum "Or-

ganisation follows strategy". Faced with the coming decades of IT Revolution and radical change, corporate leaders throughout the world cannot avoid re-defining their organisations. This task is usually couched in terms of "going cyber". Not only businesses but organisations have to get cyberized. Within the organisation, cyberization tends to proceed at differential speeds and is usually most advanced in manufacturing, which explains why corporations have been strengthening the use of IT in other areas like marketing, procurement, logistics, inventory control, and office work. Aims of such cyberization are cost savings, faster response to marketplace and operational efficiency. Many corporations are yet to reap these benefits from cyberization.

However, re-defining and re-inventing the organisation today is not as simple as that. Organisation may be defined by divisional structure or by hierarchical structure. The issue of how best to introduce IT into the organisation has been discussed extensively. But an organisation can also be defined by its mission—the vision and the strategic objective in the case of the business organisation. It is here that Chandler's dictum has a bearing. Corporate vision is the message the that a corporation projects to society as to what that corporation exists for. Sony has a vision of "digital dream kids", and tells us that it intends to provide society with entertainment based on digital technology. Toyota Motors has a vision of "harmony" (with society and environment), and tells us that it intends to develop automobiles that are friendly with society and environment. Unfortunately, only a minority of Japanese corporations succeed in projecting such visions. When considering vision, it is not enough merely to say that the company wants to contribute to the well-being of the nation through business activity. Vision has to be more specifically rooted in that company's identity and character.

Once the vision is established, the next step is to define strategic objective(s). Everywhere strategy is talked about, but rarely is it defined precisely. As Kim and Mauborgne (1999) state, market creation, rather than incremental improvements in cost and quality within existing businesses, must be the central strategic challenge to corporations. It has always been so, but the need and potential for market creation, based on radical technological changes, are even larger today. People are tired of more of the same. Kim and Mauborgne rightly point out that "key insights into new market spaces rarely come from projecting the trend. Instead, they arise from business insights into how the trend will change value to customers".

True, some industries compete principally on price and function, and other industries on feelings. In Japan, too many industries compete on feelings and frivolous extras only add to price, not customer value. In such a case, organisational changes to enable production and distribution of much simpler, sharply lower- priced products and services, which requires to break free from the pack, can be a distinct strategic objective. There is more room for such an objective now to create more customer value. For example, chain coffee bars like Doutour and Starbucks have proliferated in Japan. They are a low-cost operation based on self-service, and offer a cup of coffee at about Y200, whereas traditional independent coffee shops offer it at much higher price. On-line brokerage houses have succeeded in cutting transaction commission by nine-tenths. However, in other cases, turning a functional and low-price business into a luxury emotional business can also be a distinct strategic objective. In Japan, truly luxury goods and services are not produced well, and tend to be dominated by imports or foreign companies. Japanese companies have yet to find a distinct strategic objective aimed at high-end consumers with sophistication.

If strategy means market creation based on new technologies and new market opportunities, managerial leadership and coordination are essential. The best organisation will not by itself evolve in that direction. It is believed that large, integrated companies today are dinosaurs that will soon be displaced by focused, flexible, and relatively small companies. Although this belief seems to be correct in general, we have to carefully avoid one-size-fits-all thinking. For example, Sony changed from majority ownership to 100 per cent ownership of some of its subsidiaries in January 2000, which means tighter control by the parent. This is an issue of centralization vs. decentralization of management, which may not always be mutually contradictory.

As Professor Christensen (2000) of the Harvard Business School states, companies can outsource, play virtual games, and concentrate on core capabilities so far as many of their activities can be standardized. Machines not meant for the frontiers of performance can be made more effectively in a nonintegrated model, such as the system made popular by Dell Computer Corp. Cisco Systems Inc., which exploited the modular architecture of its routers to disrupt the telecommunications—switching business from the low end.

However, even these nonintegrated companies have been forced to integrate many R&D and manufacturing activities internally when they moved into the cutting edge. When truly new technologies emerge and companies wish to create new market space on that basis, virtual, nonintegrated organisations will not work. And, exploiting new technologies and creating new products and services must be the most important ele-

ment in the definition of strategic objective(s). This observation will by and large apply to the manufacturing industry, but also to the financial industry and possibly to the distribution industry.

Exploiting new technologies and creating new products and services must be the most important element in the definition of strategic objective(s).

Thus, organisation will follow strategy. But the converse is also likely to be true. At any given point in time, a corporation is endowed with certain resources and capabilities, which cannot be changed instantly. Organisational changes according to defined strategic objective(s) will take place over a certain time interval. Changes will have to be paced carefully. Big audacious changes rammed through the organisation will usually not work. At the same time, however, small organisational changes, so small as to be almost imperceptible, will not work. Japanese corporations usually prefer small, gradual change, but in the age of IT Revolution, not stable technologies, this approach is not advisable.

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The world is full of willing people, some willing to work, the rest willing to let them.

– Robert Frost

Dynamics of Knowledge Management & Intellectual Capital

P.N. Rastogi

This paper outlines briefly the nature, significance, rationale, and requirements of managing knowledge in organisations. Management of knowledge (KM) is viewed as a dynamic multi-feedback cyclical process involving organisational learning, innovation, competencies/capabilities, stream-lined work processes, human capital and social capital of the enterprise. The process is driven by the firm's turbulent business environment, and generates intellectual capital (IC) as its resultant. Intellectual capital is here viewed as the holistic meta-level capacity and capability of an enterprise to cope with the challenge of value creation amidst constant change. Managerial policy implications for sustained competitiveness are inferred from the KM-IC process.

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The competitive advantage of an enterprise is neither static nor lasting. Its nature and direction are continually defined and driven by the expertise and capabilities, creativity and innovation of the companies competing in an open market. "An organisation's capacity to improve existing skills and learn new ones", say Prahalad and Hamel (1990), "offers the most defensible competitive advantage of all". Herein lies the nature and rationale of learning and knowledge management in organisations.

Knowledge Management: Nature & Scope

Development and deepening of existing, and/or creation of new skills, competencies, capabilities, and expertise, depend on a continual cultivation, sharing, and use of knowledge by organisation members. A systematic and integrative coordination of organisation-wide activities of acquiring, creating, storing, sharing, diffusing, developing and deploying knowledge by individuals and groups in pursuit of organisational goals, defines the nature and scope of knowledge management. Knowledge management is a business process. It is based on learning. It involves creativity and innovation as knowledge generating activities, and leads to creation of expertise, skills, competencies and capabilities as usable forms of knowledge. The latter constitute the dynamic bases of a firm's competitive advantage. In this sense knowledge has become the key economic resource and the dominant source of competitive advantage[1]. "Leveraging organisational knowledge is not only important, but may be the most important job a management has" (Drucker, 1995).

1. The importance of knowledge in this context can be seen from the fact that the present market value of Microsoft at over $ 460 bn exceeds the total market value of all auto firms in USA. Similarly, the present market value of Infosys exceeds the market value of much larger auto and steel firms like Telco and Tisco in India.

Knowledge management is the process through which firms create and use their institutional or collective knowledge. It includes three sub-processes (Sarvary, 1999):

- Organisational Learning – the process through which the firm acquires information and/or knowledge;
- Knowledge Production – the process that transforms and integrates raw information into knowledge which, in turn, is useful to solve business problems; and
- Knowledge Distribution – the process that allows members of the organisation to access and use the collective knowledge of the firm.

Knowledge management comprises knowledge–focused activities. Eight major categories of such activities are (Ruggles, 1998):

- generating new knowledge
- accessing valuable knowledge from outside sources
- using accessible knowledge in decision making
- embedding knowledge in processes, products, and/or services
- representing knowledge in documents, databases and software
- facilitating knowledge growth through culture and incentives
- transferring existing knowledge into other parts of the organisation, and
- measuring the value of knowledge assets, and/or the impact of knowledge management

A succinct definition of KM defines it as systematic leveraging of information and expertise to improve organisational innovation, responsiveness, productivity, and competence (Lotus- IBM).

Knowledge management is the systematic leveraging of information and expertise to improve organisational innovation, responsiveness, productivity, and competence.

Globally competitive firms today are those which have the insight and foresight to develop, mobilize, and allocate their knowledge resources to ever new productive uses. Continuing development and expanding productivity of their knowledge resources are the most important determinants of their sustained high performance. Their practice of knowledge management is based on their belief that if they do not live in the future today, they will live in the past tomorrow. For this purpose, they have become engines of inquiry. They constantly and obsessively question their operations and processes, their theory of business, and the logic of their business models.

Knowledge management operations

Management of knowledge by a firm is driven by its strategy. Strategic objectives specify the desired business results. The latter specify the requirements of knowledge for decisions and actions in support of strategic goals. For meeting the requisite requirements of knowledge, firms plan and implement a set of KM operations as follows:

- **Identification** of the nature, kinds and modes of knowledge required for a competitively effective implementation of enterprise strategy. The knowledge may be explicit i.e., in the form of structured information; or it may be tacit (subjective) in the form of implicit operational know-how, or heuristics.
- **Mapping** the existing and available knowledge (including expertise and skills) in terms of its context, relevance, and locations. Preparation of "knowledge maps" assists employees to find out who knows what. Company 'yellow pages', skills inventory, and export databases denote various forms of such maps.
- **Capturing** the existing knowledge through its formalized representation.
- **Acquiring** needed knowledge and information including know-how from external sources as necessary.
- **Storing** existing, acquired, and created knowledge in properly indexed and inter-linked knowledge repositories.
- **Sharing** knowledge through its automatic access and distribution to users on the basis of their need and interest. It includes transfer and diffusion of best practices. Tacit knowledge can however be shared only through interpersonal interaction. This KM operation thence also supports and facilitates knowledge work collaboration among people through collocated and/or virtual teams.

- **Applying** i.e., retrieving and using knowledge including best practices, in support of decisions, actions, problem-solving, automating routine work, providing job aids, and training. The notion of putting the combined knowledge of the firm at an employee's disposal at his/her work site is the essence of Knowledge Management System (KMS). The basic goal of a KMS is to take key items of data and information from various sources, such as groupware, databases, applications, and people's minds, and make them easily available to users in an organized and logical form.
- **Creating** i.e., generating or discovering new knowledge through R&D, experimentation, lessons learned, creative thinking, and innovation. This is the most advanced stage of KM in a firm.

Knowledge repositories occupy a central place in any knowledge management system. A knowledge repository is an online, computer-based storehouse of organised information, expertise, experience, and documents about a particular domain of knowledge. The latter may range from business intelligence and customer-relationship-management to supply-chain management or new strategic initiatives. Creation of a knowledge repository involves collection, summarization, organisation and integration of knowledge across multiple information sources. They serve as foundation and knowledge sources for supporting problem-solving, performance improvement, skills and capability development, and process reengineering efforts.

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IT – infrastructure for KM

Some of the world's leading companies have created highly sophisticated, IT infrastructure for their KM activities. Buckman Laboratories' infrastructure for its knowledge management system (K' Netrix) for example comprises electronic forums, on-line libraries, a knowledge base, electronic mail, Internet/World-Wide-Web, intranet, project tracking systems, customer relationship management systems, groupware, bulletin boards, virtual conference rooms, and databases that capture institutional memory (O'Dell & Grayson Jr. 1998).

IT – infrastructure provides relevant, rich, timely, and accurate information to every employee who may need and use it. Such an infrastructural support system thereby makes a very big difference to a company's ability to cope with its complex and difficult problems and challenges. If information about production, product(s), service(s), distribution, marketing problems, and other important issues and emerging opportunities, gets through the organisation within minutes and hours, instead of days and weeks; and the concerned people are thereby enabled to work on the problems/issues/opportunities without time lags, the business can enhance its strategic readiness, and responsiveness substantially.

British Petroleum's creation of a virtual team network, as a core part of its IT – infrastructure support system for its KM, for example, produced the following big benefits (Prokesch, 1997):

- Big reduction in the man-hours needed to solve problems as a result of improved interaction between land-based drilling engineers and offshore rig crews.
- Notable decrease in the number of helicopter trips to offshore oil platforms.
- Avoidance of a refinery shutdown because technical experts at another location could examine a corrosion problem remotely.
- Reduction in rework during construction projects because designers, fabricators, construction workers, and operations people could collaborate more effectively.

The company estimated a saving of at least $30 millions from its virtual teams network, in the first year alone. Each member of BP's top management team, and each general manager of the business units, has at least one virtual team work-station. The network enables the firm to engage in continual conversations about competitive dynamics, performance and corporate values.

Structural support infrastructure

Structural support infrastructure refers to coordination of organisation – wide KM activities by a new role position designated as Chief Knowledge Manager (CKM). CKM oversees the involvement and varying participation of other major role positions like senior managers, functional or line managers, information systems staff, KMS staff, human resource managers, cross-

functional and other project teams' leaders, and individual contributors; toward implementing KM operations in the organisation. For this purpose, he/she also helps devise appropriate performance appraisal systems, incentive schemes, and other promotional measures toward fostering a culture of knowledge sharing, use, and creation.

A CKM most importantly however, must understand clearly the company's business model, the model's logic, and strategic drivers. On the basis of such an understanding, he must be clear about the nature and kinds of knowledge that are vital for the company's success and will help create value[2]. A CKM needs to be able to match knowledge and ideas with present and emerging business needs and challenges, and be most of all a knowledge broker. A knowledge broker guides and helps transfer, synchronize, and relate business knowledge across business areas/functions/units toward engendering both improvement and innovation. In his/her role as a knowledge broker, a CKM is expected to enthuse, guide, and enable others to continually strengthen a company's market position through leveraging its knowledge resources. He/She is expected to help and encourage multifunctional teams addressing critical business and/or technical problems. He/she is expected to focus organisation members at all levels on the creation and delivery of superior value through learning, creativity, innovation, and superior business practices.

KM implementation problems & difficulties

Implementation of a KM programme is neither easy nor simple. It is beset with numerous problems and difficulties. A survey of extant literature, reveals the following implementation challenges:

- Motivating employees to search, accept, and adopt best industry practices.
- Developing metrics toward appraising the effectiveness of a KM programme, and measuring its results.
- Motivating employees to share knowledge.
- Making knowledge usable i.e., storing it in an easy to understand form and enabling the employees to relate it to their work.
- Identifying suitable people for staffing and implementing the KM programme. The *programme demands a multi-disciplinary* background, and people management skills of a high order.
- Changing people's perceptions and behavior.
- Identifying and representing the organisation's existing knowledge.
- Defining the scope of KM initiatives
- Developing common understanding of the company's business model and strategic drivers.
- Changing bureaucratic culture and organisation structure.
- Staff turn over with special reference to attracting and retaining talented people.

If these difficulties are further compounded by a weak commitment of the firm's top management, the development of a knowledge management programme cannot take off. But even when strong support of top management for the programme is in evidence, the programme may still fail to realize its promise and potential if the following "eleven deadliest sins" are not avoided (Fahey & Prusak, 1998):

- Not developing a working definition of knowledge i.e., failure to distinguish between data, information and knowledge; and lack of a shared understanding of what the knowledge-driven company is all about.
- Emphasizing knowledge stock to the detriment of knowledge flow.
- Viewing knowledge as existing predominantly outside the heads of individuals.
- Not understanding that a fundamental intermediate purpose of managing knowledge is to create a shared context (through dialogue).
- Paying little heed to the role and importance of tacit knowledge.
- Disentangling knowledge from its uses.
- Downplaying thinking and reasoning i.e. failing to challenge prevailing modes of thinking, reasoning, assumptions and beliefs.
- Focusing on the past and present, and not on the future.
- Failing to recognize the importance of experimentation.
- Substituting technological contact for human interface i.e. face-to-face dialogue.

2. For an analysis of the kinds of knowledge a firm needs, see Rastogi (1999a).

- Seeking to develop direct measures of knowledge.

Action imperatives for KM

The foregoing problems and difficulties, constraints and impediments in the implementation a KM programme, are not easily rectifiable. There are no easy or simple solutions. What an organisation may however, usefully do, is to initiate a concerted set of measures toward progressively building up the company's capacity for resolving and overcoming the problems and difficulties. These measures are focused on building a learning organisation (Rastogi, 1998). The latter is an imperative prerequisite for effectively implementing a KM programme.

Building a learning organisation is an imperative prerequisite for effectively implementing a KM programme.

The action requirements may be listed briefly as follows. They entail a co-ordinated recasting of the firm's training, incentives, and communications programmes, along with organisational policies, procedures, rules and routines. The action requirements/ measures are:

- Creating and stressing continuous learning opportunities for people.
- Providing opportunities for people to engage in dialogue and inquiry.
- Encouraging and rewarding collaboration and team learning in a sustained manner.
- Establishing systems to capture and share learning.
- Involving people toward developing and sharing a collective vision.
- Identifying and developing leaders who model and support learning at the individual, team, and organisational levels.
- Developing shared understanding first at local levels since the locus of learning, and use of knowledge resides largely at local levels; and then gradually moving toward the level of a company as a whole.
- Providing individuals frequent occasions for discussing, debating, and clarifying for themselves as to what constitutes knowledge in their areas of work.
- Helping people identify the role, requirements, and implications of knowledge for their work performance.
- Focusing more on the flow of knowledge than on its stock.
- While benchmarking processes of other companies for comparison and learning, managers must not lose focus of what may be unique in their own company's situations.
- Creating a 'boundaryless' organisation. 'Boundarylessness' means "behavior that is open, where people act without regard to status or functional loyalty, and also look for ideas from anywhere" (Jack Welch).
- Remembering that in any successful innovation and change, there is a crucial common factor: a strong and motivating goal that anyone on a team can easily understand and embrace.
- Introducing a skill-based pay plan as a part of a wider system of incentives, rewards and recognition. In a skill-based plan, employees are paid more for developing and mastering new skills that are relevant to company's strategic concerns. Such a plan (or plans) helps create a multi-skilled workforce, and engenders a culture which values and rewards continuous learning by people.

Corporate IQ vs. IC

The planning and implementation of all the foregoing actions and initiatives would require concerted efforts of managerial leadership. These efforts would be guided, shaped, and co-ordinated by the new role position of the CKM. To the extent, all the foregoing efforts toward building a learning organisation, and developing human capital, are successful, they would engender and enhance a company's 'corporate IQ'.

> "Corporate IQ is a measure of how easily your company can share information broadly, and of how well people within your organisation can build on each other's ideas – Contributions to corporate IQ come from individual learning, and from cross- pollination of different people's ideas" (Gates, 1999, p. 239).

Given the rapidly changing and highly competitive markets in which most firms today compete, a company can create a competitive edge only on the basis of new concepts of customer-valued products, services, and

ways of doing business. The ability to move information and ideas quickly around a company is useless, if the information does not tell managers and employees how to create value, and the ideas are obsolete or irrelevant. Information and ideas, learning and knowledge, must enable a company to improve, innovate, develop and deploy inimitable competencies and capabilities. Knowledge must create or add value. In this sense, the foregoing concept of corporate IQ does not go far enough. It is of limited significance at best.

Creation of value through management of knowledge is however, not a simple or stand alone task or function. It is rather an intricate, multilateral, and highly interactive organization-wide process that engenders a firm's holistic meta-level intellectual capacity and capability to cope with the challenge of constant change (Rastogi, 1999).

Creation of value through management of knowledge is an intricate, multilateral, and highly interactive organization-wide process.

This holistic meta-level capacity and capability of a firm may be termed as its intellectual capital (IC). The intellectual capital of a firm, in this sense, is a continuing resultant of its organization-wide KM process, and as such underlies the firm's trajectory of performance over time. The nature and dynamics such a powerful KM-IC process may be delineated as follows.

Dynamics of the KM-IC process

The dynamics of a firm's KM-IC process, and the multilateral nonlinear interactions involved therein, may be depicted in the form of a multi-feedback loop system as in Fig. 1. The nature and structure of the system dynamics of Fig. 1 may be broadly and briefly outlined as follows:

Complex turbulent, and uncertain business environment (BE) continually confronts an enterprise with ever emerging challenges and opportunities. They determine the organisation's competitive strategy (CS). Both strategy and environment drive organisational learning (OL). The latter, also influences the firm's strategy in terms of cognitive inputs. Organisational learning includes both adaptive and generative learning, and involves regular appraisals of external and internal changes, Strategy (CS) and organisational learning (OL) together determine the nature, domains and dimensions of the firm's knowledge

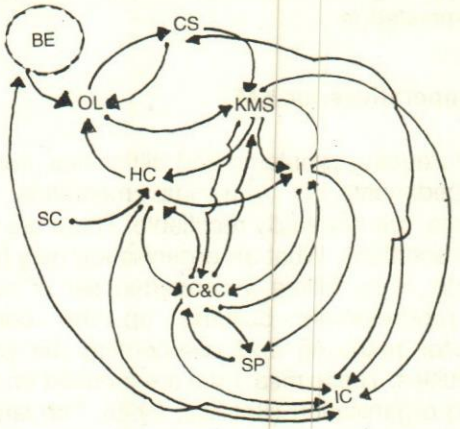

Fig. 1. Dynamics of the KM-IC process

Symbols

* BE - Business Environment
* CS - Competitive Strategy
* HC - Human Capital
* SC - Social Capital
* SP - Streamlined Processes
* OL - Organisational Learning
* KMS - Knowledge Management System
* I - Innovation
* C&C - Competencies & Capabilities
* IC - Intellectual Capital

management system (KMS). The quality and value of organisational learning however, significantly depend on the organisation's human capital (HC).

Human capital represents the talents, skills, creativity, motivation, and commitment of the members of an organisation. It is powerfully shaped by the social capital (SC) of the enterprise. Social capital of a firm denotes its ethos of trust and cooperation, help and care, shared values and vision. In the absence of such an ethos, HC can not develop i.e., people in an organisation can not meaningfully engage in organisational learning (OL), innovation (I), development of firm-specific competencies and capabilities (C&C), and steamlining of business processes (SP) as a way of life. Consequently, the organisation would also not be able to cultivate and use its intellectual capital (IC), which is bound up with a creative and flexible integration and orchestration of the firm's innovativeness, competencies and capabilities, and streamlined processes. Human capital (HC) drives and determines the quality and productivity of organisational learning (OL), innovation (I), competencies and capabilities (C&C) and intellectual capital (IC); and is itself shaped by the firm's social capital (SC), and knowledge management system (KMS).

The knowledge management system (KMS) is also a bank of ideas, knowledge and expertise of a firm. It provides valuable inputs of ideas, information, and ex-

pertise to facilitate the firm's innovation (I) efforts; supports development of needed skills, competencies, and capabilities; helps in a continual streamlining of core business processes (SP); and fosters an unceasing enrichment of its human capital (HC). Innovation (I) helps and facilitates the development of competencies and capabilities (C&C) further. C&C in turn, enrich; and are reciprocally strengthened by HC, KMS, and SP in a mutually supportive manner.

Knowledge management system provides valuable inputs of ideas, information, and expertise to facilitate innovation, supports development of skills, competencies, and capabilities; helps in streamlining of core business processes and fosters enrichment of human capital.

A new conceptualization of intellectual capital

Fig. 1, further shows that innovation or innovativeness (I), competencies and capabilities (C&C), streamlined processes (SP), human capital (HC), and knowledge and expertise bank (KMS) of an organisation conjoin together to create its intellectual capital (IC). The latter, in turn, strengthens the firm's strategy (CS), and influences its business environment (BE).

IC of an enterprise, in the present context, represents its overall or holistic meta-level intellectual capacity and capability for problem-solving and goal achievement in an on-going manner. Intellectual capital represents the overall intellectual managerial prowess of an organisation to address effectively present and potential, extant and emerging challenges and opportunities confronting it. In this sense, IC also denotes the reverse potentiality of a competitively successful or 'excellent' learning and innovative IC-rich organisation to change and shape its business environment. In the same sense, it also denotes an IC-rich firm's capacity to realize its self-set ambitions and visionary goals. In the same sense, it also further denotes an IC-rich firm's capacity to fashion its own future, while IC-poor firms remain busy in trying to forecast the same.

Intellectual capital of an enterprise as a holistic macrolevel managerial concept essentially conveys a firm's abiding ability to create value in a competitively superior manner. Difference between the market value and book value of a firm i.e., its market-value-added, provides a financial measure of the firm's IC. The ratio of market value to book value, adjusted for inflationary variation, is also used in the same context; and provides a basis for performance comparison among firms. A time varying trajectory of such a ratio, (after taking into account powerful random factors if any) may help indicate the relative enrichment or impoverishment of a firm's intellectual capital over time. The ratio, as well as, market-value-added figures for a firm, also communicate investors' expectation of the firm's potential for future earnings.

Intellectual capital of a firm is viewed here as the firm's overall or holistic capacity and capability which emerges from its creative and flexible orchestration and co-ordination of its human capital, innovativeness, competencies and capabilities, streamlined processes, and expertise. It denotes a firm's higher level capacity and capability to create and capture value in a milieu of constant change.

Appraising IC

The nature and effectiveness or prowess of a firm's IC may be qualitatively assessed and appraised as follows:

- The firm must be able to emit a matching variety of responses corresponding to each and every type of challenge that may confront it. The number and variety of responses may be more than the variety of challenges or problem situations; but they must not be less. If for any challenge or problem situation, the firm cannot emit a matching response, the necessary condition for the efficacy of the firm's IC would remain unmet.
- Out of the variety of responses that the firm can emit toward any given problem situation, at least one must be effective in a meaningful and measurable sense. This is the first of the two sufficient conditions for the efficacy of the firm's IC.
- The firm's emitted response to a problem situation must not only be effective, but must also be executed in a timely manner. The firm must also respond with the requisite rapidity of response. This is the second of the sufficient conditions of effectiveness.

These premises together define the necessary and sufficient conditions for the potency or effectiveness of a firm's IC. They are fashioned after the cybernetic Law of Requisite Variety (Ashby, 1956).

Managerial policy inferences

Dynamics of the KM-IC process as depicted in

Fig. 1, lead to derivation of certain useful inferences[3]. These inferences are rather broad in nature owing to a relatively macro level representation of the analyzed system. The inferences however, provide meaningful guidance towards the formulation and implementation of relevant managerial policies for managing knowledge in and by business enterprises.

Fig. 1 shows that the dynamics of the KM-IC process are driven by two analytically exogenous variables: business environment (BE) and social capital (SC). Business environment shapes a firm's competitive strategy (CS) and organisational learning (OL). Both CS and OL are, in fact, the bases of a firm's knowledge management process. Lack of clarity regarding the purpose, thrust, and direction of either of them can depreciate the whole process. Social capital determines the productivity and quality of a firm's human capital (HC). HC is, in fact, the pivot of not only a firm's KM process; but also of a firm's entire spectrum of business performance. In Fig. 1, HC is seen to influence directly most of the remaining system variables. In the absence of talented, skilled, creative, and collaborative knowledge workers, the KM-IC process would fail to gather momentum even if all other requirements are met.

A firm's organisational learning (OL) must focus on the changes occurring in its business environment in a proactive manner. OL must avoid getting trapped in managerial assumptions based on past business successes. It must be aligned with the requirements of a firm's competitive strategy, and include learning from its competitors, customers, suppliers and alliance partners besides interesting firms in other industries.

A firm's design and operation of its KMS must reflect its dynamic and shifting strategic concerns. The system must capture and disseminate information, ideas, knowledge, and expertise regarding the firm's competitive business priorities, besides facilitating innovation and development of competencies in the same context. It must also help provide real time support to the firm's management of volatile and uncertain business conditions.

A firm's efforts to develop its human capital must follow, or be concomitant with its sustained and proactive efforts to enrich its social capital. Without a rich base of social capital i.e. an ethos of trust and cooperation, sharing and caring, common vision and values, the development of human capital cannot effectively take off. HC, as mentioned earlier, is the pivot of a firm's performance.

Nurturance of innovation, development and renewal of competencies and capabilities, and streamlining of core business processes; must mutually complement and amplify each other. All of them are rooted in the management of knowledge on the one hand, and human capital, on the other.

Intellectual capital (IC) is not a thing. It is a firm's holistic meta-level intellectual capacity and active capability based on a continuing flexible and creative orchestration of its human capital, innovative prowess, competencies and capabilities, stream lined processes, and stock of expertise. It is the core and base of a firm's competitiveness under uncertain and volatile business conditions. Development and management of a firm's KMS must therefore be oriented around the development of a firm's IC as its prime goal.

Development of IC does not require a plan. It is rather a continuous outcome of an iterative organisation-wide process. The latter involves dense webs of participation, involvement, and collaboration across the entire range of an organisation's membership. Formation and functioning of such webs are not possible without the enabling support base of a firm's social capital (SC).

The entire dynamic system as depicted in fig. 1, is very richly and multilaterally interconnected and highly interactive in its structure. There are no one or two salient variables, which are the exclusive foci of input and output links. Rather, all of the central variables i.e. HC, KM, I, C&C, and IC are seen to be the foci of intense internal interactions. This implies that any piecemeal or fragmented effort to focus on only one or two variables for change and improvement, would be ineffective. The change or development effort would therefore need to be broad-based, integrated, synchronous, synergistic, coordinated, and continually orchestrated across the enterprise as a whole.

Conclusion

Enterprises today are headed toward a milieu of intensifying competition in an increasingly complex, dynamic, uncertain, and borderless world. They are pushed as never before for continuous innovation, creativity, competencies, efficiency, value creation, and new learning. All of these, in essence, are knowledge intensive activities centering on the exploration, creation and exploitation of knowledge. In this sense, knowledge management has become a centerpiece of competitive-

3. For a comprehensive discussion of multi-cyclical feedback systems analysis, see Rastogi (1992).

ness today. It is however, people who are the creators, carriers, and users of knowledge. Competitive advantage is therefore shifting toward attracting best people, and developing and deploying them as appreciating human capital. This means providing them opportunities for continuous development of their skills, competencies, and knowledge; viewing and using them as partners in crafting and executing business strategy; involving them intimately in searching and seizing new opportunities for value creation and capture; stretching them toward new concepts of product, service, and business; and rewarding them as partners in raising the trajectory of enterprise performance.

People are the creators, carriers, and users of knowledge. Competitive advantage is therefore shifting toward attracting best people, and developing and deploying them as appreciating human capital.

The practice of knowledge management in the context of firms' struggle to survive and thrive in a turbulent business environment, is not a philosophical exercise. It is inevitably infused or fused with entrepreneurialism. KM practicing organisations unceasingly evolve toward being and becoming a storehouse of business expertise; a growing pool of cutting edge competencies, skills, best practices, techniques, and tools; a collaborative collectivity of autonomous and peak performing employees; an exemplar of speed and brain power in all domains of its activity; an agile player responding rapidly to market shifts; and a bearer of a culture of constant innovation and value creation. Management of knowledge does not signify, or lead to a terminal goal or destination. It is rather an unending journey along a pathway of uncertainly and unceasing change. The purpose and direction of this journey are shaped by the shared vision and values of leaders and people in organisations; and sustained by their development and use of their organisations' intellectual capital.

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Wireless Local Area Networks on the Horizon

Hemant Kumar Sabat

As Wireless Local Area Networks (WLANs) become more widely recognized as a general-purpose connectivity alternative for a broad range of business customers, it is imperative to understand the business applications, technology options, network topologies, and prevalent industry standards. In this paper, the author discusses the current state, the value proposition and future potential of WLANs.

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Mobile computing can be performed within the confines of a corporate or campus environment as well as over longer distances with the assistance of wireless bridges like cellular phones or WLAN services. A Wireless Local Area Network (WLAN) is a flexible, on-premise data transfer and communication system, which generally acts as an extension of or complement to wired LAN (generally made of twisted pair, coaxial cable) within a building or campus (Rupley, 1999). The aim of a WLAN is to provide flexible last-mile connectivity between the source of information and the user. Electromagnetic waves are used to transfer information without the requirement for wires or any other physical connection. Depending on the complexity of the system, the number of users, and the degree of centralization, a WLAN can come in various configurations: a simple independent WLAN (number of terminals connected to each other) or an infrastructure WLAN (number of terminals connected to a centralized access point), among others.

The aim of a WLAN is to provide flexible last-mile connectivity between the source of information and the user. Electromagnetic waves are used to transfer information without wires or any other physical connection.

WLANs: Current State

Current wireless remote access solutions

Of the four wireless packet data networks—BellSouth Wireless Data's Mobitex, American Mobile's ARDIS network, Metricom's Ricochet, and Cellular Digital Packet Data (CDPD)—only Metricom's Ricochet network and CDPD are viable solutions for remote wireless access; the other two packet networks have bandwidth

constraints and are used for wireless text messaging only. Ricochet network provides the best solution today for remote access, offering 28 kbps speeds as well as some Virtual Private Networking technologies to extend corporate applications to mobile workers. CDPD is still a niche service, offering limited Web content and wireless Internet Protocol (IP) services.

Metricom's Ricochet network

Metricom's Ricochet network is one of four packet data solutions that provides remote wireless Internet/Intranet access from a fixed location (data cannot be retrieved while the subscriber is in motion under the current system). It provides higher speed access to the Internet/Intranet with the luxury of an "always on" connection. Ricochet is geared to the mobile worker who spends a lot of time on the road. The network is a wide area system in the U.S. (not deployed nationwide yet) using spread spectrum, packet-switched technology. Ricochet subscriber devices have small antennas that exchange data with Ricochet micro cell radios mounted on city streetlight and utility poles. Ricochet's service currently provides access speeds of up to 28.8 kbps in the U.S. A wireless modem (which plugs into the serial port of a computer) must be purchased separately. With funding from MCI WorldCom and Vulcan Ventures to further build out the network across the U.S., Metricom plans to launch a 128 Kbps service called Ricochet 2 in 46 metropolitan areas by mid-2001. Ricochet 2 will provide mobility to its customers, traveling at speeds of up to 70 mph.

Notwithstanding the above developments, there are a few hurdles in Metricom's growth graph:

- It is not really a direct competitor of Motient or BellSouth as it focuses on wirelessly enabling laptop computers with special modems and has launched with very limited geographic coverage.
- Metricom is not expected to cover 100 million POPs until late 2001 and does not yet support handheld devices.
- Metricom's data speeds of 128 kbps are similar to the 3G speeds being rolled out by the cellular networks which, coupled with Bluetooth, could make Metricom a less attractive alternative to a wireless data user, especially given Metricom's small footprint.

Cellular Digital Packet Data

CDPD is a packet data service offered over analog cellular systems. This technology consists of a set of communication protocols supporting access to the Internet and other public, packet-switched networks. CDPD supports IP in the network layer (Layer 3), which allows CDPD networks to operate as an extension of TCP/IP data communications networks. Therefore, no specialized CDPD gateway is required and the existing applications from the transport layer and above run as they normally would.

Business applications of WLANs

Vertical markets, including health-care, retail, manufacturing, production/warehousing, and academic arenas have profited from productivity gains of using hand-held terminals and notebook computers to transmit real-time information to centralized hosts for processing (Ruber, 1999; Total Telecom, 1999). Table 1 summarizes popular uses of WLANs as a general-purpose connectivity tool in a range of industry sectors.

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How WLANs operate

WLANs consist of a number of nodes, or stations (STAs), that use a wireless interface to communicate with other nodes and with Access Points (APs[1]) that connect WLANs with wired media. The data being transmitted is superimposed on the radio carrier (i.e., radio carrier is modulated by the information) so that it can be accurately extracted at the receiver. Multiple radio carriers can exist in the same space at the same time without interfering with each other if the radio waves are transmitted on different radio frequencies. A WLAN tunes in one radio frequency while rejecting all other ratio signals on different frequencies.

WLAN technology options

WLANs use electromagnetic waves in the radio or infrared frequency range to communicate information from one point to another without relying on any physical connection (Table 2). Radio Frequency (RF) can be based

1. A device that transports data between a wireless network and a wired network infrastructure.

Table 1: Business Application of WLANs

Health care	Doctors and nurses in hospitals are more productive because hand-held or notebook computers with WLAN capability deliver patient information instantly. WLAN will allow health care professionals to make use of mobile handheld computers to input and access patient information real-time. This will help eliminate duplicate or outdated information as well as treatment delays.
Consulting	Consulting or accounting audit engagement teams or small workgroups increase productivity with quick network setup.
Education	WLANs facilitate convenient untethered access to information. The usage of notebook computers has been very popular lately in many Universities. WLAN will be able to fully leverage mobile connectivity to allow a more fluid connection by students.
Older buildings	WLAN installation is much less invasive than LAN installation. This is valuable when historical preservation and aesthetics are important. Also, LAN installation is more likely to release asbestos or other unsafe materials into the environment. Network managers installing networked computers in older buildings find that WLANs are a cost-effective network infrastructure solution.
Retail	Stores use WLANs to simplify frequent network reconfiguration, monitor inventories, and provide shoppers with point-of-purchase product information. Food orders can be input directly from the table while retail outlets will be able to set up extra registers during peak seasons.
Satellite offices & trade show	WLANs minimize setup requirements by allowing network managers to install pre-configured networks.
Warehouse & production facilities	Workers use WLANs to exchange information with central databases and increase their productivity. Portable terminals are used for real-time stock count and inventory tracking. With the assistance of barcode reader, the wireless data links are used to locate and maintain pallets and boxes locations.
Backup for wired LANs	WLANs can provide backup for mission-critical applications running on wired networks.
Network management	Network managers in dynamic environments minimize the overhead of moves, adds, and changes with WLANs, thereby reducing the cost of LAN ownership. Network managers implement WLANs to provide backup for mission-critical applications running on wired networks.
Training	Training sites at corporations and students at universities use wireless connectivity to facilitate access to information, information exchanges, and learning.
Executive information	Senior executives in conference rooms make quicker decisions because they have real-time information at fingertips.
Corporate	With WLAN system, corporate employees can take advantage of mobile networking for web browsing, email and file sharing within the office.
Manufacturing shop floor	WLAN will help shop floor workstation to communicate with the company main network. This is especially so where the workstation needs to be mobile.
Building-to-building	It is often more economical to use a wireless bridge between buildings rather than physically laid cable or telecommunication lines.
Finance	Using handheld PC, financial traders are able to receive up-to-date financial information. It is helpful when the trader has to be mobile.

on either narrowband or spread spectrum technology. Spread Spectrum can use either Direct Sequence Spread Spectrum (DSSS) or a Frequency Hopping Spread Spectrum (FHSS) technique to transmit data. Infrared (IR) systems use infrared frequencies in the electromagnetic spectrum to carry data. IR system use either directed (line-of-sight) or diffuse technology.

Standards, media access & network topologies

Standards and media access

Table 3 summarizes the key currently approved standards for WLANs. The majority of these standards were developed by European Telecommunications Standards Institute (ETSI).

The IEEE 802.11 standard

In 1997, the primary standard governing this relatively new technological phenomenon was ratified by Institute of Electrical and Electronics Engineers (IEEE). Through IEEE 802.11 standard, it seeks to provide a uniform set of standards that enables interoperability among WLAN products from different vendors. The IEEE 802 Standards Committee formed the IEEE 802.11 WLAN Standards Working Group in 19990 (IEEE P802.11 Working Group 1999). The Working Group consists of companies from the United States, Canada, Europe, Israel and the Pacific Rim. The IEEE 802.11 Working Group took on the task of developing a global standard for radio equipment and networks operating in the 2.4 GHz unlicensed frequency band.

Currently, IEEE 802.11 supports 1 Mbps data rates for FHSS, and both 1 Mbps and 2 Mbps for DSSS. The standard does not specify technology or implementation; it states the specifications for Physical and Media Access Control (MAC[2]) layers of the Open Systems Interaction (OSI) model.

2. Physical layer handles signaling of voltages; MAC layer handles error checking, recovery and hardware addressing.

Table 2: Technology options for WLANs

(A) Radio frequency (RF)	There are two variations of RF technology: narrowband and spread spectrum.
(1) *Narrowband*	A narrowband radio system transmits and receives user information on a specific radio frequency. Narrowband radio keeps the radio signal frequency as narrow as possible just to pass the information. Undesirable crosstalk between communication channels is avoided by carefully coordinating different users on different channel frequencies. Privacy and noninterference are accomplished by the use of separate radio frequencies. The radio receiver filters out all radio signals except the ones on its designated frequency. The global spectrum allocation for radio technology at 2.4 GHz is as follows: *Region* — *Allocated Spectrum* US — 2.4000 - 2.4835 GHz Europe — 2.4000 - 2.4835 GHz Japan — 2.471 - 2.497 GHz France — 2.4465 - 2.4835 GHz Spain — 2.445 - 2.475 GHz
(2) *Spread spectrum*	It is wideband radio frequency technique developed by the military for use in reliable, secure, mission-critical communications systems. More bandwidth is consumed than in the case of narrowband transmission. The receiver knows the parameters of the spread-spectrum signal being broadcast. There are two types of spread spectrum radio: frequency hopping and direct sequence. (1) *Frequency Hopping Spread Spectrum (FHSS)* FHSS uses a narrowband carrier that changes frequency in a pattern known to both transmitter and receiver. Properly synchronized, the net effect is to maintain a single logical channel. (2) *Direct Sequence Spread Spectrum (DSSS)* DSSS generates a redundant bit pattern (called chipping code or chip) for each bit to be transmitted. The longer the chip, the greater the probability that the original data can be recovered (and the more bandwidth required).
(B) Infrared frequency (IRF)	Infrared (IR) systems use infrared frequencies in the electromagnetic spectrum to carry data. These systems use either directed (line-of- sight) or diffuse technology. (1) *Directed (line-of-sight) IRF technology* Inexpensive directed systems provide very limited range (3 feet) and typically are used for Personal Area Networks (PANs) but occasionally are used in specific WLAN applications. High performance directed IR is impractical for mobile users and is therefore used only to implement fixed sub-networks. (2) *Diffuse (or reflective) IRF technology* These WLAN systems do not require line-of-sight, but cells are limited to individual rooms.

Table 3: Approved WLAN standards

Country	Approved standards	Documents	Approval authority
Europe	European Telecommunications Standards Institute	ETSI 300-328, ETSI 300-339	National Type Approval Authorities
France	La Reglementation en France por les Equipements fonctionnant dans la bande de frequences 2.4 GHz "RLAN-Radio Local Area Network"	SP/DGPT/ATAS/23, ETSI 300-328, ETSI 300-339	Direction Generale des Postes et Telecommunications
Japan	Research and Development Center for Radio Communications (RCR)	RCR STD-33A	Ministry of Telecommunications (MKK)
North America	Industry Canada (IC), Canada Documents: GL36 Federal Communications Commission (FCC), USA	CRF47, Part 15, Sections 15.205, 15.209, 15.247.	Industry Canada (Canada), FCC (USA)
Spain	Supplemento Del Numero 164 Del Boletin Oficial Del Estado (Published 10 July 91, Revised 25 June 93)	ETSI 300-328, ETSI 300-339	Cuadro Nacional De Atribucion De Frecuesias

Note: Operation in countries in regions outside Japan or North America, may be subject to additional or alternative national regulations.

Media access

WLAN accesses the shared media or the network through Carrier Sense Multiple. Access/Collision Avoidance (CSMA/CA) protocol. The standard also enables WLAN users to roam between WLAN transmission ranges without interruption – a feature currently not offered by all vendors.

Ad hoc standards

The IEEE 802.11 Working Group has been working to develop higher speed standards in the 2.4 GHz and 5 GHz frequency bands. However, due to the long-time shortcoming of the WLAN standardization, many vendors have already developed their proprietary standards.

(i) WLAN Interoperability Forum (WLAN Forum): WLAN Interoperability Forum (WLAN Forum) is one of the multi-vendor consortiums (Wireless LAN Interoperability Forum, 1999). The WLAN Forum is funded by Hewlett-Packard, IBM, Motorola and Sharp. The Forum provides a standard called Open Air, which offers standards for data communications, roaming, set up, security,

configuration and coexistence. Open Air is interoperable with IEEE 802.11.

(ii) Wireless Ethernet Compatibility Alliance (WEDA): Recently, 3 Com, Aironet, Intersil, Lucent and Nokia announced the formation of Wireless Ethernet Compatibility Alliance (WECA) to facilitate adoption of high-speed WLAN networking. The WECA, claiming to be compliant with IEEE 802.11 High Rate standard, is working towards multi-vendor interoperability within the same wireless infrastructure. However, the new consortium may produce another ad hoc extended standard.

(iii) Bluetooth: Bluetooth is an ad hoc industry technical standard for wireless devices to connect with each other (Judge, 1999; Mitchell, 2000; Ruber, 1999). It was founded by 3 Com, Ericsson, IBM, Intel, Lucent, Microsoft, Motorola, Nokia, and Toshiba. Bluetooth wireless technology is a short-range radio technology that allows high-speed data transmission between devices like mobile phones, Personal Digital Assistants (PDAs). It is a system solution comprising hardware, software, and interoperability requirements for inter-device communications operating globally in the 2.4 GHz spectrum band with raw data speeds of 500-1,000 Kbps. It is aimed at instant data exchange and other communications among Net devices, and between devices and the Internet.

Three exciting aspects of this system solution are:

Elimination of cables typically used to connect devices. The range of each Bluetooth radio transmitter is approximately 10 meters, which can be extended to 100 meters with amplification. Devices with embedded Bluetooth components support both point-to- point and point-to-multipoint connections, allowing for the interaction of Personal Area Networks (PANs), LANs, and Wide Area Networks (WANs).

Bypass the traditional wireless network connectivity. The solution offers the ability to have various devices automatically synchronize or serve Internet or other data to mobile devices without traditional wireless network connectivity.

An alternative to location-based solutions. A network of fixed devices (i.e., immobile and tethered to the Internet, like a cash register) constantly talking to mobile devices via Bluetooth or comparable LAN or PAN networks obviates today's location-based solutions. The fixed devices know where they are, and the mobile device talks to the fixed to give its coordinates and the fixed serves up the information either to the device or back to the carrier via a landline connection.

However, Bluetooth is competing with WLAN standards since its technology can be applied to connection of PCs, mobile phone and other peripherals. Toshiba is the first manufacturer to ship Bluetooth products commercially in the U.S., and has already done so in Japan. However, Toshiba's Bluetooth card for laptop PCs will be somewhat useless to initial buyers, since the cellular phones it is meant to talk to would not be available until later in 2001. IBM will be shipping a Bluetooth laptop card in the near term as well.

The challenges

The existence of these ad hoc standards, in addition to IEEE 802.11, is influencing customers' investment decisions in WLAN technology. This has set a premium on interoperability among these standards. More importantly, the industry itself might encounter confusion due to these multiple standards. These two forces have the potential to stall the accelerated growth of WLAN technology thereby reducing the use of full potential of this technological phenomenon.

Network topologies

The standard defines protocols for two types of networks: ad hoc and client/server networks.

Ad hoc network (or Independent Basic Service Set or Independent WLAN): In an ad hoc network, communications are established between multiple nodes or STAs, or Basic Service Sets (BSSs3), in a given coverage area without the use of an AP or server (Fig. 1). Two or more wireless nodes use wireless adapters to communicate as peers within a shared cell coverage area.

Extended-range independent WLANs: The range of an ad hoc WLAN can be extended using an AP that functions as a repeater (Fig. 2). The main function of the AP is to form a bridge between wireless and wired LANs. The AP is analogous to a base station used in cellular phone networks. When an AP is present, stations do not communicate on a peer-to-peer basis. All communications between stations or between a station and a wired network client go through the AP. APs form a part of the wired network infrastructure; they are not mobile.

Client-server network (or Extended Service Set): A client-server network consists of a series of overlapping APs (Fig. 3). An AP controls the allocation of transmission

3. A BSS consists of two or more wireless nodes, or stations (STAs), which have recognized each other and have established communications.

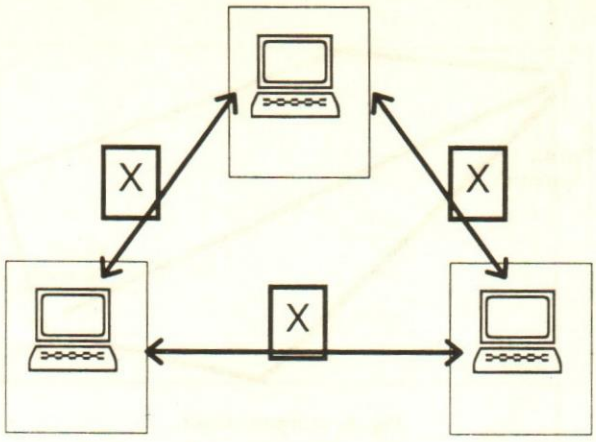

Fig. 1. Ad hoc network

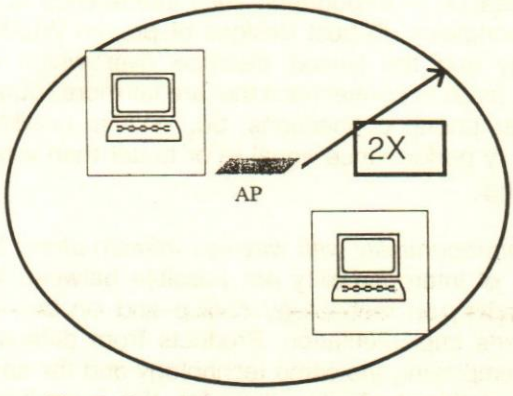

Fig. 2. Extended range independent WLAN

time for all network nodes and allows mobile nodes (such as laptop computers) to roam freely from cell to cell. The APs route data among nodes and between nodes and servers, ensuring the coordination of data traffic.

Security

IEEE 802.11 provides for security via two methods: authentication, and encryption.

Authentication: Authentication is the means by which one station is verified to have authorization to communicate with a second station in a given coverage area. Authentication can be either Open System or Shared Key.

- In an Open System, any STA may request authentication. The STA receiving the request may grant authentication to any request, or only those from stations on a user-defined list.
- In a Shared Key system, only stations which possess a secret encrypted key can be authenticated.

Encryption: Encryption is intended to provide a level of security comparable to that of a wired LAN. The Wired Equivalent Privacy (WEP) feature uses an algorithm from RSA Data Security, Inc. The WEP algorithm was selected to meet the following criteria: reasonably strong, self-synchronizing, computationally efficient, exportable, and optional.

Timing and power management

All station clocks within a BSS are synchronized by periodic transmission of time stamped beacons. Synchronization is maintained to within four microseconds plus propagation delay (or latency). Timing beacons also play an important role in power management.

Roaming

The IEEE 802.11 standard identifies the basic message formats to support roaming[4], but everything else is left up to network vendors. In order to fill the void, the Inter-Access Point Protocol (IAPP) was jointly developed by Aironet, Lucent Technologies, and Digital

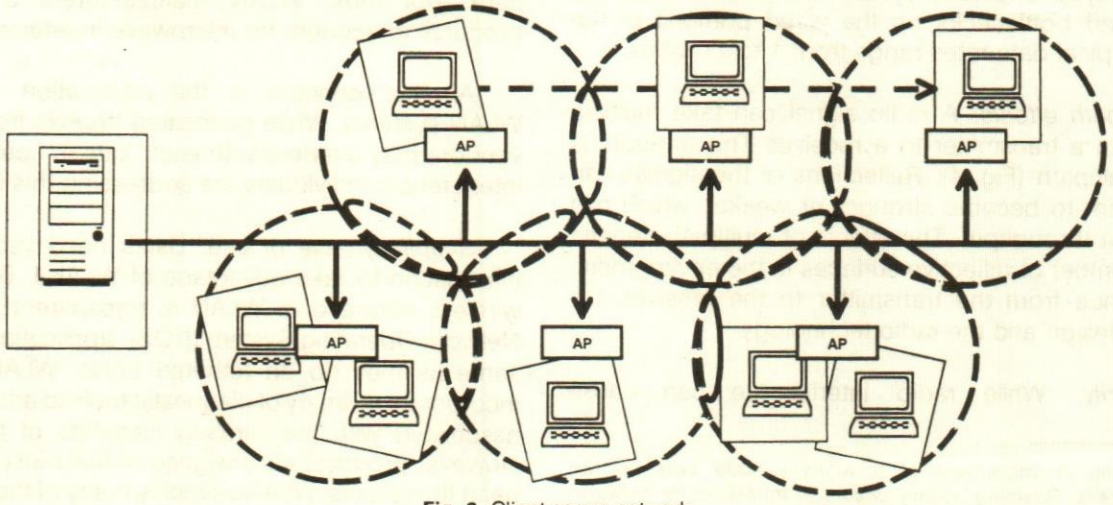

Fig. 3. Client-server network

Ocean. Among other things, IAPP extends multi-vendor interoperability to the roaming function.

Other wireless networks

WLAN configurations include independent networks, offering peer-to-peer connectivity, and infrastructure networks, supporting fully distributed data communications. Point-to-point local-area wireless solutions, such as LAN-LAN bridging and Personal Area Networks (PANs), may overlap with some WLAN applications but fundamentally address different user needs.

Value of WLANs

Table 4 compares wired LANs with WLANs based on a variety of factors related to installation, cost, functionality, and maintenance. WLANs offer productivity, service, convenience, and cost advantages over traditional wired networks:

Range/coverage: The distance over which RF waves can communicate is a function of product design (including transmitted power and receiver design) and the propagation path, especially in indoor environments. Interactions with typical building objects can affect how energy propagates, and thus affect the range and coverage a particular system achieves. The range (or radius of coverage) for typical WLAN systems varies from under 100 feet to more than 500 feet. Coverage can be extended. Roaming, which can be provided through microcells, can increase mobility.

Throughput: The actual throughput in WLANs is dependent on products and set-up. Factors that affect throughput include airwave congestion (number of users), propagation factors such as range and multipath, the type of WLAN system used, as well as the latency and bottlenecks on the wired portions of the WLAN. Typical data rates range from 1 to 11 Mbps.

Multipath effects: A radio signal can take multipie paths from a transmitter to a receiver. This attribute is called multipath (Fig. 4). Reflections of the signals can cause them to become stronger or weaker, which can affect data throughput. The effects of multipath depend on the number of reflective surfaces in the environment, the distance from the transmitter to the receiver, the product design and the radio technology.

Integrity: While radio interference can cause

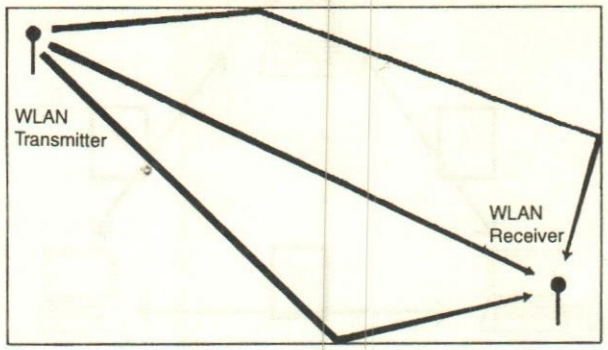

Fig. 4. Multipath effect

degradation in throughput, such interference is rare in the workplace. Robust designs of proven WLAN technology and the limited distance over which signals travel result in connections that are far more robust than cellular phone connections. So, WLANs provide data integrity performance equal to or better than wired networking.

Interoperability with wireless infrastructure: Several types of interoperability are possible between WLANs depending on technology choice and on the specific vendor's implementation. Products from different vendors employing the same technology and the same implementation typically allow for the interchange of adapters and access points. An eventual goal of the IEEE 802.11 specification is to allow compliant products to interoperate without explicit collaboration between vendors.

Interference and coexistence: The unlicensed nature of radio-based WLANs means that other products that transmit energy in the same frequency spectrum can potentially provide some measure of interference to a WLAN system. Microwave ovens are a potential concern. But most WLAN manufacturers design their products to account for microwave interference.

Another concern is the co-location of multiple WLAN systems. While co-located WLANs from different vendors may interfere with each, others coexist without interference. Individuals are addressing this issue.

Simplicity/ease of use: Users need very little new information to take advantage of WLANs. Because the wireless nature of a WLAN is transparent to a user's Network Operating System (NOS), applications work the same as they do on tethered LANs. WLAN products incorporate a variety of diagnostic tools to address issues associated with the wireless elements of the system. However, products are designed so that most users rarely need these tools. WLANs simplify many of the installation

4. Roaming is movement of a wireless node between two microcells. Roaming usually occurs in infrastructure networks built around multiple access points.

Table 4: Wired LANs versus WLANs

Factors	Wired LANs	WLANs
Mobility	• Not to the same extent	• Access to information even when mobile, thereby increasing efficiency and productivity.
Installation speed and simplicity	• More difficult and time-consuming to install	• Fast and easy; eliminates the need to pull cable through walls and ceilings
Installation flexibility	• The network, being tethered, is limited by the media accessibility	• Wireless technology allows the network to go where wire cannot go. • Simplicity of installation. WLANs do not require cable to be snaked through or around walls and ceilings.
Costs	• Higher maintenance and support costs.	• Reduced costs of ownership: While the initial investment required for wireless LAN hardware can be higher than for wired LAN hardware, overall installation expenses and life cycle costs can be significant lower. • Installation expenses can be significantly lower. WLANs eliminate the direct costs of cable installation. • Network maintenance costs are reduced. WLANs can easily be transferred from one location to another, scalability and flexibility of WLANs reduces user downtime and administrative overhead costs. • Long-term cost benefits are greatest in dynamic environments that require scalability and flexibility.
Scalability and Flexibility	• Not as easy to scale.	• Configured in a variety of topologies to meet the needs of specific applications and installations. Configurations are easily changed. • Network managers can pre-configure entire networks before installing them at remote locations. Once configured, WLANs can be moved from place to place with little or no modification.
Security Considerations	• Physical security • User authorization and external eavesdropping • Attacks from within network	• Security considerations are similar to that of wired LANs. • However, because wireless technology has roots in military applications, security has long been a design criterion for wireless devices. In general, individual nodes must be security-enabled before they are allowed to participate in network traffic. WLAN addresses security via authentication and encryption (see Glossary)
Range/coverage	• Depends on wire media used.	• Varies between less than 100 feet to more than 300 feet for an individual cell.
Roaming	• No roaming facility.	• Long-term benefits are greatest in dynamic environments requiring frequent moves, additions and changes.
Throughput	• 11 Mbps is typical for a wired Ethernet LAN, though maximum speeds can be close to Gbps, depending on the network.	• 1 to 10 Mbps
Multi-path effects		• Reflections of the signals can cause them to become stronger or weaker, which can affect data throughput.
Integrity and reliability	• Wires can be tapped; physical damage to wires reduces reliability in data transfer.	• Radio interference can cause degradation in throughput. • Designs of proven WLAN technology and the limited distance over which signals travel result in connections that are far more robust than cellular phone connections and provide data integrity performance equal to or better than wired networking.
Interoperability	• Easy interoperability.	• Dependent on vendor's technology choice and method of implementation. Products from different vendors employing the same technology and implementation are typically interoperable.
Interference and co-existence	• Less interference.	• Other products that transmit in the same frequency spectrum can potentially interfere with a WLAN system.
Battery life for mobile platforms		• WLAN vendors typically employ special design techniques to maximize the host computer's energy usage and battery life.
Safety		• The output power of WLAN systems is much less than that of a hand-held cellular phone. Since radio waves fade rapidly over distance, users are exposed to very little radio frequency (RF) energy.

and configuration issues that plague network managers. Since only the APs of WLANs require cabling, network managers are freed from pulling cables for WLAN end users. Lack of cabling also makes moves, adds, and changes trivial operations on WLANs. Finally, the portable nature of WLANs lets network managers preconfigure and troubleshoot entire networks before installing them at remote locations. Once configured, WLANs can be moved from place to place with little or no modification.

Users need very little new information to take advantage of WLANs.

Security: Because wireless technology has roots in military applications, security has long been a design criterion for wireless devices. So, WLANs are more secure than most wired LANs. Complex encryption techniques make it impossible for all but the most sophisticated to gain unauthorized access to network traffic.

Decreased cost of ownership: Intense competition and rapid technological advancements are driving organizations to cut costs and operate more efficiently. WLAN technology offers a cost-effective networking solution that minimizes large capital investments in wiring and cable infrastructure. According to a survey conducted by the Wireless Local Area Network Alliance (WLANA), the average total cost per user for a WLAN solution is $4,550 (ROI/Cost-Benefit Study, 1999). However, organisations installing an average of 300 client cards reaped annual savings of up to $4.9 million, which translates into per user savings of $15,989. WLANs drive costs out of the system through easier installations that avoid construction and wiring in buildings.

Scalability: Wireless networks can support large numbers of nodes and/or large physical areas by adding APs to boost or extent coverage. WLAN installations are scalable and flexible because they are easily configured to serve as a standalone network or as a complement to installed wired LAN topologies. WLANs can be strategically placed throughout a network to provide connectivity in areas where wired LANs simply cannot service. For example, due to the size and layout of some manufacturing warehouse facilities, forklifts contain wireless transmitters that enable drivers to gather and communicate information through laptop computers. Network managers have the flexibility to design wireless networks that are extremely simple or quite complex.

Battery life for mobile platforms: End-user wireless products are capable of being completely untethered, and run off the battery power from their host notebook or hand-held computer. WLAN vendors typically employ special design techniques to maximize the host computer's energy usage and battery life.

Safety: The output power of WLAN systems is very low, much less than that of a hand-held cellular phone. Since radio waves fade rapidly over distance, very little exposure to RF energy is provided to those in the area of a WLAN system. WLANs must meet stringent government and industry regulations for safety. No adverse health effects have ever been attributed to WLANs.

Since radio waves fade rapidly over distance, no adverse health effects have ever been attributed to WLANs.

Increased mobility and network speed: The fundamental value proposition of a WLAN solution is that it enables mobility of the workforce. Computers and hand-held devices access real-time information without a physical connection to an outlet. The benefits of mobility and speed are immense. For example, customer requests for information (such as an order status) are delivered in near-real time through WLAN speeds. Inventory stocks are tracked and monitored more closely with the use of wireless scanners, avoiding stock outs and delivering customer satisfaction.

Rapid return on investment: With declining hardware prices and advancements in wireless networking, WLANs are an increasingly attractive alternative to LANs. Payback periods required to cover initial investment in WLANs average 6-12 months (Table 5).

Table 5: Return on investment from WLANs in industries

(In Millions)	Retail	Manu-facturing	Health-care	Office automation	Education
Benefits per company ($)	5.6	2.2	0.94	2.5	0.5
Costs per company ($)	4.2	1.3	0.90	1.3	0.3
Payback (No. of months)	9.7	7.2	11.4	6.3	7.1

Source: "ROI/Cost-Benefit Study" conducted by WLAN Alliance.

Future potential

The future developments in the WLAN field will address the following issues:

- How to meet the demands for higher perfor-

mance, higher data rates and higher bandwidths

- How to facilitate interoperability between WLAN products from different equipment manufacturers
- How to expand the WLAN applications horizontally

Dan Mitchell (2000) projects the number of wireless users will be 1.1 billion by 2004. Strategy Analytics (2000) forecast the U.S. cellular penetration to be 80 per cent (or 227 million) by 2005; at the end of 1999, it was 86 million. Not only this, according to the GartnerGroup, WLAN nodes comprise only a fraction of 1 per cent of 43 million Ethernet nodes shipped today. Over the next ten years, this percentage is estimated to grow to between 5 per cent and 10 per cent of all Ethernet nodes. That is, a growth rate of 600 per cent over the next ten years. Frost & Sullivan estimate that by 2005, WLAN industry will be worth $1.63 billion in annual sales (Fig. 5). Growth will depend on three key factors: transmission speed, interoperability and standards compliance, and Internet demand (Gillooly, 1999; Edwards, 1999).

WLAN Revenue Growth

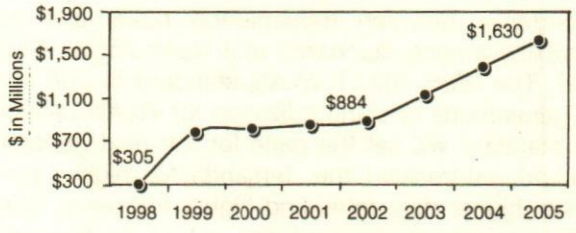

Fig. 5. Wireless revenue growth forecast

Sources: Communications Week, 1999; Moozakis, 1999

The challenges

The main limitation to the success of wireless data stems from the fact that today there is no wireless network that can satisfy the needs for all wireless data users. While two-way paging ReFLEX networks and the dedicated packet data networks of American Mobile ARDIS and BellSouth Wireless Data's Mobitex are well suited for messaging applications, remote access to the Internet is limited by the device and spectrum. For now, it appears that circuit-switched dialup will be the best solution to remote access. That said, paying a premium for wireless circuit switched access at 14.4 kbps is difficult to justify when dialing up over a landline telephone is less costly, faster and more reliable. The major issues with current wireless data solutions are as follows.

Range/coverage and in-building reception: Complaints about CDPD service are poor coverage and in-building penetration, which lead to high incidences of faulty data transmission. Many of the likely early adopters of wireless data will require near-ubiquitous coverage. The coverage will continue to improve given that the majority of wireless capital expenditure is related to building out the secondary markets as well as filling "holes" in existing operational markets. WLANs will be used mainly by people on the move and not as the last point of connectivity between the final user and the closest wired source of information. While the latter would continue, the revenue opportunity would be limited. Increased coverage and high degree of mobility would imply handy devices; hence, mobile operators come into the picture. Therefore, mobile operators would have to look for Intranet related product offerings on mobile phones to exploit the wireless LAN opportunity.

WLANs will be used mainly by people on the move.

Bandwidth and access speeds: There is no current definition of the characteristics for the higher data rate signal. However, for many of the options available to achieve it, there is a clear upgrade path to maintain interoperability with 1 and 2 Mbps systems while providing a faster data rate as well. In the future, these upgrade paths will be refined to ensure complete compatibility across products from multiple vendors. Today's WLANs transmit at 2 Mbps. This speed is low when compared to that of the wired counterparts. Because of bandwidth and device constraints, Jupiter Communications (1999) maintains that mobile access is not suited to using the Web as such, but rather to using narrowly customized data services that may be delivered over the Internet. Wireless access speeds will have to improve. With flat rate pricing inevitable and the fact that web pages will eventually be based on higher access speeds provided by Digital Subscriber Line (DSL) and cable modems, throughput will have to increase significantly. The migration to IP-based wireless networks and 3G (Third Generation technologies) should address bandwidth and access speeds while dramatically lowering the cost of transmission. Transmission rates of 11 Mbps are appearing in the market. 24 Mbps WLAN products should be available in early 2001. A group of manufacturers, called the HiperLan2/Global Forum (H2GF), have joined together to develop a 54 Mbps model that works with ATM, Internet Protocol packets and Ethernet (Communications Week, 1999; Moozakis, 1999). This group uses a standard, which is developed by ETSI (Fig. 6). It operates through FHSS in 5 GHz range (Dix, 1999). By contrast, the IEEE standard

uses the 2.4 GHz range. This standard allows for either FHSS or DSSS Ethernet. With two camps created, the immediate future of WLANs will be focused on negotiating and posturing for a dominant technology. Once these standards are settled and faster transmission rates are available, uses for WLANs will expand beyond their traditional segments towards a wider customer base.

Table 6: Transmission rates, interoperability and standards

Company	Type	Planned technology	Standard
Nortel/Symbol	DSSS	11-24 Mbps (Wireless Voice over IP)	IEEE 802.11
Proxim	FHSS	24 Mbps	HiperLAN/2
Lucent	DSSS	2 Mbps - add Turbo	IEEE 802.11
Cisco/Aironet	DSSS	11-22 Mbps	IEEE 802.11
RadioLAN	Narrowband	10 Mbps - current	None - uses unlicensed 5 GHz band

Sources: Information for analysis and inference was obtained from www.symbol.com, www.lucent.com, www.nortel.com, www.weca.cm, www.radiolan.com, www.proxim.com, and Ruber, 1999.

Universal standard protocols needed to access Web: With the creation of a dozen ad hoc standards, interoperability among WLAN products from different equipment manufacturers will be important to the success of the standard. For the wireless Internet access via mobile telephony to improve, universal protocols need to be adopted by the content providers as well as the equipment manufacturers. Despite the claims by several carriers, no full-service Internet access is available today on a cellular phone, 2-way pager or Personal Digital Assistant (PDA). The content that is retrieved over a cellular phone, two-way pager or PDA is provided by a content provider, who through partnership agreements, has enabled the Web page to be accessible by smaller devices. The Wireless Access Protocol (WAP) Forum endeavors to promote open standards in delivering Web-based content to any wireless device and network, regardless of technology.

Integrity/Security/Reliability: remote and secure LAN/Intranet access: A significant hurdle in a packet-switched, wireless data solution is circumventing corporate firewalls to retrieve proprietary data without compromising security. Wireless LAN users would be accessing company Intranets, and hence, a lot of confidential information. The main security issue with wireless networks, especially radio networks, is that they intentionally propagate data over an area that may go beyond that physically controlled by an organisation. The combination of Internet and secure LAN and Intranet access may be attractively packaged together as a wireless data product offering. If remote WLAN access

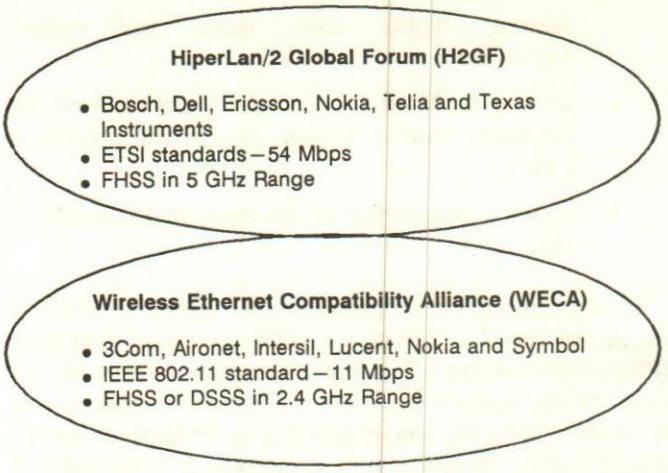

Fig. 6. The two rival camps

was available, the mobile phone could be used as a productivity tool, and therefore, an employer may be more inclined to pay for wireless data. Wireless Knowledge, a joint venture of Microsoft and Qualcomm, is aiming at this goal. Most corporations are reluctant to provide access to corporate resources through the Internet/Intranet and require that assess be accomplished through dial up (usually to a remote access server).

Transmission rates, and interoperability among standards and technologies: Table 6 states the interdependence between transmission rates, and interoperability among standards and technologies (Ruber, 1999). The IEEE 802.11 WLAN standard is one of the first generations of standardization for WLAN networks. This standard will set the pace for the next generation standard, addressing the demands for higher performance, higher data rates and higher frequency bands. Since a universal standard has yet to be formed for WLAN, many wireless products will not interoperate with those from a different company.

Backward compatibility: Preliminary research on high-speed WLAN solutions suggests that backward compatibility will be limited. This may hinder adoption rates at least in small and medium sized enterprises and even in the big corporate enterprises in the initial stages.

Throughput: With increased coverage, the amount of frequency spectrum used would rise. This would necessitate proper planning on the optimum use of spectrum. Higher throughput would be essential to control prices to manageable levels, and hence, drive demand.

Simplicity and ease of use: Importantly, WLANs will generally be used by people without an adequate technological background and without access to support personnel. Hence, user friendliness and simplicity of systems will be key to the success of this technology.

Expansion into horizontal markets: Currently, WLAN applications are mostly in vertical markets, hospitals, education, and manufacturing. It is expected that many horizontal applications will follow as 802.11 network infrastructure is installed. Over time, an increase in demand for 802.11 products is expected to increase competition. This will make WLANs more efficient and economical for all applications requiring wireless connectivity. For example, the need for higher data rates, for applications requiring wireless connectivity at 10 Mbps and higher will force WLAN vendors to manufacture products that match the data rate of the majority of wired LANs. Most current WLANs are compatible only with Ethernet. New standards are emerging to make WLANs work with Asynchronous Transfer Mode (ATM), token ring, Fire Wire, and others (Mitchell, 2000).

Opportunities galore

At least in the near future, WLANs will not be able to substitute wired LANs because of the two critical advantages that wired LANs will continue to have – namely, speed and size. Therefore, the significance of WLANs will be restricted to businesses where productivity is driven by a high degree of staff mobility coupled with the need to have access to real-time information. In the current scenario, WLANs will be a threat to telecommunications companies, with corporate customers accessing Intranets through WLANs rather than their mobile phones. However, the advent of 3G will reduce today's problems of speed, visibility and wireless content. This could lead to users, particularly corporate customers, accessing corporate Intranets or even shared databases on their mobile phones, given their convenience in terms of size and mobility as compared to laptop PCs. Future research will focus on improving transmission rates, developing standards for WLANs, interoperability of different standards and technologies, wireless Web access, among other things. Development of voice recognition technologies will make mobile transactions more ubiquitous. So, plentiful resources will be directed to this field of research.

Conclusions

WLANs offer many technological and practical benefits. This technology provides mobility and sufficient scalability. Also, the freedom from physical connection between an AP and terminals reduces networking complexity and costs of ownership. Further, the benefit of wireless architecture eases network installation and shortens the installation lead-time. However, delayed process of standardization in the industry has allowed the growth of multiple ad hoc standards in response to consumers' demands. This has set a premium on interoperability between WLAN products. Another consequence has been the multi-directional growth of WLAN products. Currently, WLAN industry is catering to vertical markets. There is a need to expand horizontal business applications of WLAN technology. Due to soaring expectations of customers for better performance, in order to effectively compete or match with wired LAN industry, the focus is on increasing data rates through higher bandwidths. The near future will see an increase in wireless augmenting wired networks in business use. Improvements will be made in niche wireless markets like wireless Internet. Only after standards, transmission speeds and interoperability among products are agreed upon can the WLAN more effectively compete with wired networks.

The near future will see an increase in wireless augmenting wired networks in business use. Only after standards, transmission speeds and interoperability among products are agreed upon can the WLAN more effectively compete with wired networks.

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The Emergent e-Citizen: Information Handling in a Democratic Government

V.S.R. Krishnaiah

The Information Technology (IT) revolution in general and Internet (Net) in particular have made valuable impact on human society. It is exciting to explore the new social institution of e-citizens, which is developing. Working with democratic government will mean working with and for these e-citizen-shareholders, so it is crucial to understand who they are, what are their information needs and what they expect from an internet-worked government.

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The views expressed in the article are those of the author and need not represent his organisation.

A century ago, the world shifted from an economy based on agriculture to one based on transformation of raw materials into manufacturing goods, Today, we are undergoing another major transformation—from the industry based economy of the 20th Century to a service based economy built around the creation, manipulation and distribution of information. Integral to this information revolution has been the development of a group of computer and communication technologies collectively represented by the popular expression Information Technology (IT). This group of technologies has rapidly diffused throughout the world, initiating various industrial and economic changes that have led to globalization. That Internet is the fastest growing medium and will continue to influence the way people live and work, altering economics, redefining industries and reconstructing businesses is well known. The e-enabling of Governments, business enterprises, people and society at large is significant.

Internet is the fastest growing medium and will continue to influence the way people live and work, altering economics, redefining industries and reconstructing businesses.

Today with the emergence of Internet, 'e' stands for everything from electronic commerce to entrepreneurship. This is catching the imagination not only of the Central and State Governments but also of private citizens. As a result there is a galloping demand not only for basic services in telecom, IT and media, but also for new services which open up opportunities for growth and development. The Internet serves as a common platform for convergence of all forms—be it voices or video data and as a catalyst that transfers this data into information and finally knowledge. The new economy is

also a knowledge economy based on the application of human know-how to everything we produce and how we produce it. In the new economy more added value will be created by brain rather than brawn.

Emergence of e-citizen

The word citizen suggests a geographic or national definition of social membership. With the advent of Internet, citizens are coming on-line and the International on-line community is formed out of various communities. Organisations like Universities, companies, lower schools, and increasingly community networks are contributing members to this new social institution. Prototype Community Network Systems are forming around the world and recently the Government of India has set up one such community network connecting all the blocks of North Eastern States of India. As citizens are connected to each other across state, across the nation, across the continent and across continents, a global on-line community communication network has emerged and the prediction made by Marshal McLuhan about the creation of a "Global Village" uniting every one on the globe has become a reality. People are using the Net because it is more beneficial to be in a large community than in isolation; communication with others leads to broader ideas and cooperative activity is more productive than competition. These principles emerged from the necessity of sharing knowledge to successfully implement new technology. The culture of open discussion and sharing of technical experience started with ARPANET and other close user group networks, spilled over into the non-technical discussion groups on the Internet, and these basic principles were part of the evidence behind the discovery of e-citizens. As more people join the on-line community and contribute towards the nurturing of the Net and towards the development of a great shared social wealth, the ideas and values of e-citizens will spread and therefore it is crucial to explore this new vibrant community and resource.

A global on-line community communication network has emerged. Communication leads to broader ideas and cooperative activity is more productive than competition.

Spirit of Democracy

The spirit of democracy is true humanism. The founding fathers of our constitution dreamed of such a democracy. The word *swaraj* coined by Dadabhai Naoroji encompasses political, economic, social and moral freedom. Martin Luther King immortalized the will to dream in his famous Washington address "I have a dream". Mahatma Gandhi had dreams of *Ramrajya,* and Jawahar Lala Nehru dreamt of a socialist India with material prosperity for all, through the agency of science and technology. Their dreams were not attained in their fullness, but they are the pivots on which all significant change hangs. As the new technologies, particularly the Information Technology, can dramatically change the fate of India in the coming years, the dreams of Gandhi and Nehru can become reality. The Government of India has dreams for making India an I.T. superpower, dreams that move all the Government departments through I.T. The Hon'ble Prime Minister of the country Mr. Atal Behari Vajpayee gave a new meaning for I.T. as *'India Tomorrow'* and every citizen is buying into it. The Government has created a new Ministry of Information Technology and IT is on the top in the list of priorities of various state governments.

Al Gore, erstwhile vice president of the United States of America wrote an interesting article *Putting People First in the Information Age,* in which he stressed that "For all the stunning capabilities of the Global Information Infrastructure (GII), we must remember that at its heart it is a way to deepen and extend our oldest, and most cherished global values; rising standards of living and literacy, and an ever widening circle of democracy, freedom, and individual empowerment." So, while putting efforts in making use of IT for the development of their nations, the democratic countries have to put people in the information age and plan for using I.T. for the enrichment of people and their life standards. Another important goal must be to make life easier for those who have to constantly interface with the government on most matters.

Information Processing in a Democratic government

Democratic government by nature is an information intensive organisation unlike other forms of government. Large amounts of information are required to deliver public benefits such as education, healthcare, pensions, unemployment benefits and other social services. The information collected by the welfare programs of the Government must be stored, protected and made available when access is requested. A common man has to deal with some government agency or other virtually on a day-to-day basis, for getting certificates of records such as birth and death certificates, domicile certificate, caste/tribe certificate, examination results, land holdings, employment registration; most importantly infor-

mation on government welfare programs, projects, and schemes on a wide variety of topics such as health, rural development, poverty alleviation, employment, and also documents related to government rules and regulations, government notifications, government forms, etc. The common citizen faces difficulties due to the prevailing culture of secrecy in government agencies. Many a time it is not easy to locate the required information due to the size and volume of data handled by the government agencies and the inherent delays in manual processing of huge data.

Electronic Governance

In the last decade Information Technology has transformed everyday life. There are enormous changes in the way information is gathered, stored, moved, manipulated, analyzed, and disseminated. These developments in Information Technology(IT) provide opportunities for both government and private sector to rethink how they produce and deliver products and services, and in many cases to rethink what their basic function should be. IT has given rise to transition from an industrialized model of big government – centralized, hierarchical and operating in a physical economy – to a new model of governance, adaptive to a virtual, global, knowledge based digital economy and fundamental social shifts.

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Electronic Government has emerged as one of the flagship applications with aspiration to employ multimedia and network technologies to re-invent the way the government works. Although the opportunities are exciting, there are also significant challenges in making new technology and ideas works. Two of the key challenges are coping with the investment of time, resources, and stress to put changes in place, and dealing with the need for wide collaboration and cooperation, especially in a government context.

The push for e-governance will result in reengineering of work processes in the Government. The Government will become citizen-centric and citizens will play a larger role in shaping the day-to-day business of government. But the citizens who will shape the digital-era government are not the same citizens who have been polled and targeted and canvassed for decades. The citizen- shareholder of internetworked government will be a very different sort of political animal – one whose political opinions and expectations are shaped by the role of the Internet in politics and in daily life. Working with government will mean working with these citizen-shareholders, so it is crucial to understand who they are and what they will expect from an internet worked government. At present, however, we have only begun to understand who e-citizens are, and what they want from government, politics, and corporate citizens. A study in Wired magazine (November 1997, p. 80) suggested that "digital citizens" are politically engaged and "markedly libertarian," meaning that they have much more confidence in the ability of business and individuals to solve problems than in government. The future of citizenship is changing much more profoundly than today's surveys can show. As Don Tapscott argues, today's citizens and wired workers are just a forerunner of the net generation. The children of the baby boom – the "echo" – are growing up on the Internet, which gives them a distinctive social and political outlook. The Net generation is keenly independent, intellectually open, and inclusive. As future citizens, N-genres are committed to free expression, authenticity, and innovation.

The e-citizens expect the government to give them the right to information so that they can access any type of information regarding governance. In India, some state governments (e.g., Goa, Tamilnadu, and Rajasthan) have already exclusive legislation on the right to information. Recently Karanataka state promulgated an ordinance on Right to Information. With these initiatives, accessing government information becomes easier and the infotech gives governments a chance to provide better services to citizens. Some services even get a qualitative boost. Use of IT in enhancing delivery of services leads to responsive and transparent administration facilitating empowerment of people and satisfying their right to information.

Challenges for the Information Age Government

IT should not be viewed as a mere tool for improving governance and creating more jobs, but as a means to enhance the standard of living of the people. The advent of Information Technology has redefined the fundamentals and has the potential to change the institutions as well as the mechanisms of delivery of services forever. It is in this context that the issues of Smart Governance – Electronic Governance need to be analyzed.

Quite obviously, therefore, the objective of achiev-

ing electronic governance goes far beyond mere computerization of stand alone back office operations. It means fundamentally changing how the Government operates and this implies a new set of responsibilities for the executive, legislature and the citizenry. As part of the increased thrust on e-Governance, Ministry of Information Technology, Government of India, has set up a Centre for e-Governance (CEG) at its premises—Electronics Niketan in New Delhi. The Centre, first of its kind in the country showcases several e-Governance applications and solutions that have been implemented, and offers such other services like technical consultation, proof of concept and thematic presentations.

Achieving electronic governance goes far beyond mere computerization of back office operations. It means fundamentally changing how the Government operates.

The challenges for information age Government are many and these include the following.

- Converting all Acts, Rules, Circulars into electronic form along with other published material of interest or relevance to the public and making them available on the Internet so that e-Citizens can access them.
- Designing and creating web sites of all the Government Departments and organisations, in which various forms to be used by citizens/customers are available. The form should be available for being printed out or for being completed on the computer itself enabling submission of form on-line.
- Remote access by the public to government information and services in a variety of ways.
- Cooperative arrangement among government agencies to integrate services and provide one-stop shopping.
- Easier methods of gathering information without duplication of effort.
- Simplification or elimination of routine and repetitive tasks.
- More efficient and easier data storage and sharing through smart cards, networks.

The National Information Infrastructure (NII) initiative is envisioned as a seamless web of communication networks, computers, databases, and user devices that will put vast amounts of information and services at individual's fingertips. Private sector firms and government entities are already developing major components of that infrastructure today as components of the Internet or as local systems for providing information and services. In India, the largest network infrastructure of the country NICNET established by Government of India way back in 1987, is the vehicle for several government agencies for providing the information services. Several state Governments are now establishing information networks for providing better service through IT.

Conclusion

The Net has made a valuable impact on human society. The enhancement of people's lives provides the incentive needed for providing access to all. Society will improve if net access is made available to people and newcomers are introduced to the principles of e-citizenship. Only if access is universal will the Net itself truly advance. Ubiquitous connection is necessary for the Net to encompass all possible resources. e-citizens expect Government to introduce mass application of I.T. in direct government at all levels. To keep the bold promises of solving people's problems at the click of a button governments have to put computers in place but also change the mindset of the employees responsible for making e-Governance a happening reality. The real quality of e-Governance depends on the integrity of the man behind the machine.

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Focus

Internet Service Provider Industry – A Survey

M.P. Gupta & Arun Kumar

This paper attempts to review the growth of Internet Service Provider (ISP) industry in India and capture the perception prevailing among the user community through a questionnaire survey. Industry analysis has been carried out by SAP methodology. Statistics clearly indicate a vast opportunity for this industry. Deregulation of the ISP (Internet Service Provider) market by the Government of India has let to increase of competition and division of market into number of segments, each ISP betting on some competence to serve a selected segment. However, this is a very volatile industry where trends become norms in no time. The user survey presents the trend towards value added services, e-commerce and content revolution.

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The Internet revolution has marked the emergence of a new industry – the *Internet service provider* (ISP) industry. An ISP connects customers to the Internet. For a particular access fee, the service provider provides installation software, a username and password and access telephone number. In addition to serving individuals, ISPs also serve large companies, providing direct connection from the company's networks to the Internet. ISPs themselves are connected to one another. In India, ISP started in 1995 with VSNL as the lone player. The industry was protected and no private player could enter this market. In 1998, the ISP market was deregulated and a number of private ISPs entered the market. Today post deregulation, Department of Telecommunications (DoT) has issued license to 225 (as on 2nd February 2000) players out of which over 70 are active providing services across the country. Their optimism confirms their faith in the vast market potential of this segment. As per the published data (The Economic times, 19 June 2000), private ISPs across the country have taken over the public sector giants VSNL, MTNL and DoT, in terms of their cumulative internet subscriber base. According to data available till mid June, private ISPs have surpassed their counterparts with a comfortable margin of over 1.5 lakh, and their total subscriber base has crossed 7 lakh. The total subscriber base for the country thus stands at 12 lakh or 1.2 million.

A typical categorization of ISP is based on the level at which they operate: National ISPs, Regional and local ISPs, and Cable ISPs. National ISPs operate points of presence throughout the country. One category of national ISPs owns the network backbone and leases international connectivity while the other category leases the network and international connectivity from other ISPs. Regional and local ISPs either operate in smaller towns or particular states and serve both the business and consumer segments usually within a geographic region. Cable ISPs, yet to come in a big way, will provide Internet access through cable TV's network media. They have the advantage of providing high speed access (upto 2 MBPS) as compared with dial up lines (33.6 KBPS), and 24 hour connectivity apart from other benefits.

ISP Classification

The definition of ISP has changed globally. It is no longer restricted to only access provides but has extended to other players not involved in providing access. So classifying an ISP based on its size and geographical coverage will not render the real picture of the dynamic business model the particular ISP would have adopted. For instance, an AOL (America on line) model would be different from that of a telecom giant like AT&T's model. However, one can broadly classify international ISPs into the following categories:

- Telcos like BT, AT&T, Deutsche Telekom, MCIWorldcom and the new IP revolutionaries like Qwest, Level3 and World Port. These companies are at the top of the tier of the ISP business and provide backbone infrastructure and sell wholesale bandwidth to other ISPs. In India VSNL would fit this bill in its capacity as a bandwidth provider while at the regional level the WorldTel Reliance combine, once it commences its services could be a good example. For these companies money would flow in by leveraging their telecom infrastructure and therefore it is easier for them to adopt marketing gimmicks like offering a freebie – phone connection, virtual calling cards etc.
- Online service providers and content based ISPs such as Compuserve and AOL where the focus is more on Content and online services (read e-commerce).
- Cable operators like Excite@home and Telnet. Operators like Siticable, Incablenet, Hathway Cable and Datacom will be following similar models of marketing money on the cable network.
- IT players like IBM. Mitsubishi and Microsoft.
- Brand driven players including free ISP players like virgin net, AT&T WorldNet, EarthLink and Freeserve. While most of the Indian ISPs follow the brand driven game, Calcutta's Caltiger follows the free ISP model.

Business strategy and revenue streams are determined by the business model followed by ISP. If IT companies like Dell and IBM enter ISP segment space, it is not related to making money on ISP business but related to selling hardware and services. Then ISP becomes a value addition to its business. So is the case of content-based companies like AOL and Bertelsmann that intend cashing in on e-commerce rather than accessing or selling services. Similarly there would be a different revenue model for telcos like AT&T, MTNL and DoT where money would flow in by leveraging on telecom infrastructure. So the strategies and revenue stream are directly proportional to the business model an ISP follows. An ISP may fall in more than one category – AOL is not only one of the biggest players in the *online service providers* (OSP) category but also one of the biggest brand driven players. Similarly in India, VSNL is the bandwidth provider and brand driven player while Satyam Infoway is content and a brand driven player.

Strategies and revenue stream are directly proportional to the business model an ISP follows.

Value added services would be the next focus area, viz. web hosting, Virtual private networking, E-commerce, domain name registration, Internet roaming and also tying up with banks offering Internet banking. Some ISPs have started to consider advertising as an important business and revenue component. Though traditional brick and mortar industries are continuing to expand, the Indian market would lean towards alliances for content, value additions, and e-commerce. Most of them will start offering a one-stop shop.

The number of portals visualized in India are based on American mergers and acquisitions model. The value-added services will be main revenue stream in future and revenue from plain access will dwindle. With choice over prices for customers, demand for Internet connectivity has increased. It is expected that the base would count 8 lakh subscribers by the end of April 2000 with over four million users or browsers over the Internet. The market is further expected to grow over four million subscribers by the next year. According to a survey by the Indian Market Research Bureau (IMRB), 43 lakh households have already had first hand experience of Internet and over 0.9 million intend to acquire an Internet connection. Another research shows that demand for Internet connectivity has grown at a Compounded Annual Growth Rate (CAGR) of about 400 per cent between 1995 and 1999.

Need for New Business Model

Internet subscription is still regarded as a major source of revenue by most of the ISPs. Some of the other services offered by ISPs are: E-mail service, Web hosting, Advertising on ISPs web site, E-Commerce, Domain name service, VPN (Virtual private networking) service and E-commerce solutions Web designing. Set-

ting up an ISP infrastructure requires huge investments. Depending upon the category of ISP, investments vary. While entry cost for a simple service is not high—a new ISP needs only 35 lakh as capital cost (depending on size of ISP) for the hardware and the software, and an annual expenses of Rs 1 Crore, out of which Rs 41.80 lakh goes to VSNL for gateway usage—differentiation comes at a higher price. Therefore, an ISP would need 35,000 customers paying Rs 3000 a year (Rs 105 million annual revenues) to break even. With the fact that today more than 200 ISPs have license to operate in India and total internet subscribers are around 5 lakh, the revenue from access alone does not seem to promise profits. Thus ISPs need to find new sources of revenue. The existing business model and future business model for Indian ISP is shown in Fig. 1.

Revenue from access alone does not seem to promise profits. ISPs need to find new sources of revenue.

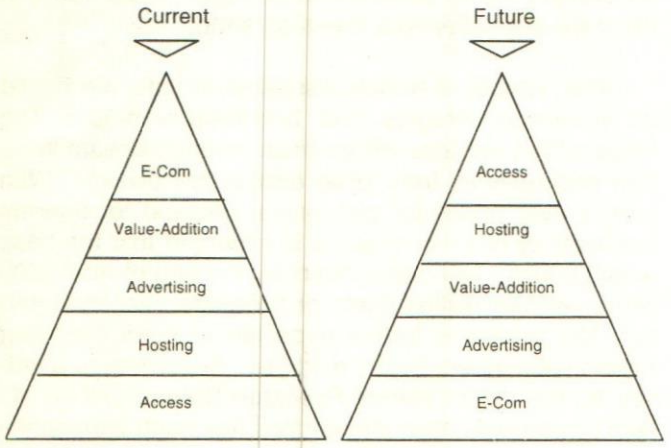

Fig. 1: Existing and future business models

Source: Dataquest January 31 2000.

The ISP market is unique unlike traditional business model. The money making proposition does form the core of an ISP business model. Access may be on the top of the business model but may not occupy the same position in the revenue model. The core of any business and revenue model for any ISP is access. This will continue until market matures and other players like wholesale bandwidth sellers enter the market. This is because providing access is not the core competency of these players. However, as of now, all ISPs are taking this route to establish themselves in the eyeballs of subscribers game. Even in the access market, some kind of segmentation is taking place with companies like Dishnet bringing in high speed access like DSL into the country, while others experiment with cable and other high speed media. VSNL is projecting itself as a reliable access provider leveraging its role in bandwidth provision while players like Bharti BT and NET4India are on the single number access. Access will continue to be an important source of revenue especially for the medium and smaller guys in the coming period, apart from occupying a place at the core of the business model. However, for some of the bigger players, this component is going to lose its importance as they develop other sources of revenue. For instance, if Satyam Infoway develops online with the AOL OSP model, chances are it will drop its access rates to bring more eyeballs to its site and earn from e-commerce.

Another important trend already evident is the maximum innovation occurring on this front. First there was hourly rate pricing and the price cuts in this system. With the market growing and maturing, few players like Net4India and Caltiger are changing the rules of the game by bringing in unlimited and even free access. Currently outside the access core, ISPs are considering advertising as an important business and revenue component but money will go only to the players with big subscriber bases. The companies will also have to fight tooth and nail with established websites like Rediff.com, IndiaWorld and other sites. The next tier would be value-added services like web hosting, co-location, net solution, virtual private network (VPN), domain names, and e-commerce as part of both business and revenue strategy. Most of the ISPs are still grappling with the value added services since the prime motive is to establish the serious-player-image in the nascent ISP industry.

Most companies seem to be following a mix of access and content before moving on to e-commerce in the footsteps of international online service providers like AOL. The model of offering Internet access and content is a successful model in the Internet business. Satyam Infoway has been very aggressive on the content model which it later intends to roll out as the e-commerce model with a spate of tie-ups and takeovers. Tie-ups with banks like Bank of Madura, ICICI bank and takeover of India World are a few examples.

Offering Internet access and content is a successful model in the Internet business.

However, how many will be successful will be directly proportional to the subscriber base. Besides, notching up a subscriber will be a kill-kill game in an increasingly crowded market. For example in Delhi, apart from all-India players like Satyam Infoway, Bharti BT, VSNL and Dishnet, local telecom majors like MTNL and upstarts like Net4India are catering to the market. Many more are expected to join the fray. If the number of licensees are any indication, assuming that all the players will be launching their services, Delhi will have about 36 players in the coming months. It will become increasingly important to segment and focus on niche areas rather than cater to the whole pie in such a crowded market. Companies are fast realizing the same and launching their net initiative around this philosophy. Net4India is targeting the HSME (home small medium segment) and will offer services ranging from email to the home users to providing web design, hosting and networking solutions to its SME clients. On the other hand, Dishnet is projecting itself as a serious access provider ranging from the low end of the market (via ETH hubs) to the high end through broadband technology like DSL and cable. Their business model rests on content, education and portal to cover the entire spectrum of the internet. Along the same line the differentiator for Satyam Infoway is, enabling business over a wire. The company has been working towards it since 1997. In Calcutta, Caltiger has introduced its free internet service and this is the differentiator for this ISP. The smaller and regional ISPs are building local support and community that will keep them afloat in the cutthroat market that is fast emerging. So each company, the giant or the local player, is defining its business and revenue model and adopting its strategy. The final business and revenue model will be clearly drawn out in the coming months.

It will become increasingly important to segment and focus on niche areas.

International Trends

Failure rate in ISP industry is very high. According to Sundar Iyer, general manager at Silicon Graphics India, "20,000 ISPs entered the game in the U.S. a few years ago; there are just about 6,000 in existence today, and only about 800 are making money." This indicates consolidation. Figures from International Data Corporation showed that almost 90 per cent of U.S. ISPs are now offering value-added services beyond basic access. Indian ISPs too should plan on offering value-added services like: internet site security, servers on hire, gateways between e-mail and pagers, distributing news feeds, roaming services for traveling users, web site hosting, chat, games and internet exchanges for smaller ISPs. In the U.S., most business ISPs are telephone companies as they already have an existing sales force that is selling communication services to businesses. Businesses also tend to be much more demanding than consumers and only well capitalized companies can provide them with service level agreements and quality of service guarantees that they require—these are typically the competencies of private U.S. telcos. The situation may differ elsewhere.

Indian ISPs should plan on offering value-added services like: internet site security, servers on hire, gateways between e-mail and pagers, web site hosting, games and internet exchanges for smaller ISPs.

Companies like Open Market are offering e-commerce solutions for ISPs (such as ShopSite). U.S.-based ISP PSINet has recently acquired the ISPs INet in Korea and Tokyo Internet Corporation in Japan, to target large corporates as well as the SME/SOHO markets. Online service America OnLine has become a major ISP in Europe, and is the largest ISP in Britain. These developments are indicative of several emerging trends in the ISP world:

- Consolidation among ISPs
- Diversified service and content offerings for the MNC
- SME and consumer markets
- International alliances and acquisitions between ISPs and content companies and
- Increasing regionalisation and localisation of content and services.

ISPs are teaming up with e-commerce solution companies to offer online cataloguing and transaction services to large cybermalls and small entrepreneurs. For instance, Netcom and France Telecom are using Open Market's e-commerce solutions; Verisign has provided solutions for U.S. ISPs and British Telecom; Intershop has targeted U.S. and Canadian ISPs. "Portal" sites are teaming up with ISPs to enhance Internet access with search facilities, navigation, customization, personal pages, content, online communities and chat. For instance, AT&T has tie-ups with Infoseek, Lycos, Excite and Yahoo; Excite also has a tie up with Telecom Italia. Tie-ups with print, broadcast and Web-only pub-

lishers are also proliferating. Sprint's default home page for Internet subscribers is CNet's Snap! In Jordan, ISP Global One and publisher Arabia Online have created an online service called Baladna. The China Internet Corporation offers Internet access as well as business content from Reuters, Agence France Presse and Bloomberg.

ISPs are teaming up with e-commerce solution companies to offer online cataloguing and transaction services to large cybermalls and small entrepreneurs.

Regionalization is another emerging trend: ISPs are teaming up with regional providers of content to create city-specific sites with local news, personal ads, entertainment, employment and real estate information. Microsoft (with proposed portals in 31 countries, MSN Web Communities, MS Internet Access, and content from Expedia and CarPoint) is competing with players like America Online (with European and Australian editions) for local markets across the world. Even the broadband channel is emerging as an arena for ISPs like @Home (in the U.S., Canada, and Britain), Telstra (which teamed up with 13 Web develops for broadband content), and SingNet (the Singapore ISP which teamed up with Philips for home content delivered by Internet TV).

Regionalization is another emerging trend.

Most of the above offerings are in the online consumer market. Several ISPs are targeting the more lucrative business-to-business commerce sector, for end-to-end solutions like Intranets and Extranets. For instance, the Internet Operations Centre offers dial-up and leased Internet access as well as Intranet/Extranet solutions for U.S. automakers and auto parts suppliers. The business trends over the last three years have been explosive growth. The U.S. market is supporting over 6,000 ISPs today; the majority of these ISPs are medium sized – i.e. serving between 10,000 and 100,000 customers. This segment is ripe for consolidation. Revenues from Internet access services in the U.S. will surpass $10 billion in 2002. Today, the top 10 consumer ISPs in the U.S. control over 60 per cent of the market; there will be much more consolidation as ISPs who do not own their own networks continue to acquire customers to take advantage of economies of scale and scope. New players will continue to enter the market. For instance, because of deregulation, utility companies are experimenting outside their traditional realm by offering other products and services like long-distance telecom services and Internet access to their customers.

ISP Market in India: Industry Analysis

According to Dataquest estimates, the access market will grow from Rs 102 Crore in 1999 to Rs 1,500 Crore by 2003 as shown in figure 2.

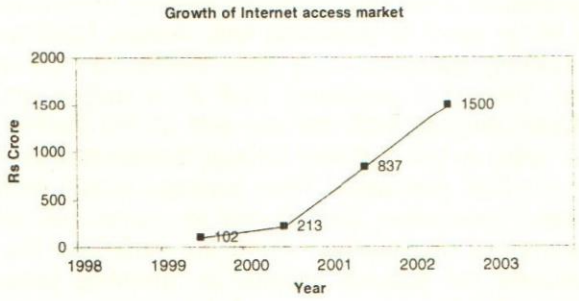

Fig. 2: Growth of Internet access market

Source: Dataquest, January 31, 2000

However, access is not going to be lucrative. The reason is this market will be shared by a number of players who have license to operate in India. In addition, some of the pie will go to free Internet access providers who have no stake in the market but are important players in the numbers game. Till mid June 2000, private ISPs have surpassed their counterparts with a comfortable margin of over 1.5 lakh, and their total subscriber base has crossed 7 lakh. The total subscriber base for the country thus stands at 12 lakh or 1.2 million.

Potential of Indian Market

Right now, the PC penetration in India (and the number of PCs connected to the Internet) is abysmally low (Table 1). As the access costs and the cost of PCs fall, the market for Internet access, in terms of number of subscribers, should explode.

Growth of the corporate access market is also expected with large domestic computerization measures in the Government sector. Already initiatives are underway on the part of the Government to start a comprehensive move towards electronic governance. The

Table 1: PC/Internet Penetration comparison (Source: Indiainfoline estimates)

	India	US	Asia-Pacific
Population	1000	270.3	2769.6
Number of Internet users	0.5	62.8	10.2
Net-enabled PCs	0.3	87.4	9.5
Internet users/ population (%)	0.1%	23.2%	0.4%

corporate access market will also grow as the economy gathers momentum and companies realize the benefits of using the Internet. Internet penetration remains confined to only the major towns and cities due to lack of proper telecom infrastructure. With the setting up of a National Telecom Backbone, it is expected that Internet will reach more areas of the country. Higher bandwidth availability is also expected to spur the usage of Internet in terms of both number of subscribers as well as the usage time by a particular user. Internet usage will also get boost because of the development of alternative means of access. The most obvious way is using the TV Cable network, given the enormous TV penetration in India. Currently, 30mm Indian households have a TV. If this segment of the population can be tapped, Internet usage can explode. At present set-top boxes, which connect users to the Internet through the TV, are quite costly. However, with increasing penetration the cost of these boxes should fall and help increase ISP demand.

Enormous potential is seen in the Indian ISP market by global software and hardware vendors. Microsoft. Compaq, Intel, Cisco and Loral Orion have announced an informal tie-up to target the Indian Internet service providers (ISP) market. The five are positioning themselves as a single-point source for equipment purchase and implementation of ISPs' systems. While Microsoft is offering its Microsoft Commercial Internet System (MCIS) 2.0, Compaq is trying to sell its Internet computer servers. Intel wants its products to be the preferred platform, Cisco is to provide the networking solutions and Loral Orion the international gateway for connectivity to Internet backbones. Although the grouping of these companies does not include a formal marketing arrangement, their coming together could develop into a commercial relationship. Some of the companies already have marketing tie-ups with one another.

Characteristics of the Indian ISP market

- Poor telecom infrastructure is a grim reality in India. This is a big bottleneck for all kinds of Internet-related services. Although the Government is trying out various steps to smoothen out the difficulties, ISPs would definitely have to contend with the situation. It would be impossible for most of the private ISPs to set up their own networking backbone. So, unless the Government takes the initiative to ensure that there is a national Telecom backbone, which is hired out to the ISPs at competitive rates, it will be a difficult market for most of the ISPs.
- High bandwidth cost – Currently, bandwidth is being leased from VSNL as it is the only agency having own international gateways. Leasing costs are high due to VSNL's monopoly situation as well as the fact that due to low usage, VSNL is unable to contract attractive rates for hiring international circuit lines. It is expected that as VSNL goes in for hiring higher bandwidth (with increased Internet usage in India), VSNL will get this at better rates.
- Slow internet adoption – Even in the face of decreasing PC prices and decreasing access costs, Internet growth in India has been anything but explosive, even though the base was so low. The primary reason for this is the low purchasing power in the country. So new players entering the market have to be realistic about the size of the market and the rate at which it grows. They have to have a long-term horizon to look for payback on their investments in the ISP business.

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- The intensity of competition in the Indian market is very high given the fact that Internet penetration level is still quite low. All ISPs are fighting for a share in the pie, the size of which does not allow all the players to enjoy economies of scale.
- Like most other Internet businesses, first mover advantage is quite critical. This is all the more so because the services are not very well differentiated and access is the main services being offered. Once an ISP can hook on to a particular viewer, it is unlikely that the viewer will change to another ISP provided the quality of service is satisfactory.

Growth Drivers

Increase in the number of people accessing the

Web and increase in per person use of the Web, will determine the growth of the ISP industry.

Growth drivers in the retail segment: Development of newer applications will drive demand from usage.

Fall in PC prices/fall in access costs – fall in PC prices should help PC penetration and improve Internet usage. As ISP access charges fall with increasing competition and as they increasingly cross-subsidize access charges with e-commerce and advertisement revenues, Internet penetration will increase.

Improvement in access: as speeds of connection and speeds of data transfer improve, consumer usage is expected to improve.

Growth Drivers for the Corporate Segment: Internet access enables savings on both time and cost aspects due to improved communication and information gathering. Improvement in productivity makes up for the costs associated with access. A presence on the web is now an important requirement to ensure adequate publicity for any corporate to reach out to customers, investors. Additionally, businesses gain the ability to increase sales through e-commerce transactions and decrease dependence on traditional distribution channels.

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SAP Analysis of Indian ISP Industry

Field studies are conducted in those situations where it is required to study a situation deeply. In a field study questionnaire, structured and unstructured interviews and observations are taken to develop case studies. Case studies developed are analyzed by culling out typicality rather than uniqueness of the situation. Focus on typicality leads to meaningful generalizations and scientific abstraction whereas uniqueness would preclude these. Case studies look deceptively simple, but they require thorough familiarity with the existing theoretical knowledge of the field of inquiry by the researcher and also the skill to differentiate significant variables from insignificant ones. An unbiased approach is mandatory. If bias creeps in, some significant factors may be lost sight of, some factors even though not significant may get more attention, faithful longitudinal approach would not be taken, etc. Sushil, (2000) has recommended a formal analysis methodology for critically examining a case study. This methodology consists of two phases. In SAP analysis we describe the case through three basic components that define the dynamic interplay of reality in flexible systems management paradigm. These are situation, actor, and process (SAP). They interact flexibly on multiple planes in the ambiguous reality and help us understand the reality.

Context: Context defines the background and the environmental norms that impinge upon the reality. The components operate in it.

Situation: The present status, potential for growth or decay, accelerating and decelerating forces, present and future state of the art, etc. taken together define the situation.

Actors: The participants who influence the situation and alter it by their actions or inaction are termed as actors. Actors may be both extra and intra-mural, since both can influence the situation.

Process: The procedural steps taken by the actors which alter the situation are termed as the process. Some processes may be explicitly identifiable while some others would be implicit. Any dynamic behaviour that alters the situation has the potential of being a process.

Synthesis succeeds SAP analysis helping us to identify the learning issues. Learning issues emphasise the typicality of the situation as well as some features of its uniqueness. Learning issues also lead to action. While learning issues derived out of a particular case are applicable to similar other cases, this application should be preceded by proper adoption. Learning issues lead to actions resulting in improved performance, positive growth and enhanced productivity and profitability. Improved performance is the sum total of the SAP analysis and LAP synthesis. In defining performance, various end results which are to be achieved, should be itemized and delineated.

Context of present analysis: Decreasing access charges and increasing competition in the Indian ISP industry.

Situation

- The international bandwidth that ISPs require is very expensive. Today ISPs need higher bandwidth to provide faster Internet access to subscribers. At the moment VSNL provides international bandwidth to all ISPs. According to one estimate for an average

ISP the cost of international bandwidth is around 40 per cent of the total annual expenses which is very high. In the new ISP policy, the government has allowed private operators to setup international gateways but it will take time before prices of bandwidth come down due to competition.

- Today international Internet bandwidth available is more than 40 Mbps.
- Around 225 ISPs hold license to provide Internet access out of which around 50 are active ISPs. The high number of ISPs trying to capture a relatively low market is reflective of fierce competition among the ISPs.
- Number of Internet subscribers as estimated by IDC is around 5.2 lakhs in the end of 1999. This is very small and all ISP are relying on high growth of Internet subscriber base. Depending on category of ISP, it may require around 35,000 customers paying on an average Rs 3000 a year to just break even if they were depending on access as the only source of revenue. Given the increase in competition, the average revenue per customer is bound to decrease.
- Government is keen to promote ISPs in India. It had drafted ISP policy in 1998 and is allowing private ISPs to operate in the market. Also ISPs have been exempted from license fees for the first five years.

Government is keen to promote ISPs in India.

- Few companies like Satyam Infoway, Mantra Online are planning to take advantage of IPO, whereas, small ISPs are focussing on large subscriber base to incur revenue.
- Foreign investors have also started appreciating the Indian Internet market and have started investing. For example, W3c.com has entered the market with Australian partners Intract Internet Service and Tek-Co. Pty. Pacific Internet is another example of foreign ISP.
- Within a span of one year of de-regulation, the competition has forced the ISPs to slash prices by almost 50 per cent and there is no uniformity of rates being offered by ISPs.

Problems faced by ISPs

- Dual role of VSNL and DoT as infrastructure provider and competitor is a gray area.
- Dependence on VSNL for international bandwidth Although private players have been allowed to set up international gateways, it will take time for prices to come down.
- Most of the private players like Satyam, BPL and Bharti BT have evinced interest in setting up their own gateways and acquiring total control over bandwidth.
- Poor state of telecom, especially the last mile connectivity, with the power vested in DoT and MTNL. However, even private players realize that until private basic telecom providers set up their operations, they cannot do much on this front.
- Poor telecom infrastructure coupled with low PC penetration only adds to the woes of the industry. No wonder there is enthusiasm about Internet over cable.

Actors

- All major upcoming ISPs. Their pricing strategy will determine the cost of Internet to end-user.
- Government of India. Government of India is acting as a catalyst for growth of ISP industry. It has allowed private ISPs to operate in India and is also allowing some ISPs to setup their own international gateway and provide it to other ISPs on commercial basis.
- Satyam Infoway—Its recent acquisition of India-World.co.in for Rs 499 crore all cash deal has raised the bar for all future deals. This is important as in future all ISPs will feel the need to provide quality content through their web sites. For this the cost of acquiring existing companies with eyeballs may be very expensive and time for developing own site may be too long.

Customer retention is a major problem for all ISPs.

- *VSNL*. It is the only operator providing international bandwidth to all ISPs. It has international bandwidth around 145 Mbps.
- MTNL and Dot—These are the basic telephony service providers. Their networks are used by end customers to gain access to the Internet.
- Customer. He is God for all ISPs. Customer reten-

tion is a major problem for all ISPs. Due to poor services provided by most ISPs in India, customer is lured by other ISPs to switch over. Result is loss of existing customers.

Processes

- New ISP policy has been implemented.
- Government deregulated the ISP market and gave license to over 225 ISPs by now.
- New players will provide gateway services as it has been allowed.
- Cyber laws are soon to be implemented which will increase the amount of revenues from e-commerce.

Learning Issues

- The competition in ISP market will become very fierce in future.
- ISPs should look for different sources of revenue other than revenue from subscription only. This is because as competition becomes fierce, the average revenue from customer will decrease and to break even, a very large subscription base will be required.
- Customer will benefit from this competition and cost of Internet subscription will decrease.
- Internet penetration will increase in Indian markets once cable networks are used for Internet access.

A Survey of Internet Users

A research was conducted on users of Internet to find answers to questions such as: what changes are likely to occur in ISP industry and what strategies should ISPs embark on? Sampling method used was convenience sampling. The sample consisted of 390 subscribers to Internet access of various ISPs in Delhi. Survey region was Delhi and method was personal interview. Data was collected from current users of the Internet at home, people operating cyber cafes, users using Internet from office/college/place of work.

- When asked about the purpose of using Internet, following results were found (Fig. 3):
- 'Email' came out to be the most important reason for using the Internet followed by 'searching for information', 'finding career opportunity', 'chatting', and 'leisure'. Today almost all the ISPs provide free email accounts to their customers. This is more of a necessity rather than an option to ISPs.

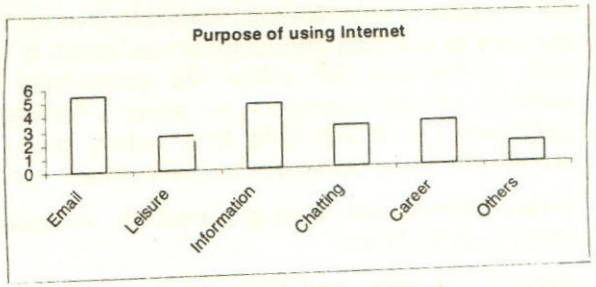

Fig. 3: Purpose of using Internet

- To evaluate the decision-making process of selecting an ISP, respondents were asked how they chose their ISP and were asked to rank seven factors. Figure 4 shows the average scores of factors

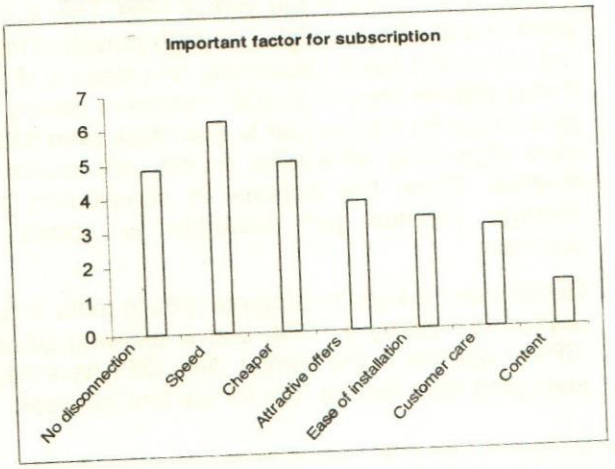

Fig. 4: Important factor for subscription

- Highest rank was that of 'speed' followed by cheaper rates, then not getting disconnected, attractive offers, ease of installation, customer care and finally content, Therefore, the segment that looks for content is different from the one that is looking for access subscription. The rationale of providing content to Internet users is to generate revenue by means of e-commerce transactions on the web site. Again, the learnings from these figures are that ISPs need to improve their services to get a sustained growth of customers.

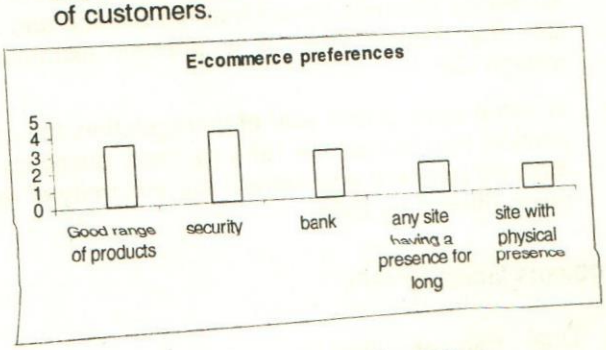

Fig. 5: E-commerce preferences

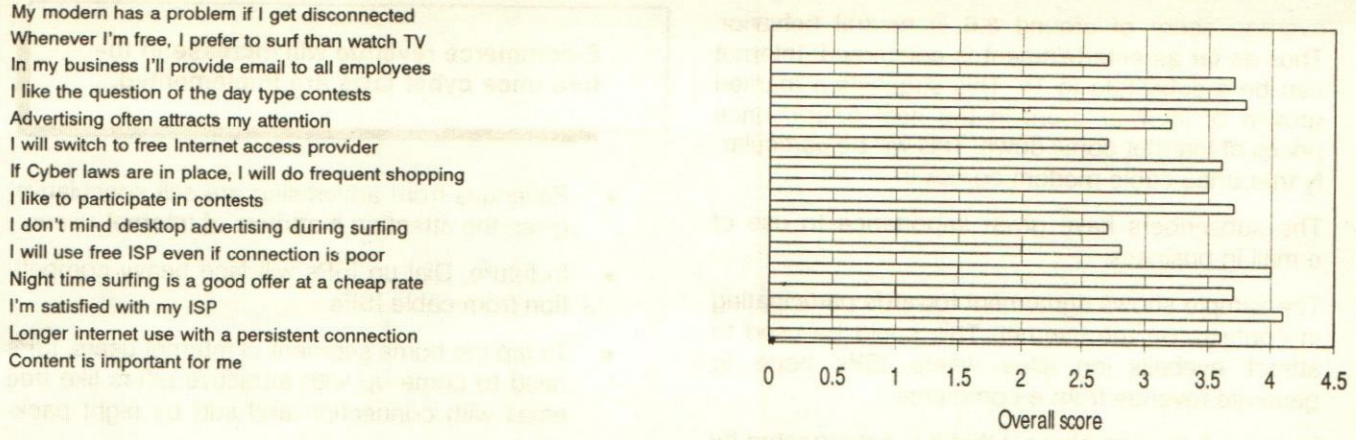

Fig. 6. Perception mapping

- Respondents were asked how they would choose a site to shop from, to find their E-commerce preferences. Respondents were asked to rank five factors. Figure 5 presents the overall scores:
- Most respondents considered security from hackers a very important factor, followed by a site offering good range of products. An important observation was that respondents said that if their bank opens an e-commerce web site, they would prefer to shop from that site. Most respondents are worried about security on the Internet. Once cyber laws are in place, ISPs can hope to increase their e-commerce revenue.
- Finally, respondents were asked a set of 14 questions to map their perceptions about ISPs and Internet in general. They were asked to select one option out of the following five:

'Strongly agree (5)', 'Agree (4)', 'Neutral (3)', 'Disagree (2)', 'Strongly disagree (1)'

The results are shown in Fig. 6. The attributes shown in the graph are mapped to following questions in that order:

- I have learnt from my past experience that if my dialup connection gets disconnected very frequently, then problem lies with my modem and not ISP.
- When I am free, I mostly surf the net rather than watch TV, if both are available at same cost.
- If I was doing business (or in my existing business) I will provide Internet access to all employees or at least provide them email facility.
- Whenever I find a survey like 'question of day' type contest, I like to participate.
- Advertisements on the net often attract my attention and I click to find more information.
- If free Internet access companies come, I won't even consider buying internet from other paid ISPs.
- Once cyber laws are implemented, I will do shopping on the net more frequently.
- I like to participate in contests on web sites.
- I don't mind if ISPs offer connection for cheaper rate even if it uses some of my desktop space for advertising during surfing.
- I would continue to use free Internet access for the next year even if quality of connection is poor.
- Surfing during nighttime is a very good offer if it comes at cheaper rates.
- If I get persistent connection with good speed also then I tend to use Internet for longer duration.
- I am satisfied with my ISP.
- I think content provided by ISPs is very important for me.

Analysis of perception mapping

- An overall score of 2.6 out of 5 in first question suggests that respondents are aware of the fact that services provided are of poor quality and not their equipment.
- In second question where respondents were asked if they prefer to watch TV or surf the net, the

average score of around 3.6 is neutral behavior. Thus as far as entertainment is concerned, Internet can be a substitute to TV. This suggests a marked growth of Internet users in the near future, once prices of Internet come down. This will be particularly true once cable modem comes in.

- The subscribers have given importance to use of e-mail in business.
- The sample shows agreement towards participating in contests on the Internet. This could be used to attract eyeballs on sites where ISPs hope to generate revenue from e-commerce.
- In general, the sample said that it is not attracted by the advertising on Internet web sites. Today companies are betting on publicity through advertising on Internet. However, if this channel fails to show results, then inflow of revenue from this channel is speculative.
- The respondents were strongly in favor of free ISP. However, in response to another question, respondents clearly said that they would discontinue use of free ISP if quality of connection were poor. Thus, inspite of free ISPs operating in market by betting on advertising revenue, paid ISPs will continue to get subscribers for the sake of quality of services.
    - In general, respondents said that they would not like if their ISPs use some of their desktop space for advertising. This goes against the model of free ISPs.
    - ISPs can offer surf by night packages to Internet users as the survey suggests people are willing to purchase surf by night package if it comes at a cheap rate. This will also help in better network utilization as network is less loaded at night as compared to daytime.
    - People say that they tend to use Internet longer if they get a persistent connection, this suggests that demand of Internet will go up once better quality of connection is provided to subscribers.

Based on above observations following conclusions can be made:

- Home Internet users will grow at a tremendous rate once price of computers and Internet access comes down.
- Paid ISP will continue to survive in the market inspite of free ISPs offering services to subscribers.
- E-commerce revenue will increase in future once cyber laws are implemented.

E-commerce revenue will increase in future once cyber laws are implemented.

- Revenues from advertising are still speculative, given the attention it attracts of Internet users.
- In future, Dial up ISPs will face heavy competition from cable ISPs.
- To tap the home segment of Internet users, ISPs need to come up with attractive offers like free email with connection and surf by night packages.

Concluding Remarks

This study attempted to assess the business models of ISP industry in India. Statistics have clearly confirmed the fact that the opportunity base is there in the world of information superhighway. The Indian ISP industry is growing rapidly and moving up the value chain providing value added services. The government policies are liberal and are trying to propagate the growth of Internet in India. Substitutes of Internet pose negligible threat to ISPs. Internet has many applications for users like collecting information, sending e-mails, leisure activity etc. Internet would stand as a better option for all such applications because of its faster speed. In case of international bandwidth, existing bargaining power of supplier is high since only one player operates (VSNL); although some more ISPs have been given licenses to setup international gateways it will take time for competition to hot up. However soon many private players will enter the market and thus bargaining power of suppliers will decrease. The following are a few recommendations:

- ISPs need to find multiple sources of revenue rather than just access.
- ISPs should provide end to end web solutions from web site development to web site hosting and maintenance.
- They should tie up with some e-commerce company and invest in that so that it earns revenue from e-commerce transactions from that web site.
- ISPs should focus on developing local content catering to various regions. This will lead to increase in eyeballs to their web site.
- They need to improve services in terms of speed of connection and connectivity to compete with cable media ISPs.

- To segment various customers, different connection schemes should be available like night by surf, unlimited access etc.
- Revenue from advertising is still speculative and free ISPs should concentrate on revenue from e-commerce.
- ISPs should explore the WAP gateway opportunities as it is still in the nascent stage in India and market needs to be tapped.

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□

It is my profound belief that a man or woman who rises up through the hierarchy of a corporation must justify his or her position every single day. They must also be in a state of perpetual anxiety, the healthy anxiety that makes one reject complacency.

– Jacques Maisonrouge

Better service for the customer is for the good of the public, and this is the true purpose of enterprise.

– Konosuke Matsushita

E-Governance

Parminder S. Miglani

This article explores how Governments with the aid of technology can bring about "E-Governance" thus uplifting the social and economic life of citizens. The subject deals in depth with the need for E-governance in the changing face of society, the benefits accruing to the citizens, government and businesses, its implementation, as well as the impediments in the course of such an implementation. Realizing that E-governance involves sharing of information between the Government and citizens in a transparent manner, it calls for a paradigm shift where the society is seen as partner of the state and not as its opponent.

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Governments worldwide have taken initiatives in harnessing technologies for citizens' convenience and welfare. Prompted by the phenomenal success of usage of Internet by corporates to run cost-effective businesses, governments have chosen to adopt the same model for customer centric approach where the customer is a citizen! E-governance, therefore, is not a modern day buzzword or "Pentium III powered" fantasy but has multiple definitions. In simple terms, it is a smoother interface between government and citizens for SMART (Simple, Moral, Accountable, Responsive and Transparent) governance. E-governance is basically an application of Information and Communication Technology (ICT) to the process of government functioning.

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Evolution of E-governance

Developing countries including India, are in the motion of coming out from colonial or feudal hangover. The bureaucracy in these governments was structured to serve the colonial power of industrial age economics with "red tapes" introduced to various layers of administration to serve as checks and controls. After independence, these governments started with the most appropriate vision of being social reformers, acting as agents of development by providing employment and attempting to produce everything from needles to satellites. But lately the strategy is to concentrate on core competencies to respond to the changing pattern of societal needs. Competition from global markets, the need to deliver faster services and most importantly comprehension of the latest technologies have resulted in the need for governments to act as a catalyst for social and economical upliftment, rather than just being social reformers.

The self-introspection by governments led to some basic questions. Primarily, the contexts of the questions are as follows:

- How to be more responsive and accessible to the unprecedented changing needs of the society?
- How to provide high quality governance with lower quantity of personnel?
- How to enhance its role as a catalyst of economic growth and govern the means of wealth creation and distribution especially in developing countries?

The answers to these questions reinforced the thrust for embracing efficient e-governance.

Touchstones in Indian Perspective

While no form of technology usage can completely replace the involvement of human governance even its limited usage in Indian perspective is sufficient enough to improve our day to day life. For this, the government should judge itself against the following parameters

Accessibility: Ability to reach the masses in rural places and villages where the real India lives.

Economical: No extra cost burden for the services by application of new indirect/direct taxes.

Efficiency: Faster quality service delivery. At present files move at snail's pace with "through proper channel" tags resulting in unending hassle for each government interaction.

Transparency: This can raise standards of accountability in all faces of public life and build more enthusiasm and sense of ownership by citizens in nation building.

Benefits

There are significant benefits to each segment of the governance involved:

Citizens

- Better transparency and integrity in dealing with the government.
- Choice of alternate delivery channels besides government offices and convenience offered by extended hours (24 hours day, 7 days week).
- Greater synergy in dialogue and decision making at planning and implementation level, thereby facilitating the convergence of shared agenda.
- Creation of electronic forums (portals) to raise their concerns on subjects ranging from local issues to fundamental rights.
- And most important, easier accessibility of services in remote villages and townships provides a real meaning to the phrase 'zero distance'.

Government

- Increased productivity by means of digital service delivery to the citizens.
- Reduction in duplication of information by networking of various inter and intra-departments that will make the process of data collection and analysis easier and economical.
- Efficient electronic storage of information leading to thin government but quality governance.
- Incubating feedback mechanism and institutionalization of service levels for administration and bureaucracy to respond.
- This would result in the ultimate integration of e-governance with poverty alleviation programs, thus establishing the true e- raj.

Business

- Business transactions at lower costs and faster speed via electronic payment/invoicing.
- Shift from monopoly of government on information to transparency in norms.
- Transition from cumbersome procedures for clearances to improved relations by providing quick approvals.
- Improved transparency and information on tender and procurement process.
- Outsourcing of government IT operations to business sector.
- Providing recommendations in policy framework constitution by extending the participatory model of management.
- Market expansion and organized job creation and its overall impact on the macro-economy of the nation.

Impediments to E-governance

There are a number of impediments in the way to

e-governance and few of them are universally common to any change.

Mind Set: For instituting a viable e-governance, there is a need for a paradigm shift to see the society as partners of governance and not as an opponent to the state. There is only a small section of dynamic and responsive bureaucracy backed by vibrant political leadership examples of which can be seen in states of AP, MP and to some extent in Karnataka. That small pie of bureaucracy should be mustered and rewarded to share the platform with society in decision management. This is a fundamental change in mindset of bureaucracy attempting to come out from the colonial/feudal hangover.

Power of Knowledge: Information (and derived knowledge) is a source of power and as a tool in the hands of society can bring about more accountability in governance. Government should release its monopoly on information. In a knowledge-based economy, lack of information has the ability to tilt the weight away from weaker sections of society. ICT can assist in bridging the gap of "digital divide" between information haves and have nots. In a country like India, it can do wonders compared to following the normal trajectory of development. It is worth giving a try especially in troubled northeast states or J&K and newborn states of Uttranchal, Jharkand or relatively underdeveloped states like Bihar etc.

Information is a source of power and as a tool in the hands of society can bring about more accountability in governance.

Government Structure: The structure created to serve the colonial power revolved around the model of "concealment revenue generation" rather than "open social development". There is a need to change this perception from "everything is confidential unless stated otherwise" to "everything is public unless stated otherwise". Developed countries have introduced or are in the process of introducing new information bills to bridge the gap between the state and the society. This has immense potential to bring the previously excluded communities to center-stage of social-economic activities.

Legal Framework: The digital era affects every pattern and norm of society from the way people seek information to payment of taxes to privacy. This has resulted in an unprecedented urgency to recipro-cate the realities with introduction of new laws or amending the existing laws to respond at faster speed. Despite there being an overall acceptance to electronic storage over paper document, there is reluctance due to absence of appropriate legal framework. Parliament has passed the Indian IT Act 2000 to give a boost to e-governance and facilitate reforms in legal, financial and administrative systems. There may be a need based revision in some portions of the Act which can be achieved by incorporating appropriate legislation from other governments especially USA and Singapore.

Labour and Union: In the charged environment of transition, a section of the government staff may ask for a larger share because of natural fear of job retrenchment. There is a need to educate them with past precedence of similar type of initiatives. Computerization of railway tickets reservations in mid 80's and bank automation in early 90's are examples of such mammoth tasks that were initially opposed by staff unions and their success stories are well known. In addition to this, most of the staff is aged and adverse to usage of new technology. Adoption of change can be made easier by developing courseware and methodologies to suitably catalyze the factors.

Knowledge Management: At the core, e-governance is about effective management of information that exists at such a volume. Generally, the best practice is to steal the ideas from other successful implementations but interestingly lack of this practice prevails everywhere. All governments have huge data to interpret and to add to the problem is the escalating pace. There are indeed governments' internal/external automated systems but most of them operate vertically rather than horizontally and act as independent islands of information. With a well-chalked out plan, information can be turned into effective knowledge for accurate trend analysis and forecasting. Simple example could be developing the central or state budgets at panchayat levels, as it is critical for planning purposes to know the utilization pattern. A more complex instance could be to develop a transport management system by analyzing the traffic statistics.

Language: This is a very peculiar problem to Indian context but at the same time a critical factor for success. The front ending of e-governance should be the regional language. Perfecting the Optical Character Reading (OCR) technology and database for implementation to local language can be taken so as to minimize efforts in language specific implementation.

Process Reengineering: Of late, it has been realized that benefits of computerization in service delivery arm

of the government were not significant compared to the cost/efforts involved. This is leading to a situation where 10 computer operators and few system resources are replacing 10 manual counters. Emphasis should be on administrative reforms, restructuring the processes and institutionalizing ICT to such changes. In addition, the knowledge transfers between various inter and intra departments of government are not efficient, resulting in redundant information and incompatibility between various arms of the governments. Better synergies between these independent islands of automation can be achieved by reviewing the existing workflow of information and introducing greater levels of simplification to increase productivity.

Infrastructure: Automation of various government departments requires huge investment in purchase of hardware and software. It is easier said than done in a cash strapped economy. It is not likely to figure in the priority list of a politically weak government trying to reduce its fiscal deficit. There are, however, various innovative models either in practice or in consideration by various governments worldwide. These range from leasing of infrastructure to revenue sharing (on the lines of build-operate-transfer (BOT) model getting popular on toll road/bridges) to Application or Full Service provider (ASP/FSP) model.

Automation of various government departments requires huge investment in purchase of hardware and software.

Connectivity: Low penetration (0.25% of total population) is a serious hindrance in achieving the goal of providing e-governance to the masses in rural India. Hence widespread use of information kiosks becomes inevitable and at the very minimum these could be used at the district level and at important public places such as railway stations, airports, post offices, district courts, libraries etc. The success story of setting up Public Call Offices (PCO) across the country should be replicated to establish these information kiosks. Also a large pie of urban households is on cable TV network. Corporate investment should be invited for using this mode to address this segment of society.

Working Model

Like accomplishing any other initiative, implementing e-governance has the following key steps:

- Vision
- Roadmap
- Architecture
- Implementation

Vision: The government must set up a high power steering committee with a "can-do" approach to translate the definition of e-governance into reality. The selling has to come from the top. Since the tool of e-governance is ICT, the most suitable candidate is the IT ministry but unfortunately in a good number of states (governance is a state matter), the portfolio is held by chief ministers defeating the very purpose of dedicated efforts for this uphill task.

Roadmap: An overall approach on the lines of "start small and think big" must be laid down to ensure that the vision sought is achieved. It could be to:

- Develop criteria for pilot selection and generate a list of potential candidates.
- Evaluate the pilots on the selection criteria for impact and feasibility.
- Confirm the selection through independent citizen surveys or internal feedback.
- Finalize/prioritize the list of pilots and rollout plans for implementation.

The dimensions for impact analysis would be:

- Usage Level: Should have maximum citizen interface.
- Efficiency: High productivity and efficiency.
- Urgency: Requiring immediate needs.
- Visibility: Symbolic, pioneer and highly visible
- Value Addition: Value delivered to the citizen. Should be a queue shift from a manual counter to an information kiosk.

Following dimensions can be considered for estimating the feasibility study:

- Ease of Implementation: With respect to the complexity of processes and regulation.
- Low Capital Outlay: Minimal cost to the government.
- Quick Win: Shorter timeframe to implement
- Acceptability: Zero or Low learning curve to users
- Technology: Incorporating high-end technology with no critical issues for implementation.

Repository of best practices can be further enriched by continuous interaction with subject matter experts from within the country, United Nations, Universities, other state governments etc.

Architecture: It should have following characteristics

- Omnipresence: Usage from everywhere—be it work, home or public place via kiosks
- Accessibility: Via a variety of devices like PC, network computers, cell phones, palm pilots, kiosks etc.
- Usability: Easy human interfaces by use of multimedia and graphics.
- Consistency: Consistent interface will introduce standardization across current and future applications.
- Scalability: Keeping the long-term needs of increasing the response time without change in the underlying components
- Portability: Applications should operate on heterogeneous platforms
- Flexibility: To take advantage of future technology, based on open system standards and easier computing for large-scale data aggregation.
- Manageability: Easy to operate and maintain for future changes with respect to regulation and process reengineering.

Implementation Strategy: Of all the key steps involved in evolving a working model of e-governance initiatives, it is the easiest step but covering all aspects of the government. It will require changes in the processes, new systems, and training to develop new skills and shared values. Initially it should start with a pilot identified on the parameters of impact analysis and feasibility study. After defining the critical path and key success factors for the pilot and monitoring them throughout the implementation, the performance of all ministries should be recorded and tabled in the parliament for more transparency. Once implemented successfully, the strategy of expansion should have following three dimensions:

Implementing new applications: New applications should be identified on similar lines with a well defined roll out program embracing more government departments—at local, state and centre level. Comprehensive training programs and workshops should range from awareness to advance courses on the state of art tools and technologies and thereby empower users. Leveraging this experience to rollout the plan would assist in the ongoing deployment of the new applications.

Expanding Reach: Given the scalability of modern technology, implemented applications can be expanded and extended to a higher reach with only incremental costs. This would ensure higher profitability on the transaction based business model having maximum citizen interfaces.

Expanding Functionality: Once the objective of quick wins has been achieved and the usage of application has reached a stage, the logical extension is to enrich the application by adding more functions. The modularity of modern application development approach can assist in obtaining this objective.

Role of Corporate World in E-governance

One of the safest mechanisms to start any initiative is to copy the ideas used by other governments worldwide and customize it to local conditions. Many governments as in USA, Singapore, UK, Australia etc. are role models in this arena. Fortunately we do not have to go very far as some state governments in India have already planned the strategy—AP and MP are pioneers amongst them.

Outsourcing, a logical extension

Economies of scale, better efficiency and flexibility to concentrate on core-competencies have led to outsourcing, a major function, by 90 per cent of fortune 500 companies. IT is recognized as being a critical tool for e-governance and with the worldwide norm of outsourcing IT operations in place, following are the distinguished advantages of outsourcing:

Economies of scale, better efficiency and flexibility to concentrate on core-competencies have led to outsourcing.

- Continuous access to state of the art technologies with same or reduced cost, a clear cut advantage for a government under pressure from IMF and World Bank to reduce its fiscal deficit.
- Use of variable cost vs. a fixed cost as requirement increases. Attrition and growing need of training in ever-changing technology(nightmare for high technology solution providers) to be

managed by outsourcing partner

- Ability to negotiate Service Level Agreements (SLA) and using pressure points for continuous improvement.
- Flexibility to release or differently utilize support and IT staff.

With a market size of over US$ 200bn, outsourcing is an internationally recognized practice worldwide. The world is passing through one more revolution of ICT and hundreds of Indians form an important part of this revolution. Unfortunately while this giant Indian ICT force is helping governments and companies across the globe, it is yet to touch the domestic front in totality. The government and the Indian corporate must join hands to provide a forum for utilizing this unmatched skill and expertise of Indians to give one more boost to Indian ICT industry.

Levels of Outsourcing

Outsourcing of any entity's IT operations has three distinct levels, each with its own complexities, challenges and benefits. These are depicted in Fig. 1.

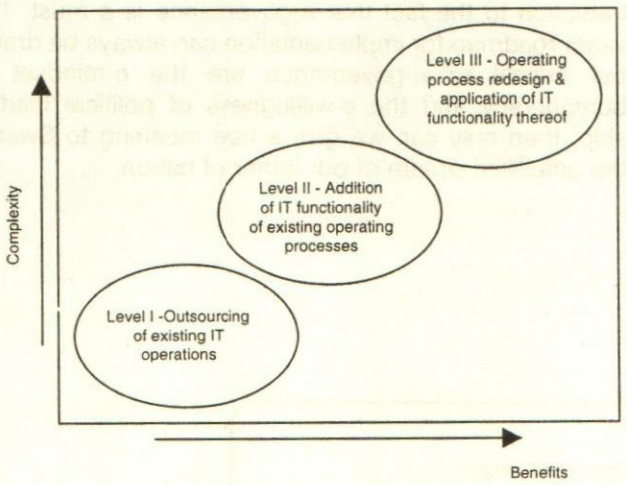

Fig. 1: IT Outsourcing

- The most basic level of IT outsourcing involves the transfer of part or whole of existing IT operations performed by the entity to the external service provider, on an as-is basis. The key benefits of this form of outsourcing are derived from efficiency improvements, arising from aggregation/consolidation of IT operations across different arms of the entity – efficiencies in areas such as procurement of equipment, recruitment of manpower, operational management and maintenance.
- At the second level, outsourcing of IT operations involves the addition of IT functionality to existing business processes within the entity. At this stage, the outsourcing service provider attempts to automate existing operating processes or parts therein, without affecting the inherent functioning of these processes. The key additional benefits of outsourcing in this scenario include increased quality of service; increased efficiency of internal operations; and faster rollout of added IT functionality.
- At the third (and most complex) level, outsourcing of IT operations may involve operating process redesign for efficiency maximization and application of IT functionality to the redesigned processes. The potential benefits of outsourcing in this scenario are likely to be very significant, and would include optimization of process efficiency through removal of redundancies, apart from the efficiency gains within individual elements of the process and increased quality of service to process users.

Issues in Outsourcing

Outsourcing of IT functions for the identified departments within the government (or a subset thereof) is likely to throw up a number of issues and challenges for the external service provider. These issues are as follows:

- *Confidentiality:* Security of data and transactions is often a key consideration in outsourcing service provision, especially if public networks such as the Internet are used for service delivery. These considerations are likely to be of great importance to the government, and the outsource service provider will need to invest in elaborate physical and electronic security and back-up systems.

Security of data and transactions is often a key consideration in outsourcing service provision.

- *Manpower:* The government has significant human resources performing IT activities in-house. The changeover to an external service provider is likely to result in a number of challenges, including resistance to outsourcing from government employees, especially from those employees engaged in the affected processes.

- *System:* The current IT setup within the government consists of multiple "islands" of technology, each with its own hardware and software platforms, and limited scope of integration. The immediate issue that the outsource service provider will need to grapple with is to provide services across these diverse platforms. In the long term, the service provider will additionally need to manage the migration of these diverse technologies to common platforms based on open standards.
- *Legal Framework:* Outsourcing of IT operations requires the development of specific frameworks and procedures to be followed by government agencies in order to maintain adequate control and transparency, and to ensure the delivery of quality services. The pilot study must examine the legislation, rules and procedures under which other Governments worldwide entrust the functioning of some of their operations, particularly IT operations, to external service providers.
- *SLA:* Another set of important issues is related to the level of services provided by the outsourcing partner, in terms of issues such as uptime, back-ups, support, etc. The pilot study will need to develop model SLA that incorporates all of these issues.
- *Cost Savings:* Management of costs is likely to be another key consideration of the government with regard to outsourcing. The outsource service provider will need to demonstrate, upfront, the benefits to be provided in terms of cost savings. Further, there may also be a need to guarantee cost savings to the government for the purpose of securing the contract.

Conclusion

In an information-overloaded era so many jargons are floating around, that a new one to coin would be B2G – Business to Government. There are no statistical money value projections available for this segment but certainly the convenience provided to society when weighed is priceless. When most of the world is struggling to ride the waves of e-governance revolution, India has an advantage of less teething problems because of its large pool of skilled resources. There are, however, different schools of thought on the approach and pace of the implementation but fortunately there is no contradiction to the fact that e-governance is a must. The exact roadmap for implementation can always be drawn but critical to e-governance are the e-mindset of bureaucracy and the e-willingness of political leadership; then only can we give a true meaning to Swaraj, the unfulfilled dream of our father of nation. □

Critical to e-governance are the e-mindset of bureaucracy and the e-willingness of political leadership.

No customer can be worse than no customer.

– Leopold Fechtner

Next Generation Web & Microsoft.NET Strategy

Punya Palit

This article discusses the evolution of web technology and how Microsoft's.NET strategy will address the challenges of the next generation web.

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Revolutions are a way of life in the computer industry. Only 20 years ago, the world was still in the mainframe era. Few people had access to computers, and then it was only via the nearest IT department. The PC and the graphical user interface changed all that, democratizing computing for tens of millions of people and transforming the computer into a truly mass-market product. Corporations realized that networks of PCs and PC-based servers could change the way they did business, while for consumers the PC quickly established itself as a new medium for home entertainment. Then the Internet came along. It revolutionized the way we communicate, created a rich new source of information and entertainment, and added an "e" to commerce. Today, close to 300 million people worldwide use the Web. According to International Data Corp., more than a quarter of a trillion dollars' worth of business will be transacted over the Internet this year.

Overview

Yet for all these wonders, there is still plenty of room for improvement. Today's Internet largely mirrors the old mainframe model. Despite bountiful bandwidth, information is still locked up in centralized databases, with "gatekeepers" controlling access. Users must rely on the Web server to perform every operation, just like the old timesharing model. Web sites are isolated islands and cannot communicate with each other on a user's behalf in any meaningful way. Today's Web does little more than simply serve up individual pages to individual users—pages that mostly present HTML "pictures" of data, but not the data itself (at present, making both available is too technically demanding for most Web sites). And the browser is in many respects a glorified read-only dumb terminal—you can easily browse information, but it is difficult to edit, analyze, or manipulate (that is, all the things knowledge workers actually need to do with it). Personalization consists of redundantly entering and giving up control of your personal informa-

tion to every site you visit. You have to adapt to the technology, instead of the technology adapting to you.

Despite bountiful bandwidth, information is still locked up in centralized databases, with "gatekeepers" controlling access.

These problems are multiplied if you use more than one PC or mobile device. To access your online information, e-mail, offline files and other data, you have to struggle with multiple (and often incompatible) interfaces, varying levels of data access, and only intermittent synchronization of all the information you need (i.e., when you physically link your device with your PC). Online data is presented in an incomplete and predefined format, greatly limiting its usefulness. The concept of a customized "personal information space" that adapts to your needs is still a dream.

Is all this really as good as it gets? Everyone believes the Web will evolve, but for that evolution to be truly empowering for developers, businesses, and consumers, a radical new vision is needed. Microsoft's goal is to provide that vision and the technology to make it a reality. Microsoft is creating an advanced new generation of software that will drive the Next Generation Internet. This initiative is called MicrosoftØ.NET, and its purpose is to make information available any time, any place, on any device. The driving force behind Microsoft.NET is a shift in focus from individual Web sites or devices to new constellations of computers, devices, and services that work together to deliver broader, richer solutions. People will have control over how, when, and what information is delivered to them. Computers, devices, and services will be able to collaborate directly with each other, and businesses will be able to offer their products and services in a way that lets customers embed them in their own electronic fabric.

What.NET Means for You

The Microsoft.NET platform will fundamentally change the way computers and users interact. By bringing employees, customers, data, and business applications into a coherent and intelligently interactive whole,.NET will allow businesses to benefit from radically increased efficiency and productivity.

Today's Limitations

- The mechanisms by which people can interact with computers are extremely limited—generally to a keyboard and mouse for input, and a monitor for output.
- User information is principally a local phenomenon; if you log in from a different machine, your preferences, data, and applications are not accessible.
- Users must directly act on information, rather than setting intelligent preferences that then automatically act on the user's behalf.
- Data for the same user across different applications and sites is difficult or impossible to automatically integrate into a single, coherent view for the user.
- Users who want to work from home or on the move are constrained in their access to applications and data that reside only on their machines at work, creating a barrier to additional productivity.
- Data designed for a particular device—whether it's a PC, a pager, a cell phone, or a PDA—cannot be directly accessed from other devices; at best, it can be periodically synchronized.

NET promises to address all these deficiencies. It will do this by realizing the vision of enabling access to all of a user's data and applications anywhere and from any device. In addition, .NET technologies will enable both loosely coupled and tightly coupled linking of applications in logical ways.

Data: Secure, Universally Accessible

Users will be able to interact with their data through handwriting, speech, and vision technologies. Their data will live securely on the Internet so that they can access it from their PCs at work and at home, from their cell phones or pagers, from their PDAs, and even from the combination pager/cell phone/PDA-PC device that's on the horizon. Applications will be able to gracefully adapt the functionality they offer to the limitations and opportunities presented by the device with which the user is interacting. Applications will be able to act on a user's preferences and directives.

All of this will work together to make users significantly more productive in their use of computing technologies. .NET is designed to take people beyond worrying about how they need to interact with their computers, freeing them to focus on what to do with their computers to perform their tasks and accomplish their goals. Activities that are still hard now—like reconciling statements from a number of different banks,

credit-card companies, and billing agents so that you can pay your bills and file your expense reports—will become much easier as user data can be linked across sites and applications.

.NET is designed to take people beyond worrying about how they need to interact with their computers, freeing them to focus on what to do, computers to perform their tasks and accomplish their goals.

New Kinds of Applications, New Ways to Develop Them

These changes will arise from a new generation of applications, created and connected by today's software developers using the .NET platform, with XML as an industry standard. From a technical standpoint, .NET will change the way applications can be developed, and it will also enable creation of new kinds of applications. .NET extends the ideas of both the Internet and operating systems by making the Internet itself the basis of a new operating system. Ultimately, this will allow developers to create programmes that transcend device boundaries and fully harness the connectivity of the Internet in their applications. Businesses will thus benefit from radically increased efficiency and productivity, as .NET brings employees, customers, data, and business applications into a coherent and intelligently interactive whole. In short, .NET promises a world of business without boundaries.

.NET is important to end-users because it makes computers easier to use and far more functional. Specifically, it frees them from the artificial constraints of hardware: User data lives on the Internet, not on the laptop—it can be accessed from any desktop, laptop, cell phone, or PDA, and can be integrated across applications.

.NET makes computers easier to use. User data lives on the Internet, not on the laptop—it can be accessed from any desktop, laptop, cell phone, or PDA, and can be integrated across applications.

.NET will allow users to make connections and complete transactions that now require hours of time and frustrating reentry of data. By allowing multiple secure data feeds to be merged into a single user interface—or even a programmable decision engine—the .NET architecture will free users from the limitations imposed by the data silos that populate the Web today. Users will have access to their data, how they want to view it, how they want to use it. .NET is important to developers because it will both change the way they develop applications, and enable the creation of whole new kinds of applications. At the core of the new development paradigm is the concept of a Web service. Web services are services that expose their functionality on the Internet through the Simple Object Access Protocol[1] (SOAP), which is based on Extensible Markup Language[2] (XML).

The fundamental idea behind Microsoft.NET is that the focus is shifting from individual Web sites or devices connected to the Internet, to constellations of computers, devices and services that work together to deliver broader, richer solutions. People will have control over how, when and what information is delivered to them. Computers, devices and services will be able to collaborate with each other to provide rich services, instead of being isolated islands where the user provides the only integration. Businesses will be able to offer their products and services in a way that lets customers seamlessly embed them in their own electronic fabric. It is a vision that extends the personal empowerment first offered by the PC in the 1980s. Microsoft.NET will help drive a transformation in the Internet that will see HTML-based presentation augmented by programmable XML-based information. XML is a widely supported industry standard defined by the World Wide Web Consortium, the same organisation that created the standards for the Web browser. It was developed with extensive input from Microsoft, but is not a proprietary Microsoft technology. XML provides a means of separating actual data from the presentational view of that data. It is a key to the Next Generation Internet, offering a way to unlock information so that it can be organized, programmed and edited; a way to distribute data in more useful ways to a variety of digital devices; and allowing Web sites to collaborate and provide a constellation of Web Services that will be able to interact with each another.

1. SOAP Provide a standard object invocation protocol built on Internet standards, using HTTP as the transport and XML for data encoding.
2. XML allows developers to easily describe and deliver rich, structured data from any application in a standard, consistent way. XML does not replace HTML; rather, it is a complementary format.

Microsoft.NET comprises the following:

Microsoft .NET platform: Includes.NET infrastructure and tools to build and operate a new generation of services; .NET user experience to enable rich clients; .NET building block services, a new generation of highly distributed mega services; and .NET device software to enable a new breed of smart Internet devices.

Microsoft .NET products and services: Includes Windows .NET, with a core integrated set of building block services; MSN™ .NET; personal subscription services; Office .NET; Visual Studio® .NET; and bCentral™ for .NET.

Third-party .NET services: A vast range of partners and developers will have the opportunity to produce corporate and vertical services built on the .NET platform.

For consumers, that means simplicity of integrated services; unified browsing, editing and authoring; access to all your files, work and media online and off; a holistic experience across devices; personalization everywhere; and zero management. It means, for example, that any change to your information—whether input via your PC or handheld or smart credit card—will instantly and automatically be available everywhere that information is needed. For knowledge workers and businesses, it means unified browsing, editing and authoring; rich coordinated communication; a seamless mobile experience; and powerful information-management and e-commerce tools that will transparently move between internal and Internet-based services, and support a new era of dynamic trading relationships. For independent software developers, it means the opportunity to create advanced new services for the Internet Age—services that are able to automatically access and leverage information either locally or remotely, working with any device or language, without having to rewrite code for each environment. Everything on the Internet becomes a potential building block for this new generation of services, while every application can be exposed as a service on the Internet.

The core Microsoft .NET building block services that will be offered include:

Identity: Building on Microsoft passport and Windows authentication technology, provides levels of authentication ranging from passwords and wallets to smart cards and biometric devices. Enables developers to build services that provide personalization and privacy for their customers, who in turn can enjoy new levels of safe and secure access to their services, no matter where they are or on what device.

Notification and Messaging: Integrates instant messaging, e-mail, fax, voice mail, and other forms of notification and messaging into a unified experience, delivered to any PC or smart device. Builds on the Hotmail® Web-based e-mail service, Exchange, and Instant Messenger.

Personalization: Puts you in control by enabling you to create rules and preferences that implicitly and explicitly define how notifications and messages should be handled, how requests to share your data should be treated, and how your multiple devices should be coordinated (e.g., always synchronize my laptop computer with the full contents of my Microsoft .NET storage service). It will also make moving your data to a new PC a snap.

XML Store: Uses a universal language (XML) and protocol (SOAP) to describe what data means, enabling data to maintain its integrity when transmitted and handled by multiple Web sites and users. The result is that Web sites become flexible services that can interact, and exchange and leverage each other's data. Microsoft .NET also offers a secure, addressable place to store data on the Web. Each of your devices can access this, optimally replicating data for efficiency and offline use. Other services can access your store with your consent. Brings together elements of NTFS, SQL Server™, Exchange and MSN Communities.

Calendar: A crucial dimension of user control is time: When is it permissible to interrupt me, and when should I be left alone? This becomes especially important as people use more devices more of the time, and as users and services interact more richly. Microsoft .NET provides the basis for securely and privately integrating your work, social, and home calendars so that they are accessible to all of your devices and, with your consent, other services and individuals. Builds on the Microsoft Outlook® messaging and collaboration client and the Hotmail Calendar.

Directory and Search: Microsoft NET makes it possible to find services and people with which to interact. Microsoft .NET directories are more than search engines or "yellow pages." They can interact programmatically with services to answer specific schema-based questions about the capabilities of those services. They can also be aggregated and customized by other services and combined with them.

Dynamic Delivery: Enables Microsoft and developers to dynamically offer incremental levels of functionality and reliable automatic upgrades on demand, without user installation or configuration. Microsoft .NET proactively adapts to what you want to

do, on any of your devices. This inversion of the traditional installation-dependent application model is a necessity in a world where users will enjoy the benefits of services on multiple devices.

Microsoft .NET building block services can be consumed on any platform that supports XML. Windows will offer the best environment to create and deliver Web Services, while Windows-based clients will be optimized to distribute Web services to every kind of device. And Microsoft Windows DNA 2000 already provides the first comprehensive XML-enabled infrastructure for building and operating Web Services.

Microsoft .NET Enterprise Servers

The .NET Enterprise Servers are the fastest way to integrate, manage, and Web-enable the enterprise. With .NET Enterprise Servers, Microsoft is delivering enterprise-ready server offerings—with the reliability, performance, scalability, and manageability required by enterprise solutions. Backed by a global support network, and a rich set of industry partners, to provide complete solutions, the .NET Enterprise Servers let you integrate and Web-enable your enterprise today while building the foundation for the next-generation of Internet applications.

Designed with mission-critical performance in mind, .NET Enterprise Servers are built from the ground up for interoperability, using open Web standards such as Extensible Markup Language (XML). The .NET Enterprise Servers, along with the Microsoft Windows® 2000 platform, supply the foundation for developing and managing applications for the .NET platform. Microsoft .NET enables the third generation of the Internet, where software is delivered as a service, is accessible by any device any time from any place, and is fully programmable and customizable. Microsoft designed the .NET Enterprise Servers specifically to help companies rapidly integrate and orchestrate services and applications into a single comprehensive solution.

.NET Enterprise Server is available from the Microsoft products web site. The .NET Enterprise Servers include the following:

Microsoft Application Center 2000: The deployment and management tool for high availability Web applications built on Windows 2000.

Microsoft BizTalk Server 2000: Orchestrate business processes and Web services within and between organisations.

Microsoft Commerce Server 2000: The solution for quickly building an effective online business.

Microsoft Exchange 2000: The reliable, easy to manage messaging and collaboration solution for bringing users and knowledge together.

Microsoft Host Integration Server 2000: Integration components for host systems.

Microsoft Internet Security and Acceleration Server 2000: Integrated firewall and Web cache server built to make the Web-enabled enterprise safer, faster, and more manageable.

Microsoft Mobile Information 2001 Server: The reliable and scalable platform for wireless solutions that brings mobile users and information together—anytime, anywhere, on any device.

Microsoft SQL Server 2000: The complete database and analysis solution for delivering scalable Web applications.

What .NET Means for IT Professionals

Today IT professionals can take advantage of the same technologies on which the .NET platform is being built. The .NET Enterprise Servers and the Windows® 2000 operating systems provide a solid foundation for creating highly manageable applications that can be brought to market quickly. Because they take advantage of Extensible Markup Language (XML), applications created on this platform will continue to have value as the infrastructure of the Web evolves.

The .NET platform has, at its core, unprecedented levels of scale based on a significantly different approach to building applications. The Web services model on which it is based means that while the central business elements of corporate applications will still generally be managed locally, the services to support them—user authentication, file storage, user preference management, calendaring, mail, and the like—can be subscribed to seamlessly instead of locally managed. IT professionals will be able to focus more on delivering value to their businesses, and less on the details of installing new redundant arrays of independent disks (RAID arrays) for servers storing user files and mail. The Web services mode will also enable dynamic deployment of new software releases and updates. Since users will be working in extremely connected ways, management can be made simpler by taking advantage of this connectivity. Easier management will also enable IT professionals to be more responsive to changes in business needs.

Web services mode will enable dynamic deployment of new software releases and updates.

The .NET Web services model for developing applications will open up a new way of creating enterprise applications. Federation of internal and external services will enable simplified creation of applications that bring together corporate data with associated data from vendors and partners, resulting in an unprecedented depth of functionality for the benefit of end users. A company's employee benefits application, for example, will be able to simply subscribe to information from its HR database, to the Web service from its benefits management company, and to the Web service from its payroll management company. The end users will be able to interact with a single intuitive interface displaying how much vacation time they have accrued, what benefits they personally receive, and how much their last paycheck was.

Conclusion: The .NET Revolution

The Microsoft .NET platform will revolutionize computing and communications in the first decade of the 21st century by being the first platform that takes full advantage of both. Microsoft .NET will make computing and communicating simpler and easier than ever. It will spawn a new generation of Internet services, and enable tens of thousands of software developers to create revolutionary new kinds of online services and businesses. It will put you back in control, and enable greater control of your privacy, digital identity and data. Microsoft .NET will only succeed if others share broadly in its success. Microsoft's business philosophy has always been to produce low-cost, high-volume, high-performance software that empowers individual and business users, and creates opportunities for customers, partners and every independent developer. Microsoft .NET takes this philosophy to a new level.

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Productivity growth is the single most important economic indicator. It determines how fast living standards can grow. The reason why the average American today is seven times better off than his counterpart at the turn of the century is that he is seven times as productive.

– The Economist: The New Economy Survey, Sept. 2000

Feature

Strategic Issues in Supply Chain Management – An Indian Perspective

Vidhu Shekhar Jha

Supply Chain Management (SCM) is a methodology which presents an integrated approach to resolve issues in sourcing, customer-service, demand flow and distribution. This paper gives a conceptual framework for SCM, discusses the problems and challenges in India, as also how strategy, quality and cost affect SCM concepts. The paper also touches upon the major strategies for making SCM effective in organisations.

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The concept of supply chain management as such is not new but it is the perception of the role that has brought new interpretations. Evans and Danks (1997) have traced the development and Role of Supply Chain Management (SCM) over the last three decades.

Role of Supply Chain Management

In 1970s, SCM was more commonly known as *distribution.* The functional role called for integration of warehousing and transportation in an organisation. The approach emphasized the role of efficient distribution and movement of inventories with main objectives of reduction of inventories and distribution costs. The role of SCM changed during early and late eighties. With increased domestic competition and rising costs everywhere, especially in areas of transportation, emphasis shifted to lowering of supply chain operating costs. The focus came to be riveted on supply chain cost structure with a view to reengineer the same to achieve reduction in costs. At the close of 1980s, improvement of customer service became the new acknowledged role of supply chain management with the objective of increased profitability and greater market share. In the 1990s, the era of globalisation and economic liberalisation which brought in highly intensive competition, intensification of customer service and growth became the new roles of SCM.

The business results of a company draw sustenance from three Ps – Plan, People and Processes. These factors are inter-dependent and interact with each other to produce a business output in the shape of customer satisfaction, market share and productivity. SCM system seeks to integrate the 3 Ps. (Sardana & Sahey, 1998). Supply Chain Management is one such methodology which presents an integrated approach to resolve issues in sourcing, customer-service, demand flow and distribution.

Supply Chain Management presents an integrated approach to resolve issues in sourcing, customer-service, demand flow and distribution.

The results derived by applying SCM are:

- Reduced operational costs
- Improved flow of supplies
- Reduction in delays in distribution and increased customer satisfaction

Conceptual framework for Supply Chain Management

Fig. 1 gives a conceptual frame work for supply chain management

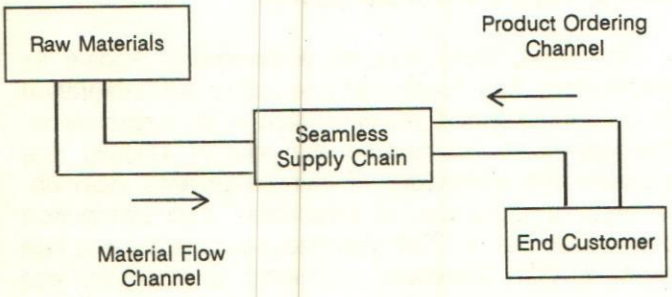

Fig. 1: Seamless Supply Chain (Sardana & Sahey, 1998)

If the supply chain is not managed properly, the delivery chain is automatically bound to be affected resulting in customer-dissatisfaction and finally loss of business. Supply chain management involves both the hardware as well as software aspects.

Hardware: Physical elements of logistics and purchase

Software: Overall philosophy of the business enterprises dealing with the supplier or vendor or customer.

Supply chain management can also be looked at from another point of view. "The competition for an enterprise may come from its suppliers and customers apart from their existing and potential rivals as well as substitute products and services"(Porter, 1999). Competitiveness of an organisation can be related to in house manufacturing Vs outsourcing core competency of an organisation and how effectively it is utilised. Competitiveness can be enhanced in terms of Quality, Price and Time. The ultimate requirement of successful SCM is creative or innovative approach to management. It is desirable for organisations to benchmark one's activities with the best practice in the market and also encourage a culture of innovative thinking.

Supply Chain Management in India – Problems

The main objective of SCM is to fulfill the demand at the right place, at the right time with the right quality at the lowest possible cost. The science of movement of materials, intermediates and final products from the producer to the consumer is called Logistics. Logistics is an integral part of SCM. The critical relationship between supplier (vendor) and company (producer) on the basis of cost, quality, speed and flexibility is given in Table 1.

The main objective of SCM is to fulfill the demand at the right place, at the right time with the right quality at the lowest possible cost.

Table 1: The Critical Relationships

Supplier-Company Relationship	Cost	Quality	Speed	Flexibility
Multiple Suppliers, Single Company	Transaction-based	Company-dictated	Transaction-based	Company-dictated
Multiple Suppliers, Multiple Companies	Transaction-based	Transaction-based	Transaction-based	Transaction-based
Single Suppliers, Multiple Companies	Supplier-dictated	Supplier-dictated	Supplier-dictated	Supplier-dictated

Source: Dubey Rajeev Porter, 1999.

Critical parameters for competitive position could be demand estimation and the maturity life cycle of the product. The supply chain characteristics could be Flexibility, Cost, Quality and Responsiveness.

How Strategy Changes the Chain

- If customisation is the differentiator, suppliers must be chosen for their versatility
- When customer tastes are fast changing, the supply chain has to be fast and flexible

- Firms in mature markets build long supply chains and branding the product only.
- Companies that compete on cost in the market place pick suppliers on the basis of price

How Quality Changes the Chain

- Customers define quality standards that the entire supply chain must meet.
- Suppliers conform to their buyers' Just-in-Time (JIT) and Lean Manufacturing Systems adapt to have greater responsiveness in the chain.
- Manufacturers partner their vendors in determining designs and product specifications.
- Companies pass on the Costs of Poor Quality (COPQ) to their Suppliers (Vendors) instead of taking them on themselves.

How Cost Management Changes the Chain

- Demand forecast tools are being used to micro-tailor orders for suppliers
- Inventories are being decimated as companies source on a need based-system
- Manufacturers set target costs to their suppliers instead of asking for prices
- Companies help their vendors to lower their production costs so as to pay lower prices.

Business leaders have this to say in the context of SCM:

- "It was companies, who used to compare themselves with each other earlier. Today, the competition is much broader—between supply chains. The one with the best supply chain will walk away with the customer, however competent individual pockets in the supply chain are"—Rohit Agarwal, V.P (Strategic Marketing), Herndon, USA
- "The idea is to focus on the tasks that add the real value—so that you can capture the greatest profits—while leaving the rest to your suppliers"—Vijay Krishna, CEO, Godrej-GE
- "If I have to launch a product from scratch every 18 months, and continue modifying it every 3-months, it has to be a collaborative effort"—Adarsh Gupta, Executive Director, Liberty Shoes
- "The cost of every activity in the supply chain has to be lower than the value it adds, otherwise, it is of no use"—K Ramachandran, CEO, Philips India

Major Strategies

Strategic Supply Chain can be considered to comprise of the following key components:

Sourcing Strategy

- Proper specifications—quality of input materials and designs
- Value analysis and bargaining leverage
- Vendor analysis and broad based data bank
- Information system—use for cost benefit
- Segmental and geographical scope for procurement
- Long term agreements and technological coalitions
- Global sourcing

Inventory Strategy

- Service level policy
- Replenishment strategy
- Stock-turnover target

Warehousing Strategy

- Number of stock-holding points
- Location of depots
- Warehousing design/layout
- Material handling methods

Transport Strategy

- Fleet mix
- Lease/Buy decisions
- Customer pick-up/delivery etc.
- Vehicle utilisation targets
- Routing flexibility
- Modes of transportation

Customer Satisfaction Strategy

- Order status policy
- Order processing systems

- Policy for acceptance/claims for defective supplies
- Stock availability vs ordering convenience
- Frequency & reliability of delivery including documentation

Adapted from (Vittal, 1999)

Supply Chain Management in Indian Companies: Challenges

Several parallel forces re-shaping the world of global business are contributing to the shift of the supply chain from a position where it was critical to cost and quality to one where it is becoming one of the most powerful ways for companies to offer greater and differentiated value to customers. In many cases, manufacturing is giving way to assembling on shopfloors since companies no longer find it either economical or quality smart to be vertically integrated. For example, earlier the Mumbai-based Blow Plast Company used to buy lock components and give them to an assembler. Now, it procures entire lock assemblies – tested and certified for quality by its vendor. This was the result of an analysis of transaction – costs vis-a-vis material costs, which revealed the inefficiencies in the system.

Every component and raw material – in some cases, even the design that goes into a product needs increasingly – specialised manufacturing expertise. Larsen & Tourbo for instance, outsources its Computer Aided Design (CAD)/Computer Aided Manufacture (CAM) designs for gas turbines for power stations instead of doing it itself. Hero Motors an automobile motor making company gets its post-engineering moulds and dies from Taiwan, Japan and Europe. Reebok – a sports shoe making company now in India, outsources its entire product range and limits itself to only marketing of the product.

Thus the competitive advantage is shifting from the shopfloor – where the assembling process is becoming a commoditized one – to getting those inputs for the company, or just manufacturing to managing the supply chain for the company. Delhi based Liberty Shoes is able to introduce 1,600 new styles every year. The dummy foot is created by the company in Italy, Korea, Spain or Germany, moulds for soles come from Italy and Germany. The uppers are designed indigenously through internal CAD/CAM facilities even as some specialised designs are also bought from design studios in Europe.

Competitive advantage flows from the ability of a company to perform activities on the industry's value chain – designing, or manufacturing, or servicing for instance – in a way that offers greater value to the customer than those of competitors. In today's typically constructed value chain, about 80 per cent of the value addition is done not by the manufacturer and the marketer, but by those who supply the components and raw material. In the TV industry, for instance, tuners and electronic gadgets undergo such quick changes that all TV manufacturers rely heavily on the suppliers ability to introduce new concepts and components.

In today's value chain, 80 per cent of the value addition is done not by the manufacturer and the marketer, but by those who supply the components and raw material.

The focus must shift from building differentiation into one's own activities to ensure that the players in the supply chain of the company are also building differentiation into theirs. For example, a car maker cannot expect to offer value to its customers from the way it assembles its vehicles. Instead, it must ensure that its suppliers perform their tasks such that the specific component that each manufactures can offer greater value to the customer. So, the aggregation of the unique customer value that a company can extract from the entire supply chain of the company can provide the company with a definitive competitive advantage. For instance, if Maruti Udyog a major car making company in India can give its customers the benefit of improved seating systems with bucket seats, it is because its vendors, Krishna Maruti and Bharat Seats, have been continuously upgrading their products with fresh technology investments.

Strategic supply chain can help troubled companies operating in mature markets where there is high degree of competition. For example, the refrigeration equipment manufacturer Blue-Starwas suffering from an average on-time delivery record of just 33 per cent at its chiller-manufacturing plant at Thane (Maharashtra). The plant was struggling to breakeven due to high inventories. Blue Star asked Price Waterhouse Coopers (PWC) to restructure its supply-chain completely. An initial audit revealed that just 10 per cent of its 449 vendors accounted for 60 per cent of business. But Blue star still had to devote 90 per cent of its supply chain resources to deal with the remaining 400 odd vendors. As a result 85 per cent of time was wasted on non-value adding activities. PWC realized that the company needed a leaner supply chain. It reduced the number of vendors to 142. Simultaneously PWC also introduced a 2-bin- system of Kanban Just-in-Time system on the shopfloor for automatic replenishment of C – class items, such as rubber part, nuts, bolts,

without piling high inventories. This was backed by installation of special software, which has crashed Blue Star's planning time for new jobs from 3 days to 2 hours. The software requisitions supplies from vendors in the right quantity and at the right time. From inability to meet orders, Blue Star has reached a stage where marketing is under increased pressure to sell what the plant can produce. The supply chain management has really helped the company. Efforts are being made in many companies like Tata Steel, major Steel Company, Tata Engineering, (Automobile Company) to reengineer the supply chain to remain competitive in their respective industries.

Conclusion

Global competitiveness today means that the customer is supreme. Only those enterprises are going to be successful, which are able to provide goods and services to the customer in a timely and cost effective manner creating customer delight. Every link in the supply chain can add upto competitive advantage for an organisation. Companies which adapt and implement major strategies in supply chain management will be able to leverage competitive advantage in the market.

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Knowledge is of two kinds. We know a subject ourselves, or we know where we can find information upon it.

– Samuel Johnson

To stay ahead, you must have your next idea waiting in the wings.

– Rosabeth Moss Kanter

Feature

Quality Function Deployment (QFD) in Technical Setting

S.S. Mahapatra

Application of Total Quality Management (TQM) in manufacturing organisations is a way of life these days. However, the implementation level of TQM principles in service sector is not encouraging due to lack of identification of end-customers as in the case of educational establishments. To this end, an attempt has been made in this paper to define the customers in an educational setting and to apply Quality Function Deployment (QFD), an important tool of TQM, for collecting the voice of customers. QFD process enables to translate the voice of customers into system design requirements and provides valuable information that helps policy-makers to assess the existing system and adopt new policies to have competitive edge in the market place. A case study in an educational (Technical) establishment is undertaken to demonstrate the applicability of QFD method.

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In today's competitive environment, quality is the key to an organisation's success and survival. The pragmatic view of assuring quality through controlling the tolerance levels is no more applicable. Rather, the organisations emphasize on changing the mindset of the people from "errors are inevitable" to "doing things right, the first time and every time". In order to compete effectively, organisations must embrace the principles of Total Quality Management (TQM) and incorporate them in all of their activities. TQM may be defined as an organisational approach in delighting customers by meeting their expectations on a continuous basis through everyone involved with the organisation, working on continuous improvement in all products/services/processes along with proper problem solving methodology (Arora, 1998). In short, TQM calls for continuous improvement – a never-ending philosophy of change for the better.

Quality in Service Industry

TQM in manufacturing organisations has become a way of life today. Even the service departments of such organisations are total quality pursuit. However, the level of TQM implementation in service organisations is not encouraging inspite of the fact that the growth rate of buyers of services is increasing as much as the manufactured products. Customers demand quality in manufactured products and services. Services range from medical assistance, specialised education, urban transit through mail-order supplies, fast food restaurant and recreational facilities. Today, service organisations account for almost two-thirds of the private, non-

The level of TQM implementation in service organisations is not encouraging inspite of the fact that growth rate of buyers of services is increasing.

governmental workforce (Feigenbaum, 1991). The late adoption of TQM principles in service sectors may be attributed to difficulties in distinguishing the product and the customer, as in the case of educational settings.

Education establishments, particularly technical institutions, play a vital role in not only educating students on TQM principles but also implementing these concepts for their own survival and improvement. Educational institutions in India must implement the principles of TQM due to the changing student demographics, diminishing government funding, and dramatically increased competition. In the West, educational institutions have already discovered the need for TQM implementation. Results of a recent study reveal that 206 colleges and universities, 74 community colleges, and 135 K-12 school districts in the USA have implemented or are implementing either quality improvement practices in their administrations or quality related courses in their curricula or both (Rubach, 1994). Since educational institutions deal with multiple levels of customers, they must address, in some fashion, the needs and concerns of all customers. The measurement of customer satisfaction is regarded as one of greatest challenges in an educational establishment as it involves (Cloutier & Richards, 1994) the role of students as customers, who may not be capable of judging whether their education is being well imparted and delivered.

With resources becoming limited, efficiency and effectiveness in meeting the needs of customers become crucial factors for existence. Quality Function Deployment (QFD) method can be used to measure customer satisfaction in an educational institution. QFD can be applied in a technical education setting to identify customer needs and enable policies to be formulated to satisfy those needs. By using the QFD method, a complex process becomes manageable, and vital information is obtained from problem development through issue resolution. However, the methodology is quite general and can be used in any service organisation but emphasis is on technical education setting for demonstration purpose only.

By using QFD method, a complex process becomes manageable, and vital information is obtained from problem development through issue resolution.

Review of Literature

TQM results in higher quality, lower cost products and services that respond faster to the needs of customers. In the context of today's business world, the object of customer service is to provide goods or services that meet or exceed customer requirement (Marchese, 1993). Implementation of TQM in education also requires a customer-driven focus. Nevertheless, the basic question lies in the identification of customers in an educational setting. In the new paradigm of education, students are treated as primary customers and a partnership between faculty and students needs to be fostered in a discovery and learning process (Brower, 1994). The goal of the collaborative TQM process is to create an environment that is not just user- friendly but user-seductive, an environment that allows the instructor and students to really become excited about their work. Few researchers are reluctant to define the student as the primary customer. In their view, the goal of each office is to meet or exceed the expectations of its internal customers (Marchese, 1991). Since, the issue on who is the end customer or the primary customer is not resolved yet, it necessitates careful attention for implementing TQM practices in academics.

There is an all-round feeling that education is too process centered and not sufficiently student-centered (Rhodes, 1992). The student-centered view allows treating the students as customers when they are recipients of services like registration, parking, library or food. However, the customer analogy seems to be inappropriate when applied to students as recipient of education. The student becomes the raw material of a specific process of production. In other words, the educational institutions provide the added value between the suppliers of students and the employers of their students (Ewell, 1993). Since students are both customer and product, they are valuable export to employers and community. It is likely that customers of educational institutions, particularly technical education, include students, alumni, employers, the academic disciplinary community, the professional community, and the economic areas and regions served by the technical institutions. Each will have their own definition of satisfaction, and each definition must be known and effectively addressed.

Quality Function Deployment

Quality Function Deployment (QFD) is a quality assurance system that helps to ensure that the voice of customer is clearly heard and followed in the development of a product or service. Normally, customers express their requirements in vague linguistic terms, which are difficult to understand. However, application of QFD eases out the process of translating customer attributes into engineering or quality characteristics. The followings are the three facts of QFD.

- The cross-sectional team in charge of implementing it.
- The process itself and
- The graphical display that guides the process.

Quality Function Deployment (QFD) is a quality assurance system that helps to ensure that the voice of customer is clearly heard and followed in the development of a product or service.

An ideal QFD team consists of representatives from each of the major work groups within the organization. Each member shares special knowledge of the capabilities and requirements of his/her department and possesses a clear sense of what the customer demands. This team's collective understanding enables the members to identify potential production or operating system problems associated with their own functional areas. It is important that QFD team members willingly meet regularly and able to work in a team atmosphere.

The QFD process is a sequence of activities for processing customer attributes so that these attributes can directly shape the design and production of the product/service. The fundamental steps of this process are:

- To identify the customer.
- To identify what the customer wants; and
- To identify how to fulfil what the customers want.

In identifying the customers, the organisation must objectively determine the group or groups that best describe its current desired customer base. After the customer base has been identified, the wants of the customers are determined. These wants are commonly referred to as the "whats" and can be derived using a variety of methods. When collecting these wants, it is critical for the organisation to use the terms, phases, and language of the customer. Therefore, the best way to obtain the whats is through the interview/questionnaire survey. As the whats are plentiful, the QFD team will combine all duplicate terms and group them based on similar characteristics. After consolidating the whats, the QFD team works with customers to determine customer priorities.

Once the whats are established, the QFD team then determines the mechanisms that would satisfy them. These mechanisms are commonly referred to as the "hows". Whereas the whats are expressed in customer terms, the hows are expressed in technical terms. All the hows will not be selected for implementation. The QFD team decides which ones are selected using a technical importance rating based on the number of whats to which each how contributes. With the whats and hows in place, the QFD team then establishes relationships between them. They assign a strength value of none, weak, medium, or strong to each relationship. Furthermore, the team will also assess each how with respect to its interaction with the other hows to determine if there is positive, negative, or no correlation. During the third phase, the QFD team incorporates all this information on a graphical display known as the House of Quality. This house provides a framework that guides the team through the QFD process. It is a matrix that identifies the whats, the hows, the relationship between them, and criteria for deciding which of the hows will provide the greatest customer satisfaction. The peak of the house identifies the inter-relationships between the hows. Sometimes organisations need to carry this process further by using multiple houses of quality. In such case, the hows of the first house become the whats of the second house, and the process repeats itself. When the house of quality is complete, the QFD team can then analyse and use it to achieve a product/service realization that will allow the organisation to enjoy greater customer and employee satisfaction, improved product performance, and enhanced profitability.

Customers wants are referred to as the "whats". Once the whats are established, QFD team determines the mechanisms that would satisfy them. These mechanisms are commonly referred to as the "hows".

Case Study

Technical institutions or educational institutions in general aim at preparing their students to develop the ability to adapt to changing and growing technology, provide the opportunity to exhibit their full potential, and create a sense of innovation in them. In short, education is a process of moulding students as self-reliant individuals. If the institution is viewed as a production process, then raw minds enter it and come out as qualified persons when the students are treated as products. Students are also primary customers of an educational institution, which provides various services to them. Students need to pay a substantial amount in monetary terms to the institution for availing these

facilities. Therefore, the voice of students must be heard by the management of the institution while formulating organisational policies and developing facilities.

The quality of education that the institution imparts, determines the richness of knowledge possessed by their students. The quantum of knowledge acquired by students has direct bearing on their market value. Rapid growth of knowledge workers has compelled institutions to consider the development of necessary infrastructure for imparting quality education. Educational institutions are recognized by the achievements of their students. Since technical educational establishments are mushrooming these days, institutions must impart quality education to have competitive edge over others for their own survival. Recently, government funding to academic institutions has been reduced drastically. Institutions are forced to generate funds from various sources for meeting their expenses towards infrastructure development and recurring expenditure. Institutions can be self-supporting through the development of methodologies for improving the quality of education/research and establishing a brand of their own. Apathetic attitude of administration to meet the requirements of students and faculty gives rise to dissatisfaction and results in failure to achieve the institutional objectives resulting in loss of the credibility of the organisation. Several institutions try to maintain the status quo with the false impression that what they are doing is the best. They rarely accept the continuous improvement aspect of TQM and hardly upgrade themselves to meet the challenges of the changing scenario, resulting in their own downfall.

A case study was undertaken in a reputed technical institution of Eastern India. The institution offers B.E. and M.E. degree courses in nine core engineering branches apart from M.Sc. degree in three science disciplines. The institution is recognised as Centre of excellence by All India Council of Technical Education (AICTE), QIP Centre for few engineering disciplines and most of the B.E. courses have obtained "A" grade by AICTE accreditation committee. Few departments are also engaged in active research, industrial consultancy, and project works offered by Ministry of Human Resources Development (MHRD). This is one of the oldest institutions in the region. The present student and faculty strength are 450 and 180 respectively. There are 300 supporting staff (technical and non-technical) working in this institution. In addition to teaching departments, several service departments like Hall Management, Cultural Association, Athletic Association, Training and Placement Department, Examination Centre, Audio-visual Association, Photography Association etc. exist in the institution. The institution is an autonomous body run by a Board of Governors (BOG). Head of the institution takes care of the day-to-day affairs with the advice of three deans. The authorities now feel that the students and faculties are highly dissatisfied with the prevalent academic activities and facilities. In order to enhance academic standards, the authority intends to understand the voice of customers and completely redesign the existing system in terms of facilities. Therefore, a team of nine members representing major engineering branches, hall management and cultural association was formed under the leadership of Dean, Academic Affairs. The objective of the study, the team had undertaken, was to highlight the following facts:

- Customer Needs and System Design Requirements.
- Specific Problems associated with imparting Quality Education.
- Policies to be formulated to alleviate the identified limitations.

In order to obtain relevant and useful information from the study, the team adopted QFD method since it is frequently used in various decision-making problems due to its versatility (Pitman et. al., 1996, Prasad, 1995, Khoo & Ho, 1996). The following assumptions were made to simplify the task.

- Environment factors such as, cultural activities, sanitary facilities, health-care services, recreational and food facilities were not explicitly considered.
- Factors related to work culture such as, reduction of incidence of supporting staff and higher authorities, harmonious relationship between students and faculties were not explicitly considered.
- Factors contributing to academic activities only were of importance.
- The students were considered as products as well as customers.

A group of seventy students was selected and their needs identified through several brainstorming sessions. The team selected various system design requirements to satisfy these needs.

Customer Needs

Excellent Faculty: In order to impart education effectively, excellent faculties in various specialization areas are required. The faculty must have good communication skills and be role models for motivating the students in pursuit of knowledge.

Computational and Information Technology (IT) Facilities: Reliable computers and necessary software.

Practical Orientation in Teaching: Practical orientation in teaching helps to correlate theory and its practical relevance, making the study more interesting and motivating students to learn more. Teaching from only textbooks limits the knowledge and exposure, ultimately the studies become monotonous.

Practical orientation in teaching helps to correlate theory and its practical relevance.

Modern Teaching Aids: Aids like Over Head Projectors (OHPS), Video films, VCDs, encyclopaedias are useful.

State-of-the art Syllabus (Modern and Technological Advancements): Knowledge upgradation is an important factor in deciding the technical competence of an institution. Incorporation of modern and technological advancement in the course curriculum leads to increased awareness and interest in students.

Modern and Well Equipped Library: In order to help the students to broaden their horizon of knowledge, the library must be equipped with sufficient reference material, sufficient number of new edition of textbooks and journals. Reduction of search time and reduction of lead-time (i.e. time for issuing of books) are the important features of a good library.

Strict Adherence to Schedule: The practice of punctuality and sincerity are equally applicable to both faculty and students. Such practices have tremendous influence on students. In addition, strict adherence to schedule makes activities of the institution proceed in an orderly manner.

Better Job Opportunities: Performance of the institution is evaluated by the job opportunities it can provide. It directly reflects the market value of the institutional produce.

System Design Requirements

Keeping in view the stated needs as customer attributes, the following system design requirements were considered. It must be noted that the list is neither complete nor sufficient since the consideration of system design requirements is purely situation-specific. The following requirements are chosen only to demonstrate the methodology.

Motivated Faculty: The important attributes that motivate the faculty may be work time flexibility, growth opportunities, flexibility in course content, reduction of incidence of authority, reduction of file follow-up, transparency in administration, mutual trust and belief, better health-care facilities, rewards and incentive schemes, recognition and schooling facilities.

Fast Computing, Networking and E-mail Facilities: Educational institution requires facilities in the field of communication such as LAN (Local Area Network), access to Internet, connection of regional libraries by WAN (Wide Area Network), Telephone, E- mail and FAX facilities. For solving complex mathematical models, fast computation facility is essential.

Industry Institute Interaction: In order to provide orientation in teaching, the institute needs to constantly interact with industries and carry out consultancy and project works.

Visual Teaching Aids and Computer Simulation Packages: Aids like OHPS, video, films, prototypes, physical models, simulation models, animated models, study materials and handouts, photocopying facilities, virtual classroom facilities are required to make the learning process faster.

Opportunity for Knowledge Upgradation: Technical magazines, journals, books, interaction with experts from industries and premier institutions, short term courses, conferences and workshops, training in specialized fields are essential for knowledge upgradation.

Library Modernisation: Sufficient, latest and new edition of books and journals, electronic library, library automation, advisory board for monitoring library activities, orderliness, book lending norms, quick access to published database, electronic journal subscription facility and trained personnel are few attributes of a modern library.

Firm Policy on Academic Indiscipline: Discipline is a pre-requisite for learning process. Firm policy on academic indiscipline is essential.

Capability to attract Companies for Campus Interview: It includes better hospitability for the interviewers, emphasis on software training, rigorous practical training, industrial visits, industry based project works, mastery in core subjects, knowledge on state-of-the-art technology, development of managerial and communication skills, concept of team-work, general knowledge and etiquette.

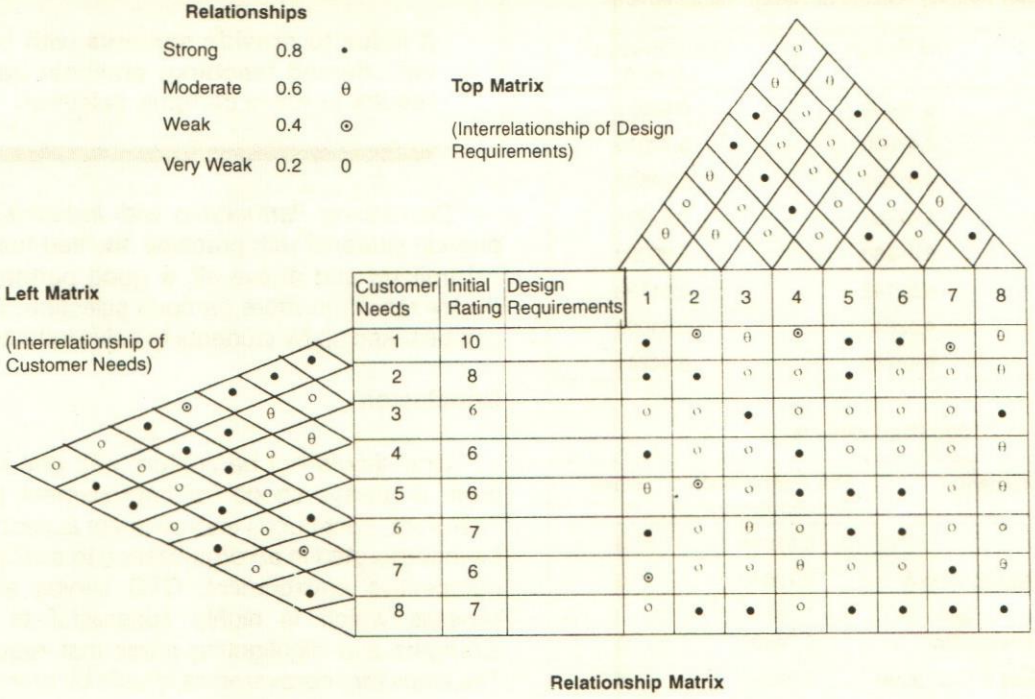

Fig. 1: The House of Quality

A house of quality was formed as shown in Fig. 1. and various entries obtained from the selected group of students through questionnaire survey.

Results & Discussion

Revised customer ratings for the attributes/needs were determined from the left correlation matrix of Fig. 1.

$$\text{Customer Rating}_i = Z_i + \left[\frac{1}{(n-1)}\right] * \sum_{j \neq i}^{n} B_{ij} Z_j$$

where

B_{ij} and Z_j denote the relationship between customer needs i and j

Z_i the initial customer rating

The revised rating for the second customer need was calculated as follows when the initial customer rating is 8.

$$\text{Revised Rating} = 8 + \frac{1}{(8-1)} * [10 * 0.8 + 6 * 0.8 + 7 * 0.8 + 6 * 0.2 + 7 * 0.8] = 12.28572$$

The individual rating of each design requirement was obtained using the following relation.

$$\text{Individual Rating}_i = \sum_{j}^{n} A_{ij} X_j$$

Where A_{ij} and X_j denote the relative importance of the i^{th} characteristic with respect to the j^{th} customer need in the relationship matrix and the importance of the j^{th} customer need perceived by customer i.e. customer rating and n is the number of customer needs.

Individual Rating of design requirement$_1$ =

$$13.80000 * 0.8 + 12.28572 * 0.8 + 9.82857 * 0.2 + 9.60000 * 0.8 + 9.94286 * 0.6 + 11.14286 * 0.8 + 9.08571 * 0.4 + 10.62857 * 0.2$$

$$= 6.39429$$

Then revised rating for each design requirement was calculated as for customer needs using Equation 1. The final ratings of design requirements were normalized by dividing each rating with the maximum available rating. The final ratings are tabulated in Table 1. Using the normalized ratings, the design requirements were prioritized as per their importance of design requirements. These are shown in Table. 2.

In accordance with the above results, the factors to be considered while formulating organization-wide policies are listed in the following in consultation with the management.

Table. 1: Normalized Refined Ratings of Design Requirements

The Customer	The Design	The Normalized Rating
13.80000	6.39429	0.93051
12.28572	4.47000	0.72010
9.82857	4.93929	0.74503
9.60000	4.42286	0.59391
9.94286	6.49286	1.00000
11.14286	5.57143	0.81792
9.08571	4.32643	0.64000
10.62857	6.42786	0.94741

Table. 2: Ranking of Design Requirements

The Design Requirements	The Normalised Refined Ratings	Ranks
Motivated faculty	0.93051	3
Fast Computing, Networking & E-Mail Positives	0.72010	6
Industry Institute Interaction	0.74503	5
Visual Teaching Aids & Computer Simulation Packages	0.59391	8
Opportunity for Knowledge Upgradation	1.00000	1
Library Modernisation	0.81792	4
Firm Policy on Academic Indiscipline	0.64000	7
Capability to Attract Companies for Campus Interviews	0.94741	2

Enhancing Knowledge: It includes upgradation of knowledge, state-of-art technology, development of general knowledge, exposing students to the facilities available all around and intensifying their urge to know more.

Delighting Guests: Proper treatment to guests, particularly, the interviewers has a great impact on them and helps in enhancing campus selection statistics.

All Round Development: Cultural activities, sports events, technical seminars etc. create versatility and help in all-round development of individual. These may help to develop communication skills, presentation skills, sporting ability etc. of students.

Faculty Promotions: Promotions and recognition to deserving faculty motivates to strive for excellence. Therefore, promotion policies need to be reviewed.

Recommendations of the Library Advisory Board: Many changes, already listed, are required for proper functioning of a library and hence a library advisory board is necessary.

It helps to provide students with practical oriented teaching; practical training results in more campus selection.

Developing Partnership with Industries: It helps to provide students with practical oriented teaching, practical training and above all, a good partnership with industry results in more campus selection. Even projects can be taken up by students to solve industrial problems.

Conclusion

One should not be content with one time study, as there is always scope for improvement in any setup. Therefore, continuous improvement aspect of TQM must be incorporated in an organization to succeed in today's competitive environment. QFD serves as a powerful process which is highly successful in eliciting the strengths and highlighting areas that require attention. The steps for improvements should be practised for overall improvement of the education (technical) setting. The method adopted here is quite general and not limited to educational setting only. It can be applied to any service sector if the customer needs and system design requirements are identified properly.

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Feature

Business-Social Partnership

Sunita Singh-Sengupta

The study is aimed at examining the business-social partnership in organisations. The idea was to understand how to interconnect organisations with the larger community. The study was conducted in two large organisations in the eastern part of India. Seventy-eight managers from senior, middle and junior levels participated in the study. The overall findings indicate that the respondents believed in maximizing benefits as well as contributing to the development of the society.

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Companies making investments in the social and physical environment today will be leaders in their business tomorrow. Organisations in pursuit of social responsibility should redesign in order to discharge corporate obligation to the social and economic wellbeing of the community. Every community has a special continuing responsibility towards the people of the area in which it is located. The company should spare its engineers, doctors, and managers, advise the people of the villages and supervise new development undertaken as a cooperative effort by the company.

Community Development & Corporates

The corporate sector's approach to community development generally does not seem to be a thought-out-strategy but a haphazard effort to get maximum mileage with the investing public. Therefore, most companies were content with donating money, something that didn't need too much involvement. For them anything that entailed continuous involvement and responsibility was tedious (Meera Sheth, 1998). Business is a socio-cultural activity which impacts upon the lives of many more people than those who actually work in, or directly benefit from the profits and share dividends of the company. Then business needs to undefine the way in which a company sees itself, away from a rigid adherence to a narrowly focussed 'single' bottom line, with companies seeing themselves as responsible only to their shareholders, towards a more socially, ethically and environmentally aware definition of themselves as a company 'doing business in the public eye'.

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Doing culture by doing business in public is, therefore, a powerful catalyst for establishing a sustainable society, where everyone is recognized as legitimate stakeholders able to comment openly. Such openness is therefore, a public conversation that takes places as a part of a public culture, and this lies at the heart of corporate citizenship, because it is participation in this public conversation which defines public culture as expressive citizenship (Birch, 2000).

Business is emerging as the dominant institution in society. Many companies realize that with their elevated status as the dominant social institution, comes elevated responsibility. Beyond the philosophical reasons, a sustainable community outreach programme makes good business sense (Les, 1999). There is a dire need to address the issues related to corporate social performance. However, there is no common set of measures for assessing corporate social impacts (Davenport, 2000). One of the alternatives is linking strategy with ethics.

Linking strategy with ethics

Every strategic action a company takes should be ethical because every business has an ethical duty to each of the five constituencies: Shareholders, employees, customers, suppliers, and the community at large. Each of these constituencies affects the organisation and is affected by it. A company's duty to employees arises out of respect for the worth and dignity of individuals who devote their energies to the business and who depend on the business for their economic wellbeing. At best the chosen strategy should promote employee's interests as concerns wage and salary levels, career opportunities, job security, and overall working conditions. Duty to customer arises out of expectations that attend the purchase of a good or service. Should a seller inform consumers fully about the contents of its products, especially if it contains ingredients that, though officially approved for use, are suspected of having potentially harmful effects? A company's ethical duty to its suppliers arises out of the market relationship that exists between them. They are partners in the sense that the quality of suppliers' parts affects the quality of a firm's own product. They are adversaries in the sense that the supplier wants the highest price and profit it can get while the buyer wants a cheaper price, better quality, and speedier service. A company confronts several ethical issues in its supplier relationships. Duty to the community at large stems from its status as the citizen of the community and as an institution of society. The community and public interest should be accorded the same recognition and attention as the other four constituencies. Whether a company is a good community citizen is ultimately demonstrated by the way it supports community activities, encourages employees to participate in community activities, handles the health and safety aspects of its operations, accepts responsibility for overcoming environmental pollution, relates to regulatory bodies and employee unions, and exhibits high ethical standards (Thompson & Strickland, 1995).

As a June 1999 report from The Financial Times entitled "Responsible Business in the Global Economy" made clear, business (both big and small) worldwide is 'increasingly recognizing the need to professionalize the way in which it invests in the wider community as both a contribution to increased social cohesion and to a stimulation of their own business development'. This can be done, the report suggests, by business:

Responsible Business worldwide is 'increasingly recognizing the need to professionalize the way in which it invests in the wider community as both a contribution to increased social cohesion and to a stimulation of their own business development'.

- Moving from one-off cash donations to community organisations and activities to more innovative and leveraged funding mechanisms,
- Giving in-kind support, particularly mobilizing the core competencies of the company,
- Moving from one-way philanthropy to mutually beneficial relationships,
- Changing focus from a charity based handout approach (except perhaps in emergencies) to longer term community partnerships,
- Moving from a reactive funder to an active problem-solver.

At the heart of this, and other similar moves away from philanthropy as the main driver in corporate citizenship or corporate social responsibility discourses, is the increasing importance of the concept of partnership (Birch, 2000).

For most companies, monetary donation is the most common means of corporate involvement because social development is not the core competence of a company. A company cannot, therefore, take the role of governmental agencies, but it certainly can supplement the efforts made by the governmental as well as non-governmental organisations. If a company wants

to avail the advantages of being socially responsible it seems to have two choices – either hire social development professionals or partner an NGO. The latter option is less explored but has many advantages, once a good partner is found (Venkateswaran, 1998). The advantages of partnership mode is that NGOs provide an entry into the community as social work is their forte. However, there are certain disadvantages which the companies should guard against, some of the most obvious disadvantages being different perceptions on what needs to be done for a community/area and less control on how money is spent.

This gives room for the first option – the do – it – yourself mode. The advantages of this option are that it ensures that development work is in tune with company objectives. It also enables to have better control over the utilization of money. But most companies lack skills in social work and have the impression that communities keep expecting more. Therefore, they have restricted themselves to managing their corporate social responsibility through donations. However, money cannot substitute for the managerial, technical and marketing skills that companies have. Further, such companies are unlikely to reap the benefits of developing a more in-depth relationship with their local communities that may be of strategic and long term importance to their business (Mehta, 1998).

Local cultures affect how consumers expect companies to behave as does the response and type of product that a company will sell in a given country. A very good example is Tata Iron and Steel Rural Development Society in India (TSRDS) established by Tata in the late 1970s. It functions as an NGO, whose purpose is to focus on education and literacy, health and medical activities; agriculture and irrigation, drinking water, vocational training etc. Another example is KGVK (Krishi Gram Vikas Kendra) by Usha Martin. KGVK did not confine to a small area which was close to the factory premises of Usha Martin. As a result it was able to survive on its own, creating a separate identity independent of the corporate identity, not relying excessively on its corporate parent for funds. A human base for the consideration of problems was encouraged, so that those involved with the project moved beyond input-output ratios and cost-benefit analyses as a justification for actions. By being removed from the corporate influence, it was possible to shift the non-profit motive from the profit motive.

The ethical aspect of social responsibility has also been put forward in some codes of ethics by business associations in some countries. For example, in the Philippines, increasing interest in social responsibility among employers and managers was witnessed in the participation of more than 900 chief executives of business in workshops organised by the Bishops Businessmen's Conference for Human Development (BBC) which resulted in a code of ethics for business known as the ABC code of ethics. A survey conducted among over 4000 businesses in the Philippines found that around 70 per cent of those who replied had adopted some form of code of ethics. In Thailand the Buddhist tradition of "sharing happiness and sorrows" with others creates a form of social responsibility among people. Thus, a growing number of business leaders view corporate social investment as an attempt to find a new way to arrange the economic order and improve the benefits of economic growth (Hopkins, 1999).

Business is being redefined as a socially accountable community. Auditing of the business' environmental, ethical, social and profitability bottom lines will enable the business, and its shareholders (if applicable) and all of its stakeholders, direct and indirect, to make a difference to the society overall. This is the acceptable face of sustainable capitalism. To do that requires the business to be very clear about its own intentions towards its various stakeholder groups and that means setting and living to, accountable standards internally (Birch, 2000).

At this point two things become important – Corporate Social Performance and Business-Social Partnership. This study examines the two in the context of Indian organisations. Corporate Social Performance is considered in this paper in terms of what Wood defines as, "... A business organisation's configuration of principles of social responsibility, processes of social responsiveness and policies, programmes and observable outcomes as they related to the firm's societal relationship" (1991, p.693).

Methodology

A structured schedule was used to ascertain responses related to above-mentioned parameters. Three broad categories of variables were taken into account.

Individual Level Factors

Attitude towards business ethics questionnaire: Whether the manager acts ethically or unethically is the result of a complex interaction between individual characteristics, structural variables and the organisation's culture. The scale developed by Arie Reichel and Yoram Neumann (1988) was adopted in the present study. The scale had 18 items. The responses were obtained on a 5-point scale where Strongly Agree means 5, Agree means 4, Neither Agree Nor Disagree means 3, Dis-

agree means 2 and Strongly Disagree means 1. The scores ranged from 1-5 on each item. The reliability of the scale was .75.

Organisation Level Factors

Measures of social responsibility: Social responsibility of the organisations was examined in two parts. In part-I attempt was made to have a general understanding of the organisation's activities towards connecting itself with the larger community. Part II dealt with the specific activities related to the organisation's responsiveness towards the community.

Strategy and ethics questionnaire: It was measured in three different contexts:

- In terms of organisational values/credos
- Organisational policies with respect to shareholders, customers, employees, suppliers and community. The views on all the five dimensions were collected with the help of open-ended items. The items were framed to ascertain the views of the respondents with respect to organisation's objective and its relationship.
- A four-item scale was used to examine organisational citizenship behaviour. The items pertained to stakeholder satisfaction and involvement, perception of legal atmosphere at the workplace and responsible decision making.

Background Information: Items related to respondent's age, educational qualification, level in the organisation, size of the organisation, etc. were sought to understand their demographic profile. A total number of 78 respondents participated in the study. Out of these 59 per cent were working in small sized organisations and rest (41 per cent) in large sized ones. The respondents were from varied age groups – 30.8 per cent between 25-30 years, 29.5 per cent between 31-39 years, 30.8 per cent between 40-49 years, 6.4 per cent between 50-59 years and 2.6 per cent above 60 years. The educational qualification of the respondents was between graduation and post-graduation. About 50 per cent of the respondents reported business as the main disciplinary background of their education whereas 41 per cent reported it to be applied science. A marginal percentage of respondents (9%) were found to have social science as their educational discipline. The samples constituted senior (39.7%), middle (48.7%) and junior (11.5%) level managers who mostly spent their lives in Eastern India. Out of these respondents 55.1 per cent spent their childhood in joint family, 41.0 per cent in nuclear family, 2.6 per cent in hostels and 1.3 per cent in hostels as well as in nuclear family.

The study was conducted in the eastern part of India in two family owned business houses. Organisation-1 constituted of small companies related to mainly finance and construction works. The company believes in simplicity and fair practices. Ethical practices are emphasised and practiced which makes the employees perceive a sense of fairness and equity. Organisation - 2 was started in 1960 alongwith a Scotish company. Today it is no. 1 in the country and number 5 in the world. Its two important products are wire and wire ropes 70 per cent of which is being exported. It has its international offices in USA, UK, Thailand and Denmark. The company is well known for its social activities. Krishi Gramin Vikas Kendra (KGVK) in Ranchi is one of the examples started by the company on an experimental nature in the sixties. The company believed that community and corporate development would have to go hand in hand because of the considerable poverty that existed in the vicinity of the factory. On the other hand, those who worked within the company had jobs and enjoyed a relatively improved standard of living while the majority did not have jobs and barely survived. Somewhere down the line, there was a mistaken feeling that this disparity was growing and the company was the culprit. That was the background in which the company began to take up the issue of community development actively. The company believed in creating a mood to think ahead and create a climate for developed India.

Community and corporate development would have to go hand in hand.

The Vice-Presidents of both the companies were sent a formal request letter seeking their permission to conduct the study in their respective companies. The data were collected from June 1999 - December 1999. The investigator invested sufficient time in interviewing and observing the people. Apart from using the schedule, informal interviews were conducted in order to have a better understanding of the related issues.

Results

The focus of the study was not to examine the organizational differences, therefore, the analyses were done on the total sample.

Individual Level Factors

Attitude towards business ethics: The scale had 18

items, which were factor analyzed. The factors above .50 were taken into account. The descriptive statistics were computed on the factor scores and entered in Table 1.

The mean scores reported in Table 1 suggest that the respondents' attitude towards business ethics seemed to be meeting the social responsibility as well as maximizing benefits. The former was given priority over the latter. Ethics as such was found not to be given much importance as the respondents believed in business making money and therefore there is no place for ethics because business needs economic attitudes. However the respondents seemed to emphasize the moral dimension of ethics on doing business in a good way.

Table 1: Mean and SD of Factors Related to Attitude Towards Business Ethics

Factors	Mean Scores	SD Scores
Maximising Benefits	11.24	4.12
Business is Making Money	9.67	2.93
Social Responsibility	11.73	2.45
Do Your Work Well	6.33	0.68
No Place for Ethics	8.58	1.41
Business needs Economic Attitude	7.26	1.50

Note: N = 78.

Organization Level Factors

Social Responsibility Measures

Part I: General Understanding

- How do you connect yourself to the larger community?

The examination on the issue started with an open-ended item stating how do you connect yourself with the larger community. The obtained responses were content analyzed and the procured percentage of responses showed that 36.58 per cent of the respondents stated it to be through social activities. A small number of respondents (9.75%) expressed it specifically to be through NGOs. Rest seemed to have very generalised perceptions, like being a part of the community.

- Do you have any clear-cut stated policy on social development?

60.3 per cent of the respondents agreed that their organisations do not have any clear-cut policy on social development against 39.7 per cent who thought other way.

- What do you consider your social responsibility to be
  - Towards employees
  - Towards developing community
  - Both

The findings disclosed that 35.9 per cent of the respondents considered it to be towards employees, 29.5 per cent viewed it to be towards developing community and 37.6 per cent of the respondents perceived the social responsibility of their organisation to be towards both.

- Do you adopt any village or community in order to develop?

55.1 per cent of the respondents said no whereas 44.9 per cent of them accepted it. The difference in the finding is because of two different types of organisations.

- What do you do to uplift the less privileged section of the society?

This was an open-ended item. The content analysis of the obtained responses indicated that 31.70 per cent of the respondents were of view by providing help in terms of house loan, health facilities, literacy etc. 17.07 per cent said by providing counselling and vocational training. Only 2.43 per cent of the respondents reported appointing NGO or creating committee to look after it. The findings, hence, indicated that business social partnership is still not focussed.

- Do you feel that giving donation to community for its development enhances the image of the company in the eyes of peers and of investing public?

53.8 per cent of the respondents responded in an affirmative fashion whereas 46.2 per cent replied in a negative tone.

- When you invest in social development, do you look at what is in it for you tomorrow or in the long term?

25.6 per cent of the respondents reported it to be generally the case, 29.5 per cent were of the opinion that it seemed to be true sometimes. The two together accounts 55.5 per cent of respondents' views. The reported mean score is 3.42 on a 5-point scale which again provides support to the fact that to some extent the statement stands true.

- The company gives donation basically for image building and tax benefits?

The reported mean score ($X = 3.01$) suggested that companies do not necessarily give donation for image

building and tax benefits. 30.8 per cent of respondents strongly denied the fact against 25.6 per cent of respondents who favoured it.

- Responses were obtained on arrangements between business-social partnership. The majority of respondents (63.41%) did not respond to it. This clearly shows the absence of such an arrangement. 17.07 per cent of the respondents expressed the view by being connected with NGO and similar number of respondents (17.07%) stated by providing help directly through the company.

Part 2: Specific Activities

The organisation's responsiveness towards community were examined with specific references to purposes, motive, strategy, staff, structure, initiative, contribution, drivers and sustainability. The valid percent of responses along with the mean and SD scores on each dimension are in Table 2.

Table 2: Responses on Organisational's Responsiveness Towards Community

Variables	Numerical Value	Valid Percentage of Responses
Purpose		
Philanthropy	1	0.0
Strategic philanthropy	2	23.1
Community investment	3	6.4
Healthy business environment	4	70.5
Mean Score 3.47		
SD Score = 0.85		
Motive		
Morality	1	53.8
Long-term self interest	2	41.0
Long-term direct self interest	3	5.1
Direct self interest	4	0.0
Mean Score = 1.51		
SD Score = 0.60		
Strategy		
Adhoc	1	20.5
Systematic	2	51.3
Strategic	3	28.2
Organisational ownership	4	0.0
Mean Score = 2.08		
SD Score = 1.29		
Structure		
Detached from business activity	1	28.2
Detached but linked in business interests	2	12.8
Part of line structure	3	5.1
Integrated with business functions	4	53.8
Mean Score = 2.85		
SD Score = 1.34		
Initiative		
Passive	1	7.7
Responsive to requests in target areas	2	25.6
Initiating	3	39.7
Integrated into daily decision making	4	26.9
Mean Score = 2.86		
SD Score = 0.91		
Contribution		
Mainly cash or goods	1	10.3
Cash and donations, skills and cash	2	24.4
Business resources	3	37.2
Imbedded in profit and growth goals	4	28.2
Mean Score = 2.83		
SD Score = 0.96		
Drivers		
Chairman's whim	1	20.5
Guidelines in place	2	33.3
Business-linked guidelines in place	3	10.3
Part of business strategy	4	35.9
Mean Score = 2.61		
SD Score = 1.17		
Sustainability		
One off	1	2.6
Assistance on specific issues	2	14.1
Nurturing NGOs and building their capacity	3	15.4
Ongoing part of business management, goals and appraisals	4	67.9
Mean Score = 3.49		
SD Score = 0.83		

Note: N = 78

Table 2 indicated that 70.5 per cent of the respondents reported healthy business environment as the main purpose of social responsibility. The motive behind such social activities was highlighted to be morality (by 53.8 per cent of respondents) and long- term self-interest (by 41 per cent of respondents). About 51.3 per cent reported the strategy behind meeting such social responsibilities to be systematic. 51.3 per cent reported all levels of management to be involved in it and thus the structure of such activities seemed to be integrated with business functions as highlighted by 53.8 per cent of the respondents. Meeting social responsibilities by the organisations seemed to be based on initiating (39.7%) and integrated into daily decision making (26.9%). A good number of respondents (25.6%) explained initiative to be in the form of response to requests in target areas. On the dimension of contribution made by the organisation for social development activities, no clear-cut trend emerged. It seemed a mixture

of different kinds of contribution. 24.4 per cent of respondents reported it to be in terms of cash and donations, skill and cash; 37.2 per cent explained the contribution to be in terms of business resources, and 28.2 per cent suggested it to be imbedded in profit and growth goals. An interesting finding emerged with respect to the drivers behind such social activities. Some said it to be chairman's whim (20.5 per cent of respondents), some perceived it to be a part of business strategy and for some (33.3%) it seemed to be the guidelines in place. Finally, they were asked to judge the sustainability of such social activities. 67.9 per cent reported it to be ongoing part of business management, goals and appraisals. It definitely seemed not to be one off as it was highlighted by only 2.6 per cent of the respondents. The point to be focussed on is poor attention (15.4%) on business-social partnership for sustainable social-responsibilities.

Strategy & Ethics

Organisational Value/Credos. This was an open-ended item. The obtained responses were factor analysed and the percentage of response along with its categories are presented in Table 3.

Table 3: Responses Indicating Organisational Values/Credos

Organisational Values	Percentage of Responses
Fair practices	34.61
Social responsibility, humane approach and ethical practices	11.54
Customer satisfaction, employee satisfaction and quality of work	30.77
Team work and hard working behaviour	15.38
Benefit maximisation	3.85
To be a global force	3.85

Note: N = 78.

Table 3 indicated credos of the organisation to be fair practices and the company seemed to value customer satisfaction, employee satisfaction and quality of work. The respondents reported the organisational value to be teamwork and hard working behaviour with a sense of social responsibility, humane approach and ethical practices. Surprisingly, benefit maximization and to be a global force seemed to have low priority.

Organisational policy and stakeholders. As mentioned the views of the respondents were obtained regarding the organisation's objective and relationship with respect to customers, shareholders, employees, suppliers and community at large. The procured responses were content analysed and are presented in Table 4 along with percentages.

Customers. The findings indicated that the organisation's objective with respect to customer seemed to be to satisfy by providing quality product at reasonable price (43.90%)and good value and satisfactory services (24.39%). Relationship with customers was reported to be co-operative, cordial, transparent (31.70%), friendly (29.26%) and professional (26.82%).

Shareholders. Good return was found to be the organisation's objective with respect to shareholders. Quite a good number of respondents (26.82%) did not write anything, which indicates that such things are not clear in the organisations. Similarly 31.70 per cent of respondents did not give their view with respect to organisation's relationship with shareholders, which again reflects the absence of a mechanism which makes things explicit to the people. It should be noted that the respondents were mostly senior and middle level managers. However, the obtained results indicated the relationship to be cordial, trustworthy, transparent (29.26%) and professional (24.39%). Only 14.63 per cent perceived the relationship to be as a member of the organisation.

Employees. The objective of the organisation seemed to be to motivate the employees to achieve the organisational goals for which they are rewarded (29.76%) so that they (employees) can give maximum output to the organisation (14.63%). Interestingly, the organisation's policy seemed to be very poor regarding, satisfying employee's need and solving problems (9.75%), treating them as important part of the company (7.31%) and providing opportunity for their personal development (2.82%). Surprisingly, they perceived the relationship to be cordial and cooperative (31.70%)and friendly (17.07%) with some amount of family feeling (19.51%). The relationship was not reported to be professional (as 4.87 per cent only found it to be professional).

Suppliers. The findings hinted that the objective of the organisation with its suppliers was getting quality product at reasonable price on time (46.34%) and promoting mutual benefits (21.95%). The relationship (as perceived by the respondents) was reported to be cordial and friendly (46.33%) but professional (29.26%).

Communities. Finally, the respondents were asked to express their views regarding the policy of the organisation with respect to community at large. It should be noted that the selection of the sample was done in such a way so that organisations doing social activities and practicing ethics constitute the sample. Even then 26.82 per cent of the respondents could not write any-

Table 4: Organisational Policy & Stakeholders

Dimension	Objective	% of Responses	Relationship	% of Responses
Customers	Satisfy by providing quality product at reasonable price	43.90	Friendly	29.26
	Satisfy by giving high priority	21.95	Co-operative, cordial and transparent	31.70
	Make new customers through old ones and retaining the customers	4.87	Professional	26.82
	Good value and satisfactory service	24.39	No Response	7.31
	No response	4.87	As family member	4.87
Shareholders	Good return	46.34	Professional	
	Assurance about profitability	17.07	As a member of the organisation	14.63
	No Response	26.82	Cordial, trustworthy and transparent	29.26
	Express real picture of the company	9.75	No Response	31.70
Employees	Maximum output	14.63	Cordial and co-operative	31.70
	Motivate to achieve goals and reward it	29.26	Family feeling	19.51
	Satisfy by fulfilling needs and solving problems	9.75	Friendly	17.07
	No response	12.19	Professional	4.87
	Treat as important part of the company	7.31	Give importance	12.19
	Provide opportunity for their personal development	2.82		
Suppliers	Mutual benefits	21.95	Team mate	9.75
	Quality product of reasonable price on time	46.34	Cordial and friendly	46.33
	Treat as an integral part of the company	4.87	Professional	29.26
	Timely payment	12.19	No Response	14.6
	No Response	14.63		
Communities	Social welfare	24.39	Family Member-Neighbourly	9.75
	Provide help to target groups who are in need	36.58	Co-operative and cordial	19.1
	Sensitive to the needs of the community like good citizen	7.31	Friendly	19.51
	No Response	26.82	Well-wisher	17.07
	Including community welfare in the objectives of the community	4.87	No Response	34.14

Note: N = 78.

thing, which suggests that such activities were not focussed. 36.58 per cent of the respondents were of view that the organisation provided help to those who needed it and approached the organisation. This again indicated the absence of a clear-cut social policy and prevalence of one-off policy in the organisation. Only 24.39 reported organisation's objective to the community as doing some amount of social welfare. Expectedly, 34.14 per cent of the respondents provided no response on the issue of organisation's relationship with the community at large. However, the trend of the findings (as reported in Table 4) showed the relationship of the organisation with the larger community to be cordial (19.1%), friendly (19.51%) and that of a well-wisher (17.07%).

Organisational citizenship behaviour. A four-item scale was used to examine it. The items pertained to stakeholder satisfaction and involvement, perception of legal atmosphere at the workplace and responsible decision making.

Stakeholder satisfaction and Involvement. All items on a 5-point scale were used to measure it. The obtained mean score (3.96) suggested it to be to some extent. The valid percentage of the frequency distribution on different anchor points indicated that 37.2 per cent of the respondents reported the stakeholder satisfaction and involvement to be to great extent, however, 29.5 per cent of them seemed to be of view that it is to some extent. A good number of respondents (25.6%) were found not to say anything related to it and 7.7 per cent felt it to be little extent.

Legal atmosphere at the workplace. Two items measured the perception of respondents about the

prevalence of legal atmosphere at the workplace. The responses were obtained on a 5- point scale on:

- The extent the workplace constitution protects the rights of organisational citizens
- The employees of this organisation are more concerned for their rights than their responsibilities.

The findings indicated that 60.3 per cent of the respondents perceived that the workplace constitution seemed to protect the right of the organisational citizens to some extent. The obtained mean score was 3.88, which substantiates it. The responses obtained on the second item denied the assumption that the employees are more concerned for their rights than their responsibilities. The obtained mean score was 2.24. Further, 48.7 per cent of the respondents reported it to be false against 21.8 per cent who hold it to be true. 25.6 per cent of the respondents said it to be quite false against 1.3 per cent of them reporting it to be quite true.

Responsible decision making. It was measured with the help of a simple item, which the respondents had to judge on a 5-point scale. 52.6 per cent of the respondents reported that sometimes the credo of organisation helps in taking practical decisions against 38.5 per cent who were of the opinion that seems to be generally. The obtained mean score ($x = 4.27$) suggests it to be towards the upper end which provides support to the finding.

Discussion

The present research was conducted to examine the business-social partnership in the organisations in order to perform its social responsibility. This incorporates organisational responsibilities and duties towards its stakeholders and the larger community.

The findings indicated that the benefits of high-integrity and high-responsibility organisation are well established conscience mechanisms which emphasize on fair practices which is manifested in responsible decision making and perception of a legal atmosphere at workplace. Transparency in the organisation can be perceived when it has fair practices and high standards of business ethics, which is manifested in its day-to-day dealings. However, the results disclosed the absence of such attitude towards business ethics. Consequently poor conscience mechanisms secured to prevail. Auditing of the business, environmental, ethical, social and profitability bottom lines will enable the business to make a difference to the continuous improvement to society overall (Birch; 2000). To do this the organisation should be clear about its own intentions towards various stakeholders and society at large. The findings indicated that in the sampled organisations, the company's mission statement was satisfaction and success through values based practices and quality work for which they seemed to believe in fair practices as guiding principles and therefore the credos of the organisation was reported to be fair practices along with stakeholder satisfaction. But reality indicated (based on results) that stakeholder satisfaction and involvement was only up to some extent. Further, the responsible decision making seemed not to be integrated into managerial/decision making practices. There is need for sustaining organisations as communities which is both transparent and learning for maintaining sustainable competitive advantage.

Auditing of the business, environmental, ethical, social and profitability bottom lines will enable the business to make a difference to the continuous improvement to society overall

The results hinted at poor business-social partnership. However, the organisation's responsiveness towards community was perceived to be aimed at healthy business environment with a motive of morality and long-term self-interest. The company's initiative seemed to be based on the request of the target. Sustainability was reported to be an ongoing part of business goals. But still in the absence of clear-cut policy on social development, the companies seemed to have poor business-social partnership.

In every organisation two types of cultures prevail: Professional culture, and Community culture. The strength of a company including both its creativity and organisational flexibility depends consequently both on the professional and social competence of its employees. The quality of a company's community culture appears to have a decisive influence on its professional creativity. Cultural knowledge also links the company and its professional culture with the rest of the world – local, national, international. The cultural foundations of professional competence make the employees aware of the variety of relationships which a company shares with its environment. Consequently, it also makes the company more aware of its moral responsibilities towards nature and community at large. The basis of strong business can no longer be profit (or maximum profit) but serving the community.

Kanter (1999) argues persuasively for the value of such business/community partnerships and suggests six main characteristics of successful private/public partnerships: a clear business agenda, strong partners committed to change, investment by both parties, rootedness in the user community, links to other community organisations and a long term commitment to sustain and replicate the results. The best way to ensure full commitment is to have both partners put their resources on the line.

Implications

The study helped in analysing organisational practices for doing business in a better way. To realize it we need to have a feeling of responsiveness towards the society. This requires an active development of partnerships between government, business and society which is likely to contribute to the welfare of the society without losing profitability. New paradigms of partnership need to be developed and favoured which will be a shift from corporate philanthropy (For example, TISCO, Godrej etc.). The new partnership, between government, business and society, need to be based on the social commitment of the organisation. This will require a serious sustainable and cultural change within the corporate world which needs to be understood by government and community: "Business is not separate from society ...companies are not only engines of economic growth but also pivotal agents of social and political integration" (Fomburn, 1998, p. 28).

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Productivity is being able to do things that you were never able to do before.

— Jim Manzi

Feature

Corporate Performance During 1990s

P. Rameshan

The present paper attempts to evaluate the performance of the corporate sector and selected sub-sectors during 1992-93 to 1989-99 based mainly on CMIE data. The evaluation has been done across the domestic private, public and foreign segments of the corporate sector. The selected sub-sectors for which the analysis has been carried out are petroleum, food products, automobiles, electronics and electric machinery. The results show, among other things, a declining long-term trend in the profitability of private and foreign sectors and a general declining trend in the capital market dependence of all segments of corporate sector analysed here. A surprising result is the rising long-term trend in the profitability of public sector corporations.

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The 1990s have seen unprecedented changes in the industrial/business environment of India (see Handbook of Industrial Statistics 1991 for details of policy changes in 1991 and Economic Survey 1992-93 to 1999-2000 for details of subsequent policy changes). Such changes included, among other things, the following. Several important sectors kept earlier under licensing were delicensed. Almost the entire economy was substantially de-regulated. Several key and infrastructure sectors that were earlier under public monopolies were demonopolised. Several major healthy public enterprises were partially privatised. Rates of almost all categories of tax were significantly reduced. Customs duties were substantially reduced and rationalised. Domestic capital market access was liberalised. Indian borders were opened up for foreign access to Indian capital and product markets and Indian access to foreign capital and product markets. Provisions for foreign collaboration and technology acquisition were greatly liberalised. And, a market-based foreign exchange access was provided to the business sector for business purposes especially under the current account. As a result of these changes, several benefits were expected to occur to the Indian businessmen such as greater competitiveness, both domestically and internationally; faster growth of output and revenue; improved profitability; reduced tax burden; increased exports; increased inflow of foreign capital equipment and inputs that will improve the production efficiency and productivity of Indian enterprises; increased competition, which may also lead to increased selling costs; improved cost efficiency; increased market borrowing, probably at lower interest burden due to the reduced interest rates due to market forces unleashed in the financial markets and the accessibility to foreign capital markets; and increased opportunities to use capital market for project financing due to the expansion of capital and stock markets and due to the simplified financial market procedures. We may be able to identify several other advantages too.

Reform Expectations & Corporate Performance

How far we have the reform expectations about the

Indian business sector been realised over the years after 1991? At aggregate level, the important objective of achieving a stable high industrial growth over the years during 1990s has not been fully realised. While 3-4 initial years saw some good performance of Indian industry, Indian business witnessed considerable slowdown during the 2-3 years since 1996-97. A number of business publications and journals in recent past have analysed the various aspects of such slowdown [e.g., see Rameshan & Srinivasan, 1999]. For recapitulation, Table 1 and 2 provide some evidence on the unstable nature of the industrial growth in India. Table 1 gives a comparative picture over years since 1951-52. It may be surprising to note that the best growth range the Indian industry could ever experience during a five-year period since 1951-52 belonged to the second half of 1980s and not to the 1990s. As Table 2 reveals, industrial growth during 1998-99 was as low as 4.5 per cent, a rate similar to the lowest rate observed in any year during the entire 1980s. Going by sectors, earlier studies on different categories of public enterprises have shown that there was no unique way in which their performance changed since 1991 (Rameshan, 1996, 1997, 1998 & 1999).

The best growth range the Indian industry could ever experience belonged to the second half of 1980s and not to the 1990s.

Table 1: Ranges of Industrial Growth Rates (%)

Period	Lowest Rate	Highest Rate
1951-52-1955-56	1.1	10.2
1956-57-1960-61	0.4	9.9
1961-62-1965-66	2.5	10.3
1966-67-1970-71	2.0	8.8
1971-72-1975-76	1.8	5.1
1976-77-1980-81	–3.3	9.2
1981-82-1985-86	4.3	9.2
1986-87-1990-91	6.0	10.5
1991-92-1995-96	–1.7	12.7
1996-97-1998-99	4.5	6.6

Source: Compiled from Economic Survey, various issues

Table 2: Annual Growth Rate (%) of Secondary Sector 1991-92 to 1998-99

Year	Secondary Sector	GDP
1980-81 Series		
1991-92	–1.7	0.8
1992-93	4.4	5.3
1993-94	6.9	6.2
1993-94 Series		
1994-95	9.3	7.0
1995-96	12.5	7.3
1996-97	6.6	7.5
1997-98	5.6	5.0
1998-99	4.5	6.8

Source: Economic Survey 1999-2000, p. S-10

Table 3: Global Ranking of Indian Business Management

Parameter	Rank (Out of 59 Countries)
Overall Management Quality	37
Total Quality Management	43
Approach to Human Resources	43
Staff Training	55
Delegation of Authority	45
Compensation Link With Performance	45
Competence of Financial Officers	31
Production Processes	47
Marketing Quality	38
Customer Orientation	49
Advantage of Unique Products & Processes	49
Exporting With Distribution & Marketing	50
Pioneering Own Technology	38
Local Product Design	46
Own International Brands	46
Own Foreign Distribution & Marketing	46
Extensive Export to Neighbouring Nations	57
Wide International Presence of Exports	43
Senior Management of Professionals	47
High Quality Local Management Education	18
Foreign Experience of Managers	43
Management Use of Computers	46
Effectiveness of Corporate Boards	50

Source: Compiled from 'The Global Competitiveness Report 1999'

Even in terms of international perception about Indian business, the Indian business sector does not seem to have reached an enviable position despite all noble expectations about reforms of about a decade. This is evident if one looks at the recent international ranking of Indian business management on various parameters. For instance, The Global Competitiveness Report 1999 assigns very low ranks in almost all respects to Indian management. This is obvious from Table 3. Ironically, the business sector may not be able to blame the government for its problems because the Indian government factor itself has a much better inter-

national ranking compared to companies. Of course, there are several government policy related and other problems still remaining, e.g., on the external front, infrastructure, labour, etc. Nevertheless, the rankings show that Indian business sector is still unable to grapple with its old problems despite substantial changes in the Indian business environment and to improve its performance as much as to raise its international standing.

Does that mean that Indian business did not at all improve its performance during 1990s? Obviously, no. Because, several industries like food products, automobiles, electronics, and electricals have been able to attract substantial new foreign investments. A number of other de-regulated, de-licensed and de-monopolised sectors have also seen vast increase in domestic private sector activities. Such sectors have also witnessed increased competition among Indian companies, between Indian and foreign companies and between public and private sector companies. Competition is expected to have a strong positive impact on performance. Hence, it may be reasonable to argue that the Indian business sector possibly improved its performance to some extent during 1990s. To verify this argument, however, it may be necessary to evaluate certain performance parameters of Indian business for 1990s. Therefore, a study is attempted to evaluate a few selected financial parameters for the period 1992-93 – 1998-99. This is done for the corporate sector for which systematic comparable data are available in the CMIE publications (CMIE, 2000) with break ups for public sector, Indian private sector and foreign private sector.

Table 4: Top 10 Industries on Value Added Share (Rank)

Industry	1980-81	1990-91	1995-96	
Chemicals etc	2	1	1	
Wool, Silk etc	1	2	2	
Electrical Machinery	10	3	3	√
Food Products	8	4	4	√
Transport Equipment	5	5	5	√
Basic Metal Industries	3	6	6	
Repair of Capital Good	6	8	7	
Petroleum etc	15	7	8	√
Non-elect. Machinery	7	9	9	
Metal Products	9	12	10	

Source: Compiled from Annual Survey of Industries, various issues

The analysis is extended to a few selected industries, viz., petroleum, food products, automobiles, electronics, and electricals. Those sectors have witnessed heightened foreign and domestic private activities since 1991 much more than many other sectors. Incidentally, the electrical machinery, food products, transport equipment and petroleum industries were ranked respectively third, fourth, fifth and eighth in terms of value added share in factory sector during 1995-96, as Table 4 shows. The reduction and rationalisation of import duties during 1990s have also benefited the above industries tremendously. For instance, Table 5 shows that customs collection rate, i.e., ratio of total import duties collected on an item to its total import value, of food products has declined from 47 per cent in 1990-91 to just 15 per cent in 1998-99. Similarly, electrical equipment industry received the largest foreign collaboration approvals during 1991-97 while transport equipment and food products received the fifth and sixth largest approvals (see Table 6). Food processing and transport equipment and food products received the fifth and sixth largest approvals (see Table 6). Food processing and transport equipment companies also experienced a big surge in their stock prices. For example, the stock index increased over 3½ times for the food-processing sector and over 3 times for the transport equipment sector between 1990-91 and 1996-97, which is clear from Table 7.

Table 5: Customs Collection Rate: % of Imports Value

Sector	1990-91	1995-96	1998-99
POL*	34	30	29
Food	47	23	15
Capital Goods	60	33	42

* Petroleum Oil & Lubricants

Source: Economic Survey 1999-2000, Table 2.6, p. 39.

Table 6: Total Foreign Collaboration Approvals 1991-1997

Sector	Number	Rank
Food Processing Telecommunications	647	6
Commercial Office & Household Equipment	484	10
Transport Equipment	746	5
Electrical Equipment	2195	1

Source: Handbook of Industrial Statistics & Policy 1998

Table 7: Share Price Index

Sector	Index 1990-91	Index 1996-97
Food Processing	746	2688
Electronics & Electrical	264	432
Transport Equipment	606	1897

Source: Handbook of Industrial Statistics & Policy 1998

Performance Parameters

The corporate performance analysis of this study is

carried out in terms of the following financial parameters:

- Ratio of profit before depreciation, interest and taxes (PBDIT) to capital employed, which will indicate the changes in gross profitability. Profitability is expected to increase due to improved technologies and increased competition leading to greater efficiency, productivity and cost effectiveness.
- Ratio of corporate taxes to the pre-tax profit (PBT), which will reveal the changes in the corporate tax burden. The reduction in corporate tax rates is expected to reduce the tax burden.
- Ratio of exports to net sales. it will reveal the corporate sector's success in or resort to accessing the international markets. Reforms were expected to improve the efficiency and international competitiveness, and therefore exports, of the business sector.
- Ratio of imports to exports, which will show the import intensity of exports or import outflow per every rupee earned. Dismantling of import curbs were expected to increase the import outflow of business sector.
- Ratio of capital goods imports to increase in gross fixed assets (GFA), which will reveal the extent of the foreign origin of the corporate fixed assets. The liberalisation of import provisions and of provisions of technology acquisition and royalty payments was expected to increase the dependence of business sector on foreign capital equipment in its bid to modernise the production system.
- Ratio of selling costs to net sales, which is to reveal the selling cost effectiveness. Increased competition, changing behaviour of consumers and large-scale entry of foreign companies were expected to increase the selling costs of producers.
- Ratio of total cost to net sales. It should reveal the cost effectiveness of business sector. The factors mentioned in the first parameter are expected to improve the cost effectiveness of the corporate sector.
- Ratio of interest payment to total borrowing, which may reveal the changing interest cost burden of the corporate sector. Since the capital market reforms and global capital market access are expected to provide the business sector access to cheaper funds, the interest cost burden may be declining.

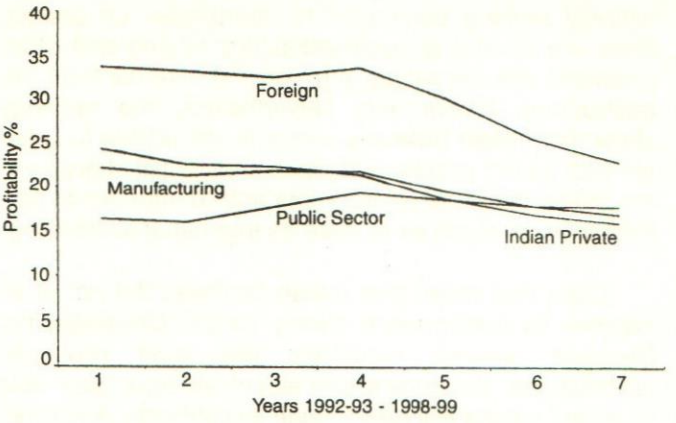

Fig. 1(a): Corporate Profitability: PBDIT-Capital Employed Ratio (%)

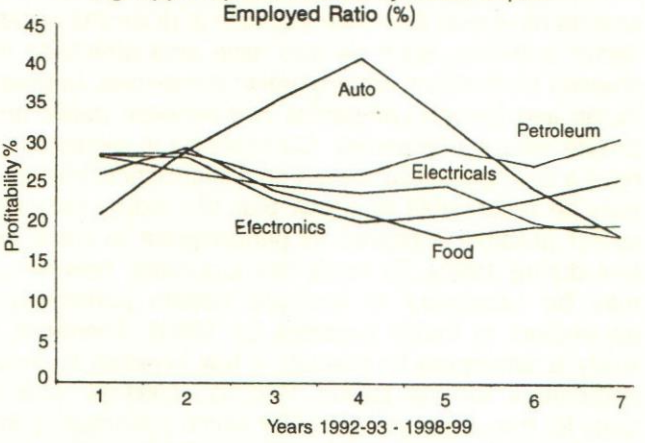

Fig. 1(b): Corporate Profitability (Selected Sectors):

- Ratio of capital market funds to total funds, which is expected to show the capital market dependence of corporate sector. The factors mentioned in the previous parameter are also expected to increase the dependence of business sector on the capital markets except that in some years during 1990s when the stock market was highly volatile and crashing, the dependence on capital market might have reduced temporarily.

The period for which the analysis has been carried out is 1992-93 to 1989-99. The data needed for this analysis have been taken from the CMIE publications (May & June, 2000). The analysis covers the corporate manufacturing sector and the sub-sectors, public sector, Indian private sector and foreign private sector. Table 8 provides a comparative picture of the shares in gross sales of the different sub-sectors of corporate sector as covered in this study.

As per Table 8, the corporate sector covered in this analysis accounted for more than two-third of the factory sector included in the Annual Survey of Industries. Between 1992-93 and 1989-99, the share of public sector in

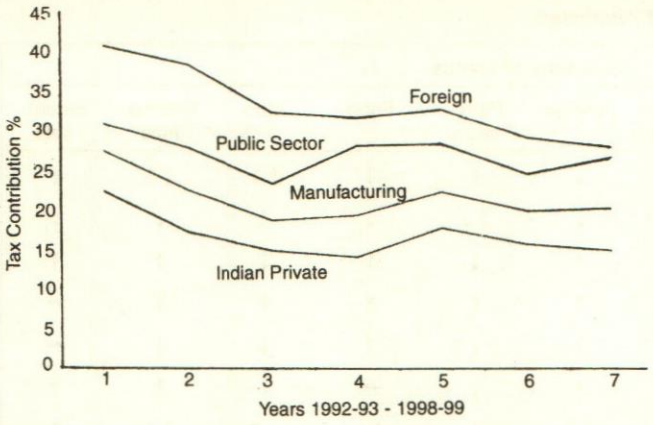

Fig. 2(a): Corporate Tax Contribution: Corporate Taxes-PBT Ratio

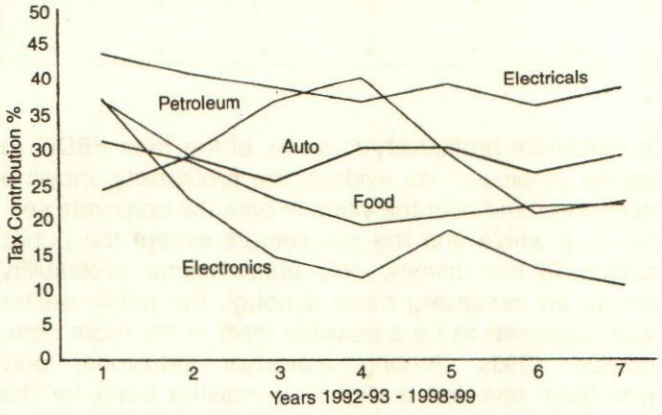

Fig. 2(b): Corporate Tax Contribution (Selected Sectors): Corporate Taxes-PBT Ratio

gross sales stands reduced by 2 percentage points while that the Indian private sector increased by a similar magnitude. Surprisingly, the foreign private sector of India in this respect remained almost at the same position at the end. This is so despite the widespread fear that foreign companies might swarm Indian business and gobble up Indian companies one by one.

Table 8: Share of Different Corporate Segments in Gross Sales (%)

Industry Segment	1992-93	1994-95	1996-97	1998-99
Manufacturing	100.0	100.0	100.0	100.0
Value of Output As % of Factory Sector	67.8	71.8	67.7	–)
Public Sector	33.7	30.2	29.7	31.7
Indian Private	54.2	58.6	58.6	56.1
Foreign Private	12.0	11.2	11.7	12.1
Petroleum	18.5	18.0	19.7	22.4
Food	4.8	5.5	5.4	4.8
Auto	5.5	6.0	7.1	6.1
Electronics	3.6	3.8	3.9	4.8
Electricals	5.3	4.9	4.9	4.6

Source: Compiled from CMIE, May & June 2000

Analysis of Performance

For analysing the corporate performance, we will make use of Tables 9 and 10 and Figures 1(a) through 9(b). Table 9 reports the compounded annual growth rate during 1993-99 of corporate gross sales, wages & salaries, selling costs, total costs, pre-tax profit and dividend payout. The growth rates are also given for the three sub-sectors and the five sample industries. The figures present the annual trends in the selected performance parameters during 1992-93 – 1998-99 in respect of the corporate sector, its sub-sectors and the five industries. Table 10 presents a summary of the trends revealed in Figures 1(a) through 9(b).

Table 9: Compounded Annual Growth of Selected Variables: A Comparison Across Segments

Industry Segment	CAGR 1993-99 (%)					
	Gross Sales	Wages & Salaries	Selling Costs	Total Costs	PBT	Dividend Payout
Manufacturing	14.5	13.4	14.9	14.9	6.0	20.1
Public Sector	13.1	10.8	10.3	12.7	12.2	19.9
Indian Private	14.9	14.5	17.9	15.9	0.5	19.0
Foreign Private	15.9	15.2	22.8	16.9	18.6	23.5
Petroleum	17.8	16.8	11.8	17.1	21.1	37.5
Food	17.1	14.3	19.8	17.7	6.9	17.8
Auto	14.4	13.3	22.0	14.4	20.5	9.6
Electronics	18.1	21.0	23.3	18.9	20.3	29.5
Electricals	13.1	14.0	21.5	13.9	1.6	15.0

Source: Compiled from CMIE, May 2000

Compounded Annual Growth Rates

As one can see from Table 9, the corporate sector registered very impressive growth in gross sales; however, the corporate profits did not grow significantly since the total costs as well as the wages & salaries and selling costs grew faster. In spite of low profit growth, dividend payments increased faster, possibly reflecting the stock market realities and demands facing the corporate sector. The growth of different financial variables was equally fast among the sub-sectors too; however, in every respect foreign private sector experienced the largest growth in pre- tax profits, the public sector produced an impressive growth both in profits and in its dividend payments. Public enterprises also showed the lowest growths in wages & salaries, selling costs and total costs.

Among the selected individual industries,

Table 10: Corporate Sector Performance: Summary of Trends in Selected Parameters

Parameter	Summary of Trends									
	Expected Trend	Overall Trend	Public Sector	Indian Private	Foreign	Petro-leum	Food	Auto	Electro-nics	Electri-cals
Corporate Profitability	↑	↓	↑	↓	↓	↑	↓	↑↓	↓↑	↓
Tax Contribution,	↓	↓	↓	↓	↓	↑↓	↓	↑	↓	↓
Foreign Market Access	↑	↑	↓	↑	↑	↓	↑	↓	↑	↑
Import Intensity	↑	↔	↑	↔	↑	↑	↑	↑	↓	↔
Foreign Origin of Fixed Assets	↑	↑	↑↓	↑	↑	↑↓↑	↑	↓	↓	↔
Selling Cost Effectiveness	↑	↔	↓	↑	↑	↓	↔	↑	↑	↑
Total Cost Effectiveness	↓	↓↑	↓↑	↓↑	↓↑	↓	↑↓	↓↑	↑↓	↑
Cost of Borrowing	↓	↓	↑	↓	↓	↑	↓	↑↓	↓	↑↓
Capital market Dependence	↑	↓	↓	↓	↓	↓	↓	↓	↓	↓

Source: Compiled from Figures 1(a) Through 9(b)

electronics experienced the largest growth in both gross sales and the cost items. At the same time, petroleum industry that is dominated by the public sector made the largest growth in pre-tax profit and dividend payments and the smallest growth in selling costs. Despite the lowest growth of total costs in electrical machinery industry, this industry could ensure only a very small annual growth in pre-tax profits. The food products industry also faced a lower growth in profitability. The growth rates of profits of petroleum, automobile and electronics industries are almost identical while the growth rates of their dividend payments are glaringly dissimilar.

Taking annual growth rate of pre-tax profits as a summary indicative measure, it appears *prima facie* that the Indian private corporate sector could not perform well under the changed environment while the public sector performed impressively contrary to general expectations at the time of initiating the reforms. Further, the public sector dominated petroleum industry could perform as good as the foreign company dominated automobile and electronics sectors.

Indian private corporate sector could not perform well under the changed environment while the public sector performed impressively contrary to general expectations

Trends in Selected Parameters

To begin with, Figure 1(a) and 1(b) depict the trends in corporate profitability in terms of the ratio PBDIT to capital employed. As evident, the profitability shows a declining trend over the years in both the corporate sector as a whole and the sub-sectors except the public sector. To our dismay, only public sector profitability shows an increasing trend although the public sector was supposed to be a possible loser in the more competitive 1990s. Among individual industries, only petroleum revealed a slightly increasing trend for the entire period while electronics experienced rising trend in the last few years. Other sectors faced declining profitability trends except that automobiles sector had in the earlier years an increasing profitability. In short, the profitability performance of the corporate sector, especially private, during 1990s has not been satisfactory.

Corporate tax contribution to the government has been generally showing a slight declining trend. This can be understood from Figures 2(a) and 2(b). The declining trend is most obvious for the foreign private sector while it is the least obvious for the public sector. Foreign sector has derived the maximum benefits from the reduction of corporate tax rates since 1991. Nonetheless, foreign companies still carried the highest corporate tax burden. Among the selected industries, electronics showed a sharp long term declining trend in corporate tax burden to a lower extent. Automobile sector seems to have faced a marginally rising trend in corporate tax obligations. For petroleum sector, there is a sharp decline after 1995-96. On the whole, the declining corporate tax rates seem to have benefitted a large segment of the corporate sector.

The corporate sector appears successful in generating an increasing proportion of its net sales revenue from the foreign markets. As Figures 3(a) and 3(b)

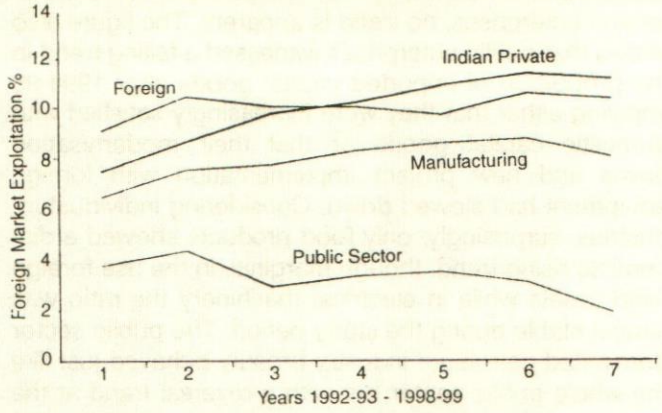

Fig. 3(a): Corporate Foreign Market Exploitation: Exports-Net Sales Ratio

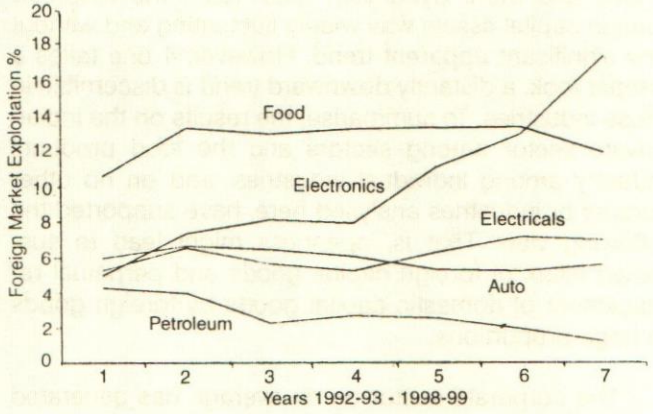

Fig. 3(b): Corporate Foreign Market Exploitation (Selected Sectors): Exports-Net Sales Ratio

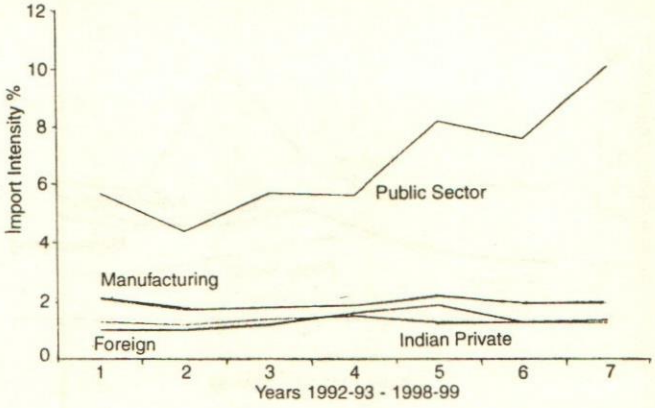

Fig. 4(a): Corporate Import Intensity of Exports: Imports-Exports Ratio

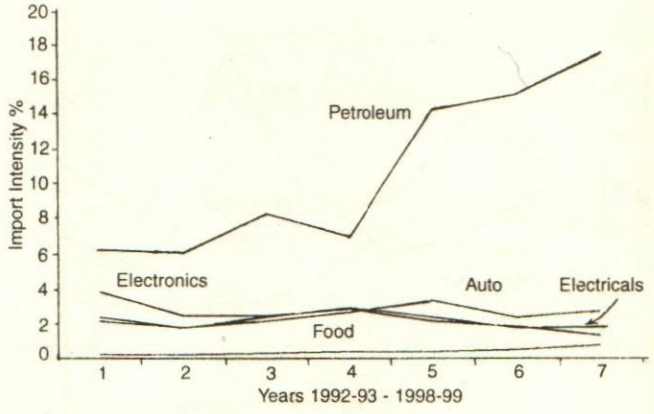

Fig. 4(b): Corporate Import Intensity of Exports (Selected Sectors): Imports-Exports Ratio

reveal, except the public sector, which registered a declining trend in export proportion, all sectors showed increasing trend in the export-net sales ratio. The performance in this respect is the best for the Indian private sector. The increasing trend experienced by the foreign sector is only marginal. This probably lends some support to the argument of the reform critics that the foreign companies would increasingly orient themselves toward the domestic market and would slacken export efforts once the export obligations are relaxed. At the same time, the results also reveal the laxity of public enterprises in their export efforts. Electronics industry has experienced an impressive export performance during the 1990s, probably aided by the IT and related segments. While electrical companies showed a slightly increasing trend in the export proportion, food and automobiles segments revealed respectively marginally rising and falling trends in their export efforts. In the public sector dominated petroleum industry, the role of exports in net sales revenues received a beating. In summary, only the newly liberated Indian private sector and the dynamic electronics industry appear to have risen to expectations in exploiting the foreign markets left open by the liberalisation and globalisation.

A look at Figures 4(a) and 4(b) makes it clear that the public sector and the public sector dominated petroleum industry experienced sharp increase in import intensity. This is probably due to the steep rise in oil demand in India as well as in oil prices in recent years in international markets. The whole corporate sector and Indian private sector and electrical goods industry at the same time showed a high degree of stability in this respect. While the foreign private sector and automobile and food product companies increased the import intensity of their export at a small rate, the electronics industry could in fact reduce its import intensity. The increase in import intensity could be partly due to the large-scale entry of foreign companies into Indian market and their habit of sourcing materials and components from abroad. And, partly it could be due to the effort of many Indian companies to modernise their production systems taking advantage of the liberalisation of imports and technology acquisitions. Similarly, the new investments in production facilities by foreign firms and the growth of new Indian entrepreneurs in

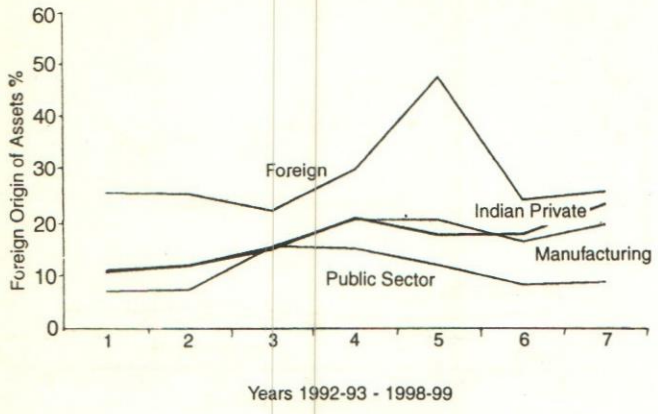

Fig. 5(a): Foreign Origin of Corporate Fixed Assets: Capital Goods Imports-Increase in Gross Fixed Assets Ratio

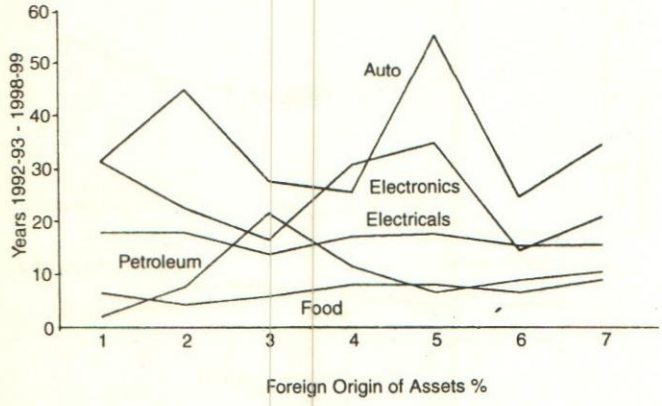

Fig. 5(b): Foreign Origin of Corporate Fixed Assets (Selected Sectors): Capital Goods Imports-Increase in Gross Fixed Assets Ratio

electronics probably pre-empted the relative rise of imports in electronics sector. So, in the post reform scenario, only the electronics industry assisted the economy in reducing the import burden, while the food sector continued to have imports at least less than its exports notwithstanding the closing of the gap between the two due to rise in imports. (Also see Rameshan, 2000, for some evidence on the resource leakage from India in the macroeconomic context).

Figures 5(a) and 5(b) present the trends in the extent of foreign origin of corporate fixed assets, measured by capital goods imports in proportion to increase in gross fixed assets. The parameter is expected to show an increasing trend since the increased openness provided companies with a unique opportunity to acquire foreign capital equipment and machinery that embodied superior foreign technologies. As expected, the corporate sector as a whole experienced a slightly rising trend in the use of foreign capital assets although the rise has not been consistent over the years. Among sectors, the Indian private sector had consistency in the rising trend of capital goods import proportion. For foreign enterprises, no trend is apparent. The figure also shows that public enterprises witnessed a falling trend in the proportion of imported capital goods after 1994-95 implying either that they were increasingly satisfied with domestic capital goods or that their modernisation drives and new project implementation with foreign equipment had slowed down. Considering individual industries, surprisingly, only food products showed a discernible rising trend, though marginal, in the use foreign fixed assets while in electrical machinery the ratio was almost stable during the study period. The public sector dominated petroleum industry broadly behaved just like the whole public sector but with a reversal trend at the end of the study period. In the automobiles and electronics industries, which experienced a spurt in activities and more dynamism after 1991, the resort to foreign capital assets was widely fluctuating and without any significant apparent trend. However, if one takes a deeper look, a distantly downward trend is discernible in those industries. To summarise, the results on the Indian private sector among sectors and the food products industry among individual industries, and on no other sectors or industries analysed here, have supported the following view. That is, openness might lead to sustained influx of foreign capital goods and perpetual replacement of domestic capital goods by foreign goods in large proportions.

The corporate sector on an average has generated an up and down trend, so as to provide a look of long term stability, in its selling expenses as a proportion of net sales during the study period, as visible in Figure 6(a). This average feature seems to be due to a declining trend in the selling cost proportions of the public sector. Because, the selling cost proportions clearly increased in the Indian private and foreign sectors, with the trend in the latter's case being more pronounced. Figure 6(a) illustrates that the public sector pattern in respect of selling cost proportion is followed almost exactly by petroleum which is not surprising given the public sector dominance of petrolium industry. There is a definite rising trend of selling cost proportion in automobiles sector. It may have emanated from the intensive competition that this sector has been experiencing ever since the bunched entry of a number of foreign companies into India after 1991. In food products, there appeared no clear trend, upward or downward, in selling expense proportions during the given period, whereas in electrical goods there occurred a marginal falling trend in the selling cost ratio. At the same time, electronics industry, which is also characterized by substantial competition during 1990s, began to have declining proportions, after 5 years of rising trend, after 1996-97 probably reflecting the industrial slowdown that the Indian industry faced after 1996-97. The essence of

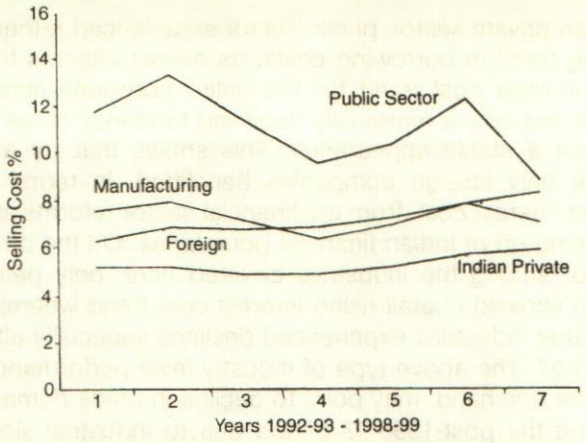

Fig. 6(a): Corporate Selling Cost Effectiveness: Selling Costs-Net Sales Ratio

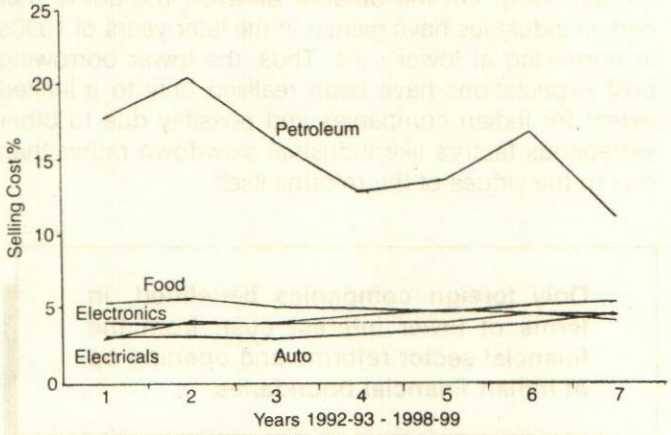

Fig. 6(b): Corporate Selling Cost Effectiveness (Selected Sectors): Selling Costs-Net Sales Ratio

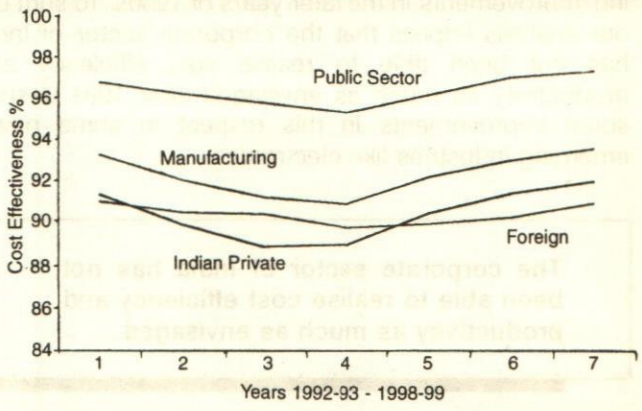

Fig. 7(a): Corporate Cost Effectiveness: Total Cost-Net Sales Ratio

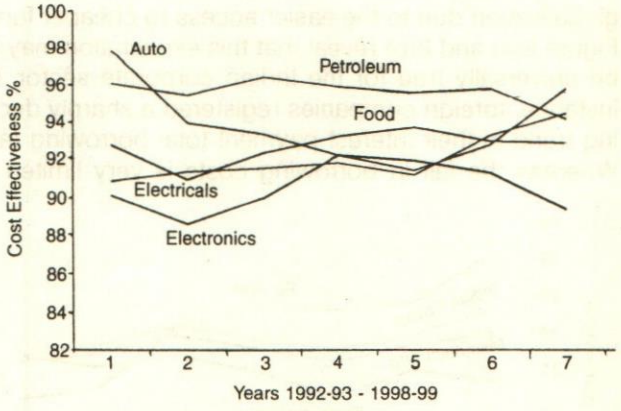

Fig. 7(b): Corporate Cost Effectiveness (Selected Sectors): Total Cost-Net Sales Ratio

the discussion may be that foreign private companies drove up their selling costs in their attempt to capture market shares from established Indian companies, in the process of which the latter were also probably forced to hike up their selling expenses. The fact that competition played an important role in raising the selling costs may be implicit in the rising selling costs of automobiles and, in later years, of electronics that have seen highly intensive competition between the foreign and Indian companies in recent years. What role the industrial slowdown after 1996-97 played in determining the selling costs is not obvious except that in the case of electronics the trend was downward during the slowdown period.

The fact that competition played an important role in raising the selling costs may be implicit in the rising selling costs of automobiles and electronics that have seen highly intensive competition between foreign and Indian companies.

The trends in total cost-net sales ratio are very interesting indeed. This can be understood with reference to Figures 7(a) and 7(b). Both for the corporate sector as a whole and for the three sub-sectors, that is, till 1995-96, the cost ratio declined while it has been rising after that. In other words, the corporate cost effectiveness in general improved till 1995-96, but deteriorated thereafter. Importantly, the cost improvement in the initial years was faster in the Indian private sector, subsequent deterioration also started earlier and was faster in the Indian private sector, as compared to the foreign companies. True to its old tradition of poor cost effectiveness, the public sector always had a much lower total effectiveness during 1990s too. At industry level, while electrical machinery had its total costs showing a more permanent rising trend, the automobiles sector followed the overall falling and rising trend, in total cost although with the exception that its declining trend continued up to 1996-97. However, in some of the industries, especially electronics, the total cost effectiveness started show-

ing improvements in the later years of 1990s. To sum up, our analysis implies that the corporate sector of India has not been able to realise cost efficiency and productivity as much as envisaged after 1991 despite some improvements in this respect in some newly emerging industries like electronics.

The corporate sector of India has not been able to realise cost efficiency and productivity as much as envisaged.

The cost of corporate borrowing during 1990s could be favourably affected during the liberalisation and globalisation due to the easier access to cheaper funds. Figure 8(a) and 8(b) reveal that this expectation may not be universally true for the Indian corporate sector. For instance, foreign companies registered a sharply declining trend in their interest payment-total borrowing ratio. Whereas the fall in borrowing costs is very limited for Indian private sector, public sector experienced rather a rising trend in borrowing costs. Its overall effect is that the interest cost trend for the entire corporate sector exhibited only a marginally declining tendency so as to give it a stable appearance. This shows that by and large only foreign companies benefitted, in terms of lower interest cost, from the financial sector reforms and opening up of Indian financial boundaries. On the other hand, among the industries covered here, only petroleum showed overall rising interest cost trend whereas, all other industries experienced declines especially after 1996-97. The above type of industry level performance, on the one hand, may point to decline in credit demand during the post-1996-97 period due to industrial slowdown and to the subsequent decline in interest rates in the economy. On the other, it unravels the ability that certain industries have gained in the later years of 1990s in borrowing at lower cost. Thus, the lower borrowing cost expectations have been realised only to a limited extent for Indian companies and possibly due to other extraneous factors like industrial slowdown rather than due to the virtues of the reforms itself.

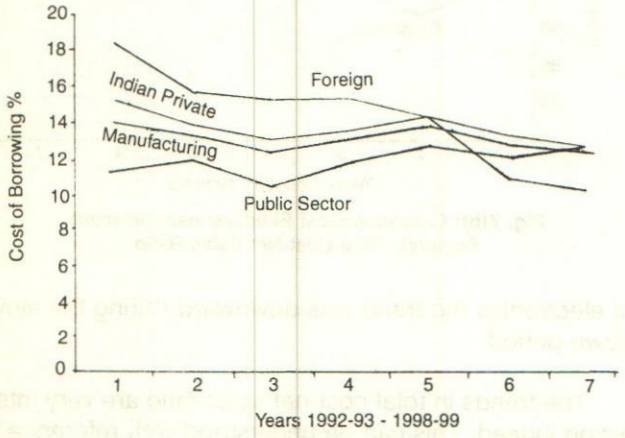

Fig. 8(a): Corporate Cost of Borrowing: Interest Payment-Total Borrowing Ratio

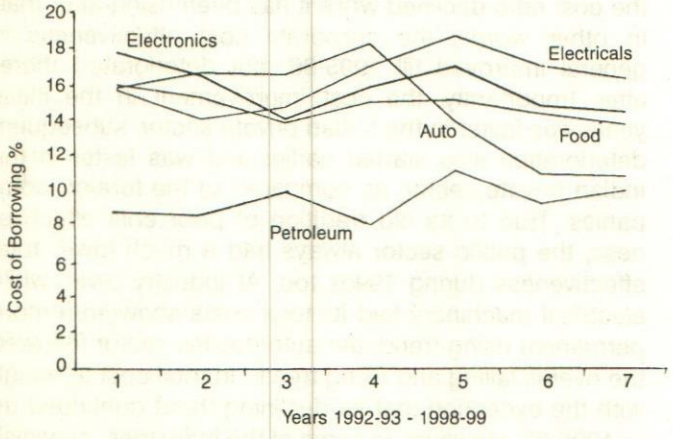

Fig. 8(b): Corporate Cost of Borrowing (Selected Sectors): Interest Payment-Total Borrowing Ratio

Only foreign companies benefitted, in terms of lower interest cost, from the financial sector reforms and opening up of Indian financial boundaries.

The corporate sector as a whole, its sub-sectors and the individual industries – all showed overall declining trend in their capital market dependence for funds especially after 1994-95. As may be discerned from Figures 9(a) and 9(b), such decline has been sharpest for the Indian private sector and the electronics industry and lowest for the foreign corporate sector and the foreign company dominated automobiles industry. Automobile industry has also the minimum year to year fluctuations in the ratio of capital market funds to total funds. A major reason for the huge year-to-year fluctuations as well as for the overall declining trend in the stock market dependence of the various sectors and industries seems to be the high stock market volatility and the frequent ups and downs in the stock demand. The stock market problems, on the other hand, could be attributed to a host of factors. These may include the poor confidence of small investors in the Indian stock market, the lack of depth in the Indian stock market, the uncertainties in India's business climate due to domestic and international political factors, and global economic and financial problems and crises.

A summary of the discussion on corporate performance trends has been presented in Table 10.

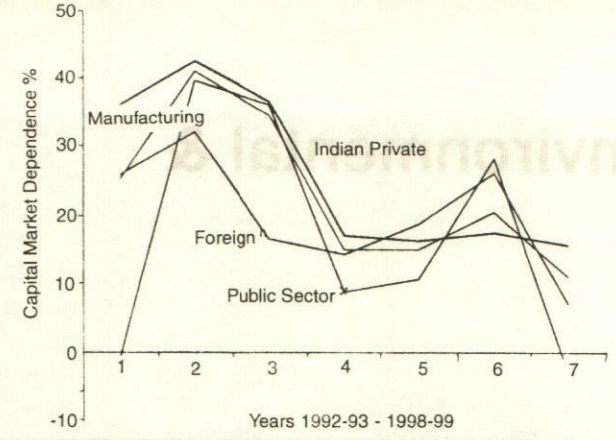

Fig. 9(a): Corporate Capital Market Dependence: Capital Market Funds-Total Funds Ratio

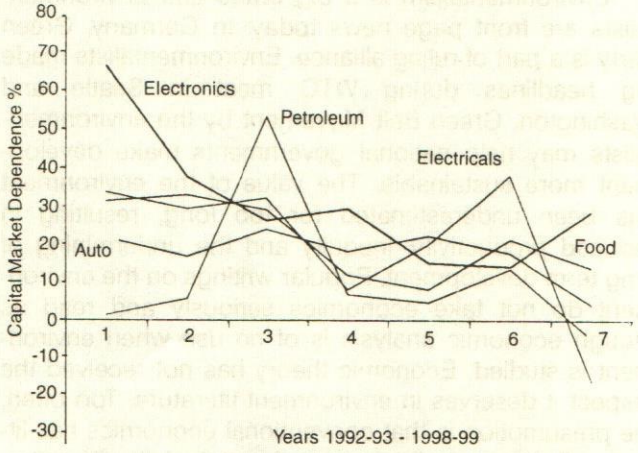

Fig. 9(b): Corporate Capital Market Dependence (Selected Sectors): Capital Market Funds-Total Funds Ratio

Concluding Remarks

In the aftermath of the sweeping policy changes initiated in 1991, the Indian industry in general and the corporate sector in particular have been expected to produce much improved performances in respect of various parameters. However, neither the industrial growth rates during 1990s nor the international perceptions toward the Indian industry indicated the realisation of expected performance in Indian industry. The analysis confirms that there has hardly been any sustained improvement in the performance of the corporate sector either[1]. The corporate sector, especially the private, did not have a satisfactory profitability performance during 1990s. Since corporate tax burden also declined substantially at the same time, the impact of declining profitability on post-tax profits might have been mitigated in some degrees. In promoting exports, some success was achieved mostly in the Indian private sector and electronics industry and not in foreign or public sectors or other industries. Even in reducing import burden, only electronics industry among the industries covered here has lent a helping hand to the economy. Corporate selling expenses also soared due to increased competition. Possibly, the foreign private companies incurred increased selling costs in their attempt to capture market shares from Indian companies, in the process of which they also forced the Indian companies to raise their selling expenses. The corporate sector could not also realise wide spread cost efficiency and productivity as much as envisaged by the policy reformers and analysts. Further, expectations that Indian companies would enjoy lower borrowing costs due to financial reforms and increased market access have been realised only to a limited extent, that too more due to other extraneous factors like industrial slowdown than due to the virtues of the reforms itself. Moreover, the corporate sector experienced huge year-to-year fluctuations as well as overall declining trend in its stock market dependence possibly due to high volatility and frequent ups and downs in demand in Indian stock market. At least the domestic private sector and the food products industry analysed here have also supported the belief that openness would lead to sustained influx of foreign capital goods and perpetual replacement of domestic capital goods by foreign goods in large proportions. To conclude, the analysis does not demonstrate that the Indian corporate sector has produced such a dramatic improvement in its performance during 1990s that makes the Indian corporate sector an enviable entity in the world of business around the globe.

1. As a matter of fact, the Business Confidence Index has fallen substantially after 1995 and the recovery in the index till the end of 1999 was insufficient to push it to the 1995-level (NCAER, 2000).

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Feature

Economic Valuation of Environmental & Natural Resources

T.R. Shanmugam & D. Suresh Kumar

Economics has a major role to play in bringing together and mutually reinforcing environment and development. On the basis of broad assessments of environmental and natural resources, economic tools can be employed to help determine the desirability of environment related projects, their design, and location. Economic analysis is vital in pinpointing the need for introducing new incentives or removing misguided ones. Keeping these issues in view, the present paper aims to analyse the valuation of environmental resources and offers methodologies for valuation of natural resources.

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Environmentalism is a big brand and environmentalists are front page news today. In Germany, Green Party is a part of ruling alliance. Environmentalists made big headlines during WTO meet in Seatle and Washington. Green Belt Movement by the environmentalists may help national governments make development more sustainable. The value of the environment has been underestimated for too long, resulting in reduced productivity, inequity and the undermining of long term development. Popular writings on the environment do not take economics seriously and read as though economic analysis is of no use when environment is studied. Economic theory has not received the respect it deserves in environment literature. Too often, the presumption is that conventional economics has little to offer in analysing issues of sustainability. The concept of sustainable development in environmental literature is static and has little practical application. In contrast, modern economic theory of optimal control offers a flexible and disciplined ethical framework for analysing environmental issues over time, in a manner that takes the welfare of future generations fully into account.

Four questions are to be addressed when the principles of economic valuation of environmental resources are studied: How does modern economic theory analyse debate on economic development vis-a-vis environmental damage? What are the trade-offs among sustainability, growth and equity? What are the advanced methods provided by modern economics for analysing private and social management of environmental assets? and how useful are they in the real world policy formulations? The present study addresses these issues.

Economy & Environment

An economy is a collection of production, distribution and consumption functions within an all-encom-

passing natural world. Nature is the provider of raw materials without which production and consumption would be impossible. Production and consumption activities produce residuals, which affect natural environment. In Fig. 1, the link marked 'a' represents raw materials flowing into economy for production and consumption. The study of nature in its role as provider of raw material is called natural resource economics. This includes rate of extraction, depletion, replenishment, growth function and scarcity of natural resources. The link marked 'b' shows the impact of economy on the quality of natural environment. Study of residual flow and its impact on nature is environmental economics. One feature of the modern world is that the dividing line between natural resource economics and environmental economics is blurring in many cases. Many resource extraction processes, such as timber cutting and brick making, have direct repercussions on environmental quality. There are plenty of instances where environmental pollution has impact on natural resource extraction processes. Sea water pollution interfering with replenishment of fish stock and ground water pollution reducing agricultural yields are examples. Despite these blurred edges, the distinction made by economists between these two services of the natural world (natural resource economics and environmental economics) is sufficiently strong and well developed.

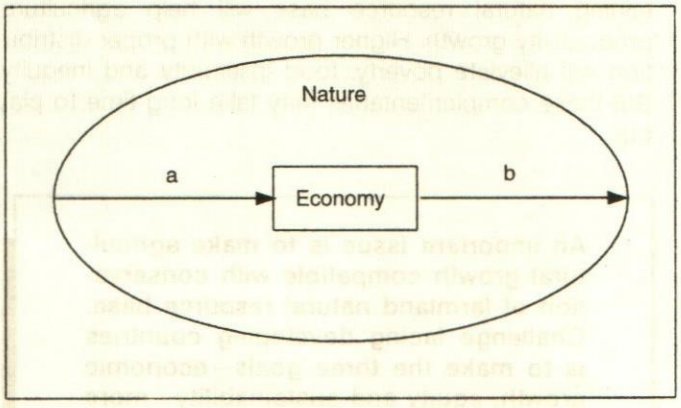

Fig. 1: The Economy and the Environment

Figure 2 shows a more complex system rendering the relationships between natural resources extracted and residuals discharged. The elements within the circle are parts of the economic system, the whole of which is basically encapsulated within the natural environment. The economy has been divided into two categories, producers and consumers. Production uses NR (natural resources) from nature and creates goods (outputs) and residuals RPP (residual produced after production). Some of the residuals are recycled (RRP–residuals recycled after production) and some are discharged (RDP-residuals discharged after production). Then the produced goods flow to consumers. Consumption uses

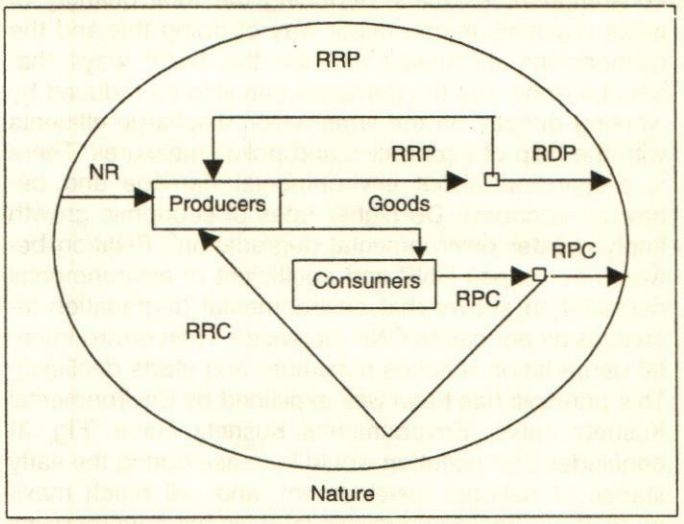

Fig. 2: The Fundamental Balance

the goods and disposes residuals (RPC–residuals produced after consumption). Some proportion of residuals are recycled (RRC–residuals recycled after consumption) and some proportion of residuals are discharged (RDC–residuals discharged after consumption). The first law of thermodynamics, the famous law on the conservation of matter, assures us that, in the long run, raw materials or natural resources extracted (NR) must be equal to total residuals discharged (RDP + RDC) in terms of physical quantities.

$$NR = RDP + RDC$$

In the long run, raw materials or natural resources extracted must be equal to total residuals discharged.

One must assume in the 'long run' for several reasons. If the system is growing, the economy can retain some proportion of the natural resources for future use. Recycling can also delay the disposal of residuals. But recycling can never be perfect, each cycle loses some proportion of recycled material. Thus the fundamental materials balance equation must hold only in the long run. If the economy wishes to reduce the mass of residuals, it should reduce the extraction of quantities of natural resources. This law holds good from a strictly physical standpoint. it does not speak about the quality aspect of residuals and sustainable development to manage environment damages. These fundamental relationships are very important. But the ultimate goal of national government is to reduce damages caused by the discharge of production and

consumption residuals. Reducing the total quantity of these residuals is one major way of doing this and the relationships discussed indicate the basic ways that may be done. But the damages can also be reduced by working directly on the firms which discharge effluents with the help of economics and policy measures. There is a question about environmental damage and behaviour economy. Do higher rates of economic growth imply greater environmental degradation? Relation between per capita GNP and coefficient of environmental degradation shows that environmental degradation increases as per capita GNP increases. Then environmental degradation reaches maximum and starts declining. This principle has been well explained by Environmental Kusnetz curve. Environmental Kusnetz curve (Fig. 3) concludes that pollution would increase during the early stages of national development, and will reach maximum. It will begin to diminish later, as the country gains adequate resources to tackle the pollution problems. This happens because at low level of income, people tend to value development over environmental quality. But as they reach higher economic growth, people are willing to donate more money for improving environmental quality. The marginal willingness to pay for good quality environment increases, as income of the country increases. This is clearly a matter of great importance for developing countries.

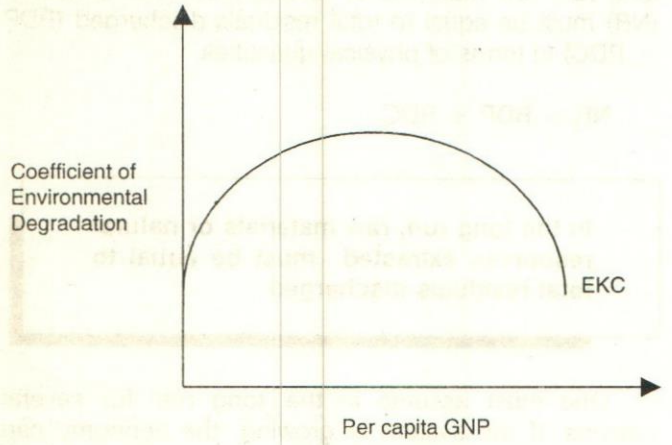

Fig. 3: Environmental Kusnetz Curve

The Critical Triangle

In most of the developing world, increased output will have to come from higher yields, not more land under the plough. As the arable land frontier is closed, higher yields will require intensification of agriculture on land already cleared. An important issue is to make agricultural growth compatible with conservation of the farmland natural resource base and of the commons. Environmental threat takes diverse forms across agroclimatic zones. The major challenge facing

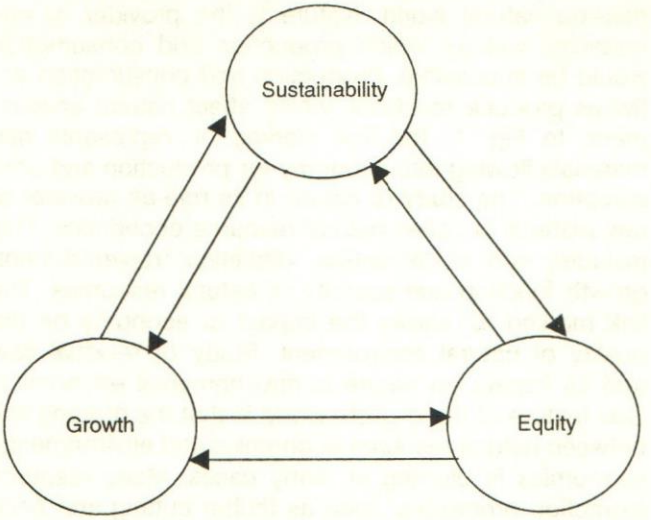

Fig. 4: The Critical Triangle of Development

developing countries is to make the three goals—economic growth, equity and sustainability—more compatible (Fig. 4). Continued agricultural growth is a necessity, not an option. This growth should be achieved on sustainable basis so as not to jeopardise the underlying base of natural resources. The growth should be equitable if it is to contribute to alleviate poverty and to attain food security. In the long run, all the three goals are complementary. For example, sustaining natural resource base will help agricultural productivity growth. Higher growth with proper distribution will alleviate poverty, food insecurity and inequity. But these complementaries may take long time to play out.

An important issue is to make agricultural growth compatible with conservation of farmland natural resource base. Challenge facing developing countries is to make the three goals—economic growth, equity and sustainability—more compatible.

Link between Poverty & Environment

The poorest of the poor occupy the least resilient, most threatened environmental areas of the world. The very fact of low resilience to stress and shock means that an exogenous event, such as a change in climate, could induce the poor to take actions that further degrade the environment. This happens when the poor are in some way confined to an ecologically fragile area and react to stress by intensifying their use of limited resources, that is, by deforestation and overgrazing.

The stress in question could include population growth and economic signals from policymakers that diminish the incentives to maintain a stable equilibrium between the local economy and its environment.

On this analysis, poverty is not so much a cause, in the narrow sense, of environmental degradation, as a mechanism by which the true underlying causes are transformed into action that degrade the environment. Put another way, poverty does not necessarily, in and of itself, lead to environmental degradation. That depends on the options available to the poor and on their responses to outside stimuli and pressures. Poverty however, removes their ability to respond and adapt because the time horizon is typically short and few feasible options are available. This leaves only two types of reaction: they can attempt to supplement scarce assets by using free common property or open access resources, or they can leave the land altogether and move to urban areas. The result of moving to urban areas is to swap one form of degradation for another, that is, rural for urban. Because poverty is also associated with poor health, the capability of responding to exogenous factors is further reduced by the physical effort involved. Association of poverty with illiteracy compounds the issue, since illiteracy also reduces the ability of individuals to respond to pressures. Poverty in all its manifestations keeps the poor from being able to respond to environmental degradation arising from other underlying causes and it thus becomes a disabling factor.

This idea of poverty as a disabling factor rather than an underlying cause of environmental degradation permits us to take into account other compounding issues. Population growth acts as both an underlying cause and a compounding factor. In developing countries, population growth is reducing the average farm size, thus lowering productivity and deepening poverty. As poverty increases, the ability to escape environmental degradation is reduced even further. The same phenomenon leads farmers to clear and crop hillsides in an effort to maintain their income. Expanding agricultural area is associated with deforestation and with increased soil erosion. The generalised picture of the links between poverty and environment must not be exaggerated. The existence of poverty does not mean that environmental degradation will necessarily follow. As the model suggests, if the underlying causes or shocks are absent, the state of poverty is likely to persist, but without environmental degradation.

Idea of poverty as a disabling factor rather than an underlying cause of environmental degradation permits us to take into account other compounding issues.

Link Between Environment & Growth

The critical issue is not whether there should be agricultural growth or how fast it should be, but how to undertake such growth so that the natural resource base is not degraded. Population pressure in many areas is forcing farmers to shift from extensive production systems to intensive systems that make use of more inputs, especially fertilizers. In other areas, failure to intensify agriculture has led to the extension of farming on to fragile margins and consequent natural resource degradation. In areas where farmers have increased the intensity of land use by shortening fallow, the limits to yield growth are quickly reached. These concerns need to be addressed, but within the context of poverty-environment and growth-environment links.

Agricultural growth needs to combine sustainability—whereby private and common land and water resources are protected and degradation is stopped and reversed—with intensification where there are land constraints. Intensified use of the commons and open-access areas, can even help the environment. Diversifying economic activity and diversifying product mix on farms can be important to making growth and sustainability more compatible. Diversification of income sources into nonagricultural activities is needed in some areas to reduce pressure on land and to finance land improvements and buy inputs produced off-farm, especially where agricultural intensification is under way. In some cases it may be better to promote nonagricultural income generation activities in areas where agricultural growth is difficult to promote or where environmental consequences of growth are severe. Working off-farm is then an "escape value" that reduces reliance on fragile land and pays the food bill. Diversification of agricultural activities can also move farming away from production patterns that damage the environment toward production strategies better suited to fragile soils, such as horticultural and perennial crops. While the concern about environmental damage has been of most recent origin, issues related to economic growth in developing countries have been around for many years. This em-

Agricultural growth needs to combine sustainability with intensification.

phasis on economic development will continue as the developing economies strive to close the economic gap with the developed economies. So there is a need to look at the relationship between economic development and environmental quality.

The production possibility between green Gross Domestic Product (gGDP) and environmental quality shows (Fig. 5) complementary relationship. Green GDP refers adjusted measure of GDP to reflect environmental concerns. This can be estimated in a simple way by using the formula.

$$gGDP = GDP + ES - ED$$

where,

gGDP = green Gross Domestic Product

GDP = Gross Domestic Product

ES = Value of Environmental and Natural Resource Services

ED = Value of Environmental damage and Natural resource Depletion

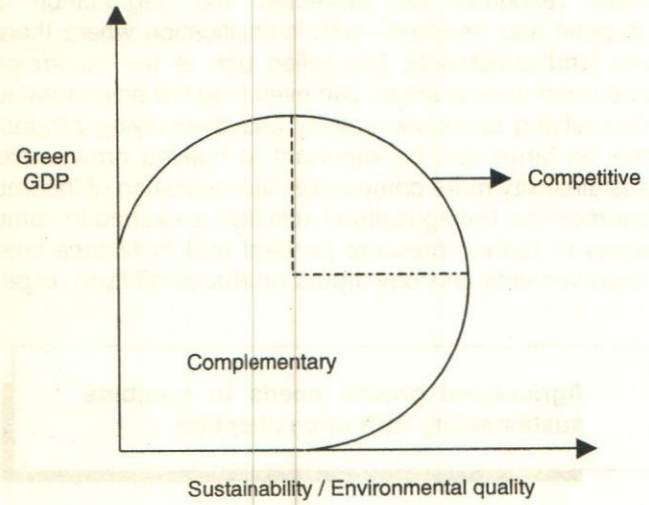

Fig. 5: Link Between Environment and Growth

The relationship between gGDP and environmental quality can also be extended to study differential impact of environmental quality on gGDP between developed and developing countries. The production possibility curve labeled 'A' is for a developed country, while 'B' refers to a developing country (Fig. 6). The developing country has to compromise on environmental quality to reach the same level of national output of developed country. Because of past natural resource exploitation, population pressure, less sophisticated technology, the poor countries cannot offer environmental quality standards as high as those the industrial countries are accustomed to. Developing countries should realise that

Degradation of environmental resources has the potential for being more highly destructive in developing countries.

environmental protection measures are financed out of the stomachs of their own people. Most developing countries depend proportionately more on primary industries than do developed ones. For example, they usually have a greater proportion of their population involved in agriculture and allied activities. Thus, degradation of environmental resources has the potential for being more highly destructive of productive assets in developing countries. In industrial countries, environmental quality issues hinge primarily on matters of human health and the aesthetic quality of the environment. Further more, technological development have decoupled, to a considerable extent, the resource using sector from the rest of the economy. In developing countries, on the other hand, environmental issues are related to decline in present productivity and also to the degradation of future productivity of natural resources on which many people are directly dependent. According to this argument, the environment and the growth of country are not so much substitutes as they are complements. Achieving growth with sustainability involves two sets of issues.

- First issue concerns market failure or economic institutional failure. There exist social costs and

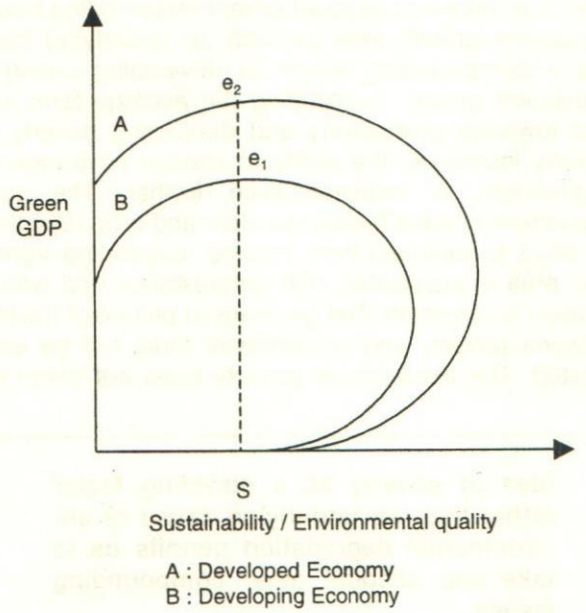

Fig. 6: Production Possibility Curves

social benefits when environmental resources are assessed. It concerns the method of valuing environmental costs and benefits.

- The second issue concerns the designing of policy measures to internalise external costs and external benefits into their own resource / production management decisions. Taxing is a method of policy measure suggested in this context.

Market Failure

A market is an institution in which buyers and sellers carry out mutually agreed-upon exchanges. We normally expect that people, when they buy or sell on a market, are looking for the best terms they can get. Presumably buyers would like to pay a low price while sellers would prefer high prices. What brings all these conflicting objectives into balance is the adjustment of prices on the market. Fig. 7. is a simple market model. Buyers' desires are represented by the demand curve labeled D. It shows the quantity of natural resource that buyers would buy at different prices. It has the typical downward slope, the higher the price, the lower the quantity demanded, and vice versa. Underlying the demand curve are such factors as consumer tastes and preferences, the number of potential consumers in the market, and their income levels. The curve labeled S is the supply curve showing the quantity of the natural resource that producers would willingly make available at different prices. It is upward sloping; higher prices represent greater incentives for suppliers and, therefore, larger quantities are supplied, and vice versa. The main factors affecting the height and shape of the supply curve are production costs; these, in turn, are related to the prices of inputs used in production of this item and the level of technology inherent in the production process. It is important to keep in mind that the demand and supply curves represent possibilities, or alternatives. During any particular time only one quantity of a natural resource can change hands, and sellers and buyers can be on only one point of their supply and demand curves, respectively. It is easy to see that there is only one price at which the quantity demanded by buyers is consistent with the quantity that sellers will make available. That is the price where the two curves intersect, marked p^m. Similarly, the total quantity that buyers and sellers will exchange at this price is labeled q^m.

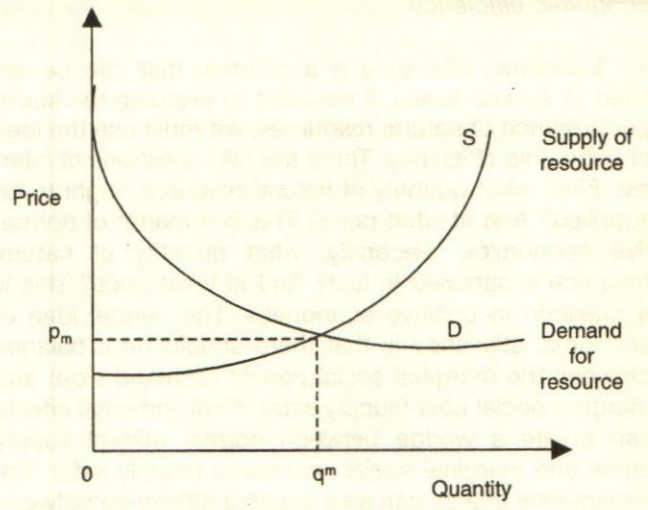

Fig. 7: The Market Model

For the market to work effectively there must be competition among sellers and among buyers. None can be large enough that their own performance affects market prices, or powerful enough that they can control how the market performs. Price must be allowed to adjust freely, so that it can "discover" the quantities that bring buyers and sellers into balance. At prices higher than p^m sellers will attempt to supply more than buyers want. In a surplus situation like this, competition forces prices downward. If prices are temporarily lower than p^m, a shortage develops and competition will force the price to adjust upward. At the equilibrium, quantity demanded equals quantity supplied. It is important to look at it also from the other direction. At the quantity q^m, there is an equality between the marginal willingness to pay by consumers for an additional unit of the item and the marginal costs of producing the item. These are equal at the value of p^m. If price and quantity are allowed to adjust freely and competition does infact exist, equality will arise through the normal interaction of buyers and sellers, between the marginal valuation that consumers have for a good (their marginal willingness to pay) and the costs of making available another unit of the good (the marginal costs of production). The question is whether markets ordinarily produce results that are efficient from the standpoint of society? The answer is no. When environmental resources are concerned, there are likely to be very substantial differences between market values and social values. This is called market failure and it calls for public or policy intervention either to override the markets directly or to rearrange things so that they will work more effectively.

When environmental resources are concerned, there are substantial differences between market values and social values. This market failure calls for public or policy intervention.

Economic efficiency

Economic efficiency is a criterion that can be applied at several levels. if we want to evaluate the social performance of natural resources, we must use the idea of economic efficiency. There are two questions of interest. First, what quantity of natural resource ought to be supplied? And at what price? This is a matter of normative economics. Secondly, what quantity of natural resource is supplied in fact? And at what price? This is a question in positive economics. The central idea of economic efficiency is that there should be a balance between the marginal social benefit (demand side) and marginal social cost (supply side). Environmental effects can create a wedge between normal market supply curve and marginal social cost curve (supply side). Environmental effects can also create a difference between normal market demand curve and the marginal social benefit curve (demand side). On supply side, external costs are included, while on demand side external benefits are included.

Social costs

When entrepreneurs in a market make decisions about what and how much to produce, they normally take into account the price of what they will produce and the cost of items for which they will have to pay: labor, raw materials, machinery, energy, and so on. These are the *private* costs of the firm. Any firm, assuming it has the objective of maximizing its profits, will try to keep its production costs as low as possible. This is a worthwhile outcome for both the firm and society because inputs always have opportunity costs; they could have been used to produce something else. Furthermore, firms will be alert to ways of reducing costs when the relative prices of inputs change. But in many production operations, there is another type of cost that, while representing a true cost to society, does not show up in the firm's profit and loss statement. It is the *external costs.* They are called external because, although they are real costs to some members of society, firms do not normally take them into account when they go about making their decisions about output rates. Another way of saying this is that there are costs that are external to firms but internal to society as a whole.

One of the major types of external cost is the cost inflicted on people through environmental degradation. Suppose a cassava processing mill is located somewhere on the upstream reaches of a river and that, in the course of its operation, it discharges a large amount of wastewater into the river. The wastewater is full of organic matter that arises from the process of converting cassava to sago. This waste material gradually is converted to more benign materials by the natural assimilative capacity of the river water but, before that happens, a number of people downstream are affected by the lower quality of water in the river. Perhaps the water borne residuals reduce the number of fish in the river, affecting downstream fishers. The river may also be less attractive to look at, affecting people who would like to swim or sail on it. The river water is used downstream as a source of water for a public water supply system, and the degraded water quality means that the town has to engage in more costly treatment processes before the water can be sent through the water mains. All of these downstream costs are real costs associated with producing sago, just as much as the raw materials, labor, energy etc., used internally by the plant. But from the mill's standpoint these downstream costs are external costs. They are costs that are borne by someone other than the people who make decisions about operating the processing mill. At the end of the year, the profit and loss statement of the cassava processing mill will contain no reference whatever to these downstream external costs.

One of the major types of external cost is the cost inflicted on people through environmental degradation.

The third component is user cost or scarcity rent. It arises from inter temporal considerations. It involves trade offs between today and future. Environmental problems due to effluent discharges require a long time to dissipate. If good soils are affected by pollution today, then there will be scarcity of good soil in future. In that case damaging one unit of soil now implies that it will be unavailable in the future. This places a scarcity premium on the resource. Thus, social costs have three components. In terms of full social cost accounting,

Social cost = Private cost + User cost

Applying marginal concepts,

MSC = MPC + MEC + MUC

For the above reasons, marginal social cost curve shows upward shift over marginal private cost curve (Fig. 8).

Social Benefits

Social benefits include private and external benefits. An external benefit is a benefit that accrues to somebody who is outside, or external, to the decision about

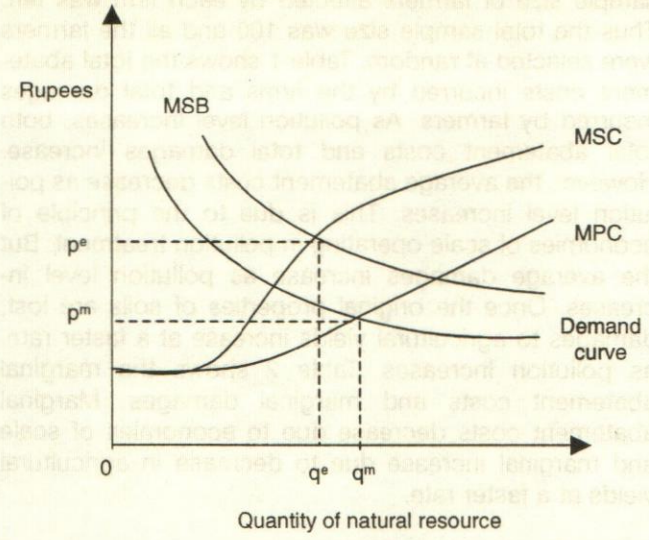

Fig. 8: Socially Efficient Rates of Resource

consuming or using the good or resource that causes the externality. When the use of an item leads to an external benefit, the market willingness to pay for that item will understate the social willingness to pay. Suppose in land on the outskirts of an urban area, the farmer cultivates agroforestry and sells his produce to people in the city. Of course, the farmer's main concern is the income he can derive from the operation, and he makes decisions about inputs and outputs according to their effect on that income. But the land kept in agroforestry produces several other benefits, including a habitat for birds and other small animals, honey production and scenic values for passer-by. These benefits, while internal from the standpoint of society, are external from the standpoint of the farmer. They do not appear anywhere in his profit and loss position. They are external benefits of his farming decisions. In this case the agroforestry value of the land to the farmer understates the social willingness to pay to have the land in agroforestry. All the external benefits that people get from something are equal to the amount they are willing to pay for it. We can use demand curves to determine the benefits of making various things available to people. Even if the price is equal to marginal social cost, there is no guarantee that social welfare is maximised, because price is different from social benefits. For example, the farmer produces trees and sells at P_0 = marginal social cost. By cultivating trees, the farmer keeps the air cleaner, thus creating a benefit to others. If we add the value of this benefit to the price, we obtain marginal social benefit. If the government adds the external benefits to the price of wood, the consumer has to pay full marginal social benefit. The efficient level of production of tree is identified by the intersection of the two curves, marginal social cost curve and marginal social benefit curve, labeled q^e in the figure. At this level, the social benefit is p^e (Fig. 8). Comparing market model (Figs. 7 and 8) and social model, the market output is too high compared to social output and the market price is too low compared to social price.

Environmental Policy Analysis

The market system, left to itself, will not normally produce results that are socially efficient. The quantity of output that actually appears in a market and its price are matters of positive economics. We now move to the public policy issues. If we know the fact that certain results occur in the economic real world are not socially efficient, how should we change them? This is a matter of normative economics.

The market system, left to itself, will not normally produce results that are socially efficient.

Fixing Standard

In the case of environmental policy, the command and control approach consists of relying on standards to bring about improvements in environmental quality. In general, greater the pollution, greater the damages it produces. To describe the relationship between pollution and damage, we will use the idea of marginal damage function. It shows the charge in damages stemming from a unit change in pollution. The marginal damage function shows that marginal damages are increasing modestly at the beginning and more rapidly as pollution gets larger. The marginal damage functions have thresholds, that is, values of pollution below which marginal damages are zero. Thus the pollutant can increase to these threshold levels without causing any increase in damages. Marginal abatement costs decrease when pollution gets larger. We shall assume that each firm is better informed about the most efficient manner for reducing its own pollution and economies of scale are present in the emission treatment. The marginal abatement cost, defined as the change in the total variable cost, for unit change in emission reduction, is increasing in the level of emission reduction. Hence, the marginal abatement cost function originates on the horizontal axis at the point of uncontrolled pollution level, that is pollution level prior to undertaking any abatement activities. In general, the marginal abatement cost originates from right (uncontrolled pollution level) and slopes upward to the right, rising the marginal abatement cost for a change in the level of emission reduction. Figure 9 shows an emission standard of e^s

where marginal damages are equal to marginal abatement costs. In case of environmental policy, the command and control approach consists of relying on standards of various types to bring about improvements in environmental quality. In general, a standard is simply a mandated level of performance. An emission standard is a maximum rate of emissions that is legally allowed.

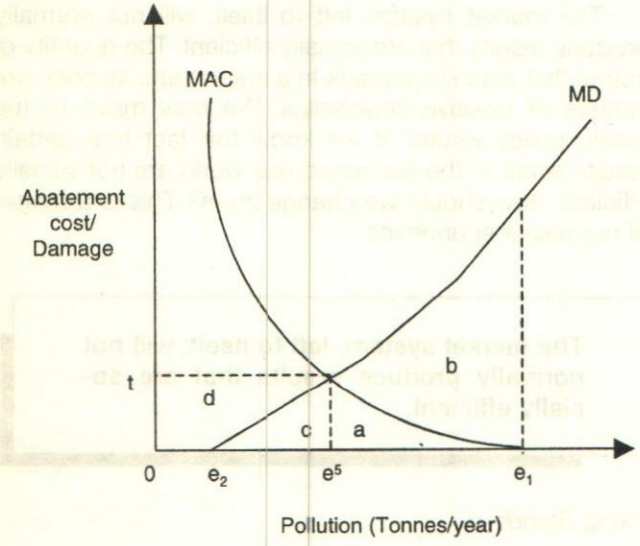

Fig. 9: Fixing Rate of Tax and Standard

Taxing

The most straight forward approach to control pollution of a particular residual is to have a public policy for taxing each unit of pollution. In a tax system, the government must say to the polluters that the polluter may discharge any amount of residuals he wishes, but his effluents will be measured in quantity and quality and his damages valued in monetary terms. He will be required to pay the amount equal to his effluents damage. If the marginal damages and marginal abatement costs are known, then the answer presumably would be to set the tax so as to produce efficient level of emissions, as in Fig. 9. The tax levels are fixed at the intersection of marginal abatement costs. At 't', total abatement costs equal 'a'. But the tax payment is (c+d) and so the total costs to the firm is (a+c+d). In case of standard, the total costs to the firm is 'a' only. The reduction in pollution level is same [(a+b+c) to c)] in both standard and tax system. However in tax system, money received from the firms (c+d) is used to treat the effluents. In standard system no money is received for treatment of effluents. Hence taxing is beneficial to the society and standard system is beneficial to firms.

Keeping these issues in view, a case study was undertaken in Salem district of Tamil Nadu. Ten sago processing firms and 100 farmers affected by the effluent discharges of these firms were selected. The sample size of farmers affected by each firm was ten. Thus the total sample size was 100 and all the farmers were selected at random. Table 1 shows the total abatement costs incurred by the firms and total damages incurred by farmers. As pollution level increases, both total abatement costs and total damages increase. However, the average abatement costs decrease as pollution level increases. This is due to the principle of economies of scale operating in pollution treatment. But the average damages increase as pollution level increases. Once the original properties of soils are lost, damages to agricultural yields increase at a faster rate, as pollution increases. Table 2 shows the marginal abatement costs and marginal damages. Marginal abatement costs decrease due to economies of scale and marginal increase due to decrease in agricultural yields at a faster rate.

Table 1: Abatement Costs & Damages

Pollution level (tons/year)	Total abatement costs (Rs)	Total damages (Rs)	Average Abatement costs (Rs/ton)	Average Damage (Rs/ton)
0	..	..	..	..
1	1962	1589	1962	1589
2	3846	3281	1923	1640.50
3	5613	5046	1871	1682
4	7048	7359	1762	1839.75
5	8357	9948	1671.40	1989.60

Table 2: Marginal Abatement Costs & Marginal Damages

Pollution level (tons/year)	Marginal Abatement costs (rs/ton)	Marginal damages (Rs/ton)
0	..	..
1	1962	1589
2	1884	1692
3	1767	1765
4	1435	2313
5	1309	2589

Table 3 shows various policy alternatives. If the firms treat all five tonnes of effluents, there will not be any pollution. The society will be benefited from this outcome. If the government fixes a standard that the firm has to treat two tonnes of effluents and can discharge three tonnes without treatment, then the society will incur a loss of Rs. 5046 due to damages and the firm will spend Rs. 2744 towards treatment. If the government fixes no standard and allows all effluents, then the total damage is at Rs. 9948 to the society. If the government fixes tax rate of Rs. 1767 per tonne of effluent by equat-

ing marginal abatement costs and marginal damages, then the firm has to pay Rs. 5301 as total taxes and spend Rs. 2744 towards treatment. Tax is a transfer payment and this amount will be useful to the society for treating pollution and cleaning the environment.

Table 3: Policy Alternatives

Policy	Alternatives	Firms	Society
No Pollution	Treating all five tonnes per year	TAC is Rs. 8357	No damage
Fixing Standard	Pollution level @ three tonnes per year. The firm will treat fourth and fifth units (two tonnes)	TAC is (8357-5613) Rs. 2744	Total damage is Rs. 5046
No treatment	Pollution level @ five tonnes per year.	TAC is Zero	Total damage is Rs. 9948
Taxing	Tax rate at Rs. 1767 per tonne. The firm will treat two tonnes and discharge three tonnes	TAC = 2744 TAX = 5301 Total = 8045	Total Damage is Rs. 5046

Conclusion

Used properly, economics can identify the policy instruments necessary for sustainable development. At the same time, the broader policy focus requires that the traditional economic approach be reassessed and that methodologies be improved and refined. Infact, much can be gained if the tools and concepts offered by modern economic theory are applied systematically and correctly. Modern economic analysis avoids taking a static view and instead focuses on the dynamic nature of the complex environmental and natural resource problems with their multitude of linkages and indirect effects. Social cost and benefit accounting considers externality and intergenerational equity. Compared to market model, social model produces efficient results. Taxing is an important policy instrument which forces the polluter to pay a certain tax for every unit of effluent discharged by the industries. Although tax system ends up costing the firm more than the standards approach, it is essentially getting the services of quality environment. Taxes are transfer payments which are paid to purify environment by the firms. Hence society prefers taxes over standards.

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A race horse that can run a mile a few seconds faster is worth twice as much. That little extra proves to be the greatest value.

– John D. Hess

Feature

Energy Use & Projection for Rural Households in Tamil Nadu

K. Uma, J. John Gunasekar, P. Subramanian & A. Sampath Rajan

Analysis of energy profile of specific sectors is crucial for energy planning. The article presents a study on the energy consumption pattern in rural households.

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Energy is a critical commodity which supports life system on earth. The demand for energy in rural India is growing rapidly due to rise in population on one hand and increased use of energy as an input on the other. However, the present position in respect to the availability of energy and its use presents an unsatisfactory picture. As such the energy profile is beset with several serious problems which need remedial measures.

Energy Profile in households

Total energy supplies, both commercial and non-commercial, increased from 82.7 MTOE (Million Tonnes of Oil Equivalent) in 1950-51 to as much as 291 MTOE in 1990-91. In the total energy consumption, the share of commercial energy increased from 26 per cent in 1950-51 to 49 per cent in 1990-91 and that of non- commercial energy declined from 74 per cent (61.20 MTOE) to 41 per cent (110.31 MTOE). Though the share of non-commercial energy in the country has come down, its consumption in absolute terms has increased. In commercial energy consumption (Table 1), the share of household sector was 13.8 per cent in 1990-91 of which larger share was used by urban households. The use of non- commercial energy was predominant (98 per cent) in rural villages (Revelle, 1976), particularly in household sector. Commercial energy sources available in the rural sector are oil and electricity while non-commercial energy sources are fuel wood, agricultural residues and animal dung. In rural India, wood is the principal source as fuel (68.5 per cent) followed by oil products (16.9 per cent), animal dung (8.3 per cent), coal products (2.3 per cent), electricity (0.6 per cent) and others (3.4 per cent) (Report of the working group of energy policy, Planning commission, New Delhi, 1979). Firewood, kerosene, animal dung and agricultural residues provide cooking fuel to the bulk of rural population (Maheshwari et.al, 1981). Rural areas suffer both because of the limited availability of commercial energy and due to poor efficiency of gadgets used. Efficiency of firewood fuelled

chulhas and kerosene stoves has to be enhanced from existing levels, by proper development and enforcement of efficiency standards.

Commercial energy sources available in the rural sector are oil and electricity while non-commercial sources are fuel wood, agricultural residues and animal dung.

Table 1: Sectoral Share in Commercial Energy Consumption (%)

Sector	1960-61	1970-71	1980-81	1990-91
Household	10.6	14.3	12.3	13.8
Agriculture	1.8	3.8	6.1	9.0
Industry	40.7	51.6	57.0	50.4
Transport	44.9	29.4	23.5	24.5
Others	2.0	6.9	1.1	2.3

Source: Eighth Five Year Plan (1992-97) Vol. II, p. 162, Planning Commission, Govt. of India.

With this background, based on the technical programme in VII Five Year Plan home management component in Tamil Nadu Agricultural University has been initiated as a sub-centre under the All India Co-ordinated Research Project on Energy Requirement in Agricultural Sector. This sub-centre carried out studies to identify wasteful uses of energy in domestic sector and to establish technically superior and economically viable alternatives that improve quality of life in rural areas. Energy requirement is directly proportional to the well-being of the community and the socio-economic status of rural community influences energy consumption.

At household level, energy is required for cooking and lighting (Giriappa, 1991). Both commercial and non-commercial sources supply these requirements. Human effort is put forth to perform household activities like cooking, cleaning, child care, water collection, shopping, animal maintenance, farming etc. Estimation of energy requirements in unit operations in household sector is important in energy planning. Hence a detailed survey was conducted to estimate the available commercial and non-commercial sources and pattern of their utilization, the time and energy expanded.

The study was carried out with the following objectives:

- To examine the types and quantities of fuels used for household activities.
- To identify the household activities performed by different family members in rural households.
- To assess human energy consumption for different household activities.
- To make projections of energy demand for rural households.

Methodology

Energy assessment surveys were carried out in seven villages of different agroclimatic zones of Tamil Nadu (Table 2). The whole village survey approach was adopted to collect data from each farm household and non-farm household. The farm households were again classified into five categories viz., marginal (<1ha), small (1-2 ha), semi-medium (2-4 ha), medium (4-10/ha) and large farm (> 10ha) households based on the size of land holdings. A pre-tested questionnaire was used to obtain information from the households with special emphasis on commercial energy like kerosene and electricity used for lighting, traditional energy devices and practices and daily use of non-commercial fuels like firewood, dung and farm residues and fuel procurement. It also included the pattern of time utilization by men, women and children for household activities. In all the seven villages, the data were collected by both observation and recall methods. From the data collected, the energy consumption was determined using energy equivalents for various operations and energy sources (Mittal et. al, 1998). For zonewise and categorywise interpretation, weighted average was used.

Table 2: Villages Selected from Seven Agro-climatic Regions for Household Energy Assessment

Year of Survey	Village	District	Zone	No. of household
1986-87	Kempanoor	Coimbatore	Western	194
1987-88	Perumalpatti	Tutucorin	Southern	119
1987-88	Kokkal	Nilgiris	Hilly and high altitude	129
1988-89	Thiruvidai-maruthur	Thanjavur	Cauvery delta	221
1989-90	Sembala-kurichi	South Arcot	North eastern	122
1990-91	Therisen-amcope	Kanya-kumari	High rainfall	162
1991-92	Thimma-puram	Dharma-puri	North western	135

Energy Demand Projection

Several studies have showed the linkages between energy consumption and the distribution of income.

First, the total energy consumption per capita increases with the per capita GDP (Perspective Planning Division, 1981). Second, the share that traditional fuel sources (biomass) contributes to total energy consumption decreases with increasing per capita income.

The share that traditional fuel sources (biomass) contributes to total energy consumption decreases with increasing per capita income.

Energy consumption per capita is strongly positively associated with income. Also, the mix of energy carriers varies with income and its distribution (Hemalatha, 1988). In order to make projections of household energy demand; income elasticity of demand for energy was estimated using the following formula:

$$\eta_e = \frac{\Delta E}{\Delta I} \cdot \frac{I}{E}$$

Where,

η_e - Income elasticity of demand for energy

ΔE - Change in per capita energy consumption

ΔI - Change in per capita income

E - Base per capita energy

I - Base per capital income

The per capita income growth for the State of Tamil Nadu for the period 1992-99 was arrived at using the information from statistics available with Directorate of Economics and Statistics, Govt. of Tamil Nadu. The income growth rate was four per cent. The per capita increase in energy consumption for a given change in per capita income was measured through using the income elasticity. The η_e indicates the percentage change in per capita energy consumption for a given percentage change in per capita income. In the study, the base income was the per capita income of landless households which is the lowest. The highest income was found in medium farm households. The difference between the lowest and highest income was considered as the increase in income (ΔI). The corresponding energy intake for lowest and highest income households were taken to compute ΔE. The estimated income elasticity of demand for energy was 0.22. This means one per cent increase in per capita income will lead to 0.22 per cent increase in per capita energy consumption. Then projection was made (Paulino, 1986) using was $C_p = C_t (1 + \eta r)^{p-t}$

Where,

C_p - Projected demand for energy for the year P

C_t - Energy consumption at t^{th} year

η - Income elasticity of demand for energy

r - Income growth rate

However single income elasticity was assumed for all households for want of relevant data.

Increase in demand for energy is caused by two major factors viz. population growth and per capita income growth. The population growth adopted for the study is 1.332 per cent per annum, which was calculated from the rural population decennial growth rate of 13.32 per cent for the state of Tamil Nadu for 1981-91 census period. Using this population growth rate, rural population for each zone was projected for 2005 AD using the base population of 1991. Assuming average household size of five persons, the number of households for each region was arrived[1]. Thus the total increase in demand is the sum of increase in demand due to population growth and due to income growth. Population growth rate, income growth rate and income elasticity are the parameters used for projection of energy demand. The results of the household survey conducted in various zones of Tamil Nadu are as follows.

Farm Household Characteristics

The demographic details and household features in the villages showed that the family size ranged from 4 to 5.5. Most of the villages had nuclear families (67 to 95 per cent). On the average, all villages put together, about 29 per cent of households were landless and the rest farm households. There were no large farms present in the study villages. Medium farm category was also found to be absent in Kokkal, Thiruvidaimaruthur and Sembalakurichi villages. The per capita income (deflated at 1981 prices) of landless labourers in Thiruvidaimaruthur, Kempanoor and Sembalakurichi villages was around Rs. 600, whereas in Perumalpatti, Therisenamcope, Kokkal and Thimmapuram villages, it ranged between Rs. 1200 and Rs. 7998 depending upon the level of employment opportunities and wage rate given to the labour in the respective regions (Table 3). Thiruvidaimaruthur and Sembalakurichi villages had the lowest per capita income (Rs. 700) and highest in Thimmapuram with Rs. 9017 because of cultivation of commercial crops like jasmine, sugarcane and better employment opportunities coupled with joint family system. None of the farmers in Kempanoor, Perumalpatti

1. *Source:* Studies in the Department of Agricultural Economics.

Table 3: Per capita income of inhabitants

Rs./annum (Constant Price - Deflated for 1981 prices)

Category	Kempanoor		Perumalpatti		Kokkal		Thiruvidai-maruthur		Sembalakurich		Therisenamcope		Thimmapuram	
	(Western)		(Southern)		(Hilly)		(Cauvery Delta)		(North Eastern)		(High Rainfall)		(North Western)	
	Actual 1986	Const. Price	Actual 1987	Const. Price	Actual 1988	Const. Price	Actual 1989	Const. Price	Actual 1990	Const. Price	Actual 1991	Const. Price	Actual 1992	Const. Price
Landless	882	629	1967	1295	2802	1653	742	413.34	1224	626.83	2760	1234	21314	7998
Marginal	930	663	1619	1066	3139	1852	1549	862.63	944	483.46	3760	1681	19502	7318
Small	1776	1266	2444	1609	4163	2456	1929	1074.2	1577	807.40	4087	1827	27053	10151
Semi-medium	2883	2055	3756	2473	5683	3353	2379	1324.6	5493	2812.5	4156	1858	31932	11982
Medium	4303	3067	8994	5921	–	–	–	–	–	–	5680	2539	39690	14893
Mean	1427	1017	1979	1303	2010	1186	1254	698	1225	627	3707	1657	24029	9017

and Kokkal villages had reinforced concrete houses as the standard of living was relatively poor in hilly or dry land areas. Only tiled houses (constructed with stone and mud) were prevalent among the marginal, small, semi-medium and medium farmers in the three villages with one house per household. In Thiruvidaimaruthur village, thatched houses were constructed with mud alone. The number and type of houses reflected the status of people in that village.

Commercial Energy Used for Lighting

In rural non-electrified houses, kerosene lamps were used for lighting which included chimney lamps, open-wick lamps and improvised bottle lamps. The use of kerosene and electricity for lighting was generally minimal because of low availability, apart from high installation costs in the latter case. Kerosene was available through Public Distribution System at subsidised rates. Excess quantity if required was purchased from private sellers for higher prices. Table 4 indicates the categorywise quantity of kerosene and electricity used for lighting per day per household. On an average, about 2.03 MJ of electricity was utilised in electrified houses of landless households and about 3.97 MJ of kerosene was utilised in non-electrified houses of the same population in a day. In farm households, on an average, higher quantity (4.41 to 9.07 MJ/day) of electricity and lesser quantity of kerosene (0.99 to 5.62 MJ/day) were consumed. Total commercial energy consumption per day was found to be high among small and semi-medium farm categories and lowest in landless labour.

Table 4: Categorywise Commercial Energy Consumption for lighting, MJ/day

Category	Kerosene	Electricity	Total Commercial energy
Landless labour	3.97	2.03	6.00
Marginal farmer	3.97	4.41	7.39
Small farmer	5.62	5.97	11.60
Semi-medium farmer	1.98	9.07	11.05
Medium farmer	0.99	8.35	9.34

Table 4a: Zonewise Commercial Energy Consumption for lighting

Zone	Name of the village	Kerosene		Electricity		Total Commercial energy
		lit/ month	MJ/ Mon.	kWh/ month	MJ/ Mon.	MJ/ month
Western	Kempanoor 1986	3.52	116.40	5.16	61.55	177.90
Southern	Perumalpatti 1987	2.86	94.58	6.37	75.99	170.57
Hilly	Kokkal 1988	5.74	189.80	2.87	34.23	224.20
Cauvery delta	Thiruvidaimaruthur 1989	2.4	79.40	9.34	111.30	190.70
North eastern	Sembalakurici 1990	3.12	103.10	5.55	66.21	169.30
High rainfall	Therisensamcope 1991	1.16	38.36	20.91	249.5	287.8
North Western	Thimmapuram 1992	2.49	82.34	22.15	264.2	346.58

With regard to zonal comparison of commercial fuels (Table 4a), kerosene consumption was highest (5.74 lit/month) in Kokkal and lowest (1.156 lit/month) in Therisenamcope, whereas electricity usage was found

to follow reverse trend (2.87 and 20.91 kWh per month respectively). In Kokkal a hilly region, consumption of electrical energy was minimum because of non-availability of electricity and poor electrification. It was also noticed that the people used to go to bed much earlier, thus usage of lighting was comparatively less. In Therisenamcope, meagre quantity of kerosene was used for lighting. This indicated that electrified houses were more when compared to other regions which was proved by its highest electricity consumption among different zones in Tamil Nadu.

In Perumalpatti, kerosene consumption was high and ranged from 2-4 lit/month among all farm categories indicating that in case of power failure, all categories used kerosene lamps. Among the villages, total commercial energy consumption per month for lighting was found to be highest in Thimmapuram (346.5 MJ/month) followed by Therisenamcope and Kokkal, whereas in other zones, its consumption was lowest (<200 MJ/month). While comparing kerosene and electricity consumption, both are inversely related. As farm size increases, kerosene consumption decreases. Kerosene consumption is inversely proportional to the size of farm, whereas electricity consumption is directly proportional to farm size (Giriappa, 1991).

Kerosene consumption is inversely proportional to the size of farm, whereas electricity consumption is directly proportional to farm size.

Non-commercial Energy Used for Cooking

Use of fuel was found to be predominant in cooking and heating. Cooking activity included human energy but fuel used could vary depending upon the cooking devices, vessels, food materials and preparation methods. The traditional and cultural practices of families had greater influence on cooking practices, devices used and meal pattern. As indicated in the study of Dendukuri 1989, the majority of families in all villages cooked indoors. Very few households (about 10 per cent) cooked outdoors using traditional chulha made up of bricks or stones. To avoid smoke deposition and radiated heat inside the room, about 20 per cent of the households of all the villages cooked food in the verandah. The typical cooking device used in all regions consisted of potter's model of two pot and single pot traditional chulhas. The normal practice was to use the left side main pot hole for cooking rice and right side pot hole for pulses and vegetables or other minor items like dosai making or for heating water during winter. The commonly used cooking vessels were made up of mud, aluminium and brass, in a variety of shapes like spherical and flat-bottomed pots and vessels. Many housewives have changed their utensils from mud pots to aluminium because of their better look, long life and less fuel consumption.

Food was cooked twice a day in landless, marginal and small households in all the villages whereas it was cooked thrice a day in medium and large farm households. Among the two meal houses, one was cooked early in the morning before householders go for work and the other in the evening after they returned from field work. The large farm households, where the ladies were not engaged in field activities cooked three times a day since their only job was to look after the household activities with the help of assistants. The major difference observed among the seven villages was frequency of cooking. In Sembalakurich, most of the landless households cooked once a day, that too finger millet or pearl millet which was stored in water for the entire day to feed the entire family. In Thiruvidaimaruthur, rice was the staple food, cooked twice a day. In Kempanoor village which has urban influence, most of the households cooked three times a day and used rice and wheat as staple food. Traditional fuel like firewood, cowdung and agricultural waste were the major cooking fuels (Sharan, 1987 & Giriappa, 1991). Kerosene stoves were not used for cooking except in few households where it was used only in case of emergency. The source-wise and category-wise distribution of non-commercial fuel energy used for cooking in the seven villages are given in Table 5 and Table 5a.

Table 5: Categorywise Non-Commercial Energy Consumption for Cooking, MJ/day

Category	Firewood	Agricultural Waste	Cow-dung*	Mean for Total
Landless labour	38.6	12.30	26.23	77.1
Marginal farmer	46.8	15.06	35.98	97.84
Small farmer	49.2	23.22	37.1	109.5
Semi-medium Farmer	48.7	25.48	42.8	116.9
Medium Farmer	31.94	36.14	–	68.08

*Used in only one village – Thiruvidaimaruthur

Firewood: In Sembalakurichi and Kokkal villages, the entire population used fire wood only, which ranged from 3 to 6 kg day (around 63 to 64 MJ/day), whereas in Kempanoor it was about 3-5 kg per day (62 MJ/day), followed by Thimmapuram and Thiruvidaimaruthur (42.9 and 33.2 MJ/day) villages. The relatively high consump-

tion of wood in summer may be attributed to three reasons. First, wood burns faster in hot weather. Secondly, several families resorted to outdoor cooking during the season, implying greater radiation losses and higher requirements of cooking fuel. Thirdly, there was less compulsion to restrict fuel use in this season as dry fuel as well as time for gathering were available to women.

Table 5a: Zonewise Non-Commercial Energy Consumption for Cooking, MJ/day

Zone	Name of the village	Firewood	Agri-cultural I Waste	Cow-dung	Total
Western	Kempanoor	62.3	6.14	–	68.4
Southern	Perumalpatti	7.27	47.2	–	54.4
Hilly	Kokkal	62.7	–	–	62.7
Cauvery delta	Thiruvidai-maruthur	33.2	22.4	31.7	87.3
North eastern	Sembala-kurichi	64.2	–	–	64.2
High rainfall	Therisena-mcope	22.5	8.27	–	30.8
North Western	Thimma-puram	42.9	35.6	–	78.5

Dry dung: The entire procedure of preparation, drying, collecting and stocking takes 3 to 4 work days per household. Dung cakes prepared and stored on a large scale during summer, generally last for 4 to 7 months (i.e.) upto mid-January, depending upon the livestock availability and quantity prepared in individual households. Cowdung (31.7 MJ/day) as a fuel is important in Thiruvidaimaruthur because of large availability of livestock population and more time spent by women folk in that village in preparing dung as fuel. Livestock availability and quantity prepared was high in larger farm holdings when compared to landless and marginal. Hence low consumption was presumed in lower farm categories, where significantly higher consumption of dry dung as fuel was observed in summer because animals were less stable-bound, providing greater opportunity for collection of dung from common land by lower economic groups. In addition, dung of freely grazing cattle was gathered for fuel by many landless, marginal and small farm households who do not own livestock. But in Thimmapuram, cow dung was not used as fuel in spite of availability and it was mainly used as a farm yard manure rather than as a fuel.

Farm & Forest Residues: Stalks of pigeon pea, cotton and banana twigs were the crop residues widely used as fuel in Tamil Nadu for the periods soon after these crops had been harvested. Forest residues included dry twigs, barks, leaves and wood shavings. All these low-grade fuels required constant attention while cooking as they burned fast. They also emitted more smoke and were difficult to transport and store. The landless, small and marginal farmers who had less access to wood resources of good quality, were partially or wholly dependent on these forest/farm residues. It was noticed, while comparing the non-commercial usage among different categories, landless consumed more firewood and less of agricultural wastes (Giriappa, 1991). As the farm size increased, use of firewood decreased and vice versa in agricultural wastes. Utilisation of firewood and farm/forest residues were highest in winter and lowest during the monsoon. In Perumalpatti village, agricultural waste from chillies and cotton plant was the main source of fuel (47.2 MJ/day) for cooking; in addition to firewood of about 7.3 MJ/day (Table 5a). Contrary to the above, along with firewood 35.6, 22.4 and 6 MJ/day of agricultural wastes from vegetable crops like brinjal, bhendi and chillies were used as fuel in Thimmapuram, Thiruvidaimaruthur and Kempanoor respectively. Consumption of cooking fuels varied between landless labourers and farmers (Sharan et. al. 1987, Hemalatha, 1988). Consumption of landless and marginal was found to be lowest (around 70 MJ/day). For other categories, it increased as farm size increased. Commercial energy used for household activity especially for cooking was not predominant due to non-availability and high cost.

Commercial energy used for household activity especially for cooking was not predominant due to non-availability and high cost.

Human Energy: Typical houses in this rural area had tiled roofs and walls of stone and mud. Floors were plastered with mud in majority of houses. Floors paved with stone or unpolished stabs were observed mainly in economically better placed households. In particular, kitchens had mud floors in almost all houses to enable weekly plastering which is a local tradition. Yearly tasks include felling and storing fuel wood, making food preserves and attending to repairs of the house. Categorywise consumption shows that animal maintenance and household maintenance energy varies across categories. For other activities, there is no remarkable difference (Table 6). It was observed that womenfolk had the major share (8-10 per cent) of work pertaining to home. The daily time-use pattern of women for household activities is indicated in Table 7. In all villages, cooking consumed 2-4 hours followed by household maintenance which included washing of

Table 6: Energy spent by women - categorywise (MJ/day)

Activities	Landless Labourers	Marginal Farmers	Small Farmers	Semi-Medium Farmers	Medium Farmers
Cooking	4.09	4.51	4.69	4.85	4.79
Child rearing	0.80	0.45	0.58	0.78	1.43
Shopping	0.92	1.28	1.03	0.40	1.12
Animal Maintenance	0.70	1.54	2.17	2.38	2.82
Household Maintenance	3.06	3.24	3.45	4.29	5.06
Collection of water	1.15	0.82	1.17	1.30	1.96
Total	10.7	11.8	13.1	14.0	17.62

clothes, cleaning vessels and cleaning the house (0.5-4 hours). Time spent for household maintenance was found to be highest in Thimmapuram followed by Therisenamcope. Shopping was another time consuming activity especially at Sembalakurichi and Thimmapuram village, where the town was situated 10 km away and there was no proper transport facilities available. The people had to walk 2-4 km up and down to take a bus to the market and spent about 1 to 1.30 hours whereas in other zones they spent less than an hour. Time taken for animal maintenance was around one hour in almost all the villages except in Kokkal because this being a hilly area, availability of animal power was negligible. Hours spent for animal maintenance was nearly 2 hours in Thimmapuram followed by Thiruvidaimaruthur. Water collection activity consumed about 1-2 hours per day in Kempanoor and it was less than one hour in other zones. Due to urban influence, cooking (three times a day) and water consumption was higher in Kempanoor. Time spent for household activities was lowest in hilly areas and highest in North Western Zone. Totally 6-10 hrs was being spent by women for home activities irrespective of villages. As most women were engaged in agricultural or other outside work, the household work was being carried out early morning and late evening in landless, marginal and small farm households. The daily energy expenditure pattern for different household activities is indicated in Table 8.

As observed in Sehgal and Mittal (1982) report, cooking consumed the maximum amount of energy (71-77 per cent) in household activities and the same was observed in this study. In Thimmapuram village, the energy spent for household maintenance was higher and women

Table 7: Time spent by women for different household activities (h/day)

Activities	Kempanoor (Western)	Perumalpatti (Southern)	Kokkal (Hilly)	Thiruvidaimaruthur (Cauvery Delta)	Sembalakurichi (North Eastern)	Therisenamcope (High Rainfall)	Thimmapuram (North Western)
Cooking	3.185	2.085	3.515	3.458	2.17	2.12	2.60
Child caring	0.904	0.3676	0.12	0.4423	0.37	0.34	0.61
Shopping	0.84	0.1564	0.325	0.4203	1.05	0.55	1.07
Animal Maintenance	0.49	0.986	–	1.055	0.96	0.57	1.75
Household Maintenance	2.34	1.694	0.482	1.969	1.74	3.37	4.32
Collection of water	1.349	0.6448	0.296	0.398	0.75	0.67	0.87
Total	9.108	5.93	4.74	7.74	7.04	7.62	11.22

Table 8: Energy spent by women for different household activities (MJ/day)

Activities	Kempanoor	Perumalpatti	Kokkal	Thiruvidai-maruthur	Sembala-kurich	Therisen-amcope	Thimma-puram
Cooking	4.97	3.27	5.52	5.4	3.40	3.32	4.08
Child caring	1.42	0.58	0.15	0.69	0.58	0.41	0.95
Shopping	1.32	0.18	0.50	0.66	1.66	0.86	1.71
Animal Maintenance	0.77	1.55	–	1.42	1.5	0.89	4.11
Household Maintenance	3.68	2.68	0.75	3.09	2.73	5.29	5.22
Collection of water	2.12	1.01	0.47	0.91	1.17	1.05	1.43
Total	14.28	9.27	7.39	12.17	11.04	11.96	17.5

Table 9: Annual consumption of energy for rural households

GJ/H.H

1	2	3	4	5	6	7	8	9	10	11	12	13
Zone	No. of Rural families	Total (6+9+13)	Kerosene	Electricity	Com-mercial (4+5)	Fire wood	Agricul-tural Waste	Non-Com-mercial (7+8)	Men	Women	Chile	Human (10+11+12)
Western	682075	37.0	2.2	0.76	2.96	22.7	2.24	24.96	3.9	5.2	–	9.2
Southern	1426802	26.7	1.2	0.85	2.02	2.66	17.2	19.85	12.4	3.5	0.19	4.9
Hilly	71356.8	31.8	2.34	0.41	2.72	22.9	–	22.9	3.2	2.7	0.3	6.2
Cauvery delta	1533194	39.9	0.86	1.35	2.21	12.1	8.1	31.86	1.3	4.5	–	5.9
North eastern	1748420	30.7	1.28	0.78	2.07	23.4	–	23.4	1.3	3.7	0.28	5.2
High rainfall	260648	20.1	0.45	3.02	3.47	8.2	3.0	11.2	0.5	4.5	0.35	5.4
North Western	991648	40.2	0.97	3.2	4.17	15.65	12.9	28.6	0.7	6.6	–	7.4

Table 10: Percentage of sourcewise energy consumption for household activities

Energy source	Kempanoor	Perumalpatti	Kokkal	Thiruvidai-maruthur	Sembala-kurichi	Therisen-amcope	Thimma-puram
	(Western)	(Southern)	(Hilly)	(Cauvery Delta)	(North Eastern)	(High Rainfall)	(North Western)
Human							
Men	10.74	4.61	10.11	3.31	4.09	2.61	1.91
Women	14.04	12.91	8.51	11.34	12.11	22.58	16.48
Children	–	0.71	0.94	–	0.94	1.74	–
Total	24.78	18.23	19.56	14.68	17.14	26.94	18.38
Non-Commercial							
Firewood	61.15	9.91	71.78	30.34	76.13	40.81	38.92
Agricultural waste	6.03	64.33	–	20.47	–	15.00	32.30
Cowdung	–	–	–	28.97	–	–	–
Total	67.18	74.24	71.78	79.79	76.13	55.81	71.22
Commercial							
Kerosene	5.99	4.35	7.36	2.14	4.17	2.23	2.41
Electricity	2.04	3.17	1.28	3.38	2.56	15.03	7.98
Total	8.03	7.52	8.64	5.52	6.73	17.25	10.39

were not involved in off-farm activities especially in income generating activities. In addition, energy spent for animal maintenance was as high as cooking and household maintenance. This indicated that diversified agriculture was practiced in this village ensuring higher per capital income of Rs. 9017 per annum. In Kokkal village, human energy consumption for household maintenance was very low with 0.754 MJ per day because of hilly tract, they had small houses and clean environment due to less air pollutants. Collection of water also consumed less energy when compared to other activities (0.4676 MJ of energy per day). Maximum energy spent for collecting water was 2.11 MJ/day in Kempanoor village. Energy consumption among different categories of farm and non-farm households per annum is given in Table 9. It could be inferred from the table that there were three levels of energy consumption among different zones. The high energy consumption zones were North Western Zone with 40 GJ, Cauvery Delta Zone with 39.9 GJ and Western zone with 37 GJ. Medium energy consumption zones were North Eastern and Hill zone with 31 GJ. Low energy consumption zones were Southern

Table 11: Energy Demand Projection (Based on the Income Elasticity of Demand for Energy @ 0.88 % per annum)

(in lakh G.J.)

1	2	3		4		5		6		7		8		9		10	
Zone	No. of Rural families	Total (6+9+10)		Kerosene		Electricity		Commercial (4+5)		Fire wood		Agricultural Waste		Non-Commercial (7+8)		Human	
		1991	2005	1991	2005	1991	2005	1991	2005	1991	2005	1991	2005	1991	2005	1991	2005
Western	682075	252	284.8	15.00	16.95	5.18	5.86	20.18	22.8	154.8	175	15.2	17.2	169.8	191	62.7	70.88
Southern	1426802	381	430.7	17.12	19.35	12.12	13.7	28.82	32.58	37.95	42.9	245.4	277.4	283.9	320.9	69.9	79.0
Hilly	71356.8	22.7	25.6	1.66	1.87	0.29	0.33	1.94	2.19	16.3	18.4	–	–	16.3	18.4	4.4	4.97
Cauvery delta	1533194	612	691.8	13.18	14.9	20.69	23.4	33.88	38.3	185.5	209.7	124.18	140.4	488.4	552	90.4	102.2
North eastern	1748420	537	607.1	22.3	25.2	13.6	15.4	36.1	40.8	409	462.4	–	–	409	462.4	90.9	102.76
High rainfall	260648	52.4	59.2	1.17	1.32	7.87	8.9	9.04	10.2	21.3	24.1	7.82	8.84	29.2	33.0	14.07	15.91
North Western	991648	399	451	9.62	10.88	31.7	35.8	41.35	46.7	155.2	155.2	175.5	127.9	144.6	283.6	320.6	73.38
Total		2256	2550.2	80	90.4	91.5	103.4	171.23	193.6	980	1107.9	520.5	588.4	1680.2	1898.3	405.75	458.67

Table 12: Energy Demand Projection (Based on the Population Growth @ 1.332 % per annum)

(in lakh G.J.)

1	2	3		4		5		6		7		8		9		10	
Zone	No. of Rural families	Total (6+9+10)		Kerosene		Electricity		Commercial (4+5)		Fire wood		Agricultural Waste		Non-Commercial (7+8)		Human	
		1991	2005	1991	2005	1991	2005	1991	2005	1991	2005	1991	2005	1991	2005	1991	2005
Western	682075	252	303.28	15.00	18.05	5.18	6.23	20.18	24.28	154.8	186.3	15.2	18.29	169.8	204.35	62.7	75.46
Southern	1426802	381	458.54	17.12	20.6	12.12	14.58	28.82	34.68	37.95	45.67	245.4	295.3	283.9	341.67	69.9	84.12
Hilly	71356.8	22.7	27.31	1.66	1.99	0.29	0.35	1.94	2.33	16.3	19.61	–	–	16.3	19.61	4.4	5.29
Cauvery delta	1533194	612	736.55	13.18	15.86	20.69	24.9	33.88	40.77	185.5	223.25	124.18	149.45	488.4	587.7	90.4	108.79
North eastern	1748420	537	646.2	22.3	26.83	13.6	16.36	36.1	43.44	409	492.23	–	–	409	492.23	90.9	109.39
High rainfall	260648	52.4	63.06	1.17	1.41	7.87	9.47	9.04	10.87	21.3	25.63	7.82	9.41	29.2	35.14	14.07	16.93
North Western	991648	399	480.20	9.62	11.58	31.7	38.15	41.35	49.76	155.2	186.78	127.9	153.9	283.6	341.31	73.38	88.31
Total		2256	2715.1	80	96.2	91.5	110.12	171.23	206.07	980	1176.4	520.5	626.4	1680.2	2022.2	405.75	488.32

Zone with 26.7 GJ and High rainfall zone (20 GJ) energy consumption/household/annum respectively.

The share of each source of energy contributing to household activities among different zones of Tamil Nadu is presented in Table 10. About 55 to 80 per cent of energy was obtained from non-commercial energy sources and only 6 to 17 per cent was obtained from commercial sources. Among fuels, firewood contributed more except in Perumalpatti (Maheshwari et al., 1981 & Reddy, 1981). Human energy provided about 15 to 27 per cent of total energy and it was the second major energy source (Reddy, 1981) in rural households. Sharma and Bhatia (1987) found significant regional differences in different fuels which was also proved by this study. Regarding zone-wise consumption, Cauvery delta used highest non-commercial sources of energy (80 per cent) and lowest human and commercial energy. Human energy and commercial energy utilised for household activities were maximum in High Rainfall zone.

Energy Demand Projection

The sourcewise projections of energy demand for different zones are given in Table 11 and 12 based on

population growth and income growth respectively. Using the above, the increase in demand for energy for Tamil Nadu was arrived at and given in Table 13 and this was interpreted briefly as follows.

Based on income elasticity of demand, projected commercial, non-commercial and human energy would be 193.6, 1898.3 and 458.67 Lakh G.J. respectively. Projected energy demand due to increase in population would be 206.07, 2022.15 and 488.32 for the same respectively. The additional commercial, non-commercial and human energy requirement for 2005 AD for rural Tamil Nadu would be 57.19, 561.2 and 135.52 L.GJ when compared to present consumption. So increase in demand for total energy both due to population and income growth would be 753.54 L.GJ for rural Tamil Nadu.

Table 13: Increase in Demand for Energy

(in lakh G.J)

Energy Sources	Current Consumption	Energy Projection for 2005 AD (Due to Income Growth Rate)	Energy Projection for 2005 AD (Due to Population Growth Rate)	Increase in Demand for Energy (Both Due to Population and Income Growth)
1. Kerosene	80.0	90.4	96.2	26.7
2. Electricity	91.5	103.4	110.1	30.6
I. Commercial energy (1+2)	171.2	193.6	206.1	57.2
3. Firewood	980.0	1107.9	1176.4	327.3
4. Agricultural Waste	520.5	588.4	626.4	173.9
II. Non-commercial energy (3+4)	1680.2	1898.3	2022.2	561.2
III. Human Energy	405.8	458.7	488.3	135.5
Total (I+II=III)	2256.0	2550.2	2715.1	753.5

Conclusion

Conclusions that emerged out of this study were as follows.

- As the farm size increased, kerosene consumption decreased whereas electricity consumption rose. In case of non-commercial energy consumption, firewood consumption was highest in marginal farm category, likewise, variation in firewood and agricultural waste was observed. Consumption of agricultural waste was found to be low in landless and high in medium category indicating that larger farms have more quantity of agricultural wastes.
- Non-commercial energy consumption was highest in Thiruvidaimaruthur and lowest in Therisenamcope; firewood consumption was high in Sembalakurichi and agricultural waste consumption was high in Perumalpatti.
- In Thimmapuram, women were not permitted to work outside the household. In future, dependency of rural population on non-commercial energy may get reduced due to introduction of LPG and electrical devices. Increase in literacy level and employment opportunities for women may change fuel energy consumption not only in quantity but also in type and sources. Food habits may also influence the types of fuel used.
- Rural households which can not afford commercial energy still depend on non commercial energy. The shift to commercial energy may not take place in the near future. Hence, there is a need for designing user-friendly and cost effective chulahs for rural households to use non-commercial energy efficiently. Commercial energy consumption is maintained at the current level because of subsidies extended to electricity and kerosene. In order to ensure equity in energy consumption it is critical that the present level of subsidies for poor households be continued.

There is a need for designing user-friendly and cost effective chulahs for rural households to use non-commercial energy efficiently.

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The kaizen philosophy assumes that our way of life—be it our working life, our social life, or our home life—deserves to be constantly improved.

— Masaaki Imai

The ideas of control and improvement are often confused with one another. This is because quality control and quality improvement are inseparable.

— Kooru Ishikawa

Feature

Developments in the Practice of Maintenance Management

Bikash Bhadury

Practice of maintenance has undergone significant changes. Maintenance was, till recently, synonymous with repairs and consisted only of breakdown maintenance. Maintenance managers were charged with the responsibility of efficient management of repairs and ensuring that machines were brought back to working order as soon as possible. Over the years, maintenance managers have realised the importance of preventive maintenance. The article enumerates and elaborates on the developments in the field of maintenance.

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Maintenance is essentially an act of care or upkeep, and this not only includes fixing or mending broken parts and machines but also ensuring that such acts of repair renew or revive the equipment, that is, restore it to a sound or healthy state. At the same time, maintenance must include all activities taken to ensure prevention of failures and also prevention of deterioration of the equipment to the extent possible. Maintenance must not only restore an equipment to its working state so that it can be used to produce goods and services but also must preserve it and extend its useful working life. There are two kinds of maintenance activities, namely, restorative or corrective, and preventive.

Maintenance Function: Objectives

The manager of maintenance function, therefore, has two distinct roles, namely, as manager of physical assets and also as provider of service to his customers, who are his colleagues in production and other departments of a manufacturing organisation. His first role requires him to take proper care of the physical assets and to take actions which will extend, or prolong, their useful working life. The second role demands provision of prompt and fast reaction to his customers' needs. This role, therefore, has the objective of maximization of plant and equipment availability. These two roles are seemingly contradictory, but are, in reality, complementary since timely and efficient customer service can only be provided if plant and equipment are managed properly. Moreover, these objectives should be attained at a minimum cost. Thus, the objectives of maintenance are maximization of plant and equipment availability at minimum cost and proper care and upkeep of physical assets to ensure that their useful working life is also extended.

In continuous process industries, such as steel, fertilizer and pharmaceutical industries and thermal power

plants, maintenance should logically be a very important function. Continuous process industries very often use plants of single-stream series design, and failure of a machine may result in shutdown of a line, or even the entire plant, and unlike manufacturing industry, in continuous process industry, production jobs cannot be sub-contracted and the plant produces product only as long as machines are working. However, maintenance has been, and in many cases, still is, a thankless job. It is considered a necessary evil by management and does not get the attention it deserves. However, there is an awareness now of the pressing need for effective maintenance of plant and machinery. This realization came primarily through conferences and seminars, but the scale was turned by two basic economic reasons, which are as follows:

- Availability is increasingly being recognized as an essential factor in process plant operation. Moreover, with increasing use of automation, availability has become an important factor in manufacturing industry as well.
- Industrial plant and equipment are becomingly increasingly complex and their costs are also growing rapidly. This complexity coupled with higher costs of acquisition has brought about significantly higher costs of maintenance.

Maintenance affects company profits and profitability and this is primarily due to the effect of equipment availability, cost of maintenance and useful life of equipment on production costs, profits and profitability. The ways in which maintenance affects costs, profits and profitability are as follows:

- Through its relationship with availability, maintenance gives rise to the indirect cost of maintenance, namely, the cost of lost production, which occurs when the equipment, or the plant, is either under scheduled maintenance or under repair,
- Through its relationship with direct costs of maintenance, which includes the costs of maintenance manpower, spares and incidental materials, and also tools and instruments required to carry out the maintenance job, and
- Through its relationship with the useful life of the equipment, or the plant

Prevention of Failures – Condition Based Maintenance & Opportunistic Maintenance

Preventive maintenance is the total of all functions aimed at maintaining and improving, if possible, the reliability (and availability) performance characteristics of assets, in the form of plant, equipment and machinery. Preventive maintenance activities are undertaken because the costs of lost production from unexpected breakdowns is significant (in addition to the risk of secondary and/or consequential damages), and also because of the fact that when the asset receives proper care during its useful life, the cost of owning it is usually lower and its useful life is also usually longer. Moreover, preventive maintenance of production equipment is important for product quality and is an essential input for process control. This is evident from the fact that the process control clause of ISO9000 (clause 4.9 of ISO 9001: 1994) stresses the need for 'suitable maintenance of equipment to ensure continuing process capability.'

Preventive maintenance is aimed at maintaining the reliability (and availability) performance characteristics of plant, equipment and machinery.

In the early days, preventive maintenance took the form of routine activities like cleaning of the machine, the internals and working surfaces, and oiling and greasing, periodic replacements of bearings and other items with pre-determined lives, and periodic overhauls. Such routine maintenance, or periodic preventive maintenance, is based on the assumption that mechanical failures and process of deterioration of components depend only on the running time of the machine. The limitations of periodic preventive maintenance are as follows:

- It does not give full guarantee against breakdowns. This is particularly applicable to random failures, and if random failures are predominant, then periodic preventive maintenance has no effect on equipment availability,
- Some of the maintenance actions are unnecessary, and sometimes the plant, or equipment, is maintained too frequently resulting in a corresponding loss of production capacity.
- The components are, in many cases, not allowed to run till the end of their mechanical life, and are, at times, replaced too early.
- Increased number of running in failures may be caused by periodic overhauls. Incorrect assembly has been found to be critical cause of failure for mechanical equipment, and incorrect assembly may occur during servicing and overhaul.

Thus for the sake of equipment availability and useful life of plant and equipment, adequate and timely actions must be taken to minimize the incidence of incipient, or random, failures. Failures are caused by processes of accumulation of damages to the component and they give rise to gradual changes in the physical properties of the component. Thus, observation of specific parameter(s) rationally should make available such information through the analysis of which it is possible to predict the failure of the component. Such indicative parameters are called prognostic parameters, and the basis of predictive preventive maintenance, or condition based maintenance, is the observation, measurement and analysis of these prognostic parameters. Use of predictive, or condition based, maintenance becomes essential since identification of the condition of the equipment by monitoring of certain parameter(s) gives an early signal of an impending failure, and this not only enables timely preventive action but also facilitates maintenance planning. Condition monitoring can, in some cases, be carried out on-line (that is, while the equipment is running), whereas, in some other cases, the equipment has to be shut down for the purpose of observation and measurement of the prognostic parameter(s) (off-line). The monitoring methods generally used for plant and machinery are visual, performance, vibration, sound-level or noise, and wear-debris monitoring. These monitoring techniques are now highly developed and sensitive, and they can be used to monitor complex expensive machinery, either continuously (on-line) and periodically (on-line and off-line). The use of these techniques can lead to the detection of failure initiation thus, allowing, sufficient time to plan and execute necessary preventive action.

All condition monitoring is not of the on-line variety. In some cases, an equipment needs to be shut down for observation and measurement of the parameter(s). Moreover, in most cases, equipment inspection also requires stoppage, or shutdown of the equipment. The decision to shut down, whether it is for condition monitoring, periodic inspection, component replacement, or minor repair or adjustment, is a very difficult one since it entails loss of production and revenue. This is even more difficult in continuous process plants where shutdown of an equipment may entail the shutdown of a line, or the entire plant. At the same time, non-performance of these essential maintenance tasks may result in catastrophic failures, which, in turn, may cause much longer shutdowns and greater losses of revenue. Opportunistic maintenance is a term which is applied to maintenance work which is carried out during an equipment, or plant, shutdown, but which is not directed at the primary cause of failure or shutdown. In other words, an equipment can be stopped for maintenance or non-maintenance reasons and whenever such stoppages take place, there exist opportunities for carrying out preventive maintenance work of the shutdown variety. In manufacturing industry, significantly large production windows can and do sometimes occur. However, in continuous process industries, the production windows available are much smaller since they are primarily caused by the non-availability of raw materials/raw stock. In this context, it must be noted that in a system consisting of many equipment, the failure of one of its constituents may present an opportunity for carrying out preventive maintenance work on other equipment of the system. Similarly, the failure of multi-component equipment may present an opportunity for carrying out preventive maintenance on other components along with corrective maintenance work on the failed component. However, effective use of opportunistic maintenance calls for computerized maintenance planning and control procedures/algorithms.

Designing out Maintenance Activities – Maintenance Prevention (MP) & Maintainability Improvement (MI)

Designing out maintenance activities are directed at improving the availability of plant and machinery (Bhadury 1998). Such activities can either be directed at improving the reliability of the equipment (as denoted by an increasing MTBF) and/or improving its maintainability, which, in turn, is denoted by a decreasing MTTR. Thus, these activities, or efforts, are essentially of the following two types:

- Reliability and maintainability improvement efforts carried out at the stages of design, manufacture and installation (and also commissioning) of the equipment, and
- Reliability and maintainability improvement efforts carried out by the user of the equipment during its useful life,

This is shown in Fig. 1, wherein designing-out-of-maintenance activities have been initially classified under these two heads.

The Japanese use the term maintenance prevention (MP) for the first type of activity. This activity is directed at facilitating maintenance – free design in new equipment. For an effective design, the designer must be able to identify important failure modes and failure mechanisms, and attempt to eliminate them. If he cannot eliminate some of them, then he must take actions to mitigate the consequences of these failure modes and mechanisms. Failure mode is the observable behaviour of an item when it fails, as for example, the failure of an electric motor due to bearing seizure, whereas failure mechanism is the cause of the observ-

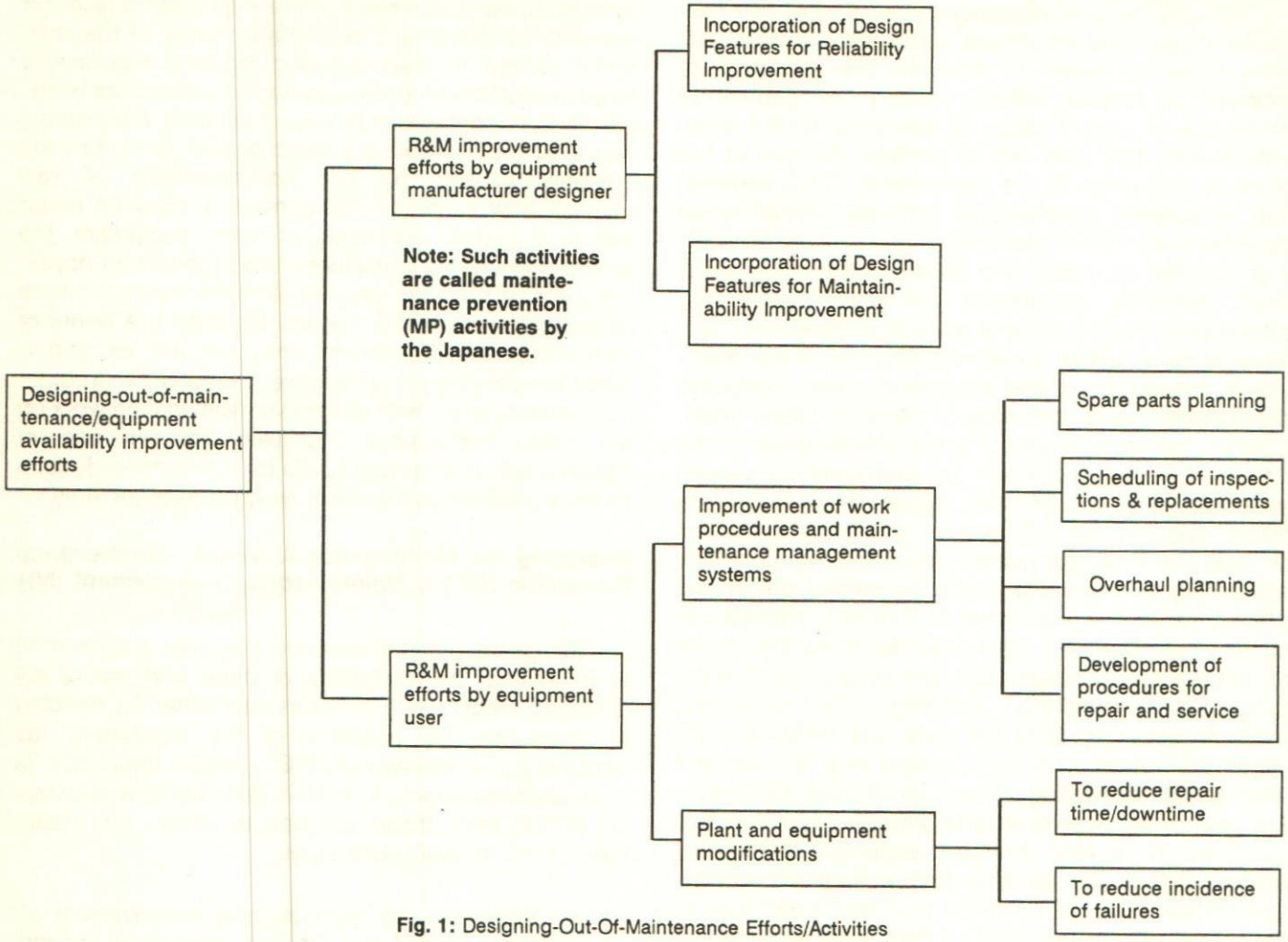

Fig. 1: Designing-Out-Of-Maintenance Efforts/Activities

able failure mode. Reliability block diagrams/system logic diagrams, FMEA and FMECA can be used to identify the important failure modes and failure mechanisms. Fault trees can also be constructed for undesirable faults/fault events, and fault tree analysis (FTA) can be used for identifying critical components and sub-systems. During the design and manufacture of an equipment, it may often be necessary or even desirable, in some cases, to trade off reliability for maintainability, or safety or one failure mode for another. Self-announcing failure modes, or ones which signal impending failure, or failure modes which allow partial operation of an equipment are generally preferred.

We come next to what the Japanese call maintainability improvement (MI). Here maintainability stands for the ease of maintenance, and accordingly, MI refers to activities that can reduce the time needed for the maintenance of plant and equipment. Reduction of maintenance can also be due to reduction of incidence of failures, and accordingly, MI also includes activities which are directed at reliability improvement. This has been shown in Fig. 1, where plant and equipment modification activities have been shown to include those which are directed at the reduction of the incidence of failures in addition to those which are meant to reduce the time required for the maintenance action. As shown in Fig. 1, MI includes both development of improved repair and maintenance procedures and maintenance management systems, and plant and equipment modifications. Main objectives of MI activities are:

- Identification of important causes of poor maintenance and excessive downtime, and
- Elimination, if possible, of these causes, without introducing new ones.

Main objectives of MI activities are identification of important causes of poor maintenance and excessive downtime, and elimination of these causes.

In cases where it is not possible to eliminate the causes, the objective is to mitigate the effect of these causes by minimizing the downtime for each type of failure.

Reliability Centred Maintenance (RCM)

The concept of reliability centred maintenance originated in the aircraft industry. It has now been successfully applied for more than 20 years, initially within the aircraft industry, and later in military establishments, nuclear power industries and the offshore oil and gas industry (Rausand, 1998). Users of reliability centred maintenance have been able to achieve significant reductions in maintenance costs, while maintaining, and in some cases, even improving, the availability of their operating systems. The following are the underlying tenets of this concept:

- The inherent reliability[1] of a system, which, in turn, is a function of its qualities of design and manufacture, can only be realized through implementation of an effective preventive maintenance program.
- Periodic preventive maintenance, consisting of only periodic replacements and periodic overhauls, cannot, by itself, form the basis of an effective maintenance strategy.
- Potential failures must be detected, in time, with the help of condition monitoring techniques.
- Hidden failures, which tend to be overlooked, must be detected through a program of scheduled preventive inspections.

Accordingly, the following four basic scheduled maintenance tasks are used to avert functional failures, potential failures and hidden failures of operating systems:

- Scheduled condition monitoring to detect onset of a failure
- Scheduled overhaul to enable the system to be restored to its original failure resistance.
- Scheduled replacement of components/ items to prevent critical failures of the operating system.
- Scheduled inspections/function tests to discover failures/deficiencies of a hidden nature.

1. Inherent availability is more appropriate since, for the user, availability of operating systems is the practical manifestation of their reliability.

The main focus of RCM is on system functions. This is clearly evident from the definition provided by the Electric Power Research Institute (EPRI) (Rausand, 1998). According to EPRI, RCM is: "a systematic consideration of system functions, the way functions can fail, and a priority based consideration of safety and economics that identifies applicable and effective preventive maintenance tasks".

As shown in Fig. 2, the RCM exercise starts with the selection of the system and its definition. This is followed by functional failure analysis (FFA). This is the most important and basic step of the exercise, and, during FFA, functional failures are identified through a systematic study of system functions and interfaces. For each of the functional failures thus identified, the critical items, or the maintenance significant items (MSI's), are selected in the next step. The criticality of the item may be due to its functional significance and/or the maintenance cost involved. Thus both these aspects must be

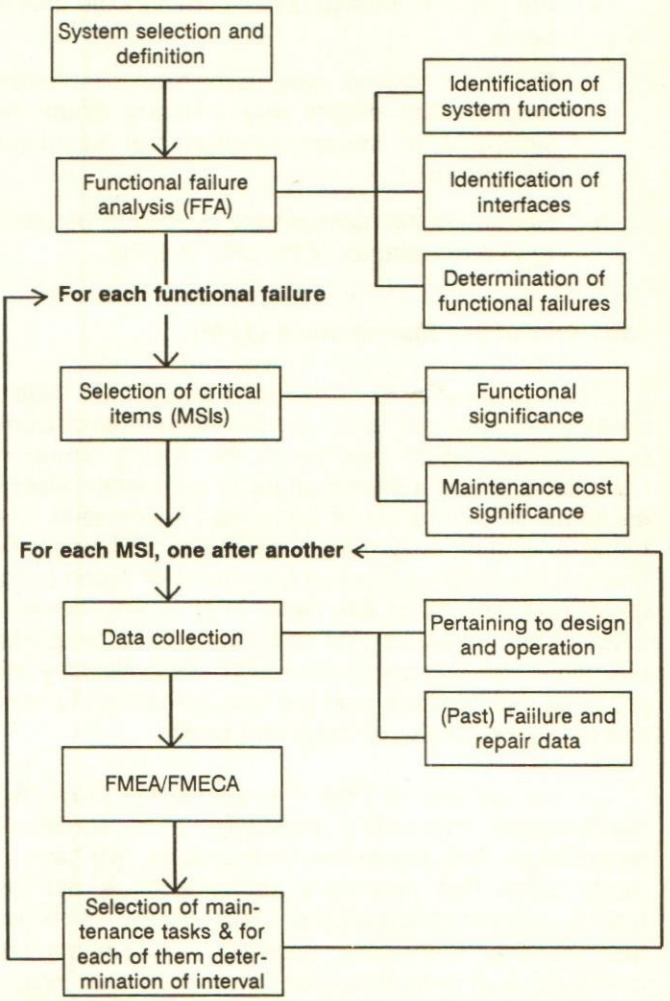

Fig. 2: Systematic RCM Procedure-Sequence of Steps

taken into account in the selection of MSI's. For each of these MSI's, FMEA/FMECA has then to be carried out. But before that, data relating to the design and operation of the item (component/sub-system) and its past failure and repair data has to be collected in the fourth step. The fifth step is a structured failure modes, effects and criticality analysis (FMECA). FMECA is preferable, but in cases, where data needed for the determination of criticality is not available, failure modes and effects analysis (FMEA) can be used. Based on this analysis, that is, for each of the important failure modes, the four kinds of scheduled maintenance tasks, as noted, are decided upon for the MSI's together with the determination of the relevant intervals. Through this systematic procedure as shown in Fig. 2, RCM attempts to:

- Define the functions and associated performance standards of the equipment/plant in the given operating context
- Identify the functional failures
- For these functional failures, identify the critical items
- For each critical item, determine the failure modes, their effects and criticality (from the viewpoint of system function and functional failure) and
- Determine the maintenance actions to be taken to prevent failures of the critical items.

Total Productive Maintenance (TPM)

TPM is a Japanese innovation and it was initially developed in the mid 1960's by the Nippondenso Company Limited, which belongs to the Toyota Group of companies and is a manufacturer of automotive electrical parts. In the 1970's, it underwent refinements and found acceptance by many companies in Japan, and finally in the 1980's,it crossed the shores of Japan to the developed nations of the West. TPM is not merely a concept but a practical and down-to-earth technique for not only improving plant and equipment availability and reducing maintenance cost but also achieving improvements in productivity, revenue and profits.

In the context of TPM, Pm stands for productive maintenance. Productive maintenance is something much larger than preventive maintenance. We have already noted that preventive maintenance is not just routine, or periodic preventive, maintenance, that is, not just cleaning, lubrication, periodic replacements and overhauls, and periodic inspection. It must also include predictive maintenance based on monitoring of the condition of component(s)/machine/equipment, and designing-out-of-maintenance activities, which, in turn, should include both maintenance prevention (MP) and maintainability improvement (MI). Therefore, preventive maintenance is sum total of periodic, or routine, preventive maintenance, predictive maintenance, and MP and MI activities. In addition to all this, productive maintenance recognizes that loss of production caused by equipment and machine breakdowns is not the only kind of loss which affects the productivity of equipment and machines. Productivity is also affected by other kinds of losses, which are

- Setup and adjustment losses
- Losses due to idling and minor stoppages
- Losses due to reduced speed or operation at less than full load
- Losses due to defects in process and production of defective products and
- Losses due to reduced yield from the startup of the machine to the point of stable production.

These five together with the losses due to downtime caused by equipment breakdowns are called the 'six big losses'. These six big losses cause a reduction in overall equipment effectiveness, and the objective of productive maintenance is improvement of overall equipment effectiveness. Thus, total in TPM stands for:

- Total effectiveness aimed at the pursuit of economic efficiency and improvement of productivity and profitability, and
- Total maintenance which must include condition-based maintenance of plant and machinery, building in of reliability and maintainability features, plant modifications and other activities aimed at maintenance prevention and designing-out-of-maintenance.

Moreover, total also includes total participation, which, in turn, is achieved through a motivated workforce, job enlargement of production operators, maintenance skills training of maintenance tradesmen, and small group activity in every department and shop and at every level of the organisation.

The three identifying characteristics of TPM are:

- Stress on the elimination of the six major equipment losses,
- Autonomous maintenance, and
- Use of small group autonomous activity for TPM promotion. Under autonomous main-

tenance, production operators are charged with the responsibility of maintaining their own machines in good running order, and are also expected to be capable of detecting potential problems to avert major breakdowns.

Activities carried out by the production operator include the following:

- Maintenance of normal operation of the equipment—this includes maintenance of operating standards and adherence to standard operating procedures, and proper adjustment of machine during setups and operation.
- Equipment maintenance—this includes routine maintenance tasks of cleaning, lubrication, bolting/tightening of fasteners, daily inspections and minor servicing, and certain periodic inspections of the equipment.
- Early detection of abnormality and prompt reporting.

They are also held responsible for ensuring that there is no overloading of the machines and overstressing of the components. Implementation of autonomous maintenance calls for a fundamental change of altitude in employees—moving away from the 'I operate and you fix' syndrome. This change of attitude implies cooperation and recognition of the fact that operations and maintenance are inseparable when it comes to the job of looking after the maintenance of production equipment and machines. Moreover, implementation of autonomous maintenance and TPM cannot be carried out without the participation of employees. Employee participation through the use of small group autonomous activity is the most essential ingredient for implementation of autonomous maintenance and for TPM promotion.

Concluding Remarks

Maintenance function has come a long way. Initially preventive maintenance consisted only of routine, or periodic preventive, maintenance tasks. Soon condition based maintenance was added to maintenance management, and the task of the maintenance manager was enlarged to ensuring maximization of plant and equipment availability. The efficacy of opportunistic maintenance also became evident, particularly in continuous process industries. Maximization of availability and need to extend the useful life of plant and equipment became a major challenge. The maintenance management function had to necessarily change, since for designing-out-of maintenance activities, it had to collect reliability and maintainability data of plant and equipment, identify recurrent failures and important reasons for loss of availability, and take recourse to sophisticated and modern tools, such as FMEA/FMECA and fault tree analysis. RCM was a major innovation and it brought together all the lessons learnt over the years. It effectively uses condition monitoring techniques, past data collection and analysis, and FMECA, and stresses the importance of a formal program of preventive maintenance. TPM is still larger, since it goes beyond the earlier limits of maintenance management. It looks at other kinds of losses of production and productivity, and also espouses the use of a formal program of employee participation for effective management of maintenance function.

Employee participation through the use of small group autonomous activity is the most essential ingredient for implementation of autonomous maintenance and for TPM promotion.

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Feature

Production & Marketing of Basmati Rice in Punjab: A Study

P.S. Rangi & M.S. Sidhu

Punjab can boast of maximum yield (production per hectare) of rice in the country though area under the crop is only 5 per cent of the national average. The study presents the facts and figures regarding the cultivation and marketing of basmati rice in Punjab.

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Rice is one of the important cereal crops in the world. Average paddy production in the triennium (1995-97) has been about 564 million tonnes. India's share in world rice production was 21.5 per cent during 1995-97 leading to the country ranking as the second largest producer of rice in the world next only to China (Rangi & Sidhu, 1999) – the latter produces about 35 per cent of the world's rice production. India figures among the top producers merely because of its large area and not due to efficiency in production (Chand, 1997). The other important rice producing countries are Indonesia, Bangladesh, Vietnam, Thailand and Myanamar.

Rice Production in India

Rice is the most widely grown staple cereal crop in India. It is grown twice a year but predominantly during the kharif season. The area under rice crop was about 43 million hectares in the country during the year 1997-98 with West Bengal having the maximum rice area (13.6 per cent) followed by Uttar Pradesh (13.0 per cent), Madhya Pradesh (12.4 per cent), Bihar (11.5 per cent), Orissa (10.4 per cent), and Andhra Pradesh (8.1 per cent), the share of Punjab being 5.3 per cent. The major rice producing states are West Bengal, Uttar Pradesh, Andhra Pradesh, Punjab, Bihar and Orissa. Punjab had the maximum yield (3465 kgs per hectare) of rice in comparison to the national average of 1895 kgs per hectare during 1997-98. The production of rice which had witnessed a very high rate of growth of 3.76 per cent per annum during the eighties decelerated to 1.61 per cent per annum during the nineties (Government of India, 1998). Since rice accounts for 40-45 per cent of the total cereal production, it would be difficult to sustain the growth of foodgrain production unless this trend is reversed (Government of India, 1998).

After wheat, rice is the most important crop in Punjab, though it is not a traditional crop of the state. It was earlier grown only in low lying areas (Singh, 2000). In

the pre-green revolution period, its cultivation was confined mainly to Amritsar, Gurdaspur and Kapurthala districts. The farmers of Punjab have adopted the rice crop on a large scale only since mid-seventies. The area under the crop was just 3.90 lakh hectares in 1970-71 which increased by 5.46 times to 25.20 lakh hectares in 1998-99. At present the crop has about one-third share in the gross cropped area and 60 per cent share in the net area sown. Except for some areas of the south-western districts and Kandi belt of the state, rice is grown all over the State of Punjab. Main concentration of area under basmati rice is in Amritsar and Gurdaspur districts. The area under the crop has increased from about 41 thousand hectares in 1991-92 to about 1.26 lakh hectares in 1998-99. It is a major cash crop for farmers of the border districts of the State. India along with Pakistan are major exporters of basmati rice in the world market. Basmati rice is nature's gift exclusive to the Indian sub-continent. Farmers of this sub-continent (India and Pakistan) have been growing scented rice since centuries (Ahuja, et al. 1995). Basmati rice is a good foreign exchange earner for our country.

Keeping in view the importance of the crop, the present study has been undertaken to review the production and marketing of basmati rice in Punjab.

Methodology

This paper is based on the report submitted by the authors to the State Government on basmati rice in September, 2000*. It was based on the primary as well as secondary data. The primary data was collected from 75 farmers of Amritsar and Gurdaspur districts for the year 1998-99. The sample was not confined to particular group of villages of these districts but an attempt was made to give wider representation to different categories of farmers from a vast area of these two districts. The data was collected through personal interview method and convenience sampling technique was used for selection of respondents.

Results & Discussion

Area, production & yield of basmati rice

Data regarding area, production and yield of basmati rice in Punjab has been given in Table 1. During the period 1991-92 to 1998-99, the area under the crop varied from about 41 thousand hectares in 1991-92 to 1.45 lakh hectares in 1992-93. There has been inter-year fluctuation in the area on account of prices received by the farmers as well as its yield. As already stated, the main concentration of area under basmati rice is in Amritsar and Gurdaspur districts of the State. The crop has almost disappeared from another traditional basmati rich growing district, i.e., Kapurthala in the recent past due to attack of various diseases and subsequent decline in its yield. The production of basmati rice was about 52 thousand tonnes in 1991-92. It reached the peak level of about 2.63 lakh tonnes in 1992-93 but again started fluctuating on account of variation in area. It was 87 thousand tonnes in 1996-97 but further increased to 1.49 lakh tonnes in 1998-99. The yield of the crop was maximum, i.e., 1813 kgs per hectare in 1992-93. After that, it started declining and reached the level of 1186 kgs per hectare in 1998-99, because basmati rice is host to a number of diseases such as blasts, bakenee/foot rot and brown spot and insect pests such as leaf fodder and stem borer. The dominance of paddy-wheat rotation has mainly created this menace in the state.

Table 1: Area, production and yield of basmati rice in Punjab, 1991-92 through 1998-99

Year	Area (hect.)	Production (m. tonnes)	Yield (kgs/hect.)
1991-92	41380	51642	1248
1992-93	145040 (250.51)	262958 (409.19)	1813 (45.27)
1993-94	87160 (110.63)	133703 (158.90)	1534 (22.92)
1994-95	67950 (64.21)	88811 (71.97)	1307 (4.73)
1995-96	86440 (108.89)	120757 (133.83)	1397 (11.94)
1996-97	64800 (56.60)	87156 (68.77)	1345 (7.77)
1997-98	91160 (120.30)	123886 (139.89)	1359 (8.89)
1998-99	126000 (204.49)	149436 (189.37)	1186 –(4.67)

Note: Figures in parentheses indicate the percentage increase over 1991-92.

Source: Director of Agriculture, Punjab, Chandigarh.

Market arrival

Information regarding market arrival of basmati paddy from 1988-89 through 1998-99 is shown in table 2. The data indicates that there were inter-year fluctuations in the market arrivals on account of variations in production. The maximum arrival, i.e., 1.59 lakh tonnes was recorded in 1992-93. In the recent past, it was less than one lakh tonnes each year. The recorded market arrival was low compared to the percentage of produc-

* Ranji, P.S. et al. 2000. Report of the Expert Group on Basmati Rice, Submitted to the State Government/PAGREXCO in September 2000, pp. 1-81.

tion as millers, traders, etc. made direct purchase from the farmers and evaded payment of official market taxes and cesses. Hence, the official figures were less although actual market arrival of the produce might be higher. Evasion of market fee, taxes and cesses has very wide implications for the state economy because it adversely affects the revenue of the Punjab Mandi Board/State Government. These funds are mainly utilized for development of infrastructure which is vital for any economy. The State Government as well as Punjab Mandi Board may strengthen their enforcement wings and guilty millers and traders should be fined heavily irrespective of their political affiliations and contribution towards party funds.

Table 2: Market arrivals of basmati paddy in Punjab, 1988-89 through 1998-99

(tonnes)

Year	Market arrivals*	%age of production
1988-89	123460	-
1989-90	112521	-
1990-91	51760	-
1991-92	52901	61.34
1992-93	159503	36.32
1993-94	141384	63.32
1994-95	66840	45.07
1995-96	94236	46.73
1996-97	82495	56.68
1997-98	97098	46.93
1998-99	78349	31.40

*As on August 31 each year.

Note: Market arrivals were less in proportion to production on account of evasion of market fee by the millers, traders, etc.

Source: Deptt. of Foods and Supplies, Punjab, Chandigarh.

Scenario of basmati paddy at farm level

The study revealed that 36 per cent of sample farmers operated on 5 to 10 acres, 17 per cent up to 5 acres, about 21 per cent 10 to 20 acres, 11 per cent 20 to 30 acres and the rest (about 15 per cent) 30 acres and above. The last category of farmers generally comprised joint families. The average size of operational holdings was 16.2 acres out of which about 89 per cent area was owned and about 11 per cent was leased-in during the year 1998- 99. About 52 per cent of sample farmers had their own tractors whereas 45 per cent depended on custom hiring. One per cent each of the farms was bullock operated and tractor-cum-bullock operated. 64 per cent of sample farmers had tubewells as a source of irrigation whereas 36 per cent had both tubewell as well as canal irrigation.

Wheat, paddy (basmati and non-basmati) and sugarcane were the principal crops cultivated by the farmers. They allocated about 81 per cent of the area operated to wheat crop during rabi followed by non-basmati paddy (44 per cent), basmati paddy (38 per cent) crop during kharif and sugarcane (2 per cent). The rest of the area was under fodder crops, sunflower, maize, peas, etc. The entire area under basmati paddy was of basmati-386 variety which is locally known as Pakistani basmati. The per farm production of basmati paddy was 40.92 qtls and average yield obtained by the sample farms was 658 kgs per acre. The yield was dismally low during the year 1998-99 as it was not a normal year for this crop. Per farm under basmati paddy was 6.22 acres.

Marketed Surplus

The average production, family consumption and marketed surplus of basmati paddy with the sample farmers is given in Table 3. Table 3 showed that the selected farmers retained 5.25 per cent of the production for family consumption and seed. The requirement for seed was 1.25 per cent of the production on account of low seed rate. The rice is not a staple food of the Punjabis, therefore, four per cent of the production was kept for family consumption. The sample farmers had reported that basmati rice is generally used during social ceremonies in their families. It was also gifted to their wards and relatives settled in towns and cities. The marketed surplus was 94.75 per cent of the production which seems to be quite high. Earlier studies have also shown that the marketed surplus of rice was much higher in Punjab mainly due to low consumption of rice at the farms and higher production per unit area (Rangi, 1986).

Marketed surplus of rice was higher in Punjab mainly due to low consumption of rice at farms and higher production per unit area.

Disposal of marketed surplus

The study brought out that 92 per cent of the sample farmers sold their produce through normal market channel in the regulated markets, three per cent in the village itself to the itinerant traders and five per cent had no surplus to sell. About 89 per cent of sample farmers sold their produce in the post-harvest period itself. But in quantity terms, it was about 98 per cent of the total marketed surplus. The rest 11 per cent sold the produce in lean period. In quantity terms, it was just two per cent of the marketed surplus. The farmers reported

that they kept the produce to be sold in lean period in the hope that price would rise further as their past experience has shown that the price generally rises in the lean period. However, it also declined during some years due to market forces of demand and supply. The traders as well as arhtiyas play an important role in this regard. Generally, paddy is not stored by the farmers because it is likely to deteriorate in quality due to high moisture content (Rangi, 1986).

Table 3: Per holding production and marketed surplus of basmati paddy with the selected farmers, 1998-99

	Particulars	Quantity (qtls)	%age to the production
I.	Production	40.92	–
II.	Family consumption	1.64	4.00
III.	Seed	0.51	1.25
IV.	Total consumption (II + III)	2.15	5.25
V.	Marketed surplus (I-IV)	38.77	94.75

Cost of cultivation of basmati paddy

The various components of cost of cultivation of basmati paddy are given in Table 4. The cost of cultivation of basmati paddy was about Rs 9369 per acre. The operational and fixed costs were almost equal at about 50.02 and 49.98 per cent respectively. Labour cost is the single most important component in the total cost of cultivation of any crop in the country. Human labour generally accounts for between 30 and 60 per cent of total operational cost in various crops depending upon method of cultivation and variations in agro-economic conditions under which these crops are grown in different states (Government of India, 1998). For raising basmati paddy, major operational cost was on human labour (about 20 per cent), fertilizers (about 8 per cent), machine expenses (about 8 per cent), irrigation charges (about 7 per cent) and insecticides and pesticides expenses (about 3 per cent). The fixed cost mainly comprised land rent (about 42 per cent) and interest on fixed capital (about 7 per cent). It is worthwhile to point out here that farmers did not bear any land revenue, cesses and taxes because the Punjab Government had abolished such levies since February, 1997.

The gross as well as net returns from the basmati paddy cultivation are shown in Table 5. The gross returns were Rs. 12194 per acre and net returns were estimated at Rs. 2825 acre during the year 1998-99. The returns over variable cost were about Rs. 7508 per acre. Another study has shown that net returns over variable costs were about Rs. 3083 per acre from the basmati rice in Punjab during the year 1994-95 (Singh, 1996). To encourage

Table 4: Cost of cultivation of basmati paddy 1998-99

(Rs. per acre)

Sr. No.	Items	Cost	%age to total cost
(a)	**Operational cost**	4686.19	50.02
	Human labour	1844.88	19.69
	Bullock labour	56.60	0.60
	Machine expenses	708.45	7.56
	Irrigation charges	648.91	6.93
	Seed	148.42	1.58
	Fertiliser	768.15	8.21
	Manure	36.93	0.39
	Insecticides and pesticides	312.00	3.33
	Misc. charges	3.38	0.04
	Interest on working capital	158.47	1.69
(b)	**Fixed cost**	4682.73	49.98
	Land rent	3895.00	41.57
	Land revenue cesses and taxes	–	–
	Depreciation on Farm buildings and implements	104.65	1.12
	Interest on fixed Capital	683.08	7.29
(c)	Total cost (a + b)	9368.92	100.00

Table 5: Economics of basmati paddy in Punjab, 1998-99

Particulars	Rs. per acre
Yield (qtls per acre)	6.58
Price received by the farmers (Rs/qtl)	1800.00
Value of main product	11844.00
Value of by-product	350.00
Gross returns	12194.00
Returns over variable cost	7507.81
Net returns (gross returns - total cost)	2825.08

farmers to increase area under basmati paddy in Amritsar and Gurdaspur districts, the State as well as Central Government may formulate a policy of giving price support to basmati paddy at the rate of 3.5 times the price fixed for "A" grade varieties of non-basmati paddy (parmal varieties). The yield of basmati paddy is less vis-a-vis non-basmati paddy varieties. The price of basmati rice is high in the international market, therefore, export of basmati rice may be a good source of foreign exchange earnings for the country. Alternatively, if the government fights shy of giving price support to basmati growers, contract farming for this crop may be tried and the millers as well as exporters may be encouraged toward contract farming system. The need of the hour is to exploit the potential of the Punjab farmers in this respect. On a pilot basis, contract farming may be started from Chogawon block of Amritsar district where the quality as well as yield of the produce is very high.

To encourage farmers to increase area under basmati paddy Government may formulate a policy of giving price support at the rate of 3.5 times the price fixed for 'A' grade varieties of non-basmati paddy.

Price spreads of basmati rice

The price spread of basmati paddy (rice) through the main distribution channel for the year 1998-99 is given in Table 6. The farmer's sale price was Rs 1800 per qtl of paddy which worked out to be about 67 per cent of the consumer's price. The farmer's net price was about 66 per cent of the retailer's sale price to the consumer. The wholesaler's and retailer's margin was 1.11 and 7.40 per cent respectively of the consumer's price. The miller's margin was 5.36 per cent whereas his costs worked out to be 16.73 per cent of the final price. The main items of expenses were marketing charges (7.68 per cent), interest charges (3.44 per cent), storage loss (1.43 per cent), processing charges (1.38 per cent) and incidental charges (0.76 per cent). The miller had to bear transportation cost of Rs 25.00 per qtl for sale of produce in Delhi market where price generally rules higher in comparison to Punjab. Delhi itself is a big consuming market having a population of 123 lakhs. Moreover, it serves as a distribution centre for the whole of north India being the principal secondary market of the country. The wholesaler's and retailer's costs were 0.26 and 2.34 per cent respectively of the consumer's price.

Price spreads for export channel

The price spreads of basmati rice in case of export channel is given in Table 7. The total cost borne by the miller was Rs 3703.59 per qtl which was 78.30 per cent of the export price at Mumbai. It may be mentioned here that most of the exporters are millers also, therefore, their expenses have been treated at par. The exporter had to bear Rs 572 per qtl for export of basmati rice at Mumbai port. In this regard, he had to pay APEDA registration charges (Rs 10 per qtl), packing charges (Rs 125 per qtl), transportation cost by container (Rs 100 per qtl), terminal handling charges (Rs 150 per qtl), clearing agent expenses (Rs 102 per qtl) and agency charges (Rs 75 per qtl). The exporter's/miller's margin was about 10 per cent of the export price. Even in absolute terms, it was almost double (Rs 241 per qtl). Hence, there was an additional advantage of Rs 213 per qtl which is quite sufficient incentive to the exporters. Indirectly, farmers were also gainers because they got high price of their produce in the local market through

Table 6: Price spreads for basmati paddy (rice), Punjab, 1998-99 (Channel: Producer-Miller-Wholesaler (Delhi)-Retailer-Consumer) (1 qtl of rice = 1.67 qtl of basmati paddy)

Sr. No.	Particulars	Rs/qtl	%age share in consumer's rupee
A.	Net price received by the farmer	2966.32	65.92
	Expenses borne by the farmer	39.68	0.88
B.	Miller's purchase price/farmer's sale price	3006.00	66.80
C.	Expenses borne by the miller	697.59	15.50
	Marketing charges	345.69	7.68
	Incidental charges	34.18	0.76
	Storage charges	16.70	0.37
	Storage loss and driage	64.30	1.43
	Processing charges	62.29	1.38
	Depreciation of machinery and equipment	11.39	0.25
	Overhead expenses	8.35	0.19
	Interest charges	154.69	3.44
D.	Total cost of the miller (B+C)	3703.59	82.30
E.	Expenses borne by the miller for sale of rice:		
	Cost of gunny bag	20.00	0.45
	Storage cost	10.00	0.22
	Transportation cost to Delhi including labour cost	25.00	0.56
F.	Miller's margin	241.41	5.36
G.	Wholesaler's purchase price/miller's sale price	4000.00	88.89
	Expenses borne by the wholesaler	11.75	0.26
	Storage cost	5.00	0.11
	Labour charges	2.50	0.06
	Misc. expenses	4.25	0.09
H.	Wholesaler's margin	50.00	1.11
I.	Retailer's purchase price/wholesaler's sale price	4061.75	90.26
	Expenses borne by the retailer	105.42	2.34
J.	Margin of the retailer	332.83	7.40
K.	Consumer's purchase price/retailer's sale price	4500.00	100.00

increased demand for exports. India along with Pakistan, are the principal basmati rice exporting countries of the world. At present, the quality of Indian rice in better in comparison to the Pakistani basmati. Above all, our marketing credibility is also high as far as export of basmati rice is concerned.

Basmati rice is in great demand in Saudi Arabia and U.A.E., Behrain, Kuwait and Oman due to excellent cooking quality and suitability for *Biryani* and *Pulao* (Ahuja, et al. 1995). Migration of Indians and Pakistanis to various parts of the world has also resulted in in-

creasing demands (Thakrar & Ahuja, 1993). In America, demand for aromatic and basmati rice is increasing at the rate of 50 per cent a year (Huke & Huke, 1990) and market is not limited to immigrants alone as aromatic rice is appreciated by main stream population. Basmati rice has crossed all cultural barriers and is served in Mexican hotels in America. The perception and requirements of basmati rice differ in various countries (Thakrar & Ahuja, 1993). Rice is a promising food crop for export in the world market in the near future. Hence, it is suggested that production of scented fine quality rice varieties like basmati should be encouraged in the country because these varieties of rice have more demand in international markets (Sharda, Deoghere & Shande, 1998).

Table 7: Price spread of basmati rice, Punjab, 1998-99 (Export Channel)

Particulars	Rs per qtl	%age share in export price
Cost of one qtl of rice*	3703.59	78.30
Expenses borne by the miller/ Exporter for export (FOB Mumbai)	572.00	12.09
– APEDA registration charges	10.00	0.20
– Packing charges	125.00	2.64
– Transportation cost by container**	110.00	2.33
– Terminal handling charges	150.00	3.17
– Clearing agent expenses	102.00	2.16
– Agency charges	75.00	1.59
Exporter's/miller's margin	454.41	9.61
Export price (FOB Mumbai)	4730.00	100.00

* For details of cost, refer to Table 6.

** Also included insurance charges.

The listed recommendations may go a long way in bringing improvements in production as well as marketing of basmati paddy/rice in the State:

To encourage farmers to increase the area under basmati rice in Amritsar and Gurdaspur districts, the State as well as Central Governments may formulate a policy to ensure support price for basmati paddy at the rate of 3.5 times of the price fixed for "A" grade varieties of non-basmati paddy (parmal varieties).

Contract farming for basmati rice may also be tried by giving 3.5 times higher price in comparison to the "A" grade varieties of non-basmati paddy. On a pilot basis, contract farming may be started from Chogawan block of Amritsar district where quality of the produce as well as the yield is high.

There is need to set up the Indian Basmati Rice Board on the pattern of other commodity Boards such as Tea, Coffee and Jute Boards.

Basmati rice yield needs to be improved further by raising genetic yield barriers and narrowing yield gaps through better management practices.

There should be block plantation of the basmati rice. The non-basmati rice may not be allowed to be transplanted in the basmati rice growing blocks because the former's diseases/pests have adverse effect on the latter's yield. Their times of sowing are also different.

In agriculturally developed State like Punjab, the market levies including sales tax works out to above 11 per cent in case of basmati paddy. This increases the total cost of the miller/trader/exporter. These market charges may be reduced by 50 per cent in case of produce purchased by the millers/traders/exporters for export purposes so that they are able to compete in the world market where there is stiff competition from our neighbour country – Pakistan.

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Feature

Rice Production Scenario in Assam – Problems & Prospects

Nilotpal Borthakur

Assam is traditionally a major rice producing state in the eastern rice belt of the country. Yet even after decades of green revolution, the productivity is low due to several bio-physical and technological constraints. Moreover, there has been observed yield gap between the potential and actual yield of rice. Since yield gap forms the future scope of growth, a suitable policy is needed to promote and sustain rice culture in Assam. This paper examines some of these issues.

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Assam is one of the major rice producing states in the eastern rice belt of the country. Rice occupies 67 per cent of the total cropped area and also accounts for nearly 93 per cent of the total foodgrain production in the state. The benefits of green revolution have not been impressive in Assam despite having adequate rainfall, fertile soil and unlimited scope for stepping up rice production. Hence, great concern is expressed by planners and administrators on the continued low productivity of rice. "Special Rice Production Programme" was launched in Assam along with other eastern states from the beginning of the Seventh Five Year Plan. The Eighth Plan document also gave priority to similar programmes for augmenting rice production in the state. However, the impact of these programmes is not very encouraging. All these necessitate a scientific research into some of the issues of rice production scenario in Assam. The present study is, therefore, an attempt to discuss these issues in the green revolution period.

Benefits of green revolution have not been impressive despite Assam having adequate rainfall, fertile soil and unlimited scope for stepping up rice production.

Production growth & Instability

Rice is grown in Assam under rainfed condition from monsoonal rain. Among the three distinct rice crops, wet land transplanted rice, known as winter rice, is the main crop as it alone occupied 68.67 per cent of total rice area in the state in 1997. A careful examination of panel data on rice production reveals that production of total rice in Assam was 1,968 thousand tones in 1971 which increased to 3,328 thousand tones in 1997 (Table 1). But productivity in-

crease, a major constituent of production increase was not satisfactory during these three decades of green revolution period. Total rice yield of 1,336 kg per ha estimated in 1997 was only a marginal increase over 1,006 kg per ha recorded in 1971. However, during this period area increase was to the extent of 550 thousand ha which contributed substantially towards production increase. Of the three rice crops, summer rice or *boro* rice recorded the highest yield of 1701 kg per ha, but its area coverage was only 6.81 per cent of total rice area in 1997.

Table 1: Area, Production and Yield of Rice in Assam

	Type of rice	1971	1981	1991	1997
Area (000 ha)	Winter	1404.68	1630.20	1804.54	1736.28
	Autumn	525.04	590.00	638.95	619.60
	Summer	31.54	34.90	128.47	171.80
	Total	**1974.24**	**2255.10**	**2571.96**	**2527.67**
Production (,000 tonnes)	Winter	1525.84	1820.63	2486.65	2515.75
	Autumn	321.58	377.07	494.22	520.19
	Summer	47.12	34.64	216.30	292.21
	Total	**1986.81**	**2232.33**	**3197.16**	**3328.75**
Yield (kg/ha)	Winter	1086	1117	1399	1467
	Autumn	612	693	785	853
	Summer	1494	993	1684	1701
	Total	**1006**	**990**	**1261**	**1336**

Source: Statistical hand Book of Assam, Directorate of Economics and Statistics, Government of Assam.

In order to study growth in rice production more precisely, exponential trend equation of the form $Y = ab^t$, was fitted to the area, production and yield data to estimate compound growth rates.

Table 2 presents compound growth rates in area, production and yield of rice in Assam in the green revolution period. Total rice production in Assam increased slowly by a significant compound growth rate of 1.812 per cent during 1971-97. This increase was mainly due to expansion of rice area and partly due to yield increases. Similar trend was observed in the case of winter rice also. Against this, autumn rice recorded very insignificant growth in area, production and yield. However, area expansion under summer rice showed steady increase during the period. Yet this crop failed to show any significant improvement in its yield in Assam.

In order to examine the sources of changes in rice production, both area and yield data were detrended linearly and centred around their respective means for the periods 1951-70 and 1971-97 separately. Detrended area were multiplied with the corresponding detrended yield to get the detrended production for each time period. The variance of production was then decomposed into its constituent sources, *viz.* area variance, yield variance and area-yield covariance and higher order interaction between area and yield using Bohrnstedt and Goldberger (1969) expression for the covariance of products of random variables. The pattern of changes in the sources of growth and instability was examined using Hazell's (1984) decomposition scheme.

Table 2: Estimated compound growth rates in area, production and yield of rice in Assam during 1971-97

Type of rice	Area	production	Yield
Winter rice	1.102*	2.111*	0.985*
Autumn rice	0.739	0.875	0.134
Summer rice	3.878*	4.041	0.178
Total rice	1.071*	1.812*	0.773**

* Significant in 1 per cent probability level

** Significant in 5 per cent probability level

Table 3: Sources of increases in mean production and variance of production of rice in Assam during the period 1971-97 over 1951- 70

(per cent)

Sources of increase in mean production	
Change in mean area	77.61
Change in mean yield	17.12
Change in area-yield covariance	–0.02
Interaction between changes in mean area and mean yield	5.29
Per cent increase in mean production	42.65
Sources of increase in variance of production	
Change in mean area	11.82
Change in mean yield	3.47
Change in area variance	9.31
Change in yield variance	44.16
Change in area-yield co-variance	–10.23
Change in interaction terms	21.65
Change in residual	19.82
Per cent increase in variance of production	163.47*

* Significant at 1 per cent probability level.

Note: The sum of sources is 100 per cent for total absolute increase in mean production and variance of production, respectively.

Increase in mean production of total rice in Assam during the period 1971-97 over 1951-70 was 42.65 per cent (Table 3). Highest contribution to this change came from change in mean area (77.61 per cent), while a meager 17.12 per cent contribution came from yield improvement. Instability in production as measured by variance of production increased by 163.47 per cent

during the period 1971-97 over 1951-70. Amongst various sources, yield instability was the prime source (44.16 per cent), which increased the instability in rice production. However, change in area-yield covariance showed marginal stabilizing effect on production of total rice in Assam.

Use of Basic Inputs

Fertilizer

Fertilizer consumption level in Assam is one of the lowest in the country and was 18.2 kg per ha in 1996-97 as against the all India average of 76.8 kg per ha (Table 4). Moreover, there was wide variability in per ha consumption of fertilizer. Morigaon district recorded the highest fertilizer consumption of 73.5 kg per ha, while it was only 1.4 kg per ha in North Lakhimpur district. A crash programme for increasing the use of fertiliser was launched in the year 1990-91 and the year was observed as "fertilizer year" in the state. Despite this, fertilizer consumption in rice culture did not achieve desired level. Fertilizer application in winter rice crop is considered risky by farmers. Heavy rainfall within a few months from May to September results in water logging and flood and the runoff water washes down applied fertilizer from the fields. Soil erosion is another problem leading to nutrient loss in the hills districts of the state. Moreover, area coverage under autumn and summer rice is also low due to improper irrigation facility across the state and hence fertilizer application in these crops is also far from satisfactory.

Table 4: Consumption of fertilizer in Assam

(,000 tonnes)

Year	N	P_2O_5	K_2O	Total	Kg/ha of GCA
1980-81	7.00	1.40	1.50	9.90	2.9
1985-86	9.40	3.60	3.70	16.70	4.9
1990-91	20.58	8.45	8.64	37.68	11.5
1996-97	32.15	5.84	17.81	55.81	14.6
1997-98	38.42	15.06	17.77	71.25	18.2

Source: Statistical Hand Book of Assam, Directorate of Economics and Statistics, Government of Assam

Fertilizer application in winter rice crop is considered risky by farmers. Heavy rainfall results in water logging and flood and the runoff water washes down applied fertilizer from the fields.

Seed

Assam is chronically deficient in its requirement of quality rice seeds and is entirely dependent on seeds from outside the state. Procurement, distribution and sale of quality high yielding variety (HYV) seed have been undertaken by the Assam Seed Corporation (ASC) Ltd. As a result the coverage of HYVs of rice in Assam was 49.39 per cent in 1997-98. Since the state's own production of seeds does not meet its requirement, the state has to procure seeds from Government and private agencies to make up for the deficit. The necessity of having to depend for supply of seeds on outside firms, often results in unusual time lag. The uncertainity about supply of seeds of the recommended varieties in requisite quantity frustrates production plans and targets under HYV cultivation. The present deficit of 49 per cent in domestic seed production will widen over time.

Since the state's own production of seeds does not meet its requirement the necessity of having to depend for supply of seeds on outside firms, results in unusual time lag.

Plant Protection

The hot and humid climate of Assam with high relative humidity is favourable for frequent occurrence of pests and diseases. Nearly 11 lakh ha of cropped area is affected by crop pests annually. Per ha pesticide use in Assam is only 140 gram and it is low as compared to even neighbouring states like Tripura (326 gm), Manipur and Meghalaya (208 gm each).

Irrigation

Assam is endowed with large water resource of which a small proportion has been exploited so far. Although the state falls in the high rainfall zone, requisite water for irrigation is available only during monsoon months leaving remaining five months dry in most places. Moreover, during monsoon long dry spells are also very frequent causing delay in trasplanting operations to a great extent. Further, strategy for alternative crop production in the pre-flood and post-flood periods proves futile in the absence of irrigation. Implementation of various plans and programmes in respect of irrigation started from Third Five Year Plan. During this period two irrigation projects were taken up. Subsequently, surface irrigation projects and ground water irrigation projects came into existence. Exploitation of ground water received emphasis during Fifth and Sixth Five Year Plans.

Up to March 1996, irrigation potential created in Assam was 480.08 thousand ha out of which only 23.56 per cent was fully utilized (Table 5). Although flow irrigation accounted for 37.13 per cent of the created potential, percentage utilization was very poor in the case of lift (8.73 per cent) and ground water (7.83 per cent) irrigation. The low intensity of utilization of ground water, despite ground water being available at shallow depth, is for no other reason than the fact that irrigation in the state is largely utilized for stabilizing the *kharif* crop and in the *kharif* crop season water abounds. Under utilization of ground water is an indication of low crop intensity as ground water is required in the rabi crop season. Realising this, State Department of Agriculture in a recent effort installed 1 lakh shallow tube wells for cultivation of autumn and summer rice under Samridha Krishak Yojana. This programme received tremendous response from the farmers and total rice production is expected to increase substantially during 2000-2001. The ground water exploited by shallow tube wells is considered to be a very useful source of water to small and marginal farmers. The potential for ground water development in the Brahmaputra valley is quite high. Rainfall is far in excess of evapo-transpiration and the potential recharge during the monsoon season. The water table is near the surface, soil profiles are highly permeable and draw down is minimal. From Table 5 it appears that there is still vast scope for utilisation of existing potential in Assam. At the same time it is also interesting to observe that the existing irrigation potential created (480 thousand ha) is far below the assessed irrigation potential of 2700 thousand ha.

State Department of Agriculture in a recent effort installed 1 lakh shallow tube wells for cultivation of autumn and summer rice. This programme received tremendous response.

Farm Machinery

In Assam, mechanization level has barely achieved the level of 0.40 H.P. per ha and is well below the national average of 1.0 H.P. per ha. Use of electrical power is very low in the state and is used for operation of water pumps and threshers. Animal power is mostly used for draught purpose and all other agricultural operations are carried out with manually operated tools and devices. The availability of farm machinery and implements is also very low in Assam. There were 2.1 tractors/power-tillers per thousand ha of net sown area of the state in 1996. Similarly, the number of shallow tube well, sprayer and paddy weeder available per thousand ha of net sown area were only 17.9, 5.8 and 6.3, respectively.

Table 5: Sourcewise irrigation potential created and utilized in Assam

(,000 ha)

Irrigation source	Potential created upto March '96	Potential utilized up to 1995-96	Percentage utilized
Surface water Flow	252.24	93.67	37.13
	(52.54)	(82.83)	
Lift	175.76	15.34	8.73
	(36.61)	(13.56)	
Ground water	52.08	4.08	7.83
	(10.85)	(3.61)	
Total	480.08	113.09	23.56
	(100)	(100)	

(Figures in the parentheses indicate percentage to total)

Source: Office of the Chief Engineer Irrigation, Government of Assam

Demand-Supply Estimation

Estimations of demand for and supply of rice were made for the years 2005 and 2010 A.D. and are presented in Table 6 in order to highlight the possible demand-supply gap of rice in the state. In view of the present production pattern and resource availability, these estimates might help policy makers to formulate appropriate development strategies to boost rice production in Assam.

Table 6: Projected demand for and supply of rice in Assam

(Tonnes)

	2005	2010
Projected Supply		
Winter rice	30,10,558	31,76,511
Autumn rice	6,95,138	8,19,308
Summer rice	5,61,573	6,67,291
Total supply	42,67,269	46,63,110
Projected total demand	66,17,093	83,74,907
Demand-supply gap	**23,49,824**	**37,11,797**

Supply projection

Total supply of rice in Assam was estimated by projecting area and yield on the basis of past trends for the years 2005 and 2010 A.D. using the following formula:

$$Q_t = Q_0 (1 + r/100)^n,$$

where, Q_t = projected area/yield

Q_0 = base year area/yield

r = compound growth rate of area/yield

n = number of years to which projection is to be made

The area under rice was estimated to be 29.77 lakh and 31.44 lakh ha in 2005 and 2010 A.D. This expected increase of 6.18 lakh ha in 2010 over 1991 rice area was considered realistic in view of the following reasons:

Firstly, the present cropping intensity in Assam was low and the rice crop is grown as rainfed. However, with the implementation of *Samridha Krishak Yojana* (SKY), nearly 1 lakh shallow tubewells were installed in the state during the year 1999-2000 which would increase area under summer and autumn rice in the state in the near future. Secondly, jute area recorded a gradual declining trend since 1970-71. Relative profitability, unremunerative price of jute and inadequate marketing facility for sale of jute products had resulted in diversion of land from jute to autumn rice cultivation. Consequently, the increase in area under rice was sought to be justified. The yield of rice in the years 2005 and 2010 A.D. was estimated at 1433 kg per ha respectively. These estimates were observed very much realistic in view of 0.77 per cent growth in yield during 1971-97 and slow diffusion of technology in the state. The above discussions clearly showed the possibility of increasing the total supply of rice in Assam to estimated level of 42.67 lakh and 46.63 lakh tones in 2005 and 2010 A.D., respectively.

Demand Projection

The key variables for estimating the demand for rice were, population growth, base period consumption, rate of growth in per capita income and the income elasticity of demand for rice. Population of Assam increased by an annual growth rate 2.62 per cent during 1971-91. Alternatively, it was expected that the present growth rate of population would come down in future due to popularization of family planning programme and various population control policies of the Government. Hence, a population growth rate of 2.00 per cent per annum was assumed for the period 1991-2010 A.D. for projection of population in the state. Accordingly, the projected population of the state for the years 2005 and 2010 AD would be 28.98 million and 31.21 million, respectively. The trend estimates indicated that the state income of Assam increased by a compound growth rate of 8.71 per cent per year under current price. Using this growth rate, the total income of Assam under current price for the years 2005 and 2010 was estimated at Rs. 27,718.36 crore and Rs. 42,083.81 crore, respectively. Thus, per capita income, estimated by dividing total state income by the population of the concerned year was calculated to be Rs. 9,563.69 and Rs. 13,483.81 per year, respectively for the years 2005 and 2010 A.D.

Saikia and Talukdar (1988) estimated income elasticity of demand for rice in Assam at 0.47 by fitting normalized quadratic demand model to the 38th round of NSS data. This income elasticity of demand for rice was used in the present estimation of total demand for rice in Assam. Having arrived at the income elasticity of demand and rate of growth of per capita income, demand for rice was worked out as follows:

$D_t = D_0 (1 + r/100)^e$,

where, D_t = per capita demand in year 't'

D_0 = per capita availability in kg in base year

r = percentage increase in per capita state income at current price

e = income elasticity of demand for rice

Accordingly, per capita demand for rice per year was estimated at 228.31 kg and 268.32 kg per year for the years 2005 and 2010 A.D., respectively. Similarly, total demand for rice in the state was estimated by multiplying per capita demand with the projected population of the concerned year and, thus, total demand was estimated as 66.17 lakh and 83.75 lakh tones for the years 2005 and 2010 AD, respectively (Table 6). Thus, Assam would be a deficit state and 23.50 lakh and 37.12 lakh tones of rice would have to be imported during the years 2005 and 2010, respectively under the assumption of present production trend and consumption habit of the people.

Assam would be a deficit state and rice would have to be imported under the assumption of present production trend and consumption habit.

Required production trend

In view of the widening demand-supply gap, it is also of importance to estimate the required production trend for its effective neutralisation. It was, therefore, estimated that the production of rice in Assam should be increased by a compound growth rate of 4.933 per cent per annum for 10 per cent neutralization of total

demand-supply gap in 2010 A.D. (Table 7). Since widespread area expansion is a limiting factor particularly for winter rice, significant yield improvement becomes the only alternative for achieving this required production trend. However, in the case of autumn and summer rice there remains scope in Assam to increase area coverage under assured irrigation along with yield improvement. Assuming existing rate of area expansion, it was also estimated that the yield level of rice should increase by compound growth rates of 4.228 and 4.378 per cent per annum for 100 per cent neutralisation of the estimated demand-supply gap in 2005 and 2010 A.D., respectively. However, these growth rates could be achieved by raising the average yield of rice in Assam gradually to the estimated levels of 2347 kg in 2005 and 2971 kg in 2010 A.D.

Table 7: Estimated compound growth rates in production and yield of rice required for neutralisation of demand–supply gap of rice in Assam

Year	Extent of neutralisation of demand-supply gap		
	100 per cent	75 per cent	50 per cent
	Required production growth rate (per cent)		
2005	4969	4.319	3.609
2010	4.933	4.312	3.626
	Required Yield growth rate (per cent)		
2005	4.222	3.585	2.882
2010	4.378	3.767	3.079
	Required per ha yield (kg)		
2005	2347	2139	1931
2010	2971	2642	2313

Future potential–Yield Gap

Each rice variety has its own yield potential. But the yield realised in the farmers' field is very different from the yield obtained under experimental conditions. There are several environmental, physical and socio-economic factors responsible for such yield differentials. In view of the rapidly growing population and the consequent gap between demand for and supply of rice, this untapped production reservoir otherwise known as 'yield gap', has become an increasingly important issue.

From the results of this study it appears that achieving a state average rice yield of 2971 kg per ha from the present 1336 kg per ha during a ten year period is a tall order. But a study conducted in 1997-98 revealed that progressive farmers of Assam achieved area weighted average yield of 2616 kg per ha of winter, autumn and summer HYV irrigated rice in Assam, which is 96 per cent higher than the present average yield of rice in the state. In addition, Regional Agricultural Research Station, Titabor of Assam Agricultural University has released a number of high yielding varieties of rice in recent times. Of them Bahadur and Ranjit, two promising winter varieties, have produced average yield 5.1 tones per ha in 20 front line demonstration trials conducted across the state. Similarly autumn varieties like Chilarai, Lachit and Luit produced yield of 3.5-4 tones per ha in the farmers' situation. Jyotiprasad, Bishnuprasad and Joimati, released for summer season, are very recent additions to Assam agriculture. Yet they have produced very good results when grown under adequate irrigation. These summer varieties produced 5.5 to 7.5 tones per ha in demonstration trials conducted in farmers' field.

Reasons for not being able to achieve near potential yield of rice by the Assam farmers are many. Various biological, socio-economic and technological constraints affecting the adoption of recommended level of new technology are mainly responsible for this yield gap. However, barring biological and socio- economic factors, the gap between the progressive farmers' yield and the average farm yield could be bridged to a great extent by removing the technological constraints controlling the yield of rice in Assam.

Gap between the progressive farmers' yield and the average farm yield could be bridged by removing technological constraints.

Conclusion

Crop production strategies followed after green-revolution have brought about considerable changes in Assam agriculture, yet continued low productively of rice has been an important cause of concern for the policy makers. Positive steps for reducing yield gap through modernization of agriculture should be taken in the state on priority basis. In view of low input use in rice cultivation, productivity increase is possible in Assam. In order to increase fertilizer consumption, large scale fertilizer trials in farmers' field would be helpful. Moreover, infrastructural bottlenecks relating to input delivery system and credit should also be removed. Since irrigation is a crucial input for productivity increase, an integrated water management and operation strategy focusing on fuller utilization of benefits from major/medium and minor irrigation projects is required in the state. Installation of nearly 1 lakh shallow tube wells in 1999-2000

under Samridha Krishak Yojana would substantially increase autumn and summer rice production if both the farmers and extension agencies work in tandem and the crop is grown with all sincerity. Coverage of high yielding varieties being low in Assam a new orientation in extension policy is necessary in order to motivate farmers. Moreover, location specific research and development of cropping pattern plans are required to mitigate the existing yield gap of rice.

In the national scenario, Assam agriculture should be treated separately as this state can contribute towards country's food security. A big push is necessary in terms of investment, research and extension so that the constraints of low productivity can be removed. Moreover, research, and extension should go together to increase productivity of rice in Assam.

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The problem is not that there are problems. The problem is expecting otherwise and thinking that having problems is a problem.

– Theodore Rubin

Book Reviews

Local Social Development, Asian Productivity Organisation, APO Tokyo, 2000, pp. 274.

High rates of economic growth in the past has led to disparities in income and living standards between rural and urban areas and urbanization with all its attendant evils. In order to achieve balanced economic development by promoting rural development, the Asia Productivity Organisation (APO) launched an Integrated Local Community Development (ILCD) Programme in 1996.

The APO organized in Sri Lanka a seminar on Training Method for Integrated Local Community Development: International Trainers' Training on Local Social Development. This publication is a report of the proceedings of the Seminar, and the papers presented there. It aims at disseminating the findings and recommendations of the Seminar to policymakers, planners, training officers, practitioners, students, NGO staff and others concerned with training for sustainable local community development.

The book is divided into four parts. Part I gives a summary of findings. Part II deals with Resource Papers and Part III contains Country Papers, Part IV has appendices.

Part I gives the highlights of resource papers. It is divided into three modules and country papers. Module I deals with conceptual Issues in Local Social Development, Module II explains the participatory Approach to ILCD, and Module III discusses the Role of Development and Social organisation. the section on country papers provides interesting reading and throws a lot of light on the experience of different countries in Local Social Development.

In the past, development was narrowly defined and meant little more than increase in gross domestic product. But, nowadays, emphasis is placed on factors which improve the quality of human life such as employment opportunities, nutrition, literacy, poverty alleviation and the like. Development emphasizes on people as the subjects and initiators of development.

The failure of the conventional development strategies to generate the desired economic growth and reduce poverty, has led to a shift in development paradigm from growth-oriented strategy to a more people-centred comprehensive approach, and brought into focus the primary concerns for growth, equitable distribution, and sustainable development. Today, development implies sustainable growth that is accompanies with equity. Therefore, policy makers and planners have begun modifying their plans to include social elements into their development programmes. This approach, which gained popular support beginning the early 1970s, grew into an independent development strategy called local social development planning (UNCRD - 1988).

The papers presented at the seminar and assembled here have succeeded in fulfilling the following objectives of the seminar: (a) to review and share with the participants some lessons of a common experience and existing knowledge on training methods in ILCD, particularly in manpower development for front-line development workers; (b) to enable the participants to fully know and appreciate the principles and practices on training for front-line development workers ...and (c) to indicate future actions aimed at improving the participants' capabilities and skills ...which meet the specific objectives of development programmes.

As one of the resource persons puts it, "while research and training on economic policies and technical aspects can be effective tools of conventional education for a limited group of elites and technocrats, it is in fact the numerous front-line change agents and workers who "walk the fields" to implement various development activities at the local level that need realistic training to render them more effective in their work" (p2). The book goes a long way in fulfilling the need.

The book is remarkable for the conceptual clarity

which is absolutely essential for operationalizing any programme. For example, even at the outset, it tells the reader what it means by Local Social Development in a precise way.

The term 'local' refers to "...the first point of contact, interaction and negotiation between the people and government or non-government agencies... (UNCRO, 1985)." Again, according to UNCRD (1988), the term 'social' refers to "the non-material or less economic factors which contribute to the overall quality of human life, and in particular, those aspects which are more concerned with people rather than with material things". True, it is rather difficult to distinguish between economic, social and political development. That is why, it is pointed out that "social development cannot take place without economic development; and economic development is meaningless unless accompanied by improvements in social welfare for the whole population" (Midgely). In short, local social development planning means a conscious attempt to improve the quality of human life at the micro-level".

A close study of the 'country papers' reveals that local social development of each country is unique in its own way and one can gain many insights into the working of the local social development programmes in hundred ways. And these programmes cover a wide range: slum improvement, problems of urbanization such as collection of domestic waste of low income areas in Bangladesh, training methods for Integrated Local Community Development in the Republic of China, Water Project in Fiji, Community Development Programme and National Extension Blocks, and Integrated Child Development Scheme in India, Co-operatives in Indonesia, Women's Local Community Development Programme in the Islamic Republic of Iran, Saemual Undong Movement (A New Village Movement) in the Republic of Korea, special programme for nomadic people and diversification of livestock production involving community participation in Mongolia, Maternal and Child Welfare Programme and Programme of Development of border areas and national race in Myanmar, "Community Development through Social Mobilization" programmes in Nepal, Integrated Rural Development Programme Integrated Agricultural Programme, Change Agents' Programme and Dry Zone Development Project in Sri Lanka, Population and Community Development Association Programmes in Thailand, and infrastructure, road construction, education and poverty alleviation programmes in Vietnam. It may be noted that the section on the Saemaul Undong movement of the Republic of Korea makes a fascinating reading.

The book also gives details of some field studies. On the whole, this highly informative book can serve as a practical guide for those involved in Local Social Development. the printing is very good and the book has been edited in an excellent manner.

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Changing Productivity Movement in Asia and the Pacific – Challenges and Lessons, Asian Productivity Organisation, 1999, APO Tokyo.

The Asian Productivity Organisation (APO) is an inter-governmental regional organisation to increase productivity in the countries of Asia and the Pacific through mutual co-operation. To achieve these objectives APO provides a common platform for practitioners to share their experiences. In the words of Takashi Tajima, Secretary General, APO (Refer Foreward), promoting exchange of experiences among the member countries has been one of the core objectives of the APO's projects since its inception. The volume under review is one such attempt and is an outcome of deliberations of Round Table Follow up Conference held in Fiji on issues in finding out new ways of strengthening bilateral co-operation in the background of Asian Economic crisis. The publication is an attempt to capture networking arrangements, human resource strategies and future challenges and broad directions of the productivity movement. the volume entitled 'Changing Productivity Movement in Asia and the Pacific – Challenges and Lessons' has sixteen papers and these together provide a mosaic of problems faced and solutions being sought to improve productivity in its various dimensions.

M. Tajul Islam, Abdul Baqui Choudhry and Ahmed Ali Shah in their paper on Bangladesh state that Bangladesh has the lowest savings – GDP ratio and per capita income in the world. the country is also faced with disquieting problems of unbridled population growth, under-employment, disproportionate load of dependency, food shortages, shortages of power and electricity, landlessness and technological backwardness. Many of these can be attributed to low productivity.

Tracing the history of productivity movement, the authors point out that productivity issues were never considered priority issues as late as in early 1980's. Bangladesh became a member of APO after one decade of independence. National Center for Monitoring Labour Productivity, later renamed as Bangladesh Productivity Centre came up in 1983. Bangladesh economy is dominated by agriculture sector and there-

fore labour is a major factor contributing to GDP. Productivity growth of human resource is the most significant aspect. In Bangladesh major attempts to improve productivity are being made in this direction.

Republic of China (ROC) has made tremendous strides in economic development in the last three decades and is considered today one of the world's top trading countries. The author, Casper Shih points out that this has been achieved with the rapid growth of small and medium sized enterprises (SME's). China Productivity Centre (CPC) has played a significant role through its management, technology and HRD consulting work. CPC has been the main disseminator of automation technology. The rising labour costs has marked a paradigm shift in productivity movement away from low cost OEM arrangements to customer driven ODM and OBM manufacturing. Cultivation of quality centered corporate cultures and quality skills are two more directions to overcome the restrictions of access to resources in Taiwan.

Fiji National Training Council (FNTC) is the forerunner to the National Productivity Organisation (NPO) and was established in 1973 to be umbrella for vocational education and training organisations. Nelson Delailomaloma points out that initially the concept of productivity was interpreted to mean work harder and produce more for the same pay. The workers union therefore opposed it. Productivity movement in Fiji is still in stages of infancy. Provision of funds and active support of the government continue to be a major concern to NPO.

National Productivity Council (NPC) is one of the oldest and largest productivity organisation in APO family. Set up in 1958 it is one of the front runners. In his long paper S.S. Sharma has traced the changing role of the NPC over the years. As per the authors NPC will have to come to grip with new challenges from multi-national consultancies and forces of globalization. It will require developing multi-disciplinary approaches to find solutions and to help the clients in implementation of the reports. Mr. Sharma has also raised a question on the adequacy of a strength of 250 productivity specialists in NPC. One is not inclined to accept the apprehension in absence of comparative figures from countries as Japan and Korea where productivity movement has strong roots. Besides, NPC can always use services of a large corpus of professionally qualified productivity specialists outside NPC. One had indeed looked forward to an in-depth analysis of failure of productivity movement in India as compared to strides made by pacific rim countries.

Mulyadi Kurdi in his paper on Indonesia has traced the history of productivity movement. Established in 1968, National Productivity Organisation (NPO) has undergone changes in organisational structure three times. National Productivity Center had the main functions of expanding means for creating awareness, to conduct research, plan and develop efforts to increase productivity in agriculture and industrial sectors and to conduct guidance to improve productivity Manpower Productivity Center (MPC), in second change carried out functions of planning manpower productivity development. In the third change, Directorate of Manpower Productivity Development (MPD) has functions related to arrange productivity guidance, training, measurement and management of men and materials. Productivity movement is yet to make its mark in all economic sectors.

MKEK Abadi is his paper on Iran points that National Iranian Productivity Organisation (NIPO) was established in 1992 and has main goals of developing productivity culture and to increase the number and ability of consultants and institutions to improve productivity. The author makes a bold suggestion that in place of NPO's dependence on the support and commitment of the government, we should start looking for autonomous and profit making organisation to promote productivity.

Japan, in many aspects has become a role model for many Asian countries. However Japanese problems are somewhat different from other Asian cases. Jinnosuke Miyai and Koh Kasuga, in their paper on Japan point out these slowed down economic growth, quickly aging Japanese population, diversifying senses of value, changing industrial structure toward technology, intensive and information related industries and globalized world economy and appreciated value of the year. This has led to restructure productivity activities so as to cover wider socio-economic issues of national importance and to deal with social productivity as well. This has given birth to the new look NPO as Japan Productivity Center-Socio-Economic Development (JPC-SED) to provide efforts for improving socio-economic systems and to promote productivity at industry and enterprise levels. The paper provides detailed discussion on major thrust areas and treatment of issues such as quality and employment systems. The problems faced by Japan and the solutions developed to tackle the same will set the trend for other developing economies.

Jae Uk Chae's paper on Republic of Korea has a similar scenario. Korea has reached convergence state; the emphasis has shifted from labour or capital productivity to total factor productivity. Qualitative strategies have to be changed. Korea Productivity Center, now as

a special corporate body, has to lay emphasis on value addition of output rather on maximization strategy of output.

National Productivity Corporation (NPC) is a federal statutory body in Malaysia and has a major thrust to carry out productivity and quality research, promotion of productivity and quality enhancement practices and to provide training and management systems for development of productivity and quality enhancement. Ismail Adam points out that NPC has also developed a system to evaluate its efficiency using three indicators: Cost Efficiency, Staff Efficiency and Time Efficiency. It may be worth emulation by NPO's is other countries.

Pagvajav–Un Shurchuluu refers to the past political history of Mongolia, as a one party communist state and its heavy dependence on the Soviet Union for economic development. Its transition to market oriented-economy is only recent and the country is facing socio-economic difficulties. Productivity in Mangolia is lower because of input factor prices especially of labour, energy, capital and materials. This is complicated further by overall sluggish sales and low utilization of plant capacities.

Nepalese economy is one more case of poor productivity growth. Diresh Prashad Pant attributes the same to political instability and frequent changes in government leadership. Exports have declined and imports increased owing to low capacity of local industries. Nepal did not experience any serious economic crisis because of insulation capabilities of the Indian economy. The author opines that productivity movement in Nepal faces behavioral or cultural problems rather than structural ones. Nepal needs to develop a work culture that focuses on productivity. It is indeed a bold and rational analysis.

Pakistan has limited resources. As per M.A. Jabbar Khan, there is a tremendous scope for productivity and quality improvement in Pakistan. A national effort with a multi-dimensional, multi- disciplinary and multimedia approach is needed to create a positive climate for productivity. Productivity, as per the author, requires to become a part of the culture and a way of life. Pakistan has recognized productivity as a prime determinant of economic development during the ninth five year plan period.

Carles A Sayco, Jr. in his paper on Philippines describes the evolution of the productivity movement in terms of four major phases: Phase I, National Government Commitment to Productivity Production; Phase-II, Program Assistance and Institutional Development Promotion; Phase-III, Policy and Program Intervention and Phase-IV, Consolidation and Support to Multi-Sectoral Productivity Initiatives. The Phase IV has started from 1996 and major developments include formulation and adoption of National Action Agenda for Productivity (NAAP) and establishment of Philippines Quality Award Program.

Lee-Suan-Hiang's paper on Singapore highlights evolution of Productivity movement closely linked to the transformation of economy. Because of tight labour market, Singapore had to restructure its economy toward more capital, skill and technology intensive industries. This called for promotion of investments and encouragement of R&D. New strategies were needed to improve productivity.

Productivity Movement in Sri Lanka is still in stages of evolution, although the need for the same was established way back in 1996 when Sri Lanka joined APO. K.H. Camillus Fernando in his paper emphasizes that the concept of Productivity has taken a broader meaning. Besides increasing GDP it is also necessary that the gains are shared in a equitable and rational manner with entire population. Green Productivity should also focus on the need for sustainable developments in harmony with nature.

Vietnam is still considered as one of the poorest countries in the world with an average per capita income of about USD 300. Nguyen Huu Thien in his paper traces the same to large scale destruction during the war. Vietnamese economy has been mainly based on agriculture with a self sustaining system. But Vietnam has a rich experience of overcoming economic crisis. It is now turning into a market and getting integrated with many countries through trade and commerce. It has drawn up plan to enhance socio-economic growth for industrialization and modernization of the country.

There is a common thread discernible in this excellent volume. The necessity to improve productivity is as relevant today as it was in the days of F.W. Taylor. The developing economies of countries like Nepal or Vietnam or Mongolia require the same to increase the per capita income, to cut down the rising unemployment and to improve the living standards of their people. The developed pacific rim economies look at productivity improvement as a tool for socio-economic development. Globalization has thrown up new challenges of competition in areas of quality, short deliveries, customer service, innovations and costs making productivity improvement as an imperative and an integral part of any strategic planning. Besides, there is no end to the process. It continues as new challenges arise. Lee Suan–Hiang sums it beautifully that Productivity is a Marathon with on end and the winning combination requires stamina, determination and innovation. In the

emerging new environment, productivity has also come to acquire a new definition in a broader perspective. It is no longer limited to be a ratio of output per labour or materials or per capital (Factor Productivity) or even Total Factor Productivity but has come to include all of the performance parameters in its output. This has thrown up new issues and challenges to develop suitable models to measure and manage productivity.

The book should prove to be a very good addition to existing literature on productivity. It is recommended to the policy makers who are engaged to draw up plans for national socio-economic growth, practitioners, consultants and specialists who wish to make productivity and productivity improvement as the focus for planning. It should also serve as a reference book to students and researchers who are interested to trace the history of productivity movement in Asia and the Pacific.

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Population, Poverty and Environment in North East India, *edited by B. Datta Ray, H.K. Mazhari, P.M. Passah and M.C. Pandey,* Concept Publishing Company, New Delhi, 2000, pp. 412, Rs. 600.

The publication of Population, Poverty and Environment in North East India edited by B. Datta Ray, H.K. Mazhari, P.M. Passah and M.C. Pandey is a welcome addition to the existing stock of literature on North-East India. The book is a good collection of 42 articles dealing with various key issues concerning North-Eastern Region. Case studies are undertaken to test competing hypotheses prevalent in existing literature on population, poverty and rural development. The publication is an outcome of a National Seminar held in Shillong in 1996 under North East India Council for Social Science Research. the volume is very timely as a lot of debate is going on at the international, national and different regional forums on population, poverty and environmental issues. Every article in the volume is based on specific thrust. Hence it becomes difficult to review such a volume. However, as the title of the volume indicates the papers included in the volume can be grouped under three themes – Population, Poverty and Environment. No doubt this procedure is unfair to individual contributors, yet as I understand there is no way out to avoid this.

There are 17 articles dealing with issues on population dynamics. Major thrust of the most of the articles is on high population pressure in the region and this is because of high fertility rate and large scale in-migration. Because of this there is overcrowding in agriculture, decline in land-man ratio, large scale unemployment, shortage of various civic amenities, environmental degradation etc. in the region. Increasing migration into the region has brought in more hardships to the local inhabitants, particularly to the different tribal communities in the form of land alienation, falling wage rate and increasing misery. For purpose of policy most of the paper writers recommend fertility control and containing migration to arrest population pressure in the region. The study of H. Goswami indicates strong inverse relationship between social values and fertility decline and thus argues for raising social values to check population growth. Philomath Passah's paper suggests for raising female literacy and providing better health facilities to reduce population growth.

16 articles deal with poverty and related issues. The major focus of discussion in the papers relates to measuring the magnitude of poverty and the factors responsible for such a scenario. The papers show how poverty is widespread and nutritional level is very low among majority of people in the region. Citing a number studies, P.K. Mishra holds the opinion that poverty is man made and is the product of development process. B.S. Butola' study finds the existing social structure and production relationship responsible for poverty of many. Keya Sengupta measures poverty among different states of North-Eastern Region with the help of some indices taken from N.S.S. Report. They have found that there lies variation in the incidence of poverty between the states not due to calorie intake but due to differences in local and regional factors. Studies also speak of gender bias in availing different public health facilities. To reduce poverty the paper writers argue for developing education and expanding non-farm activities in rural areas. The role of Government and N.G.Os are emphasized by many authors in ameliorating poverty and providing basic services to the under-privileged.

Papers on environment focus on issues like soil erosion, air and water pollution etc. The authors found that because of reckless cutting of trees, shifting cultivation etc., the topsoil is eroding rapidly resulting in decline in crop productivity. The misuse of various infrastructures has brought about rising air and water pollution. To counter this trend the authors advocate for creating awareness among the people along with strong measures to check environment degradation in the region.

The papers in the volume provide a lot of data on different socio-economic issues dealing with North Eastern Region. The contributors in the volume are drawn from a variety of fields having specialised knowledge and field experience on different issues confronting the

region. As such the book will be very useful to students, researchers and policy makers interested in the development of North East India.

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Cases on South Asia: Human Resources and Industrial Relations, Vol. I Case Studies, Vol. II Teaching Notes, *ed. by C.S. Venkataratnam*, International Labour Office, Geneva.

Based on a project sponsored by the Bureau for Employers' Activities of the International Labour Organisation two volumes under review present twenty three case studies and teaching notes respectively on human resource management and industrial relations. Evidence is presented from five South Asian countries.

Modernisation and restructuring, privatisation, skills development, corporate decline and turnaround and labour-management cooperation are the five themes under which these case studies in volume 1 have been categorised. It identifies problems and prospects of growth for several companies. Of the twenty three companies in five countries four are from India. They are: Bharat Cement Limited, Durgapur Steel Limited, Pfitzer Limited, Star Mills Limited. Factors such as poor product quality, high production cost, underutilisation of capacity and consequent low production, high energy consumption, high level of pollution, high manning ratios relative to its output seem to have reduced the profitability of the plant. On the other hand, in Pakistan, Hinopak Motors Limited seems to be following a significant human resource policy highlighting that the interests of the company and those of its employees are inseparable. It pledged to maintain a work environment that can attract most qualified individuals, provide an atmosphere which helps its people contribute to their fullest potential, enhance and perpetuate corporate values, promote harmonious industrial relations. The employees in the Nepal Bank Limited were not sufficiently motivated though – low remuneration and incentives, insufficient physical facilities, unpleasant working environment, ineffective performance appraisal system and inadequate attention to human resource development are some of the factors which hampered the efficiency of the employees in the Bank. On the whole, evidence from different countries and companies is suggestive of a strong positive association between productivity and the human resource development policy pursued by the companies.

The second volume takes up the same companies again to identify the issues and the learning objectives. How restructuring pays off in terms of cutting down costs and increasing profits and how to handle the human side of an enterprise in the restructuring process, for example, are some of the objectives of the study on Bangladesh Tobacco Company Limited. The Nepal Bank Limited on the other hand, identifies the impact of financial sector reforms on human resources and industrial relations so as to develop appropriate strategies to meet the emerging challenges. Both the volumes unfold interesting issues using the company level information. However, the organisation of the contents could have been much better from academic point of view.

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Environmental Business Management – An Introduction *by Klaus North* – ILO, Geneva; Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, pp. 160, Paper Back.

Conversion of raw materials to products inevitably lead to generation of wastes, which may vary depending upon various factors like process efficiency, variations in process parameters, raw materials used, material handling procedures, operation and maintenance practices, etc. The management of these wastes, once generated, in an environmentally benign manner, would mean costly as well as dead investments for enterprises. Hence, it would be prudent for any enterprise to go in for the prevention of these wastes at the source itself, for economic as well as ecological reasons. This can be achieved only by incorporating environmental aspects/considerations in all the decision making process. 'Environmental Business Management' is a means to integrate the environmental values and requirements into all managerial functions with the aim of enhancing the overall economic and environmental performance of an enterprise.

Green Investments or investments made for the enhancement of environmental performance in enterprises were never viewed positively by the entrepreneurs. However, of late, many proactive entrepreneurs have started showing interest in trying to make the enterprises *green and lean.* This could have been due to various reasons like pressure from Green consumers, loss of market share to green competitors, discovery of new markets, major industrial accident, ...etc.

The 'Environmental Business Management – An Introduction' is a book, which is well written, well illustrated with lots of examples and Case studies. The

book can virtually prod the entrepreneur/practising manger to review/look out for the hidden and unexplored potential (both economical and environmental) within their business establishment or in their other spheres of activity. It is a book which can be recommended as **'a must read'** by every management student, practising managers, environmentalists, eco-enthusiasts, etc. and is a book worthwhile to be possessed.

The book is divided into four parts. The first part is more generic in nature and introduces the reader to the aspects of environment care and linked business opportunities and threats, how to make a quick environmental challenge scan of one's enterprise, the global environmental issues, how to turn environmental threats into opportunities. Here the author effectively creates interest in the reader to explore further.

The second part deals mostly at enterprise level issues and the managerial response to them. It deals at length various aspects of the responses that could be taken up by the respective functional departments (Marketing, R&D, Materials, Production, Projects, Financial, Personnel and the Occupational Health and Safety) apart from the top management, to meet the environmental challenges'. Here it also details as to how to develop a Corporate Green Business Plan following an Environmental Strengths-Weaknesses-Opportunities-Threats (SWOT) analysis. Further, the author also give some tips as to when and how to choose/seek outside advice.

The third part deals more with the tools/techniques to make one's enterprise lean. Green and clean. This part is more of an appreciation module on different techniques and systems (EMS, EMAS, etc) being practised world over and has some interesting statistics on the initiatives taken on these lines. It even gives some basic advice as how to develop a training program on environment, as well as benefits of integrating environmental subjects along with other general management programs.

The fourth and final section gives a lot of information on the various international institution/groups/organisations involved in environmental activities; and even has given some tips to the managers to effectively handle some of the pressure groups.

The only negative point to be raised if at all is that the author has not suggested some books for further reading, which the readers would rather obviously be interested in, considering the wonderful way in which the author has treated the subject.

I would personally rate it as one of the excellent books I've come across in the field of Environmental Management; and would proudly recommend it to any practising manger, environmental interest groups. This book surely change the outlook of managers/ entrepreneurs towards environmental investments and would orient them in making their business all the more sustainable. The author has been capable in projecting the environmental challenges in a comprehensive manner incorporating the linkages and possible responses by each of the departments of an enterprising in making the business lean, clean and green. It gives a broad, but yet very clear idea to a generalist/administrator on the environmental aspects of business management. The book may ideally be priced in the range of Rs. 230/- to Rs. 275/-.

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Management and Cultural Values—The Indigenisation of Organisations in Asia *edited by Henry S.R. Kao, Durganand Sinha and Bernhard Wilpert*, Sage Publications, New Delhi, 1999, pp. 332, Rs. 425 (Cloth)/Rs. 245 (Paper).

The book contains invaluable collection of papers contributed by scholars from different countries including Canada, India, Korea, Taiwan and Thailand. The papers presented emphasize that the focus has shifted from merely adopting western theories, conclusions and practices to one which cherishes the unique social and cultural factors influencing human behaviour and the applications of psychology for National development citing the case of Japan which has risen phoenix—like from the ashes of world war II and become within a very short period one of the foremost industrially advanced countries in the world, without having to cast off its traditional social values and cultural characteristics.

The book is recommended for a majority of us who have been fashioned by our background of a preeminently Western education and orientation. The authors suggest that rather than transplanting and importing wholesale the management theories and models developed in socio-cultural setting of the west, there is need to evolve these in the cultural contexts of Asian realities.

The contributions in this volume provides specific examples of the process of indigenization in the fields of management and organisation illustrating how the values, norms, perceptions and expectations generated by a culture are interwoven in its managerial styles and

organisational functioning. The chapters dealing with Thai leadership, the concept of corporate statesmanship and special features of corporate culture in Korean enterprises exemplify the so called 'integrative model' of management.

The main thrust of the book is on indigenous practices in management and organisations. The chapters in the book are organised in four sections. The 1st section, comprising three papers, focuses on conceptual and theoretical issues of indigenisation in the work setting. The second section, also comprising four papers, relates to work culture and the way it is influenced by socio-cultural values and institutional characteristics. The third section deals specifically with the value-organisation interface. It includes a chapter on meaning of work in Islam and the contribution of Islamic civilization to the theory of management and organisation—a perspective that is neglected in the mainstream literature on management. The five papers constituting the fourth and last section deal with the indigenous influences emerging from historical and cultural scenarios that affect the pattern of a managerial leadership.

In fact the papers constituting this book go on to provide specific examples of the integrative processes in management and organisations in operations in the Asian context.

The book contains wonderful writings that point to the fact that work behaviour is to be understood and interpreted not in terms of imported models, principle and theories which is often the case, but reflects indigenous development that require for their explanation, the culturally derived categories and is recommended for reading by one and all.

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Marketing Research, *by G.C. Beri*, Tata McGraHill Publishing Company Ltd., pp. 474.

In the present age of globalisation and liberalisation of Indian economy, Business world has undergone a phenomenal changes in its mode of operations. Due to the massive technological advancement, breakthrough innovations, and intense competition, consumer markets and flooded with wide ranges of products at competitive prices. Customer has become the king and Monopoly has become the word of irrelevance. Moreover, customers have become so knowledgeable and demanding that it becomes really difficult to know the exact requirement of the market, to evaluate marketing actions and monitor the marketing performance. Another major problem faced by manufacturers in today's competitive market scenario is the identification of potential areas for marketing their products, the probable demand for the same and the extent of profitability and competition. All such problems can be tackled effectively only by a systematic investigation tool. Marketing Research is one such powerful tool to deal with the marketing related problems by furnishing the important information pertaining to market and customers to the manufacturers. Though marketing research has been in use for more than 100 years in different parts of the globe but the development in this area was rather slow and sporadic. In India, it is only after liberalisation and globalisation of economy in early years of 90's, the extensive use of Marketing Research has been started by various companies to tackle the marketing puzzles like consumer and market behaviour, market potential, brand positioning etc.

The book under review also deals with the basic concepts as well as the application of Marketing Research as a tool to tackle the marketing puzzles. The book aims at the lucid exposition of the various concept and techniques used in the marketing research with case studies and examples for better understanding of the concepts.

The book is divided into four sections. First section consisting of five chapters, deals with the basic concepts of Marketing Research. Author has explained the basic concepts of Marketing Research, its importance, marketing information systems, the research process and the research design. Some new concepts like Marketing Decision Support Systems (MDSS), its advantages vis-a-vis marketing information system, Bayesian analysis have also been explained in this section.

The second section of the book consisting of six chapter deals with the process of data collection, sampling and interviewing. Various aspects covered in this section are, types of data, design of questionnaires, scaling techniques, Sampling designs, Sample size Decisions, Interviewing etc.

The third section of the book consisting of eight chapters deals with the aspects like Data processing, Analysis and Reporting using various statistical concepts as well as computer processing.

The last section i.e. Fourth section deals with the application of Marketing Research in various facets of the business like Sales Analysis and Forecasting, New Product Development and Test Marketing, Advertising

Research, Market Segmentation and Brand Positioning, Export Marketing Research etc.

To put in a nutshell, the book is a very good textbook with comprehensive coverage to basic concepts as well as applications. Apart from this, good number of case studies covering various industry segments are dealt at the end of every section, which is certainly a very useful for a reader to fully understand the concepts and applications of marketing research in real time situation. Statistical concepts and techniques are extensively used in the book, which are very useful to deal a problem in a more objective manner and for precise results. The book shall be of great use to the students of management and business studies as well as practising managers.

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HRD In the New Millennium *edited by Udai Pareek and U. Sisodia*, Tata McGraw Hill publishing, New Delhi, pp. 273; 1999.

It has been almost a decade since Indian economy began to liberalise, privatise and globalise. The process of structural and functional change in all aspects like economic, social, cultural are continuing and it may not be too distant in the future when it would become fully market and customer oriented. The future is going to be more demanding. Therefore, the H.R. function will have to develop new strategy and technologies to enable organisation to survive cope and adopt in the turbulent and dynamic environment.

The book on HRD in the new millennium has been divided into four major themes and 22 chapters. The first part covers six chapters titled HRD for nation building. It focuses on the slow human development in India despite 50 years of independence. The gap between urban and rural, poor and rich is so large, that seems very difficult to bridge it. Unless we put a full stop on illiteracy and cultural dependence and opportunities for generating employment, the development may seems not too far. For sustenance and continuous growth, symbiosis between state and the people, management and worker (s) is very essential. This can be possible only if decentralisation and empowerment is put into practice and such an environment is created in the organisations.

The problem when looked at positively, becomes a challenge and opportunity of improvement. Efforts are need to be made to identify and resolve them successfully to benefit the organisations at the earliest. Bringing about 100 per cent literacy, transparency in work, changing value system of our bureaucracy, encouraging inventions, innovations and propagating them, is needed for growth and development. The book lays emphasis on higher education irrespective of gender discrimination, regional imbalances etc. as a solution to the pertaining problems. The last chapter of the section highlighted on nation building through greater understanding of the processes, technological and economic change and social equality. For sustain and continuous growth lot of efforts are required like rationalisation of law, decentralisation, transparency, preparing for innovation etc. besides empowerment as mentioned earlier. this could bring structural and functional change in economic, social and cultural sphere on one hand and attitudinal change on the another hand.

The 2nd part focusing on Shaping HRD as a competitive advantage is also divided into six chapters. The first chapter advocated strategies on integrating HRD approach with the world class organisations by unionising industries for new strategies, planning related with labour laws, polices and practices on micro level. It emphasised that the role of all HR managers needs to be reviewed and redefined. Their skills should be enhanced continuously for higher performance. Trade unions are to be oriented for healthy and fruitful growth of the nation. Various other strategies have been advocated for enhancing the value of human resource like scorecard approach, HR audit, HRM with quality, redesigning HR processes for all employer, trade unions, employers' etc.

The third part titled Empowerment and knowledge management is divided into 5 chapters. The first and second chapter envisaged that in 21st century the entrepreneurs would be more socially and ethical oriented. The author has advocated "empowering people for greater synergy, tangible improvements and thereby achieving excellence. The process of empowering has resulted in bringing good industrial relation and thereby higher productivity. The third chapter gives emphasis on shift from tall to horizontal organisation structure, which would be more customers focused. It might be achieved through structural and functional transformation. Though the process of transformation may bring lot of resistance and obsolescence, but it can be reduced by participative approach. The last chapter emphasises the need and importance of on knowledge management, which is imperative for the success of any organisation. Developing human capital and building a learning organisation can resolve many problems related with management of knowledge.

The last part of the book titled proactive role of HRD

is divided into 5 chapters. The first and second chapters highlighted on beliefs and challenges before the HRD professionals for developing positive work-culture. The author has focused on organisational harmony with the environment, learning the value of the organisation, changing from the tribal mindset, appreciating and matching the content with their context, removing all barriers and boundaries, experience complete freedom without any fears and limitations for cultural change. HRD professionals have to build the culture in the organisations through proper change management by actively involving themselves and adopting lead role. This can be met by developing excellence in human process and building a positive work culture within the organisation.

The third chapter of this part highlighted that there is analogy between human body and organisation. Both required being healthy by performing functional activity. Performing organisation and HR professional focuses on creating value with long term strategy in view. Performing organisation can share the experience of value creation in their company and author believes that HR professional would add lot of value in it. In the forth chapter while depicting emerging trends in the organisation today and tomorrow, book emphasises the turbulence and the state of flux in the market. Employees of tomorrow will have a greater say in their work allocation and decision-making. The conflict between robots and the people would be important issues for HRD professionals in coming era. The future will be more demanding and will depend on internal and external organisational development facilitators. In new millennium O.D facilitator has to meet very complex and newer challenges. The require of large-scale interactive processes (LSIP) for facilitators can bring paradigm shift for new millennium. It advocated that using LSIP can solve the critical competencies of future organisation, analyses of why people resist change and sharing experience of initiating change in different organisation. Author has given lot of illustration in this regard. Author has emphasises on speed, cost, quality of output, people involvement for smooth change. In the last part he has discussed about the global trends towards future related with strategies, leadership, systems, skills, structure etc.,

This book has a wide coverage and provides answer of various questions being raised by the line manager and the HRD professionals. It covers the issues from micro to macro levels. In each chapter various HRD issues with case studies mainly from Indian experience has been highlighted to make the understanding easy and simple. It perceived various challenges in new millennium, which has to be faced by all irrespective of staff, executives, administrator, CEO or HRD professional.

This book is unique in itself and will enlighten readers on various practical issues related with HRD on organisational to national levels. It is a very useful compilation of contributions from professional thinker, industrialist and practitioner in the field of HRD. They perceived the challenges in the new millennium, which HRD particularly HR professionals, line managers, OD facilitators, students, teachers etc. for adding knowledge and experience on various HR issues.

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Knowledge Management: Enabling Business Growth *by Ganesh Natarajan and Sandhya Shekhar,* Tata McGraw-Hill, 2000.

Unlike other resources that get depleted with the use and follow the law of diminishing returns, the knowledge bank gets constantly renewed and enriched with use and sharing of knowledge. Upholding the above fact and propelled by the irresistible urge to share knowledge Ganesh Natarajan and Sandhya Shekhar takes one through an exciting journey on Knowledge Management (KM) in this book. This is truly a compilation of significant learning from real life experiences.

The world is changing fast and the world of business in changing faster. The benefits of applying knowledge are truly universal and are imperative for success in the new millennium. So what actually is KM? In simple words it is nothing but "knowing what is there is know". But how? Before dwelling into the art to science of KM, the authors make the readers clearly understand the importance of KM with a case of the transnational European Insurance Corporation.

By clarifying some fundamental issues known as DIKW quartlet (Data, Information, Knowledge and Wisdom) and providing an overview of various terminologies the authors demystify KM. The introduction of the Dual Model for KM solutions at this point gives a practical perspective of the Information-Knowledge inter-relationships.

The third chapter takes a detailed look at all relevant technologies and identifies the role each one of them plays in the specific context of KM. One factor which the authors emphasise throughout the KM journey in this book is that KM strategies have more to do with business imperatives and organisational culture than technology (especially IT). The technology can only give a push as an enabler. The chapter discussing on KM from the processes perspective traces the relationship be-

tween KM and various disciplines that have been used by organisations from time to time like Industrial Engineering, Information Management, BPR, Quality Management etc. The chapter gives a profile of the "Millennium Enterprise" and explains how KM presents a thread of connectivity to integrate people and processes towards the corporate objectives.

The fifth chapter titled 'Learning Systems Perspective" examines the problems that HR and training managers face today and what does web-based training (WBT) have to offer. The technological and conceptual synergies between web based learning and KM is explained in this chapter by focusing on how former can become a very strong foundation and enabler for the latter. It discusses the currently prevalent standards and technologies for web-based training and importance of these on overall decision making. The KM technology evaluation concludes with the final selection of the software tool set. The KM toolbox looks at the key factors that are driving technology decisions for KM solutions.

The KM tool market has over 200 tools that range widely in terms of technology, functionality and price. The annexure on a representative list of KM tool vendors gives precious little idea about the vendor, the tool and its capabilities. The selection of the right KM tool is made more clear with the illustration of the case of the European Insurance Corporation, which is one of the case studies that had been followed right through this book. The discussion on extending the Dual Solution Model into a tool strategy takes one towards the concept of Knowledge Portals and its importance. Though there is no one-size-fits-all approach with KM solutions, Enterprise Knowledge Portals (EKP) provides a framework around which most knowledge solutions can be configured.

After reading about various aspects of KM including the technology perspective one will naturally think how in reality to build the knowledge corporation. The answer is continue the journey further through this book which is written in a simple and easily understandable language. The book presents a comprehensive plan in the context of e-business realities of the day. The essence of this ENTAGRATED PORTAL APPROACH lies in building three intelligent portals namely Knowledge Portal, Collaborative Portal and Business Portal. A step-by-step approach to implementing KM in building the knowledge corporations is given in this chapter. The discussion takes one towards the Market Facing Enterprise which is the aspiration of all modern day business corporations. The chapter concludes with a description on building knowledge corporations on the web.

At this stage in the journey through this book on KM one can't help but be curious on how to implement KM in their own organisations. The eighth chapter clearly outlines a step-by-step implementation methodology which begins with linking knowledge strategy to business strategy. It describes a deceptively simple tool called the K-Gap Analyzer which when used iteratively has multiple utilities. One beauty of this tool is that when used properly it facilitates people in arriving at very specific answers instead of generic guidelines. The four-phase methodology for KM projects, namely K-Need Identification, K-Acquisition Framework, K-Net Design and K-Net Implementation is also described here. The picture is completed by extending the Dual Model framework which has been the common thread for analysis throughout the book, into the implementation phase.

KM has for some reason largely been viewed only in the organisational context. But the authors examine some possibilities to create a knowledge enabled society that has the potential to completely transform and enhance the quality of life, in the chapter aptly titled "Changing Lives Everywhere". The whole essence of this is contained in the few verses taken from the famous 'Gitanjali' of Rabindranath Tagore, which is given at the beginning of the chapter. The journey ends with a peek into the future by analysing the current trends in IT and its implications for KM in the dotcom age.

This book titled "KNOWLEDGE MANAGEMENT" Enabling Business Growth authored by Ganesh Natarajan and Sandhya Shekhar from the Tata McGraw-Hill is an invaluable aid not only to understand the concepts and process of KM but also how to successfully implement KM. One unique feature of this book is that it focuses on core processes and provides a comprehensive practical framework that organisations can use to implement KM solutions. It uses successful real life case studies drawn from all walks of business to explain various aspects of KM and perhaps give a leg up to those who have begun on the exciting journey on KM. This book with a foreword from Prof Nitin Nohria of Harvard Business School provides some specific inputs to wide cross-sections of people from CEOs, HR Managers to educationalists. This book which is divided into 10 chapters that are aptly titled is a must read for those in knowledge oriented profession like consultancy.

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The Performance of India's Export Zones—A Comparison with the Chinese Approach *by Ashok Kundra* (Sage Publications, 2000); pp. 276; Rs. 425.

This book is based on the author's Ph.D. thesis for which the degree was awarded by the School of International Studies, JNU, New Delhi. It is divided into three parts: part 1 (Chapters 1-5) deals with the rationale, performance, problems and prospects of India's Export Processing Zones (EPZs) and Export Oriented Units (EOUs); part 2 (chapters 6, 7) analyses Chinese experiments in this context through their Special Economic Zones (SEZs) and Economic and Technological Development Zones (ETDZs); part 3 (chapters 8-10) makes a comparative study of the two countries. The author concludes that the Chinese approach to export promotion through these SEZs was much better in all respects than India's tryst with EPZs and EOUs. The book ends with certain conclusions and policy implications for India.

Since 1970s, the inward looking, import-substituting controlled economy growth strategy has been giving way to 'export-led' open economy model in principle as well as in practice. The failure of the 'visible hand' has emboldened the champions of market mechanism. A large number of developing countries as well as the erstwhile socialist economies are undergoing this transition either willingly or unwillingly (read IMF-World Bank pressure). The pace at which this transition should take place may be debatable. Some advocate a sudden, swift and one-time metamorphosis whereas others argue in favour of gradualism. Those who advocate gradualism argue in favour of setting up of EPZs and EOUs in order to derive the comparative cost advantage of free trade because the whole country may not have "trade related infrastructure and institutional framework" (page 24). 'EPZs are offshoots of free trade zones with the addition of processing, assembly or manufacturing activity. The Shannon zone set up in Ireland in 1958 was the first to bear EPZ nomenclature". The EPZs gained wide acceptance amongst developing economies during the seventies and the eighties. By 1986, there were 175 EPZs in 45 countries. Attracting foreign investment, earning foreign exchange and generating employment are the three primary objectives of the EPZs, says the author.

India's experiment with the EPZ began way back in 1965 with the setting up of Kandla Free Trade Zone (KAFTZ) in the backward area of Gujarat (Kutch). It was an era when the doctrine of protectionism/import substitution was much revered. The stated objective of KAFTZ was to ensure balanced regional development, which cannot be the primary objective of an EPZ. On the contrary, an ideal location for an EPZ is the one that ensures sound infrastructural facilities both physical as well as financial. Kandla was sadly lacking in all. It was a case of putting the wrong foot forward right in the beginning. It is worth noting that at about the same time, when 'macro-managers' of this country were contemplating a shift from institutional reforms to technological reforms in agriculture, under the Intensive Area District Programme (IADP), the twenty districts selected for the 'package deal' were such that they assured irrigation facilities needed to use HYV seeds. The success of IADP programme emboldened the government to launch the New Agricultural strategy. Had the first EPZ in India been set up on similar economical and technological considerations, the subsequent development in this respect would have been much different. As on March 31, 1998, there were seven EPZs spread over a total area of 2100 acres and a total investment (NRI, foreign and domestic) of Rs. 1343 crore. The author chronicles the growth of EPZs/EOUs in India in three phases: upto 1987-88; 1987-88 to 1990-91 onwards. The first phase represents the era of restrictive policies, the second gradual transition and the last one that of economic reforms. Keeping the primary objectives in mind, the author comes to the conclusion that the third phase was the best for EOUs in terms of export performance. The EPZs failed to performance. The EPZs failed to perform even in the post-liberalization period. They recorded a negligible increase in their share of total exports from 3.02 per cent in 1990-91 to 3.81 per cent in 1997-98. They failed to attract the desired level of foreign investment too. In short, barring SEEPZ, the performance of EPZs has been much below expectation. Some of the reasons of this lacklustre performance are lack of clear policy perspective, infrastructural bottlenecks, rigid labour policy and excessive centralization of control.

A comparison with China's SEZs dwarfs the performance of our EPZs even more; e.g. in 1997, SEZs' exports as a percentage of the country's total export were 23 per cent and the actual/utilized foreign investment in SEZs was U.S. $ 25 billion by 1995. The author points out three elements of Chinese policy that have significant relevance for India. These are its thrust on export- oriented development; focus on area-based development; decentralization of economic decision-making powers" (page 207). Unlike India, China adopted the export-led growth policy willingly and with a firm faith in its success. Its area-based development programme was based on the conscious policy paradigm of Deng development programme was based on the conscious policy paradigm of Deng Xiaoping's philosophy of permitting "some people to get rich first" and "some regions to grow faster". In China, the local/provincial authorities were given much greater administrative powers to manage SEPs/ETPZs. In their

respective areas. "The lesson from China is loud and clear that for the success of macro policies, active involvement of state governments and local authorities in implementing them is absolutely necessary". (page 212).

On its backcover, it is claimed that this book is 'a comprehensive and unique work on the subject of EPZs and EOUs in India". In terms of statistical compilation, the claim may be justified, but in terms of economic analysis, the book falls short of a serious reader's expectations. It makes a passing reference of return on investment (ROI) in EPZs (page 81, 82). There is no attempt to analyse in depth the reasons behind the lukewarm response of the domestic entrepreneurs towards EPZs. Had the author attempted a serious econometric analysis of returns/profitability in EPZs vis-à-vis DTA (Domestic Tariff Areas), the conclusions drawn and policy recommendations based thereupon would have carried more weight. There are a lot of repetitions in the book. Careful editing can reduce its size and make it more readable to the average reader. A study of the experience of ASEAN countries in this field could have made this book even more useful.

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Liberalisation and Human Resources Management: Challenges for the Corporations of Tomorrow *by Arun Monappa & Mahrukh Engineer* (1999), Response Books, A Division of Sage Publications, New Delhi, pp. 217, Rs. 195.

Liberalisation of the Indian business environment through modifications in the industrial, trade and fiscal policies by the Government has brought in changes and competition of a magnitude that was unknown to Indian Organisations. In the new liberalized scenario, where multinationals and other global players are competing in the domestic market with the monopoly players, the management of organisations is expected to be more productive and efficient for survival. More than a decade ago, similar conditions were faced by the Western countries. A cascade of changing business conditions, changing business structures, and changing leaderships had forced human resource departments of the companies to alter their perspectives on their role and function overnight. As companies moved from an exclusively bottom line obsession to a focus on customer, mission and the organisation's role, they were forced to make changes in their organisation. At the global level, the discipline of human resource management elevated itself to number two position, after information technology in the reckoning of various functional areas of management, leaving behind marketing and finance in that order.

In a similar way, Human Resources Management in Indian companies will have to assume a distinctive role since employees will make significant contributions in productivity, efficiency and customer satisfaction. The policies, structures and systems will have to be people-oriented and human centered. Indian organisations will have to give Human Resources Management a status which may even be envied by technical and support functions.

The volume under review is an outcome of a survey of 22 companies with an objective to assess the impact of Liberalisation on Human Resources Management. The authors sought the views of CEOs and senior professionals involved in HR activities in various organisations to analyze the importance Indian companies give to the management of human resources and how they use it as a strategic tool for competitive advantage.

The book is organized in six chapters. The book 1 explores the question 'What implications does the New Economic Policy have for HRM?' The authors discuss the Pre-reform conditions and compare it with the Post-reform conditions. They show that this change brings two new challenges for the human resource function: firstly, meeting the needs of the customer and secondly, taking advantage of market opportunities in terms of quality, cost and on-time delivery of the product on the service. These two factors necessitate a cultural shift in work practices and government should be committed and supportive in the transformation process.

Then the book deals with the question 'What could be done by the Indian companies in the liberalized scenario?' Important topics like restructuring, privatization of PSUs, mergers and alliances which are relevant in the liberalized Indian environment are discussed. The authors stress that the HR function has to change existing ideas and expand the perspective of the organisation to encompass global business i.e., it has to think globally and act locally. The next discussion is devoted to the question 'How can Indian companies survive in the current scenario?' Various tools and methodologies are describe here which the companies can adapt to survive and/to lead. The authors point out that the prerequisite for the absorption of these processes is for Indian organisations to change the old order into the new.

Next, the book deals with the question 'What should be the labour policy in the change scenario?' The various problems associated with the labour movement

in India are listed. Various initiatives which have to be accepted as an inevitable part of change such as the VRS, the exit policy and National Renewal Fund are discussed. The chapter is summed up by stressing the fact that the challenge of HRM is to minimize the impact of these changes by providing retraining and redeployment opportunities. Enlightened human resource policies, transparent communication systems are the need of the hour.

The authors explore the answer to the question 'What is the impact of the New Economic Environment on HRM in particular?' It is pointed out that the changed scenario calls for a more active role of HRM. Today, there is an urgent need to link HRM intricably to the business of the organisation at both the strategic and practical levels. This can be achieved by Strategic HRM, which creates a framework for aligning HR policies and practices with the organisation's business goals. Various human resource systems viz Selection & Recruitment, Training & Development, Performance Appraisal Systems and Reward are discussed. The discussion is concluded by highlighting the fact that the challenge before the HR manager is to actively coordinate, synergise and monitor these four sub-systems. He should fully utilize these tools to motivate employees and achieve the goals of the organisation.

Chapter 6 is devoted to the question 'How the discipline of HRM will turn out to be in contrast to the way it is being practised today?' On the basis of the major trends emerging in the global environment, the authors identify five issues which are expected to affect organisations in India, and, in turn, Human Resources in the future. These are: the Corporations of Tomorrow, the Information Age, Virtual Corporation, Diversity, Social Responsibility.

This book provides a contemporary perspective on HRM in the current phase of liberalisation. It discusses the effective strategies that can be implemented in various companies and what should be the government's role towards this end. The book also examines the likely changes in the sphere of human resources in the future, and how managers need to prepare themselves in turn. It provides valuable guidelines on how HRM can be used to successfully bring about the change in Public & Private Sector Organisations. The chapters are interspersed with a number of cases, many in the form of vignettes in the boxes which add more charm to this book. However, a major weakness of this book is lack of a brief discussion on the methodology and tools used in the survey. Particularly, this would have offered greater help to students for developing case studies and doing their projects.

This book is intended for multiple target groups. It can be used as a primary and/or a supplementary tool for undergraduate and graduate courses in management. It will also be useful to corporate trainers and consultants as a reference text. It will also benefit professional, trade and Industry associations interested in addressing the various issues of Human Resources Management for their respective members. The publishers deserve special appreciation for bringing out the book at a moderate price.

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India and West Asia: Emerging Markets in the Liberalisation Era *by Javed Ahmed Khan*, Sage Publications, 1999, Rs. 395.

Post World War economic reconstruction in different strategic and ideological directions brought in the inevitable cold war for establishing supremacy over growth and development approaches in the respective economic and political frameworks. The post cold war restructuring in a liberal framework, however, caught centrally planned economies, particularly the communist block and the Asian economies is the dilemma of balancing between the capitalist growth and social development in their transition phase from planned to liberal economic modeling. Two successive oil shocks in the 70s and 80s prompted the oil rich west Asian, particularly the Arab oil producing countries to concentrate on the momentum of economic liberalization to compensate the loss of their planned development in the past and to gain from the integrated world economy and markets. It has been proved beyond ambiguity that state sponsored growth and development models in the productive industrial sectors, did not succeed in addressing fundamental issues like linkage effects, economies of scale, market competitiveness and ultimately the integration into a wider world economic system. Centralised planning regimes in their spectrum, perhaps, resorted to prodigal spending rather than identifying economic objectives and appropriate means to do that. For instance, the Saudi Arabian public spending accounted for over half of their GDP in the 80s. The other oil rich economies followed suit for various reasons including security and defense. Hence, the little or no productive efficiency in these states was the obvious outcome.

Realisation has emerged in the 80s of the nature of competition and other economic and market pres-

sures the region in up to face and therefore the need to integrated the oil industry in a regional as well as global market perspective. New regional organisations (like OPEC, AFTA etc.) were born in the 90s to revitalise the oil industry and the economy from its present status to an integrated world player in the World oil market. West Asia, hence, inculcated an economic philosophy of free enterprise and a growth policy based on private sector participation. This, perhaps, provided an opportunity for developed and developing country blocks to gain on a competitive advantage basis. South Asian economies like India, with their liberalisation drive in the 90s, have been offered a wide scope for joint ventures and partnerships to gain from market forces. Indo-Arab relation has, therefore, been seen as quite significant in the emerging global market environment from the regional as well as global market perspective.

This book is an elaborate journey into the nature and structure of the economic and trade tie ups between economies in the regions, their changes and evolution and the scope and options in the new world order for mutual gains. In the initial chapters the author evaluates the economic performances of planned regimes in individual countries of the region for their wealth and welfare. There have been highlights on spending pattern of governments, the phase of liberalisation initiatives in financial markets, their progresses, the trend in foreign investment flows, the mental blocks and regional outlooks and the final approval to economic liberalisation. Within this background, the author critically evaluates the progress of liberalisation programme in various economies in the region. On the basis of this analysis, the author categorically concludes the scope and need for intra-regional economic cooperation in the form of joint ventures and collaborations. The scope and prospects of Indo-Arab economic cooperation and collaborations are discussed in elaboration in Chapters two and three. To substantiate the discussions, the author quotes the initiation and progress of Indian diplomatic and trade initiatives with various west Asian countries over the decades over chapters four and five.

Chapter six is an insight into the business prospects and opportunities in the gulf region. It highlights the need for an inter Arabic or regional trade block to counter the negative impacts of multilateral world trade. Towards this it investigates the natural and manpower resources available with the regional economic powers as well as its present utilisation patterns in a scientific manner (chapter seven). In total the book provides valuable insights into the scope and opportunities for the Indo- Arab collaborations in the oil sector. If these scope and opportunities are translated into reality, perhaps, the economic ills of India (particularly on oil account) can be eliminated.

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Strategies for Human Development in India: Public Support for Food Security edited *by N. Krishnaji and T.N. Krishnan,* Sage Publications, New Delhi, 2000, pp. 335, Rs. 475.

This book on food security is the first in the series to be published on the outcome of the UNDP Project on Strategies for Human Development in India. In this volume public distribution system is dealt as an instrument or strategy for human development as it meets the food security needs of the people. The book contains 10 papers including an introductory chapter by very eminent economists. The introductory chapter by Drs. Krishnaji and Krishnan provides the synthesis of the whole volume at a glance.

The transformation of Indian agriculture from the begging bowl status to adequate for stocks in about 25 to 30 years has very few parallels in the world. The pathway of this prosperity began with severe food scarcity problem soon after independence. The state played a major role in the dramatic transformation of agriculture to usher in green revolution, increase in food supply, attain food self-sufficiency and build up adequate food stocks to meet shortfalls in years of poor monsoon and even exports in years of good harvest. The problem of food scarcity has thus changed from one of non-availability of food supplies to operational management: of distributing supplies over space and time. The public distribution system is conceived to address the negative features of concentration of output growth and availability with reference to either specific inputs (irrigation, fertilizer, etc.) or specific crops (rice and wheat). The PDS in its present form—a producer's price—support-cum-consumer subsidy programme has evolved in the wake of food grain shortages of the 1960s. The main emphasis was on price stabilization till the 1970s and the PDS was mainly confined to urban areas and food deficit states. Various facets of operation public distribution system to mitigate the effects of inter-regional inequalities and to reach the weaker sections have been analysed in this volume with a hope that the experience suggests ways and means of making it more effective and efficient. The questions that arise about the working of PDS and the associated policies as examined in this book include Macro- level issues such as fixing the support and issue prices, the quantities to be procured and

distributed and the manner in which the stocks are to be managed as well as Micro-level issues like coverage of the PDS, ways of targetting, managing the fair price shops.

A perusal of results extracted from the studies reported in the volume indicate, among others, the following:

Large parts of rural India have benefited little from PDS because of lack of welfare orientation in he policy, though such orientation is gradually emerging. There is also a need for radically revising the production strategy itself. Agricultural growth in general and food grain output in particular should be promoted in dry regions of the country to boost local availabilities, to promote regional self-sufficiency of foodgrain production and to improve food security. Because, neither the markets, nor an ill designed PDS with no clearly specified welfare goals can provide countrywide food security based on large surpluses concentrated in few regions.

There is lot of scope for improvement for PDS particularly at micro-level. The suggestions include extending it to rural parts where it is non-existent, proper targeting/identification of beneficiaries with the help of local bodies like Village Panchayats, Nagar Palikas instead of state bureaucracy, issue of food stamps etc.

In view of PDS remaining in general expensive, largely untargeted with weak poverty reduction effects, there is a strong opinion to phase out government control over grain market as well as procurement operations. The Food Corporation of India (FCI) is suggested to compete in the market without budgetary support but free from control with the added advantage of economies of scale. The new role of the FCI may be to stabilize prices within a range, provide a minimum support price and maintain strategic buffer stocks.

The book is a highly valuable addition to analytical studies on the strategies for human development in general and public distribution system in particular and will benefit a wide range of readers who include students, teachers, researchers, planners and policy makers. Though the essays in the volume do not cover all aspects of Indian food grain economy relevant to the redesigning of a support system for food provisioning which can work better than the present PDS, the analytical insights presented in the book if pursued can make a difference to the effectivity of the PDS and thus contribute to food security of majority of the poor in India. Compared to the quality of publication both in terms of academic/analytical content and production skill, the price of the publication seems reasonable.

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The illiterate of the 21st century will not be those who cannot read and write, but those who cannot learn, unlearn and relearn.

– Alvin Toffler

News & Notes

Competitiveness Profile of India

Rank of India (1996-2000)

Year	'96	'97	'98	'99	'00
Rank	38	41	41	39	43

Challenges Ahead

- Infrastructure bottlenecks
- Inefficient management of Public Finances
- Low level of Productivity
- Large Poverty Base
- Poor status of Women

Ranking Status in various sectors

	1999	2000
Manufacturing	39	38
Research & Development	40	40
Services & Management	41	43

India's Rank

A. Domestic Economy

- Value Added 28
- Investments 25
- Savings 7
- Final Consumption 34
- Cost of Living 3
- Adaptiveness 30

B. Internationalization

- Current Account Balance 34
- Exports of Goods and Services 32
- Imports of Goods and Services 15
- Exchange Rate 11
- Portfolio Investments 46
- Foreign Direct Investments 40
- National Protectionism 44
- Openness 43

C. Government

- National Debt 42
- Government Expenditure 33
- Fiscal Policies 5
- State Efficiency 39
- State Involvement 30
- Justice and Security 29

D. Finance

- Cost of Capital 29
- Availability of Capital 38
- Stock Markets Dynamism 9
- Banking Sector Efficiency 33

E. Infrastructure

- Basic 46
- Technological 40
- Business 47
- Health 46
- Energy 46
- Environmental 46

F. Management

- Productivity 42
- Labour Costs 4
- Corporate Performance 43
- Management Efficiency 32
- Corporate Culture 44

G. Science and Telnology

- R&D Expenditures 36
- R&D Personnel 18
- Technology Management 33
- Scientific Environment 18
- Intellectual Property 40

H. People

- Population Characteristics 28
- Labour Force Characteristics 44
- Employment 3
- Unemployment 16
- Educational Structures 47
- Quality of Life 46
- Attitudes and Values 38

Source: IMD, World Competitiveness Year Book 2000

National Competitiveness, Balancesheet of India

These criteria are identified by taking the biggest value differences from the 47-country averages.

Strengths

	Rank
Domestic economy	
Gross domestic savings real growth	2
Real growth in government final consumption expenditure	3
Cost-of-living comparisons	5
Relocation of production	11
Gross domestic savings	14
Internationalization	
Growth in exports of commercial services	1
Terms of trade index	2
Export market diversification	6
Tendency to import	15
Exchange rate stability	33
Government	
Effective personal income tax rate	1
Employee's social security contribution rate	1
Employer's social security contribution rate	1
Collected capital and property taxes	5
Collected total tax revenues	11
Finance	
Real short-term interest rate	2
Interest rate spread	16
Availability of finance skills	20
Education in finance	25
Stock markets	27
Infrastructure	
GDP and energy consumption	1
Investment in telecommunications	14
Air transportation	17
Computers in use	17
New information technology	29
Management	
Overall productivity growth	4
Availability of senior managers	6
Competence level	16
Creation of firms	19
Industrial disputes	28
Science & technology	
Availability of information technology skills	1
Qualified engineers	2
Science and technology and youth	5
Relocation of R&D facilities	6
Science and education	8
People	
Employment	2
Working hours	5
Skilled labor	12
Unemployment	15
Alcohol and drug abuse	25

Weaknesses

	Rank
Domestic economy	
Private final consumption expenditure	47
Retail sales	45
Customer sophistication	43
Companies and the government	41
Government final consumption expenditure	39
Internationalization	
Integration into regional trade blocks	46
Exports of goods %	46
Cross border ventures	44
Growth in direct investment stocks abroad	43
Tourism receipts	42
Government	
Customs' administration	45
Bribing and corruption	45
Central government budget surplus/deficit %	44
Tax evasion	43
Government decisions	42
Finance	
Number of credit cards issued	44
Confidentiality of financial transactions	44
Access to foreign capital markets	43
Access to local capital markets	42
Country credit rating	40
Infrastructure	
Telephone lines	47
Cellular mobile telephone subscribers	47
Computers per capita	47
International telephone costs	46
Total Health Expenditure	40
Management	
Overall productivity (PPP)	47
Productivity in industry (PPP)	47
Labour productivity (PPP)	47
Health safety & environment	46
Productivity in services (PPP)	45
Science & technology	
Total expenditure on R&D per capita	43
Total R&D personnel nationwide per capita	42
Patent and copyright protection	42
Total R&D personnel in business enterprise per capita	41
Number of patents in force	39
People	
Illiteracy	47
Pupil-teacher ratio (primary education)	47
Human development index	46
Pupil-teacher ratio (secondary education)	45
Female labor force	44

Source: IMD, World Competitiveness Year Book (2000)

Major Industry Sectors of India: Recent Status

Tyres

During the 2000 to 2003 period, profitability of tyre producers is expected to be under pressure due to firm raw material prices and increasing competition in the car tyre category. Prices of natural rubber are expected to increase significantly in the period due to an expected decline in surplus rubber stocks. Increasing competition in the car tyre category, due to new car radial tyre capacities, would also result in a pressure on average price realisation.

The tyre industry is expected to increase at 6-7 per cent during the 2000-01 and 2004-05 period. Demand for truck tyres is expected to increase at 5.7 per cent due to an expected increase in replacement demand. Demand for car tyres is expected to increase at 12.7 per cent, based on the expected increase in car production. By 2003, the total industry capacity is expected to increase to approximately 60 million tyres.

Given the high capital cost and low expected radial penetration in truck tyres (about 5 per cent by 2005), not more than 2-3 tyre producers are expected to set up truck radial tyres capacity. However, in car radials, large capacity additions are expected by tyre producers during the next 3-5 years due to high demand growth. Car radials are expected to increase at 24 per cent, to 10 million tyres in 2004-05.

Mergers and acquisitions activity in the tyre industry is not expected to be significant during the 2000-01 to 2004-05 period. Except for the car tyre category, the intensity of competition is not expected to be significant to result in divestments by existing producers. The importance of cash flows from tyre business to the group companies is expected to be an exit barrier. Further, new multinational entrants are uncertain about investing in the Indian tyre industry, given the high level of planned capacity additions by existing companies in car radial tyres and low radial penetration in the truck tyre category.

Power

Power shortages continue to be acute in most states, ranging from 5 per cent to 30 per cent, and an average of 13 per cent at the peak level. The power deficit is largely due to the lack of a policy framework, which encourages investments in the sector, and low utilisation of the existing capacities of the State Electricity Boards (SEBs), due to their poor financial health. Structural reforms of SEBs and the setting up of independent regulatory bodies to fix tariffs are the key issues for increasing capacity through private investments and eliminating power shortages.

Capacity additions of around 32,000 MW (equally by the public sector and private sector) are expected during the 2000-01 to 2004-05 period. Coal based power plants are expected to account for about 50 per cent of the additional capacity, while liquid fuel and hydel plants would account for 25 per cent each. Hydroelectric capacity additions are expected largely due to on-going public sector projects, such as the Tehri Dam project, Sardar Sarovar project, and Nathpa Jhakri project. In 2004-05, private distribution companies could account for about 50-70 per cent of power supply to end-users.

Polymers

Growth in polymer consumption in India is expected to be among the highest in the world, at a CAGR of nearly 12 per cent during the 1999-2000 to 2004-05 period. Favorable properties, ease of adaptability and low cost have made polymers the preferred material for various applications.

During the 1999-2000 to 2004-05 period, total polymer capacity is expected to increase by 5.19 million tpa, and production by 2.89 million tonnes. Demand is expected to increase by 2.15 million tonnes during the same period. Demand growth is expected to the be highest in polystyrene (PS), at over 15 per cent; followed by polypropylene (PP), IldPE and PVC. There is a surplus situation in most polymer markets, due to recent capacity additions in the polymer industry. The surplus situation is expected to continue in IldPE and PS. However, the PP market is expected to be in a deficit situation by 2004-05. The marginal deficit situation in the ABS, SBR and PBR markets is expected to continue, due to the lack of capacity additions. During the 2000 to 2005 period, real prices (including inflation) of polymers in the domestic market are expected to decline.

Hotels

Significant consolidations are expected in the hotel industry. The combined market share of top 10 domestic hotel players and 9 hotel foreign players is expected to increase to 54 per cent in 2004, as compared with 39 per cent in October 2000.

Consolidation in the hotel industry is expected due to

- disinvestment proceedings of HCI and ITDC
- increased focus of domestic players to manage existing properties, rather than

- constructing new hotels
- continued focus of foreign players to limit exposure in India through minor equity
- participation in joint ventures, rather than direct investments in properties.

The report assesses hotel companies based on the existing and proposed plans, with respect to expansions/new properties in India and abroad, renovations, technological development, product mix and marketing alliances. The companies covered in the report include Asian Hotels, Bharat Hotels, HCI, EIH, Indian Hotels, ITC Welcomgroup, ITDC, Hotel Leelaventure, Sarovar Park Plaza Hotels and Resorts (SPPH), The Park Hotel, Accor (France), Bass (UK), Bestwestern International (US), Carlson Hospitality Worldwide, Choice Hotels International (US), Days Inn, Hyatt, Le Meridien and Marriott (US).

Cotton and Cotton Yarn

The share of cotton fabric in domestic fabric consumption (after adjusting for made-ups and garments exports) is expected to decline from 41 per cent in 1999-2000 to 31 per cent in 2004-05. The expected decline in the share of cotton fabric would be largely due to limited availability of cotton fabric, increased exports of cotton fabric and garments, and relatively lower prices and higher life of polyester fabric.

The report assesses the impact of opening of quota regime on the various levels in the textile chain. India's share in cotton yarn world trade is expected to increase due to lower labour costs, stable availability of cotton at competitive prices, and superior quality and wide range of product offerings. However, due to the lack of modernisation at the fabric processing stage and inferior quality of processed fabric, imports of superior quality fabric are expected to increase during the 2001-02 to 2004-05 period.

Man-Made Fibres

The share of man-made fabric in domestic fabric consumption (after adjusting for made-ups and garments exports) is expected to increase from 59 per cent in 1999-2000 to 69 per cent in 2004-05. Limited availability of cotton fabric, increased exports of cotton fabric and garments, and relatively lower prices and higher life of polyester fabric would be the main demand drivers for man-made fabric.

Margins of domestic polyester producers are expected to increase till 2002-03, due to limited capacity additions in the domestic and Asian markets. During the 1999-2000 to 2004-05 period, demand for polyester fibre/yarn is expected to increase at 7 per cent and 8.5 per cent respectively, largely due to the increased share of polyester fabric in the domestic market. Given the limited capacity additions in the domestic market, imports of polyester fibres and polyester yarn are expected to increase significantly from 2001-02.

Paper

The expected increase in international pulp and paper prices and increased domestic demand would result in higher margins for integrated large size paper mills during the 2000-01 to 2002-03 period. However, margins of medium size paper mills (largely agri-residue) are expected to continue to remain under pressure.

During the 1999-2000 to 2004-05 period, consolidation activity in the domestic paper market is likely to be restricted to large size paper mills. In the long term, medium size paper mills would either increase capacities to achieve a minimum economic size, or would shut down operations. (Large size paper mills are not expected to acquire medium size paper mills as most medium size paper mills have old machinery.) Small size paper mills are expected to continue to operate, given the significant demand for low priced inferior quality paper.

Source: CRISIL.

Retail E-Commerce Market in India: Business Prospects and Growth Strategies.

Efficient payment and fulfillment infrastructure would be the key prerequisites for the development of on-line retailing.

Highlights

- The Internet subscriber base is expected to increase from 0.6 million in March 2000 to 3.7 million in March 2005, and the Internet user base is forecast to increase from 3.5 million in March 2000 to 42.7 million in March 2005.
- 84 per cent of Internet users are aware of e-commerce, and 11 per cent have made at least one purchase on the Internet.
- Total e-commerce revenues in India were Rs 106 million in 1999-2000. Books account for 48 per cent; cinema tickets, 25 per cent; and music

cassettes and CDs, 23 per cent of the total revenues.

- The e-commerce market is projected to increase to Rs 4.2 billion in 2004-05.

Consumers rate range of products/services, price, customer service and convenience as crucial factors in e-commerce.

Indian Scenario: Telecom Sector

India operates a network comprising 23,527 exchanges with 19.1 mn working connections as on Nov. '96. India's tele-density of 2 fixed lines per 100 persons is less than China (4.5) and the world average is about 10 Tele-density in developed countries is about 45 per 100 Cellular penetration is at 0.1%, compared to 1.1% in China and 2% in Malaysia.

	1998
No. of exchanges	23,527
Capacity connections	22.64 mn lines
Working connections	19.13 mn lines
No. of villages	0.304 mn
No. of PCOs	0.463 mn
PCO population ratio	529

The Ninth plan target of is to have 23.7 mn working connections. Other targets were to have a PCO in every village and reduce the PCP pop to 500.

Growth of telephone connections (inclusive of MTNL)

	Lines added	Growth (%)
1996	2.2	22
1997	2.5	21
1998	3.2	22
1999	3.8	16

The basic telecom services network has expanded from 0.1 mn connections at the time of independence to 22.6 mn. Direct Exchange Lines (DELs) as on March 31,1998. It has witnessed consistently high growth of 16-17% per annum during the last decade i.e. 1987-97. The growth was further accelerated to more than 20% during the Eighth Plan. During 1997-98, the growth rate was still higher at 22.4%. Viewed in the context of requirements and population size of the country, the expansion seems average as reflected in the low telephone density of 1.84 (March 1998) against the world average of 12. The main features of the present telecom network are:

- More than 23,400 telephone exchanges working in the country.
- A network of more than 22.6 mn telephone connections with about 20% of the total connections working in the rural areas.
- STD/ISD facility is available to more than 90% subscribers.
- A network of about 0.46 mn PCOs in urban areas.
- Availability of variety of services such as mobile radio telephone, paging, fax, data transmission, etc. to cater to the business and other needs of customers.
- Cellular services are available in 4 metro cities and all other Circles except Andaman & Nicobar Islands and J&K.
- Six licenses for basic services have been granted for six states of M.P., Andhra Pradesh, Gujarat, Rajasthan and Maharashtra. Two operators M/s. Bharati Telenet Ltd. in M.P. and Hughes Ispat Ltd. in Maharashtra have started providing services.

There is huge latent demand for telephones in India. Waiting list in the metros has been brought down and MTNL claims that in some areas a customer can get a telephone on demand. Various bodies have estimated demand for fixed line connections, which are shown below.

This is the reason why the government insisted on private sector participation in basic services as it lacked resources to set up this infrastructure. It is estimated that each DEL will cost about Rs 40,000.

All figures in mn

Year	DoT DEL	Demand Gap	Pvt. Operator DEL
1999	17.4	6	5.2
2002	24.5	12	–
2006	38.6	26	–

Source: DoT, Rakesh Mohan Committee Report

ICICI estimates (mn)

Year	2002	2006
DoT Demand (based on '94 actual)	30.7	53.0
Projections (conservative)	31.5	51.8
Projections (optimistic)	44.5	89.5
Estimated Projected Demand	36.0	64.3

Source: DoT, Rakesh Mohan Committee Report

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