Creative Sparks of Innovation

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FOREWORD

Innovation is crucial for our existence and education sector cannot be an exception.

IGNOU has carved a niche for itself as the world's largest university, providing quality higher educational opportunities to the unreached through its rich range of programmes without any discrimination whatsoever. Innovation technologies and the best practices from successful models are being used to provide access and opportunities to differently abled, tribals, women and other marginalized section of the society.

The National Centre for Innovations in Distance Education (NCIDE) at IGNOU is a ground for nurturing innovations targeted towards facilitation of the Open and Distance Learning (ODL) system. It encourages innovations in ODL through collaborations within IGNOU as well as with other institutes. Keeping this in view the Centre has been organising Popular Talks to provide an interactive platform to facilitate sharing of innovative ideas and experiences in ODL.

I understand that NCIDE has been engaged in inviting various speakers from within and outside of the University for delivering talks through teleconferencing mode. These as I understand were primarily meant to share innovative experiences both at the Headquarters and also with the Regional Centres of IGNOU spread across the country. This volume, as I understand is based on various talks delivered by the experts and in-house colloquium held in NCIDE.

I am sure that dissemination of these innovative experiences through this publication will prove useful for fostering ideas and exchange of experiences among the stakeholders. I hope that NCIDE will work towards ensuring effective application of these innovative ideas for encouraging innovations in the existing educational institutions. I also hope that ODL based institutions across the country and abroad would benefit by this publication.

I commend NCIDE for bringing out this publication.

(Prof. M. Aslam)
Vice Chancellor

Content

Preface

Innovation has become the buzzword of the knowledge society today with rapid advances in new technologies and changing needs of the economy. Innovation is being viewed as the essential approach towards inclusive growth in developing economies. The world is becoming more interconnected, technology is continuously altering our relationship to information, and the learning environments of today are getting revolutionised by these developments. The ability to generate new ideas, processes and solutions, and conversion of knowledge into social good and economic wealth through the process of innovation is the crux of overall progress of a nation. Realising that innovation is the engine for the growth, prosperity and national competitiveness in the 21st century, the President of India declared 2010-20 as the 'Decade of Innovation'.

In India there is increased stress on initiatives aimed at encouraging innovations in existing educational institutions – universities, colleges and schools, as well as promoting new educational models and innovative platforms for knowledge creation, dissemination and application. Today, we find that the overall scenario of education is faced with multiple challenges concerning primarily the issues of access, equity and quality. In this backdrop Open and Distance Learning (ODL) has been found to be effectively catching up with the public imagination for the last three decades. The ODL system is in itself an innovation and it has also emerged as a fertile ground for pioneering innovations.

The National Centre for Innovations in Distance Education (NCIDE) at the Indira Gandhi National Open University (IGNOU), Maidan Garhi, New Delhi, is an all embracing facility for promoting, supporting, re-engineering and disseminating innovations in Open and Distance Learning system. It is a ground for nurturing bright and inquisitive minds whose ideas and explorations are expected to lead to innovative solutions of issues related to the ODL system. The goal of the Centre is to develop a culture of continued search for such solutions to pave the way for University's mission to offer seamless education across the various levels, achieve cost efficiency in its operations and provide borderless access to quality education. It is also *inter alia* mandated towards documentation and dissemination of the innovations and best practices in ODL system.

In view of that NCIDE has been organising a series of popular talks on *innovations and developments in open and distance education in order to facilitate the exchange of innovative ideas and experiences in the field of distance education and to foster the spirit of innovation among the faculty and students.* These talks are telecast live through the *Gyandarshan* Channel and are also webcast on every last Wednesday of a calendar month. Apart from this NCIDE has also been organising an In-house Colloquium to sensitise the members of staff towards the spirit of innovation.

The present book is a collection of papers presented at the Popular Talk Series and the In-house Colloquium over a period of more than two and half years. Other main objectives of the talk were to provide a platform for sharing of ideas, analysis and reflection on new developments in the field of distance education; to share and learn from the experiences of technology leaders for development of innovative learning solutions for distance education; and to nurture and harness the applications of innovative learning solutions in distance education. Eminent experts from the fields of ICT, distance education, management from varied organisations from all over the country were invited in this talk series.

Despite being well aware of the fact that the retail space is getting occupied slowly by the digital space we felt it necessary to bring out a compilation in the form of a book. We hope that this book will emerge as a very useful document for all the functionaries and practitioners in the ODL system. We have also received requests for such a compilation from many of our colleagues who despite their interest could not attend the talks for other commitments. This book could definitely serve their purpose.

We are indeed thankful to Prof. M. Aslam, Vice Chancellor, IGNOU for his encouragement towards this initiative. We are grateful to our colleagues at the National Centre for Innovations in Distance Education, Indira Gandhi National Open University, New Delhi, for their active cooperation in organising the talks and colloquium and subsequently preparing this publication. We extend our heartfelt thanks to the members of staff of the Electronic Media Production Centre and the Material Printing and Production Division for their support in this endeavour.

We shall look forward to comments from the readers about this compilation.

Sujata Santosh
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Dr. Ashok Jain is the Vice President (Research & Academic Development), EMPI Business School, and Former Director, NISTADS. Dr Ashok Jain is a Fellow of National Academy of Sciences, India. He spent his initial professional career in Physics research and teaching at the Universities of Delhi, Kyoto and Bristol and then shifted to Science & Technology Management and Policy Analysis Work in Indian Embassy, Tokyo as Science Attaché and in the Department of Science & Technology as Director in Science & Technology Promotion Division and then as Director National Institute of Science Technology and Development Studies (NISTADS) of CSIR from where he retired.

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Prof. Brij Kothari is a faculty member of the IIM, Ahmedabad and an Ashoka Fellow. He is the President of PlanetRead, a non-profit organisation, and BookBox, a for-profit organisation, as a Reuters Digital Vision and Microsoft Developing Country Fellow at Stanford University. Brij Kothari and his team have innovated, researched, and nationally implemented Same Language Subtitling (SLS) on TV in India, for mass literacy. He is a Schwab Foundation Social Entrepreneur of the Year, 2009. The SLS innovation was featured by President Bill Clinton at the Clinton Global Initiative in 2009.

Prof. Rishikesha T. Krishnan is a Professor in the Corporate Strategy and Policy Area, and Jamuna Raghavan Chair Professor of Entrepreneurship at the IIM, Bangalore. His research interests are in the areas of strategy, innovation and competitiveness. Prof. Krishnan has been a member of the Confederation of Indian Industry (CII) Science and Technology Task Force, the Advisory Council of CII's National Innovation Mission, and on the jury of Nasscom's innovation awards. Professor Krishnan's book *From Jugaad to Systematic Innovation: The Challenge for India,* published in February 2010 received good reviews. Prof. Krishnan is an active member of *Globelics* and *Asialics*, international fora that focus on the understanding of innovation systems and competitiveness. He has served on the editorial advisory boards of several journals.

Late Prof. Vijay Kapur was University Professor of Marketing, Sales and Strategic Management in Faculty of Management Studies, University of Delhi and former Advisor to Vice Chancellor, IGNOU. A distinguished honours graduate of the elite Lal Bahadur Shastri National Academy of Administration, Mussoorie, Professor Kapur was selected for the Indian Administrative Service (IAS) in 1977 and held multiple appointments at the state and central levels in India while a member of the service. He was a recipient of four commendations for outstanding work from the Government of India and the Government of Bihar. Prof. Kapur was formally conferred the prestigious 'Palmes Academiques' Award (The Order of the Academic Palm) at a special investiture ceremony at the Embassy of France in India on the French National Day. He has a number of publications on issues connected with Politics, International Relations and International Management among others, being published in the UK, USA and India.

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1 Innovation: The Emerging Perspective

Ashok Jain

Introduction

The term 'Innovation' is often narrowly understood in the context of scientific research as new or modified technology to improve performance of products and processes. The emerging perspective of innovation goes beyond science and technology as Akio Morita, the legendary Chairman of Sony Corporation (Akoi, 1992) puts it: Science ≠ Technology≠ Innovation.

'Innovation' is now also referred to in the context of improving the performance of 'organisations'. A new term 'Systemic or Organisational Innovation' has emerged especially in the context of service sector the contribution of which is increasing in economies of various countries including India (Chesbrough et al, 2011). For example, organisations engaged in providing education, health, governance services are introducing new ways to design and organise their work using Information and Communication Technologies for efficiently delivering better services. 'Just in time' is an example of innovation in management devised by Toyota Motor Company. In many ways Public Private Partnership (PPP) is an example of financial innovation. In addition the work of Honeybee Network in India under the leadership of Anil Gupta has opened up yet another pathway for innovation known as Grassroots Innovation emerging outside the organised structures of science, technology and industrial production (Jain & Verloop, 2012). In other words the emerging perspective of innovation extends beyond the narrow individual technological innovations.

Meaning of Innovation

A clearer interpretation of the term innovation encompassing all the above contexts beyond technological innovation has emerged. This was necessary to avoid confusion in loosely equating innovation with invention or with new technology and at times even with scientific research and development (R&D). While these are connected to innovation, none of these convey the real meaning of the term 'innovation'.

The following meaning of the term 'Innovation' as distinct from invention, new technology and R&D has emerged (Verloop, 2013; Drucker, 1985; Gaynor, 2002):

> *Innovation bridges new ideas (such as invention, scientific or other knowledge, patents, imagination, learning by doing, etc.) with activity that provides improved products, processes and services to meet the needs of society.*

However, a new idea, invention or patent in itself cannot be regarded as an innovation (as illustrated in Fig. 1.1 below).

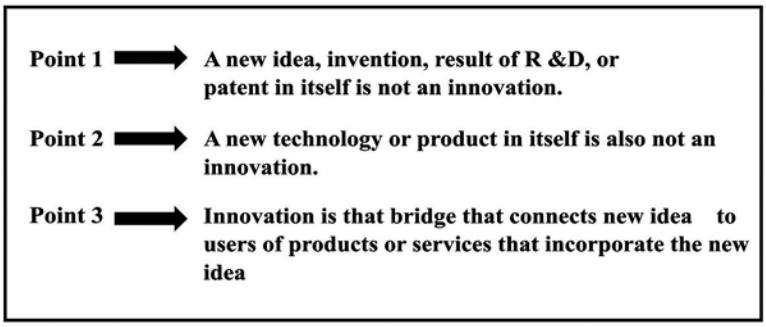

Fig. 1.1: Innovation

Bridging new ideas with adopters who put in resources (both human and financial) to reach users for resulting in better performing product or process developed by the originators has emerged as a necessary condition for innovation. Usually the originators of new ideas go up to prototypes for demonstration of better performance of a product or process but do not work for converting it to an innovation that reaches the final user.

A few examples are given below to illustrate this critical feature of innovation.

Example 1

In USA Thomas Godfrey in the year 1731 conceived and invented an instrument for navigation in sea voyages. Its usage was demonstrated in some voyages. However, United States then was not a sea-faring nation; there were no adopters of that instrument. The invention remained unrecognised and ignored. A year later, John Hadley in England made the same or similar invention independently. As all European nations engaged in maritime activity required the instrument, makers of instruments immediately adopted Hadley's invention. Hedley's invention became innovation known as Sextant (Kochar, 2004).

Example 2

Through research (R) in a laboratory new ideas are generated or acquired and by further developmental work(D) on its modified or new product or process could even be demonstrated, but this work will best be termed as invention. Process and product patents are only documents to facilitate conversion of invention into diffusible form either as a new or modified product or process. The 'output' of R&D, even if patented or demonstrated, the work will be recognised as innovation only when someone 'adopts' the demonstrated product to make it available to users.

In summary, 'Innovation' as a link between new idea and user may be represented as shown in Fig. 1.2 below.

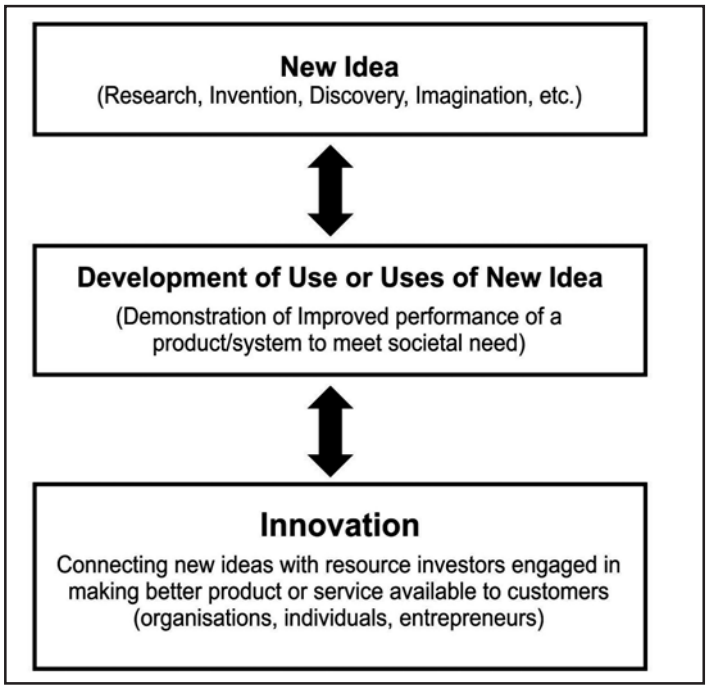

Fig. 1.2: From New Idea to Innovation

Innovation emerges only when new ideas get connected to initial adopters who then provide improved product or service to users.

Innovation Diffusion

The process by which new or modified products incorporating new ideas are adopted by large number of users is known as diffusion of innovation. When an innovation emerges, new or modified service or product based on a new idea is found worth investing resources only by a few. The subsequent spread of innovation determines the extent of its success; larger the number of adopters the more is the success of innovation. However, in the long run, at some stage all innovations are replaced by other innovations. The process is diagrammatically represented in Fig. 1.3.

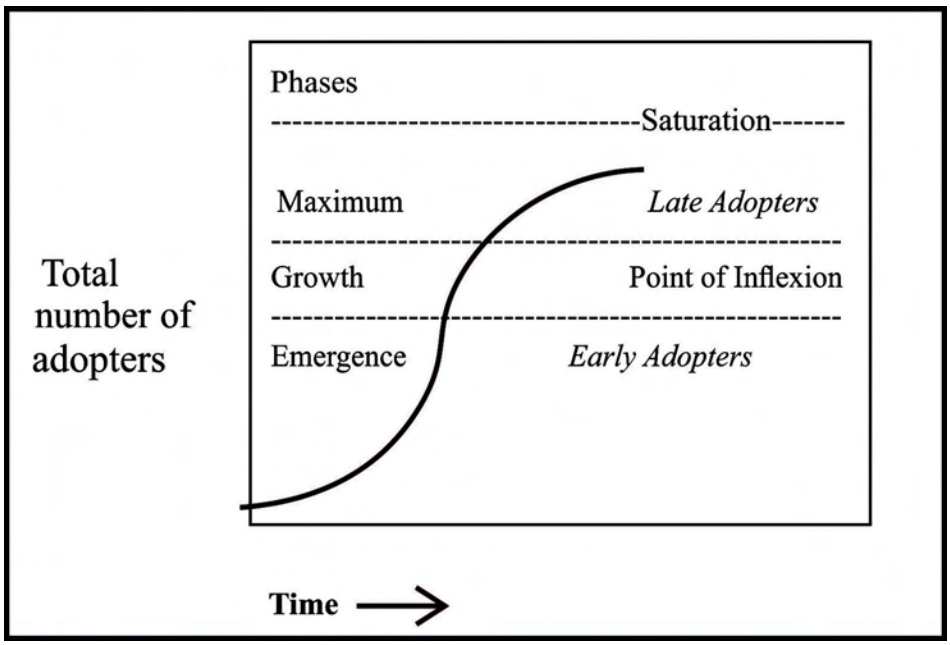

Fig. 1.3: Emergence & Diffusion of Innovation

The defining stage of innovation is its initial or early adoption. Once innovation has emerged, lot more needs to be done for its spread, and ultimately at some stage the usefulness of innovation gets exhausted or saturated and the society starts adopting yet newer ways of meeting its needs. For example, valve based radio set emerged as an innovation combining several inventions, got saturated over time and was almost completely replaced by another innovation based on the idea of semiconductors, i.e. by transistor radios. Similar is the case of colour TV replacing black and white TV. The time it takes innovation from its emergence to saturation is called 'innovation life cycle' and is known to be shortening.

Organisational Set-up of Innovation

The emerging concept of innovation requires on one hand source of new ideas that can be used in improving the performance of products and on the other a system that can then make better performing products available to users. Usually the first part (generating usable new ideas) is called Research and Development (R&D) and the other part of making products based on R&D available to users is called social and/or economic activity.

Innovation by definition is connected to R&D on one hand and to social and economic activity on the other. Consequently the organisational structure for innovation is a system that cuts across the various functions of new idea generation to production of new products /services to those who deliver these products and services. In other words at national level and within an organisation the approach is to set up an 'Innovation System' or 'Innovation Ecosystem' rather than an isolated group of either R&D or of social and economic activity.

Innovation system at the national level is represented schematically in Fig. 1.4.

National Innovation System

At the national level, while scientific research and development or R&D is carried out at Laboratories and other institutions guided by policies and programmes for science, technology and academic activities; industries and providers of services make and deliver products and services to users guided by various social and economic policies and programmes. Innovation emerges when the two get linked. National Innovation System is thus conceived as a linked system shown in Fig. 1.4.

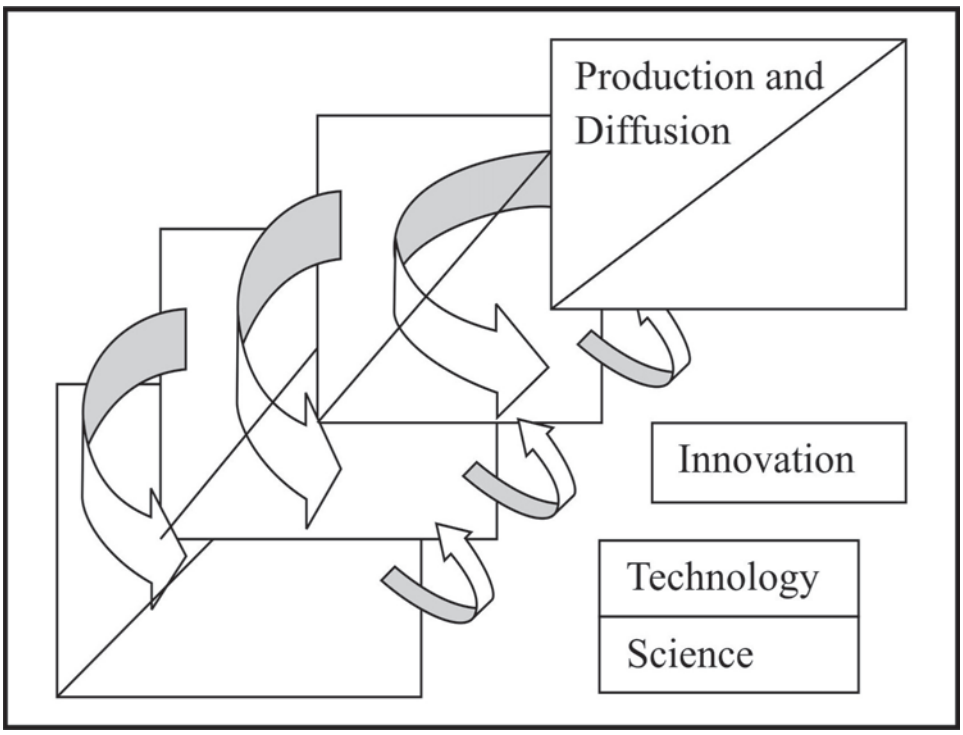

Fig. 1.4: National Innovation System
(Source: Adapted from Niwa *et al* (1993))

For example, R&D is carried out by say laboratories of Council of Scientific and Industrial Research (CSIR) or in Universities, as shown in the lower segment of Fig. 1.4. If an industry X from the upper segment of Fig. 1.4 becomes initial adopter of their results, products based on R&D made and marketed by X may become available to users. Initial adoption of R & D by industry X gives rise to an innovation.

From Fig. 1.4 it is clear that industrial innovation will not emerge without linkages between R&D and industry. Patent is only a way of telling the industry that some new know-how

exists that can be used. But unless at least one industry picks it up and becomes 'Initial Adopter' it will remain as patent and not an innovation.

This is why 'CSIR – Industry' and 'University – Industry' linkages and incubators within universities are important as these mechanisms create enabling environment for linkages or feedback loops (as shown in Fig. 1.2) between R&D and industry, thus creating an innovation ecosystem for the emergence of innovation.

In this context two connected points may be noted.

- Industry is not necessarily the only target for linkages through which innovation can emerge. Many new ideas say in education, health and even governance emerge from research and studies done in universities, but unless these are connected and tuned through feedback to the needs of organisations that provide services, organisations will not become initial adopters of the research results and no innovation will emerge.
- Often R&D or generation of new ideas and their initial adopters are within the same organisations, though usually in different groups or units. In such cases also without a system for linkages between the groups, chances of innovation emerging are bleak.

Therefore, unless a new idea (based on R&D, etc.) either from an in-house group or from outside is adopted by same or some other organisation for making products and services available to the targeted user, innovation will not emerge.

1) Innovation System within an Organisation

The objective of an organisation is to cater to the needs of its targeted user in the best possible way, i.e. to improve its performance. Therefore, the reason why an organisation will become initial adopter of its R&D based idea for making and delivering product or service is to deliver better product or service to its targeted users.

It is to be recognised that an organisation is a structure where different work functions are assigned to various groups of people or to individuals. Organisations provide products and services to users or customers by deploying human and capital resources for performing various functions. Resources deployed in any organisation may be grouped under the following five major heads (Jain, 1994):

M 1: Machinery/ Equipment/technical know-how. Usually R&D is part of these functions.

M 2: Money (Finances). This involves allocation of financial resources to various Ms.

M 3: Material/Energy (Consumables, etc.).

M 4: Manpower (Human Resource and Management)

M 5: Market, creating demands for products and services and making these available to users, supply chain, etc.

Output of the organisation that reaches a customer or user outside the organisation comes from a combination of all the Ms. Often better technical knowhow or technology comes from R&D. That is a changed M1 can be developed. But M1 in itself does not deliver a better product or service; inputs from other Ms are also necessary.

More often than not changed M1 requires concomitant changes in other Ms. Without ensuring that required changes in other Ms are possible, the organisation will neither adopt M1 for delivery of product, nor services based on M1; it will not become initial adopter and without initial adopter new technology will not become innovation.

Universities or industries are good examples to understand the structure of innovation system within an organisation.

Two examples will illustrate the point.

Example 1: An institution like IGNOU engaged in providing educational services through distance learning.

IGNOU has its own R&D group that can develop a new technical know-how or technique, i.e. it can develop a method of changing M1 that it thinks will deliver better educational service. Adoption of changed M1 by IGNOU requires consideration of the following changes:

How much extra money may be required to adopt changed M1? That is consideration of change in M4.

- Will new M1 require new consumable material, that is consideration of change in M2?
- Further is the teaching faculty ready to use changed M1 or does it require some training? In other words does change in M1 require some changes in M3?
- Finally will the students enrolled in IGNOU courses find the new way of learning better or are some trials for feedback necessary through IGNOU centres? In other words is connecting with the functional group M5 necessary before adopting changed M1?

Clearly IGNOU can become initial adopter of changed M1 and its R&D will become an innovation once all the concomitant changes in other Ms have been taken care of. Innovation will not emerge from IGNOU by simply setting up a group that develops new techniques through R&D; innovations will emerge when the organisation has a system that ensures that all the other units can synchronise their functioning for adoption of new techniques developed by the R&D group.

Example 2: Mother Dairy

Mother Dairy's supply of milk produced by individual households in villages to customers in cities has been an innovation. What was the innovation it involved?

- Setting up collection centres in villages. Known machinery for preservation of milk at low temperatures was used. Known equipment for testing the fat content of the milk was put on use and connected to a printer to give a printed slip indicating the price to be received by the supplier. It was calculated on the basis of fat content.
- Setting up centralised facilities for pasteurisation of collected milk. Again it had elements of known machinery and technology.
- Refrigerated mobile vans (nothing new) were used to transport milk from collection centres to the Central Pasteurisation Unit and for distribution of graded and standardised pasteurised milk to Mother Diary booths.
- Setting up of Mother Dairy booths for refrigerated storage and token operated dispensers in various parts of city.

In the case of Mother Dairy the design of the system from procurement of milk to making it available to users synchronously integrating all the functions (Ms) was itself an innovation; no new technology was involved. Mother Diary itself became the initial adopter of the new system. The innovation has been a success story as it subsequently diffused in terms of spreading the number of booths as also was adopted into the supply of fruits and vegetables by Safal. This type of approach is termed as Supply Chain Innovation (Mehra, 2007).

Organisational structure of innovation in relation to the five Ms within an organisation is schematically shown in Fig. 1.5 (Jain, 1994).

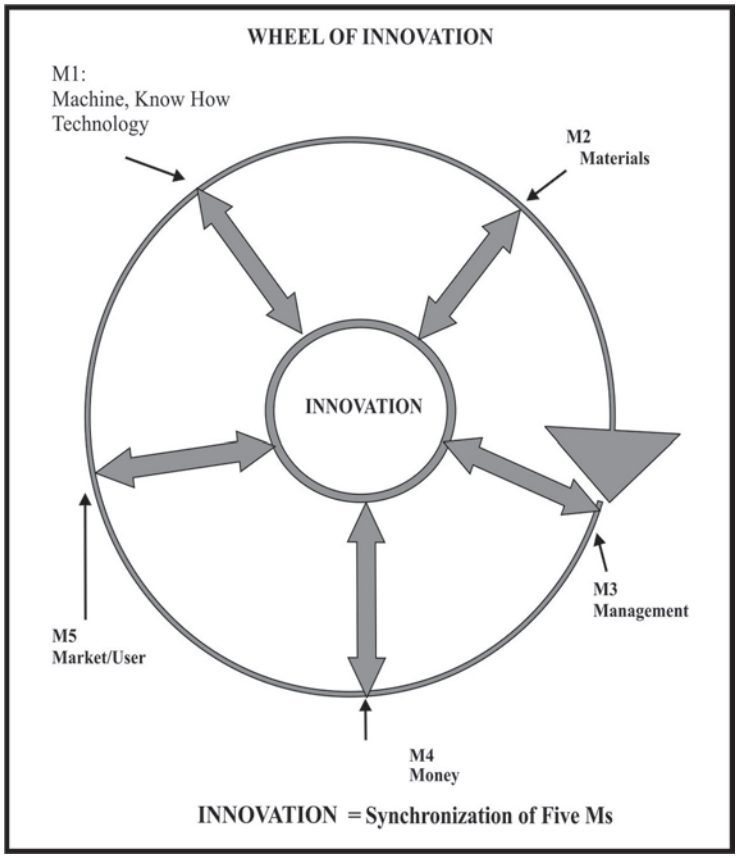

Fig. 1.5: Organisational Structure of Innovation within an Organisation (Source: Jain, 1994)

Introducing a new technology for better product or service is equivalent to modifying the 'spoke' connected to M1. To keep the wheel balanced some changes in other Ms would often become necessary so that the wheel can rotate efficiently, that is the organisation can efficiently deliver its modified mandated product or service. New idea comes through change in technology, but without synchronous changes in other functions the organisation will not be able to adopt it and become initial adopter, a necessary condition for innovation to emerge.

In passing it may be noted that many organisations that wish to make modified or better products through technical changes in existing machines or even by deploying new machines also put in considerable effort in training its manpower to use the changed or new machines, often also in informing the users of new features of their product (say by advertising) - in

other words, the organisation while changing M1 has also to put in resources in changing M3 and M5.

Grassroots Innovation

These are innovations in which the originators of new ideas are farmers and artisans who also demonstrate the usefulness and efficacy of their modified or new products and processes but in field rather than laboratories. The village community is the initial adopter of their products and processes. Thus this is another path through which new ideas get connected to users and hence emergence of innovation in a community type of organisation. These innovations emerge from grassroots and hence are termed as Grassroots Innovation.

The presence of Grassroots Innovation in India and indeed in many so-called developing countries is due to skewed economic development. In these countries a large number of people continue to live on economy, dependent primarily on agriculture and related traditional occupations (rural areas) as also those in urban, semi-urban areas with economy, dependent on modern industrial systems.

The trajectory of development in India, for example, since its independence in 1947 has been such that the formal education, science, research and industrialisation structures have grown and dominated country's developmental efforts but simultaneously another trajectory has also grown in which people trained in educational and research institutions have connected with rural occupations attempting to improve the livelihood practices of rural communities. The former trajectory has been termed as the 'elite trajectory' and the latter the 'subaltern stream' (Jain, 2002).

One of the important outcomes of efforts along the subaltern trajectory has been the emergence of an informal network called the Honey Bee Network (HBN) established by Anil Gupta, Professor at Indian Institute of Management, Ahmedabad to identify and built upon innovations embedded in local informal knowledge and practices of farmers and artisans. These innovations have been given the term Grassroots Innovations. Sustained and systemic work on grassroots innovation now covers the entire chain of Grassroots Innovation from scouting, spawning, sustaining, validating, filing patents, and scaling-up to linking with users. Recognising the national importance of Grassroots Innovations, the Government of India in 2000, through an act passed by Parliament established an autonomous umbrella organisation for Grassroots Innovation called National Innovation Foundation (NIF) supported by a corpus fund from Department of Science and Technology. A Micro Venture Innovation Fund (MVIF), sponsored by Small Industries Development Bank of India (SIDBI) also joined in to support the activities of prototype development, test marketing and pilot production. Over the years programmes under the title Grassroots Innovation have also emerged in several countries like China, South Africa, UK, US and the term finds increasing references in varied national and international contexts for a variety of technical change activities and practices (Sristi, 2013).

Grassroots Innovation are modified or new products and processes adopted by local communities based on new ideas that farmers and artisans outside the formal structures of educational, research and production have developed through trial and error and through 'learning by-doing' (Jain & Verloop, 2012).

Innovation Action Agenda: Concluding Remarks

The agenda for innovation is often misunderstood as setting up an independent group for R&D to generate new ideas, demonstrate how new ideas can work, file patents, etc. While this idea generation and demonstration are important, it does not in itself constitute work on innovation. Action agenda for innovation involves establishing inter or intra organisational linkages of the groups responsible for generation of new ideas with actors, groups and institutions who can become initial adopters for taking new idea based products and processes to users.

The objective of innovation may be capturing a market segment, as is usually the case with commercial organisations or providing better services to students, as is the case with educational institutions. In either case innovation emerges when linkages are established between new idea, for example, for changed technology, with financial, marketing and overall management functions involved in reaching the targeted 'customer'. Innovation action agenda involves various functional units within an organisation or those outside it whose mandate is to reach a 'customer' of service or product.

This is the reason why a person/group who has the authority to connect new ideas with different functionaries within an organisation or across organisations usually acts as a champion of innovation work. As evidence:

- At the National level: National Innovation Council (NIC) located in Planning Commission champions National Innovation Agenda and Action.
- At Research Organisation level: Dr R. A. Mashelkar, Director General championed reorientation of CSIR work on Innovation Agenda.
- At Corporate level: Shri Ratan Tata himself championed the innovation known as Nano. Dr. Verghese Kurien championed innovation known as Operation Flood.

Conclusion

Innovation action consists of establishing linkages of new ideas or results of R&D with other functional areas that connect better product or service with 'customers'. Customers may be students, makers and buyers of products, etc. Establishing linkages is innovation work and has necessarily to be championed and led by a person in authority over all the functional areas and not by a head of a division engaged in R&D. Even if an organisation has a unit termed as Innovation Division, its role and work is to assist the higher authority in establishing linkages of changes in any functional area such as in technology emerging from R&D group with other functional areas. The role and work agenda of Innovation Division in an organisation is thus distinctly different from that of R&D group. This distinctive work is essential for innovation to emerge. Once innovation has emerged the number of users beyond initial adopter subsequently reached by it determines its level of success. The 'success' of innovation is thus primarily determined by actions and policies related to social and economic sectors rather than by actions or policies related to science and technology that only help generate new technological ideas.

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2 Roadmap for Educational Innovation in Institutions of Higher Learning

Anil K Gupta

Introduction

It is ironic that while searching for models that promote excellence, we have not made the outstanding teachers and researchers the hub of future reforms. The fact that in any field of social investigation or higher education, the top few ranks are always occupied by public institutions has not influenced the advocacy for private institutions in the name of improving quality. Surely, mere ownership cannot influence quality. But, having achieved quality, public institutions need to be supported. The roadmap for educational innovations looks at the initiatives taken at the level of students and faculty. The concept of faculty governance has been diluted in many institutions of higher learning. The bureaucratic structures have sapped lot of energy of the students as well as faculty. It does not matter whether people perform because meritocracy itself has suffered a great deal in appointments to various positions, consultation for policy and institutional changes and for creating future vision. Time has come to arrest these tendencies and rebuild the educational edifice. A proposal for establishing an inter-university centre on innovation is made to operationalise various suggestions.

Need for Inter-University Centre for Innovation

There are several vectors available to policy makers for exploiting innovative potential of the institutions of higher learning. At the outset, it must be conceded that a majority of outstanding teachers and researchers are present in public institutions. A large number of private institutions have come up, but the fact remains that a majority of the institutions, which rank among the top five or ten in any field of education, be it natural or social sciences, are indeed public institutions. Having said that, it is also true that large scale transformation cannot take place without improving the quality in private institutions as well which have come up in a big way in the last couple of decades. As far as students are concerned, many private institutions do attract very good students. However, the innovations roadmap will require appreciating the merit where it exists and creating role models of institutional excellence but also platform excellence. The concept of platform excellence implies the ability to create cross-disciplinary and cross-institutional collaborative consortia in which innovations are nurtured, encouraged regardless of the origin. Unless the students become the fulcrum, the teachers will not be able to achieve much. Among the teachers, unless outstanding teachers become the hub, the excellence will not be nurtured. The tragedy is that even in some of the institutions of excellence, mediocre leadership gets instituted through various acts of political and administrative collisions. Once you put a mediocre person at the top, the tolerance for excellence inevitably goes down and academic freedom and administrative transparency get discounted. A mediocre leader is afraid of excellence at all levels and therefore seeks the company of conformists, compliant and congruent followers. The pursuit of academic excellence lies in the promotion of dissent, diversity and decentralised management.

The rise of authoritarian leadership styles in many institutions is not an accidental development. Around the world, academics have resisted the attempts of such kind of introverted leadership. However, when stakes are high and spoilt systems are pervasive, buying out peace and order is not very difficult. In spite of all what I have said, there is hope and let us look at how signs of these hopes can be amplified. Some of my concrete suggestions are mentioned below.

Role of Students

Given the widespread popularity of social media, it is amazing that not many academics have used it to teach the students and learn from them beyond the classroom walls.

It has been experimented by posing questions on Facebook and Linkedin and very interesting quality and quantity of response is received. Often this response helps me to moderate my class even better. It will be useful to create social media platforms for generating learning opportunities.

Time has come for replacing national social service scheme with national innovation promotion scheme to nip the institutional inertia. The students have to be encouraged to benchmark the global standards in each field, identify knowledge tool or institutional gap and create pressure on the faculty to discuss and debate the creative ways of bridging the gap.

The public institutions are supposed to serve public purpose. But private institutions driving upon pubic resources must also serve public purpose. There is an extraordinary commercialisation which has taken place in the last two decades and one cannot be sure that the accountability of institutions is being pursued in a transparent manner. Students deserve better services and they should be able to evaluate the course, the quality of faculty preparation and degree of feedback given by the faculty. Many leading institutions do it, many more need to do it. It is not my argument that judgments of the students can always be final but students' voice should matter. The feedback of high performing students should be given higher weightage.

The students should have opportunity to learn from the best teachers even if they are outside the institution and new platforms have to be generated for such learning to take place. I taught an online doctoral course with students from different countries participating in it and one of them has joined me for work from a European country.

Role of Faculty

Online courses have become a powerful way of democratising knowledge. Some of the leading universities have been offering courses online mobilising thousands of students from more than hundred countries. In mid 90's when World Wide Web was not around the way we know it now and one had to use FTP (File Transfer Protocol) to transfer files, I had taught an online course on which a doctoral student from Cornel University did the research. I had students of all ages from Northern America to Pacific including extremely experienced professional to young people. We must encourage faculty members teaching more and more courses online. In some cases, even if institutional certificates cannot be given, faculty should be empowered to issue a personal certificate depending upon the performance of the students and their proficiency. Coursera, Udacity and MITX are some of the initiatives which are going to transform the educational environment around the world. India cannot lag behind. We must encourage all institutions of excellence to put all the content of their courses in multiple formats online. If MIT can do it, there is no reason why IITs and IIMs cannot do it.

Need for Institutional Development

Linking sectoral industries with the regional and sectoral institutional development - how come despite billions of dollars invested in mining, not one gram of forest produce is valorised *in situ*. The CSR has become a phoney exercise in most of the cases. It should be obligatory in every industry to invest in sectoral and regional, academic-social interactions with clear identifiable outputs in picture. Just as we have environmental clearance, there must be an educational clearance which should not be bureaucratic in nature but be given by a collegium of institutions. In the absence of such accountability, the hinterland of large projects will continue to be a catchment of low skill labour and widespread poverty. In this regard, the public sector is no exception in neglecting the educational responsibility for the youth in the hinterland.

All the technical institutions involve a final year project by the students which often remains disconnected from the problems of society. A platform has been created by SRISTI viz. Techpedia (http://www.techpedia.in) recently. This portal is supported by DST and has been experimented with forging such partnerships in academia and informal sector. Through this platform a small team of young mavericks has persuaded the faculty members to encourage the students to take up real life problems. Some of the initial results are extremely encouraging. Such an experiment deserves to be replicated all over the country with location and institutional specific variations. With more than a million students solving just about ten thousands of problems in a year is not a big deal. There can be both IP protection as well as open source dissemination of these projects. The pity is that the country does not have any resource allocation for investing even in those projects which are found to be good by an eminent jury for further product development and entrepreneurship. On one hand, platforms like Techpedia (http://www.techpedia.in) promote originality and make a cut and paste job more difficult if not possible, on the other hand, there is a great possibility of ideas being taken up for further development in a kho-kho or relay mode.

Let us suggest some other initiatives which can be taken up. These include:

- Creating role models in every institution must be one of the urgent goals.
- Identifying the top teachers in each discipline and creating open source library of at least 50000 lectures in one year and creating social media platforms for learning. Asking top researchers and educationists to lead innovation agenda.
- Challenging students of higher education, counselling school children through local language education helplines and creating open source content in multiple languages and formats by the elite students - at least 100,000 modules of five to fifteen minutes in different formats in one year.
- Outstanding practitioners from industry, administration and social development sector to be invited as adjunct faculty by all the universities to provide high quality real life insights in each subject as well as for more meaningful search of larger than life purposes in life.
- Creating flexibility for students to take break for starting social, economic and political enterprises and come back if they wish to complete their education.
- Recognising continuing education programme for MLAs and MPs so that they understand the difficulties of the educational institutions and appreciate the need for high quality attention, resource allocation and depoliticisation of the institutions.
- Making accreditation and quality delivery of education an open and transparent process to overcome corruption and distortion of values.

The innovations are required in policy making and agenda setting platforms. Instead of assuming that Directors or Heads of various institutions represent the wisdom of those institutions, one should mobilise expertise on the basis of academic reputation and amplify their voice in agenda setting process. In some cases, it is done but in most cases it may not be happening. UK has created outstanding confluence of academic excellence and entrepreneurial upsurge in places like Cambridge. There is no reason why similar attempt cannot be made in India. The diversity in admissions is an accepted policy in most institutions of excellence world over. Unfortunately, the disciplinary diversity has gone down in the last decade in most management institutions in the country with more than 90 per cent inductees being engineers. The proportion of girls continues to be around 15 per cent. There is a need for radical departure in this regard. We need public funded proprietary programmes to create a large pool of students from disadvantaged economic background so as to select best among them for the elite institutions. Just as doctors have to spend necessary internship before being qualified to practice, there is no reason why management and technology students should not be required to serve MSME and village and slum communities before being qualified to practice. Every skill requires ground to think and the society has to decide the involvement of student in nation building process. If all the students are required to teach in schools for one year before being given degree of their discipline, we can make this country 100 per cent literate in one year and raise the quality of education in an unprecedented manner.

Inclusive society requires inclusive approaches for education and institution building. Some of the most outstanding institutions have also had some of the weakest social connection. Excellence and relevance can be connected and must get connected. The research on innovative approaches for problem solving deserves much greater attention. The societal expectations from the academic world must be raised. One of the best ways of institutionalising mediocrity at individual or institutional level is to reduce the expectation from oneself. In about seven years, by the year 2020, India is set to be the youngest country as the median age of individuals in India will be 29 years and majority of its population (64 per cent) will be in the working age group. We must ask ourselves, "Are we really expecting enough from the power of youth in one of the youngest countries".

Continuing education is a hallmark of a knowledge society. Twenty million people travel by train every day. Should not there be a possibility to register for courses of varying durations from few hours to up to fifty hours in long distance trains and get assessed for them. Education does not have to take place only in the classroom. People should be able to pursue education vigorously, autonomously and joyfully. The linkage between open university and other existing institutions must be strengthened. Indian renaissance will then not be too far away.

Conclusion

The current decade declared as 'decade of innovation' by the Prime Minister and the President signifies a transformative phase of India's destiny. Many of us being very close to this situation may not realise how important this period would be in the history of the country after a few decades or a century. Higher education is on the verge of transformation and improvement with rapid use of technology and concerns about the quality of education, academic productivity, proper use of technology and the related costs. A number of initiatives are being taken up globally thus influencing the educational environment. India cannot remain untouched by these developments. For the overall growth and development of the country it is essential to strengthen the existing educational set-up. This roadmap for educational innovation highlights certain initiatives that can be taken up to rebuild the educational edifice and give impetus to the growth of institutions of higher learning.

3 Moving from *Jugaad* to Systematic Innovation

Rishikesha T. Krishnan

Introduction

This paper/article attempts to explain how India as a country needs to move from a paradigm of Jugaad to one of systematic innovation. The present decade has been earmarked as the decade of innovation and one of the biggest challenges before the country is how to enhance the overall innovation output. The focus of this article is largely on innovation in industry, and most of the examples are from the industrial context. But, the broader context of innovation is very important even for distance education. Some examples are taken from my book from '*Jugaad to Systematic Innovation, the Challenge for India*' which talks about the larger context of innovation in the country (Krishnan, 2010).

India: A Strong Base for Innovation

A look at some of the broad data and arguments in the popular press gives the impression that India has quite a strong base for innovation. For example, many of the foreign magazines, have been citing the fact that India is now on the ascendant. It is also being suggested that India and China are overtaking the U.S. in the innovation race. Another oft-cited evidence is that India has a world class software industry. There is a rapid growth in the output in the software industry. India is also a favoured location for multinational Research and Development (R&D). In fact a large number of global companies have Research and Development centres in India. And these multinational companies account for almost half of the U.S. patents which are awarded to inventors from India. The fact that these large companies are investing in setting up R&D centres in India is in itself a suggestion that India is a good location for R&D work.

India also has a strong public R&D system. There are many strategic R&D programmes in areas like space, atomic energy, defence research and development, and so on. Some of the significant technologies like missiles, nuclear bombs, satellites and combat aircraft have emanated from these programmes. India has one of the largest Science and Technology (S&T) workforces in the world. There exists a strong R&D network, like the CSIR, that has recently been transformed into a "global innovation platform". India also has great institutions of higher education. The foreign press has also taken note of how it is more difficult to get into an IIT than into some of the top universities in the United States.

There are several innovative companies in Pharmaceuticals (*Dr. Reddy's*), Automobiles (*Tata Motors, Bajaj Auto*), Automobile components (*Bharat Forge*), Biotechnology (*Biocon*), etc. The share of R&D spending by the industry has slowly increased to more than twenty percent and this steady rise in the spending on R&D by industry is considered to be a positive sign in context of the extent of innovation that is happening in the country. A product like the '*Nano*' has featured globally on the front page of newspapers as an important innovation heralding a new era in transportation. Some other innovations in India are:

- *Advance light helicopter (Dhruv)*: India's first major high tech defence export, this helicopter uses composite materials extensively and offers contemporary features at a competitive price point and is on order by several air forces.

- *Edge*: The slimmest watch in the world launched by *Titan*.
- *Reva:* The Electric Car that promises to be the harbinger of a new generation of 'clean' automobiles by using advanced energy management systems that optimise battery use.
- *Mahindra Shaan:* A unique crossover vehicle between a tractor and utility vehicle, usable across the year thus giving farmers better utility.
- *Ethernet Transmission on Optical Networking (Tejas Networks)*: This technological innovation allowed Indian service providers to use their networks originally created for voice to provide data services and new services on telecom networks in India thus benefiting millions of customers.
- *Avadis* (Strand Life Sciences): Arguably the most powerful data analysis and visualisation platform available to biologists globally.

India: Innovation Capability

An analysis of the aggregate data suggests that the innovation capability of India is perhaps not as strong as expected. The picture is a little more complex. A closer look at the strategic innovation programmes mentioned above shows that unfortunately not many of them have spilled over in to the industrial sector. There is negligible commercial exploitation in the private sector for non strategic applications of many of the technologies developed by the strategic sector. And this is an interesting contrast to a country like Israel where a lot of the strategic technology actually becomes part of industrial use. There have been persistent problems in production, commercialisation and scaling-up of some of the technologies, for example Light Combat Aircraft (LCA) which has been very successful as a technology demonstrator has taken more than 25 years to go into commercial production. This suggests that while India is good at developing some technologies it is not very successful in translating them into industrial applications.

There are organisations like the CSIR which has a very large bank of U.S. patents and has done admirably well in developing intellectual property in the international market. However, the patent revenues from these are modest. Fig. 3.1 shows India's R&D intensity. The measure used to record treats R&D Expenditure as a percentage of GDP and as shown at Fig. 3.1, India's R&D expenditure as a percentage of GDP largely fluctuated from 0.8 to 0.9 over the last 20 years and has not gone beyond.

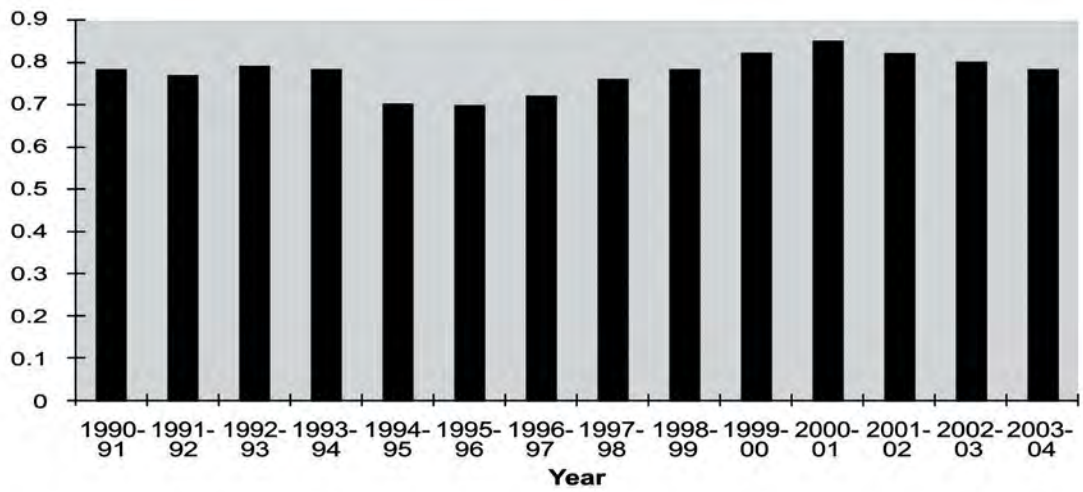

Fig. 3.1: India: R&D Expenditure as percent of GDP

This is in sharp contrast to many countries in the developed world like South Korea, Japan and even China. The graph (Fig. 3.2) shows China's R&D intensity at 1.09 percent but recent estimates suggest that it might have risen to as much as 1.5 percent.

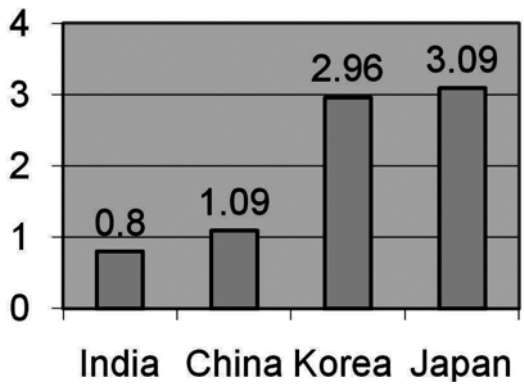

Fig. 3.2: R&D Expenditure as a percent of GDP

In case of higher education, there is poor research output except in selected fields and a few institutions. According to the observation made by government review panel "there has been a complete neglect of research culture in universities". Though the emphasis tends to be on quantity not quality, even the top institutions in India perform poorly in global comparisons. Recent study shows that the research productivity at IITs may be as low as one-tenth of the top US schools. The Fig. 3.3 illustrates the number of papers published.

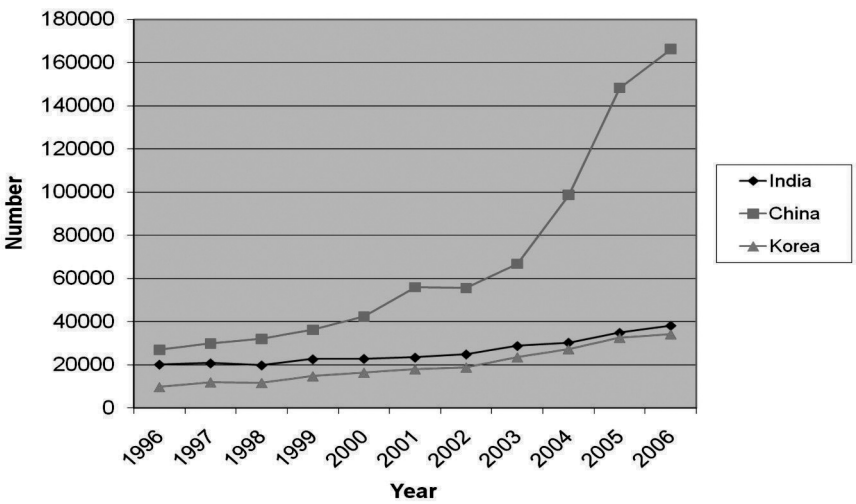

Fig. 3.3: Papers published as per SCImago

China is at the top and India is closer to Korea in terms of research output. However, Korea has a population of just about 60 millions as compared to India's much larger population. So, the output per capita on the research front is much lower in India. Another problem is that even in areas where we have traditionally been strong, for example chemistry, which has traditionally been high strength area for Indian academia and research institutions the output of research is not keeping pace with the work.

The following chart (Fig. 3.4) shows that from the year 1999 to 2003 we have 4.4% share of the world publication in chemistry. This went up to about 5.7% in the year 2004 to 2008. When compared with China (as shown in Fig. 3.5), which had 9.29% of the chemistry publication in year 1992 to 2003, and this went up to nearly 17% in to the 2004-2008. So the problem is that even in areas where India has been strong it seems to be struggling to keep pace with a country like China, which seems to be much more productive on the research front.

Technical Category	1999 to 2003		2004 to 2008		Growth
	Count	Share	Count	Share	
Chemistry	21,206	4.42%	33,504	5.71%	10%
Agricultural Science	4,303	5.91%	5,634	5.65%	17%
Materials Science	6,960	4.08%	11,126	4.81%	9%
Pharmacology	2,034	2.80%	3,866	4.25%	3%
Plant & Animal Science	8,132	3.58%	10,190	3.77%	19%
Physics	11,700	3.00%	17,295	3.70%	14%
Engineering	8,101	2.69%	14,103	3.57%	5%
Geoscience	2,839	2.64%	4,266	3.13%	13%
Space Science	1,322	2.44%	1,665	2.79%	18%
Microbiology	1,078	1.62%	2,273	2.79%	2%

Source: Thomson Reuters

Fig. 3.4: India's Share of World Publications
(Source: R&D Magazine, December 2009)

Technical Category	1999 to 2003		2004 to 2008		Growth
	Count	Share	Count	Share	
Materials Science	20,847	12.22%	48,210	20.83%	12%
Chemistry	44,573	9.29%	99,206	16.90%	15%
Physics	31,103	7.97%	66,153	14.16%	17%
Mathematics	7,321	7.37%	16,029	12.82%	16%
Engineering	19,343	6.42%	43,162	10.92%	14%
Computer Science	3,943	4.54%	16,009	10.66%	4%
Geoscience	5,322	4.95%	12,673	9.30%	11%
Pharmacology	2,259	3.11%	6,614	7.28%	7%
Environment	3,171	3.26%	9,032	6.85%	8%
Space Science	2,055	3.80%	3,514	5.89%	21%
Biology	6697	2.66%	15,971	5.86%	10%
Animal Science	5915	2.61%	14,646	5.42%	9%
Agricultural Science	1082	1.48%	4,872	4.88%	1%
Microbiology	921	1.38%	3,863	4.74%	3%
Genetics	1,642	1.43%	6,210	4.49%	5%
Immunology	493	0.87%	2,114	3.51%	2%

Source: Thomson Reuters

Fig. 3.5: China's Share of World Publications
(Source: R&D Magazine, December 2009)

A large number of multinationals are setting up R&D Centres in India but an important issue related to this activity is that a lot of work may not be genuine R&D. It is debatable if the innovations done by MNCs in India can really be categorised as advanced R&D based innovation. Only a small number of the several companies operating in India actually do innovations in cutting edge technology. They are largely engaged in software development. Many of them, rather than doing very advanced R&D in India, use the Indian centres for routine software development which supports the product development programmes in their home country.

In the industrial sector in India, there are certain other problems which crop up. For example, out of the R&D done by Indian companies, the pharmaceutical and automobile industry account for more than 60% of the total industrial R&D expenditure. So our innovation activities are largely concentrated in these two sectors. In pharmaceuticals it has been quite proven by now, that it is very difficult to do cutting edge R&D as the time it takes to come up with a new chemical entity and to take it to the market can be very long. In the last 17-18 years since Indian companies started researching aggressively for new molecules, we do not yet have a single chemical entity from India that has reached the market. There is also evidence that in some of the more progressive companies like Ranbaxy, the founders sold their stake a couple of years ago partly because they found that huge investments were required to support the R&D programme were very large. In case of some of the highly R&D intensive sectors like semiconductors and nanotechnologies research activities are there but the commercial activity in the industrial sector in these areas is quite limited.

The industry share of R&D spending is some distance away from that of the developed countries. One of the problems in the whole scenario is that the dominant paradigm of industry tends to be *Jugaad* rather than systematic R&D based innovation.

Innovation and *Jugaad*

Now, What is meant by *Jugaad*? Well, it is a pretty common phrase in north India. Very specifically it means the vehicle which is shown in the picture below (Fig. 3.6). It is a kind of transport vehicle put together with a lot of local ingenuity by people using local parts and different things that put together makes it operational.

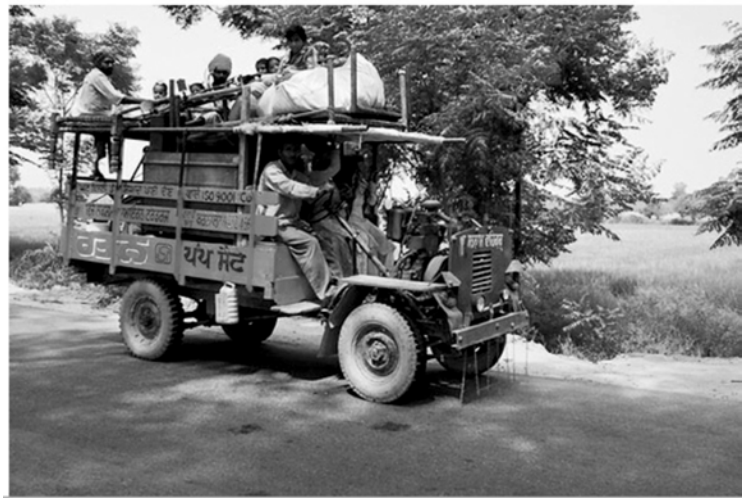

Fig. 3.6: ***Jugaad***

The good thing about *Jugaad* is that it is based on individual ingenuity. But there are certain limitations associated with this. One of the limitations in context of the modern R&D based innovation is that it has to be built on a strong scientific or engineering base, because only then it is scalable, can be converted easily into production and made available in large quantity with high quality and low defect rates. Moreover, it is also difficult to solve complex engineering problems unless you have a strong scientific and technological base. There is nothing wrong with *Jugaad per se*. But it is more craft than science. It is a good skill, it allows one to respond quickly and come out with quick solutions. But unless it is supplemented by strong science, technology and engineering capabilities, there are certain distinct limitations associated with *Jugaad*. This is one of the problems facing innovation in Inida in present times. This also gets reflected in some of the patent figures.

The graph (Fig. 3.7) shows the number of US patents, awarded to inventors from India and China. Till 2005 India and China were getting around same number of US patents but beyond 2005 China is seen moving on to a completely different trajectory.

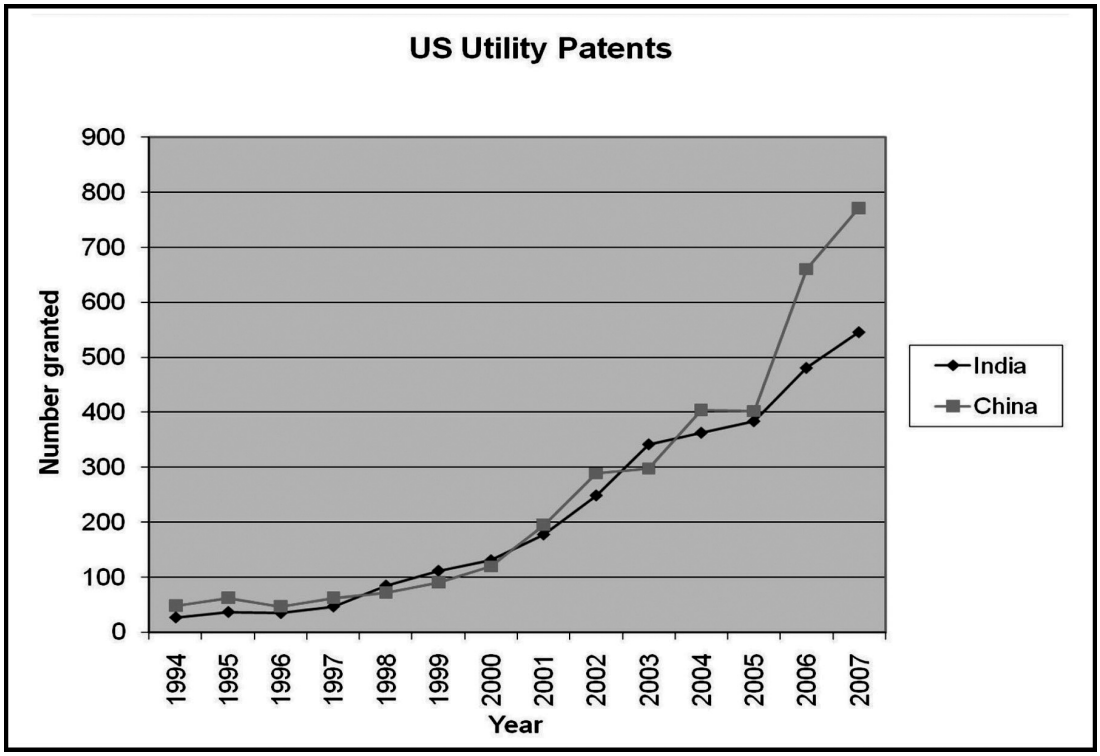

Fig. 3.7: US Utility Patents
(Source: USPTO, 2008)

The Table 3.1 shows that out of the top ten Indian companies with maximum number of US patents most of them belong to the Pharma Industry. The number of US patents awarded to Indian companies over a 14 years period from 1995 to 2008, is less than 100. And in contrast to this IBM, one single corporate, gets around 6000 US patents in a single year. Clearly we are lagging quite far behind in terms of our industrial innovations output.

Table 3.1: Top Patenters From India – "Indian" Companies

Company	*# of US Patents(95-08)*
Dr. Reddy's	98
Ranbaxy	83
Dabur	37
Indianoil	33
Biocon	31
Orchid	28
Lupin	22
Wockhardt	19
Panacea Biotec	17
Sasken Comm.	16

The aggregate indices such as the innovation performance index compiled by the economic intelligence unit shows that India is ranked only at 57. China is ranked one level below, but interesting fact is that India's projected rank in 2012 is up only by one position, i.e. from 57 to 56, whereas China is actually projected to grow by 8 positions during the same period (as shown in Fig. 3.8).

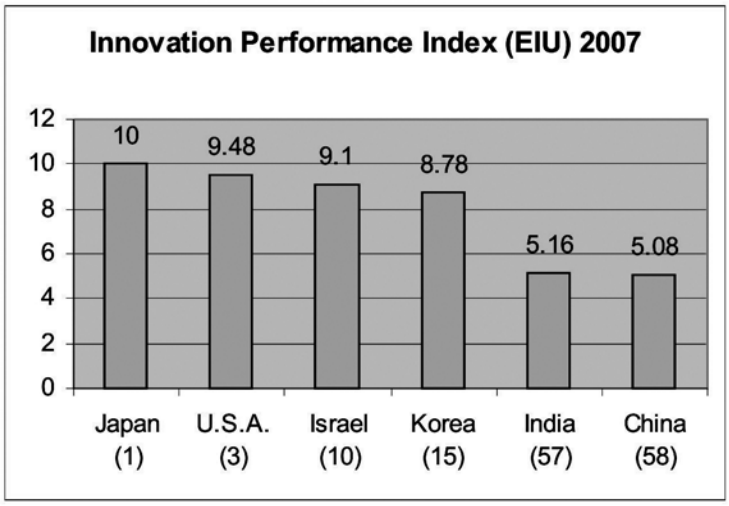

Fig. 3.8: Innovation Performance Index (EIU) 2007

Impact of Government Policy on Innovation Output

Unfortunately India does not seem to be on the right innovation trajectory as far as enhancing the innovation output is concerned. Certain measures are being taken to address this issue. The government has taken some steps. The Knowledge Commission was set up to recommend policy changes to help India take better advantage of the knowledge economy. The spending on the higher education has increased manifolds during the 11th five year plan (2007-2012). The government has planned to launch new IITs, IIMs, IISERs

and Central Universities. Many of these institutions have already started functioning. Special grants are being given to the Indian Institute of Science and selected universities. The government has formed a new innovation advisory council to give recommendations and to take actions required to enhance the innovation output. On the industrial R&D side there have been several schemes in the last decades including Technology Development Board, the New Millennium Technology Leadership initiative, the Small Business Innovation Research Initiative of the Department of Biotechnology. All of these provide financial support in various forms to industrial companies that want to pursue innovation. One question which naturally arises when one thinks about all these initiatives is that are these enough or is there something more that needs to be done in order to drive innovation output.

The Innovation System

In order to make a significant impact on innovation output, it is important to take a systemic view of how innovation happens. Innovation by companies is driven by three factors. One is the kind of inputs available, for example right people, funding, knowledge, infrastructure, and so on. It also depends on the incentive to innovate as no company will innovate unless it gets some benefit out of it. In the industrial context this usually means growth, profitability, access to new markets, and so on. The third important factor is the capacity to innovate which includes the right organisational structures, the right systems within the company, the right kind of processes and capabilities, which can enable you to understand the market needs and come up with new products and services to meet these needs. Over the last decades, it can be seen that the incentive to innovate has improved and the benefits of innovation have become quite substantial. The companies that innovate can grow and become more profitable. But there are still certain areas of concern.

The areas such as capacity to innovate as well as the inputs need to be strengthened in order to create a strong industrial innovation system. There are a lot of entities, such as academic institutions, research institutions, venture capital, incubators consultants, and so on which need to be involved in the process of working together to create the required innovational output. The incentive also depends on some aspects of government policy such as intellectual property regime and its enforcement, tax breaks, competition policy, industrial policy, and trade policy. It is important to understand what stands in the way of Indian organisations innovating effectively.

There seem to be certain sociological and cultural factors that come in the way of Indian organisations' optimising their innovation performances. Some of these include poor team work, enduring importance of upward hierarchical progression, people wanting to ascend ladders rather than necessarily becoming experts in their field, a brahaminical attitude that gives brainwork a superior position over physical work. This sometimes comes in the way of people getting the hands dirty in innovation. There exist weak systems, lack of strategic orientation and the resulting paucity of appropriate change paradigms. There are also certain soft aspects like low tolerance of failure, lack of confidence in innovation capabilities, a failure to positively reinforce the innovation efforts, and a strong need for control that comes in the way of joint working with other organisations.

While innovation is really about a lot of experimentation and trying things out, fear of failure can often mean that people do not want to experiment and try out new things. Within a company there are several other barriers. Many times the going is good therefore people do not feel the need to innovate. There is too much adherence to process and

standardisation. Capabilities and mindset are aligned to sustenance rather than innovation, there is an existing inability to quantify value, there is an inability to convince stakeholders and customers. There is no formal system of reward and recognition for innovation. Internal approval processes are too complex and there is a lack of knowledge on how to measure innovation. There is also a lack of encouragement and motivation. There is a lack of top management support and the companies are short term oriented. They tend to look only at the next few months or quarters, whereas many innovation activities have a much longer time horizon. So, we can legitimately ask - Is the situation all that hopeless or are there steps which can be taken to mitigate this?

From *Jugaad* to Systemic Innovation

What should be the agenda to enhance the innovation output? In other words "How do we make innovation work?" An agenda for change can be to move from *Jugaad* to systematic innovation. This agenda has seven points. The first one is to create a critical mass of new, innovative, technology driven firms. This has to be set up by new entrepreneurs, who are not hamstrung by the past and are willing to try out new things. India has a huge base of micro, small and medium enterprises. There is a strong need to enhance their technological capability. There is a need to transform large enterprises. A new incentive system for universities and other institutions of higher education should be created to focus on innovation. Today the system doesn't really reward academic institutions that put more emphasis on Research & Development and Innovation. There is a continuous need to enhance the process of dynamic reform of public R&D organisations, like Government Research Labs. There should be a change in the structure of the government involvement in supporting industrial R&D. Moreover, supportive societal conditions must be created for industrial innovation. This is the broad country level agenda which the nation should push. It also has to be noted that there are a lot of companies involved in innovative work at the firm level and there is much to be learnt from them — on what steps should be taken to enhance innovation.

The traditional challenges in technology and innovation management in India should also be considered. In India, the focus has always been on learning to produce, producing efficiently, improving production i.e., enhancing the output, improving the quality of the products but the focus was never really on designing of new products and services. Traditionally, technology management in India was more concerned with absorption of imported technologies and development of local alternatives, e.g. for intermediates or import substitution. The focus was more on adaptation of processes to local materials, for example, high ash content in coal, high sulphur content in crude oil. The main emphasis has always been on technology transfer, typically from laboratory to firm. The quest was on development of new processes, particularly in industries with IPR issues, for example pharmaceuticals.

But today things have changed. The markets grew at a fairly rapid pace for several years. But after a period when the release of pent-up demand offered greater growth opportunities markets in several products category are getting saturated. There are new opportunities that require fresh thinking. The so called bottom of the pyramid that is, the customers, who do not have high purchasing power, but nonetheless need products and services, is growing attractively, but cannot be addressed with existing products, services or business models. There are several national problems, such as education and health, which require fresh thinking and simply can not be solved if we follow the same resources intensive

models used in the past. Therefore, the opportunities for innovation exist almost everywhere.

Another important aspect that needs to be considered is what can be learned from successful innovators. Take an example of an industry such as mobile services. Mobiles have expanded so rapidly in the country that today we have one of the largest number of mobile phone connections in the world. And all of this happened because of a lot of innovation by the Mobile Services firms like the lifetime prepaid card, very low tariffs, and all this riding on a supply chain which was outsourced to external vendors. Many of the new business models that were followed enabled the mobile revolution to happen.

In the field of crafts, there are companies working with natural fibers, involving rural artisans from all over the country. They are engaged in developing a wide range of apparels, furniture and accessories based on these natural fibers. And now most of these companies have gone into mass retailing. The business models of these companies have some interesting features. For example, they have a non-profit part, which concentrates on artisan capability development, and works closely with the government on enhancing skills. On the other hand they also have a commercial part which looks at meeting market needs and coming out with new products and services. There are organisations, like 'Mother Earth', who have managed to marry both these models together and build a sustainable model where they use the output of the rural artisans and have also succeeded in meeting the needs of people in the urban markets. All such cases show that there is a huge potential in what is called the business model innovation, which is categorised by a new way of configuring a business and looking at different customers – how to provide value to them. This is a whole new area which Indian organisations can exploit.

Business Model Innovation

It is very important to exploit the potential of the Business Model Innovation. A business model is a conceptual framework describing how a company creates, delivers and extracts value. The Business Model can be broken down into:

- Who do we serve?
- What do we provide?
- How do we provide it?
- How do we make money?
- How do we differentiate & sustain an advantage?

Business Model Innovation arises from serving unmet or unsatisfied customer groups and providing new or different benefits. In addition to this, it also arises from delivering value in new ways and finding means of getting returns from this.

In the context of IGNOU also one can see the advantages of business model innovation. When IGNOU went into the Distance Education mode it opened up a completely new sector for providing education in the country. It was essentially a totally different model from the way higher education was traditionally imparted in India.

Example of a Structured Innovation Process

In the Automobile industry, the *Nano* has been mentioned earlier, but precursor to the Nano as far as Tata Motors is concerned was a product call the *Ace*. *'Ace'* is a small one tonne mini vehicle used for transportation of goods in small cities. How this innovation

came about is interesting to know. The Tata Motors realised that there was a need for a safe and comfortable 'last mile' vehicle to transport goods. What is the last mile?... Most of our cities today are getting more and more congested. Big trucks and other vehicles simply cannot enter the city streets and in most large cities they are also not allowed to enter. For delivering goods to a final point, much smaller vehicle is required. Traditionally this demand was met by three wheelers but they are very noisy, polluting and are also not very attractive to look at.

Tata Motors recognised this opportunity and at the same time also realised that if they came out with a four wheel vehicle instead of a three wheel one, it will enhance the status of the owner. As the society becomes more sophisticated there is concern about aesthetics, ergonomics and so on. The Tata Motors identified the user needs by a sophisticated market driven process. More than six hundred customers like drivers, owners, end users, mechanics, opinion makers, etc. were involved and were interviewed over six months. The company tried to figure out from these people as to what they wanted to see in the new vehicle. And it is interesting how they actually identified what some of these requirements were. For example, a particular driver said, "If I have a four wheeler, then a better marriage proposal will come." It was interpreted that people were seeking a higher status and better acceptance in the society. It was analysed therefore that if they could come up with a four wheel vehicle that met the requirements they will get a good market for such a product. At the same time they were very clear that it had to be very economical on cost. The management decided that design to cost is critical and if the project did not meet the cost requirements the whole project would be abandoned.

Tata Motors also brought in a number of other innovations in services, sales, support, and also in terms of the kind of team involved in the project. They used very young engineers who had a lot of sense of these new market opportunities, rather than people who had been in the company for a long time. The results have been there for all to see. They have sold more than five lakh vehicles on the *ACE* platform in the first 5 years since launch. Moreover the learning from this programme really enabled them to build the *Nano*. The learning from this is that innovation is facilitated when there is a structured process, where different milestones in the innovation activities are well laid out, when it is known at each stage how to decide, whether to go forward with the innovation process or not. This kind of structured development process can be very useful in driving the innovation output. Building a structured innovation process offers many advantages. It helps in guiding new team members. It facilitates management of multiple projects and optimises the allocation of resources across projects. It gives a clear message that not every project will reach the market. Moreover, it also facilitates the diagnosis of potential problems in the product development process.

Four Lenses of Innovation

The Tata ACE example shows that it is important to harness the four lenses of innovation (Skarzymski and Gibson, 2008). First one is challenge orthodoxies and question dogmas about what drives success. For example, in the old days, it was believed that the real strength comes from hoarding all the knowledge and information with oneself. IGNOU has taken a very courageous step forward by providing most of its course material as open resources. This is what challenging orthodoxies and questioning dogmas is all about. Second is harnessing discontinuities by spotting trends that could change the game. For example, there are lots of changes happening in the purchasing behavior of people and this is

driving the entire retail revolution in India. It is also important to leverage competencies and strategic assets. For this one should think of an organisation as a portfolio of skills and assets, not in terms of products and markets. Last requirement is to understand the unarticulated needs of the customers. One of the biggest opportunities is to understand what customers are looking for. For this you need to live inside the customer's skin, and watch the customer in his or her environment. This is also applicable in the context of the learning environments of today. It can be noticed that students today seem to learn more from social networks and a large number of other mechanisms rather than the traditional text books and lectures. It is very important to use this change in behaviours in order to do innovation more effectively.

Design-led Innovation

Another important element of innovation is how one can exploit design (Koshy, 2008). For example, companies like Titan have used traditional architectural features like palaces and Indian epics to craft watches that have been extremely popular in the market place. India has a very strong traditional arts and culture which can be an effective basis for a lot of innovation. Similarly, the one or two rupee coins being used today carry the *Bharatnatyam Mudras* used very creatively. The *Mudra* used for a one rupee coin depicts the figure one, and the one used on a two rupee coin depicts the figure two in Fig. 3.9. These were designed by the National Institute of Design, Ahmedabad for the government. This example highlights how Indian art and culture can be used to drive the innovative process. In other words design-led innovation can be a very powerful source of innovation.

Fig. 3.9: Mudras on the One Rupee and Two Rupee Coins

Orbit-shifting Challenges

There are several organisations which have done extremely well in terms of pioneering new ways of addressing problems but on a much larger scale than before, for example, the *Aravind Eye Hospital* in Madurai. Just by scaling up to unimaginable levels the numbers of cataract surgeries performed in a year they have been able to bring down the costs considerably. They have an audacious goal to cure the world of unnecessary visual impairment and have started by doing that in India. Therefore audacious goals can be great drivers of innovation. These goals can be like manufacturing the slimmest water-resistant watch in the world or revolutionising the personal transportation by producing a lower than one lakh car as in the case of the *Tata Nano* or eliminating needless visual impairment across the world as in the case of *Aravind Eye Hospital*. In other words, the top management can get the whole organisation to move towards orbit shifting instead of just incremental innovation by setting important and audacious goals for the organisations (Munshi, 2009). This is also important because in the Indian context many of our organisations have traditionally been quite paternalistic and this has constrained them from being innovative.

One thing which Indian companies have done successfully in recent years is to create an innovation base through acquisition. An example is *Moserbaer*, a company in the CD

business. Moserbaer holds 16.5% of the world's global recordable optical media market. It acquired OM&T BV, an optical technology and R&D subsidiary of *Philips*. This will enhance the leadership position of Moserbaer in the next generation optical format race. Another company which has done this very effectively is *Biocon* in the biotechnology business. If the company lacks a strong innovation base it can acquire a company which has already created that kind of an innovation base and it can be used as a platform for further innovation. The whole idea in the innovation world today is to be open – to do more collaboration work with other companies, acquire a company if required and so on.

Raw Materials for Innovation

Some other lessons to be learnt from the "management of innovation" literature are mentioned below. The most important lesson is that ideas are the extremely important; they are the raw materials which drive innovation. It is important to get everybody involved in the innovation process. It is necessary to raise the ratio of people who see themselves in innovators. It is important to give them training, time, tools and required space, benchmark the numbers of people who submit the ideas or participate in innovations events. It is also important to use the internet and intranet constructively. In order to enlarge and enhance the innovation pipeline employees should be encouraged to ideate around specific themes such as corporate challenges, customer problems and industry issues. Give focused challenges to the company or to the organisation which can get people to come up with new ideas.

The idea management literature very clearly shows that small ideas are very important. If rewards are designed carefully a lot of people participate. Idea should be a central part of work not something additional or further in position which is placed on them. It should be made easy for people to submit ideas and these should be reviewed quickly. As part of idea management best practices it is necessary to draw attention to what is important. The critical areas in which ideas are being sought should be identified. The management should help employees see beyond the obvious.

The second important raw material is experimentation. It should be remembered that failure plays a critical role in innovation. One cannot innovate unless one is willing to fail. Infact several important products, such as *Nylon* (a lab experiment that went wrong), *Post-it Notes* (failed adhesives), two wheelers (*TVS spectra* failed, but *Victor* succeeded) succeeded only because there were lots of failure earlier, and they learnt from the failures. Therefore innovation cannot happen unless one is able to create a climate for innovation and experimentation by creating infrastructure and providing resources for experiments. The culture of innovation should be built in to the organisations. People should be given a little slack time, for example companies like Google are well known for allowing their employees to spend about 20% of their time on their own innovation projects. This can be an important way of encouraging innovation.

It should also be noted that the managerial practices have an impact on innovation, depending on their aligument with encouraging intrinsic motivation (Amabile, 1998). People should be given interesting challenges to match their expertise and skills in creative thinking with their jobs. They should be given freedom also. It is essential to set aggressive goals and communicate them clearly. They should be given autonomy as regards how to solve those problems.

Appropriate resources must be provided – neither too many nor too little. Too little resources dampen the spirit of creativity. Looking at the recent innovation records of many organisations one can deduce that radical game changing innovation does not necessarily need huge resources. For example, a scramjet engine was developed by the University of Queensland by spending just two million dollars whereas NASA spent hundred million dollars trying to create the same technology. The smartness with which the resources are used that really counts. It is important to make sure that there is lots of diversity in the teams, because increasingly it is found that innovation is actually done by a team and not by individuals. The work group should be mutually supportive groups of people from diverse backgrounds. There should be free and generous recognition of the creative work. Management should give lots of encouragement to people. Long delays should be avoided and they should not be criticised prematurely and honest failure should be tolerated.

In India, if somebody comes up with an idea, he or she is immediately told why it would not work. The organisational support should facilitate information sharing and should not allow political problems to fester and kill the ideas of the people. It is also important to appropriate the value of innovation and for this various aspects need to be considered. One is Intellectual Property Strategy. This includes product-market actions such as standards, barriers to innovation and collaborative agreements. Another aspect is continual innovation which involves continuous improvement and radical innovation. It is important to keep on doing better than the earlier attempts to be ahead of others. There should be a proper legal strategy dealing with issues such as patents, copyright, trade secret and trademarks.

Finally there should be an academic agenda for innovation.

Academic Agenda for Innovation

There are certain critical points which need to be emphasized in the academic system of India. In order to enhance innovation output, the first requirement is to make people learn how to work in teams. A lot of innovations happen in a team context. But often people are not trained to be good team players. For example, it is critical to know how to disagree with each others', how to contribute to each other ideas and how to build on other ideas. Therefore, teamwork should be encouraged right from the academic study onwards. Secondly, it is essential to encourage more design projects. One of the disadvantages today is the use of excessive computer simulation. People are not doing enough with their hands and are not experimenting with real things in the real world. Particularly in the engineering field efforts must be made to create more opportunities for people to work with real engineering and technology, building products and making them work. Opportunities must also be provided for open-ended problem solving instead of giving students problems, whose solutions are known. For example, Manindra Agarwal and his students at IIT Kanpur solved some of trickiest mathematics problems a few years ago and got international recognition for that.

The Indian government today provides generous support for innovation and research programmes. The universities and academic institutions should take advantage of this opportunity to build their innovation capabilities. It is important to create a research culture, and to encourage students and faculty to undertake more research projects. The faculty should not be burdened only with teaching and should be allowed to spend more time on the innovation agenda.

A lot of innovation that has happened over time is not only because of engineering, technology and other sciences. Innovation is about understanding human beings better and a deeper understanding of what actually works. A close scrutiny of the innovations shows that their acceptance or rejection was mainly because of certain human factors. The only way to understand those human factors is through humanities and social sciences. Therefore, a greater interest must be taken in humanities and social sciences.

There is also a strong need to cultivate deliberate practice. Deliberate practice means people trying to improve themselves by setting their own goals, practicing, looking at the results of their practice, analyzing why they have not succeeded and then improving themselves. It is possible for each one of us to improve our output, our innovative abilities by setting ourselves goals and seeing how we stand up to those goals. To sum up what is required to move from just being creative improvisers to being people who can innovate very systematically having systems, processes, organisations, designs, experimentation, idea collection systems and so on, which can really drive the innovation process.

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4 Reading for a Billion: Same Language Subtitling

Brij Kothari

Introduction

According to the 2011 Census, India had 778 million officially 'literate' people and 273 million illiterates. In reality, half the so-called 'literates', or around 389 million people, can best be called 'early-literate'. They cannot read a newspaper or any simple text, for example. The Same Language Subtitling (SLS) project was initiated in 1997 at the Indian Institute of Management, Ahmedabad (IIM-A) with the goal of transitioning all early-literates from a state of early-reading to functional and fluent reading ability.

SLS is simply the idea of subtitling the lyrics of film songs (or music videos) in the 'same' language that they are sung in. It is a deceptively simple idea for what it achieves. Over the last decade, SLS has woven regular reading practice into the lives of 150 million early-readers in India.

Since 2006, SLS has been implemented on existing Bollywood film songs on TV, in 8 languages: Hindi, Bengali, Gujarati, Marathi, Telugu, Tamil, Kannada and Punjabi. A Hindi song is shown with the lyrics subtitled in Hindi, Tamil songs with Tamil subtitles, and so on in every language. What you hear is what you read. The subtitles are designed to change the color of every word in perfect timing with the song.

Several research studies have consistently found that exposure to SLS leads to a measurable improvement in reading ability. Reading skills are practiced automatically and subconsciously as a part of staple entertainment already consumed by millions. SLS is popular among viewers and known to improve TV program ratings. SLS is cost-effective. On a nationally telecast Hindi program, one US dollar gives reading practice to 5,000 people for one year.

SLS has relevance for a diversity of languages, states, and literacy contexts, not just in India, but around the world, wherever songs (music videos) are popularly seen on television and literacy skill levels are in need of improvement. Although rooted in entertainment, SLS is also empowering because it creates a context in which literacy skills remain in a lifelong state of practice and improvement for a mass of people. Former US President Bill Clinton featured SLS at the Clinton Global Initiative (CGI), on Sept. 24, 2009, calling it "A small change that has a staggering impact on people's lives". The SLS innovation is the recipient of several international awards.

The use of SLS on television, strategically for reading skill reinforcement and literacy skill enhancement on a mass scale, has never been tried anywhere in the world. Clearly, as simple an idea as SLS is, it has reached a stage of national presence by facing several challenges, starting with a long period of outright rejection by most media and literacy planners. The fact that SLS continues to steadily convert skeptics along the way is testimony to the intrinsic and now proven potential of the idea.

The following text was drawn from an article written for a conference, "Attaining the MDGs in India: The Role of Public Policy and Service Delivery" organised by the World Bank and IESE, June 17-18, 2004, New Delhi. It represents the status of the SLS project at the time.

India's Literacy Rate: A Growing Bubble

According to the 2001 Census, India's literacy rate is 65.4% (7+). Officially, the population aged seven and above comprises of 562 million literates and 296.2 million non-literates. As Table 4.1 documents, the literacy rate has experienced a dramatic rise in the last fifty years, from 18.3% in 1951 to 65.4% in 2001. The most significant decadal growth of 12.9% was in the 1990s, mainly due to the Total Literacy Campaigns (TLCs) of the National Literacy Mission (NLM), in around 450 of India's 593 districts.

Table 4.1: Decadal literacy growth in India (7+ age group)

Year	*Literacy Percentage*	*Decadal Growth*	*Non-literates (millions)*
1951	18.3	—	—
1961	28.3	10.0	249.40
1971	34.4	6.1	283.03
1981	43.5	9.1	305.31
1991	52.5	8.7	328.88
2001	65.4	12.9	296.20

Source: NLM (2000) and 2001 Census

What does a literacy rate of 65.4% in 2001 actually mean? The Indian Census defines a literate as "A person aged 7 and above, who, can both read and write with understanding in any language. A person who can only read but cannot write, is not literate." Few would adhere to the position that 65.4% of the 7+ population can "read and write with understanding" when it is well-known that the enumeration of literacy by the census is nothing more than an individual in every household reporting on behalf of every household member whether she/he is literate. The critical question is, therefore, "What percentage of the 7+ population is literate at what level of literacy?"

Two of our studies offer a perspective on the literacy levels that might be inhabited by India's "literates". The first study was conducted in eight villages of Gujarat during January-June 2001, requiring two or more rounds of visits to every household. The census methodology was followed in the first round—simply asking an individual who was present, to report on the literacy/non-literacy status of all household members. A "reported" literacy rate of 66.7% resulted for all the villages combined, a number one would expect from the official census, due to methodological similarity. Subsequent round(s) conducted a literacy level measurement of all present individuals. The reading, writing, and numeracy abilities of 82.8% of the population (7+) were measured, using a modified version of a tool described in Kothari and Joshi (2002). Over one-third the "literate" population (36%) in the Gujarat villages sampled, was found not to be functionally literate and half the "literates" have significant room for skill improvement.

The second study was a commissioned study, designed by the author but conducted independently by AC Nielsen's ORG-Center for Social Research (ORG-CSR), in five villages in each of the following states: Uttar Pradesh, Madhya Pradesh, Bihar, Rajasthan, and Gujarat (ORG-CSR, 2003a). The findings are even more shocking. Comparable to the literacy rate thrown up by the 2001 Census, 68.2 % reported themselves to be literate. However, when asked to read the simplest of paragraphs, only 12% could read without any difficulty, 36.3% read with a range of difficulty, and 51.7% could not read at all.

The majority of children in Indian villages are deprived of opportunities for school and literacy preparedness in the most critical learning years, before entry into formal schooling. Children's books and generally print exposure beginning in early childhood does not feature automatically and richly in the lives of village children, either at home or in play and educational contexts, including *aanganwadis* and formal schooling. At the point of entry into school, children often do not have the basic concepts of print and the idea that there is some such thing as sound-print association, making the task of low quality primary schooling that much more difficult. It is not surprising, therefore, that in developed societies, the reading skills of children at the point of primary school entry, can surpass the reading skills of many Indian village children at the point of exit from primary school. Pre-school, during school, and lifelong exposure and engagement with print is a critical factor in lifelong literacy development. But as Frontline (2002) states by drawing upon the National Readership Survey (NRS) 2002, "there are 248 million literate adults who are unexposed to newspapers and magazines, in comparison to the 180 million who do read publications. Readers from nearly 6,00,000 villages make up only 48 per cent of the readership base, although rural India is home to 62.6 per cent of the country's literate population." By implication, of the 352 million "literates" in rural India, only 86.4 million people actually read any publication.

Literacy and Television Penetration

The Information and Communication Technology (ICT) with the strongest rural presence in India is television and this presence is still growing rapidly (Fig. 4.1). According to the NRS 2002 findings cited in Frontline (2002), 383.6 million people have direct access to television in 81.6 million homes. In comparison there are only 189 million radio listeners and six million internet users.

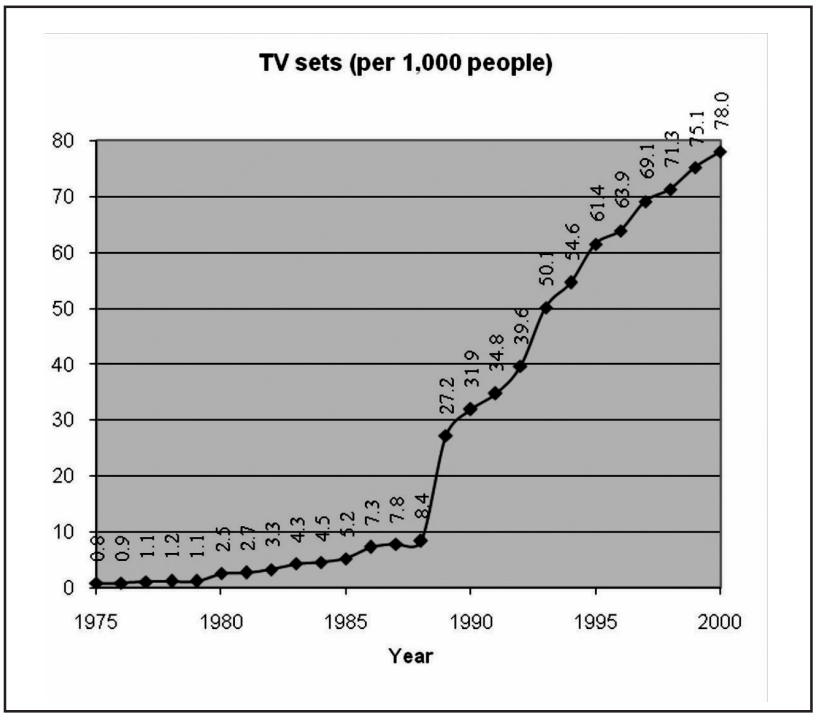

Fig. 4.1: Growth of television in India
(Source: World Development Indicators)

Television consumes a 72% share of media time or an average viewing time of 82 minutes/ person/day. Television viewing/household was at an average of 130 minutes/day. From 1999 to 2002, television access grew by 12% and Cable and Satellite (C&S) penetration grew from 29 million to 40 million. Thus, around 50% of all TV homes have C&S access, although, cable penetration is heavily concentrated in urban areas and the southern states of Tamil Nadu, Karnataka, Andhra Pradesh and Gujarat.

Access to television among people at various levels of literacy is a relevant issue for the SLS project. The literacy level census conducted in the eight villages of Gujarat offers a perspective. Even if one cannot generalise nationally on the basis of this picture, it serves to challenge a myth that television access is concentrated among the literate. TV viewers in the eight villages comprise of 33% non-literates, 45% early literates, and 22% fully literate people. The five-state ORG-CSR (2003a) study offers a startlingly similar confirmation of these proportions in a sample population at 68.2% literacy rate as shown in Fig. 4.2 (if one accepts people with no formal education as non-literate, Grade 1-5 education as early literate and Grade 6+ as fully literate).

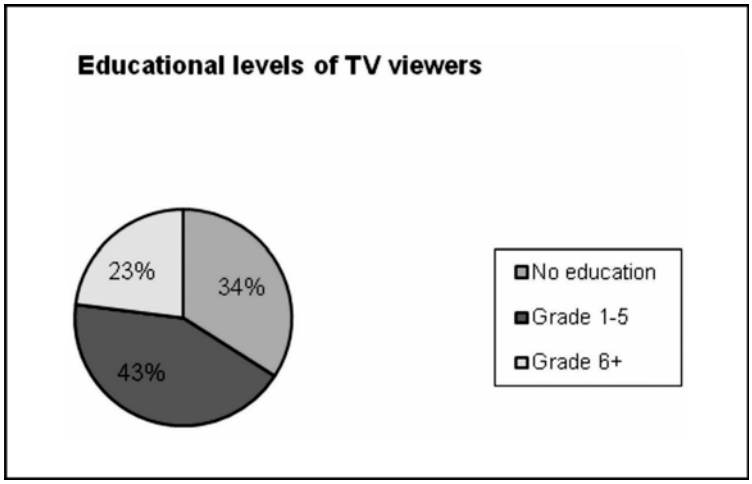

Fig. 4.2: Literacy Levels of TV viewers in Five-state Study

Assuming total TV access to be 500 million, at present, SLS can potentially contribute to the reading skill improvement of 215 million (43%) early literates and motivate an additional 170 million (34%) for literacy. Besides, 115 million (23%) fully literate people may also enjoy singing along to the lyrics.

SLS for all Shades for Literacy

SLS is SIMPLY the idea of subtitling the spoken words of motion media in the "same" language and script corresponding to the audio. If implemented on existing song programming on television, SLS makes reading, and to some extent writing, a way of popular television entertainment among millions of early literate people in India, with access to television. Others benefit too making SLS a win-win solution for media and educationists. SLS enhances the entertainment value of song-based programming for early and fully literate viewers while orienting pre-reading children and non-literate adults toward literacy, e.g., through motivation generation and print exposure in print-poor environments.

Most importantly, SLS complements any and every literacy activity that may constitute the educational environment of a person. In 1997, when the project began, these could have been seen as tall claims for such a simple change on television. Six years later, it may still feel the same without a serious consideration of the substantial feedback generated from a diversity of viewers in several completed and ongoing studies.

The key learnings from the SLS efforts are summarized as follows:

1) SLS enjoys overwhelming popularity on song-based programming, among early and fully literate viewers (around 90% prefer it as determined independently by Nielsen's ORG-CSR).
2) The fear among program producers and media planners that SLS takes away from viewing pleasure, is unfounded; only a handful of viewers find it distracting or unnecessary.
3) The popularity of SLS among the non-literate is relatively lower at 60%, as expected. More people want it even if they themselves can't read or at least do not mind its presence.
4) Improvement in reading ability was found among early reading children and adults, even through limited exposure to SLS on TV.
5) SLS works, not like a magic bullet, but rather, as a progressive enabler whose impact on skill improvement occurs over time, below the threshold of conscious learning, in the realm of entertainment.
6) Most reasons for liking SLS are broadly linked to enhancement of entertainment, such as, the ability to know the lyrics of songs, be able to write down lyrics, clarify lyrics, and sing along. However, a fair number of people find educational value in SLS, e.g., improves reading, language, and vocabulary.
7) Early literates have difficulty in reading along with some or even most songs. They do try to read, however, and do not just ignore the subtitles entirely.
8) SLS of songs has several advantages from a reading practice perspective: a) songs are inherently repetitive, b) many of them are partially known to people so reading along becomes easier, c) they come in a variety of speeds, posing a variety of reading challenges for a range of literacy abilitites, and d) there is immediate gratification through audio confirmation of what has been read or even what one may have had difficulty in reading. In other words, there is always at least a partial feeling of success in reading.
9) SLS enjoys as much popularity among the deaf as early and fully literate viewers.

Experiences and Experiments with Same Language Subtitling

Several studies have been conducted on SLS since early 1997 and each has strengthened the case for SLS. The first study involved a qualitative assessment of the reactions to SLS on Gujarati and Hindi film songs in a variety of sites in Gujarat, including villages, slums, a primary school, and public places such as a railway station (Kothari, 1998). The approach was simply to start playing subtitled songs at a public place, observe the gathered people's reactions and reading responses, and interview them on video. Overwhelmingly, people had positive things to say for SLS, expressing a range of benefits. SLS was seen as being: a) entertaining, b) educational, c) of service to the deaf and hard of hearing, and d) useful when experiencing technical problems with the audio.

In a primary school in Ahmedabad city attended by disadvantaged children, three groups of 46 children each, comparable in terms of reading ability, were created from children in Grades 4-5 (Kothari *et al.*, 2002). Over a period of roughly three months, the Subtitle Group (SG) was shown 30 minutes of Hindi film songs with SLS three times a week, the Without Subtitle Group (WSG) was shown 30 minutes of the same Hindi film songs without subtitles, but with the same weekly frequency, and the third group, a pure Control Group (CG), was not shown any film songs. All the subjects were tested before and after the three-month period with the same exact same test. The results showed significant improvement in reading. The study supports the observation that people do read the subtitles and this reading over a sustained period of exposure is expected to lead to steady improvement in decoding ability over time for a mass of people.

The encouraging outcome of the school experiment paved the way for the first ever implementation of SLS on TV for literacy (Kothari *et al.*, 2003a). Before beginning telecasts of *Chitrageet* with SLS, IIMA conducted a baseline of the literacy skill levels of 1500 people across villages and slums.

The test conducted was similar to the one used in the school experiment with Exercise One consisting of 40 mono-alphasyllables, and Exercises Two and Three consisting twenty two-alphasyllable and three-syllable words respectively. In addition, the time taken to read the exercises was recorded.

Although 1500 people were tested, the selection criteria for inclusion in the experimental group were: a) early reading ability based on a maximum of 35 alpha-syllables read in Exercise One, b) not attending formal or non-formal education, and c) moderate-high viewers of *Chitrageet*. 521 people were, thus, selected to represent the experimental or SG, i.e., people with early reading skills and on whom the impact of SLS could be measured with minimum interference from other learning contexts. The control or WSG was drawn from a village with high cable penetration and where it was found that people generally did not watch DDK programs, preferring programmes on cable instead. The 40-syllable test was conducted with the entire 7+ population of the village and those satisfying the first two criteria for the formation of SG, but who rarely watched *Chitrageet*, were included in WSG. Thus, 260 people were selected, out of the 2148 tested.

After a telecast of 25 episodes of *Chitrageet* with SLS, the exact same post-test of reading skills was administered in December, 1999, to all those in SG and WSG who could be reached. Thus, 358 people in SG (out of 521) and 121 in WSG (out of 260) were retested for improvement. Because the average pretest score for Exercise One at the syllable level was 24.1 for SG and 30.6 for WSG, an ANCOVA was conducted, the results of which are presented in Table 4.2.

Table 4.2: Average improvement in *Chitrageet* pilot

		Exercise One		**Exercise Two**			**Exercise Three**		
Groups	n	Syll.	Time	Syll.	Word	Time	Syll.	Word	Time
Subtitle	358	4.4*	-5.1*	3.5*	2.4*	-2.8*	4.1	2.6*	0.1
Without Subtitle	121	0.4*	7.2*	0.9*	0.5*	4.6*	2.9	0.9*	9.5
t value		8.112	-3.107	4.454	5.386	-2.127	1.091	3.886	-1.558
p <=		0.00*	0.00*	0.00*	0.00*	0.03*	0.27	0.00*	0.12

* Significant differences between groups at $p < 0.05$

The average number of episodes of *Chitrageet* seen over the six month period was 13, amounting to an SLS exposure of 4.3 hours. Even at this low exposure, skill improvement was more apparent in SG as compared to WSG. As in the school experiment, the improvement was incremental and across the SG as implied by statistical significance. Improvement was again more pronounced in the smaller word exercises and in terms of time taken to read.

Survey on Popularity of SLS

On August 21, 2002, *Chitrahaar*, a very popular weekly programme of Hindi film songs was aired on national TV with SLS. The event was made more momentous by the launch of SLS around India's Independence Day on August 15 and the fact that *Chitrahaar* is the first and longest running film-song programme in the history of Indian television (over 25 years). *Chitrahaar* still enjoys a viewership of around 150 million and over time, increasingly concentrated in rural areas where cable is yet to penetrate. Although it was not sure at the time how long SLS would continue on *Chitrahaar*, a benchmarking of literacy skills was required at the beginning of the project to be able to comment on improvement from SLS later. An independent literacy skill survey was initiated by ORG-CSR in early September, 2002 across Rajasthan, Uttar Pradesh, Bihar, and Madhya Pradesh in the Hindi belt and Gujarat (ORG-CSR, 2003a).

Immediately following the telecast of four SLS episodes, an independent survey was conducted by ORG-CSR (2003b) in the same five states as the baseline, to gauge the popularity of SLS on *Chitrahaar*. The state-wise distribution of the random sample of *Chitrahaar* viewers is given in Table 4.3.

Table 4.3: Sample for popularity of SLS on *Chitrahaar*

State	*Urban*	*Rural*	*Total*
Bihar	254	252	506
Gujarat	257	270	527
Madhya Pradesh	260	253	513
Rajasthan	264	263	527
Uttar Pradesh	295	218	513
Total	**1330**	**1256**	**2586**

Chitrahaar viewers were asked if they would like or not like to see SLS on the program and the reason for this. A neutral response was also possible. The overwhelming acceptance of SLS is obvious from Fig. 4.3 – 88.5% either wanted (81.4%) or were neutral (7.1%) to have SLS on *Chitrahaar* and only 11.5% did not like its presence. The pattern was very comparable between rural and urban respondents.

The top three reasons for liking SLS were ability to memorise songs (mentioned by 50.9% of respondents who liked SLS), know the lyrics (49.4%), and sing along (38.7%). In comparison only 33.7% made a link of SLS with reading/literacy gain. This is a confirmation of earlier findings that SLS is primarily seen as an enhancer of entertainment and literacy gain is a subconscious outcome. Interestingly, 20.8% respondents also mentioned that SLS could help those with hearing difficulties. Most of the people who did not like SLS thought that it was of no use (60.6% of those who did not like) and/or that it was distracting (50.2%).

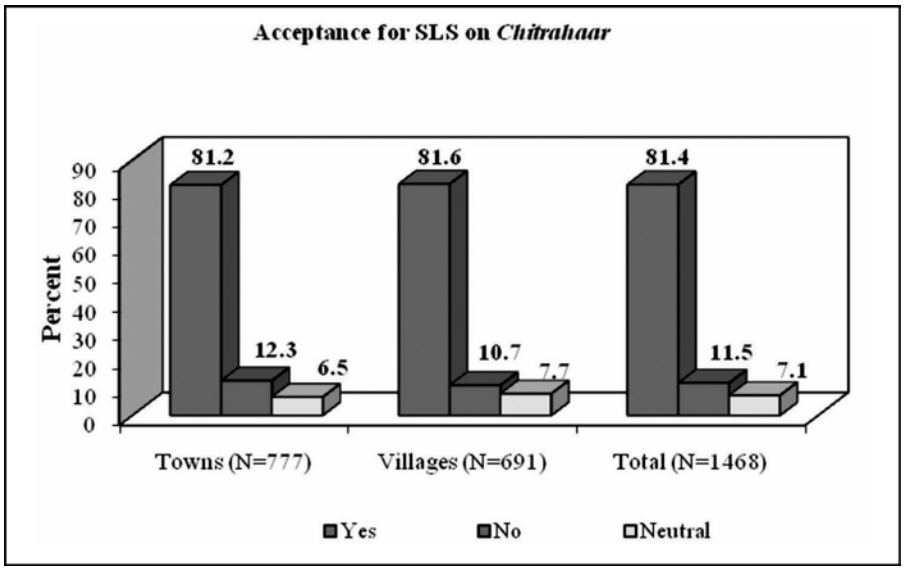

Fig. 4.3: Liking/Dislike for SLS on *Chitrahaar*

Like/dislike for SLS was most directly linked to formal education (Fig. 4.4). The least approval for SLS (only 56.4%) was among people with no formal education. But even with minimum education, liking for SLS jumps to over 85% and stays there for higher levels of education as well. Since there is a strong correlation between formal education and literacy ability, one can argue that for SLS to be liked, all that is required is some basic knowledge of the alpha-syllabary or early functional ability (Table 4.4). With a minimum of alpha-syllable knowledge, SLS begins to serve an entertainment enhancement function for which the prerequisite is reading engagement.

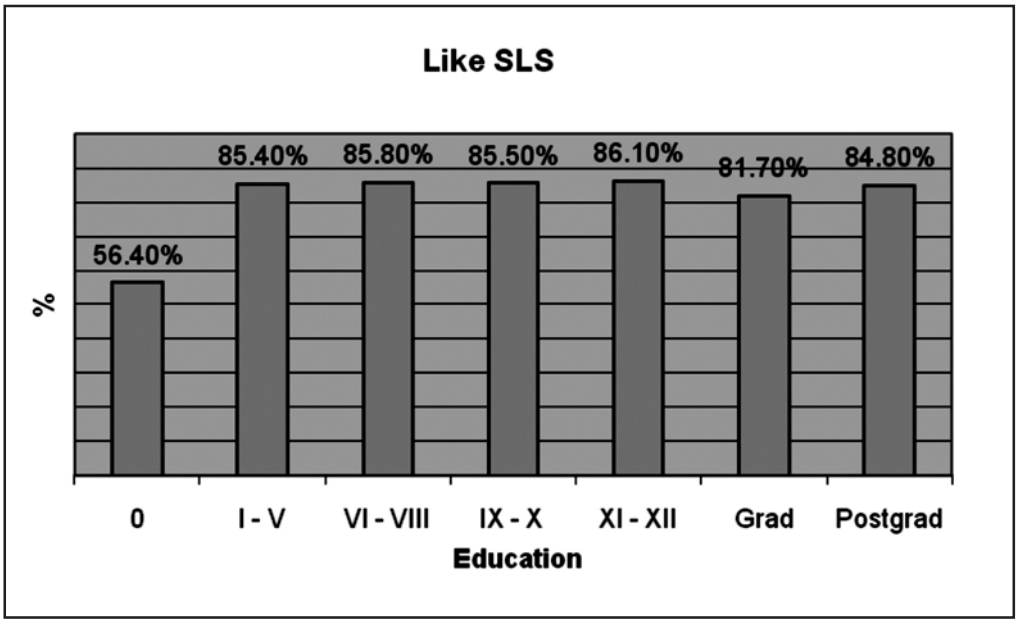

Fig. 4.4: Liking for SLS on *Chitrahaar* by Formal Education

Table 4.4: Liking for SLS by functional literacy ability

	Read newspaper	Read bus board	Read letter	Write letter
Easily	86.6%	86.5%	86.5%	86.2%
With a little difficulty	83.5%	84.3%	83.3%	85.3%
With a lot of difficulty	84.1%	80.5%	83.1%	81.0%
Cannot	55.8%	53.9%	55.8%	60.1%

Conclusion

SLS corresponds to the reinforcement of literacy skills in a phase the NLM has called Post-Literacy (PL) in the past and now, Continuing Education (CE). PL budgets are known to have routinely budgeted around $3/per person/per year. The total cost of getting a 30-minute programme of film songs subtitled professionally, at TV broadcast quality, is around $400/episode in India. Since subtitling is more or less a fixed cost irrespective of programme/language, a cost-benefit look at SLS depends on the reach of the subtitled programme among early and non-literate viewers. For example, the annual cost of adding SLS to *Chitrahaar*, a weekly 30-minute programme of Hindi film songs, is $20,800. With it reading practice is possible for 65 million early literates and motivation and print exposure to an additional 51 million non-literates, at an annual per person cost of $0.00018! As compared to traditional PL programmes in the past, SLS could be thought of as being sixteen thousand times cheaper.

While PL and CE programmes struggle to exact even short-term participation of early literates, SLS guarantees automatic reading in a home environment due to the time-honoured and ubiquitous passion for film songs. At 1,000 films produced a year in 20 languages, the Indian film industry, popularly referred to as Bollywood, far surpasses Hollywood's output. With an average of at least five songs per film, SLS can draw upon an additional 5000 film songs annually. As if this bottomless song well was not enough, folk, devotional, and other popular song genres make for SLS an inexhaustible resource to tap. The point is not to replace PL and/or CE programmes with SLS because the latter is thousands times cheaper. Instead it is argued that even if a miniscule fraction of resources for traditional programmes were to be allocated for SLS, it could effectively multiply the positive outcomes of all educational activities manifold.

The future of SLS is to spread to other parts of the globe, wherever literacy skill levels are low and songs are consumed popularly on television. It is easily possible to conceive of an International Centre for Same Language Subtitling (IC-SLS, read, 'I see SLS') where programmes reach digitally via satellite from anywhere in the world, get subtitled, and sent back digitally for local telecast, within 24-48 hours of receipt. IC-SLS would merely need to keep the required number of Non-Linear Editing systems and language experts. The challenge then is to convince broadcasters and educational agencies around the world to allow SLS on song programming. All indications so far are that SLS makes people read for the cost of a song.

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http://siteresources.worldbank.org/INTINDIA/Resources/sls.pdf (checked on September 30, 2013).

5 Nurturing Innovation in Open and Distance Learning System

Anuj Sinha

Introduction

Open and Distance Learning System is more than three decades old in India. It started with the establishment of Andhra Pradesh Open University (now called B.R Ambedkar University) in 1982. IGNOU came up as the National Open University in 1985. Thereafter, several State Open Universities and Distance Education Directorates have come up. Thirty years before nobody would have imagined that access to higher education is possible even without entering the portals of an institution of higher learning. In this regard, open and distance learning is indeed a big innovation in the scenario of education of our country. The system has impacted the teachers, students, guardians and all stakeholders, primarily by way of increasing the access. However, maintenance of quality is a big challenge and for that it is necessary that the process of innovation stays sustained.

This article reflects on the different features of Open and Distance Learning and narrates how innovation can be nurtured with a view to doing justice to each and every feature.

Background

The general public has a tendency to interchangeably use the expressions 'Open Education', 'Distance Education' and 'Correspondence Education' whereas they have different meaning. 'Correspondence Education' started on the basis of a need. The increase in population of our country has been assessed as that we are adding the population of Australia to the existing population every year. The increase is most prominent in the age group 16-24. Naturally the demand for higher education increases enormously every year. The brick and mortar infrastructure for higher education in our country is unable to cope up with this ever-growing demand. So it was felt that, rather than calling the teachers and students under the same roof at an educational institution it would be advisable to send the learning material to the residence of the learner. That is how correspondence courses got initiated. But it raised serious questions – "Where is the teacher?"; "If there is no teacher, how can proper teaching-learning transaction take place?" Since these questions could not be answered to with the desired satisfaction, lot of doubts got raised about the credibility of the system. Institutes of correspondence education do exist even today but we have come a long way by way of having a transition to the Open and Distance Learning (ODL) system.

ODL system is an aggregate of Open Learning System and Distance Education Methodology. Open Learning is a philosophy which manifests itself through several facets as under:

Learner Centredness

It is a system where all approaches towards the teaching-learning transactions are oriented towards the need of the learner.

Flexible Entry Norms

The entry norms are flexible. For example, there is no upper age limit. A candidate has to be 10+2 pass for getting entry into B.A./B.Com. but it is not essential for him to secure a particular threshold marks. One can join an academic programme at IGNOU while being a student of another university.

Individualized Study

Conventional system follows a synchronous mode of study. Here, a learner has the scope of studying according to his convenience. He can read the self-instructional printed material as per his desired schedule. Similarly, he can switch on the tape or the DVD player according to his convenience. He can freely use e-resources like open educational resources and other technology based teaching learning tools.

Trascendation of the Barrier of Space and Time

The access for study is now referred to as A3 connectivity. A3 stands for Anyone, Anytime, Anywhere. It is not only restricted to the delivery mechanism, it also includes the evaluation system.

Use of Modern Educational and Communication Technologies

With advancement of technologies, these are now being used widely in education dissemination.

Modular Approach Towards Study

A learner has flexibility of taking admission into an academic programme through several stages, like vertical mobility from Certificate to Diploma to Degree. Moreover, the learning materials are presented in modular form. A learner does not get a heavy text book which may cause intimidation, rather he gets several modules in the form of blocks.

Resource Sharing

The institution, basically an open university conducts the support services for its students through learner support centres which are hosted by existing academic institutions. The sessions pertaining to open university take place at hours which do not clash with the usual working hours of the host institution. Thus the brick and mortar infrastructure gets shared.

Option of Free Choice of Course

An open university follows a cafeteria approach. In a cafeteria the names of the dishes are provided in the menu card along with their prices. We can draw an analogy between the dishes and the courses and the prices with the number of credits. At the cafeteria one can select the dishes as per one's choice of course within the limits of one's affordability. In other words, one has to keep track of the money in one's pocket. Likewise, here one has to select courses up to the total number of credits earmarked for a programme and one has the option of free choice. One can select courses as per one's aptitude and capability.

Scientific Scheme of Evaluation

The scheme of evaluation is very scientific as it is an aggregate of formative and summative components.

Cost Effectiveness

This system is cost effective because of the provision of sharing of resources.

Support Service Network

Every institution following ODL system creates network of support services through learner support centres of different nature to suit the requirement of various programmes on offer.

Collaboration and networking with the conventional universities, state open universities, other institutions and organisations

A unique feature is the provision of collaboration with the conventional universities, other open universities, the distance education directorates, the correspondence course institutions and several other institutions/organisations of repute.

Facilities of 'Credit Transfer' and 'Credit Exemption'

Credit system is followed for the academic programmes. There is provision of 'transfer of credits' earned by a learner at an academic institution where he studied previously.

Associate Studentship

The system provides the facility of Associate Studentship, that is, one can register for a particular course without registering for the whole programme.

While Open Learning is a philosophy, Distance Education is a methodology.

It is a concept wherein the learner is at a distance from the teacher. The teacher is inbuilt in the learning material as a judicious combination of the following components:

- Print
- Audio
- Video
- Interactive Audio via radio
- Interactive Video via satellite
- Virtual classroom via internet

This means that the teacher is omnipresent. After interacting with this teacher through the above components the learners get the benefit of face-to-face counseling and guidance at the learner support centres.

Now that we have spelt out the features of Open Learning System and Distance Education Methodology, we may take their aggregate to constitute the ODL system.

Scope for Innovation in ODL System

As a matter of fact every feature of ODL can be considered to be a sub-system of the main system. In order to sustain the innovation in the ODL system we need to nurture innovation in every sub-system. Innovative practices are required in course design, course preparation, organisation of student enrolment, facilitating the exercise of the option of free choice of courses by a learner, the entire delivery mechanism, conduction of face-to-face interactive sessions and tutorial, mechanism of evaluation, impact assessment, benchmarking for quality management and research.

As mentioned earlier, tremendous advancement of technologies has taken place but despite that print happens to be the mainstay in our country. Thus one has to innovate in respect of design of the printed materials which are supposed to be self instructional, that is vastly departed from a usual text book. There is lot of room for making innovation in respect of preparing a self instructional material. The most crucial issue is that the style should be conversational like the teacher talks to the students inside the classroom. The whole classroom situation needs to be approximated as closely as possible in preparing the self instructional material.

As we have seen earlier that the Distance Education Methodology has evolved through various stages – print, audio, video, interactive audio video, virtual classroom via satellite as well as via internet. One important aspect of innovation is that of making judicious combination of the different modes depending on the objectives of the curriculum, need of the learners, cost effectiveness, timelines, etc. So let us discuss about that.

Judicious Use of Technology

Once we take the issue of technology we should be fully aware about its availability and also the different forms through which is available. During mid 80s and 90s the emphasis was on preparation of educational audio video programmes. Excellent programmes were prepared through which the learning objectives could be brought home very elegantly. But with the turn of the century we have indeed come a long way, primarily by way of application of internet which is a treasure. This has given rise to facilities of online learning, open education resources, open access, electronic portal, etc. Now, Information and Communication Technologies (ICT) encompass a big gamut of facilities. We need to make a judicious choice among them. But, let us first understand, why ICT. If we divide the whole process of civilization into three eras of revolution, namely agricultural, industrial and ICT and follow a comparative study regarding need for capital investment, training and real estate through Table 5.1 given below, then we find an interesting feature:

Table 5.1: A Comparative Study

Eras of Revolution	Capital Investment	Training Requirement	Real Estate Requirement
Agriculture	Yes	Yes	Huge
Industrial	More than above	More than above	Almost as above
ICT	More than above	More than above	Nil

In order get the desired fruits out of these revolutions, capital investment is required in each case and the quantum is in ascending order from agricultural to industrial to ICT. Same is the situation with training requirement. As a matter of fact, very sophisticated training is required in respect of ICT. But when it comes to real estate we find that the requirement is quite huge for agricultural and industrial revolution, whereas in case of ICT it is NIL. This is indeed a great advantage which needs to be exploited properly. The other advantage of ICT is complementarity of time, internet is available 24X7 and moreover, when it is night in USA it is day in India and vice versa.

While exploiting the advantage of internet, we should be aware about the following word of caution:

All that is data is not information,
All that is information is not knowledge,
All that is knowledge is not wisdom, and
All that is wisdom need not be the truth.

The above word of caution is very much relevant for the teachers and the guardians of today. They are not as much computer savvy as their students and wards. But still they need to guide the students and wards towards proper use of ICT.

In the backdrop of above we shall discuss about the strategy of teaching-learning transaction by choosing a specific subject with the idea that specificity leads to more clarity than generalisation. As a student of science let me pick up *'The First and Second Laws of Thermodynamics'*. Now what does the topic involve? It has in it a few statements, definitions, mathematical analysis, description of thermal engines and so on.

Normally a student would like to read the definitions, statements, descriptions and even the mathematical analysis from a text. For all these print is the most suitable medium. It may also be enabled through the online mode using a suitable learning management system (LMS). Where other multimedia components can be provided. The print medium, like a book has passive diagrams. Using the LMS, animated diagrams and videos can be made available. Again in the text, the keywords, the key concepts can be highlighted and provision can be made like clicking on highlight leads to opening of a page wherein further relevant description leading to more clarity can be provided. Even the mathematical analysis can be made interactive. For example, arriving at the pressure-volume relation of an ideal gas during an adiabatic process is a very common example of the first law of thermodynamics. The standard text books while presenting the said mathematical analysis presumes that the ratio between the specific heats at constraint pressure and constraint volume is invariant, which is not the exact situation. It requires to be given a thought and the invariance of the ratio comes in a restrictive sense. The steps relevant to this part of the analysis can be brought home through interactivity which can be facilitated through the LMS. Now comes the issue of some of the descriptions, particularly the thermal engines. For this aspect video happens to be the best medium. Provision can be made through the LMS for switching over from the text to audio-video snippets.

We have already mentioned that the description of thermal engines can be brought home through videos. The basic significances of the first and the second laws of thermodynamics are that they respectively rule out the possibility of what are known as perpetual motion machines of the first and second kind. There are interesting stories regarding attempts to develop perpetual motion machines. The failure to construct such machine forms the experimental bases of the two laws of thermodynamics. Such stories can help in enriching the concepts of the learners. Again videos may be considered for presentation of such stories. But the potential of audio should not be under-estimated. It is true that an audio programme will not allow us to have discussions on areas which needs visual medium. But the stories can be scripted in such a manner that the effect of video can be compensated to a great extent. After all producing an audio is simpler and cheaper than that for a video.

Audio can also be used for conducting quizzes. It has to be managed in an interactive manner where the quizmaster will be a teacher of physics. His task will not be restricted only to telling whether or not the answer provided is correct and mentioning the right

answer when the same has not been obtained from the participants. With every question he will provide an explanation regarding the correct answer irrespective of it being obtained from the participants or spelt out by him. Quiz programmes are always very vibrant and thus it would be able to sustain the interest of the learners about the subject.

There are many learning materials on thermodynamics through open education resources (OER) and open access (OA) while preparing the LMS due consideration has to be given for best possible utilisation of OER and OA, of course keeping in mind the issues related to intellectual property rights. The idea behind using OER and OA is that we need not go for reinventing the wheel. Several relevant Lectures, CDs, etc., are available on the net. It would be advisable to cut down the CDs to small snippets on points which are linked with the vital concepts. Viewing a CD for 25/30 minutes may be monotonous. Hence, the process of preparing small snippets would be useful.

The LMS can be best used for questioning. As a matter of fact, 'SAKSHAT' is an one-stop electronic portal of the MHRD, Govt. of India which was dedicated to the nation on 30th October, 2006 by the then President of the Union of India, Dr. A.P.J Abdul Kalam. It has used a four quadrant approach through its LMS. The first quadrant contains the animated text. The second has the OERs and the OAs. The third quadrant has the audio-video snippets and the fourth quadrant has the questions with solutions. A similar approach may be followed here after making judicious choice of the modes.

Here we had taken the example of the laws of thermodynamics from physics. A similar exercise can be done for any other discipline. It must be borne in mind that identification of the technological mode is extremely important before going to apply it for education dissemination. Such identification must be done based on the learner profile, infrastructure available to them and above all their sensitivity towards use of technology for teaching-learning transactions.

Conclusion

The innovation angle in respect of this topic is three-fold:

a) Identification of the ideal technological modes for dissemination of the sub-topics of a larger topic.

b) Using technology judiciously to bring home the topic elegantly.

c) Sensitising the learners as well as the teachers towards the potential of technology use for teaching-learning transactions.

As a matter of fact item (c) is very crucial without which (a) and (b) become ineffective. Moreover, one has to remember that technology can not enhance the teaching competence. If anyone is an incompetent teacher, his/her performance will be even more disastrous in front of the television camera. Innovative approaches are to be adopted to ensure the increase of outreach of the best possible teachers and teaching strategies.

6 Innovations, Ethics and Productivity – The Challenges Ahead

Vijay Kapur

Introduction

The correlation between innovations and productivity is extremely crucial. Ethics are also quite significant in this context. The whole issue of ethics has acquired a relevance of its own, especially in the backdrop of developments associated with incidents *inter alia* like the Commonwealth Games, 2G-Spectrum and the Helicopter Deal. The Government of India in its wisdom has declared the current decade as the decade of innovations but this does not mean that innovations are abounding in each and every sector of our society. This only signifies a sense of increased sensitivity towards the spirit of innovation. This article sets out to present a scenario in all three areas, that is, innovations, ethics and productivity, and also outlines some challenges ahead.

Innovation Process

Innovation is the embodiment, combination or synthesis of knowledge in original, relevant value based ideas, products, processes, services. Innovation is generally understood as the successful introduction of a new thing or method. Albert Einstein said, "*Innovation is not the product of logical thought, although the result is tied to logical structure*". Peter Drucker, who is considered as the father of Modern Management, said, "*Innovation is the specific instrument of entrepreneurship, the act that endows resources with new capacity to create wealth.*" This highlights that there are two different perspectives of innovation as discussed further. There are certain variables of innovation which are vital to it.

Innovation activities are all scientific, technological, organisational, financial, and commercial steps which actually, or are intended to, lead to the implementation of innovations. Innovation activities also include Research and Development (R&D), that is not directly related to the development of a specific innovation (OECD/Eurostat, 2005).

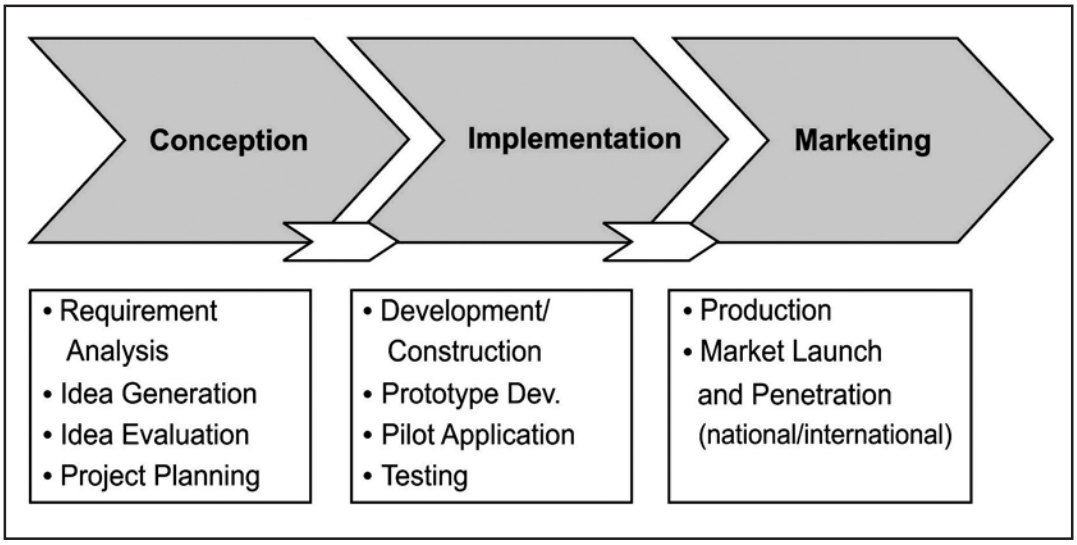

Fig. 6.1: Simplified Innovation Process
(Source: Herstatt et al, 2008)

An innovative idea, and its success, is dependent on various cultural parameters. Innovation is composed of two parts — the generation of an idea or invention and the conversion of that idea into some useful application or a business. An innovative idea should develop into a business application or any other application in the sphere of education or any other area. This clearly highlights that there is an umbilical linkage between innovation, new ideas and application. Fig. 6.1 illustrates the innovation process in a simple manner.

Innovations usually do not take place in a static environment. They are rather a result of a dynamic process involving interplay of several firm internal and external factors. R&D may constitute a major – though not exclusive – part of the 'innovation process'. The innovation process encompasses several systematic steps such as requirement analysis, idea generation, project planning, product development, and marketing (Herstatt et al, 2008).

Innovation involves management restructuring and technological transformation. The use of e-mail for communication is an example of technological transformation. This innovation influenced the entire communication process at large, changing the way people interact and exchange messages. The e-mail culture has influenced the cultural context of the society. Innovation is imperative for improving the quality of life. Without innovation it is not possible to bring out improvement in the quality of life of people around the world. One can easily make out that the way of life is much different from what it was twenty years ago.

Dimensions of Innovation

Innovation can be of several types involving innovation in process, product/service or strategy. These can vary in degree of newness. In a collectivist culture like the one which exists in our society, there is too much dependence on the process oriented scenario. Though process is important, but if innovation has to be successful there has to be some tangible outcome. Innovation can be incremental or a radical one. For example, the ODL System is considered to be a radical innovation. Actually it is both incremental and radical innovation, as it has led to a change in the perception of delivery of education. The impact of an innovation is another important dimension of innovation. The impact of an innovation can be both, continuous to discontinuous. Jack Welch, who literally rebuilt the General Electronics (GE) company, said "*Chaos is important because everybody certainly gets accustomed to finding their place within the new structure*".

The Matrix in Fig. 6.2 lays out a proposed model for creativity and innovation. It presents the whole issue of creativity and innovation and the linkage which exists between these two variables. The determinants include leadership, people management, policy and strategy, resources, customer satisfaction and the whole idea of learning and results. The approach adopted towards creativity and innovation is closely interlinked as it showcases and defines how the society uses the creative concept within itself and makes innovation a part of the entire social structure.

In India there is no dearth of innovators but for various reasons, at the structural level, it is not considered to be an innovative society. Another aspect is that India has a good improvisational culture, but there is a difference between improvisation and innovation. Therefore, it is required to be seen, how innovation and improvisation are perceived needs to be integrated into the thought processes.

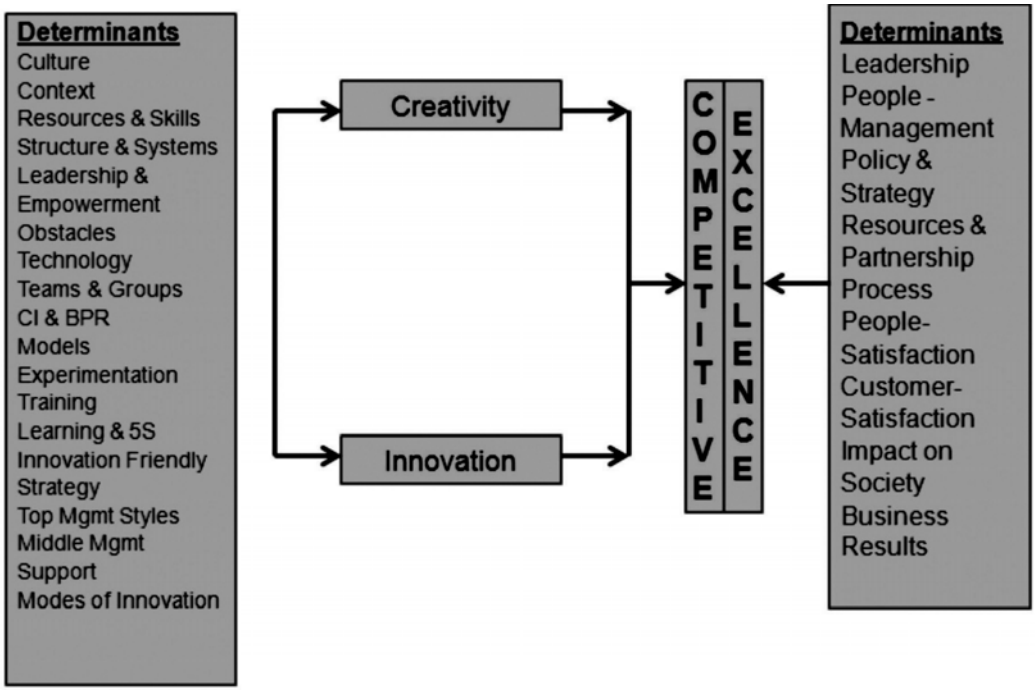

Fig. 6.2: Proposed Model for Creativity and Innovation
(Source: PA & Bhattacharyya, 2007)

According to the Global Competitiveness Report 2007-08, which places India on rank 26th worldwide for 'innovation and sophistication factors', India fares reasonably well in innovation factors for instance, the availability of scientists and engineers and the quality of scientific research institutions. On the other hand India lands on a relatively poor rank (71) as far as Government procurement of advanced technology products is concerned (Herstatt et al, 2008), as shown in Fig. 6.3. This figure also highlights that there is a wide disconnect between the government procurement of advance technology products, utility patents, and the capacity for innovations. This means that the quality of scientific research is improving but the impact of innovation at the grassroot level is negligible, and if at all present it is very fluid and widely disbursed.

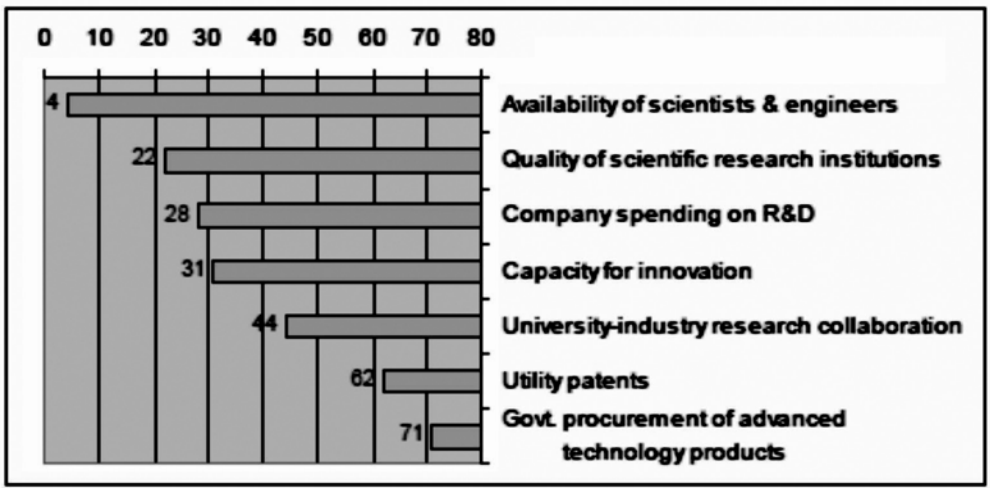

Fig. 6.3: India's Ranking in a Worldwide Survey on Innovation Factors
(Source: Herstatt et al, 2008)

The Drivers of Innovation

There is a strong need for sustainable development in a society along with an increased demand for accountability. Moreover, change within the economic structure and the greater availability of potentially useful technologies coupled with on-going competition in these technologies are some other factors which give impetus to innovation. There are several drivers of innovation such as the financial pressures to reduce costs, increase efficiency, the need to do more with less, increased competition, shorter product life cycle, and stricter regulations. These drivers play a crucial role in moving the innovation matrix forward. One of the significant issues associated with innovation is the need for a greater emphasis on commercialising scientific discoveries, particularly in the areas of Information Technology (IT) and bio-sciences. The speed and potential value of scientific progress has lead to an increased emphasis on solid and well designed portfolios of research projects. The universities should be the active drivers of innovation giving the desired impetus to the entire innovation process. Unfortunately in our part of the world this aspect gets neglected. The Government of India is now thinking of setting up specific entities, called innovation universities, specifically devoted to innovation. Academic entrepreneurship and the entrepreneurial university are also important because the existing *status quo* needs to be addressed.

A strong need is being felt for a greater preponderance of university-industry partnerships, dedicated to the entire concept of innovation. In case of India the situation is not optimal. The lack of innovation infrastructure or hubs, linking the industry, services, researchers and academics is a major constraint in India (Herstatt et al, 2008). There is a demand for greater emphasis on radical innovation and top line growth. Even a small idea can make a tremendous impact and this is the genesis of what innovation is all about. Governance is an area that affects everyone and there is marked stress on innovation in governance. Innovation in governance involves changes in the processes with a lot of emphasis on service delivery, process redesign and quality management systems design. It also involves changes in the organisational structure and design. The performance management system should be clearly linked to accountability parameters. A participatory culture in decision making needs to be developed. Internal communications should be free and frank. There should be an increased emphasis on knowledge management. Budgeting is another area in governance where innovative concepts and practices, such as performance budgeting, can be introduced. All this requires innovative thinking, use of more IT applications, a problem solving approach and more importantly a proper strategy formulation. Proper strategy formulation deals with the strategic decisions which can raise the performance levels significantly. *Pareto's Law*, also known as the 80-20 syndrome can be mentioned here. The *Pareto's Law* states that for many events roughly 80% of the effects come from 20% of the causes. In the Indian culture perhaps it is more in the ratio of ninety-ten or even more than that. Around 90% of the people are doing 10% of the work and 10% percent are doing 90% of work. So, the matrix is extremely skewed and if innovation has to succeed this matrix should change.

Diffusion of Innovation

There are several factors which affect the diffusion of innovations. Most crucial role is played by people who are innovative and creative – this includes people who continuously keep on thinking how they can change themselves, and how they can change the system from its existing shape. There is a need for proper channels of communication which should be bottom up and not top down. There should be a positive attitude towards

change. The technological skills of the people should be continuously upgraded. A general respect for holistic nature of education, especially the scientific temper is extremely essential in the society. The rationality of the social structure is also important. Sometimes our social relationships are dictated more by variables which are akin to blind faith and this works sometimes but usually it leads to problems. The ability to accept different roles, including the ability to challenge situations is something which is integral to any culture.

Innovations in Education

ICT also serves as a valuable tool for Gross Enrolment Ratio (GER) enhancement. The GER in the country is abysmal, officially it is just around 12%. About 90% of the population in the 18-23 age group does not even complete university education. Despite the claims being made, India cannot be a knowledge society if 90% of the population does not have a college/graduate degree. The government has planned that by the year 2030 India should have maximum number of people in 18-23 age group with a university education.

In order to achieve this goal an ICT based model of imparting education can be utilised on the basis of outreach. Open and distance learning can play a crucial role as it is flexible and has significant outreach. However, many challenges related to the issues of content, accountability and quality need to be looked into. Communication mediums such as TV channel (e.g. Gyandarshan) and Radio (e.g. Gyanvani) are being used for providing educational content to the masses.

IGNOU has recently started IGNOU online module and eMBA in IT Management, which are being offered online. The programme is one of the few online programmes being offered by IGNOU to students from all over the world. Webinar forms an important mode of learning in case of online programmes. Webinar provides an interactive environment for communication between the teacher and the students. E-learning and M-learning are other significant innovations in education. One can send messages directly, and read documents and books on the mobile.

Ethics

Innovation in education is integral to the development of a society and in this the whole issue of ethics plays a significant role. The ethical construct is important because it means that there has to be a greater degree of honesty. Ethics are moral values or principles that guide our behaviour, and inform us whether the actions are right or wrong. According to Tomas Paul and Linda Elder of the Foundation for Critical Thinking, "…most people confuse ethics with behaving in accordance with social conventions, religious beliefs and the law", and do not treat ethics as a stand-alone concept. Paul and Elder (2006) define ethics as "A set of concepts and principles that guide us in determining what behaviour helps or harms sentient creatures". The Cambridge Dictionary of Philosophy states that the word 'ethics' is "commonly used interchangeably with 'morality' ... and sometimes it is used more narrowly to mean the moral principles of a particular tradition, group or individual". Ethical values are relative to moral judgements and are displayed as behaviour driven by values. Values are more enduring. Ethics means that it has to be something from within the conscience of a person. Some of the hardest leadership decisions are the ones with moral or ethical stakes. This means that a person has to look within, find out what is right and what is wrong and then decide.

Different kinds of ethical decisions often confront us and the final decision that is taken

makes the difference. Most judgements are not written in time, they are ingrained in people's perceptions. The ethical choices made by people are based on certain criteria. These are – the utilitarian criterion, the rights criterion, the justice criterion, and the care criterion.

- **Utilitarian criterion** involves a decision focussed on outcomes or consequences that emphasise the greatest good for the greatest number of people. Utilitarianism encourages efficiency and productivity. For example, offering VRS may lead to lowering of department cost.
- **Rights criterion** involves decisions consistent with fundamental liberties and privileges as freedom, rights to speak, etc. It protects individual's, basic rights but results in dilution in efficiency and productivity.
- **Justice criterion** involves decisions that impose and enforce rules fairly and impartially so there is an equitable distribution of benefits and costs. It ensures equity.
- **Care criterion** involves decisions that are based on ethical norms. This criterion expresses care in protecting the special relationships that individuals have with each other.

Justice is also mentioned in context of ethics. The rights criterion related to the issue of whether the decisions are consistent with fundamental liberties or not, and the ethical norms which are part of the care criterion, form the ethical choices which confront everyone. In present times ethical leadership has become important whether it is a political system, an administrative system, an educational system, or a business system. Ethical leadership also addresses both the moral content of a leader's goals and the means used to achieve those goals. Earlier ethics were given less attention but now the whole issue of moral and ethical leadership has assumed greater significance after business disasters such as Enron, WorldCom, Satyam, and the Harshad Mehta scandal. Some of the ethical precepts are codified in law. Fraud, for example, is defined as a material misrepresentation of fact on which someone reasonably relies to his or her detriment. The notion of misrepresentation implies the intent to deceive, and not a mere oversight. Ethical leadership is more than being ethical. It involves reinforcing ethics through organisational mechanisms such as communication and reward system.

In India, the whistleblower system is still being codified. This is required so that if there is any malfeasance it can be informed without posing any risk, for the whistleblower, both socially and intellectually. There are also certain administrative ethics, which include three basic components – values, standards and norms, and behaviours. Everyone has own set of values. These values include opinions and attitudes towards concepts like accountability, freedom, justice, honesty, loyalty, etc. Standards and norms include the principles that guide the actions of people and help control their behaviour (laws, codes, rules). Behaviour refers to different forms of displayed activity. All three are integral to how we perceive the whole concept of ethics.

Ethical construct for governance has five variables – religion, values, beliefs, social expectation, and conduct rules. Religion cannot be left out especially in a collectivist culture. Religion does not mean that it has to be an over-arching variable but it is an influencing variable. Change in values refers to increased accountability, equity and transparency. All these should be incorporated in the ethical construct for governance. The ethical construct is based on the ability to withstand pressure. This refers to the courage to reject co-option,

the courage to say no to something which is not acceptable. It is significant to have courage to take a stand as opposed to the effort to get included in the system. It is easy to be part of the multitude but it is very difficult to be on one side and to stand alone. The courage to take a stand is an integral part of how the ethical construct can become a part of society. It is incumbent on all of us to ensure that the ethical construct is such that individuals have the ability to distinguish the right from wrong and there is no lack of courage to challenge the system when it is wrong, without any fear.

Innovation and Productivity

Innovation and productivity are closely interlinked. Productivity is higher output per unit input and is related to high performance/cost ratio. Incremental innovation leads to incremental gain in overall productivity. In this case an example of higher mileage in automobile achieved through innovation is worth mentioning. Radical innovation enhances effectiveness. The United States is considered to be the most innovative society, because maximum number of patents are filed there, and the productivity is higher. Canada comes next. In case of other countries which are innovative the productivity is not that high. Some examples of how innovation has enhanced productivity are typewriter vis-a-vis word processor, internet, and the modern retail formats.

The resistance to innovation and productivity comes from several variables. Innovation often leads to a change in the *status quo* and the established power relationships are threatened. This change stirs powerful emotions of anxiety. The culture also plays a significant role in context of innovation. Whether the culture encourages or discourages innovation is a major determiner of the progress of the innovative ideas and concepts. Certain variables are crucial for innovation to succeed and for the development of an ethical construct in governance. One of the variables is the breakdown of the hierarchical model of decision making. It is important to move away from the hierarchical model of decision making. The decisions must be taken by all the sections of the community or the organisation. The leadership requirements for innovation to succeed must be fulfilled. This means that the leader must be a doer and have the ability to set visionary goals. It is important to debunk existing stereotypes and biases. Culture specificity is another significant aspect as it is dependent on the cultural model of the society one lives in. There is a strong need for courageous patience as opposed to mindless anxiety, like "Oh my God, if I do this, what will happen?" Innovation is very important for improving the quality of life. It is not only technology driven but it depends on the interplay between people and processes to succeed.

Harold R. Mcalindon rightly said, "*The world leaders in innovation and creativity will also be world leaders in everything else*". The whole world is changing and moving towards the economy of knowledge. Productivity and knowledge are the strongest determinants of the standard of living. Research performance is also a gradient which acts as a predictor for productivity and innovation. The innovations matrix of productivity highlights that a combination of technology, innovation, leadership, and an inspired workforce are the main ingredients of national development. And India is not an exception to this.

The economic strength is powered by competitiveness.

The competitiveness is powered by knowledge power.

The knowledge power is powered by technology.

The technology is powered by resource investment.

The resource investment is powered by return on investment.

The return on investment is powered by revenues.

The revenues are powered by volume and repeat sales.

Volume and repeat sales are powered by customer loyalty.

The customer loyalty is powered by the quality and value of products.

The quality and value of products is powered by employee productivity.

The employee productivity is powered by employee loyalty, the employee satisfaction and the working environments.

The working environment is powered by management stewardship.

The management stewardship is powered by invisible leadership.

Abdul Kalam

In the words of Warren Bennis "*Innovation by definition will not be accepted at first. It takes repeated attempts, endless demonstrations, monotonous rehearsals before innovation can be accepted and internalized by an organisation. This requires courageous patience*". The entire gamut of the knowledge, ethics, and productivity should be imbibed into the personal, organisational and national culture. It is essential to analyse the levels at which innovations must be done. Cultural innovation was earlier regarded a kind of cost reduction but now it is considered as asset creation and helps in creation of tangible and intangible assets. Innovation at all levels means cost, culture, time for implementation, productivity, knowledge relationship, knowledge retention, people retention and return on vision.

An Innovative Organisation

How to judge an innovative organisation? Whether it is a university or an enterprise, it is very important to create a strategic vision and to establish innovation as priority. Innovation, productivity and ethics should be part of vision and mission of every organisation and every university system. Companies like Apple, IBM, etc. have come to realise that innovation is fast becoming a very important factor in all aspects of life and without innovation one cannot survive in this competitive world. The organisational structure should be created as opposed to the conventional ethical structure broken by ICT. The next step is proper allocation of required resources as resources are critical for accomplishing the innovative goals and objectives. It is also important to train the workforce on creativity tools. Finally, it is important to measure and communicate results. Educational development should be synergised because without development education does not work and without education the development cannot happen. The convergence of technology has made it possible to synergise both. Convergence is very important aspect of technology adoption. It is also important to recognise creative behaviour. Creativity should be encouraged in students right from their childhood. Proper mechanisms for rewarding innovation should be put in place, breaking the bureaucratic and administrative barriers, to encourage innovation among knowledge workers.

Innovation is a new idea coupled with some kind of application which may be of value to the society and to all the stakeholders. The most interesting part of innovation is what it does and how. Innovation brings new insights, new re-designs, inventions, new product development, and awareness creation. It does so by creating value, i.e. some kind of utility to all, to the customers, to the employees of organisation, to the Governments and others. As far as innovation in education is concerned there has been a convergence in ICT and mobile telephony. The seminars have now been substituted by webinars, which are more interactive in nature. There are a large number of e-learning platforms in use. Innovation means change, and change challenges *status quo* as it questions and threatens established relationships of the various stakeholders. The cultural specificity of innovation is very important. In terms of 'Group' in polychromic cultures like India, resistance to change is

too much. This is one of the reasons why we are ranking far below in the innovation matrix. It requires a kind of a charismatic leadership which can create and sustain the climate which can support innovation.

Any construct has to look at both the short term and the long term benefits. The long term benefits imply that all those variables have to be institutionalised in to the framework. If they are not institutionalised, if an innovation is just a fleeting thing, it is not innovation in true sense and is just a superficial change in terms of functioning/functionality of a system. The main challenge is to motivate people to be continuously innovative. One should think like a maverick, because only then one will be a maverick and will facilitate change. Mavericks are those who challenge the *status quo*, they don't always succeed but sometimes their innovations change the way we think. There is a famous quote by Winston Churchill about success - "*Success is moving from one failure to another with undiminished enthusiasm. Those who have the courage will always be innovative; those who don't have the courage will give up*".

Conclusion

The cultural aspect of life is very difficult to change. The education system should protect the existing value system, and at the same time the cultural production system should also be taken care of. With developments and innovative changes in the educational system the cultural value system should remain intact. This is what India has been trying to achieve while (growing up in the ladder) by means of innovation, productivity and ethics.

When people move to other environments they feel more empowered to think. Any culture should empower people to think. An empowerment can come only when the doctrine of fear - the fear of failure, the fear of challenging the *status quo* disappears from the mindset of people. In the United States such a fear is non-existent. In India there is a fear of losing face, fear of offending somebody, as a collectivist culture is a prisoner of losing face. When you go to another society where you are not afraid of losing face and the opportunity suddenly blossoms, one is able to take advantage of the situation. Indians are very good improvisers because improvisation is integral to survival. But this does not mean that it can be converted into innovation because then it has to be given a structure which involves tremendous hard work. An idea becomes improvisational if it is not supported by institutional change. If ODL is implemented, it should be supported by statutory changes which make the entire process worthwhile. It should be institutionalised in the entire framework otherwise it will remain an improvisation only.

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7 e-Learning in Higher Education

A.K.Bakhshi

Introduction

E-learning or electronic learning basically means learning using Information and Communication Technologies (ICT). ICT is an umbrella term that encompasses all communication technologies such as internet, wireless networks, cell phones, satellite communications, digital television, etc. which provide access to information. E-learning broadly refers to the delivery of a learning, training or education programme by electronic means, i.e. through the use of a computer or electronic device. The focus of e-learning is on learning, an electronic device is just a mechanism. E-learning is also known as ICT-enabled education or digital learning. In this information age ICT can do wonders that no one can imagine. During the past few decades, ICT has provided the society with a vast array of new communication capabilities and has fundamentally changed the way we live now. We find a world of difference in the practices and procedures of various fields such as medicine, tourism, banking, business, engineering, etc. as they operate now in comparison to how they operated two decades ago. In contrast, the impact of ICT on education in India, so far however, has been far less and also slow. ICT, if used creatively, can make a big difference in the way teachers teach and students learn and can help students acquire 21st century skills like digital literacy, innovative thinking, creativity, sound reasoning, and effective communication. Integration of ICT with education is therefore very much needed if we really want to create a holistic learning environment focusing on quality, innovation, expansion, excellence, and inclusion.

Importance of e-Learning for Higher Education

India has the third largest system of higher education in the world, next only to USA and China, with nearly 700 universities and around 33000 colleges. At the time of independence, India had only 20 universities and about 500 colleges. The total enrolment in higher education in the year 2011-12 was about 2.18 crores while it was merely 3.97 lakhs in the year 1950-51. Despite all this, Gross Enrolment Ratio (GER) in higher education is still very low (about 17%) as compared to the world average of 25%. Experts hold that an enrolment ratio of 20% in higher education is the minimum requirement for economic development in the modern world. One of the challenges which higher education in India today faces, therefore, is to increase GER. To improve the GER, therefore continues to be one of the challenges for the Government of India. With the increasing cost of infrastructure and non-availability of competent and qualified faculty, opening many new universities and colleges is not going to be a very pragmatic approach to increase the GER. Under these circumstances ICT can help in solving the problem of growing demand for enrolment in higher education. If India has to achieve GER of 30% by 2020, ICT can certainly help in this direction by setting up virtual universities in future. The virtual universities will have everything online and will not require a big physical campus, infrastructure and faculty strength like conventional universities.

ICT-enabled education is not only an answer to the growing demand for increased enrolments in education, but is also in tune with the mindset of the present day students. The present day students have grown up with technology and internet. They know that technology makes lives easier and more convenient. Then why not their education too? The students will therefore be very receptive to e-learning.

Besides, ICT can also help in meeting the challenges of the growth of knowledge in different subjects. Knowledge is growing very fast in all disciplines and this poses a serious challenge for both education and research. In case of chemistry, for example there were some hundreds chemical substances in 1800, today we have much more than 30 million chemical substances. This number is expected to reach 300 million by the year 2050 and 5 billion by the year 2100 assuming the growth rate remaining same. The number of elements in the periodic table which were 63 in 1869 has also grown to 118. We may have reached a saturation stage for periodic table but definitely not for the new chemical substances or compounds. Every substance has numerous properties and this has led to the exponential growth of chemical knowledge. This unprecedented growth in chemistry is accompanied by the emergence of new ideas, concepts and theories on the chemistry scene. Fast growth of chemical literature in any specialized field of chemistry is posing a big challenge for both chemical education as well as chemical research.

ICT for Enhancing Quality of Education and Research

Education in a formal sense means the teaching-learning process and involves three important components viz. curriculum/syllabi, teaching-learning and examination. This has been illustrated in Fig. 7.1 below. ICT can provide solutions to many of the problems afflicting these three components and thus help to enhance the quality of education in our country. For example, the much required regular and more frequent revision of syllabi in view of fast growing knowledge is a big challenge in the university system. The process is very cumbersome and time consuming as it has to go through various statutory bodies besides soliciting the opinion of various subject experts. ICT can be of great help in this regard. Through emails, discussion forums, video conferencing, etc. experts across the country can work in a collaborative manner towards the regular upgradation and improvement in syllabi. They can also take the inputs from the industry if need be, to make the course up-to-date and industry relevant so that the students are better employable.

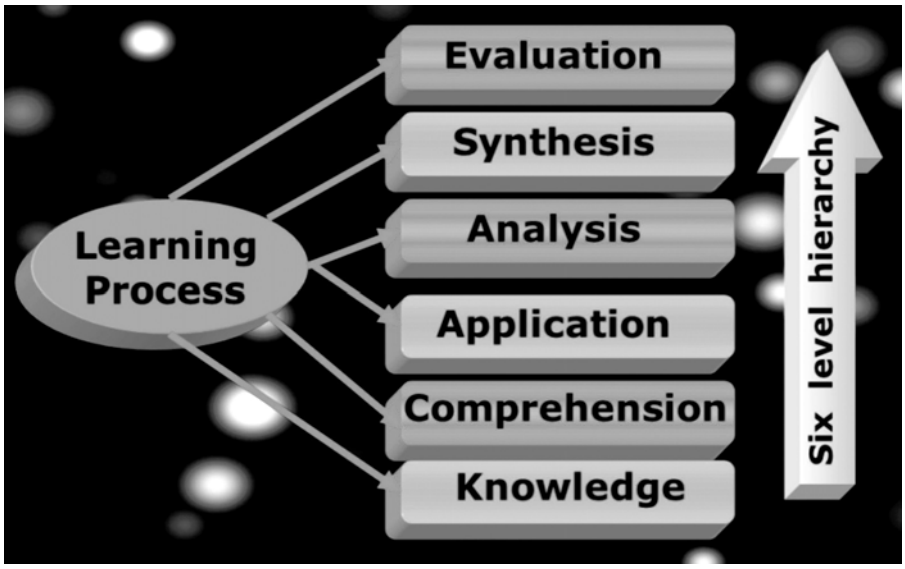

Fig. 7.1: The Teaching-Learning Process

ICT through e-learning indeed can also play a pivotal role in enhancing the quality of teaching-learning for both conventional and Open and Distance Education (ODE) universities. Traditional classroom teaching based on talk and chalk method (as shown in

Fig. 7.2 below) does have certain limitations in the sense that many complex concepts cannot be well explained just on the board and one does feel that had there been some technological aids, learning could have been more effective. Besides, there is also pressure on the teacher to finish the syllabus on time and, therefore, even though a teacher wants his students to acquire an in-depth understanding of the subject, it cannot be accomplished for want of time. Adding to this are other factors like heterogeneous group of learners, poor teacher-student ratio, lack of incentives and motivation for teachers, lack of industry exposure of teachers, etc., the present teaching-learning process cannot meet the demands of growing needs for quality higher education. ICT can help in overcoming these limitations of the present system of education.

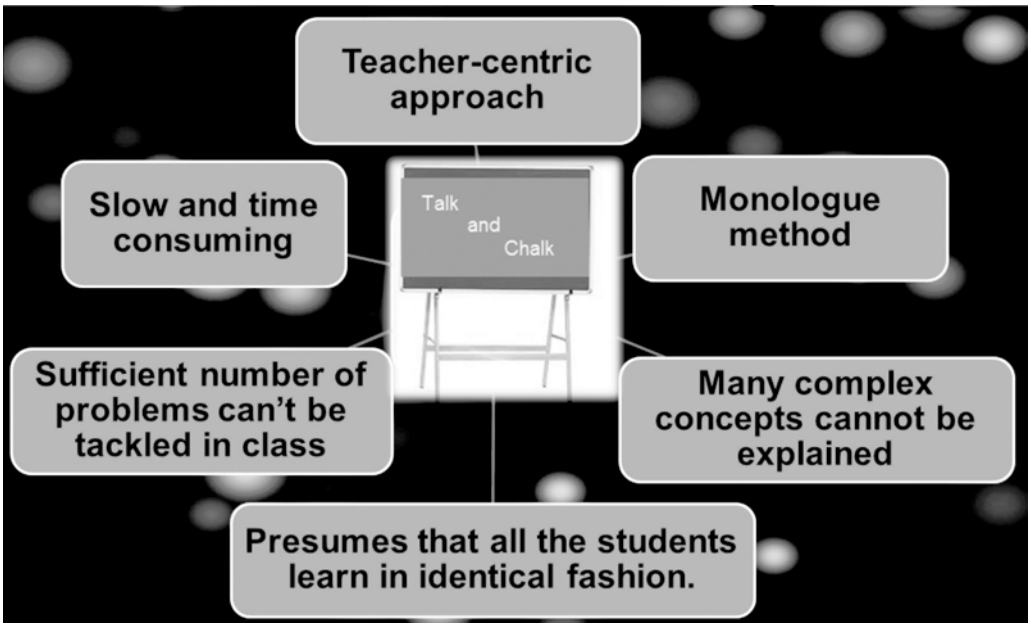

Fig. 7.2: The Limitations of Talk and Chalk Method of Teaching

In case of science education in our country, unfortunately the focus on experimental work is not as much as it should be. Here also ICT can play a very important role. Use of e-labs and virtual labs in chemistry, for example, can make the teaching-learning more greener as it can reduce the use of chemicals, as revision of experiment can be done rather than performing the experiment again and again in lab.

Due to the paucity of time and poor teacher-student ratio, frequent and uniform assessment of students is a big challenge. With the help of ICT, examination and assessments can be done more frequently and uniformly with immediate results. Analysis of testing and individualised feedback can be given, so that the weak concept can be studied again. Online testing initially requires large infrastructural investment, but it is cost effective in the long run and can meet the challenges of growing number of enrolments.

ICT can also be very useful in the area of research. The exponential growth of knowledge in different subjects poses a very serious challenge for researchers in those fields. A researcher needs to do literature survey of his research field and this task is becoming more and more difficult in view of the fast growing knowledge. ICT has a solution for this challenge in the form of electronic databases (Fig. 7.3). The printed journals are now slowly losing their significance as primary source of information and their place is now gradually

being taken by searchable electronic databases. These are now becoming the real source of information in the 21st century and are going to be extremely useful for the researchers. Using the search functions of these databases one can get the relevant information on the screen just by a click of mouse.

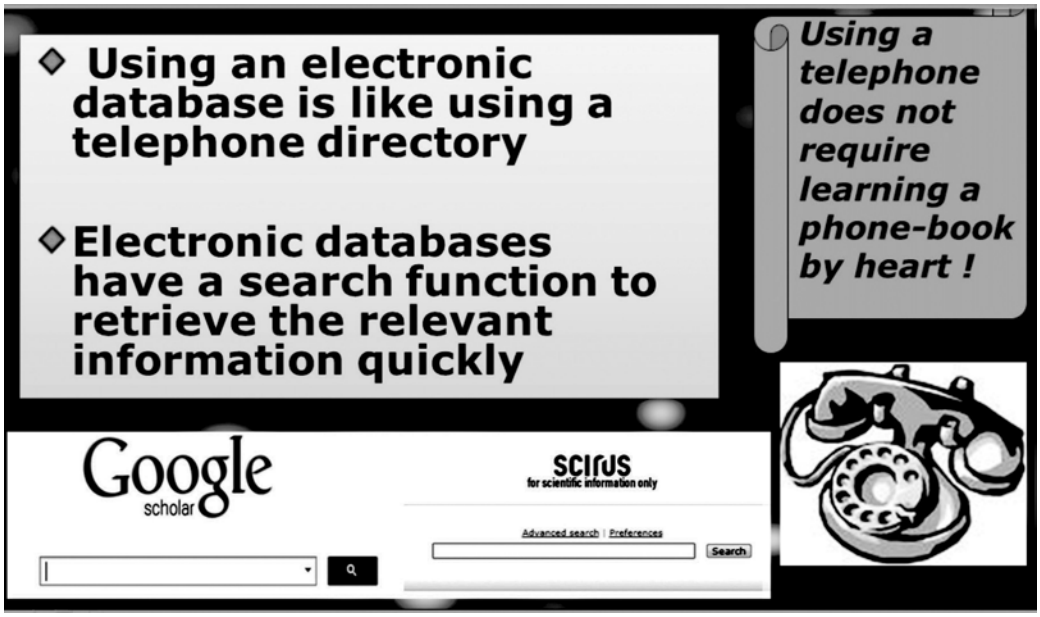

Fig. 7.3: Electronic Databases

E-Learning and Good Quality e-Content

e-Content is the basic element of e-learning and is generated from the static content by blending it with suitable technological tools and using appropriate educational pedagogies. A good quality e-content must contain as many components as desired for effective learning *viz.*, knowledge (or memorising/remembering), comprehension (or understanding), application (or applying), analysis (or analysing), evaluation (or evaluating) and synthesis (or creating). This is illustrated in Fig. 7.4 below. The success of e-learning also depends to a great extent upon the quality of e-content.

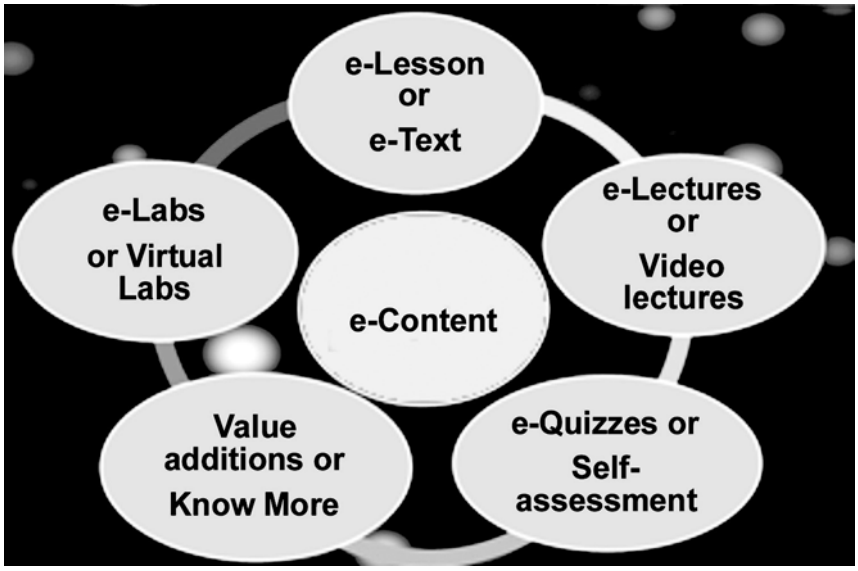

Fig. 7.4: Main Components of e-Content

A good quality e-content for any subject must be developed by top experts in that subject. It must undergo the process of reviewing after authoring to ensure that the content is conceptually correct and simple to understand. It should be followed by language/scientific editing to ensure the uniform notations and correct usage of units, symbols, etc. Multimedia enriched e-content helps communicate difficult concepts in simpler ways and thus, can offer unique advantages.

Broad type of e-content in any subject can constitute the following:

i) **e-Lesson or e-Text:** This includes basic learning materials in the form of web based notes, detailed text with images, e-books or pdfs (as shown in Fig. 7.5). It is analogous to print form of content and usually consists of content in a structured form having table of contents, introduction, description of content of the topics/sub-topics and summary.

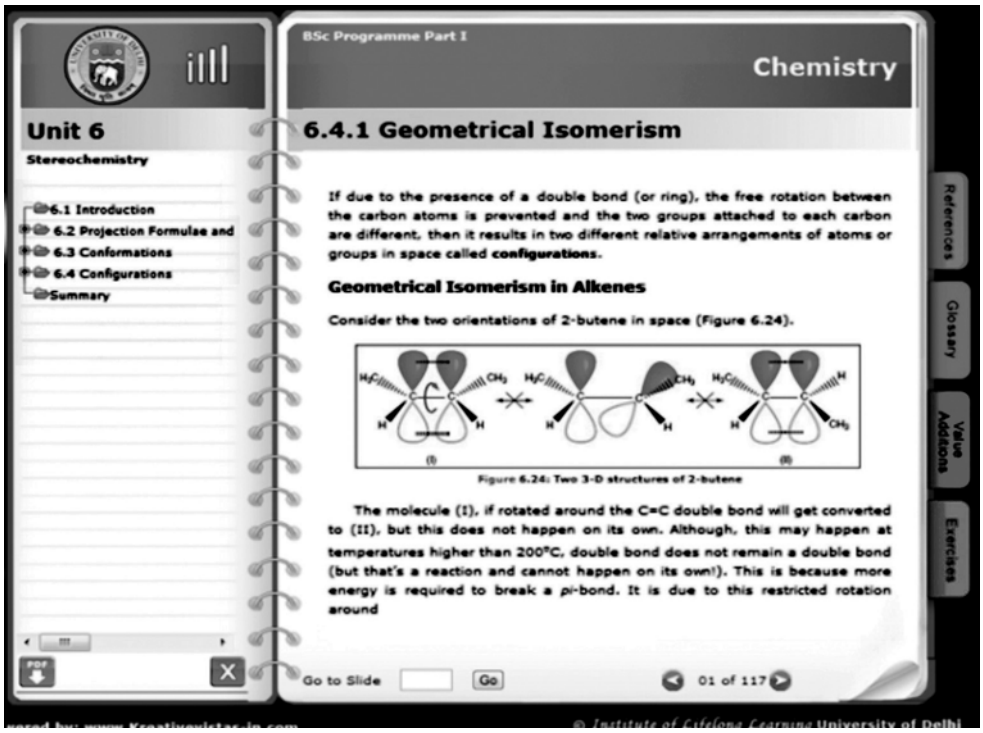

Fig. 7.5: e-Lesson or e-Text

ii) **e-Lectures or live lectures:** These are audio/video lectures along with text, images, animations, etc (as shown in Fig. 7.6). They are analogous to classroom lectures and enables best faculty members to reach out to students across the country, thereby not only connecting classrooms but also giving students quality learning material.

iii) **e-Quizzes or Self-assessments:** These are in the form of mainly objective questions like MCQs, fill-in the blanks, match type etc. to provide the student a mechanism for self-learning and assessment. They must have a complete, logical reasoning of the correct as well as incorrect answers embedded in them. These quizzes can be attempted as many times as desired and are automatically graded. A complete record of each student's performance can be accessed by teacher for analysis.

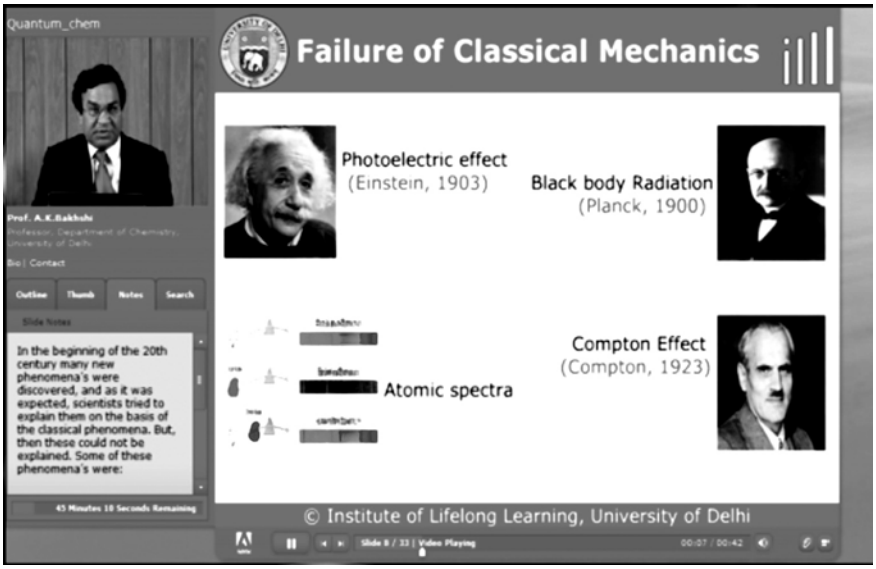

Fig. 7.6: e-Lecture

iv) **Value Additions:** These can be embedded in the e-content at appropriate places. Value-additions (as shown in Fig. 7.7) aim to diffuse the syllabi boundaries for the learners and help them to create interest towards the subject by providing them additional information related to the topic(s) like suggested readings, weblinks, common misconceptions, points to ponder, interesting facts, did you know, timelines, glossary, biographic sketch, interdisciplinary applications, etc.

Fig. 7.7: Value Additions or Know More

v) **e-Labs or virtual labs:** ICT can play a very important role in enhancing the quality of teaching-learning process for the practical component in science subjects through e-Labs or virtual labs (as shown in Fig. 7.8).

Fig. 7.8: e-Labs or Virtual Labs

They are multimedia enriched e-content consisting of step-wise instructions to learner for performing an experiment having judicious combination of text, images, audio, video and simulations with emphasis on chemistry behind each reaction (Fig. 7.9).

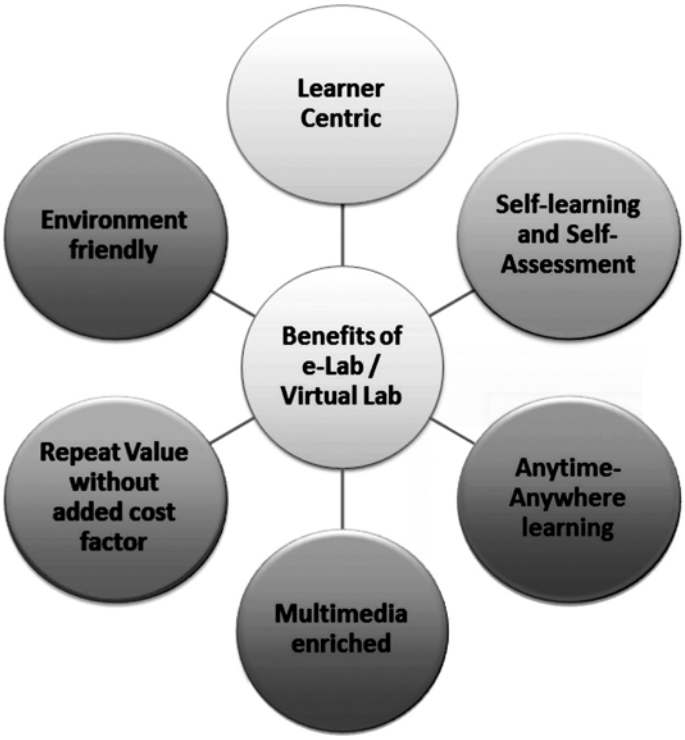

Fig. 7.9: Benefits of e-Lab/Virtual Lab

Government Efforts

Realising the importance of ICT in education, Government of India has taken several initiatives (Fig. 7.10) of which National Mission on Education through ICT (NMEICT) is a major on going initiative. NMEICT was launched in 2009 with an aim to leverage the potential of ICT in school and higher education. It is an ambitious project of the MHRD, Govt. of India with a vision of catering to the learning needs of more than 50 crores of Indians through ICT enabled education. It aims to leverage the potential of ICT in providing high quality personalised and interactive content, free of cost, to all the learners in anytime-anywhere mode.

The main objectives of the NMEICT include:

- Development of e-content for both UG and PG levels and its multi-lingual conversion. This content shall be useful for all institutions/colleges whether conventional or open and distance mode, and eventually will be useful also for the Virtual universities.
- Providing access devices and building of network and connectivity between all the universities and colleges. Aakash tablet has been developed under NMEICT.
- Capacity building of teachers and students in ICT skills.

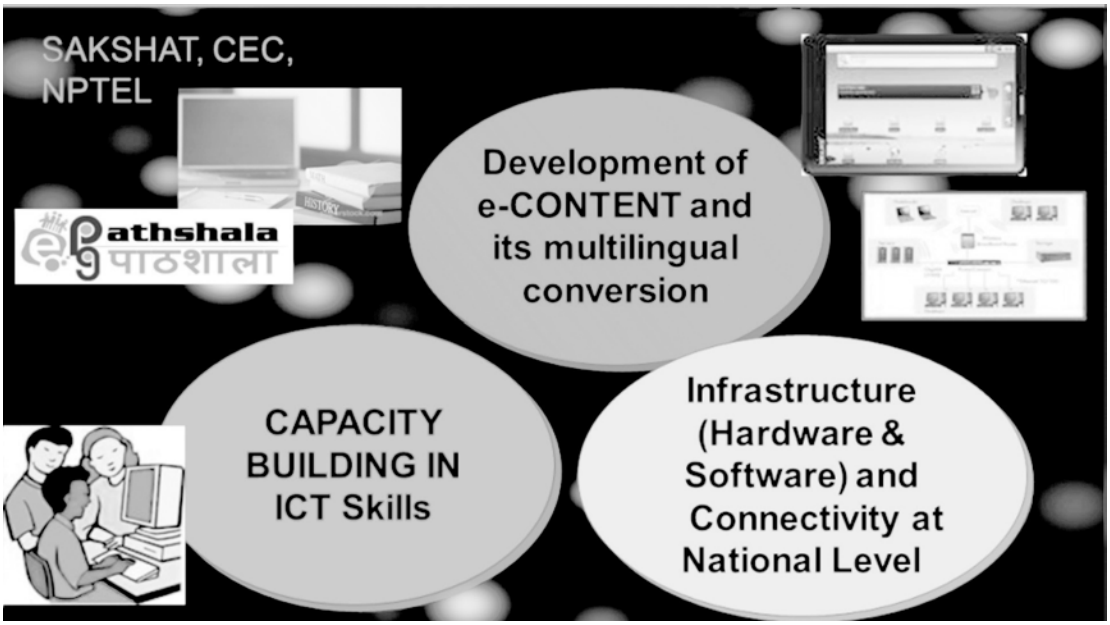

Fig.7.10: Main Objectives of NMEICT

Conclusions

In the 21st century e-learning is going to play a very major role in enhancing the quality of higher education. In view of the innumerable advantages it offers, it is going to change the face of higher education in the country. The success of e-learning in achieving its objectives to a great extend depends upon the quality of e-content offered to the students. Development of high quality multimedia enriched e-content is one of the objectives of the NMEICT and a very big challenge indeed. Once this content is developed, one needs to have its multilingual conversion so as to meet the needs of the students of the entire country. The development of this e-content needs to be supplemented with creating infrastructure and connectivity across the country and also making available to all cheap access devices to use the content.

8 Innovation in ICT Application for Education and Training: Postgraduate Diploma in E-Learning

Santosh Panda

Introduction

There have been considerable developments in media and technology in the past decades; and those developments, facilitated by the convergence of broadcasting, telecommunications, and computing, have resulted in just-in-time wireless cloud computing and cloud learning environments for people (in this case, teachers and learners) to be engaged in real-time as well as asynchronous interaction and engagement. The media and technology basket today includes the following (Fig. 8.1), and each one can be branched out further for details as also for a variety of convergence option.

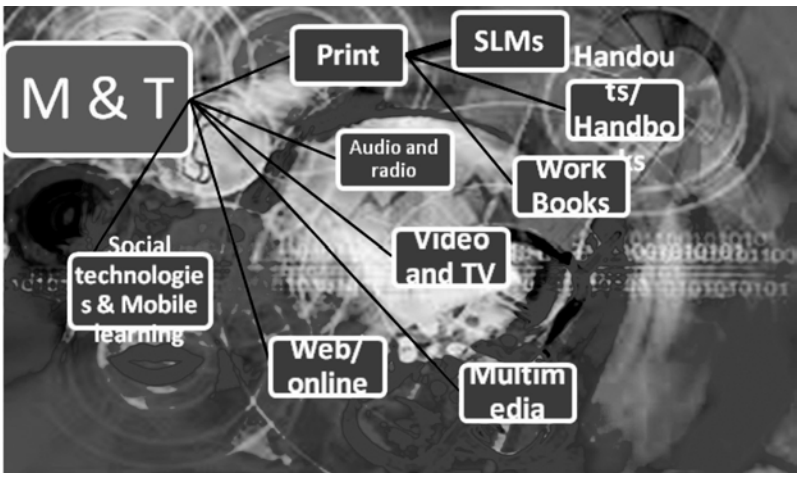

Fig. 8.1: Media and Technology Basket

Given that content, pedagoty and technology need to be considered together for designing and implementing any educational or training programmes, there are a host of essential design elements (Fig. 8.2) which need to be considered. However, at times it may lead to chaos and confusion, and therefore these design elements need to be carefully considered, and the design rubric should be practical, grounded and guided by the requirements of the learners, teachers, the content, and the learning environment.

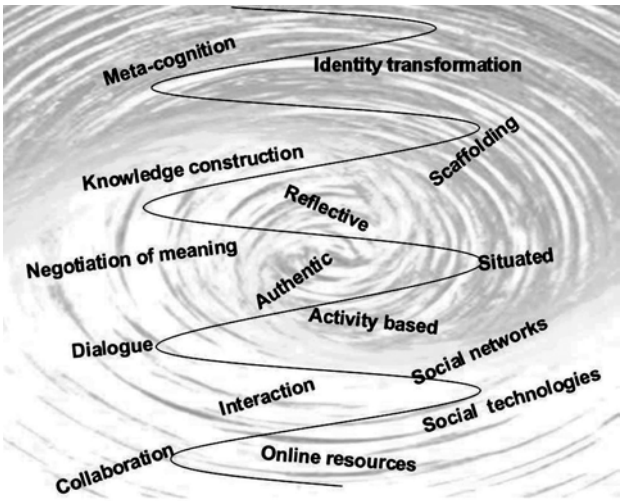

Fig. 8.2: Important Design Elements

When it boils down to designing the curriculum and its transaction, some care aspects need to be carefully worked out (Fi. 8.3). The foremost are determination

of the existing experiences of learners, as also ascertaining the graduate attributes, i.e. what one will be/will do after graduation. These coupled with learners' needs and learning environment facilitate formulation of learning objectives, and the design of the course structure which could be based on concept mapping and be modular and credit-based. The aim of any curricular intervention should be development of critical thinking, meta cognitive skills (which could be socially dedicated), and creative innovations. What is important is to link content and interaction to student engagement in authentic tasks in-context. And, for continuous and comprehensive assessment/evaluation, an assessment rubric is essential. The entire curricular experiences need to be evaluated from time to time so that the curriculum remains vibrant, authentic, and multi-disciplinary.

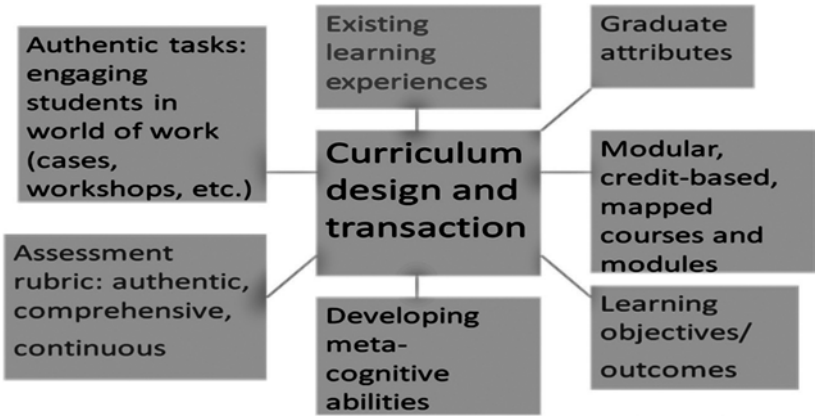

Fig. 8.3: Essential Elements of Curriculum

Any design of learning experience, in this case e-learning, needs to take into consideration the forenoted essential elements for effective learning, as also the following:

- Learning environment
- Teaching-learning
- Interaction
- Assessment
- Transfer of learning

The Postgraduate Diploma in E-Learning (PGDEL) has, as far as possible, taken into consideration the above design issues in so far as this is a programme on e-learning offered through e-learning. For purpose of clarification on the contents of and methodology for this e-learning programme, it may be underlined that *'e-learning'* was visualised as any learning experience (teaching-learning and interaction) which is mediated by the uses of a combination of any media and technology but certainly the use of computer and the web, which is webbed together through appropriate instructional design foundations. The foundational fabric, in the case, howerever, was based on the principle 'keep it simple' – flexible though structured, authentic, engaging, interactive and blended. Two foundational frameworks given in Figure 4 and Fig. 8.5 have significantly contributed to its further evolution and revision, though other seminal works have contributed to its foundation.

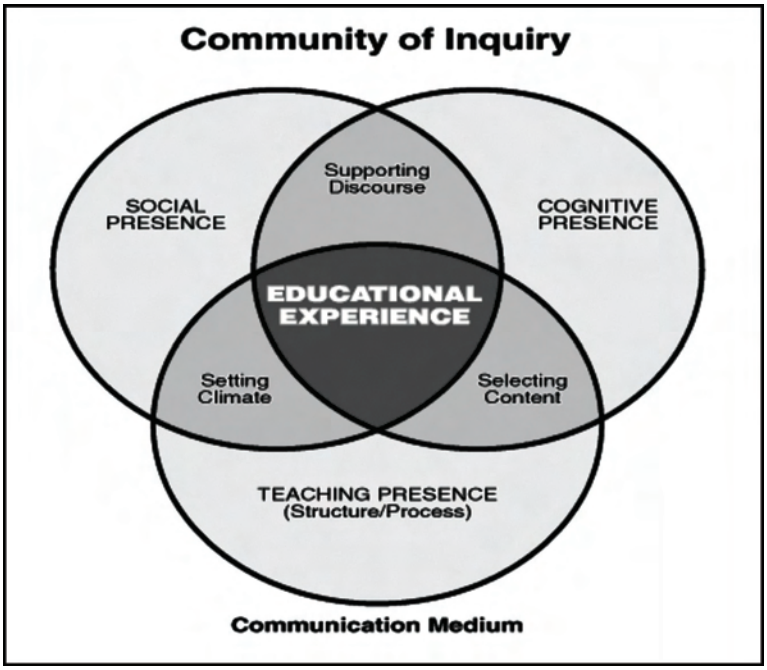

Fig. 8.4: Online Community of Enquiry (Anderson and Garrison, 1997)

In Fig. 8.4, the following can be located:

- Social, cognitive and teaching presence.
- Inquiry and critical thinking.
- Deep meaning and understanding: deep learning—exploration-integration-resolution.
- Interaction, structure (design) and leadership (facilitation and direction).
- Collaborative and asynchronous online learning.

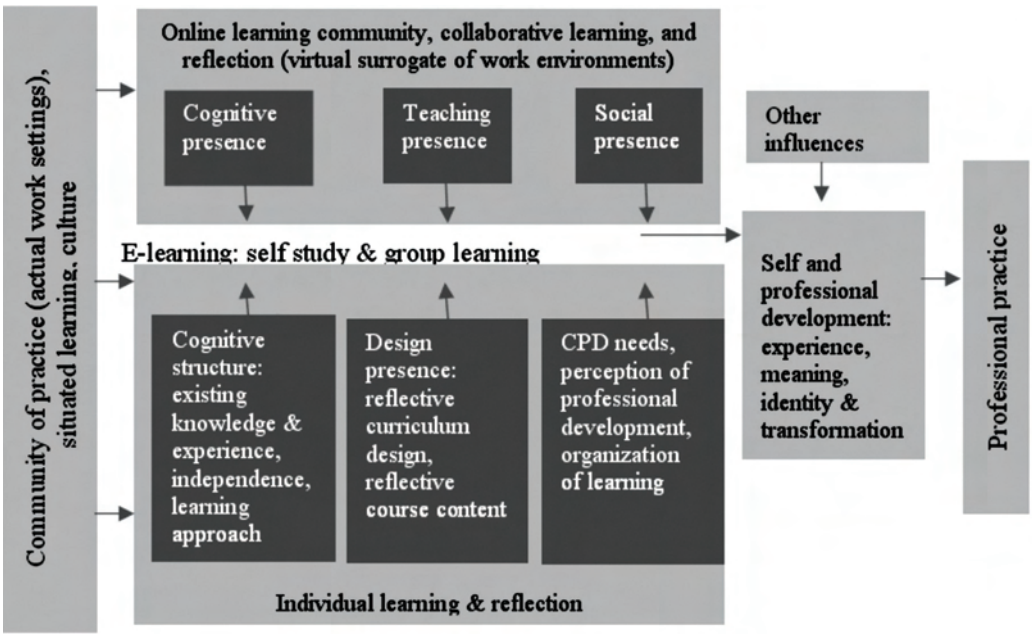

Fig. 8.5: Framework of Online Learning (Panda, 2003)

One significant aspect inherent in Fig. 8.5 is online and offline identity congruence on the one hand, and individual reflection (construction of meaning) and collaborative reflection (authentication and negotiation of meaning) on the other hand.

Based on the above, the PGDEL (Fig. 8.6) was designed as a 32-credit one-year programme offered through blended e-learning (Fig. 8.7).

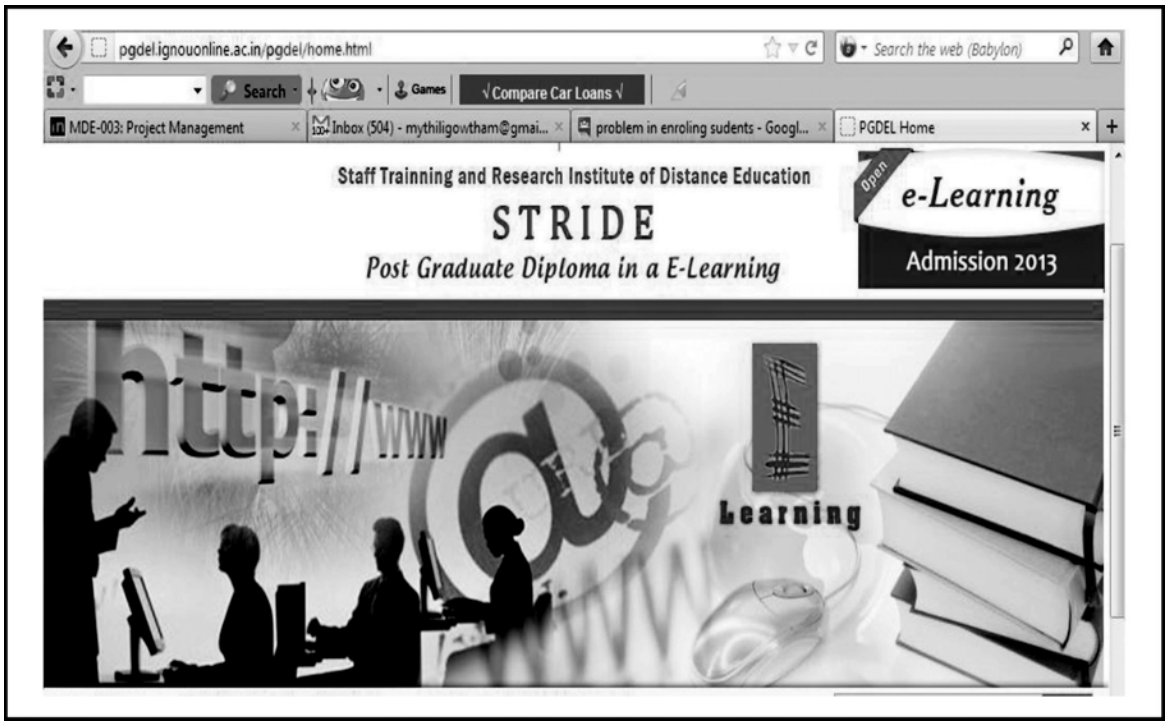

Fig. 8.6: Homepage of PGDEL

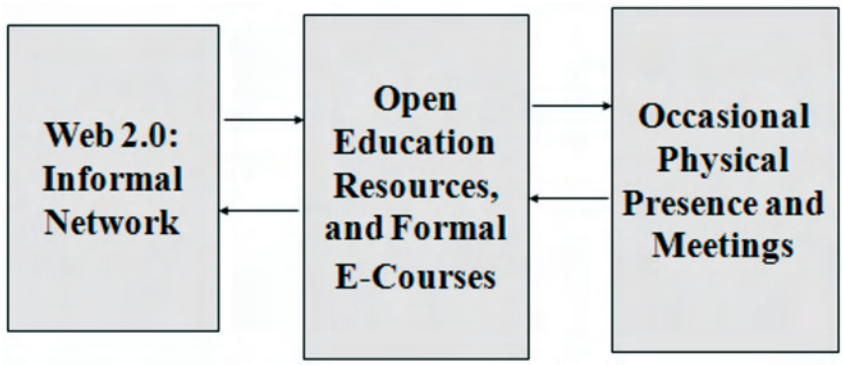

Fig. 8.7: Blended Design of PGDEL

The distribution of credit hours (1 credit = 30 hours of student work) across various components of the programme is summed up in Table 8.1.

Table 8.1: PGDEL credit hours

Course	VC	(Hrs) Self-Study (Hrs)	TMA (Hrs)	OCMA (Hrs)	DF (Hrs)	Work shop	TEE Prepa ration (Hrs)	Total (Hrs)	Google Group (Hrs not counted)
MDE-001	16	34	10	10	20	-	30	120	As it happens
MDE-002	16	24	10	10	20	-	40 (ID assessment)	120	As it happens
MDE-003	16	24	10	10	20	-	40 (PMP)	120	As it happens
MDEI-004	12	28	-	-	-	40	40	120	As it happens
MDEP-005	-	120	-	-	-	-	120	240	As it happens

The programme objectives are given as follows:

- Analyse the theoretical foundations as well as concepts relating to design, development, implementation and evaluation online education and training.
- Apply theoretical principle to design e-learning programmes.
- Identify innovative practices and developments in the field of e-learning.
- Use appropriate instructional design models for e-learning programmes.
- Teach online courses to develop collaborative learning and maintain communities of learners.
- Manage e-learning projects.
- Choose appropriate technology and develop and implement content for e-learning.

The learning resources are largely based on OER (with the coveat as given in Fig. 8.8), though additional resources and weblinks with appropriate teaching-learning and assessment functions are provided in the weekly schedule of the LMS.

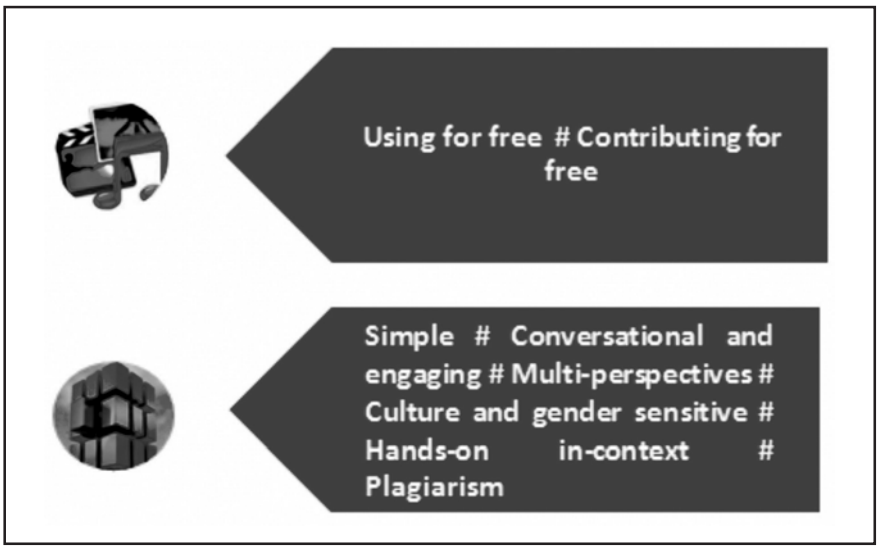

Fig. 8.8: Open Educational Resources

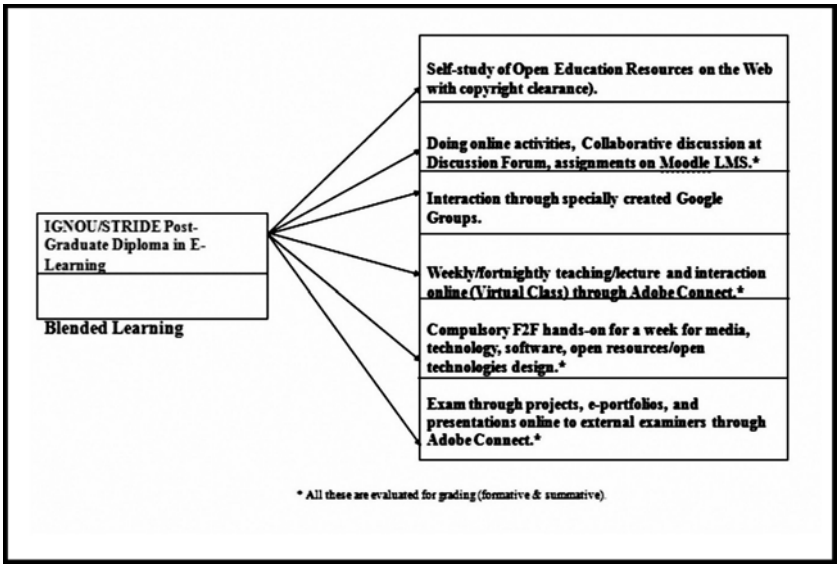

Fig. 8.9: Blended Learning Structure of PGDEL

As depicted in Fig. 8.9, the blended learning approach entailed self-study of Open Education Resources (with appropriate scaffolding); interaction through Google Groups; interaction for learning and assessment at Discussion Forums; weekly/fortnightly presentations and interactions through Virtual Class; compulsory weeklong hands-on at computer lab to learn design, use of open source media, software, social technologies and networks; and assessment online through computer-marked and tutor-marked assignments, individual and group projects, term-end examinations.

The reading materials are made available on the Moodle LMS (Fig. 8.10) and the virtual classes (Fig. 8.11) are conducted through *Adobe Connect*. At times, classes using whiteboard are conducted online too (Fig. 8.12).

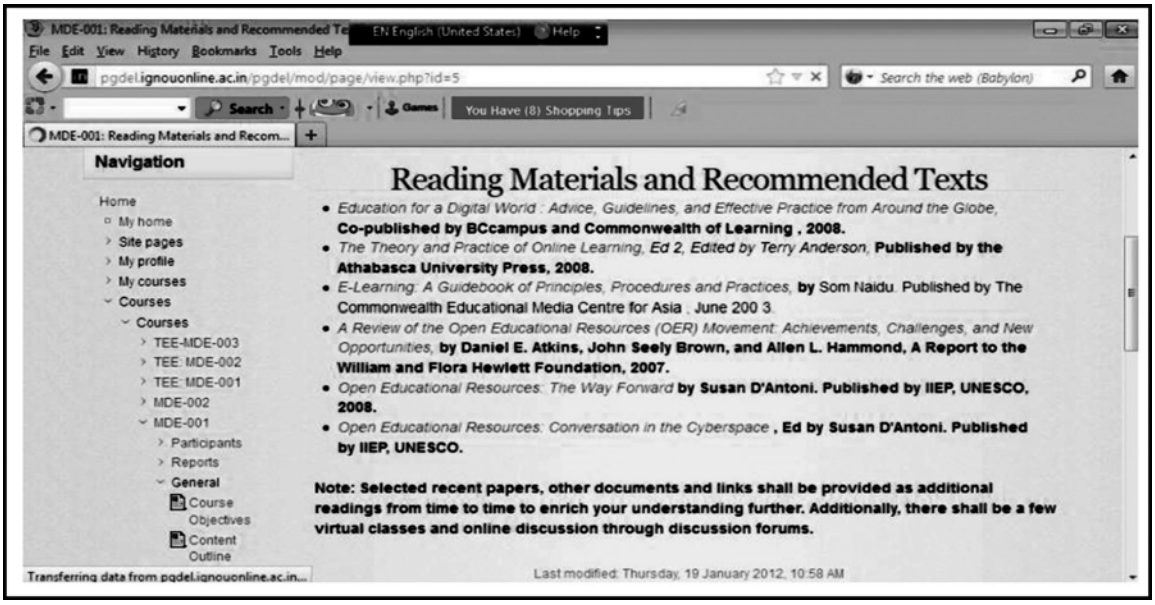

Fig. 8.10: Reading Materials Screen

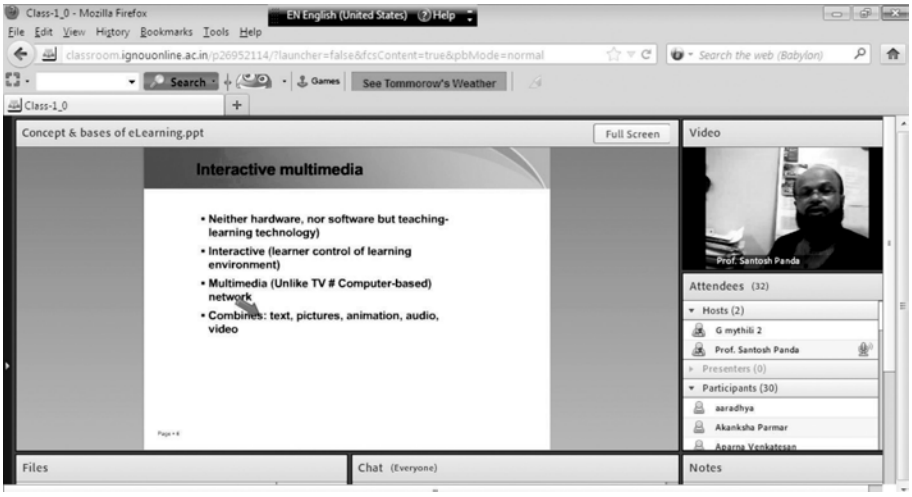

Fig. 8.11: Online/virtual class

Fig. 8.12: F2F class online

The learners, who are basically employed in corporate training, self entrepreneurships, educational institutions, among others, interact for administrative, technological and academic (but non-assessment) tasks at the specially created Google Groups (Fig. 8.13(a&b)); though the module/course-specific formal academic interaction for learning and assessment takes place at the specially designed Discussion Forum (Fig.8.14)

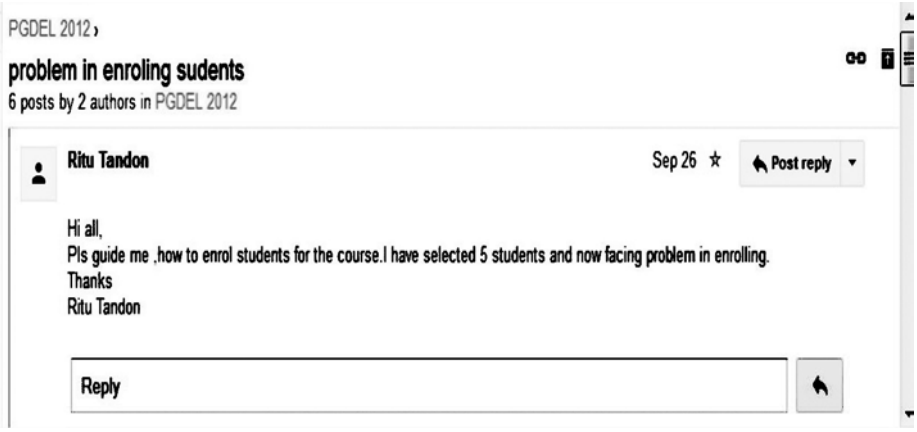

Fig. 8.13(a): Google Group Interaction

Fig. 8.13(b): Google Group Interaction

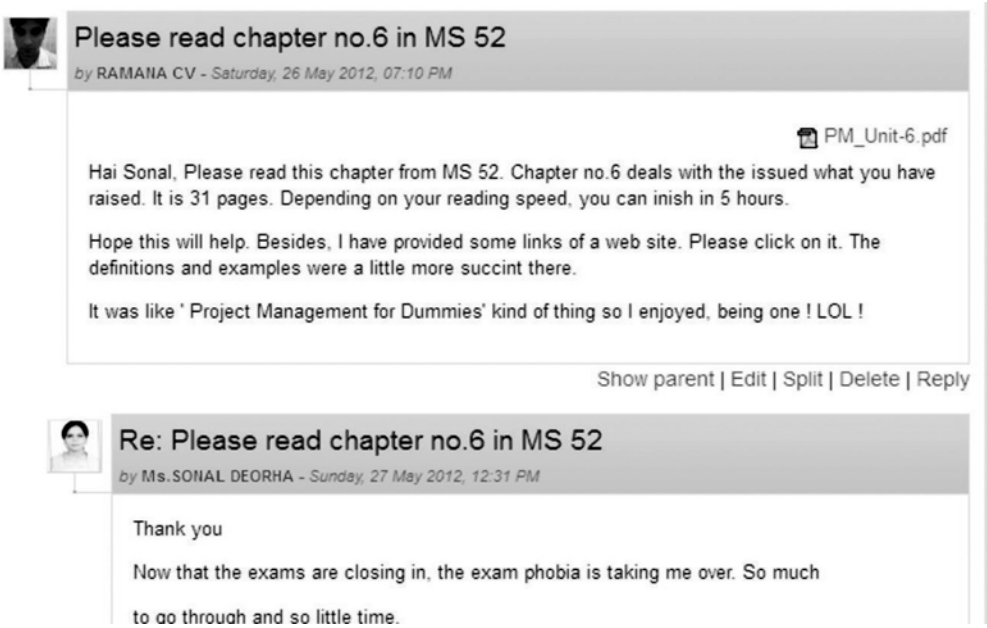

Fig. 8.14: Discussion Forum for Interaction

Out of the total five courses, Course 1 deals with the foundations of e-learning, while Course 2 is about the nittigritties of content, pedogogy and technology aspects of e-learning. In Course 3, the learners need to design a blueprint of their proposed e-learning module/course (instructional design plan) as follows:

- Programme, courses, modules, units.
- Programme/ course level, credits, duration, target audience.
- Programme/ course concept map, tasks and credit structure, graduate attributes.
- Instructional and learning objectives.
- Course content: Modules, units; self-learning material (media-mix), content development strategy.

- Self-study, interaction, collaboration.
- Implementation plan; timeline.
- Assessment strategy.
- Programme / course evaluation.

They further revise and do a media-mix at post Course 3 compulsory F2F workshop and take it forward to develop in the Moodle LMS and implement as credit-based full e-learning module for 4-6 weeks. The entire process starting from need assessement to student assessment and progrramme evaluation is collated in the form of an e-portfolio/project which forms part of Course 5. The assessment strategy for PGDEL included the following elements:

- Computer-marked assignment
- Tutor-marked assignment
- Discussion forum
- Interaction: Community of practice
- Face-to-face workshop: Audio, video, blog, wiki
- Online presentations
- Online individual/ group projects
- E-portfolio
- Any other

The programme assessment rubric is shown in Table 8.2.

Table 8.2: Assessment rubric for PGDEL

Course	TMA (Scores)	OCMA (Scores)	DF (Scores)	Online Group as Cop (Scores)	Workshop (Scores)	TEE (Scores)	e-Portfolio
MDE-001	10	10	20	-	-	60	Pass mark
MDE-002	10	10	-	20	-	60	Pass mark
MDE-003	10	10	20	-	-	60	Pass mark
MDEI-004	-	-	-	-	40	60	Pass mark
MDEP-005	-	-	-	-	-	100 (Project report)	Pass mark

Each learner has to do a final project/portfolio based on the following structure:

- Preface/ acknowledgements
- Declaration
- List of abbreviations, figures, tables
- Ch 1: Introduction
- Ch 2: Online course design
- Ch 3: Online course implementation
- Ch 4: Recommendations
- References
- Appendices
- Approved IDD/ project proposal

The assessment for the first three courses at the end of Semester 1 and for the last two courses at the end of Semester 2 are carried out online with the help of both internal and external examiners (Fig. 8.15 and 8.16).

Fig. 8.15: Online Testing/Exam

Fig. 8.16: External Examiner Taking Online Exam

Based on a national competition by IGNOU on innovative applications of ICT for teaching-learning, the PGDEL was awarded gold medal for 2013 at the University Convocation by the Hon'ble President of India (Fig. 8.17).

Fig. 8.17: Award of gold medal for innovation in ICT to the programme coordinators by the Hon'ble President of India.

9 Quality Assured Delivery of Post Graduate Diploma in Analytical Chemistry (PGDAC) Programme using Vedyadhara Open e-Learning Environment (VOLE)

Lalita S. Kumar and Sanjiv Kumar

Introduction

The success of programmes offered through Open and Distance mode depends a great deal on the quality and efficiency of the student support services provided to its learners. A quintessential distance learner has a number of very specific concerns; feeling of isolation, lack of peer-peer interaction, lack of relevant intimation from study centre, lack of proper academic support and hurdle of distance from the study centre to list a few (Fozdar, Kumar and Kannan 2006). It is pertinent that to be effective, the student support service of any institution offering programmes through Open and Distance mode must address the concerns of the learners. The spread of IGNOU learners across the length and the breadth of the country calls for urgent need for an ICT based intervention in the area of student support.

Variety of measures have been taken to provide information to the students – through the university website, Programme in-charge at the Programme Study Centres, Programme Coordinators at the School of Studies, Regional Centres and from the Divisions concerned at the headquarters, besides exploiting the options of teleconferencing, interactive radio counselling sessions, etc. Yet, the concerns of the learners are far from being addressed to the desired extent. The number and types of queries coming to the Student Support Centre situated at the headquarters are testimonies to the observation. This may be attributed to the lack of coordination amongst the community of programme and course coordinators, regional centres, study centres, academic counsellors and other stakeholders. There is a dire need of a dedicated system that can address the academic and other concerns of the distance learner and integrate all the stakeholders and the available ICT tools.

In order to meet the said need, IGNOU established the Advanced Centre for Informatics and Innovative Learning (ACIIL) as the core centre for developing and deploying technology-enhanced Open Distributed Learning Management Systems, in order to provide quality education to the learning communities across the domains. The main objective of ACIIL is to integrate systems, technology and other open source systems, thereby, leveraging a full-fledged interactive education system to a wide range of learning communities (IGNOU website). The Centre bore fruits in the form of Vedyadhara Open e-Learning Environment (*VOLE*). A major attraction of Technology Enhanced Open Learning (TEOL) is that in its basic forms it uses license free 'Free and Open Source Software' (FOSS) in all its components. Work is on to make the key software part of the *IGNOU Prashnottari Sewa (IPS)* published in the Free and Open Source Software (FOSS) domain. We have used VOLE for one of the Post Graduate Diploma programmes of the School of Sciences in order to facilitate the learners and evolve a comprehensive methodology with respect to their administrative as well as academic issues.

PGDAC Programme

P.G. Diploma in Analytical Chemistry is a continuing education programme developed after conducting a need analysis and an exploratory workshop by the Chemistry faculty using expertise from industry, academic institutions, professional/chartered bodies and federation of industry. The main objectives of the programme are to provide training in modern analytical techniques to the learners with appropriate theoretical background and to develop practical skills for examining materials 'even in trace amounts' using modern analytical methods and instruments. The programme mainly addresses the clientele from the industrial sector directly or the societal segments that play the roles of supplier or consumer to the industrial inputs and outputs, respectively. The chemists employed in this sector find it necessary to fortify, upgrade and update their knowledge regarding analytical procedures and analysis. The programme caters to the interests of candidates having B.Sc. (Major or Hons.) in Chemistry or M.Sc. (Chemistry) or Chemical Engineering, seeking employment in analytical labs. The programme is worth 32 credits spread over eight courses. Out of eight courses, 4 are Theory courses (6 credits each) and 4 Lab courses (2 credits each). To successfully complete the PG Diploma in Analytical Chemistry, the students have to earn 32 credits over a period of 1 to 3 years by successfully completing all the prescribed courses.

Why and What of Vedyadhara

IGNOU's mainstream ODL programs are based on giving self-learning materials to registered students, counselling at the Regional Centres, conducting contact sessions at the Study Centres, evaluating assignments and commenting on them, and holding term end examinations. In a short span of a little over 25 years IGNOU has become a pioneer in open and distance learning in the country and is recognised as a mega university catering to the aspirations of over three million learners pursuing higher education. The learners are spread across the length and breadth of the country and are also located in 43 other countries. The scale at which IGNOU operates, demands for enhancement of its operations by adopting 'Technology Enhanced Learning (TEL)' and education management practices.

Vedyadhara OLE is a learning environment designed to bring about this desired change in the management of ODL by effectively absorbing TEL practices. It may be visualised as a community augmented and managed framework of OLE. It enables IGNOU's Programme and Course Coordinators to support the geographically distributed community of academic counsellors and students to effectively carry out the stipulated study, practice and evaluation activities. The learning environment also addresses the appetite of the new age learner by taking cognizance of integrating global developments like the NPTEL, Open Courseware, scientific databases, learning objects repositories, open access publishing, linked libraries, etc. A detailed account of Vedyadhara can be accessed at http://vedyadhara.ignou.ac.in/wiki/images/a/ab/Vedya-Brchr-1-102K10.pdf.

Some of the key functional components of VOLE are given below.

The Programme Page

The programme page can be reached by suitable navigation starting from the IGNOU's website and is the 'face' of the programme of study. It is divided into different areas that provide a holistic view of the programme. The programme header area declares the programme title, the programme code, the programme coordinator and his/her contact details, and other details about the programme. It also provides the links to the Open Programme Blog, and the *IGNOU Prashnottari Sewa* (IPS). The column on Programme Events and Announcements lists the announcements that span over all the courses of the programme. These include

uploading of course content, assignments and other announcements, etc. The column on the left provides for the navigation for links to student zone, wiki pages, recent changes, tool box, etc. The centre stage of the page provides a brief about the programme objectives, structure, eligibility and description besides the fee structure and important dates. It also provides linkages to the programme guide and forms to be used for different purposes like, change of course, change of address, and so on.

The programme page will help the Regional Centres to counsel students and new interested learners as it will provide online information on all aspects connected with the community at large and the students in the programme. The IPS provides channels for interactions for anyone interested in the programme to send queries and get assured response from the concerned coordinator or other service wings of IGNOU concerned. A snapshot of a part of the programme page is given in Fig. 9.1.

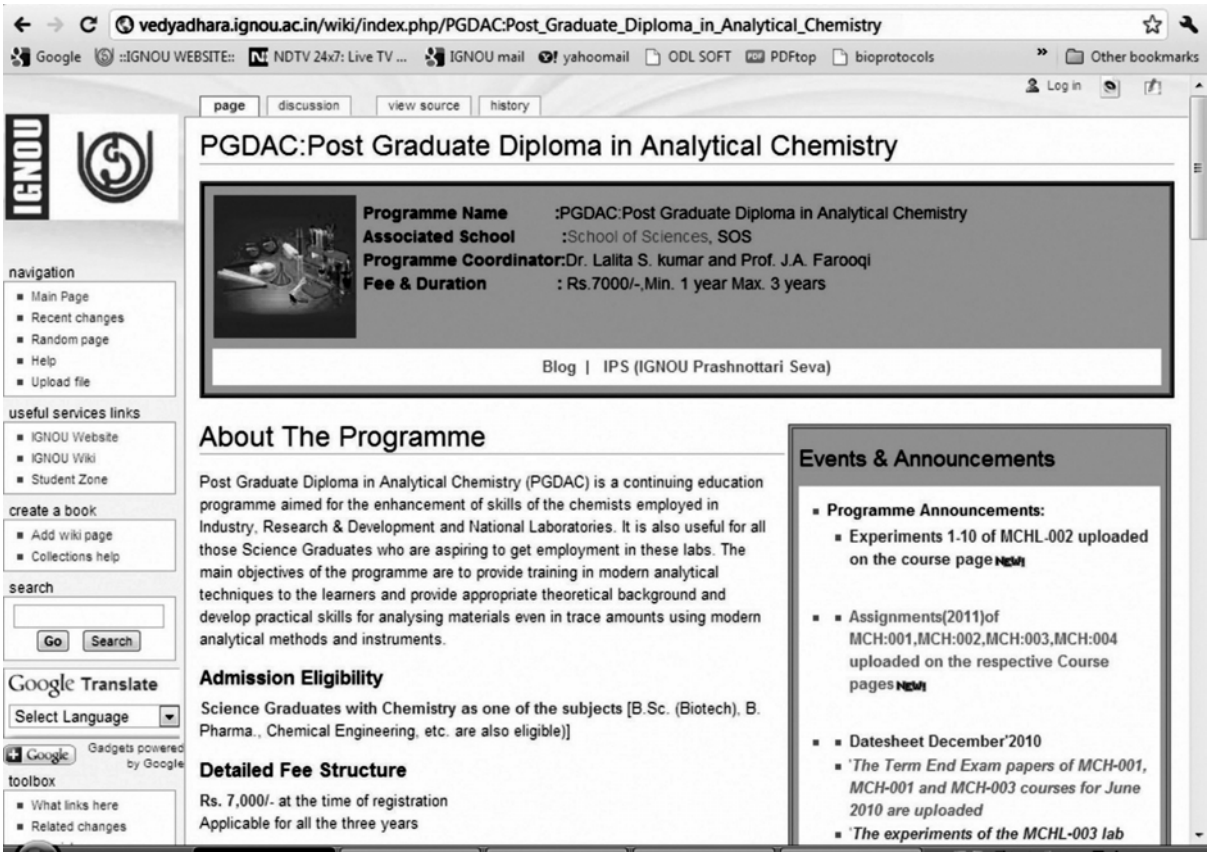

Fig 9.1: A Snapshot of a part of the Programme Page

The next key area is the course page that can be reached by clicking on the respective links on the programme page. Like the programme page the course page is also divided into different functional components. The course header has the course code, course title, associated programme, course coordinator and contact details; links to the Course Wiki area, Discussion Forum and IPS. The column on the course events and related announcements lists the items that pertain to the particular course; the uploaded assignments may be downloaded from this component area. The column on the left, as in the programme page continues to provide for the navigation for links to student zone, wiki pages; recent changes and tool box, etc. The centre stage of the page provides a brief about the course, its objectives, suggested books, etc. A snapshot of a part of the course page is given in Fig. 9.2.

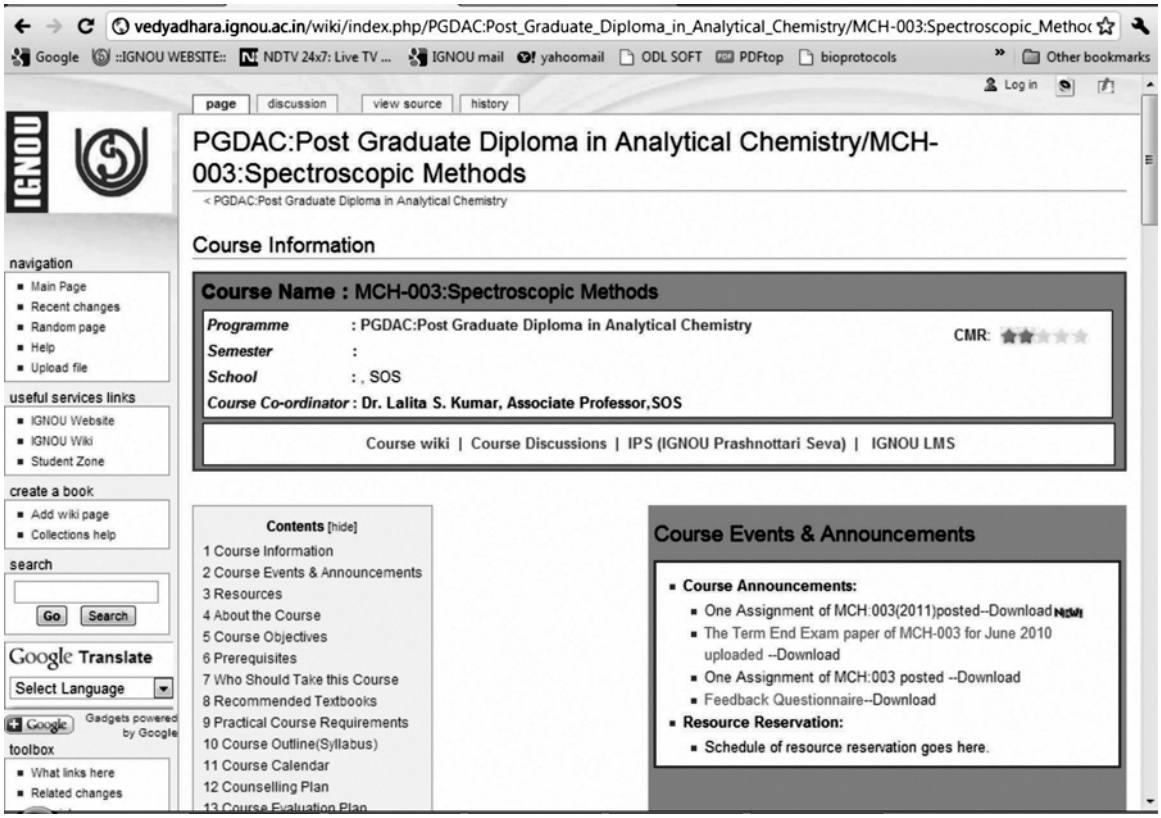

Fig. 9.2: A Snapshot of a Course Page

Resources

The study material is provided under the resources. The learner can find links to the uploaded study material here. The same can be downloaded and used. In addition to the prescribed study material, the additional resources provide unitwise links to relevant material on the WWW. These resources are selected by the course coordinator/ author on the basis of their relevance to the topics being covered in the units. The supplementary resources link on the other hand is envisaged to provide PowerPoint presentations, tutored videos, etc. to supplement the course content. An innovative feature under the supplementary resources is the 'Enriched Units'. These consist of the annotated approved course unit. The annotations provide contextual linkages to relevant animations, simulations, video lectures, quizzes, and presentations, etc., from the open source as well as the ones developed specifically for the unit. A number of enriching features have been envisaged for the purpose. A list of the same is given as under. It is in no way an exhaustive list; the course coordinator is at the liberty to use as many of these as deemed fit for the content being transacted. Newer features better suited to the subject may be added.

A list of the e-enriching features envisaged and used

- a contextual animation showing a phenomenon
- simulated experiments
- a weblink having additional content with some animated graphics
- higher learning/ detailed account /derivations etc.
- link to Self Assessment Questions (inbuilt) on the given topic

- a simulated activity/ demonstration
- a weblink for self assessment
- a video lecture; own or from an open source
- an audio lecture; own or from an open source
- a PowerPoint presentation summarizing the contents of a topic / subtopic
- a documentary/clippings of an event.

What do we achieve by e-enrichment?

The e-enrichment of the prescribed study material provides value addition to the content and facilitates learners' negotiation of the content by breaking monotony of the textual content. The added features serve to mitigate the feelings of learner isolation and the lack of teacher. The animations and simulations create inquisitiveness in the minds of the learner and provide an opportunity for heuristic learning. The PowerPoint presentations augment the learning and provide help in quick recall/revision; these in fact can be used as a resource for counselling of the learners.

Salient features of VOLE

As described above and gauged from interaction with different stakeholders, the learners, regional centre/study centre personnel, peers in the system, the salient features of VOLE can be outlined as under. The VOLE,

- provides a quality assured learning support to the learners
- alleviates their feeling of isolation
- paves way for moving from the passive ODL system to active learner and learning centric system.
- enriches the learner's learning experience through
    - Community wiki
    - Discussion forums
    - LMS and
    - Other forms of open source supported interactions

In addition to the above,

- The Regional Directors and course counsellors can make effective use of the resources for the benefit of the learners.
- The learners can download the course material and use it in the event of the printed course material not reaching; in fact, the printing of course material can be decentralized.

Features not envisaged earlier

- The content provides pre-admission counselling to the perspective learners; the learners can have a glimpse of the course content even before enrolling for the programme. (some learners in fact joined after going through the content).
- The platform can also be used as a tool for the induction of the learners and the orientation of the counsellors, study centre coordinators and others.

Impact of VOLE

A preliminary study on the efficacy of VOLE in meeting the entailed outcomes was conducted by the coordinator of the programme on the first batch of students using a pre-tested questionnaire pertaining to the basic personal information, learner's ICT usage and their experience towards the use of various features built into the *VOLE* framework for programme and course pages. In addition the counsellors and PICs of a few select places were personally interviewed for the feedback. The details of the feedback and their analysis reveal that the results are quite promising and point towards the need for a concerted effort in implementing VOLE; however, as mentioned earlier some of the features need to be worked upon more.

Future Course of Action

This being an early initiative to the use of Community Driven Open Education Management System for a P G Diploma programme, only some of the domains of the learning environment were exploited. There is ample opportunity to evolve and exploit other features for example, a provision whereby a suggestive counselling plan with scheduled content coverage could be made available on the course page. In addition, it was planned to provide the learners with variable approaches to negotiate the course content so that the learners can make an informed choice regarding the approach depending on their background, etc. Also there is a provision of course wiki and course discussions on the course pages which could not be utilised this time. The course LMS has a great potential for learner interactivity and this is one aspect which needs a lot of exploration and work. In addition IPS-IGNOU *Prashnottari Sewa* could not be exploited as it was under the development stage.

It has not escaped our attention that a detailed study establishing a correlation between student performance and VOLE utilisation would go a long way in establishing the veracity of this innovative endeavour.

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10 Design and Development for Vocational Programmes through ODL: A Case Study of IGNOU-Hero Project

Manoj Kulshrestha

Introduction

Sound programme design, effective self-learning courseware, structured training and evaluation methodology, and participation of concerned industry segment for on-the-job-training are the key factors for the success of any vocational education programme to be delivered through distance mode. Programme design should ensure the smooth educational administration of the programme for the learners. The self-learning courseware should be designed to not only compensate for the absence of the trainer but also give a good account of checklist for the developing the competence. Learner specific training and evaluation methodology is a must keeping in view the learners' profile. Presence of concerned industry segment with an educational institute ensures a comfortable transition of the learners from the world of theoretical knowledge to the real world practices.

Background

The need for a Certificate programme for the automobile technicians was strongly felt in order to improve the quality of services rendered to automobiles, especially two wheeler motorcycles. Proper maintenance of the automobile is essential for the customer and this issue is also of considerable concern to the manufacturer as trouble free after sales service helps in ensuring customer satisfaction and strengthening customer loyalty.

In India two wheelers are commonly used on a large scale. Poor public transport system, affordability, less fuel consumption, economy, and convenience are some of the factors behind its popularity. A noted preference of Indians for imported automobiles led to the interest of the foreign companies in the Indian market and many such companies entered into collaborations with Indian companies. Liberalised Indian economy proved conducive to such joint ventures in the automobile industry. Hero Honda started in 1984 as a joint venture between Hero Cycles of India and Honda of Japan. The company is the largest two wheeler manufacturer in India. In 2010, Honda decided to move out of the joint venture, Hero Group then bought the shares held by Honda. Subsequently, in August 2011 the Company was renamed Hero MotoCorp with a new corporate identity. During the 1980s, the Company introduced motorcycles that were popular in India for their fuel economy and low cost. It became the first company in India to prove that it was possible to drive a four-stroke engine vehicle without polluting the roads. The Company introduced new generation motorcycles that set industry benchmarks for fuel thrift and low emission. A popular advertising campaign based on the slogan '*Fill it – Shut it – Forget it*' emphasised the motorcycle's fuel efficiency and the company grew at a double-digit pace since inception. The technology in the bikes of Hero Honda for almost 26 years (1984–2010) has come from the Japanese counterpart Honda. Japan is one of the world's leaders in the development of new environment-friendly technologies. Honda and Toyota hybrid electric vehicles were named to have the highest fuel economy and lowest emissions.

Hero MotoCorp has a large sales and service network with over 3,000 dealerships and service points across India. These comprise a mix of dealerships, service and spare points, spare parts stockist and authorised representatives of dealers located across different geographies. Hero Honda has a customer loyalty programme since 2000, called the Hero Honda Passport Programme. After having reached an unassailable pole position in the Indian two wheeler market, Hero Honda is constantly working towards consolidating its position in the market place.

Indira Gandhi National Open University (IGNOU) has emerged as the largest open university in the world. It has been providing seamless access to sustainable and learner-centric quality education as well as skill upgrading and training to all sections of society by using innovative technologies and methodologies. It offers an array of programmes suitable for the different target groups. IGNOU and Hero Honda Motors came together in 2004 to train motorcycle mechanics and technicians under a three year industry-academia project. The programme, launched in February 2005, aimed at the development of trade level human resources engaged in motor cycle service and repair across the country by offering structured training in skill development.

A large number of motorcycle owners visit untrained technicians for the service and repair of their motorcycles due to the absence of skilled and certified technicians in the neighbourhood. These untrained technicians might either experiment the skills learnt while on-the-job, on the vehicle received for service/repair or lack in appropriate skills deemed necessary or appropriate to handle the services and repair requirements. They need training aimed at certification of the knowledge gained in expert handling of service and repair needs. The programme (IH-MTCDP) aims at offering such expert training to the working mechanics. The mechanics play an important role in increasing customer loyalty. Their role can be elaborated (Srinivasan & Dorothy, 2012) as under:

- They form crucial linkage between the Company and the customers.
- They are generally self-employed and by and large remain an unorganised sector (though of late organisations like 'Two Wheeler Mechanical Shop Owner's Association' have sprung up).
- They are generally individuals, who have learnt the job by observation while working under another 'acclaimed' Mechanic. Amateurs stay with the established mechanic till they grow confident to discharge the duty individually. Such confidence coupled with opportunities for necessary inflow of finance and availability of infrastructure, makes them branch out and start a Mechanic Shop on their own.
- Reliability of the mechanic is generally based on goodwill and faith. In India, every owner of a two wheeler has a mechanic on whom there is immense confidence– not only on their ability to repair the vehicle, but also on safe custody of the vehicle, its parts and the extra fittings – and in a sense mechanic is more like a family doctor.
- Mechanics do have a say in the assessment of pre-owned vehicles and in gauging the value of a vehicle through the eyes of the insurance companies.

The Company is also benefitted by this training programme to a large extent. Some of the uses are as under:

- It proves to be useful to retain a customer to stick to their product.

- It helps to standardise the procedure for repair and service, and to do away with trial and error method.
- Genuine branded spare parts are costly and sometimes make the customer go in for a spurious brand, if the vehicle fails frequently. Trained mechanics indirectly increase the life of the parts of the vehicle, which leads to customer satisfaction.
- Maintenance of the vehicle in a stable form keeps the customer loyal to the brand bought and also makes him stick to the brand in his future purchases.

This Project aimed at enhancing the performance of the mechanics, and providing for proper utilisation of the product by the customers. The objective was to ensure a longer period of trouble free service of the product leading to better customer satisfaction and a stronger customer loyalty. It was meant to strengthen the fidelity of the mechanics so that they may even campaign for the brand, unobtrusively, with the existing and the prospective customers. Thus it was designed to create a kind of win-win situation for the manufacturers, dealers, service providers, and the customers.

IGNOU-Hero Project

IGNOU-HMCL Motorcycle Technicians Competency Development Project (IH-MTCDP) (popularly known as IGNOU-Hero Project) is a collaborative initiative of Indira Gandhi National Open University (IGNOU), the largest open university in the world and Hero MotoCorp Ltd. (HMCL), world's number one motorcycle manufacturing company, towards the competency based skill development training for the existing motorcycle technicians and educated raw learners of the country. Under the project, a Certificate Programme in Motorcycle Service and Repair (CMSR) is on offer since April, 2006. Till now, over 10,500 learners have already been trained and certified under this programme. The salient features of the programme include use of ICT, resource sharing, education-work linkage, competency based training, and fulfilment of Corporate Social Responsibility (CSR). The Project, by throwing in the ivory towers open to the mechanics, has paved the way for dissemination of information/skills in a free-to-access form — thus making a closely guarded knowledge, (shared only in parts over an undefined period of loyal apprenticeship), available to all mechanics in the field; and perhaps, over a longer term, to the clients as well (Srinivasan & Dorothy, 2012).

The innovative programme design of CMSR programme includes firstly, the theoretical and demonstrative training of learners at training centres and then attaching them to actual work place to practice what is learnt. In fact, it is a perfect example of education-work linkage in vocational education where industry is participating shoulder-to-shoulder in terms of arranging the hands-on job training of the learners at the actual work place. Here, the learners are exposed to real world situations and the challenges of the field. Under effective evaluation mechanism, the learners are continuously evaluated by their trainer during the hands-on training session apart from participating in Trade Test at the end of the programme.

Rationale of the Programme

It has been observed that due to non-availability of skilled and certified technicians in the locale, a large number of motorcycle owners (around 70% as per the estimation of HMCL) visit untrained technicians for the service and repair of their motorcycles after the expiry of warrantee period and in the process, they face several problems due to inept handling of their vehicles. It is a well-known fact that such technicians lack appropriate skills due

to non-availability of avenues for such trainings. Therefore, to mitigate this problem, it was felt necessary that motorcycle technicians working in private garages or in authorised dealers' workshops be provided structured training in motorcycle service and repair to enhance their skills in tune with the changing techniques and technologies. The objectives of the programme are the following:

- To enhance the quality and productivity of motorcycle technicians through competency based training,
- To provide more accessible skill development training that meets the real work needs of auto industry,
- To train, assess and certify the skills and competencies of motorcycle technicians, and
- To develop entrepreneurial skills in the learners.

Competency based Vocational Qualification System : The Training Methodology

Training methodology is a very important parameter for imparting training for a particular segment of learners. It cannot be same for all. Thus, for CMSR programme, competency based vocational qualification system has been developed.

Under the qualification system, various competency statements (Performance standards for motorcycle technicians conforming to HMCL standards) have been developed. For each performance standard, corresponding performance criteria and evidences have also been formulated. The performance of a learner is assessed vis-à-vis the laid down performance standards. Thus, the generation of requisite evidences by the learners of having acquired the necessary skills, to meet the prescribed performance standards, is the key to successfully complete this programme. Hence, this way the programme can help upgrading the competency level of working motorcycle technicians.

CMSR Programme: At a Glance

Some pertinent details of the programme are given as under (Table 10.1):

Table 10.1: About the Programme

Certificate in Motorcycle Service and Repair	
Programme Code	CMSR
Programme Duration	2 Months
Programme Objectives	• To enhance the quality and productivity of motorcycle technicians through competency based training, • To provide more accessible and quality skill development training that meets the real work needs of auto industry, • To train, assess and certify the skills and competencies of motorcycle technicians, and • To develop entrepreneurial skills in the learners.
Programme Fee	Rs. 1,000 (For Working Motorcycle Technicians) Rs. 2,500 (For Raw Learners)
Eligibility	Functionally literate working motorcycle technicians
Medium of Instruction	Training: Hindi and Regional Languages Courseware : Hindi, English, Bengali, Malayalam and Tamil
Training Centres	Total 43 Training Centres across the country

The Courseware

In this programme, there are three courses which describe different aspects of motorcycle servicing and most oftenly undertaken repairs. The courseware designed and developed for the programme is full of illustrations and self-instructional in nature. Following table (Table 10.2) gives the details of prescribed courseware for the programme:

Table 10.2: Courseware for the Programme

S. No.	Course Code	Units
1.	NET-001 The Starter Kit	Unit 1 : Introduction to Service Sector
		Unit 2 : The Motorcycle
		Unit 3 : Entrepreneurship Development
2.	NET-002 Motorcycle Service and Maintenance	Unit 1 : Tools and Equipment
		Unit 2 : Motorcycle Servicing
		Unit 3 : Service and Maintenance Procedures
3.	NET-003 Motorcycle Service and Maintenance	Unit 1 : Motorcycle Repairing
		Unit 2 : Basic Troubleshooting of Motorcycle
		Unit 3 : General Safety and Service Tips

Programme Delivery

In the CMSR programme, a learner is required to pace his/her studies through self-learning courseware supplied to him/her. It is supplemented by contact sessions organised once a week, preferably on Sundays, at the designated Programme Study Centres (Vocational). To impart hands-on job training, the learners are attached to the Dealers Workshop of Hero MotoCorp Ltd. continuously for one week. Just before the trade test on last Sunday of the programme, an additional one-day counselling session is held at Training Centres to clear the doubts (if any). An illustrative process flow of educational administration during the programme duration is shown in the table (Table 10.3) below:

Table 10.3: Flow of Educational Administration during the Programme

Activity	Duration	Days of Conduction
Induction and Orientation Session	1 day	Any day before the first Training and Demonstration Session
Training and Demonstration Session	4 days	Consecutive four Sundays
Hands-on Job Training Session	6 days	Continuous six days (Sixth week)
Concluding Counselling Session	1 day	Sunday (Seventh)
Trade Test	1 day	Sunday (eighth or last)

In the programme delivery mechanism, a learner has four nodal points to get help and support, besides his own resources. These nodal points are IGNOU-HMCL Training Centres working as Study Centre, respective IGNOU Regional Centres, HMCL Dealers Workshop, and IGNOU-HMCL Project Office.

Awards

This innovative programme has won three awards as mentioned below:

- IGNOU's University Gold Medal 2008 for Innovation in Distance Education
- World Education Award 2011 for the Best Innovation in Vocational Education and Skill Training
- Educational Leadership Award 2011 for Innovative Programme Design Conclusions

Conclusions

The vocational education model developed under IGNOU-Hero Project for the motorcycle technicians may be helpful for designing similar kinds of vocational education and training programmes through Distance Learning. Keeping in view the target population and vocations, the contact sessions and other delivery components may be suitably designed. The industry participation not only in terms of sponsoring the ODL project, its continuous involvement in the delivery of the programme is the strength of the model and in fact, is the innovation in industry sponsored projects. This programme will certainly have long term impact on the learners and other stakeholders ODL system in term of its continuous refinement.

References

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