Chapter II – Part A

ANALYSIS OF E-GOVERNANCE
(E-GOVERNMENT TO E-GOVERNANCE)

“If I have seen further, it is by standing on the shoulders of giants”

- Isaac Newton
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PART-A

Background

This chapter begins with a literature scan on governance and e-governance with various definitions and dimensions. Based on an understanding of governance and e-governance, the first argument put forth relates to the need of technical education for e-governance to develop fully. The second argument is that for access, achievement and equity in education, with the opening up of choices and a transformation of the 'method' of education to lead towards integral education that cultivates the mind and soul, ICT is imperative. ICT, e-governance and OER have a significant contribution to this study; hence, these have been discussed in detail with snapshots of developments in these domains across the world. Finally the need to preserve the real aim of education and the core of education is explained.

2.1 GOVERNANCE

Globally, quality of governance is increasingly being recognized as among the primary factors behind the most remarkable development successes of human history. Across the countries of the world, it is being perceived today that good governance is a necessary condition for improving the quality of life of the people constituting them. Absence of good governance explains some of the worst instances of disappointing, missed development opportunities for many nation states. (National Human Development Report, 2001, Government of India)
As India is poised on the threshold of being a world leader, good governance is imperative now, more than ever for a steady, committed trajectory of development. This study is an attempt to systematically address the issue of governance in the delivery of technology enhanced education.

To get an understanding of what is and what constitutes Governance, some definitions of Governance are first looked at.

‘Governance is the institutional capacity of public organisations to provide the public and other goods demanded by a country’s citizens or their representatives in an effective, transparent, impartial and accountable manner, subject to resource constraints.’ (*World Bank, 2000a: 48*)

In the context of this study, NPTEL is the national program which attempts to deliver ‘education’, a public good which is aggressively demanded by the citizens. Subject to resource constraints, the study assesses whether these services are provided in an effective and accountable manner based on the needs of the students, who are the consumers in this case. Some other characteristics of governance are given below.

“It is characterized by ‘predictable, open and enlightened policy making; a bureaucracy imbued with a professional ethos; an executive arm of government accountable for its actions and a strong civil society participating in public affairs; and all behaving under the rule of law.’” (*World Bank 1994*)

Governance can be identified as broadly referring to ‘the setting and management of the political rules of the game, and more substantially with a search for control, steering and accountability’. (*Governance by Anne Mette Kjaer*)

In order that these processes lead towards their desired social ends, governance requires the exercise of legitimate political power by the designated bodies in a manner that is perceived as equitable, non-discriminatory, socially sensitive, participatory, and above all accountable to the people at large. In many of the programs and policies formulated by the government including efforts such as the NPTEL, these principles are broadly adhered to as these are generic, universally relevant and accepted features of good governance. Today in a global context, there is a fair degree of unanimity and agreement on what constitutes good governance.

The transformation of the public sector involves 'less government' (or less rowing) but 'more governance' (or more steering) (Rhodes, 1996:655). This is a very visual definition and is especially relevant in a domain like education which has a very large number of players and stakeholders. Governance, here, would have to leverage the 'traction' and 'rowing' ability of all these stakeholders and play a more subtle but decisive role in steering and giving a clear direction to the sector.

The Oxford dictionary defines governance as the action or manner of governing a state, organization; and to govern is to conduct the policy, actions, and affairs of (a state, organization, or people) with authority. This, in turn, is originally from Latin gubernare 'to steer, rule', and from Greek kubernan 'to steer.'

Another interesting definition of governance has been given by Harold Laski “The definition I wish to propose concerns the notion of governance. Scholars such as Elinor Ostrom and Douglass North have pointed out that governance should not be equated with government. Governance is simply organizing collective action and entails establishing

institutions. Institutions can be viewed as the rules of the game that permit, prescribe, or prohibit certain actions.”

The model that is proposed in this study seeks to leverage and harness the currently isolated and individual entities, which function like ‘silos’. They could all be organized and orchestrated into a meaningful service delivery mode with all the required policies, rules and regulations in place.

In other words, governance is the process of putting in place frameworks and rules, systems and processes for carrying out various tasks and providing functions and services that help to enhance the quality of life of the inhabitants and citizens.

The present study focuses on the integration of legacy systems using a common architecture with standardized IT and educational services on a common platform irrespective of physical distances and providing a plethora of choices to empower the citizens. Given that India has a huge share of youth population as shown in the figure below, it may not be very long before India comes to be the human resource capital of the world – both in terms of quantity and quality.

**Graph No. : 2.1**

Having defined governance broadly as “the setting, application and enforcement of the rules of the game”, it follows that these rules need to be legitimated if they are to be stable. (Governance: Kjaer, A.M). This, in turn, derives authenticity from democracy as well as efficiency. There have been discussions on whether it is possible to have both or whether there is a trade-off between the two. While democracy may, at times, entail a lot of time, dissipation of resources and also weaken the efficiency and speed of decision making, it is evident that without democratic inclusion of citizens, the citizens’ co-operation in achieving social and economic outcomes may not be obtained. Further, the two interpretations of democracy—the aggregative and the integrative need not be mutually exclusive. In fact, in a healthy democracy, for sustainability, the two interpretations ought to co-exist. There is a third important dimension of sustainability. This is extremely important in a country like India, in comparison with countries like China. In this context, democracy provides for in-built ‘grid lines’ which can absorb shocks and tremors in the process of collective decision making and development. This has also been called the democratic dividend that sounds similar to the more popular concept of ‘demographic dividend’. The idea is to supplement representative democracy with constitutionally ordered self-governing associations, organizations or Institutions.

As one moves to governance in the domain of Public administration and Policy, the traditional model of Max Weber is first understood, which is based on the fact that modern bureaucracy is characterized by general rules, and it is imperative that the administration would not constitute a realm of free, arbitrary action and discretion of personally motivated favour and valuation (Weber, 1978:979). While this is called a more traditional definition, its relevance in today’s context cannot be
exaggerated. As has been witnessed in the series of scams and corruption cases that have engaged the attention of the nation, these basic principles are absolutely non-negotiable.

The basic organising principle between the administrative apparatus and the sovereign people is the acceptance of undeniable human rights, the principle of the rule of law and the state’s monopoly of the means of coercion. While this was the traditional model guiding practitioners of public administration and students, these have since been challenged and often replaced (Peters and Wright, 1996:628).

More recently, in the discourse on public sector reform, also referred to as NPM (New Public Management), the common elements identified are:

- Deliberate, planned change to public bureaucracies
- Synonymous with innovation
- Improvements in public service efficiency
- Effectiveness-intended outcome of reform process
- The urgency of the reform and the justification by the need to cope with the uncertainties and rapid changes taking place in the organisational environment (Turner and Hulme, 1997:106)

These are, by and large, the main guiding principles of most of the projects, schemes and programs that are rolled out in recent years. The missions that have been set up by state and central government for the health sector, urban development sector as well as effort like the National e-Governance Action Plan have increasingly begun to be formulated along these lines. Outfits such as the Knowledge Consortium of Gujarat (KCG) that have been set up in Gujarat are also examples of such an approach.
The other important features of NPM include privatization (selling or transfer of public sector enterprises to private ownerships), agencification (or the establishment of semi-autonomous agencies responsible for operational management), competition as a tool to enhance efficiency, (dismantling the monopoly of the state), decentralization (or transfer of powers and functions to the lower levels by which decisions, which are more responsive to the needs of the local community, can be taken) and very importantly, citizens' empowerment (clients, users and citizens) holding the public officials accountable, which may improve the quality of services. In fact, against a backdrop of NPM reforms and the constantly changing scenario of centralizing and decentralizing or centripetal and centrifugal tendencies of governments, there is an increasing need for policy networks, task forces and think tanks in implementation. Increasingly, it has been found that most services get delivered in the domain of governance through such interconnectedness and networks. These networks may be formed across existing organisations or with new entities that are specifically created to facilitate such inter-linkages needed for smoother service delivery. The constitution of missions for implementation of different programs across various sectors in India is a case in point. As indicated earlier, these include the SSA 22, the NRHM 23, the NURM 24, to name a few. The institutions of organisations like the DRDA 25 in every district and leveraging of special purpose vehicles for various PPP projects also present the network elements in the governance landscape which is commonplace today.

22 Sarva Siksha Abhiyaan- http://ssa.nic.in/
23 National Rural Health Mission- www.mohfw.nic.in/nrhm.htm
24 National Urban Renewal Mission- http://innurm.nic.in/
25 District Rural Development Agency http://rural.nic.in/drda.htm
In the words of Rhodes, “Inter-organisational linkages are a defining characteristic of service delivery and I use the term network to describe the several interdependent actors involved in delivering services. These networks are made of organisations which need to exchange resources (for example, money, information, expertise) to achieve their objectives...

As British government creates agencies, bypasses local governments, uses special purpose bodies to deliver services, and encourages public-private partnerships, so networks become increasingly prominent among British governing structures” (Rhodes, 1996:658)

There is an understanding today of networks as ‘stable patterns of social relations between interdependent actors which take shape around policy problems and/or policy programmes’ (Kickert, Klijn and Koppenjan, 1999:6) and in the complex settings that are found today, a new approach to governance that emerges is that ‘Governance is about managing networks’ (Rhodes, 1996:658).

In the current research a multi-tier structure of education delivery mechanism has been proposed with NKN as apex body at the top and state, district and cluster level bodies in the steady state for future. A detailed diagram has been described in Chapter VI. Not only is there a vertical networking proposed, it is seen that there is a far greater horizontal networking proposed. All the Universities, Colleges and other Institutions of research and education are all ‘networked’ making the resultant multiversity a fairly flat but well connected entity. This is a manifestation of the new networked governance paradigm.

The three important players in a modern state are broadly identified as markets, government and civil society. From an education sector context too, the main players could be identified as the clients or students,
institutions, government and various educational and academic networks, resources etc. Kjaer describes markets, hierarchies and networks, comparing the basis of relationships in each, the degree of dependence, medium of exchange, means of conflict resolution and culture across these three governing structures. From the analysis, it is clear that the traditional hierarchies are not in synchronisation with modern day society, and that given the basic raison d'etre of markets of maximising profits, there could be an inherent inability for market forces to deliver public services. In actual practice, there have been frequent market failures in the case of public goods and yet, there is a point of view today that government should increasingly depend and rely on networks for delivery of services. In fact, there cannot be an exclusion of private sector participation in governance, especially in higher education. As shown in the figure below, 63.2% of total institutes of higher education are of the private and unaided sector.

**Graph No. : 2.2**

![Graph showing the percentage of unaided private higher education institutes as a percentage of total institutes from 2001 to 2006.](image)

Hence, this is the trend which will have to continue if the feverishly mounting demands are to be met. While government alone cannot cope
with this bursting demand, as explained earlier, it can play a very pro-
active role in steering all of these by providing the infrastructure or 
platform like the ‘multiversity’ for all these courses and educational 
resources to be served at cost and putting in place strict and enforceable 
quality norms, standards and cost regulations for all dimensions of 
education.

Governance as self-organising networks is as distinct a governing 
structure as markets and hierarchies. A key challenge for government is 
to enable these networks and to seek out new forms of co-operation...
Game playing, joint action, mutual adjustment and networking are the 
new skills of the public manager (Rhodes, 1996:666).

In this context, governance now refers to a broader process of managing 
the rules by which public policy is formulated and implemented. This has 
been referred to as meta-governance by Bob Jessop and does not merely 
refer to managing networks but all the institutional set-ups that 
characterize public policy-making. Governance, in this sense, is an 
analytical concept for addressing responses to the emergence of networks 
and is not the description of one particular response. It is about co-
ordinating the plurality and complexity of hierarchies, markets and 
networks. Networks, too, have an inherent deficiency due to which they 
may not be able to steer in a balanced way, becoming, at times, highly 
skewed towards a few powerful interests. Governance process, therefore, 
must be based on hierarchical structures and networks. While the 
discourse here is at the granularity of networks, which represent diverse 
interests and concerns, the concept of governance at the level of the 
individual is very important and a paradigm of ‘every citizen matters’, 
even as collective growth and development is orchestrated, ought to be 
the goal of an ideal system of governance.
Sri Aurobindo says, "The State is bound to act crudely and in the mass; it is incapable of that free, harmonious and intelligently or instinctively varied action which is proper to organic growth. For the State is not an organism; it is a machinery, and it works like a machine... The State tends always to uniformity, because uniformity is easy to it and natural variation is impossible to its essentially mechanical nature; but uniformity is death, not life. A national culture, a national religion, a national education may still be useful things provided they do not interfere with the growth of human solidarity on the one side and individual freedom of thought and conscience and development on the other; for they give form to the communal soul and help it to add its quota to the sum of human advancement; but a State education, a State religion, a State culture are unnatural violences."

Based on this, what is needed is governance that promotes and channelizes human efforts and yet provides space and room for individual freedom of thought, conscience and development, as stated in the paragraph above. In that sense, the metaphor for good governance, including that for education would be a structure that provides 'a tree guard' for the nurture, care and development of individuals, their preferences, their self expression, creativity and highest aspiration. However, once the system is able to nurture growth to a certain level of ripeness and readiness, the 'tree guard-like governance' should then gracefully fall off and give way for the organisations, markets, public and private bodies, civil society groups and most importantly, individuals, to grow, express, create and realise their highest dreams and aspirations. Governance should and could also put in place structural guards and proactive systems and agencies for educating these stakeholders and individuals who constitute the ultimate granular unit of all such
organizations and bodies to live with a sense of mutuality, trust and harmony. Such a tree guard like approach does base itself on pro-active care, nurture and development of the faculties of all the individuals in the system and is not one that does not attend to these and leaves these matters with no attention. It is increasingly becoming clear that this may, possibly, be the only sustainable, way of living fully and letting our co-habitants live fully, in harmony with the world around us or the Universe. These would then be the building blocks with life and soul, creativity and freshness for 'leading' and 'following' the edifices, structures, organizations, networks and mechanisms of governing and governance.

Although donor agencies and the World Bank started describing the concept of good governance in terms of accountability, transparency, responsiveness, a strong civil society, clean government, these agencies also started underlining / highlighting the importance of democracy and respect for human rights. However, an attempt at clarifying the concept of governance by separating it from democracy was made by Goran Hyden(1992) with Michael Bratton. Governance is the conscious management of regime structures with a view to enhancing the legitimacy of the public realm. A regime is constituted by the explicit or implicit rules that define who the relevant political actors are, and through what channels and with what resources they actively seek political positions (Hyden,1992).

The four characteristics that bind the realm of governance, as given by Hyden, are:

1. Authority, which refers to legitimate power.

2. Reciprocity. This is a form of social interaction that generates new forms of consensus about basic rules of politics.
3. Trust, as impersonal trust between different groupings and towards public authorities.

4. Accountability, which is about the responsiveness of public authority to citizens.

These are the elements that generate legitimacy for the political system in place, whatever is the regime, and if governance is characterised by these elements, according to Hyden, people would participate in the public realm with enthusiasm.

Since the concept of governance includes trust and reciprocity, it also places emphasis on social capital and civil society institutions in legitimising the public realm. Adopting the governance concept means abandoning the sharp focus on the political elite in favour of an approach that includes institutions crossing the state-society divide. An approach that factors in these elements would be healthy and responsive to meeting the demands and moving further towards more development with quality, equity and access.

The former UN Secretary-General, Kofi Annan has stated, “Good governance is perhaps the single most important factor in eradicating poverty and promoting development.”

There is an emerging global consensus on the features or characteristics which constitute good governance. These have been used increasingly in evaluation and measurement of governance\(^\text{26}\). The book “The Making Sense of Governance” identifies six core principles that are widely accepted by researchers and governance stakeholders in developing and transitional societies around the world:

a. Participation: the degree of involvement by affected stakeholders

b. Fairness: the degree to which rules apply equally to everyone in society

c. Decency: the degree to which the formation and stewardship of the rules is undertaken without humiliating or harming people

d. Accountability: the extent to which political actors are responsible to society for what they say and do

e. Transparency: the degree of clarity and openness with which decisions are made

f. Efficiency: the extent to which limited human and financial resources are applied without unnecessary waste, delay or corruption.

Studying each of the principles enumerated above gives the following:

- Participation: For governance to be sustainable and lead to growth of harmony, mutuality and a spirit of solidarity with respect to the country or nation, the involvement and ownership of the concerned stakeholders would be very critical.

- Fairness: In order to inculcate healthy and sustained feelings of mutuality and respect, there must be fairness and equity in dealing with all the stakeholders. The absence of this would not be sustainable and could even have serious repercussions and violent reactions or revolts that could damage the very fabric of society.

- Decency: This principle is not merely referring to acts of commission but also, perhaps, acts of omission. This is very

important as it possibly indicates that in the process of governance, the space and care for each individual to grow on various planes, ranging from physical related to food, clothing, shelter, health to mental dimension by being well educated to emotional and vital well being and equally in the aesthetic and spiritual dimension to truly be able to live fully in harmony with the self and the world around or universe. The formulation of programs, rules and their implementation should ensure that the basic capabilities of human beings are nurtured in a proper manner, attending to all these dimensions, with freedom, without offending or humiliating them.

- **Accountability**: There should be consistency in what is claimed and what is done. People in position ought to be answerable and this is, perhaps, a key foundation for a well governed state.

- **Transparency**: The decision making processes ought to be based on openness and clarity, which in turn inspires and promotes these values in the constituent organizations and people.

- **Efficiency**: The bottom line of a good governed state has to be measured in terms of the deliverables attained, without unnecessary wastages, frictions and corruption. This could be further divided into quantity and quality of deliverables, use of time, financial and human resources and in a context that further promotes values of mutuality and oneness.

This, in a sense, is a bridge that links the cherished, traditional values of India with the modern concepts of teaching and education. In fact, the teaching and learning must happen in a space that respects all these values and does not violate any of these to ‘achieve’ results. An ideal teacher, *guru*, should be one that dispels darkness, and works with the
student as a friend, philosopher and guide. Thus, authority should lead to
efficiency and effectiveness with a great deal of importance to
reciprocity, trust, fairness, participation, decency, accountability and
transparency. This is what will make education sustainable and joyful.

In Chapter VII of this research, the NPTEL program has also been
assessed on a ‘lens’ defined by these values. It is interesting to note that
most students and faculty have realised that these values go well along
with conventional and modern, technology enhanced education. The next
section describes key concepts of e-governance.

2.2 E-GOVERNANCE

People across the world are, today, increasingly appreciating the use of
ICT to enhance the efficiency and effectiveness of government. There is
great awareness of the benefits of a connected government, with an
understanding that e-government implementation can completely change
the face of public services. Interestingly, there is a level of awareness
among the citizens and masses today, which pushes the political
leadership to increasingly articulate visions and strategies for E-
Governance and press for action and implementation. The use of the
Internet to deliver government information and services is professed by
almost every country. E-Governance is a modern mantra, with nearly
every country in the world articulating its vision and mission. While the
efficacy and appeal of E-Governance is universally accepted, there is a
‘gaping’ gap between rhetoric and actual practice. There have also been
studies to show that a very large number of E-Governance projects
worldwide are underachieving or failing.

It may be important to first of all understand and draw the distinction
between E-Governance and e-government. This is often missed and the
two terms tend to be used interchangeably. Governance is a concept that is larger than Government and includes the institutional frameworks, the delivery mechanisms and the decision making mechanisms as also the interactions and inter-connections between government authorities, employees, civil society and the citizens. E-Governance refers to the use of ICT across all the institutions, frameworks and processes described above. However, e-government is a component of E-Governance, which deals with issues like the automation of government offices to lead to increased efficiencies, speeds and reducing corruption. Specifically, e-government harnesses information technology (such as wide area networks, the internet and mobile computing) to transform relations with citizens, businesses and other arms of government. These technologies can serve a variety of ends; better delivery of government services to citizens; improved interaction with business and industry; citizen empowerment through access to information, or more efficient government management. (Subhash Bhatnagar: e government- from vision to implementation)

E-government involves using information technology, and especially the Internet, to deliver government information, and in some cases, services, to citizens, businesses, and other government agencies. It could enable citizens to interact and receive services from the government 24 hours a day, seven days a week. Some observers of e-government initiatives suggest service delivery could become more convenient, dependable, and less costly. For example, the Gartner Group describes e-government as the continuous optimization of service delivery, constituency participation, and governance by transforming internal and external relationships through technology, the Internet, and new media. World over, ICTs have been used as a tool to increase the efficiency and
effectiveness of governments. Initial attempts at e-government, were confined to areas within government offices and departments to automate those transactions which had a large component of repetitive tasks. This was also used for improving the monitoring and implementation of various government programs and schemes. It came to be used for various MIS functions which were, in turn, used for planning and monitoring the progress of various schemes and programs.

A look at the way most e-government applications have evolved over time reveals that typically, most of these projects start with a web presence, where the office provides information, contact details, rules and procedures to the citizens. The next stage is characterised by limited interactions, wherein the departments are connected by intranets, citizens are able to access information including static forms as well as online databases and statistical information. The next stage of e-government pertains to electronic delivery of services with some or all stages automated. Some of these applications include issuance of certificates and renewal of licences. The next stage of e-government refers to transformational government, wherein all stages of transactions, including payments are electronic. Innovative service delivery models, including public private partnerships are also included in this category. This has been well documented by the government on the Web II Report by the National Audit Office, UK. This is equally true of various sectors in India. In this study, the model that is evolved will also have to go gradually through the phases outlined in this paragraph as it reaches completion and full roll out.

E-Governance is a wider topic that deals with the whole spectrum of the relationship and networks within and beyond government regarding the usage and application of ICTs. E-Governance goes beyond to define and
assess the impacts technologies are having on the practice and administration of governments and the relationships between public servants and the wider society, such as dealings with the elected bodies, or outside groups such as not for profits organizations, academic institutions, NGOs or private sector corporate entities. E-Governance is the medium that facilitates the interplay of politics, policies using the tools of electronic engagement, consultation and networked collaboration.

It is recognized that both the e-government and e-governance need similar enablers for success. Broadly they are, Educational levels, Cultural readiness, Income levels, Confidence/trust in Government, Customer readiness, Privacy & data protection, Use of Customer Data by Government, Freedom of Information, Electronic commerce, Copyright regulations, Telecommunications and Cross agency operations. Government is an institutional superstructure that society uses to translate politics into policies and legislation. Governance is the outcome of the interaction of government, the public service, academic institutions and citizens throughout the political process, policy development, program design, and service delivery. Governance is also distinct from government as it concerns longer-term processes rather than immediate decisions. Governance is a set of continuous processes that usually evolve slowly with use unlike government. Governance focuses on processes instead of decisions. This may be referred to as a systemic perspective as opposed to a focus on the individual practice, player, task or process.

The "bottom line" for governance is outcomes rather than the outputs of government. Governance takes the larger view of social objectives, so it involves the coordination of efforts rather than the implementation of specific programs. How it all fits together is more important than exactly
who does what to whom by which means. Because governance focuses on goals rather than rules, it does not mean that the situation is any easier to understand or deal with. Goals are often based on values, and in today's diverse society, value consensus can be difficult to find or build. Instead, just as there are conflicts of values, so there are conflicts of goals. As such, attaining highest level of e-governance seems more relevant but challenging. In this context too, the concept of pooling the constituents at the state level into knowledge consortia is adopted. Such forums for understanding issues collectively and adopting the road maps may make the collective adoption of values and goals easier. This is particularly relevant as the multiversity approach will address some key challenges of quality and values in education that have been clearly articulated in reports presented by various commissions but have not yet been implemented cohesively and collectively.

And yet, e-governance ought to be strongly anchored to and connected to governance. The objective of invoking e-governance is to leverage ICT to make the basic tenets and principles of governance even more effective. The principles of participation, fairness, transparency, decency, accountability and efficiency have been acknowledged as those that reflect the emerging global consensus on what 'Good Governance' should be and could be. These are the basic strands that are invoked in this research as a 'dip stick' test of good governance both for evaluation and for putting in place a desirable architecture and model of implementation.

It has also been found that many of the e-governance projects are either failing or underachieving. According to one survey, only 15% of e-

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28 From E-government to E-governance, Vasant Goel and Aditya Garg, Computer Society of India
29 Governance and Development - Trying to sort out the basics by Goran Hyden and Julius Court.
government projects are successful, 35% are total failures and 55% are partial failures. (Richard Heeks 'Success and Failure rates of e-government in Developing/Transitional Countries: Overview'.)

Indeed, this finding is also of great importance. The very fact that a large number of projects covering many domains are being implemented in different regions and countries of the world is a great step forward in the advancement of e Governance.

"Freedom is not worth having if it does not connote freedom to err. It passes my comprehension how human beings, be they ever so experienced and able, can delight in depriving other human beings of that precious right" Mahatma Gandhi.

The freedom coupled with the propensity to try out different e governance projects would, as a natural process, lead to some success stories along with many stories of struggles, challenges and failures. But all these stories are basically stories of great efforts against various odds and obstacles; efforts of creating something new and innovating. Hence, it may be a good idea to even celebrate these failures and study them as they give us deep insights into the “how” and “why” of designing and implementing projects better.

This research is also, in that sense, an attempt to critically study one such e-governance project in the realm of education space. A critical study would first have to suspend judgment and objectively understand the various dimensions of the project under study. This gives one a deeper appreciation of the processes, people and structured issues. This, in turn, can help conceptualize and evolve a model for implementation. Ideally, the implementation of a model should be subsuming a mechanism and process for periodically evaluating the project. It can also give leads on
the areas that need tinkering and those dimensions that warrant a transformation.

E-governance is the use of technology to enhance governance and hence, the e-governance projects should be anchored in the features and principles of good governance. However, in reality, today, there is a disconnect between this rhetoric and e-governance practice. This disjuncture is also reflected in the frameworks that are often employed to evaluate an e-governance project. These, very often, have no concern for the basic tenets of governance and merely evaluate the extent to which the appendage - E (electronic) has brought in changes. Many of these are superficial indicators, based on merely making some of the existing processes more efficient, without revisiting the basic fundamentals of good governance and developing a perspective on whether the introduction of e-governance has substantially made any changes to this. In fact, even the choice of indicators or parameters to evaluate an e-governance project has very little to do with governance and merely addresses issues of automation and technology; e.g., the number of interactions measured as the number of clicks/hits on the web-site, type of platform used, frequency of updation, number of services automated and so on. There is, in effect, a marked difference between the rhetoric and the policy statements of e-governance on the one hand and the evaluation approaches, on the other. Ideally, e-governance should lead to empowerment, or the least, emancipation of the stakeholders concerned, making the relationships between these functional, as opposed to the dysfunctional ones that perhaps exist in many cases today. For this to happen, e-governance must be tightly coupled with governance per se. E-governance initiatives are common in most countries as they promise a more citizen-centric government and reduce operational cost.
Unfortunately most of these initiatives have not been able to achieve the benefits claimed. Often the reason for this failure is a techno-centric focus rather than a governance-centric focus\textsuperscript{30}. The very design of e-governance systems are often done with an emphasis on the ‘e’ part just as many IT projects of Technology enhanced learning are often more tilted towards technology instead of the emphasis on ‘learning’ or information dimension. There have been reports to show that the very fundamental basis on which e-governance reports are evaluated may be flawed\textsuperscript{31}. This study is conscious of these concerns and attempts to evolve a model that addresses the real issues of education and governance and uses the ‘e’ as a strategy to address these with great efficiency, transparency and speed. This is woven into the development of the multiversity model, detailed in chapter VI.

Having covered some ground on e-governance, the next section focuses on the status of e-governance in the state of Gujarat.

2.3 E-GOVERNANCE IN GUJARAT

Gujarat, a leading state in e-governance implementation has received many National awards from agencies like the Computer Society of India, Administrative Reforms Department, Government of India, including the recognition as one of the most e-prepared States in the country. Gujarat Informatics Ltd. (GIL) was established on 19\textsuperscript{th} February 1999 as a nodal agency for the development of ICT in the state by the Department of Science & Technology of Gujarat Government. GIL was primarily set up to promote ICT and accelerate the process of e-governance in the state. The thrust areas of e-governance in Gujarat relate to enabling structural,


\textsuperscript{31} Jayanti S.Ravi "Framework for evaluating E Governance Projects" presented as a part of the Chevening program at the London School of Economics and Political Science.
mechanisms for facilitating the smooth implementation of e-governance efforts, IT infrastructure development and IT Policy interventions and Projects. The basic principles guiding the e-governance initiatives of Gujarat relate to responsiveness, transparency and accountability. The e Governance initiatives of Gujarat are typically rolled out following a systematic study of the processes and a ‘proof of concept’ or a pilot project, to test out the processes and stakeholder participation to then roll it across the State, Districts, Talukas and villages. The constituent Departments and offices are also integrated into the processes, wherever needed through consistent standards; efforts are on to reach higher levels of automation to bring in greater efficiencies and transparency.

All Departments are required to prepare their IT plans and at least 2 to 3% of the budget is to be used for IT related activities. For smooth operations across departments, every department has nominated a Chief Information Officer (CIO) with assistance from systems managers, who are technical persons. Government has made it mandatory to pass the CCC (Course on Computer Concepts) and CCC + courses for new recruitment and promotion of government employees.

It is hoped that with lot of choices in the selection of courses during graduation study as proposed, a lot of students will benefit and equip themselves apriori for such skills mandated by the government.

Gujarat is in the Advanced Hierarchy level in terms of e-governance. It belongs to the top band of about nine states nationwide, which are in this hierarchy. This ranking is based on factors such as the institutional mechanism and documented policy for e-governance initiatives together with progress and outreach of various e-governance projects within these states or UT. The factors include the use of e-governance application of
ICTs for providing G2C and G2B services and for increasing efficiency in administration through G2G services. Adoption of e-governance Business Process Reengineering Establishing hierarchy in e-governance, institutional set-up, documented policy/road map and budget commitment for e-Governance, the number of e-governance projects, age of the oldest e-governance project, percentage of e-governance projects with BPR, the spread of e-governance projects and applications in Services Policy and Institutional Environment are the factors considered in this ranking.

Table: 2.1 Hierarchy in e-governance:

<table>
<thead>
<tr>
<th>Hierarchy Level</th>
<th>No. of states/UTs</th>
<th>States/UTs</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1- Advanced</td>
<td>9</td>
<td>Andhra Pradesh, Chandigarh, Chattisgarh, Gujarat, Karnataka, Kerala, Madhya Pradesh, Punjab and Tamil Nadu</td>
</tr>
<tr>
<td>H2 - Middle</td>
<td>11</td>
<td>Delhi, Goa, Haryana, Jharkhand, Lakshadweep, Maharashtra, Orissa, Rajasthan, Uttar Pradesh, Uttarakhand and West Bengal</td>
</tr>
<tr>
<td>H3 - Primary</td>
<td>15</td>
<td>Andaman and Nicobar, Arunachal Pradesh, Assam, Bihar, Dadra and Nagar Haveli, Daman and Diu, Himachal Pradesh, Jammu and Kashmir, Manipur, Meghalaya, Mizoram, Nagaland, Puducherry, Sikkim, Tripura</td>
</tr>
</tbody>
</table>

While this indicates that Gujarat is in the advanced category, the following table also reveals that Gujarat is at the last rank within this category. This, in turn, indicates that if Gujarat is to be a leader in the country in terms of e-governance, it would have to work in a concerted manner for the improvement of all the enabling factors. An important factor for improvement is the planned and accelerated development of quantity and quality of technically skilled and qualified human resources, especially graduating from Engineering and Science Colleges.
Table: 2.2 Ranking within Hierarchy in e-Governance

<table>
<thead>
<tr>
<th>Hierarchy level</th>
<th>Ranking within hierarchies</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1</td>
<td>Andhra Pradesh</td>
</tr>
<tr>
<td></td>
<td>Karnataka</td>
</tr>
<tr>
<td></td>
<td>Tamil Nadu</td>
</tr>
<tr>
<td></td>
<td>Punjab</td>
</tr>
<tr>
<td></td>
<td>Madhya Pradesh</td>
</tr>
<tr>
<td></td>
<td>Kerala</td>
</tr>
<tr>
<td></td>
<td>Chhattisgarh</td>
</tr>
<tr>
<td></td>
<td>Chandigarh</td>
</tr>
<tr>
<td></td>
<td>Gujarat</td>
</tr>
</tbody>
</table>

On the infrastructure front, Gujarat has been one of the first few states of the country to set up common infrastructure in hard ware and software by building the IP based Gujarat State Wide Area Network (GSWAN), Sachivalaya Integrated Communication Network (SICN), State Data Center / Server Farm, Common Service Centers (CSCs) and Integrated Workflow and Document Management System (IWDMS). This Connects 6 Districts on 8 Mbps & 18 Districts on 4 Mbps to State Center at Gandhinagar using leased circuits, Gandhinagar district on OFC and Tapi district on 2 Mbps via Surat. 225 Talukas are connected to District HQ on 2 Mbps leased circuits. This SWAN connects on an average 70 departmental offices at District locations and 5 offices at Taluka Locations. It interconnects more than 3500 District and Taluka level Government offices and facilitates IP based Video-conferencing between various Government offices. Using this, over 20000 E-mail IDs created for Government officers all over the state and about 260 Websites have been hosted for various departments/offices. Internet connections are provided to about 7,400 users through a 55 Mbps Internet provision at GSWAN State Centre.
Gujarat Informatics Ltd. (GIL) is the nodal agency for the development of ICT in the State with a clear mandate to promote ICT and accelerate the process of e-governance in Gujarat. Various policies related to Hardware/Networking, System Integration, Total Solution Provider (TSP), Training, Website, etc. to facilitate speedy implementation of e-governance projects have also been formulated by Gujarat.

While exhaustive details of e-governance policies may be beyond the scope of this research, but a tabulation of some of the important policies related to open standards, technology architectures, website standards, security standards and their issue date is tabulated below:

### Table No. : 2.3 List of Important Policies

<table>
<thead>
<tr>
<th>Policy Name</th>
<th>Issue Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardware/Networking System Integrator policy</td>
<td>July 30, 2004</td>
</tr>
<tr>
<td>Hardware maintenance policy</td>
<td>July 30, 2004</td>
</tr>
<tr>
<td>Total Solution Provider (TSP) policy</td>
<td>July 30, 2004</td>
</tr>
<tr>
<td>Training Policy</td>
<td>May 4, 2005</td>
</tr>
<tr>
<td>Condemnation Policy</td>
<td>November 7, 2005</td>
</tr>
<tr>
<td>Policy Name</td>
<td>Issue Date</td>
</tr>
<tr>
<td>Software Testing Policy</td>
<td>March 10, 2006</td>
</tr>
<tr>
<td>IT Policy</td>
<td>November 1, 2006</td>
</tr>
<tr>
<td>Web Site Development / Maintenance Policy</td>
<td>September 19, 2007</td>
</tr>
<tr>
<td>Gujarati (Local Language) Fonts standardization Policy</td>
<td>September 25, 2007</td>
</tr>
<tr>
<td>Security Policy</td>
<td>November 5, 2009</td>
</tr>
<tr>
<td>Asset Management</td>
<td>Under Process</td>
</tr>
</tbody>
</table>

Some E-Governance Projects of Gujarat:

Since a large number of projects have been implemented by the state, it may not be possible to exhaustively give details of each of these.

However, some of the major e-governance projects successfully implemented by GoG include **VATIS** (Value Added Tax Information System), **HMIS** (Hospital Management Information System), Integrated
Financial Management System (IFMS), e-Dhara, e-Nagarpalikas, e-Gram, e-Procurement, SWAGAT (State-Wide Attention on public Grievances by Application of Technology), Jan Suvidha Kendras in all District Collector offices, City Civic Centers (Municipal Corporations), etc. College to Career program is also being conducted with the help of TCS & Microsoft to sensitize and train students in the area of current industrial practices by Industry experts.

Some of the State Mission Mode projects implemented under the National e Governance Action Plan and their status are listed below in brief.

<table>
<thead>
<tr>
<th>Projects under NeGP</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common Service Centers- Gram Panchayat</td>
<td>E-GRAM project is implemented in 13695 Gram Panchayats (GP) equipped with VSAT linked personal computers to provide basic e-services and information dissemination.</td>
</tr>
<tr>
<td>Land Records</td>
<td>Implemented in all 26 Districts, 225 Talukas covering 18,526 villages – Operational since 2004</td>
</tr>
<tr>
<td>Property Registration</td>
<td>151 sub register offices across Gujarat have been computerized.</td>
</tr>
<tr>
<td>Agriculture-AGRISNET Project</td>
<td>Revised Detailed Project Report (DPR) prepared and submitted to GoI.</td>
</tr>
<tr>
<td>Employment Exchange</td>
<td>Implemented. Preparation of DPR for revamping the portal is in progress</td>
</tr>
<tr>
<td>Police</td>
<td>HD-IITS application is under Implementation. Preparation of RFP for Hardware procurement is in progress.</td>
</tr>
</tbody>
</table>
| Treasuries | ❖ Computerization of data at 137 sub-treasuries and their connectivity setup  
❖ Computerized Pension data system is functional & in operation  
❖ Online Budget processing through IWDMS  
❖ IFMS Implemented in 25 District Treasury offices and 15 sub treasury offices |
| Commercial Taxes | DPR is submitted to GoI. GoI had approved the project for Rs.54.16 Crore for the period 01/04/2010 to 31/03/2012. |
| Municipalities | ❖ Stand alone Computerization of 154 Nagarpalikas completed  
❖ Development of GIS database for municipalities & Surat MC  
❖ Citizen Centric Service through Municipal Corporation |
| Road Transport | Smart Card Project implemented since 1999.  
IT Road map preparation is in progress. |
| E-District | Jan Seva Kendra operationalised in district collector’s office |

**Those initiatives for improving the Government Efficiency are listed below in brief:**

a. Initiatives implemented under Government to Citizen category or G2C:

- SWAGAT (Chief Minister’s Online Grievance Redressal System)
- City Survey Information System (Property Card Computerization)
- Health – Food & Drugs Control Administration
- District Passport Application Collection Centre
- City Survey Information System (Property Card Computerization)
- e-Mamta (Name based mother and child tracking system)
- ITI Admission
- Employment Exchange
- Land Records
- Registration of Document (ReD)
- Jan Seva Kendra application (One day governance)
- Pension Information System For Dept. of Posts
- XGN (Xtended Green Node)
- Online Job Application System (OJAS) Web Counseling for Engineering, Pharmacy, MBA, MCA students
- Online Examination-Gujarat Common Entrance Test (GCET) 2009
- Online 10th & 12th Result
- eCourt
- Gujarat Portal
- Integrated Finance Management System (IFMS)
- Hospital Management Information System (HMIS) APMC (Agriculture Produce Marketing) commodity price information system
- Passport Status and Application filing on Internet
- Soil Health Card
- Citizen Centric Call Centre
- BPL data (Below Poverty Line database)
- e-Nagarpalika
- e-City
b. Initiatives implemented under Government to Business or G2B:
   - E-Procurement
   - Value Added Information System (VATIS)

c. Initiatives implemented under Government to Government (G2G) and Government to Employees (G2E):
   - Integrated workflow and Document Management System (IWDMS)
   - Gujarat State Data Centre
   - Gujarat State Wide Area Network
   - Disaster Recovery Site
   - EGram/Common Services Centers

   Similarly, the following services are also provided:

   Government to citizen (G2C) Services through eGram
   - Basic Certificates Issuance (Birth, Death, Character & Income Certificate)
   - Land Right Records Certificates (7/12, 8-A)
   - Electricity Bill Collection Services
   - NREG related Work
   - All other Government Department Data Entry Works
   - Cyber Teaching Classes
   - ITI Admission Form Distribution and Submission

   Business to Citizen (B2C) Services through eGrams
   - IRCTC (Indian Railway Catering & Tourism Corporation)
   - PCO Center & Mobile Recharging
   - APMC Rate
   - Insurance Services
   - On line Education
• All Other Internet Based Services like Merit list, on line Application form Filling etc..
• DTP Work
• Utility Bill Payment Service
• The Gujarat State Election Commission has recently implemented e-Voting for the Gandhinagar Municipal Corporation elections which took place on 19th April 2011. E-Voting has been implemented across all 11 wards of the civic body.

2.3.1 State Data Center (SDC)

The philosophy behind an Information Technology (IT) data center is to leverage the technology competencies of one organizational unit to deliver services across the enterprise. Government of Gujarat is having an IT set up to look after the needs of the many applications it has. It has a state wide Area Network called GSWAN. This network provides connectivity to various constituents of the government.

• Started as State Project in 06-07 budgets. During March 2008, Govt. of India granted Rs.55 Crores for part funding of capital cost and O&M expenses over 5 Years.

• Gujarat State Data Centre (GSDC) includes 2600 sq. ft of server & storage area, 600 sq. ft. of connectivity zone and 1300 sq. ft. of control room & utility area.

• GSDC has been connected to all the Govt. offices through GSWAN infrastructure.

• GSDC is shared, secured and managed infrastructure for consolidating and securely hosting State Level Data and applications of G2G, G2B and G2C nature.
2.3.2 Applications running at SDC

- Currently applications running at State Data Centre are IWDMS, Integrated Financial Management System- IFMS, HMIS, Labour & Employment, Printing & Stationery, GSBTM, XPLORA, GAD, Agriculture Soil and Health Card Application, eDhara-Land Record information system of Revenue Department, SWAN e-Mail service and other departmental dynamic websites hosted on web server etc.

- Gujarat State Wide Area Network (GSWAN), which connects over 3600 District and Taluka level offices, also operates out of State Data Centre.

- This would ensure 99.74% uptime for all the applications hosted at the Data Centre. The Data Centre Operator’s payment is being completely linked to the maintenance this uptime.

These give an idea of the various efforts in e-governance made by Gujarat. As is shown in the ‘INDIA: e-Readiness Assessment Report 2008’, Gujarat is in the category of ‘Aspiring Leaders’. This assessment is based on factors related to the ICT environment, readiness and usage, which have been further elaborated in the next table.

E-Readiness can be considered as the ability to pursue value creation opportunities for inclusive economic development facilitated by ICT. Therefore, it is not simply a matter of the number of computers, websites, internet service providers, internet connections, telephones and mobiles in the state/UT, but also the ability or readiness to use technology skillfully at the level of the individual, business and government.
Fig. No. : 2.1 Ranking of states in terms of different levels of e-readiness

Fig. No. : 2.2 E-readiness growth path
# Table No. : 2.4

## Distribution of States by Environment, Readiness, Usage and e-Readiness

<table>
<thead>
<tr>
<th>Levels</th>
<th>Environment</th>
<th>Readiness</th>
<th>Usage</th>
<th>e-Readiness</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1</td>
<td>Maharashtra Chandigarh Karnataka Andhra Pradesh</td>
<td>Karnataka Tamil Nadu Chandigarh Maharashtra</td>
<td>Chandigarh Delhi Andaman and Nicobar Karnataka</td>
<td>Karnataka Chandigarh Maharashtra Tamil Nadu Delhi Andhra Pradesh</td>
</tr>
<tr>
<td>L2</td>
<td>Gujarat Tamil Nadu Haryana West Bengal Punjab Assam Delhi Kerala Madhya Pradesh Uttar Pradesh</td>
<td>Haryana Andhra Pradesh Delhi Kerala Punjab West Bengal Bihar</td>
<td>Kerala Gujarat Andhra Pradesh West Bengal Jharkhand Tamil Nadu Uttarakhand</td>
<td>West Bengal Kerala Haryana Gujarat Punjab</td>
</tr>
<tr>
<td>L3</td>
<td>Orissa Goa Nagaland Tripura Puducherry</td>
<td>Gujarath Andaman and Nicobar Himachal Pradesh Goa Madhya Pradesh Orissa</td>
<td>Maharashatra Assam Punjab Haryana Himachal Pradesh Madhya Pradesh Sikkim Chhattisgarh Rajasthan</td>
<td>Andaman and Nicobar Madhya Pradesh Goa Orissa Assam Himachal Pradesh Uttar Pradesh Bihar</td>
</tr>
<tr>
<td>L4</td>
<td>Himachal Pradesh Chhattisgarh Sikkim Rajasthan</td>
<td>Chhattisgarh Uttar Pradesh Sikkim Uttar Pradesh Jharkhand Rajasthan</td>
<td>Orissa Bihar Goa Uttar Pradesh Meghalaya</td>
<td>Chhattisgarh Uttar Pradesh Jharkhand Sikkim Rajasthan</td>
</tr>
</tbody>
</table>
2.3.3 Sakshat or NMEICT (National Mission on Education through ICT)

Gujarat Sakshat

The National Mission on Education through Information and Communication Technology (NMEICT) was initiated by the MHRD in 2008 with the vision of promoting content generation, research in critical areas of imparting education and connectivity. This mission is meant to bring about the integration of knowledge and holistic efforts made by various experts and make these available to all institutions for free.

Gujarat has leveraged this opportunity offered under this National Mission and has taken giant strides in this direction. The Government of Gujarat has taken a lead in joining this Mission with respect to enabling greater connectivity, as well as enhanced e-content generation. As part of the scheme, the Government has paid Rs 4.9 Crores to BSNL as 25% contribution towards 10 years rent for the connections to 8 State Universities, while MHRD has borne the remaining 75% of the expense. Universities in the state have received 1 Gbps connectivity with 400 nodes. Further, connectivity under NMEICT has been given to more than 400 Colleges already. Under the scheme, each college gets ten nodes each of 512kbps broadband connection.

In order that teachers and students utilize the internet connectivity to gain access to standard e-content, e-journals and other e-resource, the Knowledge Consortium of Gujarat has given momentum to the Mission's step to promote e-content generation. It has paved the way to spread the Mission through its novel model which has participation of members in a State level Task Force, drilling down to University level and College level Task Forces.
The SOA architecture mentioned in Chapter VI focuses on the need of high speed connectivity (preferably OFC) to the universities. This will be the ‘highway’ on which most of the applications related to the proposed National Programs will be available.

The state NMEICT Taskforce also known as the Gujarat Sakshat Mission was formed in June 2010. Representatives of all the State Universities are part of the Mission. With guidance from senior experts involved in the Mission and through more than 30 Workshops for spreading awareness and training, across the State, Gujarat is now among the top few states who have submitted the maximum number of proposals under NMEICT for e content generation.

The MHRD has acknowledged Gujarat’s enthusiastic participation in the Mission. In less than six months, over 90 proposals were submitted and more than 15 approved for which each Investigator receives upto Rs 7 lakhs to complete the project. These proposals cover a wide range of subjects from Home Science to Microbiology, Electronics, Hotel Management and even Ayurveda. The Gujarat Ayurveda University which has a unique presence in the country has put together a fairly big project which will now enable access to traditional Indian subjects from across the globe.

Another mega project by the Department on the anvil, is a proposal under NMEICT to develop e content to supplement courses under the Choice based Credit system. Gujarat is one of the first states in the country to take major steps in revolutionizing the Education system in various ways. Introducing e content and creating an ICT enabled teaching- learning environment is one such step. Some of the Foundation and Elective courses that will be made available on the MHRD’s Sakshat Portal.
through the efforts in Gujarat, are expected to add immense employability skills and provide students with the finesse that complements what the Education system offers. This will result in empowering students to access information, gain knowledge and widen their horizons in today’s Knowledge based world.

NMEICT has thus poised to soon become a household name among students and faculties in Institutions of Higher Education in Gujarat.

With all these projects, initiatives and programs in place, there is a high level of commitment of the State to E Governance. Needless to say, there is a lot more to be done as well to further build up IT systems and integrate them with the required training. As will be discussed in the next section, the indicators and factors used for E readiness and E Governance shows that a pool of competent, technically skilled human resources is a must for the State to scale great heights in IT and e Governance, truly empowering the citizens and building their capabilities.
Chapter II – Part B

ANALYSIS OF E-GOVERNANCE (E-GOVERNMENT TO E-GOVERNANCE)

"Lead me from the unreal to the real.
Lead me from darkness to light.
Lead me from death to immorality."
- Brihadaranyaka Upanishad
2.4 E-LEARNING

Some of the E Governance Projects implemented by the State have been described in the earlier section. The questionnaire used by the “INDIA: e-Readiness Assessment Report 2008” questionnaire developed by Government of India shows that fourteen out of a total of 82 questions, specifically relate to education. Most of the others relate to policy interventions and legal provisions for facilitating the objectives of ICT. While a large number of questions also directly or indirectly depend on ICT awareness, IT education and background of technological knowledge in the State, there are specifically 14 questions out of 82 or 17% inputs that directly relate to education. In fact, education is the only sector other than general policy level interventions that is specifically included in the form. Further, out of a total of 14 main questions that pertain to education, it is found that nearly 11 of these pertain to higher and technical education, which equals about 80%.

From the e-readiness point of view, it is seen that education is of great importance. Not only is education a key service that is a component of governance and e-governance, but education is a basic pre requisite for most of the other dimensions of governance to be meaningful and fruitful.

Thus, education is both a facilitator of various dimensions of governance and a core governance activity itself. The specific area chosen for a focus in this study refers to Technology enhanced learning as a part of e-governance, which can also be called E-learning. Specifically, the implementation in

Gujarat of an e-learning project called National Program of Technology Enhanced Learning has been selected for this research.

The use of ICT in learning has come to be adopted across many countries of the world. This is used across various levels of education ranging from the primary, secondary and tertiary. It refers to the integration of technology in the learning process and not merely a superficial application of technology as a layer to speed up and facilitate the learning.

Kern\textsuperscript{33} defines e-learning as the approach using different internet and web technologies to enable, to evoke, to promote and/or to present learning processes and the development of competencies. E-learning can start with the rudimental integration of technology to the learning but goes on to describe the complex range of tasks and solutions that are a part of the net based education systems. It is possible to deliver courseware and learning opportunities anywhere, anytime with complete adherence to standards and quality. "E-learning refers to the use of internet technologies to deliver a broad array of solutions that enhance knowledge and performance."\textsuperscript{34} E-learning is now increasingly being perceived as one that provides for networkability, updating as and when required and uses standard internet technology. Networkability makes it possible to retrieve knowledge as and when needed, modify it and alter it. This is coupled with the possibility of sharing and distributing.

E-learning has many advantages which include the lowering of costs, enabling the possibilities of making the teaching, learning process interactive, it provides choices of providing inputs based on access levels and choices from the users' side for taking only the required inputs. In

\textsuperscript{33} Kern, D., Nur Mode oder Methode In: Management & Training, Luchterhand Verlag, Ausgabe 1, page 19
\textsuperscript{34} Rosenberg M. J., e-Learning, Building successful online learning in your organization, 2001
addition, the provision of updating the information literally on a minute to minute basis is a great boon. This helps access e-learning on a 24/7 basis from anywhere. The proliferation of the internet and mobile technology across the world has already done the task of priming users. As the ‘hole in the wall' experiment has shown, young learners are also found to be very nimble in figuring out the ‘how and what’ of accessing information and knowledge in e-learning. This is a very powerful tool web-enabled and takes advantage of the universal internet protocols and browsers. Apprehensions over differences in platforms and operating systems are almost things of the past. E-learning also builds communities that often facilitate meaningful sharing and learning through forums, chats, e-groups etc. The scalability of e-learning makes it a specially preferred tool for access to large numbers of students, who may be geographically spread out. The possibilities of online and on-site help on a 24/7 basis is another enabler. E-learning could also provide for a positive utilization and leverage of corporate investment in the ICT infrastructure, networks and large scale production of e-content, with the accompanying benefits of economic development and employment.

E-learning also has its share of limitations. It is not an appropriate tool for trainings that require a high level of personal contact such as communicative abilities, rhetoric etc. It limits the possibility of interacting informally with other participants during on-line trainings, unless the software specifically provides for this. According to Forrester Research the percentage rate of those who quit their e-learning course lies at 80 percent. The cause could be the insufficient quality of the training course that does not allow interaction or the courses are didactically not correct. E-learning needs a high amount of self motivation. The trainees

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should have a certain ability to learn by themselves, to assess and choose learning contents and to organize them. Demographic and cultural issues may also seem a barrier initially, but this may also turn out to be a benefit eventually, if the diversities of communities are supported. Similarly, the individuality of the learner is often quoted as a possible casualty. However, in emerging countries with very high student to teacher ratio in the conventional class rooms, the varieties of learning activity methods or LAMs that e-learning can provide can easily counter that argument.

Ashok Gupta in his article “Content Development for Online Engineering Education”\(^\text{36}\) brings out the following issues related with on-line e-content:

“Engineering education has been traditionally imparted through the lecture-tutorial-laboratory paradigm. Education technology in the last few years has tried to make teaching more effective by supplementing the chalkboard teaching by audio visual aids like overhead/ slide projectors and videos. These are, however, passive teaching tools. Recent advancement in computer multimedia has brought in a new teaching media. Multimedia education has several advantages, most noticeably; the instruction can be interactive and self-paced to meet the needs of each student. Multimedia has great potential in engineering education. The possible applications of multimedia are almost unlimited given its current capabilities. The success of multimedia application to engineering education, however, lies in the development of good computer based teaching packages.

Offering multimedia courses over the Internet has become the most recent option in computer assisted instruction. With combined emphasis on learner-centered and distance education, development of multimedia-

\(^{36}\) http://www.cdac.in/html/pdfySession3.2.pdf (Viewed on 9-4-2011)
rich courses that can be accessed over the Internet has become not only
an attractive and creative option for faculty; it is now a suggested or even
required course of action. Such courses will have the potential to serve a
dual purpose by enhancing the learning experience for resident students,
while opening up the educational experience to distance students.

The range of possibilities for the use of the Internet in education is
becoming more widely recognised. Web based courses are proliferating
and, for universities, offer cost savings in infrastructure and a far wider
potential student base. Developments in Internet technologies continue to
improve the means of sharing information globally and universities can
no longer rely solely on their earlier advantage of exclusive access to the
resources for assisting students to gain a higher education qualification.
Recent years have seen tremendous growth in the number of web-based
courses globally.

The main lesson that I learnt during this work is that good content
development requires a major initial time investment of the teacher. It is
possibly this reason that most of the course material on the web is
electronic version of lecture notes. For posting lecture notes and
assignments, the teacher does not require the knowledge of authoring
tools or the information technology. An MSWord file can be saved as
HTML file. However, if the course has to be interactive, the teacher is the
best developer because of his/her familiarity with the course. The teacher
not only has to design the content but also requires good understanding of
authoring tools. The time investment is usually at the expense of research
and publications. Therefore, there is a need for the Universities to
recognize the effort and the importance of online web based courseware."
The readiness of students and teachers on most campuses of higher education of the world, especially technical education, can be rated as reasonably alright today. A snapshot of the daily tasks and academic work of students and teachers of many Universities today shows an almost complete dependence on e-mails, references to e-journals and digital libraries, use of internet for inputs and updates for the class and assignments, use of power point presentations and streaming internet based resources, among others. Lesson plans, lecture notes, references, assignments and instructions on bulletin boards have come to be an almost normal part of the university webscape and web space. This is fairly applicable in India too, though there would be faculty members, who may be lacking in motivation or the commitment to learn ICT and grow. However, in the current research, has interviewed teachers and students have been interviewed and it is found that they have inclination towards sharing their learning material, notes and such resources.

E-learning can be a very powerful tool, particularly in tertiary education. This sentiment has gained currency for quite some time now. At the “Globalization of the University” speech delivered by the then University of California President, Richard C. Atkinson, and this idea was articulated by him. “Our rapid expanding ability to share information and ideas is leading to what can be called the globalization of the university”.

Joyce Pittman, Eugene Rutz, and Virginia Elkins\textsuperscript{37} have discussed implications for Online Content Development in their research paper and they state, “This preliminary study compared the effects of technology-enabled courses and face-to-face instruction using student learning styles

and student preferences for content types. Two groups of students enrolled in problem-based courses (one in the College of Engineering and the other in the College of Applied Science) were included in this quasi-experimental research. A survey was used to collect information about the students’ preference for content types. Kolb’s Learning Styles Inventory was used to measure student learning styles preferences. The results indicated an expected preference in the engineering technology disciplines for concrete experience over abstract conceptualization. Neither the delivery medium nor the content type (face-to-face or online) had any statistically significant impact on students’ final performance. A significant finding was that both group profiles suggested differing needs for presentation of content and learning styles for students in the two colleges. The conclusion was that learning styles could influence content type preferences among students in either environment (face-to-face or online) but this hypothesis needs more research.

2.5 OPENING UP EDUCATION FOR E-LEARNING THROUGH OPEN EDUCATIONAL RESOURCES (OER)

A UNESCO forum was convened in 2002 on the Impact of Open Courseware for Higher Education in Developing Countries to “consider the potential, for developing countries, of the Massachusetts Institute of Technology (MIT) initiative to put course materials online for open access.” This is where the term “Open Educational Resources” (OER) was coined.

A good number of initiatives have been undertaken across the world, which is now going beyond the economical dissemination of courseware or even the mere design and use of technology for it. They are looking at new ways of teaching and learning by leveraging open technologies.

38 No.47, page 19, Unlocking the gates.
These initiatives are trying to understand and provide platforms which capture the learning contexts and processes in institutions and universities as closely as possible. They include the activities and communities in which students and other stakeholders participate.

Right at the beginning, there is a need to understand the definition and contours of Open education resources and open educational content as used in the current discourse.

UNESCO has defined open content as part of the broader conceptual movement of open educational resources (OER), where content is described as "digitized educational materials and tools freely offered for educators, students and self-learners to use and reuse for the purposes of teaching, learning, and research" (2002). Going by this definition, the OER movement can be a great boon for developing countries of the world, if this opportunity is properly seized with the necessary transforming and tweaking that the prevalent system with its baggage and legacies needs.

Another definition refers to open educational content and resources as digital learning objects, such as "small (relative to the size of an entire course) instructional components that can be reused a number of times in different learning contexts . . . deliverable over the Internet . . . any number of people can access and use them simultaneously (as opposed to traditional instructional media, such as an overhead or videotape, which can only exist in one place at a time)" (Wiley, 2000). These definitions also dramatically demonstrate the possibilities of collaborating and building on individual strengths to provide the best of resources to students across the world, virtually at no cost.
This has been the main spirit with which many such efforts have been carried out in the last decade or so across the globe. While it would be impossible to do justice to even a few of them in great detail in this section, what is attempted is an overview of many such efforts with a couple of lines describing each in the following pages. This is by no means exhaustive or complete.

1. The Open Learning Initiative (OLI) is an open educational resources project at Carnegie Mellon University that began in 2002. OLI creates web-based courses that are designed so that students can learn effectively without an instructor. In addition, the courses are often used by instructors to support and complement face-to-face classroom instruction. What is interesting that unlike many projects, OLI has given a great deal of importance to the processes and dynamics of teaching and learning using OER. It is developed from collaboration among cognitive scientists, experts in human computer interaction, and seasoned faculty who had both a deep expertise in their respective fields and a strong commitment to excellence in teaching.

The OLI project has developed full courses for students at no cost and to institutions at a low cost. Elements like instructional design as well as formative assessment for students and mechanisms for ploughing back feedback into the course ware are built in. The courses also include online components such as virtual laboratories, simulations and group experiments as well as cognitive tutors.

A primary objective of the OLI project is to ‘prime’ and spawn the course development by first building a community of use for the
courses and features. The modular courses allow faculty members to calibrate and use these to fit the student needs and curricula. In that sense, there is a fair degree of freedom built into OLI. This is disseminated using free workshops for teachers and faculty. The courses cover various areas, including Biology, Causal Reasoning, Chemistry, Economics, Logic, Physics, and Statistics.

There have been evaluations of OLI. For instance, a study showed that OLI-Statistics students learned a full semester’s worth of material in half as much time and performed as well or better than students learning from traditional instruction over a full semester.\[39\]

2. The iLab Project facilitates the sharing of online laboratories by leveraging real laboratories. Unlike the physical laboratories, iLabs can be shared across colleges, universities or across the world. iLab aims at facilitating the conduct of actual lab experiments as broadly as possible within higher education and beyond. The project also aims at creating a rich set of experiment resources that for faculty members around the world to share their labs as online laboratories over the internet. These are different from simulations as iLab use remote experimental facilities to give the students the actual look and feel of working with the equipment that real world researchers and scientists use.

The study of the NPTEL programme in this research has shown that by the end of phase III, i.e., by 2012, NPTEL would have an even larger repository of courses than OCW of MIT or OLI of CMU.

Jesus del Alamo started the iLab Project in 1998 although it was several years before the project acquired its final name. The initial

inspiration for the first iLab came from the frustration that MIT's courses on semiconductor devices did not contain a laboratory component. Traditionally, students in the courses were exposed only to theoretical devices models presented in lectures and course texts. At the same time an Agilent 4155B Semiconductor Parameter Analyzer, an expensive piece of equipment bought under a research contract, was sitting largely unused in a graduate research lab. While the students could not all be physically located in the research lab, a small java applet enabled students to access the equipment through the internet and invoke the equipment. Such facilities and OER would be particularly useful in developing countries where the cost of physically setting up a large number of laboratories can be drastically cut using software applications.

3. MIT Open Course Ware (OCW) is, perhaps, among the most popular OER available in the world, used by a large number of universities and even translated into many languages, including Spanish, Portuguese, Simplified Chinese, Traditional Chinese, Thai, Persian, and Turkish. A google search for OCW MIT fetches more than 2 million (2,070,000) results.

As its web site states, MIT Open Course Ware is a free publication of MIT course materials that reflects almost all the undergraduate and graduate subjects taught at MIT. While OCW does not grant degrees or certificates, nor does it provide access to the MIT faculty, it is free and was started in 2002 with a ‘proof-of-concept’ having 50 courses. By 2007, over 1800 courses in 33 academic disciplines are published on the web site.
Statistics indicate that it has 110 million visits by 78 million visitors from virtually every country. Most MIT faculty contributes to the OCW site and about 29% feel this publishing on the OCW has positively influenced their professional standing. 94% of MIT students say OCW has positively impacted student experience.\(^4\)

**Graph No. : 2.3 MIT Population using OCW**


Charles M. Vest, President, MIT in October 2002 said, "We hope the idea of openly sharing course materials will propagate throughout many institutions and create a global web of knowledge that will enhance the quality of learning and, therefore, the quality of life worldwide.”

4. China Open Resources for Education initiative is another effort to pool such course material. The OCW staff members are also continuing to work with the Hewlett Foundation to encourage more universities and colleges to open their resources to the world. The China Open Resources for Education (CORE) organization, formed three years ago, already boasts as members Peking, Tsinghua, Beijing Jiaotong, Dalian, Central South, Xi’an Jiaotong, Central

\(^{40}\) http://ocw.mit.edu/OcwWeb/Global/OCWHelp/help.htm
Radio and TV, Sichuan, Zhejiang, and Beijing National Universities. In addition to providing a mirror site for MIT, CORE members are translating some of the MIT courses and posting their own courses to the Web. (http://www.core.org.cn).

5. Connexions - this is another OER project which began in 2000, when Richard Baraniuk and his colleagues at Rice University initiated Connexions (http://cnx.rice.edu). It initially started for providing up-to-date material on engineering but has since grown in to a huge collection of free learning materials and software tools for both higher education and schools. Using these tools, authors, instructors and learners can explore various features to publish, collaborate, build and share contents and use these. Interestingly, Connexions' Content Commons contains small "knowledge chunks" called modules that connect into courses. Covered under a Creative Commons' open license, these can be taken, adapted to meet various needs, and modified. The focus in this OER is also to build communities for administration, support and self management using Open Learning Support or OLS. Some of these subjects include Digital Signal Processing, Electrical and Computer Engineering, Bioinformatics, Botany, Biodiversity and Music. Similarly, versions of several engineering modules in Chinese, Thai, and Japanese are also now available in Connexion41.

6. Open Learning Support (OLS) of Utah University was developed by David Wiley and his colleagues which is a self-managed community software. OLS is a free, open resource that provides space on the Internet where people can connect to discuss topics, share information, debate, and so on. OLS is already linked to

41 (http://cnx.rice.edu)
2,200 modules in the Connexions collection and provides discussion services for MIT's OCW initiative. Its most important feature is its self-management. This is a very important link in the institutionalisation of such OER. While a large number of institutions may be creating OER, the need to support, hand hold and facilitate the users is extremely important and this is the focus of OLS. These communities not only support the users, they also perform the task of self-policing. If someone posts an inappropriate message, a member of the community can press the "panic button," which signals a network manager. If the manager determines the posting was inappropriate, the person can be electronically banned from the community. Several interesting features by the community make the accessing and use of OER interesting, fun and fruitful. For instance, when a very good comment or resource is mentioned in a posting, other members of the community can register "votes" for it, thereby leaving signposts for people who come along later.42

7. On May 13, 2005, the presidents of six top universities in Japan—Keio University, Kyoto University, Osaka University, Tokyo Institute of Technology, the University of Tokyo, and Waseda University—announced the formation of the Japan OCW Collaboration Group (http://www.jocw.jp). The universities are creating course materials compatible with MIT's project. Such efforts are also on in Vietnam http://www.fetp.edu.vn/fetpocwV.cfm. Similarly, Universias is a consortium of more than 720 colleges and universities in Latin America, Spain, and Portugal that have translated about 75 MIT OCW

42 http://www.educause.edu/EDUCAUSE+Quarterly/EDUCAUSEQuarterlyMagazineVolum/Open Educational ResourcesServet/ 157357 Open Learning Support
courses into Spanish and Portuguese. These courses are being widely used.

8. In the United States, Utah State University opened its USU OCW pilot program in February 2005 with eight courses from six disciplines. Utah State is a land-grant university with a mission for outreach. The university also has strong agricultural programs, which could be of great value to developing countries. Consequently, among the first sets of course materials put on the Web are Biochemical Engineering, Irrigation Conveyance and Control Systems, Sprinkle and Trickle Irrigation, and Soil-Based Hazardous Waste Management43.

9. The Johns Hopkins Bloomberg School of Public Health (JHSPH) in Baltimore, Maryland, is a worldwide authority on public health that has pioneered new research and shared its knowledge and expertise in the field for many years, educating tomorrow's scientists and practitioners. This is another exciting development as domain specialists in niche areas such as JHSPH can also join the OER movement by bringing their specialised fare to the table for those at the high end, needing more specialisation. JHSPH has joined the OER movement by creating an OCW project with eight courses on the Web, including Understanding Cost-Effectiveness Analysis in Health Care, Family Planning Policies and Programs, and Problem Solving for Immunization Programs. Such niche areas and interdisciplinary courses add further richness to the OER. The JHSPH program offers a great example of the type of knowledge valuable to all human beings.

43 http://ocw.usu.edu/Index/index_html/ECIndexPage_view
10. In 2004, a community college-level project was developed out of Foothill-DeAnza Community Colleges District in California. This is an example of ‘calibration’ and provision of choices on the vertical dimension. The concept behind the Sharing of Free Intellectual Assets (SOFIA) project is that many teachers and students in various parts of the world are ready to take advantage of Web-based materials but need more basic skills than those offered by MIT or Carnegie Mellon University. This is an OER but also performs the very important task of supporting those users from other countries and regions who may need a bridge course or more basic skills than those offered by the mainstream OER projects. It will be interesting to see how the international community receives this project.

11. A network known as the African Network of Scientific and Technological Institutions (ANSTI), had been founded in January 1980, through the financial support of United Nations Development Programme (UNDP), United Nations Educational, Scientific and Cultural Organization (UNESCO) and Germany. It is an organ of cooperation that embraces African institutions engaged in University level training and research in the fields of science and technology. The network has grown over the years to become an effective institution for the development of human resource capacity in the fields of Basic and Engineering Sciences. "UNESCO, through its project ANSTI, is implementing an e-content development programme through training and support for content development for both asynchronous mode of delivery using mainly portable media - CDs and synchronous mode on e-learning.

44 http://www.anсти.org/new/index.php?option=com_content&task=view&id=75&Itemid=71 (Viewed on 9-4-2011)
platforms. Several training activities have been mounted and academic staff from across African universities have benefited. These staff members have been engaged by UNESCO/ANSTI to develop e-content materials in various subject areas in Basic and Applied Sciences and Engineering and Technology⁴⁵.

12. The Indian Institute of Information Technology Management-Kerala (IIITM-K) has developed a site offering e-content for some 230 engineering courses.⁴⁶

The materials for the undergraduate engineering curriculum in the All India Council for Technical Education (AICTE)-approved engineering colleges are available on the website, which bagged this year's Manthan Award for India's best e-content for education. 110 courses are in the form of full length recorded video lectures covering some 40 lecture hours per course and as web-based supplementary learning materials for some 130 courses. The web content is also hosted at IIT Madras. At present, courses are available in core sciences, computer science, civil, mechanical, electronics and electrical engineering related subjects. The contents were developed in association with the ministry of human resources development's National Programme on Technology Enhanced Learning (NPTEL) helped by over 320 faculty members of the Indian Institutes of Technology (IITs) and the Indian Institute of Science (IISc).

2.6 AIM OF HIGHER EDUCATION

At this point, an understanding of the aims of higher education would be essential to appreciate the context and needs in which these possibilities

of ICT are available. Chapter I of the thesis did delve into this issue partly and the general aim of education was articulated as the promotion of the knowledge of the self, knowledge of the universe and the effective and harmonious relationship of oneself to the universe. In the context of the present epoch, a special aim is located in the context of exponentially exploding knowledge\textsuperscript{47}; and it is here that ICT becomes indispensable.

Specifically coming to higher, including technical education, the aims of education, within the general context of the foregoing paragraph, point to certain areas listed below:

- Development of critical rationality
- Widening of the quest of knowledge
- Understanding of fields of knowledge
- Appreciation of different standpoints
- Ability to move towards holistic vision
- Enlargement of areas of learning and equipment for a wide General Knowledge
- Provision of Humane Education
  - Combination of Studies related to:
    - Essentials of Science, Values and Spirituality
    - Logic
    - Ethics
    - Philosophy or meaning of life
    - Aesthetics
- Specialization and professional Excellence
- Capacity to continually pursue excellence

\textsuperscript{47} A google search on the 'domains of knowledge' returns about About 73,600,000 results in 0.08 seconds!
All these would systematically inculcate and build the capacity for lifelong education, which is a key requirement in today’s knowledge and learning society.

As mentioned earlier, all these would have to be addressed and developed in the context of an ever enlarging explosion of knowledge, vastly and rapidly changing political and social life and complexity of human relationships. All this is further happening against a backdrop of increasing mechanization, standardization, uniformity and global hugeness of structures of organisations. In this situation, ICT has become indispensible but has to be subtilised in such a way that it fosters acceleration, creativity, joy of learning and freedom of choice, pace of progress and concern for the natural and human environment. With this understanding of the aim of higher education, (including technical) education, the next section addresses some of the challenges and concerns of higher education today.

2.7 CHALLENGES AND CONCERNS OF HIGHER EDUCATION

In this section, the possibilities of technical education in the context of knowledge societies are studied. Technical education is a key factor that influences and supports a knowledge-driven society as this education trains qualified, competent and skilled human resources such as engineers, professionals and scientists. This also builds the capability of the human resources to adopt the global knowledge repositories and adapt these to the local context. Most importantly, technical education with its focus on research and development leads to generation of or construction of new knowledge. All these factors together contribute towards national productivity and enabling a country to stand ahead globally.

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Even against a background disadvantage of poor structural capabilities, weak governance and institutional capacities coupled with limited resources, access to quality technical education can empower the people and open up to know better opportunities in various sectors, bringing about raised aspirations and all round improvements. The other positive spin offs of technical education in a nation is that it spawns and incubates technological innovations and research, which, in turn, lead to higher productivity and economic growth.

The values, attitudes, understanding, thinking skills, application and knowledge that students develop while acquiring technical education are very important as these come to define the social fabric of communities and nations. This phase of education also leads to nation-building by promoting greater cohesion, mutuality, trust, democratic participation and sensitivity to diversity in religion, community, language, gender and individuality, creativity and freedom, while encouraging debate, deep reflection and introspection. It is, perhaps, during this phase of education and life that the various dimensions of life ought to be properly understood, appreciated and constructed by students.

Indian economy is growing at a fast pace presently. If India is to become a leading knowledge economy in the world, one of the key factors that need attention is the quantity and quality of its human resources. In fact, creation of knowledge, adoption of knowledge and becoming skilled in the assimilation, contextualisation and application of knowledge are some of the key areas that need special thrust in the journey towards being a leading global knowledge economy. This requires professionals in various disciplines corresponding to the different sectors of the economy such as scientists, administrators, technologists, teachers, lawyers, policy

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planners, health professionals, doctors, industrialists, among others. While all these professionals are needed, the importance of technical professionals and technologists is particularly high in a knowledge society, as these play the important role of transposing the knowledge, discoveries and innovations in the fields of science onto their applications across various sectors of the economy, including the daily lives of people. These professionals from different fields of technology and engineering would be able to pave the way and create furrows in new, uncharted terrains by undertaking research, working at the cutting edge of emerging disciplines and fields. They would have to give direction to the growth and development of knowledge and put in place mechanisms, processes, skills and human resources projected for future. This, once again, requires a base of sound technical education as this leads to the development of skilled and competent professionals and work force as well as the teachers and instructors needed for further developing new professionals. India has witnessed a huge demand for engineering education and this has led to the mushrooming of a large number of engineering institutions across the country.

There has been an unbridled expansion in technical institutions and colleges. From about 44 engineering colleges with 2570 seats at the time of independence, the number of AICTE approved colleges is 1668 with 6,53,290 seats as on 31st August, 2007. There has been a huge demand from industry for engineers in all sectors. The Nasscom-McKinsey Report (2005) had projected a shortage of 500,000 engineers in India in 2010 in just the IT and ITES sectors alone. The government has also been

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50 Profile of Engineering Education in India--Status, Concerns and Recommendations by Gautam Biswas, K L Chopra, C S Jha, D V Singh--Narosa Publishing House.
projecting a GER of nearly 15% by the end of the 11th Five year plan as against a current 11%.

Sanctioned engineering baccalaureate capacity in India 1951-2004

Table No. 2.5 Sanctioned engineering baccalaureate capacity

<table>
<thead>
<tr>
<th>Year</th>
<th>Population in Million</th>
<th>Engineering College capacity</th>
<th>Engineering college capacity per million of population</th>
</tr>
</thead>
<tbody>
<tr>
<td>1951</td>
<td>361</td>
<td>4788</td>
<td>13</td>
</tr>
<tr>
<td>1985</td>
<td>765</td>
<td>45136</td>
<td>59</td>
</tr>
<tr>
<td>1995</td>
<td>928</td>
<td>105000</td>
<td>113</td>
</tr>
<tr>
<td>2004</td>
<td>1086</td>
<td>439689</td>
<td>405</td>
</tr>
</tbody>
</table>

Source: AICTE (Ministry of Human Resources Development).

It is estimated that about 1,60,000 teachers are needed for engineering education for a student population of about twenty lakhs (two million). As against this, only about 4000 teachers are trained by higher education institutions every year. Further, since the teaching profession is not one of the more attractive career options for students from the societal status and economic point of view, a large number do not take up teaching.

The main challenges and concerns of technical education relate to the following:

1. Access
   As indicated in the last paragraph, there has been an unmanageable demand for new engineering colleges and more seats. Comparing with China, it is seen that in 2004, 34% of the total students in universities were in Engineering as compared to a mere 6% in India. Similarly, at the post graduate level, the percentage of engineering students to total students was 38.84 in China against 3 to 4% in India. Similarly, the number of science and technology personnel per 1000 population is 76 in Germany, 55 in USA, 45.9
in South Korea and 8.1 in China against a low 3.5 in India. This then brings with it the associated problems of inadequate faculty, infrastructure and so on, which are highlighted below.

2. **Equity**

Engineering education in India is plagued by many issues of inequity. For instance, of the total seats, there are 76.3% Male students as against 23.7% Female students. Similarly, with only 8.5% students of the SC community and 3.1% of ST community, this is further skewed in the case of female students as well as minorities and such other groups. Regional imbalance is another major issue with nearly 60% of the engineering graduates coming from the four states of Tamil Nadu, Andhra Pradesh, Karnataka and Maharashtra. There are no systemic facilities such as remedial programs for weak students or bridge courses in local language for students from rural, non-English medium backgrounds.

3. **Curriculum**

   a. Outdated Curriculum and resistance to adoption of new curricula by various stakeholders
   b. Absence of courses on humane education.
   c. Absence of provision of choices in the curriculum
   d. Missing courses on essentials of science, values, meaning of life and pursuits of truth, beauty and goodness.
   e. Inflexibility of choice options- often irreversible, life determining career decisions being made at the 10th standard level.
   f. Non portability of credits across various universities and states

4. **Infrastructure and Teaching Equipment, Technology & ICT in Education**

   a. Poor infrastructure
   b. Archaic resources of teaching and learning
c. Poor quality library, laboratory, playground and other facilities for students

5. Faculty Quality
   a. acute shortage of teaching staff
   b. lack of commitment of faculty
   c. unqualified or incompetent teachers
   d. faulty recruitment practices leading to corruption and poor quality teacher recruitment
   e. lack of quality refresher training options for teachers on a regular basis

6. Employability and relevance to society
   a. The complete lack of orientation of courses to deal with employability of students
   b. Soft skills, ICT skills, functional English skills and other job oriented competencies not incorporated in the curriculum.
   c. No initiative or effort on the part of colleges to provide for counseling or orientation to students in terms of career paths available and vocations.
   d. The talent for many segments and aspects of various industries are required to possess certain basic technical and behavioural skills to be considered employable for the industry. It is important to draw a distinction between ‘qualified’ and ‘employable’. According to the Nasscom-McKinsey Report for IT and ITES sector, only 25 to 30% of the engineering graduates are employable. It is also revealed in this study that a large number of companies train the fresh recruits for as many as 12 to 18 months. While India’s education system produces nearly 3 million graduates annually, only about 15 percent of this pool is readily employable, i.e., can be absorbed directly by companies.
Within the remaining 85 percent, a further 20 percent can be made employable through intensive training and the rest of the graduate pool is deemed un-employable.

**Graph No. : 2.4**

![Indian Talent Landscape](image)


7. **Systemic Climate or educational ecosystem**

    a. Lack of transparency
    b. Unwieldy and messy governance structures in universities
    c. Poor quality of students coming into higher education
    d. Prevalence of ossified mindsets with parochialism, coupled with lack of exposure visits and exchange programs is another constraint.
    e. Lack of rationalization of tuition and other fees leading to various distortions
    f. Corruption at various levels in the administration of IHEs.
    g. Politicization of campuses
    h. Indiscriminate expansion dilutes quality: Expansion, both public and private, has been unbridled and unplanned. The results –
deterioration in average quality, continuing inter-regional and intra-country inequities and increased for-profit provision of higher education – could all have serious consequences

8. Evaluation and Research output

a. Lack of systematic, sustained linkages of universities with research laboratories and Industries is another impediment which could otherwise lead to public good that could be freely shared as against pure commercial approaches and profit maximization

b. Examination systems plagued by many ills ranging from poor conduct of examinations, delays in correcting and declaring results to faulty methods used to gauge and evaluate student learning, which at best tests rote learning.

c. Lack of project work or creative works for evaluating students.

d. Research is mostly pushed down as a priority due to lack of sensitization, mentoring and orientation.

e. Lack of innovative and creative activities or projects.

9. Academic Audit and Accreditation

a. The National Board of Accreditation (NBA) is the agency set up by AICTE in September 1994 for accreditation of engineering colleges. Due to various bottlenecks in NBA, it is unable to cope with the large requirement of accreditation.

b. The accreditation is process oriented and is not factoring in output indicators.

c. With accreditation being voluntary, as in January 2008 only about 40% of the Technical colleges are accredited.

The diagram below reflects the gaps in quality based on NAAC findings as presented by the EDGE forum report of 2011:
Having dealt with the possibilities and challenges of technical education, the next section explores the linking and networking the centres of excellence or the IITs and IISc with the mushrooming, new colleges with ICT.

2.8 THE INDIAN INSTITUTES OF TECHNOLOGY – COMMITMENT TO EXCELLENCE

Against all these issues and challenges of the engineering education in India, the IITs have been completely different and have come to be recognized as world class institutions.$^{51}$

$^{51}$ The Times Higher Education Supplement international rankings of the top 200 Universities has only two Indian Institutions included in the top 200 ranking- IIT Bombay and IIT Delhi.  
http://www.timeshighereducation.co.uk/Rankings2009-Top200.html

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The Indian Institutes of Technology (IITs) have established themselves as premier institutions in technical education across the country and the world. The Institutes of Technology Act, 1961 came to define the IITs, although the IITs at Mumbai, Kanpur, Kharagpur and Chennai were established in the 1950s. Over the years, the senate of each IIT has given the mandate for good quality of syllabus for the courses, contact hours, continuous evaluation methodology and examinations. Thus, IITs have developed excellent instructional material. The instruction materials coupled with the absolutely top quality of students who make it to the IITs through a highly competitive examination have made the IITs have a very special brand name. The admission to the IITs is through a highly competitive examination called the JEE (Joint Entrance Examination). In the April 2008, as many as 320,000 candidates took the JEE for about 7000 seats, which translates to a dismal 2.2%.

The EDGE Report, 2011 gives the seats as a percentage of total test takers, which is shown below:

Graph No.: 2.5 Seats as a Percentage of Total Test Takers

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53 “Engineering Education for Everyone- A Distance Education Experiment at IIT, Bombay” IEEE 2008 by Kannan M. Moudgalya, Deepak B.Phatak, R.K.Shevgaonkar.
This is perhaps not only a national waste but also a national shame, where young students from the eighth standard onwards are seen preparing for this highly competitive exam, often staying at centres like Kota in Rajasthan, away from their homes, with a one-dimensional focus of somehow cracking the JEE. The resulting pressures, stress, disappointments are an important drain of young aspirations.

So, while there is a tremendous need to join the IITs, given their excellent course ware, faculty quality and infrastructure, there is a huge unmet need which has, in recent years been addressed to some extent by the mushrooming engineering colleges across the country. However, most of these colleges are plagued by problems of faculty shortage and poor quality of teaching staff.

In fact, the Post Graduate programs or Masters Programs in Engineering are very small and poor to be able to churn out the required quantity and quality of teachers that the mushrooming colleges need. Added to this is the fact that the expansion of the IT sector has led to the huge expansion in the high paying jobs that both fuel and quench the aspirations of students studying in technical institutions. With the result, very few of them opt to go for the teaching profession. This is also on account of the status and economic returns that have traditionally been associated with the teaching profession. (M.Moudgalya et al, IEEE 2008).

This research seeks to study how the excellence obtained in the IITs can be transmitted to other colleges and institutions of the country through a systematic means of linking, networking, which has come to define the core of modern day governance. One such effort is the National Programme of Technology Enhanced Learning (NPTEL), which has been

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54 G.Mahadevan-"A seamless Hi-Tech Learning system"- The Hindu, June 8, 2009.
described in detail in the next chapter. The lectures and classroom ambience of the IITs is captured through the NPTEL and made available to all colleges of the country virtual at no cost. Various dimensions of NPTEL along with suggested improvements and features are studied in the course of the research, which is detailed in the following chapters.

The research also acknowledges the fact that the dimensions of academic excellence and professional excellence may be well developed in the IITs. However, the question of ‘is that all there is to achieve the true aim of education?’ is also studied in some detail. While professional and academic competence and excellence may be a necessary condition for excellent education, is that a sufficient condition? This issue is also dealt with in some detail. Is this kind of competition and uni-dimensional excellence a true conception of all round excellence and real success? These are questions that are currently circulating in the mind of the nation as was evident from the tremendous success at the box office of the Bollywood film, ‘Three Idiots’, which is a scathing critique of the system that is obtained in the premier institutes of excellence in the country such as the IITs.

Incidentally, one of the IITs which has been newly set up, the IIT, Gandhinagar has also been included in this study. In fact respondents from this institute have participated in the online survey and unstructured interviews. These include faculty members and students of graduate program as well as the PhD program.

The other dimensions of life such as physical, ethical, aesthetic and spiritual dimensions are also understood and the research seeks to address the issue of providing integral education, which has, perhaps, been very elusive, across the world. The research examines whether ICT and OER
can address these issues. The next section addresses this issue in greater detail and depth.

2.9 THE CORE OF EDUCATION

The previous section addressed various aspects of technical education. It also dealt with the challenges and constraints of technical education. The issue of enabling and strengthening the learning of various competencies, understandings, skills, applications and knowledge is very important in transforming technical education. However, there is a key to making these happen, which is therefore, fundamental to and at the core of any education, including technical education.

While this key is fundamental to any education, it is particularly relevant to tertiary education. This is because as already noted, tertiary education, including technical education primarily provides the knowledge societies with the various professionals, scientists, lawyers, administrators, policy planners and most importantly teachers at all levels from primary, secondary, higher secondary, higher and technical education. This aspect of tertiary education lends it to be, perhaps, called ‘the mother of all education’.

In this section, the key of being and the key to creating humans endowed with awareness and presence is addressed. Governments and people across the world put in tremendous efforts and design laws, policies and programmes aimed at improving the quality of life of citizens and people in general. However, it is increasingly becoming clear that such efforts would be fruitful and truly sustainable if there is a precondition (condition precedent) to these efforts and campaigns. This refers to

55 taking place after secondary school, such as at university, college, etc. 
http://www.thefreedictionary.com/tertiary
universal and lasting peace and absence of war and conflicts at all levels ranging from the individual to the homes, families, communities, societies and nation\textsuperscript{56}. This, in turn, can only be possible if the collective unconsciousness that pervades societies and nations is removed from the roots. This manifestation as a collective, dysfunctional system with violence and conflict is caused by the feelings of anger, hatred, ego and jealousy that are obtained in the minds of individuals that make up society\textsuperscript{57}.

Unless the education imparted addresses this aberration and deficiency, the complex skills and competencies that are learnt may still not be sufficient to truly create a future of lasting peace and harmony.

The contents, methods and structures of the new education would have to accord significant attention to this core dimension. This will not be a mere development of the normal education that is usually obtained but a continuous effort of integral education that will gradually reduce and eliminate the wars fought in minds to produce new kinds of global beings.

The UNESCO report titled “Learning: The Treasure Within” has elaborated at length on the four pillars of learning. These are learning to know, learning to do, learning to live together and learning to be. If these are to really happen, the soul of the student would have to be discovered.

Given that the soul of the young student is intrinsically free and can only be nurtured to grow into fullness in conditions of freedom, a great deal of freedom would have to be provided in education. Similarly, boundaries of studies and subjects as well as walls of schools would have to be broken. Learning, acquiring knowledge are the very food, water, breath for the journey of the soul’s growth.

\textsuperscript{56} Education for Tomorrow by Kireet Joshi.
\textsuperscript{57} A New Earth by Eckhart Tolle.
“This imperfect nature of ours”, explains Sri Aurobindo, “contains the materials of our perfection, but inchoate, distorted, misplaced, thrown together in disorder or a poor imperfect order. All this material has to be patiently perfected, purified, reorganised, new-moulded and transformed, not hacked and hewn and slain or mutilated, not obliterated by simple coercion and denial.”

If these ideas are to be transposed and practiced in every class, it requires a great deal of flexibility and freedom in the choice of what is learnt or studied and how it is learnt depending on the students’ needs and propensity. A well trained mentor, teacher or coach who need not be a domain expert of the various subjects of study but who can be a friendly guide, who helps the student find his path and understand himself as he gains and builds knowledge, is needed.

Such a method will not result in learning and knowledge acquisition becoming a mere gloss but will make the process of generating glow from within.

In such a system, it is not merely the ‘subjects’ of study that should count. A much greater importance will have to be assigned to the inner aspiration, experience of freedom, possibility of educating oneself, self-experimentation, discovery of the inner needs and their relation with the programme of studies, and the discovery of the aim of life and the art of life. A great stress will fall upon each student’s individual work, and there has to be subtlety in forming flexible groupings of the students.

Our present structure of education is imprisoned within the walls of a triple system. This refers to the ossified, lecture system, rigid curriculum system and the examination system, which has come to personify the education system that is obtained in class rooms today. Such a rigid,
system reeks of staleness, boredom, fatigue and pain, which get further compounded by the violence of thought, loud words and crass action that are not uncommon to ‘deal with’ the repulsive rebellion that such a system evokes. What is needed is to open and break the dungeons having heaps of regurgitated curriculum, chained in with inhuman methods of overloading and distorting the most fragile and precious resource on earth - humans. Instead, the system must be infused with freshness, sunshine, hard work and commitment to excellence in an atmosphere of freedom, loving care and nurture. If we wish to make education for personality development a practical proposition, we must examine this triple system in some depth and suggest some practicable solutions.

If we wish to liberate our education system from the shackles of lectures, syllabus and examinations which are presently obtained, particularly in the context of the exponential explosion of knowledge, one effective and, perhaps, the only way of possibly addressing this is to effectively leverage ICT. This may provide for freedom and choices for educating oneself through interplay of inner needs and choices of courses in a variety of methods. This can, perhaps, lead towards the discovery of the aim of life and the art of life.

It is ironical that India, a great nation blessed with such a rich and diverse legacy is not demonstrating the courage and dynamism to actually incorporate these features into the core of education. Countries like UK have, in recent times, introduced spiritual education in their curriculum. The argumentative Indian must silence the arguments and seize the moment to lead the world and not meekly follow the developed, western countries of today like sheep. India must seize this opportunity to truly

58 Education for Tomorrow by Kireet Joshi.
empower and elevate its youth by leveraging ICT to provide the core education necessary for every young student.

Simultaneously, the magnitude or scale of the problem of access or reach of education, as captured by the GER presents a very challenging problem to us. If we are to provide education to the large numbers and address the unmet need, perhaps, the only way of negotiating this problem would be to leverage ICT and put in place some basic structural changes in the education system. Such changes would be anchored on principles of freedom, choices, individualized attention, on demand and on line evaluation, healthy collective interaction and harmony. These inputs would cater to their choices of studies, learning methods as well as the choice of taking an exam on demand or choosing not to take an examination but just audit a course to learn the subject. The new system should also provide new vistas for collaborative research and inquiry, extension and project work, internships with prospective employers, all rooted on the bedrock of compassionate mentoring and individualized attention.

The research in this thesis has been carried out against this backdrop and assumptions. Based on these ideas and thoughts, the research has been conceptualized, designed and conducted.