In this chapter,

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He who knows not and knows not, what he knows not: he is a fool - shun him.

He who knows not and knows what he knows not: he is simple - teach him.

He who knows and knows not what he knows: he is asleep - wake him.

He who knows and knows what he knows: he is wise - follow him.

*Arabian Proverb*

1.1 Preamble

It is said that *a good start is half done*; this statement has motivated us to give more time on searching the latest relevant text before working on the problems and start writing the thesis. We studied The Global Competitiveness Report 2009-2010 [Schwab, 2009] published by the World Economic Forum, and analyzed the report for global economical growth, reasons of economical disparities, and understanding the contributing factors of Global Competitiveness Index (GCI).

The report [Schwab, 2009] suggests *twelve pillars of economic competitiveness* as shown in Fig. 1.1, by considering weighted average of many components. The report clearly indicates paradigm shift of economy in the 21st Century from capital accumulation to knowledge accumulation. Hence, the countries that have been investing high on knowledge have better GCI and are kept in innovation driven economies.

The innovation driven economies have achieved this status by emphasizing on sustainable competitive advantage. However, the first economical recession of the 21st Century (by which almost whole world has been affected and surprisingly innovation driven economies affected more) indicates that more efforts are required to make this world a complete knowledge society, more efforts are required to act wisdom fully.

Peter Drucker has said – “*Company cultures are like country culture. Never try to change one. Try, instead, to work with what you’ve got*” [Peter, 1999].

So, it can be understood very well that an organization in a country inherits the country culture. Hence, organizations must have vision to think and act out of
Fig. 1.1 Twelve Pillars of Economic Competitiveness [Schwab, 2009]
box and a solid strategy to work for sustainable competitive advantage to make their economy competitive.

This is more challenging for small and medium enterprises and industries of unorganized sector where innovation and knowledge centric activities come later.

The period of recession is the period of trouble for the organizations. Turbulence imposes some challenges to organizations at all levels [Chaudhary, 2005], and can be inferred from Fig.1.2.

![Fig.1.2 Challenges in Turbulent Environment [Chaudhary, 2005]]

Knowledge is the key to success at level of management in turbulent environment. Organizations need to search for new approaches to cope with continuously increasing global competition in addition to new ways for product cost optimization, resource utilization, efficiency improvement, man-
power training and attrition rate. Organizational culture, inherited from society, also needs great care and attention of people. In totality, this gives ample opportunity for focusing on creating knowledge societies and hence the need of knowledge management comes.

1.2 Competitive Advantage

Porter [Porter, 1979] had given a very simple but useful model to analyze five competitive forces on an organization in the dynamic environment.

According to Porter, these five forces are:

- Bargaining Power of Supplier
- Bargaining Power of Customer
- Threat of Substitute Product or Service
- Threat of New Entrants
- Rivalry among Existing Firms

Understanding these forces helps the organization to make and to plan strategies for competitive advantage. Further, Porter has also suggested some generic strategies to compete successfully with competitive forces to gain competitive advantage.

These strategies are:

- Cost Leadership
- Product Differentiation
- Focus Differentiation

We examine here that how Information & Communication Technologies (ICTs) can be used effectively for implementing these generic strategies to cope with competitive forces.
1.2.1 Information & Communication Technologies (ICTs)

Technological readiness is the 09th pillar out of twelve pillars of competitiveness (Fig.1.1) as World Economic Forum has used in calculating GCI [Schwab, 2009]. Productivity of industries increases by adopting contemporary technologies and hence inclusion of this factor in GCI indicates the keenness of the economies to adopt new technologies for better productivity.

The 21st Century can not be imagined without ICT. ICT has been integrated in our daily routine in such a way that the new generation does not see any special about these and found them natural!

Technological innovation is the 12th pillar of competitiveness [Schwab, 2009] and this also addresses the need of technology in overall growth of economy and thus the country.

However, a very interesting report again from World Economic Forum deals this issue in a dedicated manner. The Global Information Technology Report (GITR) 2008-09 [Dutta, 2008] addresses the role of ICT in the growth of economy in much authenticated way.

ICT is now the backbone of any economy and it is key enabler of growth, development and modernization [Dutta, 2008]. Developed countries have maintained their competitive advantage just because of their adaptability and preparedness for ICT. ICT is the key player for innovation in their product and the processes. So realizing the importance of ICT, other economies has now also started prioritization of ICT.

Like GCI, Network Readiness Index (NRI) is an indicator showing the level of networked readiness of the world [Dutta, 2008]. The GITR 2008-09 also confirms that for general competitiveness and progress, there is continuous need to invest in ICT infrastructure and related services [Dutta, 2008].

Hence, it can be concluded very easily that NRI is also an indicator of economic growth due to strong correlation between ICT readiness and
economic growth. It is also noteworthy that ICT plays equally important role in non-ICT organizations like manufacturing, automobile, chemical, construction & infrastructure development.

Software Systems for Enterprise Resource Planning (ERP), Customer Relationship Management (CRM), Supply Chain Management (SCM), Supervisory Control And Data Acquisition (SCADA) and Computer Aided Designing & Manufacturing (CAD/CAM) on the backbone of LAN/WAN and internet are now common in industries and making organizations more efficient with increased productivity and cost effectiveness.

Table 1.1 and Fig.1.3 indicate the role of ICT in primary and secondary processes carried out by the organizations, irrespective of the nature of organization. Table 1.2 shows how ICT can enable generic competitive strategies suggested by Porter [Porter, 1979] to cope with competitive forces.

This may be noted that for knowledge intensive organizations (mainly service industries) like Software, Banking, Insurance, Health & Education etc. “Product” and “Services” can be used interchangeably.

ICT plays vital role in gaining competitive advantage for the organizations. Also, there is no doubt in affirming that exponential growth with cost effective solutions of ICT has enabled Knowledge Management (KM) to evolve as a discipline. KM can not be imagined, now without ICT. Implementation of KM processes like knowledge creation, classification, codification, dissemination and reuse is now possible effectively with ICT.

As ICT is key enabler to competitive advantage, KM is a framework for having sustainable competitive advantage. This topic has been addressed in the following pages. Also, efforts have been made to study and analyze the role of technology in knowledge management in Chapter 2.
<table>
<thead>
<tr>
<th>Organization</th>
<th>Processes</th>
<th>ICT Application</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Primary</strong></td>
<td>• Inbound Logistics</td>
<td>• SCM</td>
</tr>
<tr>
<td></td>
<td>• Inventory</td>
<td>• MRP</td>
</tr>
<tr>
<td></td>
<td>• Manufacturing</td>
<td>• ERP</td>
</tr>
<tr>
<td></td>
<td>• Sales &amp; Marketing</td>
<td>• POS</td>
</tr>
<tr>
<td></td>
<td>• Outbound Logistics</td>
<td>• Data Mining</td>
</tr>
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<td></td>
<td>• Customer Care</td>
<td>• CRM</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Collaboration Software</td>
</tr>
<tr>
<td><strong>Secondary</strong></td>
<td>• Accounts / Finance</td>
<td>• ERP</td>
</tr>
<tr>
<td></td>
<td>• Human Resource</td>
<td>• HR Info Sys</td>
</tr>
<tr>
<td></td>
<td>• R &amp; D, Innovation</td>
<td>• Simulation S/w</td>
</tr>
<tr>
<td></td>
<td>• Maintenance</td>
<td>• CAD</td>
</tr>
<tr>
<td></td>
<td>• Administration</td>
<td>• MIS</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• KMS</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Workflow Systems</td>
</tr>
<tr>
<td>Non-Manufacturing / Service / Government Departments / Health / Educational Institutions etc. (Mostly Knowledge Intensive)</td>
<td><strong>Primary</strong></td>
<td>• Portals</td>
</tr>
<tr>
<td></td>
<td>• Solution</td>
<td>• MIS</td>
</tr>
<tr>
<td></td>
<td>• Customer Satisfaction</td>
<td>• ERP</td>
</tr>
<tr>
<td></td>
<td>• Value Addition</td>
<td>• Data Mining</td>
</tr>
<tr>
<td></td>
<td>• Information</td>
<td>• CRM</td>
</tr>
<tr>
<td></td>
<td>• Knowledge</td>
<td>• KMS</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Collaboration Software</td>
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<td></td>
<td>• Administration</td>
<td>• CAD</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• MIS</td>
</tr>
</tbody>
</table>
Suppliers connected through Internet, Enabling B2B, SCM makes inventory management cost effective

Customers can place the order through Internet 24 x 7, Enabling B2C, CRM enables greater customer satisfaction

Geographical distances have no effect, remote office communicates via collaboration & workgroup software, email etc.

Fig.1.3: ICT support for Business Processes
Table 1.2: ICT enabling Generic Strategies for Competitive Advantage

<table>
<thead>
<tr>
<th>Generic Strategies</th>
<th>Role of ICT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost Leadership</td>
<td>• Increased Productivity with the use of latest technologies.</td>
</tr>
<tr>
<td></td>
<td>• Resource optimization with proper scheduling and sharing mechanism.</td>
</tr>
<tr>
<td></td>
<td>• Improved efficiency of business processes using ERP.</td>
</tr>
<tr>
<td></td>
<td>• Lowering the bargaining power of customer or supplier using CRM and SCM resulting in cost reduction.</td>
</tr>
<tr>
<td>Product Differentiation</td>
<td>• Develop new features to existing products and services.</td>
</tr>
<tr>
<td></td>
<td>• Value addition to existing product and services through ICT.</td>
</tr>
<tr>
<td></td>
<td>• Reduce differentiation advantage of competitor.</td>
</tr>
<tr>
<td>Focus Differentiation</td>
<td>• Develop new markets through internet.</td>
</tr>
<tr>
<td>• Promote Growth</td>
<td>• Develop new products and services through ICT.</td>
</tr>
<tr>
<td>• New Alliances</td>
<td>• Regional and Global Presence.</td>
</tr>
<tr>
<td></td>
<td>• Think Global, Act Global.</td>
</tr>
<tr>
<td></td>
<td>• Virtual Organizations of business alliances.</td>
</tr>
</tbody>
</table>
1.3 **KM for Sustainable Competitive Advantage**

A common understanding says that organizations can not deny the strategic value of knowledge and the need to increase and manage effectively knowledge capital. In fact, the knowledge intensive organizations run only through knowledge capital. KM can be an effective way to make organizations competitive and profitable. It is worth-mentioning that profitability is directly linked to competitiveness. More competitive the organization chances of generating greater profit shall be more.

Dynamic business environment always forces the organizations to be more adaptable. Internet and now mobile telephony has changed the way the organizations do their business. With the global presence, the magnitude of force also changes. Any change in product use, customer liking or Government policy may force the organization to accommodate these changes rapidly. Hence, knowledge sharing and managing mechanism must be there.

It must be noted that KM is not only a technology project, technology is just only the enabler. Leadership, Organization Culture and Attitude are also major deciding factors for the success of any KM initiative (Fig.1.4).

Harnessing the tacit knowledge embedded in People, Process and Products can help in achieving sustainable competitive advantage. Porter [Porter, 1979] suggested some generic strategies to compete with competitive forces. Author argues that KM can be one of the strategies to cope with competitive forces and to give organizations sustainable competitive advantage (Table 1.3).

![Fig.1.4: Enablers of KM for Sustainable Competitive Advantage](image-url)
Table 1.3: KM for Sustainable Competitive Advantage

<table>
<thead>
<tr>
<th>Industry Forces</th>
<th>KM as Business Strategy for Sustainable Competitive Advantage</th>
</tr>
</thead>
</table>
| **Bargaining Power of Supplier** | **Locking of Suppliers -**  
|                           | • Sharing knowledge of market scenario to Strengthen supply chain.  
|                           | • Improved decision making, with previous knowledge base, for better negotiations.  
|                           | • Knowing what suppliers know and what don’t know.  
|                           | • Learning from past failures/good experiences.                                      |
| **Bargaining Power of Customer** | **Locking of Customers -**  
|                           | • Knowledge about customers.  
|                           | • Consumption pattern, preferences, and behavior are instrumental in increasing the quality and reducing the cost of product and service.  
|                           | • Learning from past failures/good experiences.                                      |
| **Threat of Substitutes** | • Retaining past knowledge of products helps in developing new product or in improving the existing product features to prevent customer shift to substitute.  
|                           | • Faster innovation through knowledge chain.                                           |
| **Threat of New Entrant** | • Knowing what organizations know.  
|                           | • Focus on core competencies.  
|                           | • By knowing USPs.  
|                           | • Knowing what new entrant does not know.                                              |
| **Rivalry among Existing Competitors** | • Knowing what competitors know.  
|                           | • Sustainable learning within the organization.                                         
|                           | • Minimum Knowledge Gap.  
|                           | • Management of knowledge embedded in People, Products and Processes make organization; k-Organization and hence give competitive advantage. |
1.3.1 A Case Study of Academia

We have taken up a case of Academia and analyzed the situation in an engineering college that shows how an engineering college faces competitive forces considering Porter’s Five Forces Model [Porter, 1979].

Nature of an educational system is somewhat different from any other business organization as the output or final product can not be seen easily. Therefore, Porter’s Five Forces model can not be fully applied in academia, yet, the analogy works sufficiently. In fact, a revised model is coming out from our study.

Certificates and degrees are just like a report of the completion of the process. Apart from the subjects as per the academic curriculum that an Institute teaches, there are some other very important ingredients that a particular Institute adds to the final product (educated person), knowingly or unknowingly.

For any academic Institute the trained student can be considered as final product. Examinations are just like quality control. Author has made a simple analogy as shown in Table 1.4.

Table 1.4: Business Vs Academia

<table>
<thead>
<tr>
<th>Business Organization</th>
<th>Academic Institute</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw Material</td>
<td>Candidates with qualifying examination</td>
</tr>
<tr>
<td>Supplier</td>
<td>Society</td>
</tr>
<tr>
<td>Manufacturing Process</td>
<td>Training &amp; Education</td>
</tr>
<tr>
<td>Quality Control</td>
<td>Examination Process</td>
</tr>
<tr>
<td>Finished Product</td>
<td>Passed Candidates</td>
</tr>
<tr>
<td>Customer</td>
<td>Society</td>
</tr>
</tbody>
</table>
Apart from the subjects in syllabus, Institute gives an environment that teaches techniques, technology, social values and discipline, develops attitude and problem solving skills & enhance inter-personal communication and relationship skills and hence affects over all personality greatly.

Considering the case of A XYZ College (hypothetical) of ABC University (hypothetical). This Institute is offering various undergraduate and postgraduate programme engineering (BE/ ME programme). The syllabus is designed by the University and the Institute has no role in designing the curriculum. However, except this prescribed syllabus, Institute has freedom to introduce any other co-curricular activities to supplement the program for their students.

1.3.2 Five Force Analysis of the Case

We analyze XYZ institute on the basis of Porter’s Five Forces Model [Porter, 1979] –

**Bargaining Power of Supplier**
- Good students do not give preference to the Institute.
- Institute may not attract attention of society.
- Students who took admission are of inferior aptitude towards engineering.

**Bargaining Power of Customer**
- Reputed companies do not visit to the Institute for campus selection process.
- Some companies visit then do not offer good salary or job profile.
- Institute may have to spend a lot for the jobs of their students.

**Threat of Substitute Product or Service**
- Syllabus to be update to match with industry standards and requirements
- New branches of engineering with better job prospects and opportunities need to start.
- Courses run by this Institute got obsolete or irrelevant.
Threat of New Entrants
- A new Institute may come up with better resources
- New career option (other than engineering) may be introduced and students preferring those programme.

Rivalry among Existing Competitors
- Other Institutes are getting good students.
- Other Institutes are offering low fee structure.
- Other Institutes are having better manpower (faculty & staff members).
- Other Institutes are getting good recognition of society.

1.3.3 KM for Competing Five Forces
We have done analysis of engineering education for identifying KM strategies to compete five forces. It is worth mentioning that ICT has made very easy to implement KM strategies. Repositories, Portals, Knowledge Maps etc are some tools those can be used for KM initiatives. We summarize the KM strategies in Table 1.5.

Table 1.5: KM Strategies for an Engineering Institute

<table>
<thead>
<tr>
<th>Bargaining Power of Supplier</th>
<th>Develop a Portal by which prospective students, parents, faculty and Administrative staff are easily connected. The portal shall be used for -</th>
</tr>
</thead>
</table>
| - Good students do not give preference to the institute. | - Advising the students about branches and career prospects  
  ▪ Need expert knowledge. |
| - Institute may not attract attention of society. | - Details about Alumni from all branches, who are doing well after completion of degree  
  ▪ Need feedback and status of Alumni. |
| - Students who took admission of inferior aptitude towards engineering. | - Information about Institute policies, payment process, hostel, and other services  
  ▪ Need to codify knowledge of |
<table>
<thead>
<tr>
<th>Bargaining Power of Customer</th>
<th>Threat of Substitute Product or Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Reputed companies do not visit to the institute for campus selection process.</td>
<td>• Syllabus to be update to match with industry standards and requirements</td>
</tr>
<tr>
<td>• Some companies visit then do not offer good salary or job profile.</td>
<td>• New branches of engineering with better job prospects and opportunities need to start.</td>
</tr>
<tr>
<td>• Institute may have to spend a lot for the jobs of their students.</td>
<td>• Courses run by this institute got</td>
</tr>
</tbody>
</table>

| | • Develop a Portal by which Alumni, faculty, Placement Officer and Administrative staff are easily connected. The portal shall be used for interacting with Alumni and Prospective Employers. Same data shall be shared after filtering for the prospective students. |
| | • Using Alumni as Brand Ambassador in the corporate |
| | o By knowing the strength and status of alumni. |
| | • Repository with knowledge base of past experiences with the corporate like what they need and expect from the students, feedback about syllabus apart from contact details and previous communications. |
| | • Informing corporate about qualities of students, research facilities and strength of faculties |
| | o Need to capture knowledge of system and competency of faculty members. |

| | • If syllabus cannot be updated without the permission of University, then by knowing the need from corporate, Institute can offer supplement courses. |
| | o Use repository of experiences with corporate. |
| | • Why we have developed and introduced previous courses? This will give basis for introducing or updating new courses. |
| | • Anticipating the need of market earlier and |

- Process Knowledge Maps.
- Repository of Research work carried out.
- Repository of Research facilities.
- Identification of commercial opportunities of research work to get attraction of society.
| obsolete or irrelevant. | plan for starting new courses to get competitive advantage.  
| | o Use repository of experiences with corporate.  
| | Resource optimization by knowing strength of faculties so they can be trained for new programmes if the older programmes getting obsolete. Need competency mapping.  
| |  
| Threat of New Entrants | Resource optimization and cost saving by reducing the efforts of re-inventing the wheel. This saving can be utilized for generating better resources.  
| | Knowing what the new Institute know and not know, shall help in getting competitive advantage.  
| | Anticipating the need of market thorough alumni and corporate portals to start new career options.  
| | Online programmes may be introduced for expanding the system boundary. Need repositories of subject expertise.  
| |  
| Rivalry among Existing Firms | Need to capture and share the expertise and knowledge of existing faculty members so if they leave, system should not suffer.  
| | Upload course materials, tutorials, assignments and educational supplements  
| | Repository of expert and guest lectures.  
| | Resource optimization and cost saving by reducing the efforts of re-inventing the wheel. This saving can be utilized for inviting better faculty members.  
| | Knowledge Maps and Portals of best practices for the training of new faculty members so they can start contributing as early as possible.  
| |  

### Threat of New Entrants
- A new institute may come with better resources
- New career option (other than engineering) may be introduced and students preferring those programme.

### Rivalry among Existing Firms
- Other Institutes are getting good students.
- Other Institutes are offering low fee.
- Other Institutes are having better faculty members.
- Other Institutes are getting good attraction of society.
1.4 Motivation

In this entire world, where the population has crossed the level of 6.7 billions (where China and India are two major chunks), and still this figure is increasing continuously, none of us are same. All of us are different, behave differently, think differently and act differently on common issues. This thinking and behavioral process is greatly driven by wisdom. A wisdomful person thinks right, behaves appropriate and acts decently to a problem and challenge.

Wisdom is the ability to choose between the right and the wrong. However, the right and the wrong are the just indicators of perception. Wisdom comes with knowledge. Nature, teaches us by varied examples and the wise & observant person becomes knowledgeable with experiences. Nature has made all of us, yes, all 6.7 billions people with the same brick and mortar, but one behaves differently from other due to varied learnings and experiences. Wise and smart persons always learn from the experiences of others and hence, role of managing the knowledge comes. Smart people make the organizations smart. Smart organizations make learning sustainable and get competitive advantage.

In India traditionally, knowledge is being transferred from person to person. The societies in India, with strong family system and values, knowledge get transferred from parents to children and so on to their successors. In ancient Indian Schools and Universities, there was no medium to transfer the knowledge except Tacit-to-Tacit (T2T) knowledge conversion from the teacher to disciple. In our traditional business houses, the owner pass their knowledge to their successors like the supervisor teach the tricks of the trade to their subordinates and so on. Now the question arises what happens if the knowledge is not being codified and transferred only in tacit form? What will be the knowledge loss if the grasping and capability of understanding of the person receiving knowledge in tacit form is questionable?
Like Roman and Chinese Civilizations, ancient Indian Civilization was also very progressive, educated and technology oriented. Unfortunately due to various historical, social and political reasons, the precious knowledge could not be tapped and modern India has some questions to be answered:

- Can we re-produce that “Ashoka Stambh” in New Delhi, India near Qutub Minar?
- Can we re-build world famous “Tajmahal” at Agra, India?
- Can we re-compose “Raag Malhar” of Music Maestro Tansen?

The answer is No or at least Not Now. Unfortunately their knowledge could not be codified and was not converted to explicit form. Unbearable loss??

We strongly believe that India would have done much better if country could have managed its very precious knowledge in the past. Definitely the time will come when India will be in the innovation driven economy [Schwab, 2009], but, of course, still there is a long way to go. India is at the rank of 49 out of 134 countries [Schwab, 2009].

A survey carried out by [Griffith University, 2002] in India shows that 73% respondents found difficulty in transforming the knowledge from tacit-to-explicit (T2E) form. Lack of knowledge sharing, reinventing the wheel and information overload have also been points of concern while considering knowledge management initiatives [Griffith University, 2002].

Some of other issues also need attention:

- ICT has made market global and due to easy access of information, competitions are high. Organizations can compete with global competition by only and only with knowledge.

- Job opportunities and level of education have increased tremendously and so the attrition rates are high. Since last two years, attrition rate has gone down in IT and ITES industries due to global recession; however this is an only temporary phase. Though jobs are still available for employable
candidates. High attrition rate affects the economy in the following two ways:

- Knowledge needs some time to get acquired. Filtering and reusing of this knowledge also need time. If the employee leaves the job without experience and learning then it is a sheer wastage of resources and hence loss to the economy. Just like that a student gets the degree without acquiring any knowledge and value addition.

- When the experience and knowledgeable person leaves the organization, the loss is only to the organization. As he/she can contribute to economy by using his experience and knowledge in some other organization.

Overall, this scenario gives us great motivation to work in the field of KM. By doing, this one can also contribute in improving the competitive advantage of an organization and hence of total economy of the country. Somebody raised the question “How academic Institutions contribute to the GDP of a nation?” We argue that answer is laying in innovation and creation of knowledge.

KM has received a considerable attention, not only of business people, but also of academicians and research workers [Maponya, 2004].

The Universities have started becoming the business centers in addition to being the traditional educational centers. The knowledge is focal point. There is an important role to capture, create, store and disseminate knowledge to be played vitally by every stakeholder of the University. Every process of a University system involves the use of knowledge that needs to be managed properly so that every stakeholder is benefited rationally and proportionately.

Increased globalization is posing new challenges to the traditional Indian Universities. Apart from decreased funds, resource crunch, shortage of manpower, there is also great competition with private and foreign universities. Today’s economical, social and technological factors are changing the way
with which the Universities are working. It is very well known fact that Universities lack in adopting new ideas as compared to the business organizations in Indian context [Maponya, 2004] [Hellstrom, 2004].

It has been observed that Universities have been unable to fully utilize their infrastructure and resources. At times, there have been observations that some of the infrastructure and resources are available redundantly leading to unnecessary duplication of the efforts. Resource optimization is a serious problem yet unattended.

ICT together with KM are very powerful tools in resolving this problem while getting strategic advantages. With the increased use of ICT, KM has received considerable attention in the educational sector and especially in the Universities. People have justified that ideas, which were originally developed for managing the knowledge in business enterprises, are also amicable to the Universities. KM shall help the Universities to the reform of internal resources and hence better administration and improved teaching and research [Maponya, 2004].

Individual knowledge is the resource to any organization. KM plays a prominent role in capitalizing the individual knowledge into organizational knowledge. There are only few studies available in the literature showing the application of this idea for education sector. Hence, majority of the issue discussed and cases taken in this work are keeping education sector as major focus.

The questions that we are going to answer specifically related to this thesis have been discussed in the next section.

1.5 Research Challenges

KM has been topic of interest of various researchers from diversified fields. Domain of knowledge engineering in Artificial Intelligence is very old and has been of great interest. On the same time, KM has been topic of interest for the management researchers, and it has flourished significantly in the ICT era.
We have gone through several theories and thoughts pertaining to KM and made following observations:

1. KM is the field which leverages effectiveness and it gives competitive advantage to an individual, an organization and thus to the society and nation. The same has been elaborated in the previous sections.

2. Approaches to KM are greatly affected by social culture and technological awareness in the society.

3. No single approach or solution is suitable for all cases of KM. KM is a multidimensional effort, thus there is need to search and re-search new and simple solutions from both, technical and managerial perspectives.

4. KM can be carried out through knowledge management processes, and the same is been discussed in detail in Chapter 2.

5. Instead of developing new and complicated methodologies for KM processes, it is better to use already used and tested methodologies of other domain, for this purpose. Hence so considering the spirit of KM i.e. instead of reinventing the wheels, using them.

6. KM is about converting an ordinary organization to a learning organization; this requires efforts from within the organization and needs a holistic system perspective by integrating enterprise data & information, ICTs, business processes and culture.

7. Hence, from system perspective, the goal of KM is to identify, capture, codify, transfer and uses knowledge residing in knowledge layers.

Keeping system perspective of knowledge management in focus, research goals of this thesis are:

- How knowledge management can be as strategy for an organization (especially educational) for competing with forces from dynamic environment?
• Where does knowledge reside in the organizations? What are the methodologies has been suggested by various authors for KM processes?

• How are knowledge maps useful for KM process knowledge capturing? Is there any model for developing knowledge maps?

• Which software engineering tool can be useful for capturing process knowledge as knowledge map? Can Structure Charts be used for capturing process knowledge for an organization?

• Is there any map for capturing dynamic knowledge? If no single map is useful then can hybrid map be used?

1.6 Research Methodology

In this thesis, while considering system perspective, a holistic view of organization has been considered. KM from system perspective is a practical and proven approach to analyze various KM issues and suggest solutions of them at various levels of the organization. The system perspective focuses on interaction among all stakeholders and enables understanding and integration of technical and behavioral aspects for the fulfilling the objectives of KM.

Initially, we have established KM as a need to the society and then established KM as a one of the tool for competitive advantages. This has been shown by discussing a case of an educational Institution, by analyzing Porter’s Five Forces Model [Porter, 1979]. We suggested that, apart from generic strategies suggested by Porter, KM is another very important strategy for gaining competitive advantage.

Considering organizational structure, we have shown knowledge layers and knowledge dimensions. Then, we have referred several literatures on KM, KM processes, KM methodologies and related technologies. Analyzing these literatures, we have identified that there is a need to develop framework for knowledge capturing process, and also identified that there is a need of some simple and comprehensive knowledge maps for organizational knowledge capturing at various knowledge layers.
By focusing several situations of organization (majorly an educational institution) knowledge capturing framework has been developed. A comparison has been made with existing knowledge maps, and new knowledge maps have been suggested.

1.7 Thesis Organization

This thesis has been divided into six chapters containing description of efforts that have been made from establishing the need of KM to developing methodologies for KM from system perspective and then ends with conclusion of the work (Fig.1.5). In this thesis, research contribution has been described from this chapter itself, i.e. Chapter 1.

In Chapter 1, we have referred Global Competitiveness Report 2009-10 published by World Economic Forum [Schwab, 2009] for identifying parameters to measure global development and relative status of various countries. Then identified the position of India in this report. This report also indicates that innovation, research and development are the prominent factors on the basis of that a country gets competitive advantage. Porter suggested Five Forces Model [Porter, 1979] and generic strategies to compete with these forces. We have established the role of ICT in implementing strategies suggested by Porter [Porter, 1979] in an organization for gaining competitive advantage. By extending the same approach, we have established KM as another strategy for gaining sustainable competitive advantage. This has been explained with considering a situation of an engineering Institution. We have explored articles on ancient Indian science and technology, and found that traditionally rich India has lost that knowledge. This has given us motivation for considering KM as the basis of this thesis. Then we have identified research challenges those could take up in this work. This chapter includes all these issues as described above.
Fig.1.5: Thesis Organization
There is some state of confusion with Data, Information and Knowledge and that has been removed with clear examples in Chapter 2. In Chapter 2, we have defined knowledge in the context. Then identified layers of knowledge in the framework of organizational structure. This helped us analyzing various KM methodologies & technologies on the basis of knowledge layers. Then we explored knowledge dimensions and established relationship with knowledge layers. Tacit knowledge cycle has also been described in Chapter 2. KM is a multi-dimensional field and we have referred several literatures defining KM. Then working definition of KM has been given. Then we have established that KM can be achieved through managing KM processes. We have explored KM processes suggested by various authors and then suggested our generic KM processes. Then again an exhaustive study and reviews has been made on methodologies & technologies for executing KM processes in Chapter 2.

Knowledge Maps are one of the effective and useful methodologies for knowledge capturing. Chapter 3, Chapter 4 and Chapter 5 are focusing various issues on knowledge maps.

Chapter 3 describes knowledge mapping and types of knowledge maps. Then we have defined knowledge map in context. By referring knowledge layers described in Chapter 2, we have identified and analyzed various knowledge maps suitable for representing knowledge capturing at various knowledge layer. Taxonomy for knowledge maps has been created on the basis of root domain of knowledge maps and forms. There was a great need to formalize the knowledge map development process, we could not found any systematic model for knowledge map development and this has motivated us to suggest B-C Model. B-C Model is an iterative model for knowledge map development. We have described use of B-C Model by considering a process in an educational institution. We have shown the development of a process knowledge map through B-C Model in Chapter 3.

Development of simple, easy to use and with computational capability, knowledge maps for representing organizational system and processes have
not been given importance yet. Out of various knowledge representation techniques, diagrammatic techniques are more elaborative and easy to share. We have explored the use of Structured Systems Analysis & Designing (SSAD) tools like DFD and Structure Chart for representing system and process knowledge. In Chapter 4, we have shown the use of Context Diagram (Level 0 DFD) and Structure Chart for system and organizational process. This an unique effort as we do not find any article showing the use of Context Diagram for system knowledge map and use of Structure Chart for process knowledge map.

Another unique contribution has been made by and described in Chapter 5 on the effective use of Concept Map for domain knowledge. Relationship with system knowledge map and domain knowledge map has been established. This relationship shows that access to domain knowledge map may be restricted and judicious use of domain knowledge map may be maintained in the organization. In Chapter 5, we have shown that dynamic domain knowledge needs special attention and for which use of cyclic concept maps is complicated and also does not give decision-making capability to maps. We have proposed a unique Hybrid Concept Map by combining Decision Tree with Concept Map. Use of this Hybrid Concept Map has been described with the example in an organization.

Chapter 6, that is final chapter of thesis, contains concluding remarks of the research work and future exploration possible in this work.

1.8 Summary

The contribution of this chapter is to establish KM as one of the generic strategies for competing with the forces an organization faces to gain strategic advantage.

Knowledge is the key to success for every component of society. Economic competitiveness is greatly affected with investment on knowledge. Higher investment on knowledge leads to innovation and sustainable competitive
advantage. In the 21st Century focus is on knowledge accumulation and hence KM is needed for gaining profits.

This century is also known for advances, usefulness and impact of ICTs on the society. ICTs are the enabler of strategies for competing with competitive forces in the environment. ICTs are also enabler of KM and in fact have major contribution in spreading the concept. KM is one of the strategies for gaining competitive advantage, and especially for the country like India, in which traditionally, concept of formal KM is missing. We are still in the category of developing countries and it is utmost needed for us to realize importance of resource and time optimization, efficiency enhancement and technological innovation, so as to come out from the stage of developing countries.

In the next chapter, we throw light on concept of KM, KM processes and methodologies & technologies related with KM processes.