

**ENHANCING RESEARCH, CURRICULUM DEVELOPMENT AND ALUMNI
CONTRIBUTIONS IN SELECTED INSTITUTIONS OF HIGHER TECHNICAL
EDUCATION: DEVELOPMENT OF A FRAMEWORK WITH KNOWLEDGE
MANAGEMENT**

**THESIS SUBMITTED IN FULFILLMENT OF THE REQUIREMENT
FOR THE AWARD OF THE DEGREE
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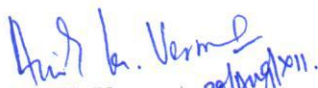
CERTIFICATE

Certified that the thesis entitled 'ENHANCING RESEARCH, CURRICULUM DEVELOPMENT AND ALUMNI CONTRIBUTIONS IN SELECTED INSTITUTIONS OF HIGHER TECHNICAL EDUCATION: DEVELOPMENT OF A FRAMEWORK WITH KNOWLEDGE MANAGEMENT' which is being submitted by Ms. Parul Dharmani Agarwal, in fulfillment of the requirements for award of the Degree of Doctor of Philosophy at Thapar University Patiala, is a record of candidate's own work, carried out by her under our supervision and guidance. The matter embodied in this thesis has not been submitted in part or full to any other University or Institute for the awarded of any degree.


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Despite all the difficulties, all the frustrations, there is a joy in having done something as well as you could and better than others thought you could

-J.R.D. Tata

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ABSTRACT

In this globalized network society, there is a paradigm shift in education from teacher centric education to learner centric education. It is very important for organizations to “know what they know” and make maximum use of their knowledge. There are hidden, untapped reservoirs of intelligence that exist in almost every organization. There is a difference in ranking in two universities with identical numbers of faculty, degree programs, expenditures, and enrollment. This difference as Milam (2001) suggests is often intangible value added by effective Knowledge Management (KM). The educational institutions can adhere to business organisations and pursue the implementation of KM for having an edge and serving the stakeholders in a better way. The present study endeavors to develop a knowledge management framework for enhancing Research, Curriculum development and Alumni contributions in the selected Institutions of Higher Technical Education (IHTE) in India. Being the power house of knowledge in our society, IHTE have immense knowledge and research plays an important role. The accurate and up to date knowledge about earlier and ongoing research and other administrative related information can be acquired and stored systematically with the implementation of KM in IHTE.

One of the main aims of any institution of Higher Technical Education (IHTE) is to impart knowledge to the students in the most effective way, meet the needs of the students more efficiently and improve educational outcomes for the students. To remain ahead of competition, even well-established IHTE have to respond to the challenge by offering learners a dynamic and industry oriented curriculum. To achieve this objective, there is a need to facilitate academia with knowledge management (KM) based platform which can help them design innovative, industry oriented, and state-of-art curriculum.

Alumni play an important role for all educational institutions. Their experience can be exploited by having their suggestions and feedback regarding Research, Curriculum Development, career development and placement services. Their valuable feedback needs to be acquired, stored and retrieved efficiently using KM.

As Research, Curriculum Development and Alumni contributions are the three important aspects of any educational institution, the current study has been undertaken to design a KM framework based on these three aspects. The objectives of the present study are:

- To understand and explore the application of KM in Research, Curriculum Development and Alumni Contributions in IHTE.
- To identify and establish the possible linkages amongst Research, Curriculum Development and Alumni Contributions.
- To propose a framework for implementing KM in Higher Educational Institutions to reap the benefits of KM in the above mentioned areas.

The present study uses a survey method to collect data on these three aspects viz. Research, Curriculum Development and Alumni Contributions from IHTE. The designations of the targeted respondents in the IHTE were categorized into two groups. The first group consists of management, senior academia that is, Professors, Associate Professors who are also dealing with managerial work and also “thinkers” are addressed as group A. The second group consists of Assistant Professors, Lecturers and Research Scholars who will be using and also contributing to the KM system and also the “doers”, are addressed as group B.

The survey instrument investigates the features which are obtained from the literature and personal observations or interviews for the inclusion in the knowledge management framework for the institutions of higher technical educational (IHTE). The study also tries to identify the perceived benefits of KM implementation in higher technical education if proposed KM framework is put into practice.

The particular stakeholder analysis helped to analyses the features to be included in KM framework. The designed KM framework covers KM enablers, KM processes, KM aspects of IHTE and perceived benefits of KM. The suggested framework will help in improving the quality of Research and Curriculum Development and will also help to incorporate Alumni feedback. Thus the competitiveness of IHTE can be enhanced by adopting the suggested framework.

Keywords: Institutions of Higher Technical Education, Knowledge Management, Research, Curriculum Development, Alumni Contributions

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ABBREVIATIONS

Abbreviation	Full Form
ANOVA	Analysis of Variance
CKO	Chief Knowledge Officer
EMS	Electronic Meeting System
ICT	Information and Communication Technology
IDC	International Data Corporation
IHTE	Institutions of Higher Technical Education
KM	Knowledge Management
NKC	National Knowledge Commission, India
SPSS	Statistical Package for the Social Sciences

CHAPTER – I

INTRODUCTION

1.1 INFORMATION AND COMMUNICATION TECHNOLOGIES (ICT) IN EDUCATION:

Information and Communication Technologies (ICT) have made a profound impact on every various aspect of human life including work and business, and contributed tremendously to the competitiveness of a nation through social and economic development. Today, connectivity, convergence, internet and networks are the new mantras for the success of so called the new ‘Global Digital Networked Economy’. ‘As a great social leveler, information technology ranks second only to death. It can raze cultural barriers, overwhelm economic inequalities, and even compensate for intellectual disparities. High technology can put unequal human beings on an equal footing, and that makes it the most potent democratizing tool ever devised’ (Pitroda, 1993, pp. 66-68).

ICT have been increasingly used to deliver on promises of universal education. It is a strong enabler of universal access and equity in education. Leveraging appropriate information and communications technologies can ensure high quality delivery of learning and teaching, educators’ professional development and efficient education management, governance and administration. Technology has caused a barrage of content being streamed non-stop through newer delivery mechanisms- namely smart phones, tablet PCs, iPads- both enabled by widespread 3G/ 4G networks. This phenomenon holds key insights into evolution in models of teaching, model and efficiency of education administration and operations.

Sometimes, organizations confuse some form of ICT with knowledge management. Information and communication technology (ICT) can enhance knowledge sharing by lowering temporal and spatial barriers between knowledge workers, and improving access to information about knowledge (Hendriks, 1999). With the use of ICT, more learners can have access to education with the flexibility of time and with no geographical barriers. ICT significantly facilitate the acquisition and absorption of knowledge, offering developing countries unprecedented opportunities to enhance

educational systems, improve policy formulation and execution, and widen the range of opportunities for business and the poor. One of the greatest hardships endured by the poor, and by many others, who live in the poorest countries, is their sense of isolation. The new communications technologies promise to reduce that sense of isolation, and open access to knowledge in ways unimaginable not long ago (World Bank, 1998).

1.2 KNOWLEDGE MANAGEMENT

It's very important for organizations to "know what they know" and make maximum use of their knowledge. In early days, it was difficult to access knowledge but now with the evolution of ICT, we are bombarded with knowledge. Just a click of the mouse, immense knowledge is available on any topic. The problem today is not how to find knowledge, but how to manage it. We have moved from scarcity of information to its abundance due to information and communication technology. Data represents observations or facts out of context that are, therefore, not directly meaningful (Zack, 1999). Information results from placing data within some meaningful content, often in the form of a message (Zack, 1999). Comprehension of patterns that emerge information is called knowledge. Knowledge is a gradual transition from data to information.

Consider this observation made by Neil Fleming in 1996 as shown in Figure 1.1.

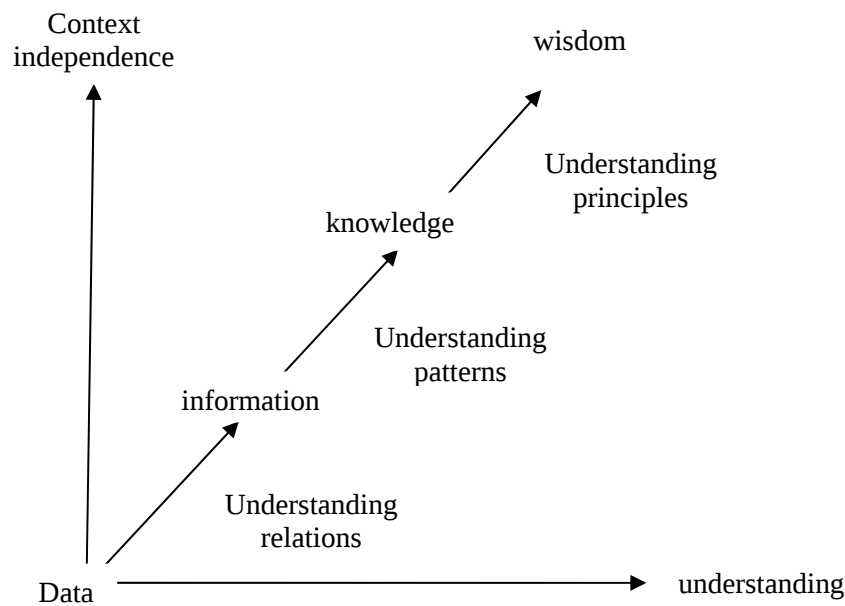


Figure1.1:Relationship between Data, Information , Knowledge and Wisdom [Source: Fleming, 1996]

Fleming (1996) concludes that:

- Information relates to description, definition, or perspective (what, who, when and where).
- Knowledge comprises strategy, practice, method, or approach (how).
- Wisdom embodies principle, insight, moral, or archetype (why).

Knowledge is broadly defined as information combined with experience, context, interpretation and reflection. It is a high value form of information that is ready for business processing, decisions and actions. Knowledge refers to the sum of what is known a familiarity, awareness, or understanding gained through experience that, in a business context, guides operations and administrative processes (Coukos and Eleni, 2003). In 1970, Drucker had assessed that knowledge will play an important role as he had stated that the ‘most valuable assets of the twenty-first-century enterprise will be its knowledge and knowledge workers.

A common way to discuss knowledge is by dividing it into two dimensions, explicit knowledge and tacit knowledge. Explicit knowledge can be expressed in words and numbers and is shared in the form of data, manuals, copyright and patents (Nonaka, 1991; Smith, 2001). Furthermore, explicit knowledge is carefully codified, stored in a hierarchy of databases and is accessed with high quality and

fast information systems. The advantage of this type of knowledge is that it is easily accessible for other people, and can therefore be reused to solve similar problems (Smith 2001). Explicit Knowledge is documented information that facilitates action. It is easily codified, communicable and transferable. It can be expressed in formal, shared language; it includes formulas, equations, rules, and best practices (Kidwell et al. 2001).

Tacit knowledge is know-how and learning embedded within the minds of the people in an organization. It involves perceptions, insights, experiences, and craftsmanship. Humans are not always able to express all tacit knowledge and as opposed to explicit knowledge it becomes difficult to share it (Kidwell et al. 2001). Therefore, tacit knowledge is often seen as the iceberg below the surface of the water, i.e., unseen and embedded in our social identity and practice (Spender 1996). Tacit knowledge is deeply rooted in actions and experiences as well as in the ideals, values or emotions that an individual embraces (Nonaka and Nishigushi 2001). Many organizations have become so complex that their knowledge is fragmented, difficult to locate and share, and therefore redundant, inconsistent, or not used at all. In today's environment of rapid change and technological discontinuity, even knowledge and expertise that can be shared is often quickly made obsolete (Zack, 1999). Organizations are being advised that to remain competitive, they must efficiently and effectively create, locate, capture, and share their organizations' knowledge and expertise, and have the ability to bring that knowledge to bear on problems and opportunities. Firms are showing a tremendous interest in implementing knowledge management processes and technologies, and are even beginning to adopt knowledge management as part of their overall business strategy (Rifkin, 1996).

According to Young, Knowledge Management is the discipline of enabling individuals, teams and entire organisations to collectively and systematically create, share and apply knowledge, to achieve their objectives. Knowledge management is to discover, develop, utilize, deliver and absorb knowledge inside and outside the organisation through an appropriate management process to meet current and future needs (Ouintas et. al., 1997).

Tiwana (2002) clearly defined the three fundamental processes of knowledge management as shown in Figure(1.2) and they are explained in brief by Tiwana which is given below:

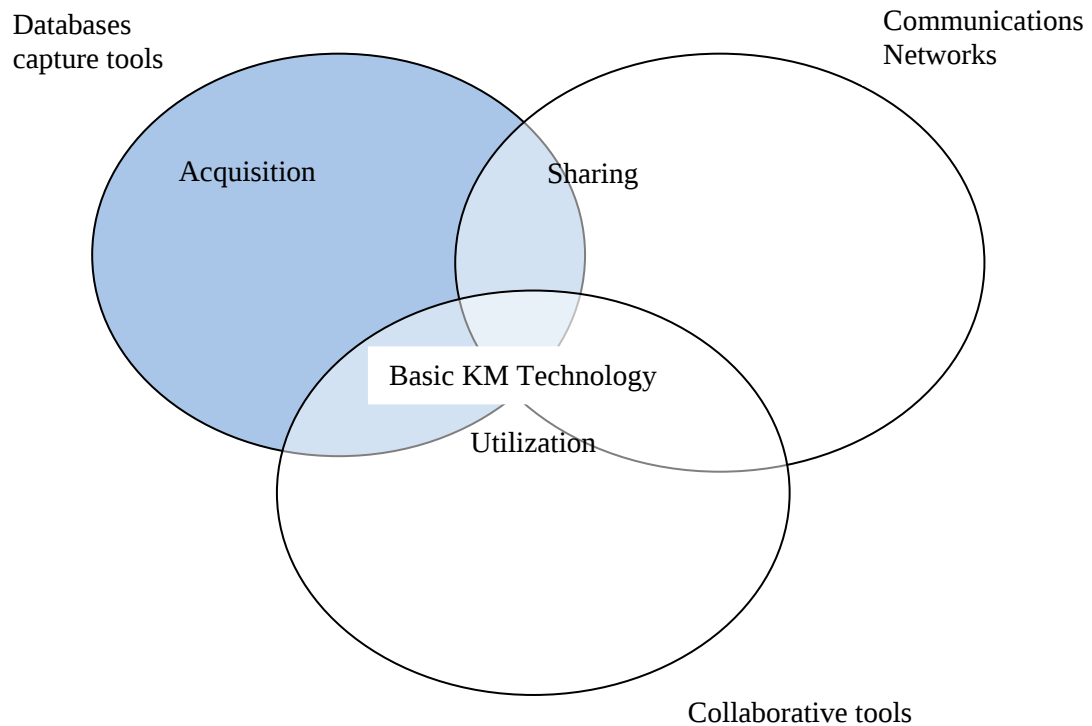


Figure1.2: Fundamental Processes of Knowledge Management by Tiwana(2002)

- **Knowledge acquisition:** Knowledge acquisition is the process of development and creation of insights, skills, and relationships. Knowledge formalization tools are examples of direct knowledge acquisition. Data capture tools with filtering abilities, intelligent databases, note-capture tools, and electronic whiteboards are examples of information technology components that can support indirectly knowledge acquisition.
- **Knowledge sharing:** Knowledge sharing is the process of disseminating and making available what is already known. A decision support system that provides a novice physician best clinical practice is an example of knowledge that is being shared with that clinical agent. Possibly, the sharing process has to be optimized on the specific context.

- **Knowledge utilization:** Learning is integrated into the organization. Whatever is broadly available throughout the company can be generalized and applied, at least in part, to new situations.

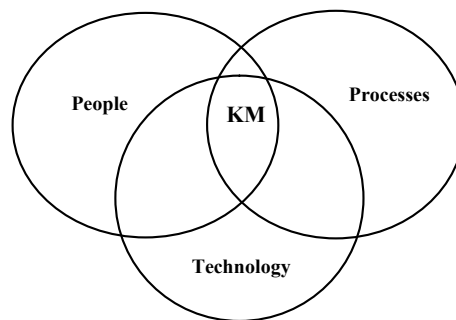
1.3 KNOWLEDGE MANAGEMENT AND HIGHER EDUCATION

Knowledge Management principles recognize that it is important for organizations to “know what they know.” All institutions inherently store, access, and deliver knowledge in some manner. Realizing the importance of Knowledge Management, the Indian Government has established National Knowledge Commission (NKC) on 13th June 2005. In the next few decades India will probably have the largest cohort of young people in the world. Given this demographic advantage over the countries of the West and even China, India is optimally positioned, in the words of our Prime Minister Mr. Manmohan Singh, to “leapfrog in the race for social and economic development” by establishing a knowledge-oriented paradigm of development. According to “National Knowledge Commission (NKC) of India: An Overview”, the NKC is in particular concerned with the following aspects of Indian education. Higher Education: Funding, regulatory frameworks, curricula, private sector participation, academic standards and research are all issues that require urgent attention and sincere resolution with a long term view in mind. Professional Education: to consolidate and extend India’s growing international presence in IT, medicine, law, engineering, etc., professional education needs to be supported creatively and its quality constantly checked and upgraded.

According to Thorn (2001), the problem is that it is such a “wide open area of study that it is difficult to understand the implications of Knowledge Management for an educational setting”. But Kidwell et al. (2001) explains “Knowledge Management should not strike higher education institutions as a radically new idea; rather it is a new spin on their *raison d’être*.” They viewed KM as a process of transforming information and intellectual assets into the ones of enduring value. According to Petrides and Nodine (2003), educational institutions however seem to be working in a more complex way, as these organizations are adaptive and are social systems where people co-operate with technologies to evolve processes to achieve common goals. Just as ecosystems rejuvenate themselves through cycles

and seasons, educational organizations grow and revitalize themselves through the knowledge they create, their processes facilitate passing that knowledge on to others and the exchanges and relationships that they foster among people.

Knowledge Management therefore, very aptly brings together three core organizational resources-people, processes and technologies-to enable the educational institutions use and share information most optimally and effectively (Figure 3). KM in education can therefore be thought of as a framework or an approach that enables people within the institution to develop a set of practices to collect information and share what they know leading to actions that improve services and outcomes (Petrides and Nodine 2003).



(Petrides, et al. 2003)

Figure1.3: Key Realms of Knowledge Management

According to Coukos and Eleni (2003), in business sector, knowledge is now being perceived as a valuable asset. Organizational knowledge refers to knowledge of the overall business the organization is in, the organization's strengths and weaknesses, the markets it serves, and the factors critical to organizational success. Universities also rely on faculty-generated knowledge and traditional means of discovery and transmission of knowledge. The main challenge confronting institutions of higher education, however, is to shift the emphasis placed on key skills, business processes, and technologies in order to create systematic and well integrated approaches to generate, codify and transfer knowledge throughout the institution.

Knowledge Acquisition:

Generating knowledge refers to the sub-processes of searching, capturing, and creating knowledge. Basically, knowledge generation includes knowledge acquired by an organization as well as that knowledge developed within.

The IHTE can acquire new knowledge by:

- Capturing the knowledge from research institutions including other universities and government laboratories.
- Dedicating resources to detect and obtain external knowledge and communicate it within the institution.
- Encouraging faculty to participate in project teams with external experts.
- Documenting the procedures, e.g., what and why the changes are made in curriculum.
- Subscribing to external databases or journals.
- Using outside consultants and borrowing from other divisions or organizations

Knowledge Storage

The knowledge storage encompasses the sub-processes of storing, categorizing, and mapping of tacit knowledge and rendering it in explicit form. In IHTE, databases, directories, procedural handbooks and email messages are examples of codified knowledge.

Knowledge exists in tacit and explicit states. Tacit knowledge is carried with us in the way we do things, as know-how. It can be revealed via processes such as mentoring or through back-and-forth, tailored explanations that occur in conversation. Explicit knowledge is shared through periodic reviews of innovations and/or discoveries, resulting in updated procedural manuals, modified goals of R and D departments, and/or databases shared by users of electronic laboratory notebooks (Donald et. al. 2006).

Knowledge Dissemination

Finally, transferring knowledge refers to the sub-processes of distributing and sharing organizational knowledge. The transfer of knowledge is the key to

organizational success, quality and competitiveness. In universities, the dissemination of knowledge can be performed in the following ways:

- Regularly updating databases of good work practices, lessons learnt.
- Preparing written documentation such as lessons learned, training manuals, good work practices, articles for publication etc.
- Internal lectures, knowledge sharing seminars.
- Sharing via intranet.
- Knowledge sharing committees.

Organizations that reward collaboration and information sharing are outperforming companies that discourage these practices (Microsoft, 2000). The impact of the use of data and information on the current educational institutions, through KM, can enable them to evolve for effective learning environment. KM can support the higher educational institutions to accomplish their mission if implemented and used effectively.

1.4 RATIONALE FOR THE STUDY

Two universities with identical numbers of faculty, degree programs, expenditures, and enrollment may vary widely in how successful they are in rankings such as those conducted by U.S. News and World Report as quoted by Milam (2001). The difference is often intangible value that is added by effective KM. Knowledge Management concept in education makes eminent sense-a wonderful combination of good intuition, practical know-how, and a feel for what might be best described as an asset of emerging theories focusing on the effective management of knowledge in higher educational institutions. Along the way, Knowledge Management in higher education supplies us with a framework for understanding how good assessment practice, in fact, depends on effective information system (Kumar and Kumar 2005).

Realizing the importance and value of KM, the researcher has identified several goals to be achieved so as to come out with a viable KM framework for India's institutions of higher technical education. The current higher learning institutions in developed countries have adapted to their changing role in a knowledge-based

society (Metaxiotis and Psarras, 2003) and recognize the value of their intellectual capital to their continuing role in society (Rowley, 2000). It is time for developing countries like India to focus on these issues, thus the current study has been undertaken to understand the implication of KM, the field of education in India. After analyzing the need of ICT for implementation of KM in IHTE and identifying KM technologies which the academia felt could be leveraged to a greater extent, this study investigates the factors affecting the implementation and use of KM for enhancing Research, Curriculum development and Alumni contributions in institutions of higher technical education.

One of the main aims of any institution of higher technical education (IHTE) is to impart knowledge to the students in the most effective way, meet the needs of the students more efficiently and improve educational outcomes for the students. To remain ahead of competition, even well-established IHTE have to respond to the challenge by offering learners a dynamic and industry oriented curriculum. Continuous focus on research is very essential for curriculum development and knowledge sharing. Alumni contributions can help in improving both research and curriculum development in IHTE. Research, Curriculum development and Alumni contributions are the three pillars of any educational institution. It is with this perspective that the current study has been undertaken to design a KM framework based on these three aspects.

The impact of the use of data and information on the current educational institutions, through Knowledge Management, can enable them to evolve effective learning environment.

1.5 ORGANIZATION OF THE THESIS

The whole thesis is organized in six Chapters as explained below.

Chapter I – Introduction

This Chapter is introductory in nature, providing a brief overview of the background of the research work. This chapter introduces the structure of thesis. The chapter covers the ICT application and knowledge management in education sector. It also covers the rationale and objectives of the study.

Chapter II – Review of the Literature and Identification of Research Gaps

In this chapter, different views of researchers on KM and KM in IHTE are presented. In depth review of KM literature helps to know the emphasis and direction in which knowledge management has developed, the time periods of the studies, the success factors and knowledge management frameworks. It helps to identify the gaps in the earlier studies and avoid duplication of results and lends right direction to research.

Chapter III –Research Design and Methodology

This chapter discusses the methodology of the study. Primary data analysis has been described. It discusses the different methodologies adopted in the study, the population of the study, tool, methods of data collection and methods of data analysis.

Chapter IV – Data Analysis

This chapter covers the analysis and discussion of responses gathered through the questionnaire administered to various stake-holders and presents the outcome of such analysis. The chapter starts with the participative stake-holders analysis which includes demographic profile and the current status of knowledge management in selected IHTE in India. It also deals with the detailed factor analysis of Research, Curriculum development and Alumni contributions. Regression analysis was also performed to find the important predictors of perceived benefits of Research, Curriculum Development and Alumni Contributions.

Chapter V – The Knowledge Management Framework For Enhancing Research, Curriculum Development And Alumni Contributions In IHTE

Finally on the basis of the findings of survey a strategic knowledge management framework is proposed along with its perceived benefits. All the three aspects, i.e., Research, Curriculum development and Alumni contributions are addressed in this framework.

Chapter VI– Conclusions, Limitations and Further Study

This chapter covers the learning, recommendations and conclusions of the study and also highlights the recommendations regarding strategic KM framework. This chapter also involves a critical assessment of the work, revisiting the hypotheses, and demonstrating precision, thoroughness, and contribution of research. The chapter also lists the further research areas.

CHAPTER-II

LITERATURE REVIEW

PROLOGUE

A review of the literature pertaining to the study is a pre-requisite for the formulation of a research plan. It enables the investigator to avoid the pit falls and difficulties experienced by predecessors and to be in a position to dig new ground in the area being investigated. To have a proper perspective of the subject, it is essential to have a bird's eye view of the findings of other academic researchers. Thus, the planning and execution of any research study should be preceded by a thorough review of literature in related fields, since it helps to familiarize with the work that has been done in that area, eliminates the possibility of unnecessary duplication of efforts and valuable information on research techniques may be gained.

A brief resume of researches conducted and related to the present study has been presented under the following heads:

- 2.1 Introduction
- 2.2 Relationship between Data, Information and Knowledge
- 2.3 Explicit and Tacit Knowledge
- 2.4 Knowledge Management
- 2.5 Knowledge Management Frameworks
- 2.6 Knowledge Management and Higher Education
- 2.7 Knowledge Management Enablers
- 2.8 Research Gaps

2.1 INTRODUCTION

A profound revolution based on information and knowledge is occurring within society which is led by developments in computing and communications technology. We are entering (or have entered) the knowledge society in which the basic economic resource...is knowledge...and where the knowledge worker will play a central role (Drucker 1993). Over the years, an organization's employees attain knowledge while performing their specific tasks which resides in their minds and that has not been put in structured and documented form. The knowledge has

been acquired along the years while taking the decisions in crucial situations, solving the problems. It is one of the most difficult tasks to transfer this knowledge to others, but at the same time it is one of the most valuable assets for any organization to lose. Knowledge Management (KM) facilitates the retention and distribution of knowledge within an organization to gain competitive advantage. To preserve and utilize knowledge, organizations are implementing Knowledge Management. An organization can deploy knowledge with knowledge management that addresses the full range of processes. These involve the acquisition, storage, dissemination and utilization of knowledge in an organization.

Knowledge management refers to the set of systematic and disciplined actions that an organization can do to derive greatest value from the available knowledge (Davenport and Prusak, 1998). Effective Knowledge Management typically requires an appropriate combination of organizational, social, and managerial initiatives along with, deployment of appropriate technology.

An organisational knowledge includes both the experience and understanding of the people in the organization and the information artefacts, such as documents and reports, available within the organization. Knowledge is classified mainly in two types: *Explicit* and *Tacit*. Polyani quoted distinction between explicit knowledge as formal knowledge. It can be articulated in language and transmitted among individuals. It is relatively easy to communicate to others in words. Tacit knowledge also known as informal knowledge is personal knowledge rooted in individual experience and involves personal belief, perspective, and values. It accumulates primarily from one's experience and is difficult to codify or express in words. It is often viewed as the real key of getting things done and creating new value.

Knowledge Management is defining and using the common knowledge gained by the experiences and skills of an organization. Wiig et al. (1997) have outlined two main aims of Knowledge Management. These are:

- i. To provide the realization of intelligent actions of an organization in order to protect organizational success and the application of that success.

- ii. To realize the Knowledge Management, for an organization as the best valuable source.

Although there has been a great deal of recognition in business world that information and knowledge management can be vital tools in organizations, now the educational administrators and teachers have begun to look at how they might use Knowledge Management to assist in creating effective learning environment. Higher education institutions have significant opportunities to apply Knowledge Management practices to support every part of their mission, explains (Kidwell et al. 2001).

This includes information that is easily measurable, as well as information which is more difficult to measure, i.e., either unspoken or informal. Knowledge is a gradual transition from data to information. Let us first understand this hierarchy.

- Data
- Information
- Knowledge

These are discussed in detail in the next section.

2.2 RELATIONSHIP BETWEEN DATA, INFORMATION AND KNOWLEDGE

Data: Like water, this rising tide of data can be viewed as an abundant, vital and necessary resource. With enough preparation, we should be able to tap that reservoir-and ride the wave-by utilizing new ways to channel raw data into meaningful information. That information, in turn, can then become the knowledge that leads to wisdom (Alberthal, 1995). According to Liew (2007), data are recorded (captured and stored) symbols and signal readings.As symbols, 'Data' is the storage of intrinsic meaning, a mere representation. The main purpose of data is to record activities or situations, to attempt to capture the true picture or real event. Therefore, all data are historical, unless used for illustration purposes, such as forecasting.Data represents a fact or statement of event without relation to other

things. It is obtained from experiments or surveys which can be used for calculations or drawing conclusions e.g. it is raining.

Information: Kogut and Zander (1992) define information as factual statement and knowledge as a statement of how to do. While information entails an understanding of the relations between data, it generally does not provide a foundation for why the data is what it is, nor an indication as to how the data is likely to change over time. Information is a relationship between data and, quite simply, is what it is, with great dependence on context for its meaning and with little implication for the future (Alberthal,1995). Data is processed to provide information, with answers to “who”, “what”, “where”, and “when” questions. Information embodies the understanding of a relationship of some sort, possibly cause and effect(Bateson,1988). For example, the temperature dropped 15 degrees and then it started raining.

Knowledge: Knowledge is broadly defined as information combined with experience, context, interpretation and reflection. Knowledge is a high value form of information that is ready to business process, decisions and actions. Knowledge refers to the sum of what is known: A familiarity, awareness or understanding gained through experience that, in a business context, guides operations and administrative processes (Coukos and Eleni 2003). Many researchers accept that knowledge is the only meaningful economic resource in the knowledge society (Foray and Lundvall, 1996; Johnston and Rolf, 1998). According to Snowden (1999) defining knowledge is not necessary, but it is essentially important to distinguish it from information. Knowledge represents a pattern that connects and generally provides a high level of predictability. According to Bateson (1988), knowledge represents a pattern that connects and generally provides a high level of predictability, for e.g. If the humidity is very high and the temperature drops substantially, the atmospheres is often unlikely to be able to hold the moisture, so it rains.

Prusak (1999) regards knowledge as a human trait and distinguishes it from information as only a human can obtain knowledge. Davenport and Prusak (1998) opine that knowledge originates and is applied in the minds of knower. In

organizations, it often becomes embedded not only in documents or repositories but also in organizational routines, processes, practices and norms.

In short, knowledge is a gradual transformation from data to information after understanding relations and when patterns are understood information transforms into knowledge as shown in figure 2.1.



Figure 2.1: Relationship between Data, Information and Knowledge

A common way to discuss knowledge is by dividing it into two dimensions, *explicit knowledge* and *tacit knowledge* which are discussed in detail in the next section.

2.3 EXPLICIT AND TACIT KNOWLEDGE

Explicit knowledge can be expressed in words and numbers and is shared in the form of data, manuals, copyright and patents (Nonaka 1991; Smith 2001). The advantage of this type of knowledge is that it is easily accessible for other people, and can therefore be reused to solve similar problems (Smith 2001). Explicit Knowledge is documented information that can facilitate action.

Explicit knowledge is:

- Easily codified
- Communicable
- Transferable

It can be expressed in formal, shared language (Kidwell et al. 2001). Examples include formulas, equations, rules, and best practices. Tacit knowledge is know-how and learning embedded within the minds of the people in an organization. It

involves perceptions, insights, experiences, and craftsmanship. Humans are not always able to express all tacit knowledge and as opposed to explicit knowledge it becomes difficult to share it. Therefore, tacit knowledge is often seen as the iceberg below the surface of the water, i.e. unseen and embedded in our social identity and practice (Spender 1996). New knowledge is created by using the process of interactions, observing, discussing, analyzing, spending time together or living in same environment

Tacit knowledge is deeply rooted in actions and experiences as well as in the ideals, values or emotions that an individual embraces (Nonaka and Nishigushi 2001). Therefore it is hard to formalize it and, difficult to communicate or share it with others. Due to this difficulty in formalizing tacit knowledge, it is often transmitted through face-to-face contact. Furthermore, tacit knowledge is technical or cognitive and is made up of mental models, values, intuitions, insights and assumptions. Technical tacit knowledge is demonstrated when people master a specific knowledge like the one gradually developed by master craftsmen (Smith 2001). These master craftsmen have years of experience and possess a wealth of expertise. Nevertheless, they often have difficulty in articulating the technical and scientific principles behind what they know. The cognitive dimension consists of mental models, beliefs, and perspectives so ingrained that we take them for granted, which hinders us to articulate them (Nonaka 1991). Tacit knowledge is:

- Personal
- Context-specific
- Difficult to formalize
- Difficult to communicate
- More difficult to transfer

Most business actions require the guidance of both explicit and tacit knowledge (Kidwell et al. 2001).

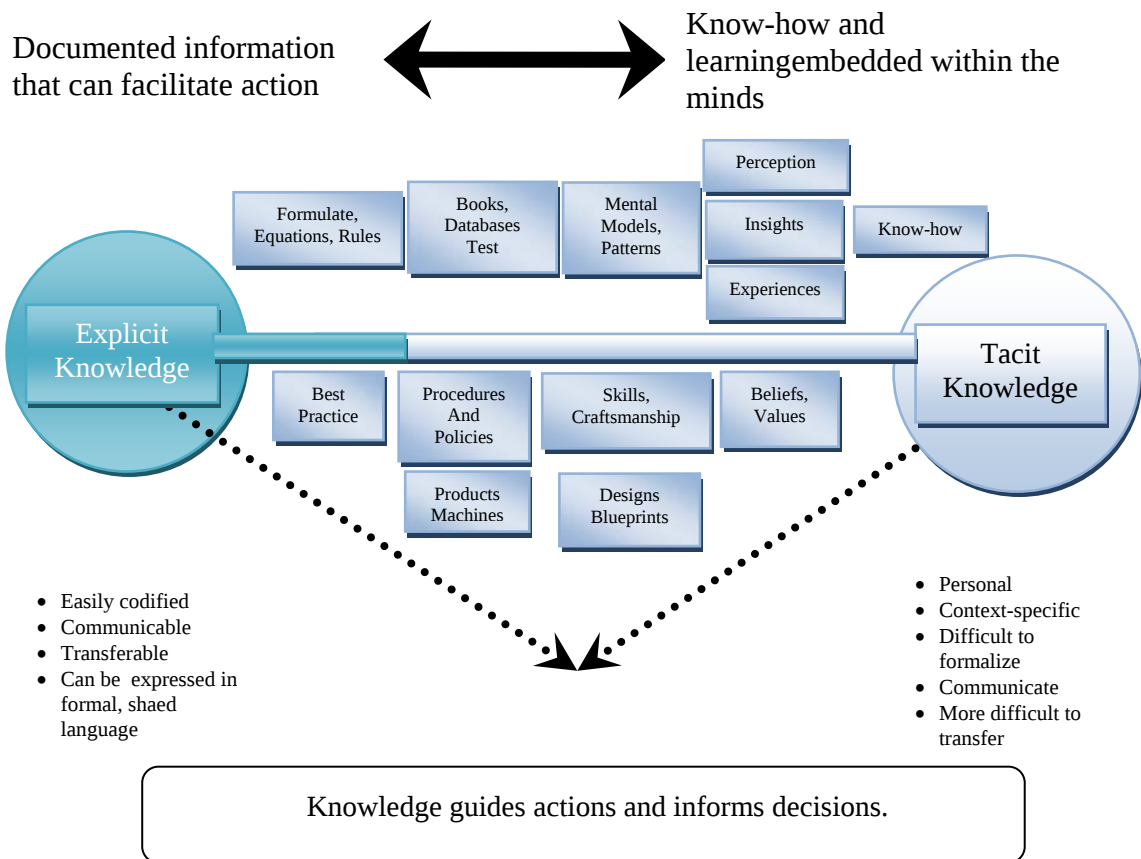


Figure 2.2: Tacit and Explicit Knowledge
(PricewaterhouseCoopers LLP, 2000)

According to Mike Davidson (1996), what's really important for any organization is:

- *Mission*: What is it trying to accomplish?
- *Competition*: How to gain a competitive edge?
- *Performance*: How to deliver the results?
- *Change*: How to cope with change?

As such, Knowledge Management, and everything else for that matter, is important only to the extent that it enhances an organization's ability and capacity to deal with, and develop in, these four dimensions.

Knowledge increases in value the more it is used, and therefore knowledge in itself is not valuable, instead it has to be applied in order to generate value (Claycomb et al. 2001). The activities for handling employees' knowledge within companies are known as Knowledge Management. Management consulting firms, which are considered as knowledge-based companies, have a high level of interest in Knowledge management since their capacity to compete on the basis of accumulated knowledge is important for their industry (Dunford 2000). The management consulting industry has experienced a constant growth during the 20th century (David 2000).

Ann Macintosh (1997) has identified some of the specific business factors, including:

- Marketplaces are increasingly competitive and the rate of innovation is rising.
- Reductions in staffing create a need to replace informal knowledge with formal methods.
- Competitive pressures reduce the size of the work force that holds valuable business knowledge.
- The amount of time available to experience and acquire knowledge has diminished.
- Early retirements and increasing mobility of the work force lead to loss of knowledge.
- There is a need to manage increasing complexity as small operating companies are trans-national sourcing operations.
- Changes in strategic direction may result in the loss of knowledge in a specific area.

The ultimate goal for a company is to ensure that the knowledge does not go home at night, i.e. knowledge should become a part of the organization as a whole (Kreiner 2002). When employees leave, knowledge, which is the most important asset of a management-consulting firm leaves as well. The only way to keep knowledge within a firm is then if the employee that leaves has transferred his or her knowledge to others in one way or another. The aim of Knowledge Management, for an organization is to create a capable organization which

measures, stores and turns knowledge into a capital, in other words, to create a learning organization (Bollinger and Smith 2001). Researchers claim that personal commitment is the key for this process of making individual knowledge a part of the organization (Goh 2002; Nonaka 1994).

Nonaka and Takeuchi (1995) didn't view tacit and explicit knowledge as separate entities, but rather as mutually complementary entities. Knowledge is created through the social interaction between tacit and explicit knowledge, an interaction Nonaka and Takeuchi term "knowledge conversion".

2.4 KNOLWEDGE MANGEMENT

The literature of knowledge management is scattered and varied, ranging from volumes of short notes on practice to articles on knowledge management topics in journals not exclusively devoted to knowledge management to a handful of scholarly journals dedicated to knowledge management (Wallacea et. al., 2011). The term knowledge management is often problematic as there is little consensus regarding its definition (Neef 1999; Bhatt 2001). In order to understand Knowledge Management, it is necessary to see the subject within the broader context of the enormous changes taking place in the global economic framework itself (Neef, 1999). The first shift towards sharing knowledge came in the mid-1990s when organisations began to think seriously about managing what they know (Davenport and Volpel 2001). Lim and Klobas (2000) expressed that the interest to create formal channels to share knowledge has grown with the sophistication of technology for sharing knowledge. Knowledge management is not solely associated with technology but uses technology as a support device to aid the capture, archiving and retrieval of information and knowledge. For successful knowledge transfer, an organisation must support a knowledge sharing culture (Lim and Klobas 2000). According to a survey conducted by Knowledge Management magazine and International Data Corporation (IDC) about the state of Knowledge Management, Dyer and McDonough (2001), highlight that the primary business uses or domains of KM are to:

- Capture and share best practices (77.7%)
- Provide training, corporate learning (62.4%)

- Manage customer relationships (58.0%)
- Deliver competitive intelligence (55.7%)
- Provide project workspace (31.4%)
- Manage legal, intellectual property (31.4%)
- Enhance web publishing (29.9%)
- Enhance supply chain management (20.1%)
- Other (5.5%)

If knowledge is to become a valuable corporate asset, it must be accessible, developed and used (Davenport and Prusak 1998). Ikujiro Nonaka and Hirotaka Takeuchi (Nonaka and Takeuchi 1995) define the knowledge-organisation through its ability to adapt to the changing environment by creating new knowledge, disseminating it effectively and embodying this knowledge into practice. Knowledge management is closely related to concepts such as organisational learning, organisational memory, information sharing, and collaborative work (Schultze,1998).

Knowledge Management is generally about the gathering, storing, disseminating and application of knowledge via the know-how and creation of work by the individuals in an organization (Miller 1999). There are many definitions of KM. The Gartner Group, an international firm that provides research, analysis and advice on many areas of information technology, articulates one of the most widely used definitions. They define KM as a discipline that encourages a mutually supported method to create, capture, organize and use information (Bair 1999; Duffy 2000).

Knowledge management (KM) is generally about the gathering, storing, disseminating and application of knowledge via the know-how and creation of work by the individuals in an organization (Miller, 1999). Many of the world's most successful corporations, businesses and organizations are investing considerable resources on KM (Alvesson and Karreman, 2001). KM principles recognize that it is important for organizations to "know what they know." Knowledge management involves the panoply of procedures and techniques used to get the most from an organization's tacit and codified know-how (Teece, 2000).

All institutions inherently store, access and deliver knowledge in some manner. Lim and Klobas (2000) suggest that two key factors for good knowledge management practices are: the extent that external knowledge changes the environment; and the extent that internal knowledge affects organisational specific requirements. Organisations that wish to distribute knowledge to their employees need to assess what type(s) of knowledge they want to distribute, external and/or internal, and to what extent. Smaller organisations will generally have a larger focus on external knowledge as they have less human resources generating quality internal knowledge, while larger organisations will concentrate more on internal knowledge.

Organisations need to be cautious not to deliver inaccurate and misleading information to individuals as decisions could be made by the recipient of the information that could lead to harmful consequences (Parker 1997; Cooke 2001). Wiig (2000) asserts that knowledge management serves to foster and promote intelligent behaviours. Skyrme and Amidon (1999) opine that any knowledge management project requires a systematic and holistic view of the knowledge agenda. Colleges and universities move closer to private-sector behaviours and values as described by academic capitalism theory (Slaughter and Leslie, 1997; Slaughter and Rhoades, 2004), and find opportunities for the influx of business strategies into higher education institutions increase.

2.5 KNOWLEDGE MANAGEMENT FRAMEWORKS

In this section some of the KM frameworks proposed by different authors are discussed which are:

- 2.5.1 Nonaka and Takeuchi's KM framework
- 2.5.2 Bukowitz and Williams KM Process Framework
- 2.5.3 Wiig's Institutional Knowledge Evolution Cycle
- 2.5.4 Gamble and Blackwell's KM Matrix

Every author has given his/her own view which gives the different perspectives to KM.

2.5.1 Nonaka and Takeuchi's KM framework

Tacit and explicit knowledge were not viewed as separate entities by Nonaka and Takeuchi, but rather as mutually complementary entities. Knowledge is created through the social interaction between tacit and explicit knowledge, an interaction Nonaka and Takeuchi term “knowledge conversion” Nonaka and Takeuchi outline through a number of case studies how knowledge is rooted in innovation and in the essentially social processes employees engage in. This notion was highlighted within a theory of knowledge

Creation, and outlined through a knowledge creation spiral (known as the SECI model and expounded in (Nonaka and Takeuchi 1995)). This model considers knowledge to be created through an interaction of tacit and explicit knowledge. This interaction is shown in Figure 2.3.

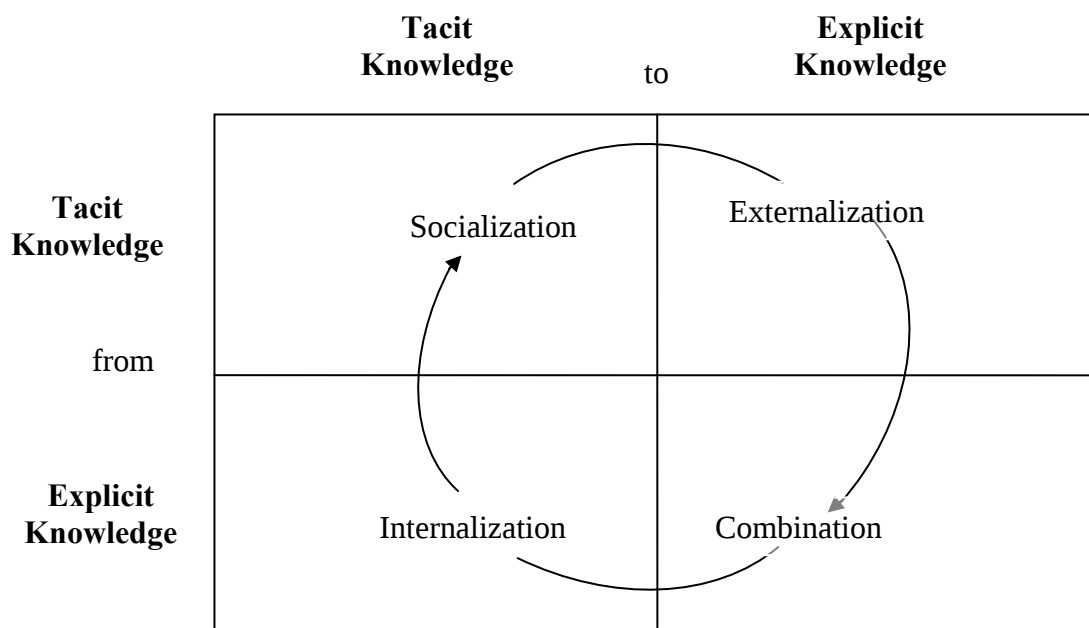


Figure 2.3: The SECI process from (Nonaka and Takeuchi 1995)

Socialization

Socialization is the process by which tacit knowledge is passed onto others. It is sharing tacit knowledge through face-to-face communication or shared experience. In this process tacit knowledge is transferred as tacit

knowledge. The examples of socialization are informal social intercourse, teaching by practical examples, and an apprenticeship.

Externalization

Externalization is the process in which tacit knowledge is linked to explicit knowledge. Tacit knowledge is converted to understandable and interpretable form, so it can be also used by others which can be accomplished by developing concepts and models. With externalization new knowledge can be created.

Combination

Combination is the process in which explicit knowledge transforms to explicit knowledge. In this phase the available data is used creatively, i.e., analyzed and organized. Explicit knowledge is combined with the knowledge that has been filed earlier. The output generated from this process could be business report, sorting, adding, categorizing etc.

Internalization

Internalization means understanding explicit knowledge. In this process tacit knowledge is created by using explicit knowledge and becomes a part of individual's basic information. The newly created tacit knowledge can be shared in organisation by socialization process thus broadening the spiral of organisational learning. Cycle continues and this is how amount of knowledge grows and the previous conceptions might change.

2.5.2 Bukowitz and Williams KM Process Framework

In this framework Bukowitz and Williams emphasizes “why” and “when” aspects. They have linked KM directly to tactical and strategic requirements as shown below:

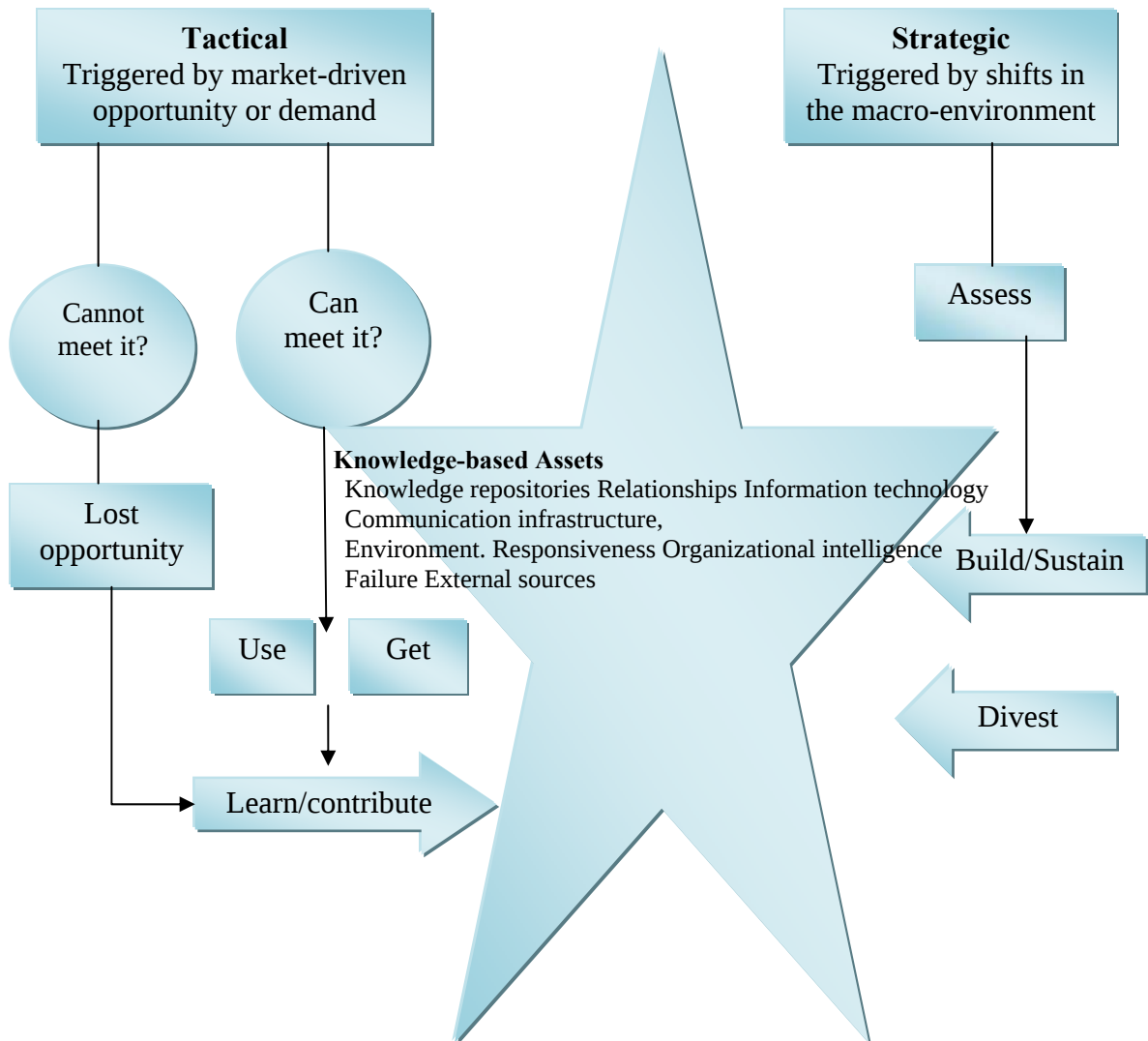


Figure 2.4: KM Process Framework by Bukowitz and Williams

They have taken into account information technologies, functional skill sets, organizational intelligence, knowledge repositories, relationships etc. Its focus is on the use and enhancement of knowledge based assets to enable the firm to respond to these issues.

2.5.3. Wiig's Institutional Knowledge Evolution Cycle

Wiig(1999) has considered five stages of institutional knowledge evolution cycle which have been depicted in fig.2.5. The five stages are:

1. Knowledge Development
2. Knowledge Acquisition
3. Knowledge Refinement
4. Knowledge Distribution and Deployment
5. Knowledge Leveraging

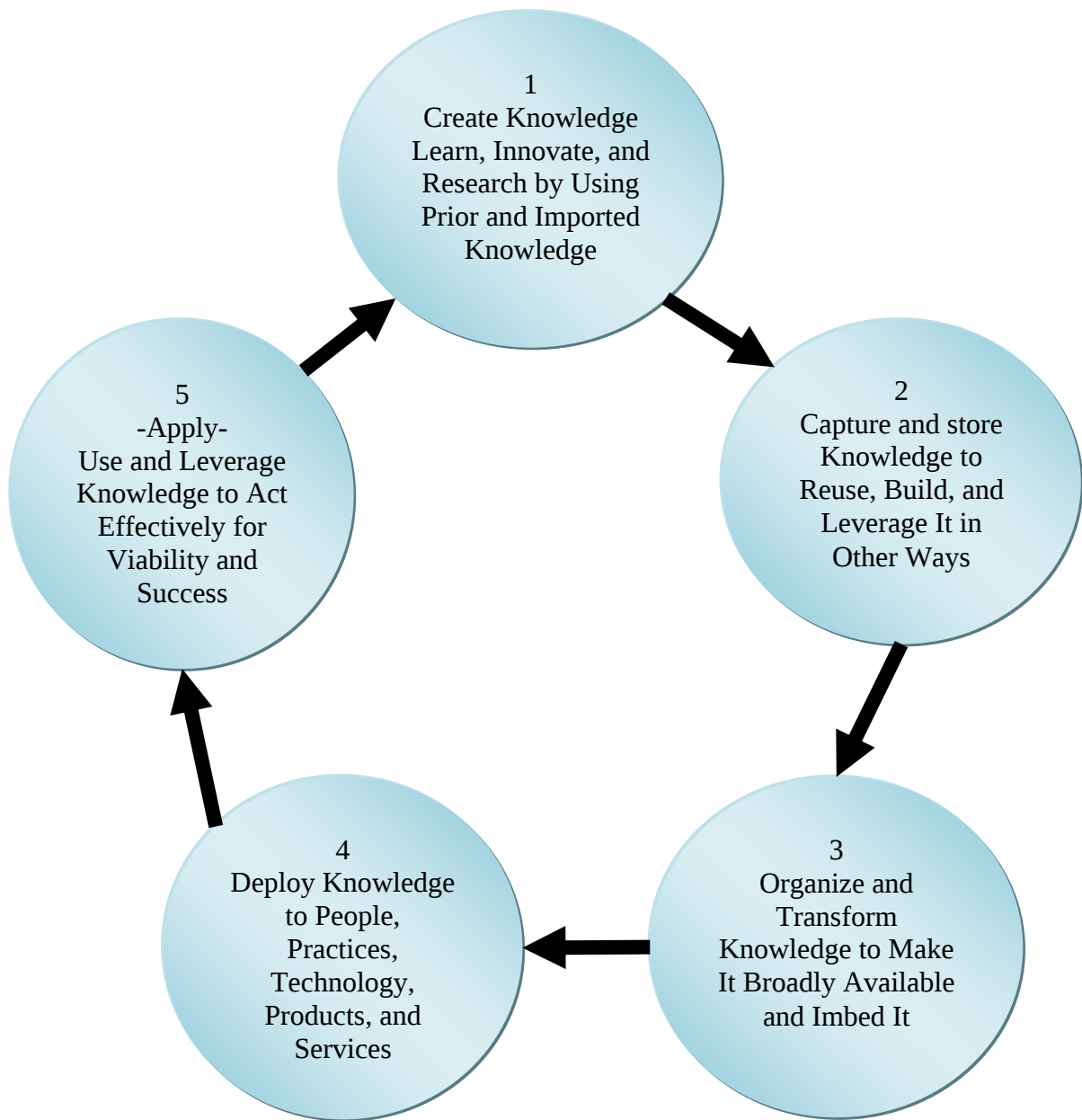


Figure 2.5: Wiig's Institutional Knowledge Evolution Cycle

2.5.4. Gamble and Blackwell's KM Matrix

In 2001 Gamble and Blackwell had presented theoretical framework for the implementation of KM which is shown below:

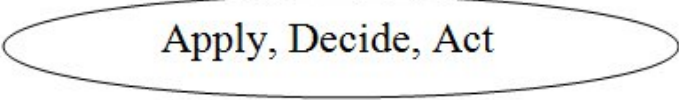
Type Approach	Tacit	Explicit	Embedded
Sense	Observe	Gather	Hypothesize
Organize	Contextualize	Categorize	Map
Socialize	Share	Disseminate	Simulate
Internalize			

Figure 2.6:Gamble and Blackwell's KM Matrix

The KM process is divided into four phases. First the organisation should locate the knowledge and then it should be organized to assess the strengths and weaknesses of the organisation. This is followed by socialization for the dissemination of knowledge. Finally, the knowledge is applied.

2.6 KNOWLEDGE MANAGEMENT AND HIGHER EDUCATION

Davenport and Prusak (1998) have said, 'Knowledge derives from minds at work'. As stated by Shariq (1997), knowledge increasingly becomes the key strategic resource of the future so we need to develop comprehensive understanding of knowledge processes for the creation, transfer and deployment of this unique asset is becoming critical. In the face of a globally expanding and highly competitive knowledge-based economy the traditional organizations are urgently seeking fundamental insights to help them nurture, harvest and manage the immense potential of their knowledge assets for capability to excel at the leading edge of innovation. Universities, and training organizations (traditional suppliers of knowledge); and businesses and knowledge based organizations in public sector (growing users of knowledge) are in need of an integrative discipline for studying,

researching and learning about the knowledge assets – human intellectual capital and technology (Shariq, 1997). Businesses improve the efficiency and effectiveness of their organizations through sound knowledge management. Similarly educational institutions can realize the potential of knowledge creation and the power of knowledge-sharing to enhance the learning of pupils, students and staff (Sallis and Jones, 2002). The need for universities to make better use of their information assets was stressed by the National Committee of Inquiry into Higher Education (1977) It highlighted the development of communications and information strategies in every university in UK by the turn of the millennium (McManus and Loughridge,1999).

Knowledge management system can create a common gateway to the data, information and knowledge. People throughout the higher educational institutions need to effectively share information and work together on projects. When employees use Knowledge Management System, best practices are stored throughout the organization, and each employee accessing the system has power similar to the best employee (Markus, 2002). In academia, most of the tacit knowledge associated with an area of study lies with the faculty who study it. The tacit knowledge of literature may be what characterizes much of the informal, side-conversations at academic conferences, in discussions between graduate students and their mentors (Hawkins, 2000). However, this information has always been informal, word-of-mouth, and not the province of the library or any other organisational unit. In commenting on knowledge management in the university context, Cronin and Davenport (2000) suggest that this informal knowledge can be captured by creating a space, and reconstituting the academic village, so that both explicit and tacit information can be combined and shared by faculty. The challenge is to design a customized, yet flexible infrastructure that supports both individual and collective learning so the organisation, whether a corporation or a university, can adapt to discontinuous change in its operating environment (Cronin and Davenport, 2000).

Bernbom (2001) explains that KM involves the discovery and capture of knowledge, the filtering and arrangement of this knowledge, and the value derived

from sharing and using this knowledge throughout the organization. It is this “organized complexity” of collaborative work to share and use information across all aspects of an institution which marks the effective use of knowledge. According to Thorn (2001), the problem is that it is such a wide open area of study that it is difficult to understand the implications of Knowledge Management for an educational setting. But Kidwell et al. (2001) explains Knowledge Management should not strike higher education institutions as a radically new idea; rather it is a new spin on their *raison d’être*. They viewed KM as a process of transforming information and intellectual assets into the ones of enduring value, while Holsapple and Joshi (2004) view it as an entity’s systematic and deliberate effort to expand, cultivate and apply available knowledge in ways that add value to the entity, in the sense of positive results in accomplishing its objectives or fulfilling its purpose. According to Petrides and Nodine (2003) educational institutions however seem to be working in a more complex way, as these organizations are adaptive and are social systems where people co-operate with technologies to evolve processes to achieve common goals. Just as ecosystems rejuvenate themselves through cycles and seasons, educational organizations grow and revitalize themselves through the knowledge they create, their processes facilitate passing that knowledge on to others and the exchanges and relationships that they foster among people.

Using Knowledge Management techniques and technologies in higher education is as vital as it is in the corporate sector. If done effectively, it can lead to better decision-making capabilities and reduce time of “product” development. Colleges and universities have significant opportunities to apply Knowledge Management practices to support every part of their mission—from education to public service to research. But implementing Knowledge Management practices wisely is a lesson that the smartest organizations in the corporate and not-for-profit sectors are learning all over again (Kidwell et al. 2001).

It is with KM that colleges and universities will be better able to increase student retention and graduation rates; retain a technology workforce in the face of severe employee shortages; expand new web-based offerings; work to analyze the cost effective use of technology to meet more enrolment; provide information, not just

data, for management; and compete in an environment where institutions cross the national borders to meet student needs anytime/anywhere (Milam2001). According to Coukos and Eleni (2003), in business sector, knowledge is now being perceived as a valuable asset. Organizational knowledge refers to knowledge of the overall business the organization is in, the organization's strengths and weaknesses, the markets it serves, and the factors critical to organizational success. Universities also rely on faculty-generated knowledge and traditional means of discovery and transmission of knowledge.

Orsenigo (2000) observed the fact that, while Western European countries do not lag behind the US in basic research or in applied R&D, they are comparatively slow to transform research into innovation and ultimately into market success. He identifies the organization of the innovation process as a particular European weakness.

Knowledge management system is a way through which people in IHTE can share the data, information and knowledge effectively. As elaborated by Markus(2000), by using best practices stored through KM, each employee can derive the same results as that of the best employee. KM is a magic wand which has a capability to give each employee power similar to the best employee. In higher education, most of the tacit knowledge associated with an area of study lies with the faculty who study it. The tacit knowledge of a literature may be what characterizes much of the informal, side-conversations at academic conferences, in discussions between graduate students and their mentors, etc. However, this information has always been informal, word-of-mouth, and not the province of the library or any other organisational unit. However, in commenting on knowledge management in the university context, Cronin and Davenport (2000) suggest that this informal knowledge can be captured by creating a space, and reconstituting the academic village, so that both explicit and tacit information can be combined and shared by faculty.

The challenge is to design a customized, yet flexible infrastructure that supports both individual and collective learning so the organisation, whether a corporation

of a university, can adapt to discontinuous change in its operating environment (Cronin and Davenport, 2000).

There is a need for the educational institutions to offer stakeholder, i.e., learners to offer effective learning environment, state-of-the-art research, dynamic and industry oriented curriculum, which can place them above par. Although there has been a great deal of recognition in the corporate world that information and knowledge management can be vital tools in organizations, now the education administrators and teachers have begun to look at how they might use knowledge management to assist in creating an effective learning environment. Higher education institutions have significant opportunities to apply knowledge management practices to support every part of their mission, explains (Kidwell et. al., 2001).

According to Petrides and Nodine (2003) educational institutions however, seem to be working in a more complex way, as these organizations are adaptive and are actually social systems where people co-operate with technologies to evolve processes to achieve common goals. One of the main aims of any IITE is to impart knowledge to the students in the most efficient way, meet the needs of the students more effectively and improve the outcomes of the students. All of this can be accomplished by developing an ingenious curriculum. Curriculum development is the process whereby values are interpreted and arranged into learning experiences (Wiles and Bondi, 2006). Richards (2001) describes curriculum development as the range of planning and implementation processes involved in developing or renewing a curriculum. Curriculum is a total plan for learning. All plans consist of a vision that interprets societal needs and a structure that translates those values into learning experiences for learner (Gupta and Earnest, 2008). Curriculum can also be defined as an educational path, when discussing the technical education system (Balu, 1982).

The learning should always be planned and guided. The educator should always plan in advance what he/she is seeking to achieve and how will he go about it. To facilitate the academia in devising the curriculum, the template of design and guidelines may be provided and also previous lesson plans can be provided for the

reference in the knowledge management system in the institutions of higher technical education.

2.7KNOWLEDGE MANAGEMENT ENABLERS

There are many factors which influence KM and are critical for success of KM. Skyrme and Amidon (1999) point out seven critical factors to a successful knowledge management effort:

- Strong link to a business imperative.
- Compelling vision and architecture.
- Knowledge leadership-the support of top management.
- Knowledge-creating and sharing culture.
- Continuous learning at all levels and among individuals and teams.
- Well developed technology infrastructure.
- Systematic organizational knowledge process.

Whereas Lucier and Torsilieri (1999) conducted studies on several knowledge projects and discovered four common traits in the less successful programs:

- No specific business objective, but only general aspirations.
- Incomplete program architecture that applies some principles of effective learning but does not build on the linked natural dynamics of organization change and knowledge creation and use.
- Insufficient focus on one or two strategic priorities.
- Top management sponsorship without active, ongoing involvement.

According to a survey conducted by McAdam and McCreedy (1997), the perceived benefits of KM are the four top scoring items which are: improved quality, efficiency, management learning and reduced costs. They are seen to relate to improving internal efficiency within the organizations. Improve consistency and competitiveness through reduced costs, were seen as being associated with efficiency.

2.8 RESEARCH GAPS

Coukos and Eleni (2003) state that despite the ongoing research contributions and efforts of private organizations to adapt to the notion of the information organization and the knowledge society, researchers have paid little attention to higher educational institutions. Although there is a great deal of research literature on Knowledge Management in the business sector, literature regarding Knowledge Management to support educational sector is scarce. Very less or no initiative has been taken by the most of the educational institutions to retain and distribute the knowledge within an organization to gain competitive advantage. Previous studies are mostly focused to address the full range of processes by which an organization deploys knowledge implementing KM in the knowledge based industries and other relevant business sector, however, limited research has been done to study the implementation of KM in the education sector. Since educational institutions are also not spared from the global competition, it is essential that they sustain their competitive edge.

Kidwell et. al.(2001)mentioned the following six areas in which KM can be implemented to improvise them:

- Research
- Curriculum Development
- Alumni Services
- Student Services
- Administrative Services
- Strategic Planning

Research and curriculum development are the core areas on which any institution's progress depends. Research reflects the institution's knowledge generating capacity and Research helps in Curriculum Development as well. Curriculum reflects the institution's ability to adapt the ever changing demands of globally competitive world. Well established alumni in the business world can facilitate, both Research and Curriculum Development with their invaluable suggestions. Hence Research, Curriculum Development and Alumni Contributions have been chosen as the areas for the development of a framework with KM.

2.9 CHAPTER SUMMARY

This chapter presents the views of earlier researchers on various aspects of Knowledge Management, the origin of the concept, the forms of knowledge, developments in methodologies related with knowledge sharing, changing face of knowledge in education, new innovative KM tools and technologies and their impact on education. The chapter also identifies the research gaps and the broad area of research. Next Chapter is going to focus on detailed methodology to set the framework for research.

CHAPTER - III

RESEARCH DESIGN AND METHODOLOGY

This Chapter covers the research design, sampling, methods of data collection, sample selection and survey areas, development of the hypotheses and methods of data analysis.

3.1 RESEARCH DESIGN

The present study endeavors to develop a framework of knowledge management for enhancing research, curriculum development and alumni contributions or services in selected institutions of higher technical education and descriptive research design has been used.

3.1.1 Objectives of the Study

The objectives of the present study are:

- To understand and explore the application of KM in Research, Curriculum Development and Alumni Contributions in IHTE.
- To identify and establish the possible linkages amongst Research, Curriculum Development and Alumni Contributions.
- To propose a framework for implementing KM in IHTE to reap the benefits of KM in the above mentioned areas.

3.1.2 Investigation Approach

- Examine the published/available literature of Knowledge Management and Higher Education and list out the learning.
- Study the existing framework of Knowledge Management.
- Design questionnaire, interview and carry out participatory stakeholders analysis.
- Evolve a shared vision of stakeholders for designing good knowledge management framework.
- Analyze and interpret the data using the appropriate statistical techniques like factor analysis, regression.

- Evolve a framework for the implementation of knowledge management in the institutions of higher technical education in India.

3.2 RESEARCH METHODOLOGY

3.2.1 Sampling Details

An effort was made to cover the selected top Institutions in Engineering and Management from all over India chosen from the best ranked institutions as given by Survey conducted by AC Nielson in India Today (2010). Statistical tools have been used to analyse the data through SPSS19. The results of this analysis have formed the input for the design of a Knowledge Management framework. The survey instrument investigates the factors for the inclusion in the Knowledge Management framework for the institutions of higher technical educational (IHTE)-an area that till date has received scant attention. The study also tries to identify the perceived benefits of KM implementation in higher technical education. From the identified list of measurement features, respondents were asked to rate the opinions about these issues using a 5-point Likert scale for each. The mean values for the usages were calculated on the following from highest to lowest with 5 being the highest and 1 being the lowest. The survey was supported by in-depth interviews with knowledge leaders of the organisations. Institutions of Higher Technical Education didn't have a well-established KM department. In most of the institutions, management representatives Dean of Academic Affairs and technical experts from computer Science Department were involved in KM. The data so collected was analyzed and KM framework had been designed.

The designations of the targeted respondents in the IHTE were categorized into two groups. The first group consists of management, senior academia that is, Professors, Associate Professors who are also dealing with managerial work would be addressed as group A. These were considered to be the best addressees because they are the overseers of their institutions' operations and are likely to be the "thought" leaders of KM. While it is

possible to argue that questionnaires should be forwarded to the CKO, the knowledge manager or the like, such positions are still not common in practice (Jarrar, 2002). The second group consists of Assistant Professors, Lecturers and Research Scholars who will be using and also contributing to the KM system. These are the “doers” and would be addressed as group B. Questionnaires together with covering letters explaining the purpose of the survey were distributed to a total of 75 IHTE in India through post, email and also by visiting institutions personally. An effort was made to cover selected top institutions in engineering and management from all over India, chosen from the best ranked institutions.

3.3 DETAILS OF THE QUESTIONNAIRE

A structured questionnaire was designed to gather data and this was supported with personal interviews with thought leaders. The survey technique was selected for the following reasons (Chauvel and Despres, 2002):

- A survey brings an issue into focus by defining and specifying its various elements.
- Its results are typically quantifiable and thus amenable to statistical analysis.
- Statistical treatment allows the results obtained from a sample to be extended to a larger population, thus enabling the generation of more global statements.
- It is faster and more direct compared to many other research methods.

The review of selected literature provided an initial development of a draft.

The following features for Research, Curriculum Development and Alumni Contributions were investigated using questionnaire to find out whether the Indian academia also believed that KM interventions could be applied to IHTE for their benefit.

Based on the literature review, Research, Curriculum Development and Alumni Contributions features are concluded which are given below:

3.3.1 Research Features for Knowledge Management Framework

The following nine features of research are considered for the inclusion in KM framework:

- i. Research interests within an institution or affiliated institutions.
- ii. Research results and funding organizations with easy search capabilities.
- iii. Commercial opportunities for research results.
- iv. Funding opportunities
- v. Pre-populated proposals, budgets and protocols
- vi. Proposal routing policies and procedures
- vii. Award notification, account setup, and negotiation policies and procedures
- viii. Contract and grant management policies and procedures.
- ix. Technical and financial report templates and policies and procedures.

3.3.2 Curriculum Development Features for Knowledge Management framework

The present research investigates the following eight features for the inclusion in curriculum development KM framework.

- i) Curriculum revision efforts that include lesson plan, content sequencing, reference of contents and so forth.
- ii) Content modularized and arranged to facilitate interdisciplinary curriculum design and development.
- iii) Assessment techniques, including best practices, outcomes tracking, faculty development opportunities and research.
- iv) Analyzed student evaluations updated each semester for lessons learned and best practices for all faculty.
- v) Corporate relationships to identify curriculum design advisory task forces, guest speakers, adjuncts, case study sites and so forth.
- vi) Information related to teaching and learning with technology including faculty development opportunities, outcomes tracking, lessons learned, technology overviews, and so forth.
- vii) Information in each disciplinary area, including updated materials, recent publications, applicable research, and so forth.

- viii) New faculty with guides for developing curriculum, working with senior faculty, establishing effective teaching styles, advising do's and do not's, supervising Ph.D. students and so forth.

3.3.3 Alumni Contributions Features for Knowledge management framework

Alumni contribution features which are investigated through the survey are as follows:

- i) Alumni's feedback for competent and industry oriented curriculum.
- ii) Alumni's contribution for research e.g. grants, industry oriented research.
- iii) Alumni services to career development efforts.
- iv) Career placement services (potentially all corporate connections of alumni) to provide a one-stop service centre for students and faculty.

The details of questionnaire along with response method used are given below:

Table 3.1: Details of the Questionnaire			
A:	Respondent and Organizational Profile	Response method	Basic objective/ purpose
1)	Your Name:		Data identification
2)	Institution Name:		Organisational Profile
3)	Place:		Demographic Data
4)	Job Title:	Please tick (✓)	Demographic Data
5)	Higher Education Institution Type:	✓	Organisational Profile
6)	What is the highest level of course your institution offers(if any other, please specify):	✓	Organisational Profile
7)	Is Knowledge Management System implemented in your institution?	✓	Organisational Profile
B:	Information and Communication Technologies(ICT)		
	"Information and communications technologies (ICT) are the computing and communications facilities and features that variously support teaching, learning and a range of activities in education."	Likert Scale	Inclination of academia towards ICT
1)	ICT skills and applications are needed to keep the pace with world in the knowledge age?	✓	
2)	Educators can use the new technology to improve their teaching, give it more variety e.g. power point shows, web discussions, URL collections, websites.	✓	

3)	The usage of ICT will improve knowledge sharing among educator and students.	√	
C:	Knowledge Management System in your Institution of Higher Technical Education		
I.	Policies and Strategies	Likert Scale	
	To what extent your institution		Level of Adoption of KM in IHTE
1)	is inclined towards having/have written KM policy or strategy.	√	
2)	has a values system or culture intended to promote knowledge sharing.	√	
3)	uses partnerships or strategic alliances to acquire knowledge.	√	
4)	rewards the employees monetarily who share the knowledge.	√	
5)	rewards the employees non monetarily who share the knowledge.	√	
II.	Knowledge Acquisition (Capturing or Gathering Knowledge)		
	Your institution regularly	Likert Scale	
1)	captures and uses knowledge obtained from research institutions including universities and government laboratories.	√	Methods used to acquire knowledge in IHTE
2)	dedicates resources to detect and obtain external knowledge and communicate it with in the institution.	√	
3)	encourages faculty to participate in project teams with external experts.	√	
4)	documents the procedures e.g. what and why the changes are made in curriculum.	√	
5)	subscribes to external databases or journals.	√	
III.	Knowledge Storage		
	To what extent your institution uses the method to store the knowledge	Likert Scale	
1)	by having the department wise database.	√	Methods used in IHTE to store knowledge.
2)	by maintaining “best practices and lessons learned” database.	√	
IV.	Knowledge Dissemination (To spread or broadcast knowledge)		
	To what extent the following methods are used for knowledge dissemination in your university/ institution	Likert Scale	
1)	preparing written documentation such as lessons learned , training manuals, good work practices, articles for publication etc.	√	
		√	
2)	internal lectures, knowledge sharing seminars?	√	
3)	sharing via intranet?	√	
4)	knowledge sharing committees?	√	

V.	Knowledge Management Technologies		
	To what extent the IHTE uses the following technologies	Likert Scale	
1)	Internet (such as search engines)	√	Preference regarding KM technologies.
2)	Intranet (such as internal portals)	√	
3)	Extranet (such as knowledge bases)	√	
4)	Data Warehousing	√	
5)	Document Management	√	
6)	Blog	√	
7)	Decision Support Systems	√	
8)	Artificial Intelligence	√	
9)	Groupware	√	
D:	Knowledge Management and Research Process		
a)	KM Research Features		
	In your opinion the KM in Higher Technical Educational Institutions should have:	Likert Scale	
1)	Research interests within an institution or affiliated institutions	√	KM Features of Research for Inclusion in KM Framework
2)	Research results and funding organizations with easy search capabilities.	√	
		√	
3)	Commercial opportunities for research results.	√	
4)	Funding opportunities	√	
5)	Pre-populated proposals, budgets and protocols	√	
6)	Proposal routing policies and procedures	√	
7)	Award notification, account setup, and negotiation policies and procedures	√	
8)	Contract and grant management policies and procedures.	√	
9)	Technical and financial report templates and policies and procedures.	√	
	According to you, what other features should be added to the Knowledge Management:	Open Ended	Suggestions
b)	Perceived Benefits		
	The following benefits can be incurred after the implementation of KM:	Likert scale	
1)	Latest research can give good inputs to improve the curriculum development process	√	Identify Perceived benefits for enhancing research in IHTE
2)	Quality research at the institution level will cultivate future scientists	√	
	Increased competitiveness and responsiveness for research grants, contracts, and commercial opportunities.	√	
		√	
4)	Reduced turnaround time for research.	√	
5)	Minimized devotion of research resources to administrative tasks.	√	
6)	Facilitation of interdisciplinary research.	√	
7)	Leveraging of previous research and proposal efforts.	√	

8)	Improved internal and external services and effectiveness.	√	
9)	Reduced administrative costs.	√	
E:	Knowledge Management and Curriculum Development (CD)		
a)	KM Curriculum Development Features		
	In your opinion the KM in Higher Educational Institutions should have:	Liker Scale	
1)	Curriculum revision efforts that includes lesson plan, content sequencing, reference of contents and so forth.	√	KM Features of Curriculum Development for Inclusion in KM Framework
2)	Content modularized and arranged to facilitate interdisciplinary curriculum design and development.	√	
3)	Assessment techniques, including best practices, outcomes tracking, faculty development opportunities, and research.	√	
4)	Analyzed student evaluations updated each semester for lessons learned and best practices for all faculty.	√	
5)	Corporate relationships to identify curriculum design advisory task forces, guest speakers, adjuncts, case study sites, and so forth.	√	
6)	Information related to teaching and learning with technology, including faculty development opportunities, outcomes tracking, lessons learned, best practices, technology overviews, and so forth.	√	
7)	Information in each disciplinary area, including updated materials, recent publications, applicable research, and so forth.	√	
8)	New faculty with guides for developing curriculum, working with senior faculty, establishing effective teaching styles, advising do's and don'ts, supervising PhD students, and so forth.	√	Suggestions
	According to you, what other features should be added to the Knowledge Management:	Open Ended	
c)	Perceived Benefits		
	The following benefits can be incurred after the implementation of KM:	Likert Scale	
1)	Good curriculum will enhance the research.	√	Identify Perceived benefits for enhancing Curriculum Development in IHTE
2)	An industry oriented and latest curriculum will produce competent professionals	√	
3)	Enhanced quality of curriculum and programs by identifying and leveraging best practices and monitoring outcomes.	√	
4)	Improved speed of curriculum revision and updating.	√	
5)	Enhanced faculty development efforts, especially for new faculty.	√	
6)	Improved administrative services related to teaching and learning with technology.	√	
7)	Improved responsiveness by monitoring and incorporating lessons learned from the experiences	√	

	of colleagues, student evaluations, and corporate or other constituent input.		
8)	Interdisciplinary curriculum design and development facilitated by navigating across departmental boundaries.	√	
F:	Knowledge Management and Alumni Contributions		
a)	KM Alumni Contributions Features		
	In your opinion the KM in Higher Educational Institutions should have:	Likert Scale	
1)	Alumni's feedback for competent and industry oriented curriculum.	√	KM Features of Alumni Contribution for Inclusion in KM Framework
2)	Alumni's contribution for research e.g. grants, industry oriented research	√	
3)	Alumni services to career development efforts.	√	
4)	Career placement services (potentially all corporate connections of alumina) to provide a one-stop service centre for students and faculty.	√	
	According to you, what other features should be added to the KM:	Open ended	
			Suggestions
b)	Perceived Benefits		
	The following benefits can be incurred after the implementation of KM:	Likert Scale	
1)	Alumni can contribute to research eg. grants, industry oriented research.	√	Identify Perceived benefits for enhancing Alumni Contributions in IHTE
2)	With alumina feedback, competent and industry oriented curriculum can be developed.	√	
3)	Improved services for alumni and other external constituents.	√	
G:	Knowledge Management Enablers		
	According to you, to what extent the following factors will enable KM in the institution:	Likert Scale	
1)	Leadership	√	Identify KM Enablers
2)	Structure, roles and responsibilities	√	
3)	Information and communications technology	√	

3.4 Tools and Techniques

3.4.1 Z-Test

Z- test is a statistical test used to determine whether two population means are different for a sample size greater than 30. The present study has used

z-test as the sample size is 141. The two groups taken in the study are: group A (senior management and senior academia) and group B (junior academia and research scholars). Z-Test has been used for hypotheses testing features of Research, Curriculum Development and Alumni Contributions for inclusion in KM framework.

3.4.2 Factor Analysis

Factor analysis is a collection of methods used to examine how underlying constructs influence the responses on a number of measured variables (DeCoster, 1998). Since many features were considered related to research, curriculum development and alumni contributions, factor analysis was performed to find out the important factors among them. Factor analysis attempts to identify a set of dimensions that is not directly observable in a large set of variables. This analysis is used to summarize a majority of the information in a data set in terms of relatively lesser new categories, called factors. Major use of factor analysis is to group similar variables so that smaller number of variables can be selected for further analysis.

Factor Analysis begins with the construction of a new set of variables based on the relationships in the correlation matrix. Principal component analysis can be used to transform a set of variables into a new set of composite variables or principal components that are not correlated with each other. These linear combinations of variables, called factors, account for the variance in the data as a whole. The best combination makes up the first component and is the first factor. The second principal component is defined as the best linear set of variables for explaining the variance not accounted for by the first factor. There may be many factors, each being the best linear combination of variables not accounted for by the previous factors (Cooper and Schindler, 2006). Factor analysis has been used in this study to reduce Research, Curriculum Development and Alumni Contributions features into smaller number of factors which can be used for further analysis.

3.4.3 Regression

In order to determine the direction and strength of relationship between variables regression has been used. Regression helps to determine the relationship between Research, Curriculum Development and Alumni Contribution factors and Perceived benefits. Factor obtained through factor analysis have been used as independent variables and perceived benefits have been used as dependant variable.

3.5 HYPOTHESES TESTING

The following hypotheses have been framed and tested:

- H₁:** There is no significant difference in the rating given to features related to research in IHTE, for inclusion in the KM framework by group A (management and senior academia) and group B (junior academia and research scholars).
- H₂:** Perceived benefits of proposed KM framework may be positively related with Research Factors.
- H₃:** There is no significant difference in the rating given to factors related to curriculum development in IHTE for inclusion in the KM framework for by group A (management and senior academia) and group B (junior academia and research scholars).
- H₄:** Perceived benefits of proposed KM framework may be positively related with Curriculum Development Factors.
- H₅:** There is no significant difference in the rating given to features related to alumni contributions in IHTE, for inclusion in the KM framework by group A (management and senior academia) and group B (junior academia and research scholars).
- H₆:** Perceived benefits of proposed KM framework may be positively related with Alumni Contribution Factors.

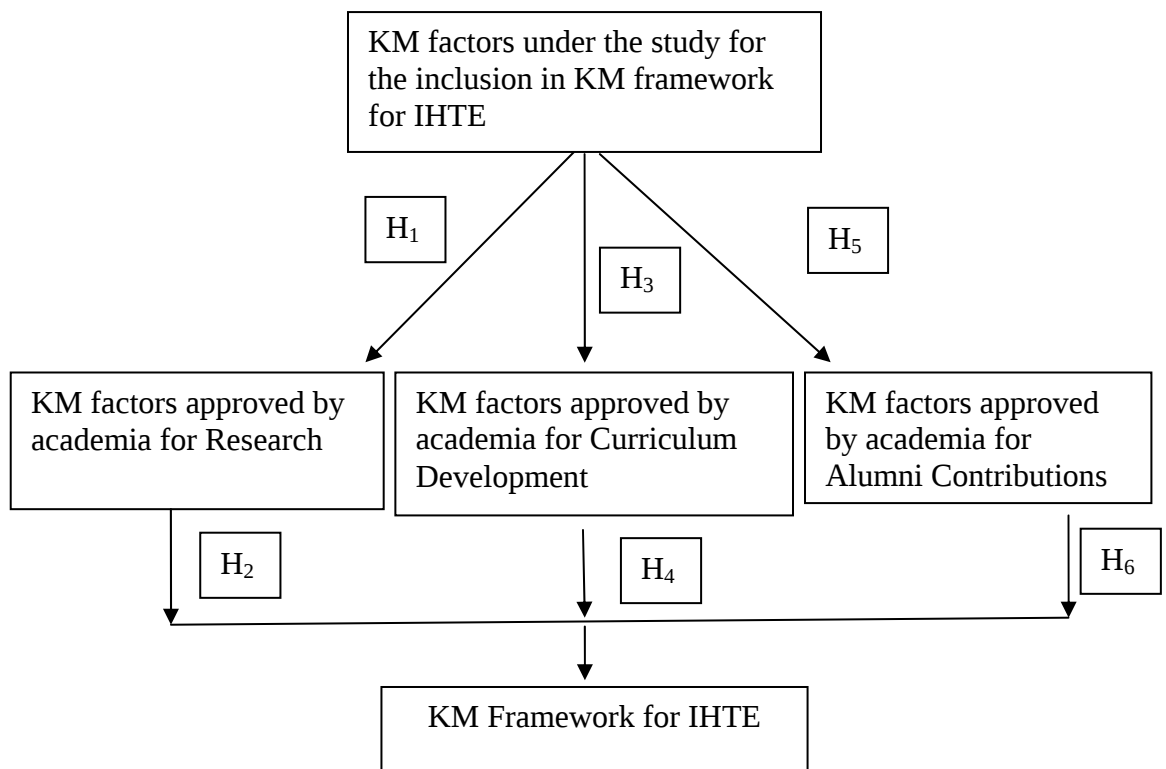


Figure 3.1: Research Framework

3.6 DATA RELIABILITY

The internal reliability of the instrument was assessed using Cronbach's Alpha and content was validated by a panel of experts. A sample of 141 respondents representing 30 IHTE's yielded coefficients ranging from 0.883 - 0.916 as shown in Table 3.2. According to Nunally (1978) the generally accepted standard for reliability estimates are values greater than 0.70. The high reliability has been observed and this implies that the items do measure the same construct satisfactorily. The overall estimated item-wise reliability has been given in the Table 3.2:

Table 3.2: Reliability		
Sr No	Factor	Cronbach Alpha
1	Knowledge Management in the respective Institution of Higher Technical Education(IHTE)	0.916

2	Knowledge Management and Research	0.927
3	Knowledge Management and Curriculum Development	0.883
4	Knowledge Management and Alumni Contributions	0.712
6	Overall	0.916

On the basis of reliability and validity results, it is believed that the instrument as a whole has valid contents. Data analysis was performed and the results were taken as inputs for designing knowledge management framework for enhancing Research, Curriculum Development and Alumni Contributions in IHTE.

3.7 CHAPTER SUMMARY

Choosing the right research design and methodology is one of the most important aspects of the research process for targeted outcomes. Today very potent and scientific tools are available which make the process even speedier, pain free, reliable and accurate. Questionnaire based primary data, and in-person interviews and observations have been chosen for the present study. This chapter presents an insight into the methodology that has been used for data analysis and interpretation in the subsequent chapters.

CHAPTER – IV

DATA ANALYSIS

This chapter deals with analysis and discussion of the responses gathered from the management, senior, junior academia and research scholars about their expectations from KM to help in evolving and developing Knowledge Management framework for enhancing Research, Curriculum Development and Alumni Contributions. For the success of any Knowledge Management, it is important to first understand the needs, priorities and aspirations of all the stakeholders. Lack of such an understanding can result in failure of KM system. The real test of the success of such systems is when the targeted people drive these initiatives rather than being driven by management or technology.

The present study takes the participative stakeholder analysis to get a shared vision of management, senior, junior academia and research scholars through the questionnaire to propose a strategic KM framework for enhancing Research, Curriculum Development and Alumni Contributions. Sampling statistics viz. z-test, factor analysis and regression have been used for data analysis.

4.1 PARTICIPATIVE ANALYSIS

An effort was made to cover the top Institutions in Engineering and Management from all over India chosen from the best ranked institutions as given by survey conducted by AC Nielson in India Today (2010) as explained earlier. Statistical tools have been used to analyse the data. The results of this analysis have helped in designing of a Knowledge Management framework. The survey instrument investigates the factors for the inclusion in the Knowledge Management framework for the Institutions of Higher Technical Educational (IHTE) –a less researched area, especially in India. The designations of the targeted respondents in the IHTE were categorized in two groups. The first group consists of management and senior academia that is, Professors, Associate Professors who are also dealing with managerial work, addressed as group A. These are “thought” leaders involved in implementation and development of KM. The second group consists of Assistant professors, Lecturers and Research scholars who will be using and also contributing to the KM and also the “doers”, addressed as group B.

Finally, the questionnaires along with covering letters explaining the purpose of the survey were distributed to a total of 75 IHTE in India. Follow-up reminders were sent to improve the response rate. Responses were finally received from 30 Institutions and data was collected by personally visiting these institutions time and again. The response rate has been 40 percent. The details of the respondents from these thirty institutions are shown in table 4.1.

Table 4.1: Profile of Respondents	
Designation	Number
Group A: Management and Senior Academia	41
Group B: Junior Academia and Research Scholars	100

In total 141 responses were received from 30 institutions of higher technical education, out of which 41 were from group A and rest 100 belong to group B as shown in figure below.

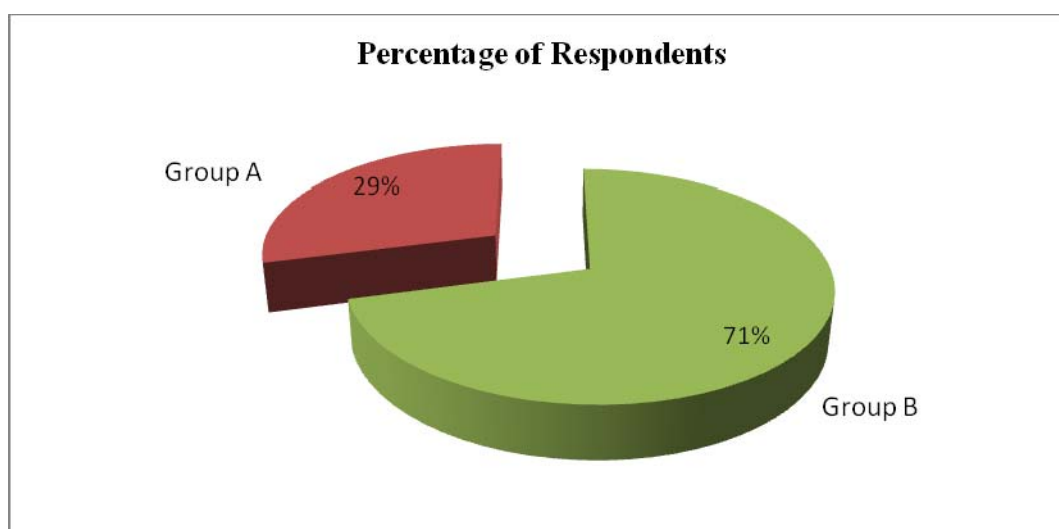


Figure4.1: GroupWise Percentage of Respondents

4.2 NEED OF ICT FOR IMPLEMENTATION OF KM IN IHTE

ICT enables and provides the entire infrastructure and tools to support KM processes within an enterprise (Hendriks, 2001). ICT in KM provides the potential for greatly enhanced access to knowledge combined with the challenge of how to manage the access (Hawkins, 2000).

Table 4.2: ICT in IHTE										
S. No.		1	2	3	4	5	Mean	Std. Dev.	Score %	Rank
1	ICT skills and applications are needed to keep the pace with world in the knowledge age	-	2	9	45	44	4.74	.46	86.2	1
2	Educators can use the new technology to improve their teaching, give it more variety, e.g. power point shows, web discussions, URL collections, websites.	-	1	15	38	46	4.54	.61	85.8	3
3	The usage of ICT will improve knowledge sharing among educator and students.	-	2	15	38	45	4.55	.64	84.8	2

The results depicted in table 4.2 confirm that the academia strongly supports the use of ICT in education and believe that it will enhance knowledge sharing. Respondents from all the 30 institutions considered ICT a very important for Knowledge Management. Regarding ICT status of institutions surveyed, there was almost consensus that ICT skills and applications are needed to keep the pace with world in the knowledge age and this got the highest rating. ‘The usage of ICT will improve knowledge sharing among educator and students’ was rated second. There was difference of opinion regarding whether educators could use the new technology to improve their teaching, to give it more variety e.g. power point slide shows, web discussions, URL collections, websites, etc.

4.3 PRESENT STATE OF KM IN THE SELECTED IHTE IN INDIA

The first objective of the study is:

OBJECTIVE 1: *To understand and explore the application of KM in Research, Curriculum Development and Alumni Contributions in IHTE.*

This has been accomplished through section 4.3.1, 4.3.2 and 4.3.4. The first section of questionnaire, focused on investigating the present state of knowledge management in the IHTE. The current status of the implementation of KM of these institutions has been measured through the ratings given in term of percentage. The categories 4 and 5 show higher inclination and implementation of KM while 1 and 2 depict the lower implementation status, 3 depicts moderate implementation of KM.

4.3.1 Policies and Strategies: The policies and strategies decided by management for KM, strategic alliances and rewards for sharing knowledge were investigated. The results are shown in table 4.3.

Table 4.3: Present State of KM Policies and Strategies in IHTE in India					
To what extent your institution	1	2	3	4	5
	(In percentage)				
is inclined towards having/have written KM policy or strategy?	5.67	9.22	27	43.3	14.9
has a values system or culture intended to promote knowledge sharing?	2.13	4.26	33.3	45.4	14.9
uses partnerships or strategic alliances to acquire knowledge?	2.84	7.09	27	47.5	15.6
rewards the employees monetarily who share the knowledge?	17.02	14.89	33.3	26.2	8.51
rewards the employees non monetarily who share the knowledge?	7.09	13.48	32.6	36.2	10.6

From the above table 4.3, it is aptly clear that IHTE are inclined towards KM policies, strategic alliances to promote knowledge sharing culture but the rewards for the sharing knowledge for the employees were rated lower in priority.

4.3.2 Knowledge Acquisition: Institutions of higher technical education by nature are the power house of knowledge. The organization should make an effort to acquire, both explicit and tacit knowledge that exists inside and outside the IHTE. It can be accomplished by dedicating resources to detect and obtain external knowledge. IHTE's interest to acquire knowledge and methods used are investigated in this section. The results are shown in table 4.4.

Table 4.4: Present State of Knowledge Acquisition in Selected IHTE in India					
The Institution:	1	2	3	4	5
	(In percentage)				
captures and uses knowledge obtained from other research institutions including universities and government laboratories.	4.96	5.67	26.2	38.3	24.8
dedicates resources to detect and obtain external knowledge and communicate it within the institution.	2.84	9.22	24.8	49.6	18.4
encourages faculties to participate in project teams with external experts	3.55	3.55	24.8	47.5	20.6
documents the procedures, e.g. , what and why the changes are made in curriculum.	4.96	8.51	24.1	40.4	22
subscribes to external databases or journals.	2.84	2.13	22.7	47.5	24.8

As shown in table 4.4 for the institutions of higher technical education the preferred mode of knowledge acquisition is through dedicating resources to detect and obtain external knowledge and communicate it within the institution. This is followed by encouraging its faculty to participate in project teams with external experts and by subscription to external databases or journals. Capturing and using knowledge obtained from other research institutions including universities and government laboratories is a little lower on priority. This maybe because knowledge sharing within research and educational institutions has not crossed a particular level and is still a distant dream. Unlike developed countries where most of industrial projects are shared with

educational institutions, research in India is still conducted in Research Institutions and less supported by Educational Institutions. This calls for a stronger Industry/ Research and Educational institution interaction.

4.3.3 Knowledge Storage: To utilize the acquired knowledge for future use, it should be stored systematically. This section (table 4.5) covers the steps taken by IHTE in this direction. The academia was inquired about the extent to which their institution uses the following methods to store knowledge:

Table 4.5: Present State of Knowledge Storage in selected IHTE in India					
Knowledge Storage in Institution is through:	1	2	3	4	5
	(In percentage)				
department wise database	5.67	4.96	14.9	39	35.5
maintaining “best practices and lessons learned” database	9.93	13.48	34.8	29.1	12.8

Majority of the institutions responded that they store knowledge through department wise database. Maintaining “best practices and lessons learned” database is still not popular in IHTE. One basic reason has been that IHTEs are yet to implement KM fully and they are in partial or initial implementation stage.

4.3.4 Knowledge Dissemination: The process described so far encompasses the collection and storage of knowledge generated and gathered, lessons learned information to allow an organisation to capitalize on its experience and improve its performance. The stored knowledge has to be disseminated effectively for sharing the benefits. Knowledge can be shared in traditional ways and also with technology driven modes. This section covers the extent to which the methods are used in institutions for knowledge dissemination:

Table 4.6: Present State of Knowledge Dissemination in Selected IHTE in India					
To what extent your institution	1	2	3	4	5
	(In percentage)				
prepares written documentation such as lessons learned , training manuals, good work practices, articles for publication etc.	3.55	4.96	24.8	46.1	20.6
conducts internal lectures, knowledge sharing seminars.	1.42	6.38	15.6	53.2	23.4
shares knowledge via intranet.	8.51	9.22	23.4	34.8	24.1
establishes knowledge sharing committees.	9.93	20.56	32.6	27.7	9.22

For dissemination of knowledge higher rating has been given to internal lectures, knowledge sharing seminars, followed by preparing written documentation such as lessons learned, training manuals, good work practices, articles for publication etc. Knowledge sharing committees were adjudged lower in rating by the academia.

In this globally competitive environment, KM implementation in IHTE should demand the highest priority, but reality speaks otherwise, as knowledge sharing in IHTE is not proper, neither is KM implementation complete. Academia is still relying on written documentation, so there is a valid reason to generate awareness about KM implementation to stimulate Research, Curriculum Development and Alumni Contributions in IHTE.

4.4 KNOWLEDGE MANAGEMENT TECHNOLOGIES

The critical role that IT can play is in its ability to support communication, collaboration, and those searching for knowledge and information (McC Campbell et al., 1999). Information technology and the advent of the personal computer have greatly enhanced organizational effectiveness, inter-organizational deployment, and cognitive advance (Grover and Davenport, 2001).

In the age of technology, one has many options to opt from the available Information and Communication Technologies (ICT). The academia was asked to rate the following ICTs according to their preference or usage in the IHTE:

- **Internet:** Internet is a worldwide system of computer networks - a network of networks in which users at any one computer can, if they have permission, get information from any other computer.
- **Intranet:** Intranet is a privately maintained computer network that can be accessed only by authorized persons, especially members or employees of the organization that owns it.
- **Extranet:** Extranet is an extension of an institution's intranet, especially over the world wide web, enabling communication between the institution and people it deals with, often by providing limited access to its intranet.
- **Data Warehousing:** Data warehousing is a large specialized database, holding perhaps hundreds of terabytes of data. A database is specifically structured for information access and reporting.
- **Document Management:** Document management is the process of handling documents in such a way that information can be created, shared, organized and stored efficiently and appropriately.
- **Blog:** Blog is a frequent, chronological publication of personal thoughts and web links.
- **Decision Support System:** Decision Support System (DSS) is an interactive software-based system intended to help decision makers compile useful information from raw data, documents, personal knowledge, and/or business models to identify and solve problems and make decisions.
- **Artificial Intelligence:** Artificial Intelligence (AI) is the study and design of intelligent agents where an intelligent agent is a system that perceives its environment and takes actions which maximizes its chances of success.
- **Groupware:** Groupware refers to programs that help people work together collectively while located remotely from each other. Groupware services can include the sharing of calendars, collective writing, e-mail handling, shared database access, electronic meetings with each person able to see and display information to others, and other activities. Groupware provides a mechanism that helps users coordinate and keep track of ongoing projects together.

The academia preferred internet to other technologies. The details of preferred choices of KM technologies using mean scores has been shown through the web diagram (fig. 4.2):

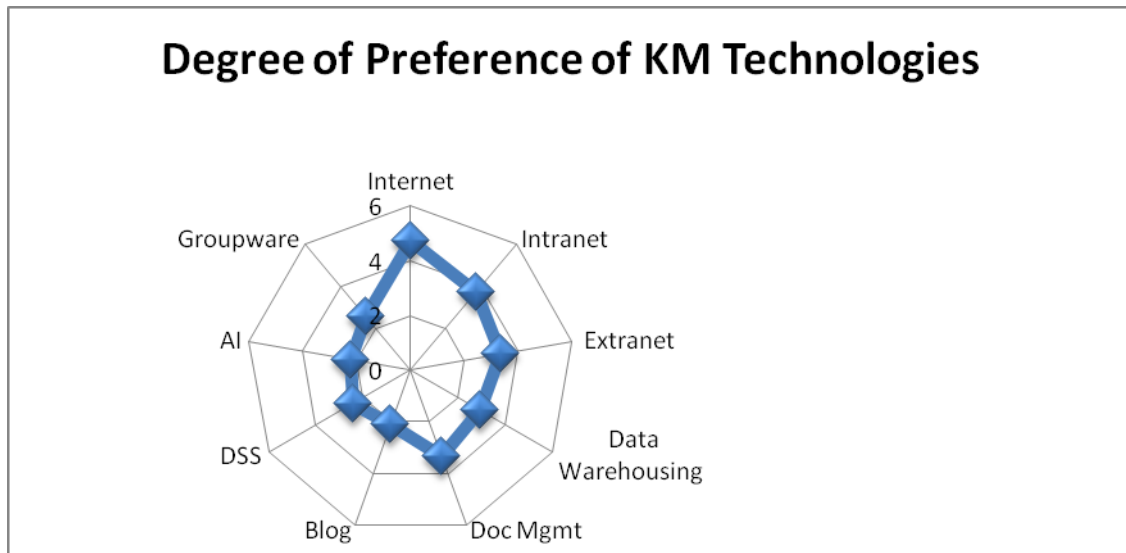


Fig.4.2: Degree of Preference of KM Technologies

The study also used factor analysis to categorise KM technologies into factors. KM technologies were categorised into two factors namely: 'preferred technologies' and 'other technologies'. Both these factors explained 61.207 percent of total variation. The results are shown in table 4.7.

Table 4.7: Factors for KM Technologies								
Fact or No	Factor Name	Eigen Value	Total % of Var.	Items	Item Loading	Mean	S.D.	Rank
1	Preferred Technologies	3.687	40.971	i. Internet	0.861	4.71	.494	1
				ii. Intranet	0.860	3.71	1.208	2
				iii. Extranet	0.811	3.24	1.180	4
Mean Score of Preferred Technologies						3.89		
2	Other Technologies	1.821	20.236	i. Data Warehousing	0.655	2.93	1.316	5
				ii. Document Management	0.595	3.51	1.168	3
				iii. Blog	0.680	2.34	1.194	8
				iv. Decision Support Systems	0.681	2.49	1.192	7
				v. Artificial Intelligence	0.661	2.29	1.213	9
				vi. Groupware	0.656	2.56	1.288	6
Mean Score of Other Technologies						2.69		

The results indicate that ‘preferred technologies’ include internet, intranet and extranet and they explain 40.971 percent of variation. The next factor viz. ‘other technologies’ consists of Data Warehousing, Document Management, Blog, Decision Support Systems, Artificial Intelligence and Groupware. This factor explains 20.236 percentage of total variation. Thus the academia has chosen the ‘preferred technologies’, i.e., internet, extranet and intranet as most widely used. The mean score of ‘preferred technologies’ is 3.89 and is higher than mean score of ‘other technologies’, i.e., 2.69.

Educational Institutions just like business organizations need to capture, manage and store knowledge from materials and resources accumulated by information technology. Their effective management and utilization has become an important issue. Knowledge management principles may be employed to make them easily

available to users for retrieval and sharing (Tan, 2005). In enriching digital resources, knowledge management strategies will have to be adopted to facilitate the usage and sharing of resources and experiences. This by and large, remains on paper only. Educational Institutions need guidance in formulating strategy to handle the mountain of files and materials.

4.5 KNOWLEDGE MANAGEMENT ENABLERS

Hogberg and Edvinsson (1998) and Kermally (2002) opine that managing knowledge is about creating an environment within your organization so that people can openly share their experience and transfer knowledge. Next step of research was to understand the factors within an organisation that can help create a KM environment. Based on earlier studies, KM enablers included in the study are: Leadership, Structure, roles and responsibilities; and Information technology infrastructure

Table 4.8 KM Enablers				
Job Title:		Leadership	Structure, roles and responsibilities	Information technology infrastructure
Group A	Mean	4.44	4.37	4.70
	Std. Deviation	.72	.54	.46
Group B	Mean	4.47	4.38	4.55
	Std. Deviation	.67	.58	.61
Total	Mean	4.45	4.40	4.59
	Std. Deviation	.69	.57	.57

Regarding importance of KM enablers (table4.8) Information technology infrastructure got the highest mean score followed by leadership with a mean score of 4.45. Structure, roles and responsibilities got a slightly lower score of 4.40. Group-wise analysis also highlighted similar results with ICT being rated higher, followed by leadership and Structure, roles and responsibilities. Empirical evidence also supports the importance of IT and leadership in KM framework. Hansen et al. (1999) and Snowden (2003) advocate IT as a potent tool for Knowledge sharing and dissemination. However, investment in technology may

not be the only factor that could enable knowledge sharing. Researchers (Chong, 2006; Liebowitz, 1999; Civi, 2000; Davenport & Prusak, 1998; Salleh & Goh, 2002) have insisted that top-management leadership and commitment are the most critical factors for a successful knowledge management project, particularly in knowledge-creating and culture-sharing activities.

4.6 RELATIONSHIP BETWEEN RESEARCH, CURRICULUM DEVELOPMENT AND ALUMNI CONTRIBUTIONS

The second objective is accomplished through this section:

OBJECTIVE 2: *To identify and establish the possible linkages amongst Research, Curriculum Development and Alumni Contributions.*

An effort was made to find out the relationship between Research and Curriculum Development; Research and Alumni Contributions; Curriculum Development and Alumni Contributions. In the structured questionnaire, six set of questions were included and inputs were also collected through personal interviews with thought leaders to extract the academia's viewpoint regarding the relationship between these. Respondents were asked to rate these issues using a 5-point likert scale. The mean values for the usages were calculated on the following with 5 being the highest and 1 being the lowest. The results have been depicted in the following three sections:

- Research and Curriculum Development
- Research and Alumni Contributions
- Curriculum Development and Alumni Contributions

4.6.1 Research and Curriculum Development

To know about the perception of academia about the interrelationship between Research and Curriculum Development, the following questions were asked:

- Latest research can give good inputs to improve the Curriculum Development process.
- Good Curriculum will enhance Research.

Out of the 141 respondents, 76% opined that Research and Curriculum Development have a strong positive feedback influence on each other:

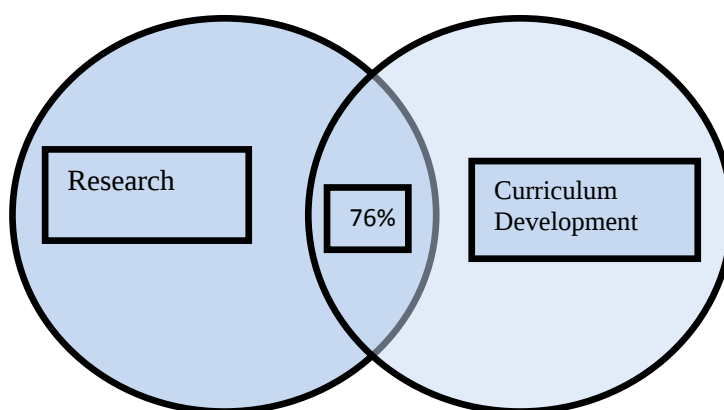


Figure 4.3: Academia's Perception of Research and Curriculum development relationship

Respondents' response is compiled in table 4.9.

Table 4.9: Relation between Research and Curriculum Development			
Factors	Managem ent and Senior Academia	Junior Academia and Research Scholars	Total
Latest research can give good inputs to improve the curriculum development process.	4.68	4.69	4.685
Good curriculum will enhance the research.	4.41	4.41	4.41

Although there is interdependence between Research and Curriculum Development, as reflected by results of both the groups but good Research will enhance Curriculum Development has higher acceptance level.

4.6.2 Research and Alumni Contributions

To understand the relation between Research and Alumni Contributions the academia was asked to rate the following:

- Quality research at the institution level will cultivate future scientists.

- Alumni can contribute to research e.g. Grants, industry oriented research.

The results suggest that 69% of the respondents expressed a strong mutual positive feedback loop between Alumni Contributions received and Research carried out by an institution.

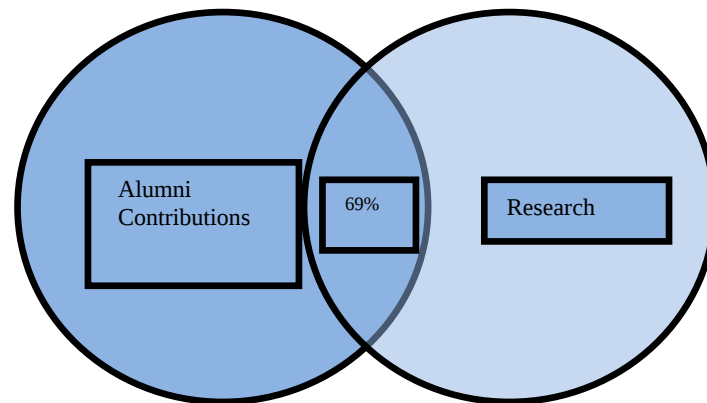


Figure 4.4: Academia’s Perception of Research and Alumni Contribution Relationship

The analysis of responses of the respondents regarding their perception about Research and Alumni Contributions are given in table 4.10.

Table 4.10: Relation between Research and Alumni Contributions			
Factors	Management and Senior Academia	Junior Academia and Research Scholars	Total
Quality research at the institution level will cultivate future scientists	4.41	4.58	4.53
Alumni can contribute to research e.g. Grants, industry oriented research.	4.21	4.28	4.26

For both the features the score of junior academia is higher. This reflects their faith that quality research at institution level can cultivate future scientists. Also they believe that alumni can contribute to research, in terms of grants and giving guidelines to initiate industry oriented research.

4.6.3 Curriculum Development and Alumni Contributions

To find out if academia perceived any linkage between Curriculum Development and Alumni Contributions, the following questions were asked:

- An industry oriented and latest curriculum will produce competent professionals.
- With alumina feedback, competent and industry oriented curriculum can be developed.

Regarding relation between Curriculum Development and Alumni Contributions, a relatively lower percentage of respondents (65%) felt that there is a strong positive feedback influence between the two.

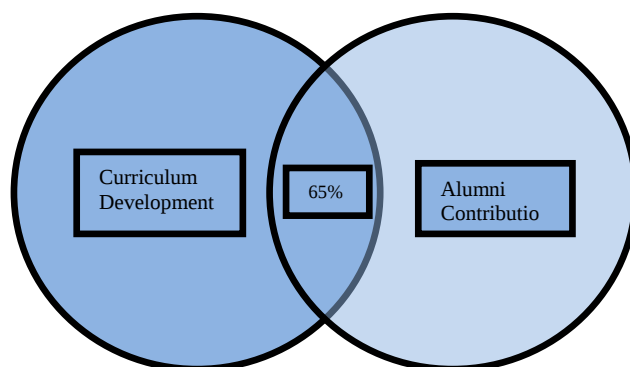


Figure 4.5: Academia's Perception of Curriculum Development and Alumni Contribution Relationship

Table 4.11: Relation between Curriculum Development and Alumni Contributions			
Factors	Management and Senior Academia	Junior Academia and Research Scholars	Total
An industry oriented and latest curriculum will produce competent professionals.	4.61	4.39	4.45
With alumina feedback, competent and industry oriented curriculum can be developed.	4.31	4.35	4.34

Group A believes more firmly that an industry oriented and latest curriculum will produce competent professionals. About the “alumina feedback and curriculum” both the groups think almost alike.

4.7 ANALYSIS OF RESEARCH FEATURES

This section covers the detailed analysis of research features. One section of questionnaire focused on getting inputs and suggestions from the academia to design KM framework. Successful KM should stem from the attention or importance placed on the necessary features and to attain the perceived benefits. The following hypotheses have been framed to examine the same:

***H₁:** There is no significant difference in the rating given to features related to research in IHTE, for the inclusion in the KM framework by group A (management and senior academia) and group B (junior academia and research scholars).*

***H₂:** Perceived benefits of proposed KM framework may be positively related with Research Factors.*

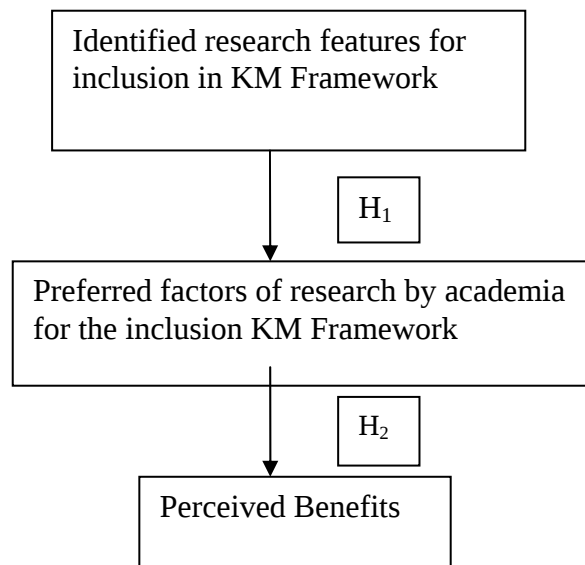


Figure 4.6: Research Features and Perceived Benefits

The following tests have been used for analysing the same:

- Mean score

- z-test
- Factor analysis
- Regression analysis

4.7.1 Research Features

The academia was asked to rate the identified features on a five point Likert-scale and to give suggestions regarding any other features that they thought should be included in KM framework. The respondents were required to indicate the level of importance of these features for the inclusion in the KM system on a scale from 1 to 5 with 1 being least important and 5 most important. The overall rating of research features is shown in fig. 4.7.

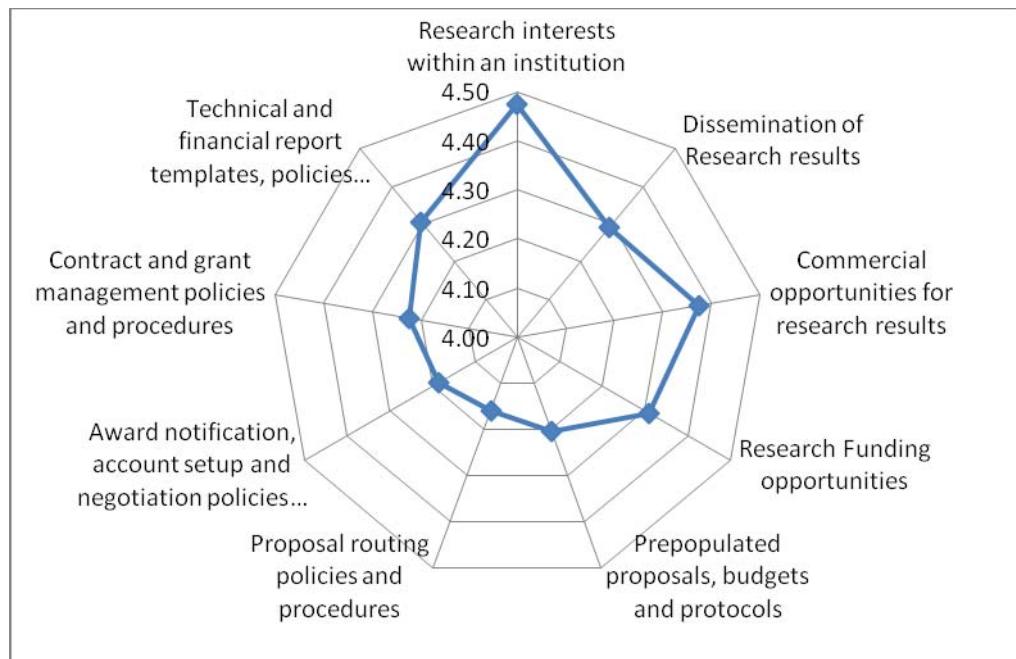


Fig. 4.7: Research Features

Group-wise mean score was calculated for all the features to examine their level of importance. The resultant values of both groups viz. GroupA (management, senior academia) and group B (junior academia and research scholar) are summarized in first two columns of table 4.12.

The values of mean score ranged between 4.12 and 4.48 for both the groups. There were differences between the mean importance values perceived by the Group A and by the Group B, so a statistical test was needed to determine their significance. Ordinary comparison z-test was performed for this purpose to find out if the two sets of rating are “significantly different” or not. For this, there is a need to specify hypothesis which is as follows:

H₁: *There is no significant difference in the rating given to features related to research in IHTE, for the inclusion in the KM framework by group A (management and senior academia) and group B (junior academia and research scholars).*

Table 4.12: Mean Score and z-test of KMResearch Features					
Research Features	Management., Senior Academia	Junior Academia and Research Scholars	z statistic	p (Sig.)	Result
Research interests within an institution or affiliated institutions	4.48	4.47	0.116	0.907	Accept
Research results and funding organizations	4.20	4.38	-1.126	0.259	Accept
Commercial opportunities for research results	4.44	4.31	0.766	0.443	Accept
Funding opportunities	4.37	4.25	0.705	0.480	Accept
Pre-populated proposals, budgets and protocols	4.29	4.12	1.060	0.288	Accept
Proposal routing policies and procedures	4.20	4.12	0.409	0.682	Accept
Award notification, account setup, and negotiation policies and procedures	4.24	4.13	0.762	0.445	Accept
Contract and grant management policies and procedures	4.32	4.13	1.239	0.215	Accept
Technical and financial report templates and policies and procedures	4.44	4.17	1.736	0.082	Accept

The z-test (table 4.12) revealed that both groups have similar opinion for both the features. There is no significant difference between management, senior academia (thinkers) and junior academia, research scholars (doers) regarding the perceived importance of the features of research for KM framework. The results reflect that the importance of the features perceived by the “thinkers” are commonly shared and agreed by the “doers”. In other words, assertions from theory are similar to those from practice. This is considered an essential finding because a more global statement can now be made about the features that are crucial for the inclusion in KM framework.

4.7.2 Research Factors

Many features were considered related to research in higher educational institutions, such as pre-populated proposals, budgets and protocols, portal-funding opportunities etc. Factor analysis was performed to reduce the features into factors and also to highlight the importance of these factors for KM framework. Principal component factor analysis with varimax rotation and Kaiser Normalization has been applied. The results of factor analysis are shown in table 4.13.

Table 4.13: Research Factors For KM Framework:							
S.No	Factor Name	Eigen Value	Total % of Var.	Items	Item Loading	Mean	S.D.
1	Research Initiation	2.762	30.684	i. Pre-populated proposals, budgets and protocols	0.832	4.21	0.77
				ii. Research funding opportunities	0.727	4.31	0.76
				iii. Research proposal routing policies and procedures	0.642	4.16	0.79
Mean Score of Research Initiation					4.23		
2	Research Facilitation	2.534	28.159	i. Contract and grant management policies and procedures.	0.799	4.23	0.76
				ii. Technical and financial report templates and policies and procedures.	0.802	4.31	0.79
				iii. Award notification, account setup, and negotiation policies and procedures.	0.761	4.19	0.71
Mean Score of Research Finances					4.24		
3.	Research Commercialization	2.068	22.978	i. Dissemination of research results and funding organizations with easy search capabilities.	0.874	4.29	0.82
				ii. Commercial opportunities for research results.	0.680	4.38	0.81
				iii. Research interest with in institution or affiliated institutions.	0.873	4.48	0.70
Mean Score of Research Commercialization					4.38		
Mean Score of all factors					4.28		

An attempt to extract the research factors contributing to KM framework resulted in three factors namely, Research Initiation; Research Facilitation; and Research Commercialization. These three factors account for 81.820% of total variation. These factors are explained below:

Research Initiation: This factor has emerged as an important factor explaining 30.684 % of total variance. The major features included in this factor along with item loadings are:

- i. Pre-populated proposals, budgets and protocols(0.832)
- ii. Research Funding opportunities(0.727)
- iii. Research Proposal routing policies and procedures(0.642)

In research initiation research funding opportunities had a higher item loading and higher mean score than other two items highlighting the importance of this feature compared to others. As we all know funding constitutes an important component of research and the nature and quality of research are often influenced by the funding options available as well as the quantum of monetary resources.

Research Facilitation: This factor has emerged as another important factor explaining 28.159% of total variance. The major components of this factor include:

- i. Contract and grant management policies and procedures (0.799)
- ii. Technical and financial report templates and policies and procedures (0.802)
- iii. Award notification, account setup, and negotiation policies and procedures(0.761).

In research facilitation the item loading of ‘contract and grant management policies and procedures’ was higher than other two features included in this factor, while in terms of mean score ‘technical and financial report templates and policies and procedures’ was rated higher.

Research Commercialization: This factor explained 22.978% of total variance. This factor has two items, viz.

- i) Dissemination of research results and funding organizations with easy search capabilities (0.874).
- ii) Research interests within an institution or affiliated institutions (0.873).
- iii) Commercial opportunities for research results (0.680).

The features of this factor had higher mean score reflecting their eminence by academia. Overall results highlight that the mean score of factor 1 viz. Research Initiation is 4.23 and the mean score of factor 2 viz. Research Facilitation is 4.24 and mean score of third factor, i.e., Research Commercialization is 4.38. Thus in terms of importance Research Commercialization and Research Facilitation have been rated higher than Research Initiation.

4.7.3 Regression Results

Regression analysis has been used to find out the relation between perceived benefits of KM framework and research factors and also to identify the important predictors of research for KM framework. The second hypothesis is:

H₂: *Perceived benefits of proposed KM framework may be positively related with Research Factors.*

The academia was asked to rate the identified perceived benefits, they think can be incurred if the research factors are included in KM framework. Mean score of perceived benefits of KM framework has been taken as dependent variable and research factors analysed through factor analysis as independent variables. The perceived benefits of research are:

- Latest research can give good inputs to improve the curriculum development process.
- Quality research at the institution level will cultivate future scientists.
- Increased competitiveness and responsiveness for research grants, contracts, and commercial opportunities.
- Reduced turnaround time for research.
- Minimized devotion of research resources to administrative tasks.
- Facilitation of interdisciplinary research.
- Leveraging of previous research and proposal efforts.
- Improved internal and external services and effectiveness.
- Reduced administrative costs.

The three factors for research identified through factor analysis are the independent variables of the regression model and these are:

- i. R₁:Research Initiation
- ii. R₂:Research Facilitation
- iii. R₃:Research Commercialization

Table 4.14:					
Regression Results of Research					
Variable	B	SE B	β	T	P
Constant	4.309	.032		136.605	.001***
Research Initiation (R ₁)	.208	.032	.424	6.577	.001***
Research Facilitation (R ₂)	.157	.032	.321	4.976	.001***
Research Commercialization (R ₃)	.189	.032	.384	5.956	.001***
Notes: R=0.656; R ² =0.430; Adjusted R ² =0.418; S.E of Regression=0.374; DW=1.629; F-statistics=34.496; Significance (F- statistics) < .001 Dependent Variable: Research Benefits Predictors of Model: Research Initiation (R ₁), Research Facilitation (R ₂) and Research Commercialization (R ₃) ** Significant at .01 percent.					

The results of the regression depict that predictors of the model are Research Initiation (R₁), Research Facilitation (R₂) and Research Commercialization (R₃). These three factors explain 41.8 percent of variation.

Hypothesis H₂: The perceived benefits of research may be positively related with Research factors.

The results of regression support that perceived benefits of research are positively related with Research Initiation, Research Facilitation and Research Commercialization. For Research Initiation (R₁) the value of B is 0.208 and is higher than that of other two variables. Thus this emerges as an important factor. Research Facilitation factor has B value of 0.189, which is

low, but it is positively related with perceived benefits of research. ANOVA results highlight that value of F-Statistics is significant ($p < .001$). Research Commercialization is also positively related with research benefits and is significant ($p < .001$). With Research Initiation the value of adjusted R^2 was 0.174, with introduction of Research commercialization, it improved to 0.318 and further adding up Research facilitation the adjusted R^2 changed to 0.418. Thus the above results highlight that the perceived benefits of research may be positively related with Research factors. Hence this hypothesis has been accepted.

4.8 ANALYSIS OF CURRICULUM DEVELOPMENT FEATURES

The next objective of the present research is to identify the curriculum development factors for inclusion in KM framework with a view to reap maximum benefits of existing knowledge in the IHTE to achieve state-of-art curriculum. The following hypotheses have been framed:

***H₃:** There is no significant difference in the rating given to the features related to curriculum development for inclusion in the KM framework by group A (management and senior academia) and group B (junior academia and research scholars).*

***H₄:** Perceived benefits of proposed KM framework may be positively related with Curriculum Development factors.*

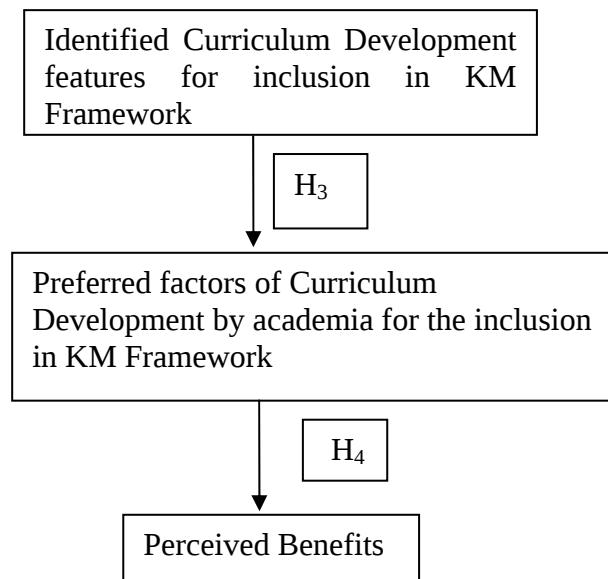


Figure 4.8: Curriculum Development Features and Perceived Benefits Analysis

In depth analysis of Curriculum Development features and factors was done using the following tests:

- Mean score
- z-test
- Factor analysis
- Regression analysis

4.8.1 Curriculum Development features for KM Framework:

The survey instrument investigated the Curriculum Development features for the inclusion in the Knowledge Management framework. On the basis of literature review the following eight features (as discussed in chapter 3), have been investigated for inclusion in KM framework. The responses to these eight features were sought from both the groups on a scale of 5 with 1 for least preferred and 5 for highly preferred. The combined rating of mean score of both the groups is depicted through web diagram (fig. 4.8).

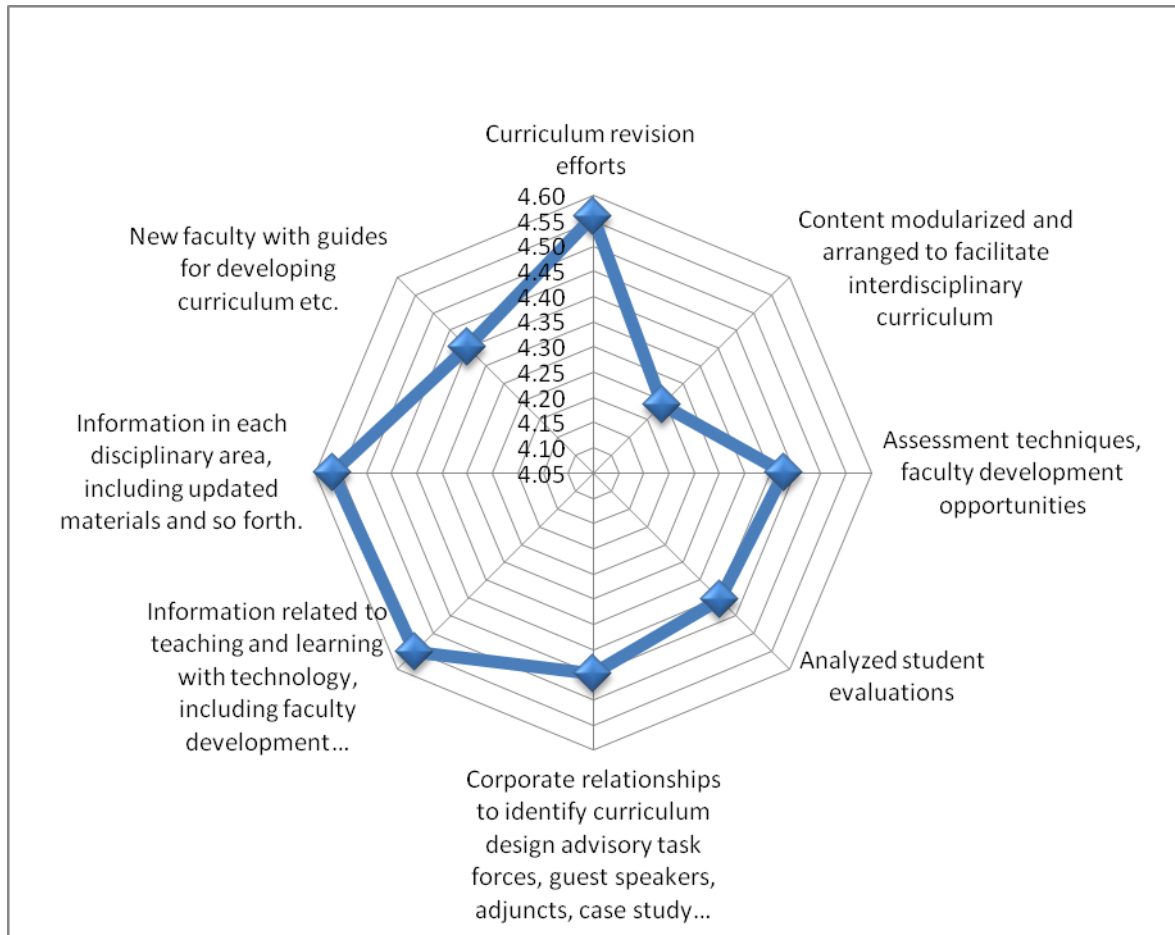


Figure 4.9: Curriculum Development Features

Mean score was calculated for both the groups for all eight features to examine their level of importance. The resultant values of both groups viz. A (management and senior academia) and B (junior academia and research scholar) are summarized in first two columns of Table 4.15. Ordinary comparison z-test was performed to find out if the two sets of rating are “significantly different” or not. For this, the specified hypothesis is as follows:

H₃: *There is no significant difference in the rating given to the features related to Curriculum Development for inclusion in the KM framework by group A (management and senior academia) and group B (junior academia and research scholars).*

Table 4.15. Mean Score and z-test of Curriculum Development KM Features					
Curriculum Development Features	Management, Senior Academia	Junior Academia and Research Scholars	z statistic	p (Sig.)	Result
Curriculum revision efforts that include lesson plan, content sequencing, reference of contents and so forth.	4.60	4.54	0.542	0.587	Accept
Content modularized and arranged to facilitate interdisciplinary curriculum design and development	4.34	4.22	0.905	0.365	Accept
Assessment techniques, including best practices, outcomes tracking, faculty development opportunities and research.	4.56	4.39	1.229	0.218	Accept
Analyzed student evaluations updated each semester for lessons learned and best practices for all faculty.	4.51	4.36	1.118	0.263	Accept
Corporate relationships to identify curriculum design advisory task forces, guest speakers, adjuncts, case study sites and so forth.	4.56	4.41	1.051	0.293	Accept
Information related to teaching and learning with technology including faculty development opportunities, outcomes tracking, technology overviews, and so forth.	4.58	4.53	0.423	0.672	Accept
Information in each disciplinary area, including updated materials, recent publications, applicable research, and so forth.	4.60	4.55	0.445	0.656	Accept
New faculty with guides for developing curriculum, working with senior faculty, establishing effective teaching styles, advising do's and do not's, supervising PhD students and so forth.	4.36	4.41	-0.297	0.765	Accept

The results of z-test revealed that both the groups, Group A:management and senior academia (thinkers) and group B : junior academia and research scholars (doers) had no significant difference between the perceived importance of features for the inclusion in KMframework. Thus this

hypothesis has been accepted. This finding is considered very important since theory assumptions are supported by practical analysis.

4.8.2. Factor Analysis of Curriculum Development

Next step was to perform factor analysis on these features to categorize similar features into factors for the inclusion in KM framework. Factor analysis helped in reducing these eight features into three factors. These three factors explain 73.638 per cent of variation. The Curriculum Development factors are:

- i. C₁: Curriculum Design and Improvisation
- ii. C₂: Faculty Development and Knowledge Bank
- iii. C₃: Corporate Feedback, Assessment Techniques and Lessons Learned

Table 4.16: Curriculum Development Factors for KM Framework							
Factor No	Factor Name	Eigen Value	% of Var. Exp.	Items	Item Loading	Mean	S.D.
1.	Curriculum Design and Improvisation	2.526	31.574	i. Curriculum revision efforts that include lesson plan, content sequencing, reference of contents and so forth.	0.889	4.56	0.60
				ii. Content modularized and arranged to facilitate interdisciplinary curriculum design and development.	0.729	4.25	0.65
Mean Score of Curriculum Design and Improvisation						4.40	
2.	Faculty Development and Knowledge bank	1.781	22.264	i. Faculty development opportunities, information related to teaching and learning with technology, outcomes tracking, technology overviews, and so forth.	0.801	4.54	0.63
				ii Information in each disciplinary area, including updated materials, recent publications, applicable	0.778	4.56	0.62

				research, and so forth.			
				iii. New faculty with guides for developing curriculum, working with senior faculty, establishing effective teaching styles, advising do's and do not's, supervising PhD students and so forth.	0.731	4.39	0.79
Mean Score of Faculty Development and Knowledge bank						4.50	
3.	Corporate Feedback, Assessment Techniques and Lessons Learned	1.584	19.800	i. Assessment techniques, including best practices, outcomes tracking and research.	0.706	4.43	0.70
				ii. Analyzed student evaluations updated each semester for lessons learned and best practices for all faculty.	0.772	4.40	0.71
				iii. Corporate relationships to identify curriculum design advisory task forces, guest speakers, adjuncts, case study sites and so forth.	0.837	4.45	0.76
Mean score of corporate feedback, assessment techniques and lessons learned						4.43	
Mean score of all factors						4.44	

Curriculum Design and Improvisation: This factor has explained 31.574 percent of variation. The major features included in this factor along with item loading are:

- i. Curriculum revision efforts that include lesson plan, content sequencing, reference of contents and so forth (0.889).
- ii. Content modularized and arranged to facilitate interdisciplinary curriculum design and development (0.729).

In case of Curriculum Design and Improvisation, its first item, “curriculum revision efforts that includes lesson plan, content sequencing, reference of contents and so forth.” had higher item loading and higher mean score and is more important than its second item, “content modularized to facilitate interdisciplinary curriculum design and development”.

Faculty Development and Knowledge Bank: The next factor, Faculty Development and Knowledge Bank had a higher mean score than other two factors and thus is vital explaining 22.264% of variance. Its features with item loading are:

- i. Faculty development opportunities, information related to teaching and learning with technology, outcomes tracking, technology overviews, and so forth (0.801).
- ii. Information in each disciplinary area, including updated materials, recent publications, applicable research, and so forth (0.778).
- iii. New faculty with guides for developing curriculum, working with senior faculty, establishing effective teaching styles, advising do's and do not's, supervising PhD students and so forth (0.731).

In this factor, “faculty development opportunities, information related to teaching and learning with technology, outcomes tracking, technology overviews and so forth” had the highest loading and second highest mean and thus is more important than other two items.

Corporate feedback, assessment techniques and lessons learned: This factor includes three features and explains 19.800% of variance. Its features with loading are as follows:

- i. Assessment techniques, including best practices, outcomes tracking and research (0.706).
- ii. Analyzed student evaluations updated each semester for lessons learned and best practices for all faculty (0.772).
- iii. Corporate relationships to identify curriculum design advisory task forces, guest speakers, adjuncts, case study sites and so forth (0.837).

In third factor the feature “corporate relationships to identify curriculum design advisory task forces, guest speakers, adjuncts, case study sites and so forth” had highest item loading and also the highest mean score highlights the eminence of this feature.

This will help the academia to access the knowledge in a systematic and convenient way without wasting their energy and time. All the three factors are important for KM framework.

4.8.3 Curriculum Development Regression Results

In this section, the fourth hypothesis is tested; i.e.;

***H₄:** Perceived benefits of proposed KM framework may be positively related with Curriculum Development factors.*

Regression results have been presented to highlight the areas of IHTE regarding curriculum development that will be benefited the most with the implementation of KM incorporating the identified Curriculum Development factors. The dependent variable is the perceived benefits of KM for Curriculum Development. For this the mean score of perceived benefits has been used. The perceived benefits identified through literature review are:

- i. Good curriculum will enhance the research.
- ii. An industry oriented and latest curriculum will produce competent professionals.
- iii. Enhanced quality of curriculum and programs by identifying and leveraging best practices and monitoring outcomes.
- iv. Improved speed of curriculum revision and updating.
- v. Enhanced faculty development efforts, especially for new faculty.
- vi. Improved administrative services related to teaching and learning with technology.
- vii. Improved responsiveness by monitoring and incorporating lessons learned from the experiences of colleagues, student evaluations, and corporate or other constituent input.
- viii. Interdisciplinary curriculum design and development facilitated by navigating across departmental boundaries.

The independent variables of the study are the three Curriculum Development factors extracted through factor analysis. These are:

- i. C₁: Curriculum Design and Improvisation

- ii. C₂: Faculty Development and Knowledge Bank
- iii. C₃: Corporate Feedback, Assessment Techniques and Lessons Learned

The details of these three factors have been explained in the earlier section. Regression results are depicted in Table 4.17. The results of step-wise regression depicts that R is 0.738 and R² is 0.544 and adjusted R² is 0.538. The predictors of model are; C₁: Curriculum Design and Improvisation; C₂: Faculty Development and Knowledge Bank. The value of F-statistics is 82.473 and is significant (p<0.001), depicting that the model is good.

Table 4.17: Regression Results of Curriculum Development					
Variable	B	SE B	β	T	P
(Constant)	1.027	0.265		3.874	0.001**
Curriculum Design and Improvisation (C ₁)	0.41	0.065	0.418	6.305	0.001**
Faculty Development and Knowledge bank (C ₂)	0.349	0.053	0.434	6.535	0.001**
Corporate Feedback, Assessment Techniques and Lessons Learned(C ₃)	0.004	0.061	0.006	0.057	0.954
Notes: R= 0.738; R ² =0.544; Adjusted R ² =0.538; S.E of Regression= .38; DW=1.54					
F-statistics=82.473, p<0.001					
C ₃ : Excluded variable					
** significant at .01 percent					

Regression results highlight that there is a positive relation between all three factors of curriculum development and perceived benefits of Curriculum Development. Thus the hypothesis H₄: *Perceived benefits of proposed KM framework may be positively related with Curriculum*

Development Factors has been accepted. Regarding the predictors of the model, Curriculum Design and Improvisation (C_1) and Faculty Development and Knowledge bank (C_2) are significant as $p < .001$. The third factor viz. Corporate Feedback, Assessment Techniques and Lessons Learned (C_3) though positively related with perceived benefits hasn't emerged as important predictor for the model.

4.9 ANALYSIS OF ALUMNI CONTRIBUTIONS FEATURES

Alumni are important for all educational institutions as they are associated with their institutions even after getting their degrees. Their suggestions and feedback can be beneficial for research, curriculum development, career development and placement services if acquired, stored and utilized efficiently by IHTE.

The following hypotheses have been proposed for Alumni Contributions features:

H₅: *There is no significant difference in the rating given to the features related to Alumni Contributions in IHTE, for inclusion in the KM framework by group A (management and senior academia) and group B (junior academia and research scholars).*

H₆: *Perceived benefits of proposed KM framework may be positively related with Alumni Contribution factors.*

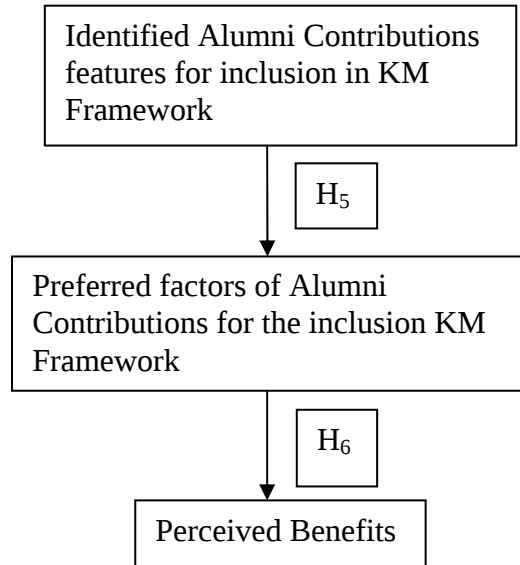


Figure 4.10: Alumni Contributions Features and Perceived Benefits Analysis

The following tests were performed:

- Mean score
- z-test
- Factor analysis
- Regression analysis

4.9.1 Alumni Contributions Features for KM Framework

Based on literature review the following four features were considered for inclusion KM framework and the rating given by academia is shown through web diagram (fig.4.10).

- Alumni's feedback for competent and industry oriented curriculum.
- Alumni's contribution for research e.g. grants, industry oriented research.
- Alumni services to career development efforts.
- Career placement services (potentially all corporate connections of alumina) to provide a one-stop service center for students, but also for faculty and staff to ensure they are informed.

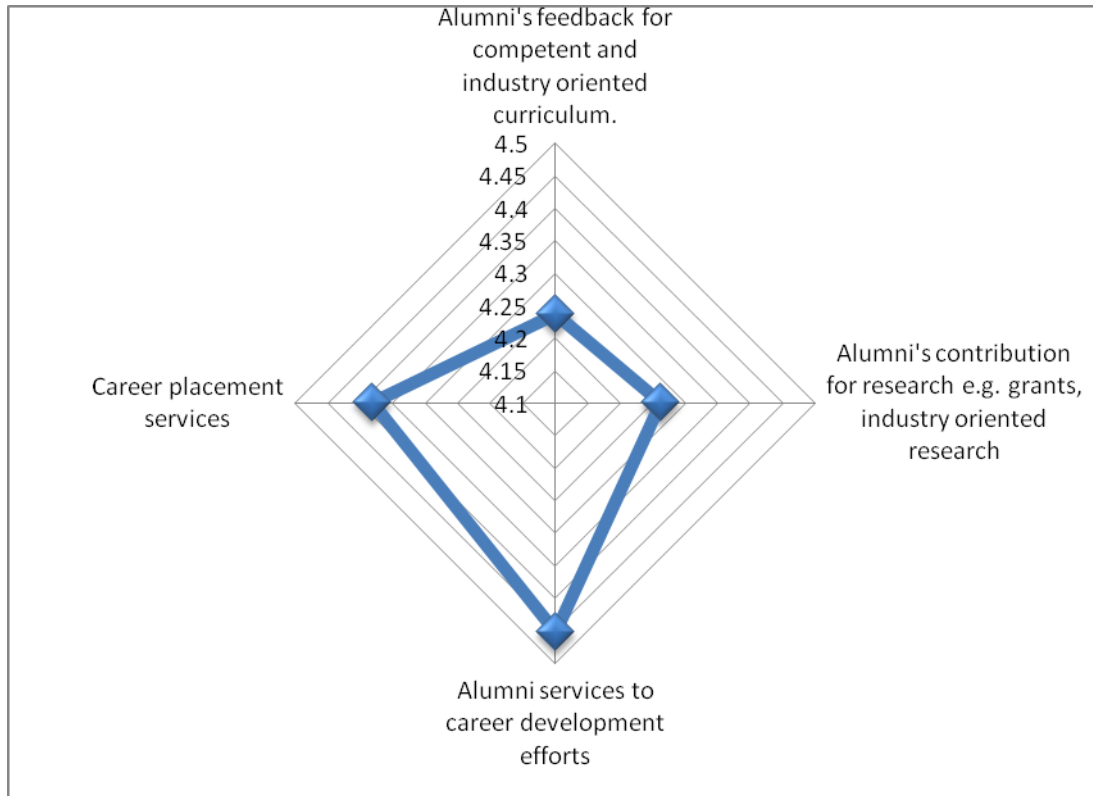


Fig4.11: Alumni Contributions Features

The academia has given maximum importance to 'Alumni Services to Career Development Efforts' and thereafter to 'Career Placement Services'. z-test was performed to find out if the ratings of group A and group B are significantly different for inclusion in KM framework. For this, the specified hypothesis is:

H₅: *There is no significant difference in the rating given to features related to Alumni Contributions for inclusion in the KM framework by group A (management and senior academia) and group B (junior academia and research scholars).*

Table 4.18. Mean Score and z-test of Alumni Contributions KM Features					
Alumni Contributions KM Features	Management, Senior Academia	Junior Academia and Research Scholars	z-statistic	p (Sig.)	Result

Alumni's feedback for competent and industry oriented curriculum.	4.42	4.18	1.824	0.068	Accept
Alumni's contribution for research e.g. grants, industry oriented research.	4.32	4.26	0.399	0.689	Accept
Alumni services to career development efforts.	4.51	4.45	0.505	0.612	Accept
Career placement services (potentially all corporate connections of alumni's) to provide a one-stop service centre for students, but also for faculty.	4.32	4.40	-0.556	0.577	Accept

The z-test revealed that both groups have similar opinion. There is no difference regarding the perceived importance of all the features between the groups, viz. thinkers and doers. Hence this hypothesis (H₅) has been accepted.

4.9.2 Alumni Contributions Factors

The result of factor analysis of Alumni Contributions factors is shown below:

Table 4.19 – Alumni Contributions Factors for KM Framework							
Factor No	Factor Name	Eigen Value	% of Var. Exp.	Items	Item Loading	Mean	S.D.
1	Research and Curriculum Enhancement	2.176	54.395	Alumni's feedback for competent and industry oriented curriculum.	0.941	4.3	.669
				Alumni's contribution for research e.g. grants, industry oriented research.	0.545	4.29	.738
Mean Score of Research and Curriculum Enhancement						4.3	
2	Career and Placement Guidance	1.001	21.002	Alumni services to career development efforts.	0.833	4.48	.639
				Career placement services (potentially all corporate connections of alumna’s) to	0.887	4.36	.682

				provide a one-stop service centre for students, but also for faculty.			
Mean score of Career and Placement Guidance						4.42	
Mean score of all factors						4.36	

Two factors have emerged from the factor analysis with two items loaded on each. These are:

Research and Curriculum Enhancement: This factor explains the maximum percentage of variance, i.e., 54.395. Its features with item loading are as follows:

- i. Alumni's feedback for competent and industry oriented curriculum (0.941).
- ii. Alumni's contribution for research e.g. grants, industry oriented research (0.545).

In this factor, "Alumni's Feedback for Competent and Industry Oriented Curriculum" had the highest item loading.

Career and Placement Guidance: This factor explained 21.002 percentage of variation. Its two features with loading are:

- i. Alumni services to career development efforts (0.833).
- ii. Career placement services (potentially all corporate connections of alumina's) to provide a one-stop service center for students, but also for faculty (0.887).

Overall results indicate that Career and placement guidance has higher mean score and moreover both features included in this factor loaded heavily with loadings more than 80 per cent. Thus this factor is more important than other factor, i.e., Research and Curriculum enhancement.

4.9.3 Regression Analysis

In this section the final hypothesis is tested; i.e.;

Hypothesis H₆: *The perceived benefits of Alumni Contributions may be positively related with Alumni Contribution factors.*

Regression Analysis has been used to identify the areas of IHTE that will benefit the most with the implementation of KM. The dependent variable is the mean score of perceived benefits of KM for Alumni Contributions. The perceived benefits of Alumni Contributions are:

- Alumni can contribute to research e.g. grants, industry oriented research.
- With alumina feedback, competent and industry oriented curriculum can be developed.
- Improved services for students.

The independent variables of the study are the two factors identified through factor analysis. These are:

A₁: Research and Curriculum Enhancement

A₂: Career and Placement Guidance

Table 4.20:					
Alumni Contributions Regression Results					
Variable	B	SE B	β	T	P
(Constant)	0.434	0.029		153.93	0.001***
Research and Curriculum Enhancement (A ₁)	0.327	0.028	0.688	11.523	0.001***
Career and Placement Guidance (A ₂)	0.090	0.028	0.189	3.169	0.002**
Notes: R= .713; R ² =0.509; Adjusted R ² =0.501; S.E of Regression= .34; DW=1.809; F-statistics=71.416 Significance (F- statistics) < .001 Dependent Variable: Perceived Benefits Predictors of Model: Research and Curriculum Enhancement (A ₁) and Research Commercialization (A ₂) *** Significant at .01 per cent **Significant at 1 per cent					

The results of the regression depict that predictors of the model are: Research and Curriculum Enhancement (A₁) and Research Commercialization (A₂). These two factors explain 50.1 percent of variation.

H₆: *The perceived benefits of Alumni Contributions may be positively related with Alumni Contributions factors.*

The results of regression support that perceived benefits are positively related with both the factors viz. Research and Curriculum Enhancement (A₁) and Research Commercialization (A₂) but Research and Curriculum Enhancement (A₁) has higher B and is more important factor. ANOVA results highlight that value of F-Statistics is significant ($p < .001$). Both the factors are significant.

Chapter Summary:

After analysing the current status of KM in technical educational institutions and KM technologies used in IHTE, an effort was made to finalize the KM factors approved by academia for Research, Curriculum Development and Alumni Contributions for KM framework through a shared stakeholder analysis. Two groups of respondents included in the study are: Group A: Management and senior academia and Group B: Junior academia and research scholars. Common shared vision of these two groups was sought to decide the Research, Curriculum Development and Alumni Contributions factors for inclusion in KM Framework. This formed the foundation for designing the KM framework presented in the next chapter.

CHAPTER - V

THE KNOWLEDGE MANAGEMENT FRAMEWORK FOR ENHANCING RESEARCH, CURRICULUM DEVELOPMENT AND ALUMNI CONTRIBUTIONS IN IHTE

"Know where to find the information and how to use it - that's the secret of success."

- Albert Einstein

Nowadays technical educational institutions in India are facing intense competition because of multitude expansion in local and global educational institutions and education delivery instruments. There are many issues like new entrants, bargaining power of customers, threat of substitute courses etc. which are bothering well established technical educational institutions. In the era of globalisation, to remain ahead in the competition even well established IHTE has to respond to the challenge by offering learners dynamic and industry oriented curriculum and providing facilities for research. To achieve this there is a need to facilitate academia with technology driven knowledge management based platform which help them to perform research in an effective manner, to design innovative, industry oriented, and state-of-art curriculum, and also to utilize alumni's contributions in an efficient manner. To accomplish this KM framework has been designed on the basis of valuable inputs provided by management and academia. The framework has been depicted in fig.5.1.

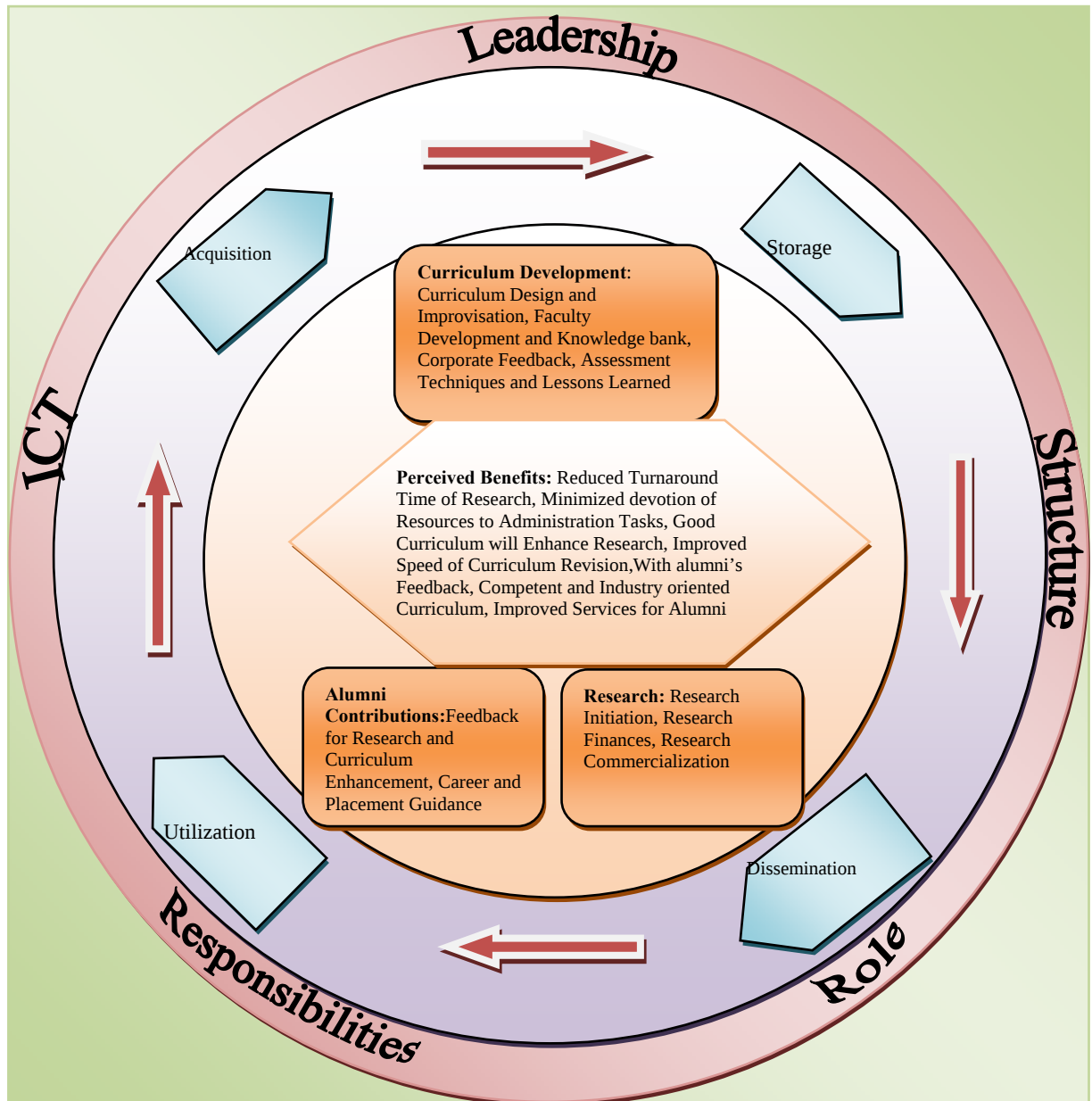


Figure 5.1: Framework to Enhance Research, Curriculum Development and Alumni Contributions in Selected Institutions of Higher Technical Education

The Knowledge Management framework is divided into four parts viz.

1. Knowledge Management Enablers
 - Leadership
 - Structure, Role and Responsibilities
 - Information and Communications Technologies(ICT)
2. Knowledge Management Processes

- Acquisition
 - Storage
 - Dissemination
 - Utilization
3. Knowledge Management Aspects in the Institutions of Higher Technical Education
 - Curriculum Development
 - Research
 - Alumni Contributions
 4. Perceived Benefits

5.1 KM ENABLERS IN IHTE

The academia has accepted the following to be the crucial enablers of KM implementation in IHTE:

5.1.1. Leadership: An organization needs to recognize that its operational efficiency and decision making capability at all levels can be enhanced by putting into practice a framework which integrates KM into the functioning of the organization and this can be provided by good leadership. This has also been emphasized by current research analysis, academia has rated leadership at second place after ICT. As explained by Hansali(2002), leadership plays a key role in ensuring success of KM within an institution. Nothing makes greater impact on an organization than when leaders model the behaviour they are trying to promote among employees.

5.1.2. Structure, Role and Responsibilities: By establishing structure and assigning roles and responsibilities, ownership and accountability can be established; otherwise there is no ownership of knowledge and learning in the organisation. An environment in which KM is nurtured can be created by a strategy of implementing policies and incentives at one level and systems and procedures at another level. Majority of academia also believes the same as is obvious from the present survey. They have agreed that ‘Structure, Role and Responsibilities’ is an important enabler

5.1.3. Information and Communications Technologies: Every IHTE has to make a shift from its traditional mode to the technological driven methods. A suitable infrastructure is a prerequisite for KM to take root in an organization and overcome initial resistance from participants. This is also supported by the academia as discussed in the previous chapter and this has been given the highest rating by academia. Since KM may be perceived as an activity in addition to regular work, appropriate infrastructure in the form of technologies and applications being in place, will soothe this resistance to the adoption of KM.

5.2 KNOWLEDGE MANAGEMENT PROCESS

The knowledge management framework has four processes namely acquisition, storage, dissemination and utilization. These four processes will be used to realize the identified factors of Research, Curriculum Development and Alumni Contributions extracted through survey analysis as discussed earlier.

5.2.1 Acquisition: Being the powerhouse of knowledge in our society, IHTE have immense knowledge. Institution's management should devise some strategy to inspire employees to participate in KM implementation and motivate the employees to share their knowledge generously and also back this with technology. During the interviews, management and academia has suggested some techniques to acquire knowledge which are discussed in detail in the next sections. The knowledge acquisition pyramid is shown in figure 5.2.

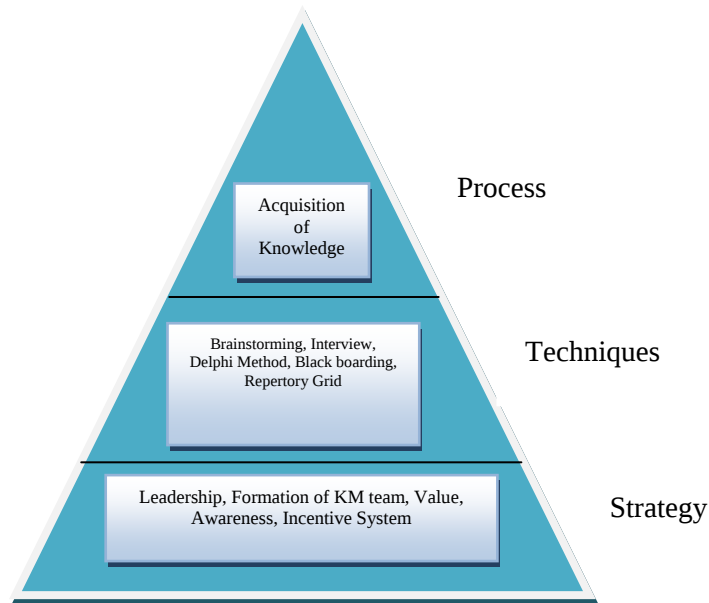


Figure 5.2: Knowledge Acquisition Pyramid

5.2.1.1 Strategy: The following strategies are proposed to the management for acquiring knowledge from academia in IHTE and for motivating them to participate in the process:

- **Formation of KM team:** Management should form a KM team which would be responsible for the implementation of knowledge management in the IHTE.
- **Awareness:** Employees should be made aware that the whole aim of the KM initiative is to increase the employees' productivity by making their job easier, not burdening them with additional tasks by screening the perceived benefits of KM.
- **Changing Perspective:** There has to be a collective buy-in and belief in employees that knowledge management will make things better. This can be achieved by arranging conference in IHTE for the exposure of KM for employees.
- **Reward System:** KM implementation can only be successful, if people are motivated to utilize and contribute towards knowledge pool. People share their knowledge because they like watching their information and knowledge being used successfully and the attention and admiration they get from their peers.

5.2.1.2 Framework to Acquire Knowledge in IHTE

The performance of knowledge management highly depends on the quality of acquired knowledge. One must first understand the need and identify the domain for capturing knowledge and ascertain the ways to capture it. The task should be carefully divided into well planned subtasks. The following framework has been proposed to capture the knowledge in IHTE.

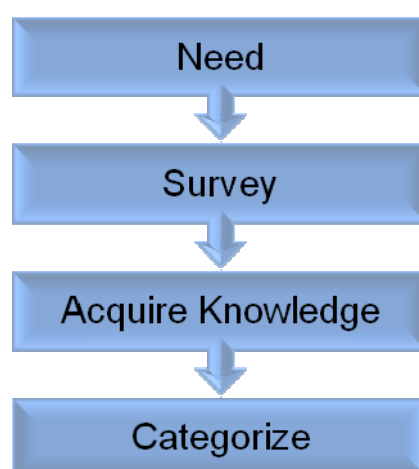


Figure 5.3: Framework to Acquire Knowledge in IHTE

- i. **Need Analysis and Domain Identification:** First of all, the need of a particular IHTE should be assessed, i.e., in which area KM should be implemented first, it can be Research, Curriculum Development or Alumni Contributions, depending upon the requirement of a particular institution. The reason should also be identified, and accordingly the domain should be identified to acquire knowledge.
- ii. **Survey/Identify:** Identified domain should be surveyed by the knowledge finder to find out which type of knowledge is available i.e., explicit or tacit in that particular domain and where or which are the sources from which the knowledge can be acquired.
- iii. **Acquiring knowledge:** There are two types of knowledge, namely explicit knowledge and tacit knowledge, which has to be acquired in IHTE. One has to follow different strategies to capture explicit and

tacit knowledge. The management should have policy, to encourage and motivate academia to share their knowledge either by having reward system or recognition.

- iv. **Categorize:** The captured knowledge should be categorized properly and should be put into context, i.e., making sense of information from the situation or location in which the information was found for the optimal use of the acquired knowledge.

5.2.1.3 Knowledge Capturing Techniques

There are several sources of explicit knowledge in higher technical education. The following are the various sources of acquiring explicit knowledge in IHTE.

To Acquire Explicit Knowledge

A knowledge finder can collect explicit knowledge in already existing knowledge bases such as:

- Library
- Internet
- Office documents
- Journals
- Conference proceedings etc.

But explicit knowledge can become outdated and requires frequent updating. The earlier versions can be archived for the future references. Many IHTE in sample are undertaking these activities.

To Acquire Tacit Knowledge

A knowledge finder can adopt any of the following ways to acquire tacit knowledge according to the situation and concerned person.

- **Interview:** A Knowledge developer can arrange a formal meeting in person, for somewhat formal discussion in which knowledge can be exchanged to capture tacit knowledge.
- **Brainstorming:** By using Brainstorming technique creative solutions to a problem can be generated. Multiple experts generate ideas on given problem looking for a convergence from which knowledge can be extracted.
- **Electronic Brainstorming:** Electronic brainstorming is a computerized version of the manual brainstorming technique. It is typically supported by an electronic meeting system (EMS) but simpler forms can also be done via email and may be browser based, or use peer-to-peer software. This allows experts to express their views without waiting for their turn.
- **Repertory Grid:** As explained in Knowledge Management Systems(2004), “Repertory Grid is a tool used to capture knowledge. The domain expert classifies and categorizes a problem domain using his/her own model. The grid is used for capturing and evaluating the expert's model. Two experts (in the same problem domain) may produce distinct sets of personal and subjective results. The grid is a scale (or a bipolar construct) on which elements can be placed within gradations. The knowledge developer usually elicits the constructs and then asks the domain expert to provide a set of examples called elements. Each element is rated according to the constructs which have been provided.”
- **Delphi Method:** Delphi method is a ‘relatively strongly structured group communication process, in which matters, on which naturally unsure and incomplete knowledge is available, are judged upon by experts (Hader and Hader, 1995).
- **Black boarding:** The experts work together to solve a specific problem using the blackboard as their workspace. Each expert gets equal opportunity to contribute to the solution via the blackboard.

5.3 KNOWLEDGE STORAGE

Prusak (1996) states that researchers in the areas of sustainable competitive advantage have come to the conclusion that the only thing that gives an organisation a competitive edge and that is sustainable, is what the organisation knows, how it uses what it knows, and how fast it can know something new. Knowledge is therefore the cause of competitive gap. To use the knowledge, it should be stored strategically backed with technology as discussed. The knowledge storage pyramid is shown in figure 5.4.

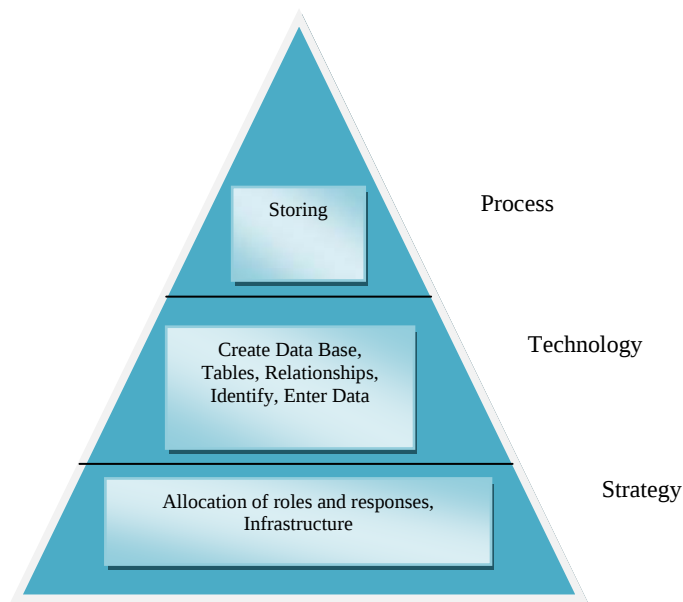


Figure 5.4: Knowledge Storage Pyramid

5.3.1 Knowledge Storage Strategy: The management or leaders should form a KM team to store the acquired knowledge and infrastructure should be provided to accomplish the same. The roles and responsibilities should be clearly defined. There should be a plan in place to store knowledge. The team should follow the plan and check also in between the process to ensure that the correct knowledge is being stored.

5.3.2 Knowledge Storage Techniques: A framework is given below to store knowledge for the quick retrieval and dissemination.

Conceptual Flow Chart of Storing Knowledge

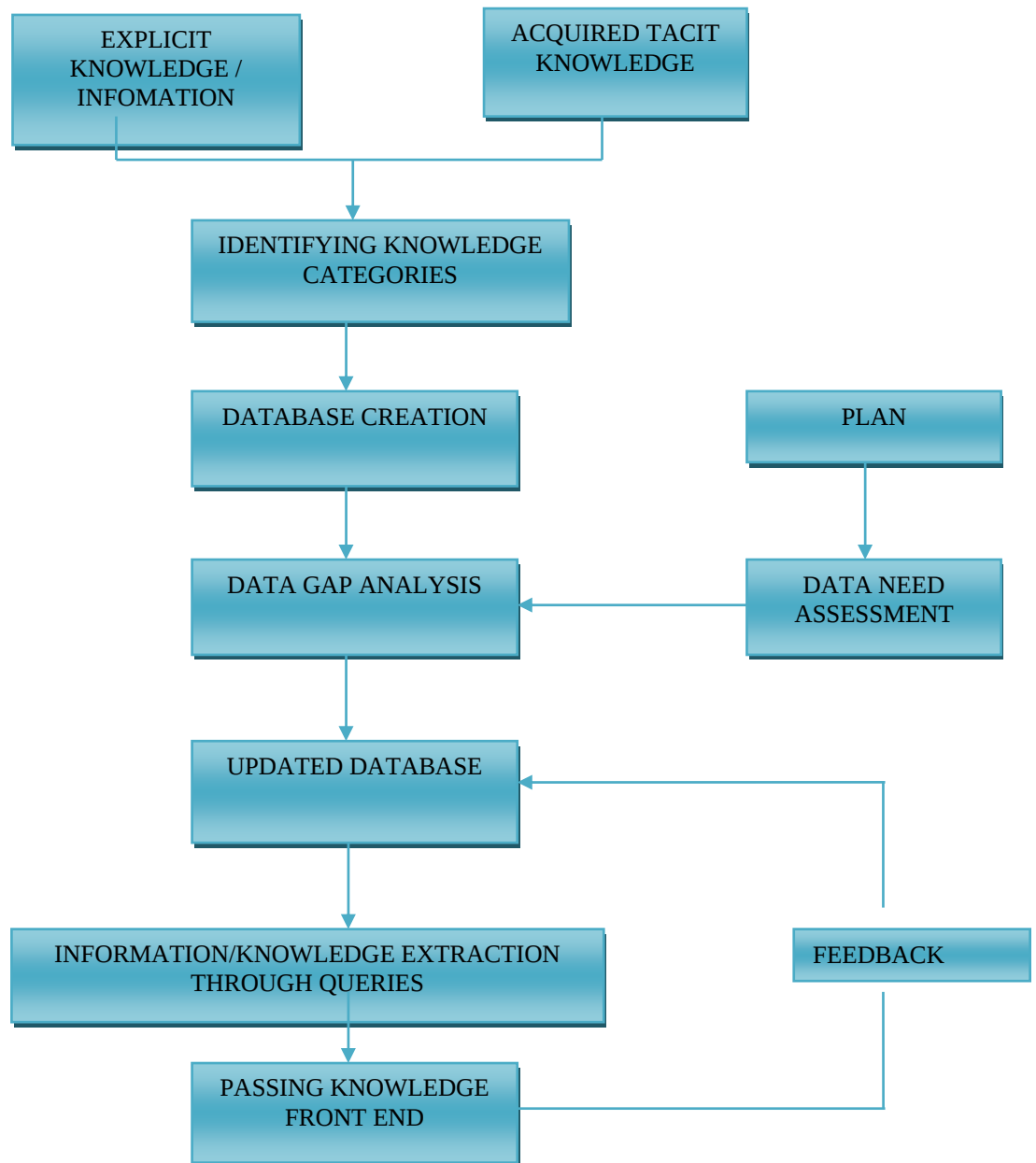


Figure5.5: Conceptual Flowchart to Store Knowledge

After the identification and collection of explicit and implicit knowledge, it should be categorized and database should be created accordingly by the technical team to store it. According to the plan the fulfillment of required

data should be assessed. The data gap analysis should be performed to confirm whether the data acquired is according to the plan or there is a need for improvement. Finally, when the updated database is designed, queries can be generated to extract information and it can be passed to any user interface.

5.4 KNOWLEDGE DISSEMINATION AND UTILIZATION

Now that the world has entered the information age, or more accurately, the knowledge age, Intellectual Capital has become an issue of intense interest and concern. Because of information technology, institutions rely more and more on expertise and technical ability, and less and less on manual labor (Brinker, 2000). The systematic sharing of knowledge is assuming a larger role in all kinds of organizations around the world (World Bank, 1999; Luen & Al-Hawamdeh, 2001). It's very important that disseminated knowledge is utilized to its maximum. To facilitate the process of dissemination and utilization of knowledge, there is a need to plan and choose the medium for the flow of knowledge.

After the electronic revolution, Information and Communication Technologies (ICT), have over taken traditional communication ways. The survey instrument has been used for getting the inputs and suggestions from academia for designing knowledge management framework for enhancing Research, Curriculum Development and Alumni Contributions in IHTE. In the conducted survey internet came out the most popular technology among academia. The academia overwhelmingly supported the idea of disseminating and accessing the knowledge on a click of a mouse. The pyramid of dissemination and utilization is depicted in figure 5.6.

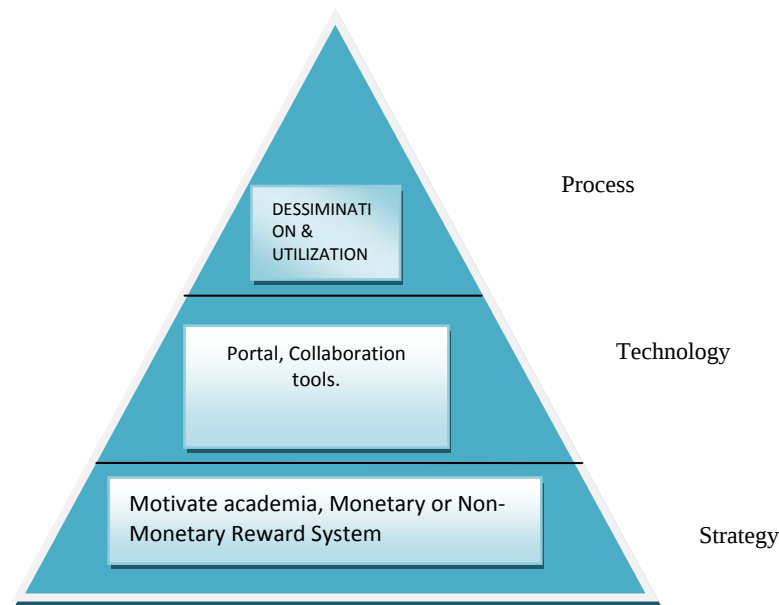


Figure 5.6: Strategy for Dissemination and Utilization

5.4.1 Strategies: Universities are constantly faced with new paradigms for knowledge production, often labeled as “modus II of knowledge production,” which are characterized by a stronger orientation towards applied research and the necessity for an interdisciplinary research approach (Gibbons, 1994). This has served as an impetus for universities to collaborate more frequently with other research institutions, as well as with the private and public sector enterprises, and even to participate in international research networks. Educational institutions, as part of the science, education, and innovation system of a nation and as knowledge producers, have knowledge as their most important output. This is then incorporated into research results, publications and used for educational purpose. The most valuable resource of any IHTE, however, is the researchers and the students with their relationship networks and the organisational routines. All of these can be seen as intangible resources and assets (Leitner, 2002). A KM strategy must address the real needs and issues. IHTE should conduct a survey to find out their preferred technology in which the users are most comfortable; KM should be implemented using that technology which can improve the chances of success. After analyzing

the data and situation, KM team should give the recommendations and strategic moves. The sequence of actions is shown below:

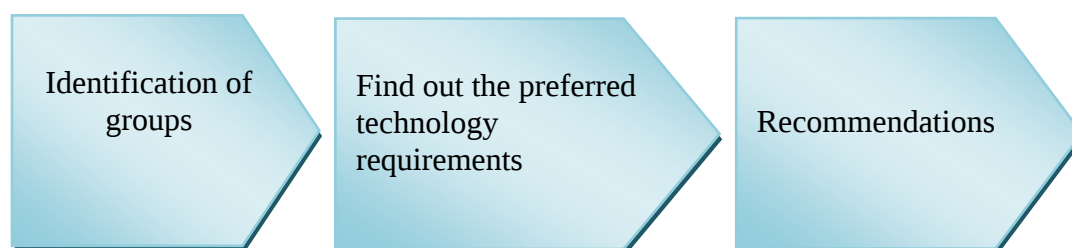


Figure5.7: Research KM Factors and Perceived Benefits Framework

First of all, the group should be identified for which knowledge management is targeted whether its academia, research scholars, students or administrative staff. Analysis should be conducted to find out their preferred technology and give recommendations accordingly. According to the present survey, the academia and research scholars have overwhelmingly supported internet technology.

5.4.2 Technology: As discussed in detail in the previous chapter, the academia is inclined towards ‘preferred technologies’ viz. Internet, Intranet and Extranet. So the researcher strongly proposes the portal system for the dissemination and utilization of knowledge in IHTE. Using internet or intranet to launch, education portals can create a common gateway to the information and knowledge that the academia in IHTE need to effectively share and thus can work jointly on projects. It can be used by IHTE to achieve their ultimate goal of departing knowledge and using knowledge, i.e., through Research and Curriculum Development effectively. Also Alumni’s contributions can be shared in the institution effectively. According to the present survey, the portal is recommended to disseminate and access knowledge since Internet, Intranet and Extranet have emerged to be more popular among academia in IHTE.

Collaboration tools

From the personal interviews with the academia in IHTE, the researcher had realized that there is a need of collaboration tools in IHTE. It was found that either the academia was hesitant to go personally to ask for information from someone or they did not know whom to approach. This problem can be solved by initiating discussion forums using collaboration tools in KM as explained below:

Discussion forum with educators: If any educator wants some suggestion on any issue or wants to discuss about new methodology, assessment techniques etc. among other educators then he can start a new topic on this discussion forum.

Discussion forum with students: If the educator wants to take feedback or wants to discuss about new teaching methodology or new ideas with students then this could be the best platform which gives the chance to express their views without any pressure.

Chat: It is a form of instant communication over the internet or intranet. By using this, a group can communicate in discussion forums, as it allows both one-to-one and one-to-many communication.

To facilitate the transfer of knowledge further this tool can be added to the knowledge management which encourages communication between academia by posting forums, having chats, discussions and video conferencing on chosen topics. These knowledge sharing sessions can be stored for the future references.

5.5 IHTE ASPECTS UNDER CONSIDERATION FOR THE IMPLEMENTATION OF KM

Three aspects of the Institutions of Higher Technical Education are considered for the implementation of KM is:

- Research
- Curriculum Development
- Alumni Contributions

5.5.1. Research

Three factors for research have been identified through factor analysis as discussed in chapter four which are:

- Research Initiation
- Research Facilitation
- Research Commercialization

These are depicted in fig.5.8 along with their perceived benefits.

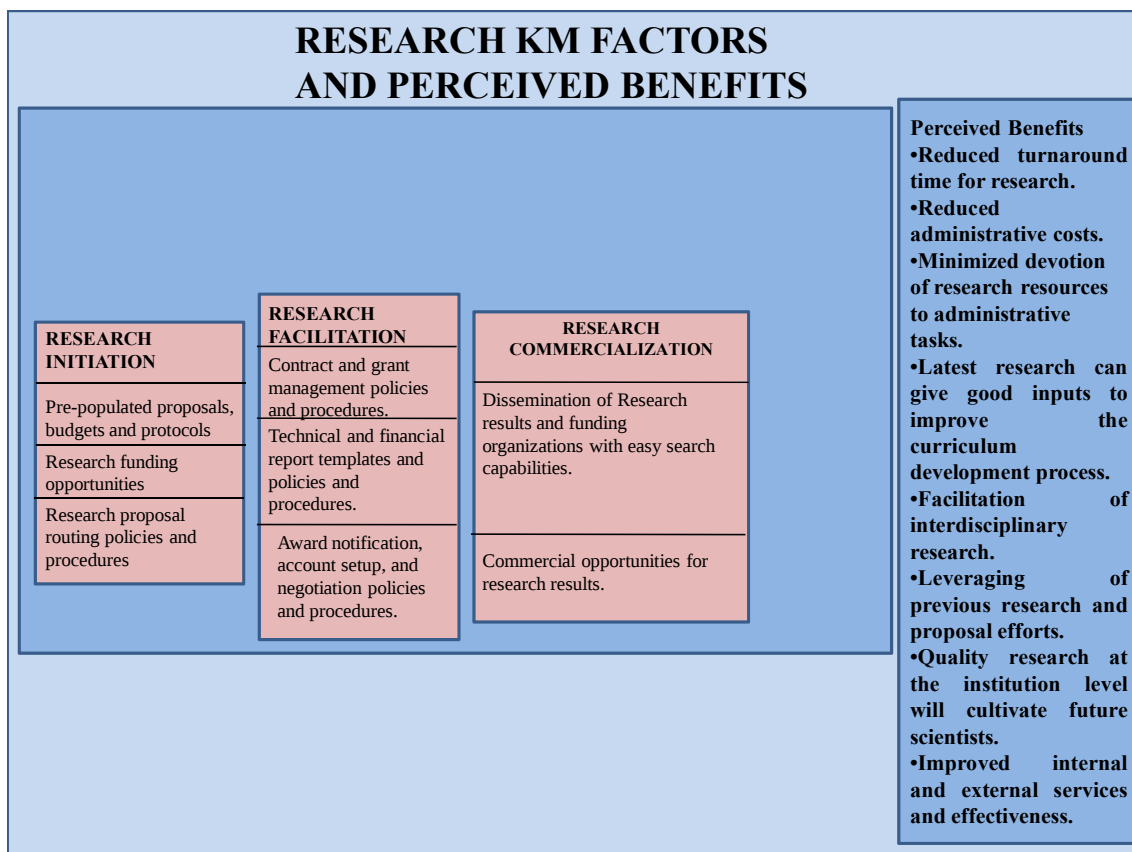


Figure 5.8: Features of Research Initiation

Research Initiation: In this section all the information regarding initiation of research in the particular institution is compiled. Research scholars can get a direction/guidance from this section while kicking off new research. The list of all the projects undertaken by the institution may be listed in this section. The novice who wants to start a new research can have an impression of work being done. Industry can see the kind of research being conducted by the institution and can sponsor it also. Its features are shown in fig. 5.9.



Figure 5.9: Research Initiation Features

- *Pre-populated proposals*: Newcomers can have assistance from this section to draft proposal.
- *Research Funding Opportunities*: The list of all government and non-government agencies which are willing to fund the research with their terms and conditions can be provided in this section.
- *Proposal Routing Policies*: All the administrative policies related to the proposal routing can be encapsulated here which can save precious time of an apprentice.

Research Initiation gives the direction to the novice. With the help of Research initiation research scholars can draft the research proposals and plan their research according to the funds provided by the research institutions.

Research Facilitation: Universities play a key role in several aspects in the process of industrial innovation, and university-industry links and collaboration are crucial for the efficiency of that process (Schuetze, 2001). Orsenigo (2000) observed the fact that, while Western European countries do not lag behind the US in basic research or in applied R&D, they are comparatively slow to transform research into innovation and ultimately into market success. He identifies the organization of the innovation process as a particular European weakness. Partly he sees this as the result of a weakness of private firms which have not developed sufficient 'absorptive capacity' (Cohen & Levinthal, 1990) and which are slow to re-organize into 'learning organizations'. The main reason for this 'European paradox' is attributed to traditional ways of university organization, and in particular a lack of institutional flexibility, and

of managerial capabilities on the part of both academic researchers and university administrators. India is also experiencing a similar situation. The gap between industry and research institutions can be minimized by introducing KM and facilitating knowledge regarding contract, account setup etc. This can be achieved by the inclusion of research facilitation features which are depicted in fig. 5.10.

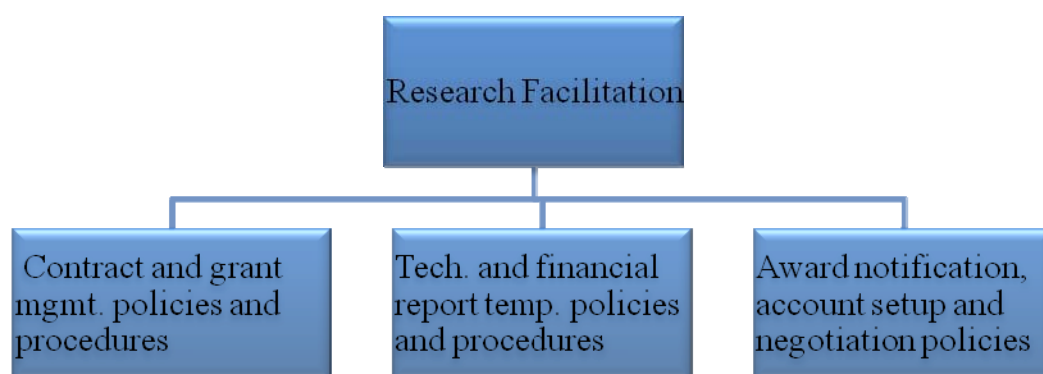


Figure 5.10: Features of Research Facilitation

- i. *Contract and grant management policies and procedures:* The focus can be on how the contract can be placed and what procedures are to be followed. Negotiation policies and procedures under taken by the research institution with funding organisation can be explicated in this section. The light can be thrown on the policies of getting grant for the research and which course of action should be followed to achieve this.
- ii. *Technical and financial report templates and policies and procedures:* To save time and to maintain uniformity technical report templates can be provided by the institution which guides the researcher to prepare their report. The outline to prepare financial reports can be given in this section. It saves a lot of time of a researcher if he/she has knowledge of above mentioned areas and can make better decisions. The information regarding finance can be communicated to the researcher through this interface.

- iii. *Award notification, account setup, and negotiation policies and procedures:* The list of all the accounts and awards and their details can be notified through this section.

Research Commercialization: In this section, dissemination of research results and its commercial opportunities are addressed.

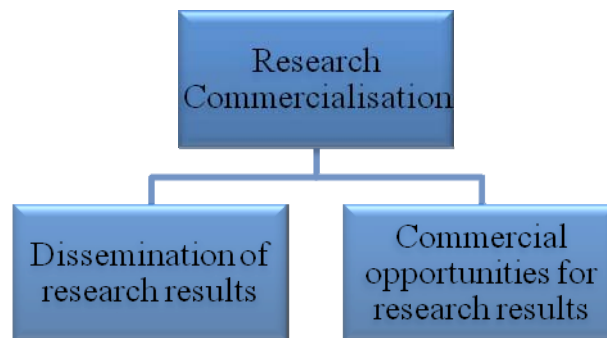


Figure 5.11: Features of Research Commercialization

- *Dissemination of research results:* Where possible, the research results can be broadcasted through knowledge management system to utilize them at the appropriate time and place. The list of funding organizations (federal agencies, foundations, and corporations) with easy search capabilities can be assessed.
- *Commercial opportunities for research results:* Archive of previously conducted conferences and seminars is readily available for the researchers so that they can have easy access to the knowledge.

Perceived Benefits of Research:

The academia was asked to rate the perceived benefits, they think can be incurred if the above research factors are implemented in KM.

- Latest research can give good inputs to improve the curriculum development process.
- Quality research at the institution level will cultivate future scientists.

- Increased competitiveness and responsiveness for research grants, contracts, and commercial opportunities.
- Reduced turnaround time for research.
- Minimized devotion of research resources to administrative tasks.
- Facilitation of interdisciplinary research.
- Leveraging of previous research and proposal efforts.
- Improved internal and external services and effectiveness.
- Reduced administrative costs.

The following bar chart shows the academia's point of view regarding perceived benefits.

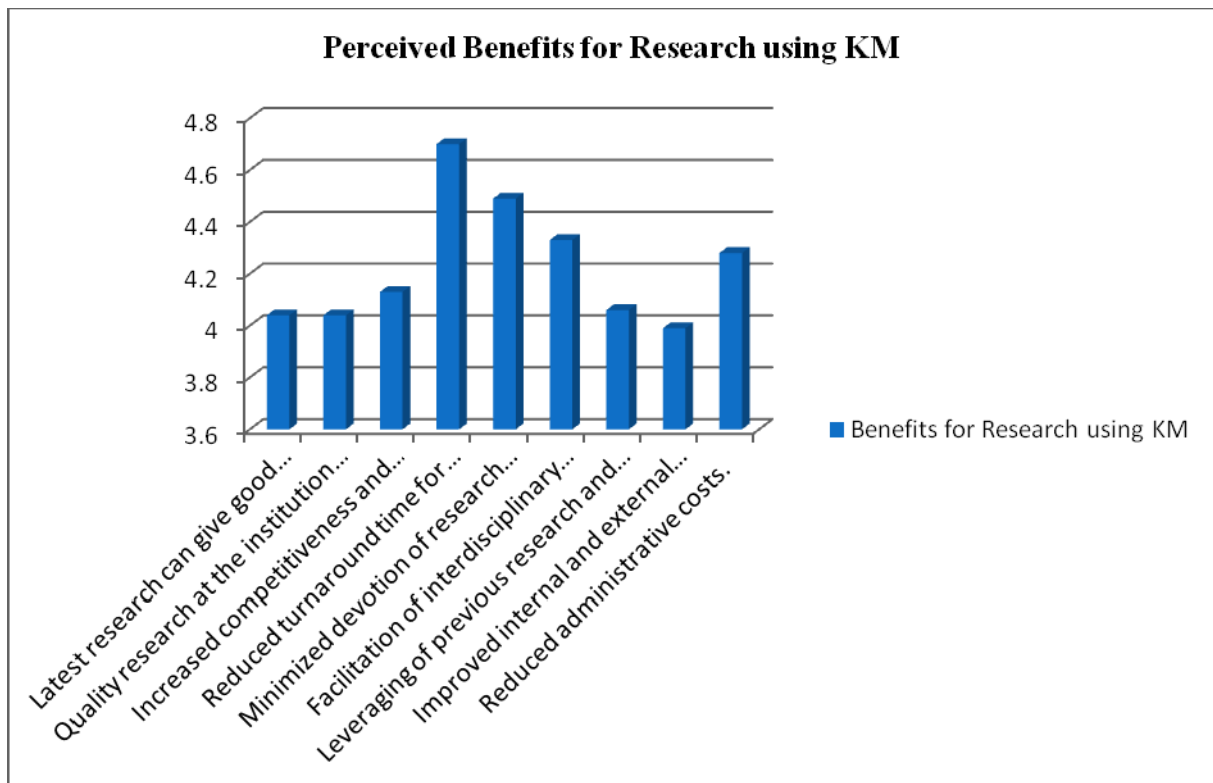


Figure 5.12: Perceived Benefits of Research using KM

Academia perceived that with implementation of KM in IHTE can reduce the turnaround time of the research. This benefit had been voted maximum and after this academia believes that researchers' time will be saved as there will be less devotion of research resources to the administrative tasks.

They believe that rest of perceived benefits can also be achieved since they are also rated high.

5.5.2. CURRICULUM DEVELOPMENT(CD)

Curriculum Development has three factors, with the incorporation of these, the academia can access knowledge in a systematic and convenient way without wasting their time and energy. The details of these factors are discussed in this section.

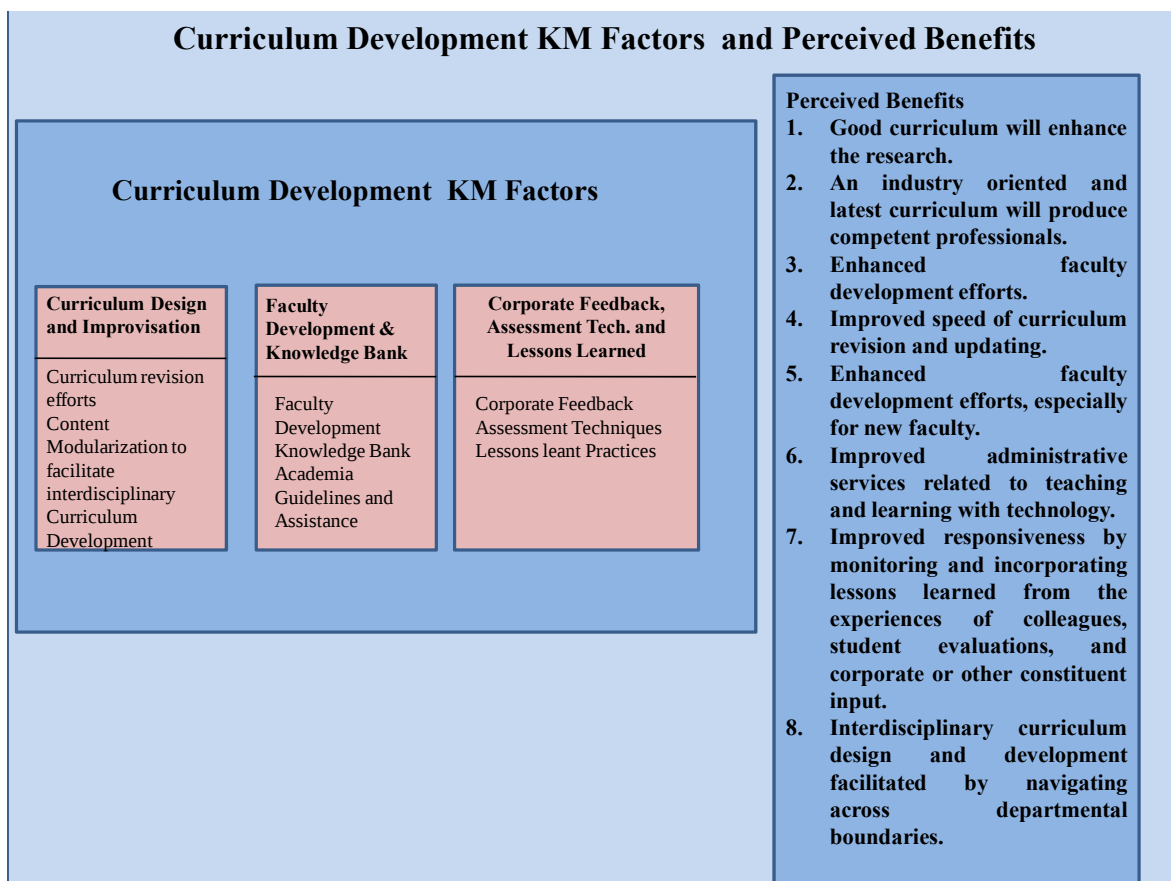


Figure 5.13: Curriculum Development KM Factors and Perceived Benefits

Curriculum Design and Improvisation

The first factor viz. Curriculum Design and Improvisation has the two features:

- i) Curriculum revision efforts that include lesson plan, content sequencing, reference of contents and so forth.

- ii) Content modularization to design interdisciplinary curriculum design and development.

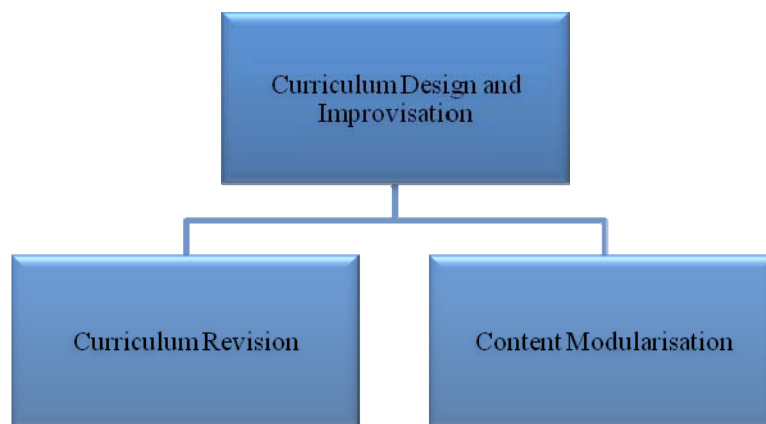


Figure5.14 : Features of Curriculum Design and Improvisation

Both the features are discussed below:

Curriculum revision efforts that include lesson plan, content sequencing, reference of contents and so forth: Learning should always be planned and guided. The educator should always plan in advance what he/she is seeking to achieve and how to achieve it. To facilitate the academia in devising the curriculum, the template of design and guidelines are provided and also previous lesson plans can be provided for the reference for the following sub sections in KM like:

- Lesson plan
- Content sequencing
- Teaching method

Content modularized to facilitate interdisciplinary curriculum design and development: Interdisciplinary curriculum is becoming very important in today's world. , Wasserstrom (2006) complains that Interdisciplinarity has become so fuzzy that a university's commitment to it is close to meaningless. If programs claiming to be interdisciplinary are fuzzy in their understanding of what Interdisciplinarity is, then their curriculum will not provide the proven educational outcomes for students that Interdisciplinarity promises”(pg. B5).

This, in turn, will severely compromise meaningful assessment of these programs. Klein (1999) argues in mapping interdisciplinary studies that interdisciplinary curriculum must make sense locally and yet, to achieve quality, also ought to be informed by research and the national conversation. Designing interdisciplinary curriculum, therefore, requires familiarity with the extensive literature on Interdisciplinary. Academia can be facilitated with the same through this section. They can share their ideas of interdisciplinary curriculum with other educators through KM system.

Faculty Development and Knowledge Bank

The second factor Faculty development and knowledge bank had a higher mean score than other two factors. This underlines the importance of this factor. Increasing number of IHTE are realizing the importance of faculty development. It is essential that a faculty development program should be both comprehensive and also based on a set of diverse, though related strategies to bring about the significant improvements in instruction demanded by the new and difficult issues facing higher education. This section presents a brief overview of faculty development.

This factor has the following features, viz.

- i) Information related to teaching and learning with technology, outcome tracking, technology overviews, and so forth.
- ii) Information in each disciplinary area, including updated materials, recent publications, applicable research and so forth.
- iii) New faculty with guides for developing curriculum, working with senior faculty, establishing effective teaching styles, advising “do’s and do not’s, supervising Ph.D. students and so forth.

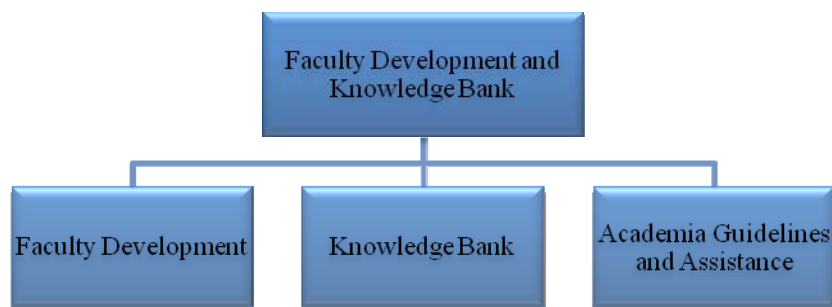


Figure 5.15: Features of Faculty Development and Knowledge Bank

Faculty development opportunities; information related to teaching and learning with technology, outcome tracking, technology overviews, and so forth:

This feature has the highest loading and second highest mean score. Educators can benefit from a more detailed view of available tools and how they can be used more effectively in support of specific teaching and learning goals. Educators can be exposed to the evolving methods of teaching and learning like:

- Laptop study
- Collaboration tools
- Classroom response systems
- Podcasting
- Lecture webcasting

Academia can update their knowledge regarding technological developments in the educational sector through this section.

Knowledge Bank; Information in each disciplinary area, including updated materials, recent publications, applicable research and so forth:

It is equally important for the higher technical institutions to assess their knowledge and to make maximum use of that knowledge. This knowledge resides in many different parts of the institution and often one part of an institution repeats the same work in another part simply because it is impossible to keep track of and make use of, knowledge in other parts. Enterprises need to know, what their knowledge assets are; and how to manage and make use of these assets to get

maximum return. To accomplish this, the following sub-sections can be added in knowledge bank:

- Information in each disciplinary area
- Updated sources
- Recent publications
- Applicable research

Academia guidelines and assistance; *New faculty with guides for developing curriculum, working with senior faculty, establishing effective teaching styles, advising “do’s and do not’s, supervising Ph.D. students and so forth:*

Every institution has its own set of rules, guidelines and recommendations which can be elucidated in this segment by incorporating following:

Teacher’s guidelines and assistance: This defines the roles and responsibilities of the educator. These guidelines will provide direction to educators to deliver his/her best to stakeholders.

Curriculum development guidelines: These guidelines are a list of suggestions for the development of curriculum. It may also explain the items such as manuals, handbooks, computer programs, audiovisual aids, etc. Depending on the medium and the number of students involved in the project or class under consideration, these guidelines can be adjusted or supplemented.

Effective teaching styles: An effective teaching methodology aims at creating a dynamic learning environment and engaging the attention of the students toward what is being taught. It also fosters interaction among the students and develops reciprocity.

Ph.D. supervision: The different scenarios and styles on supervision which are accepted by the particular IHTE can be provided. It can offer strategies for dealing with some of the challenges and provides guidelines for Ph.D. supervision and mentoring. A valuable insight into best practice models for Ph.D. supervision and mentoring, appropriate to the context of particular higher educational institution can contribute to the development of the next generation of researchers and academics who are key to vibrating research and innovating system.

Do’s and Don’ts: The management of HEI can notify its rule in this section like what is expected from the academia and what is not.

The detailed information about the rules prevalent in IHTE can be gained by visiting this section and it also helps an educator to get assistance.

Corporate feedback, assessment techniques and lessons learned

The next factor viz. “Corporate feedback, assessment techniques and lessons learned” covers the following variables:

- Assessment techniques, including best practices, outcomes tracking and research.
- Analyzed student evaluations updated each semester for lessons learned and best practices for all faculty
- Corporate relationships to identify curriculum design advisory task forces, guest speakers, adjuncts, case study sites and so forth as depicted in figure 5.16.

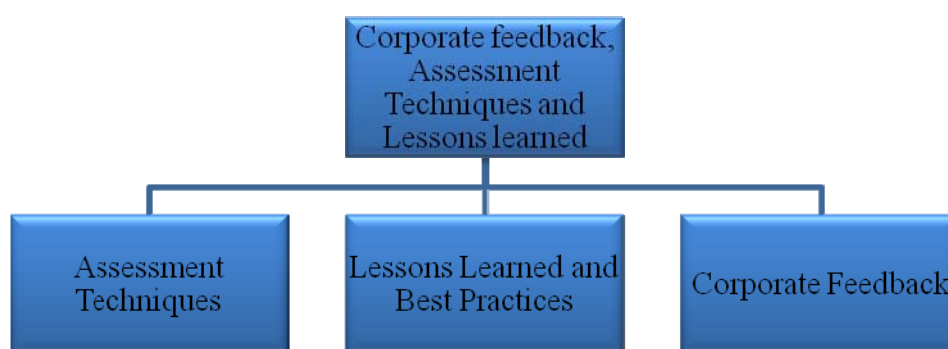


Figure 5.16: Assessment techniques, lessons learned and Corporate feedback

In this factor the variable viz. corporate relationships to identify curriculum design advisory task forces, guest speakers, adjuncts, case study sites and so forth had highest item loading and mean score. The educators can share their experiences and knowledge and can also learn from others experiences with knowledge imparted in this section.

Corporate feedback; *Corporate relationships to identify curriculum design advisory task forces, guest speakers, adjuncts, case study sites and so forth:* To keep the pace with the ever changing demands from the industry, there is a need for

the higher educational institutions to offer stakeholder that is learners to offer effective learning environment, state-of-art research, dynamic and industry oriented curriculum, which can place them above par.

Assessments techniques, including best practices, outcomes tracking and research:

Selecting appropriate means for assessment is an essential step in assessment process. There are many different ways to assess the learning of the student. By taking into account the number of learners and considering the nature of the subject, the educator should decide the method of assessment. Different prospects and guidelines about assessment methods are given in this section.

Lessons learned and best practice; Analyzed student evaluations updated each semester for lessons learned and best practices for all faculty

The educators can share their experiences and knowledge and can also learn from others experiences with knowledge imparted in this section.

Perceived Benefits of Curriculum Development:

The academia was asked to rate the identified benefits, they think can be achieved if the above Curriculum Development factors are implemented in IHTE through KM system.

1. Good curriculum will enhance the research.
2. An industry oriented and latest curriculum will produce competent professionals.
3. Enhanced quality of curriculum and programs by identifying and leveraging best practices and monitoring outcomes.
4. Improved speed of curriculum revision and updating.
5. Enhanced faculty development efforts, especially for new faculty.
6. Improved administrative services related to teaching and learning with technology.
7. Improved responsiveness by monitoring and incorporating lessons learned from the experiences of colleagues, student evaluations, and corporate or other constituent input.

8. Interdisciplinary curriculum design and development facilitated by navigating across departmental boundaries.

The following bar chart shows rating given by academia to the perceived benefits.

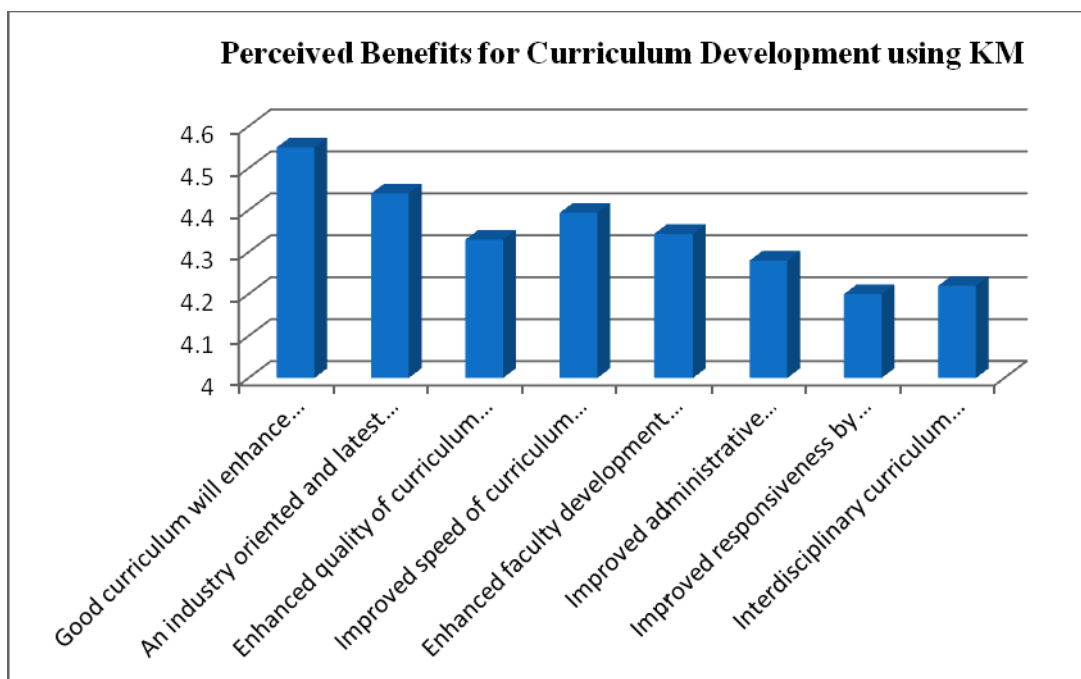


Figure 5.17: Perceived benefits of Curriculum Development

The academia believed very strongly that all the perceived benefits can be achieved if the above mentioned factors are included in KM since all the perceived benefits are given very high rating i.e. more than four. Although ‘Good curriculum will enhance research’ and ‘An industry oriented and latest curriculum will produce competent professionals’ got the highest rating.

5.5.3 Alumni Contributions

Alumni can give invaluable inputs to enhance research, curriculum development in IHTE. They can guide the students for placements and career development. Two factors have been identified in Alumni Contributions and each factor has two features.

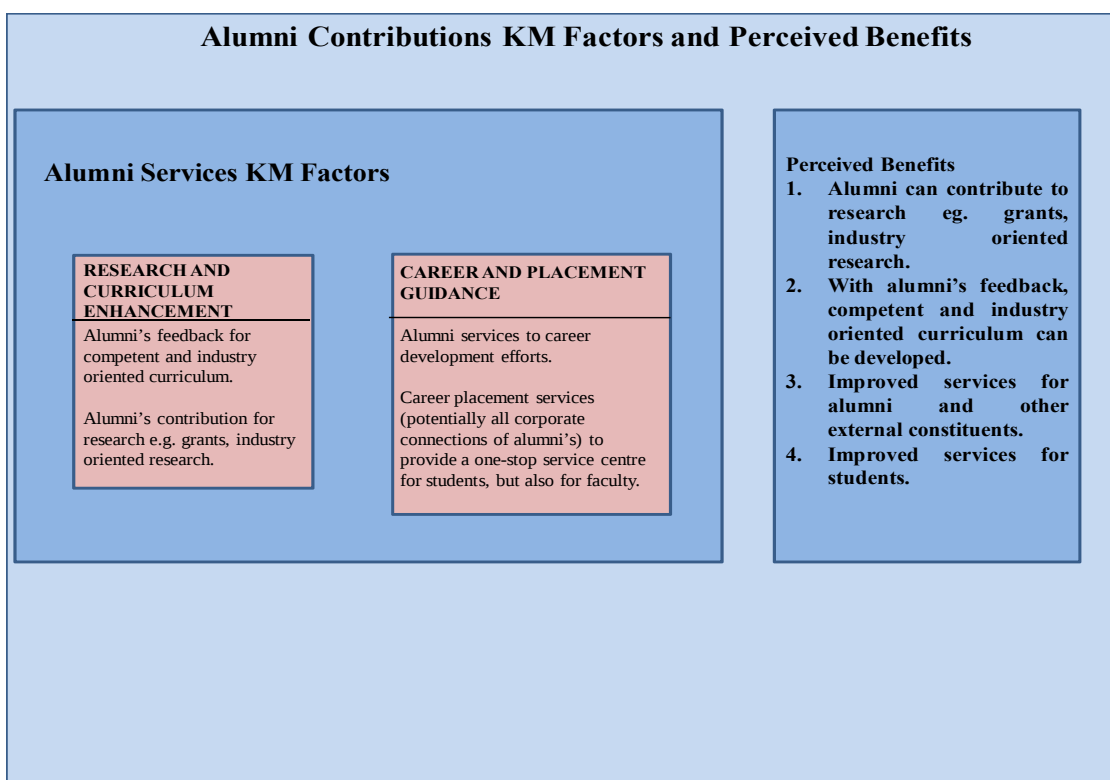


Figure5.18: Alumni Contributions KM Factors and Perceived Benefits Framework

Research and Curriculum Enhancement:

This factor has two features viz.

- Alumni's feedback for competent and industry oriented curriculum.
- Alumni's contribution for research e.g. grants, industry oriented research.

The alumni can give valuable feedback which can help IHTE to design industry oriented curriculum. A section can be devoted to incorporate the feedback from the corporate sector, alumni's suggestions regarding guest speakers, case study sites, design advisory task force etc.

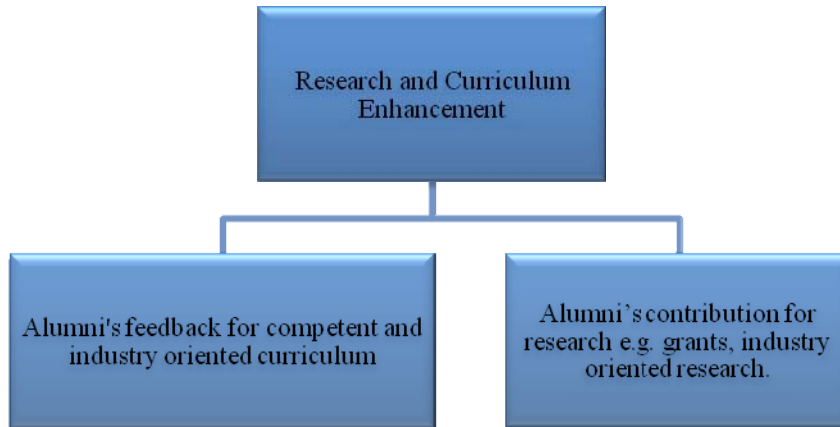


Fig.5.19: Features of Research and Curriculum Enhancement

Career and Placement Guidance

This is a second factor of alumni contributions having two features viz.

- Alumni services to career development efforts.
- Career placement services (potentially all corporate connections of alumni) to provide a one-stop service center not only for students, but also for faculty.

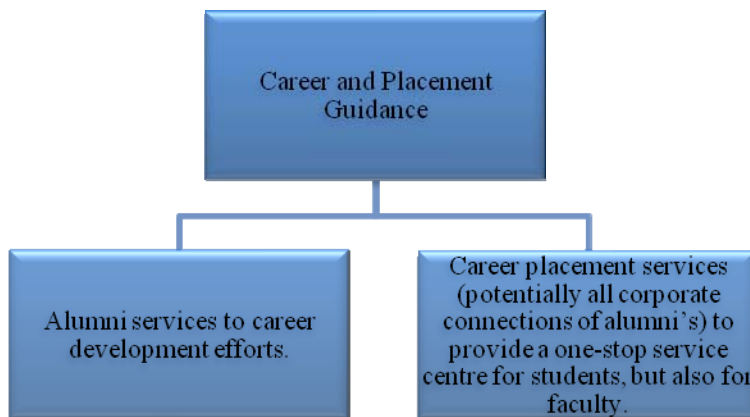


Fig.5.20: Features of Career and Placement Guidance

By incorporating above mentioned factors of Research, Curriculum Development and Alumni Contributions using four processes viz. acquisition, storage, dissemination and usage following benefits can be attained:

Perceived Benefits of Alumni Contributions

The following three important perceived benefits were considered:

- 1) Alumni can contribute to research e.g. grants, industry oriented research.
- 2) With alumni feedback, competent and industry oriented curriculum can be developed.
- 3) Improved services for alumni and other constituents.

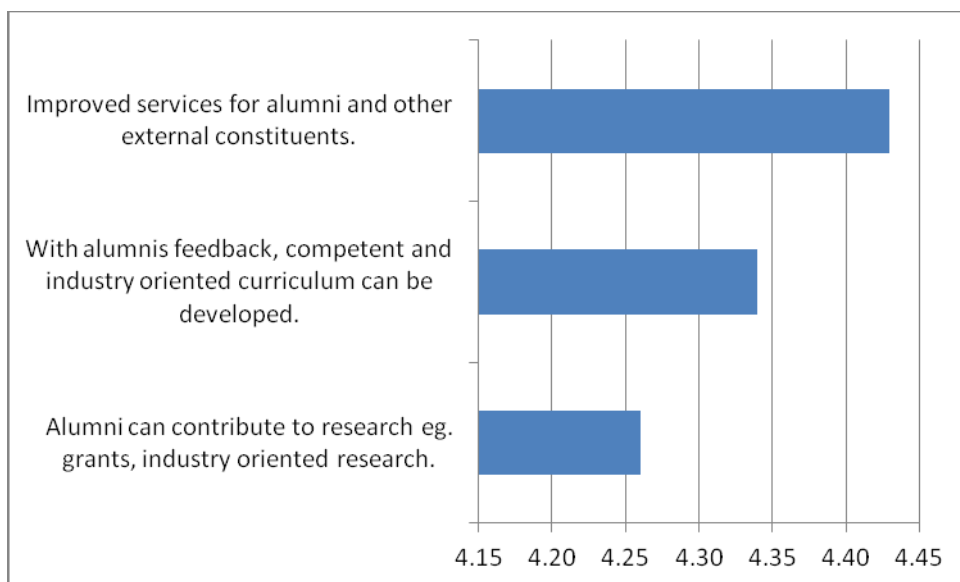


Fig. 5.21: Perceived benefits of Alumni Contributions

In the case of Alumni Contributions also, the academia strongly believed that high returns can be gained with the implementation of KM as seen above. Though ‘Improved services for alumni and external constituents’ has topped amongst others.

5.6 CHAPTER SUMMARY

This chapter is completely devoted to designing KM framework for enhancing Research, Curriculum Development and Alumni Contributions. The chapter outlines in detail its essential components of KM framework viz. KM enablers, KM processes and three aspects of IHTE under consideration viz. Research, Curriculum Development and Alumni Contributions. Detailed analysis has been provided about each element of the vital components of KM. Any Institution of Higher Technical Education can use these to place itself above others in this competitive environment.

CHAPTER VI

CONCLUSIONS

This chapter aims to recollect the various phases of the study. Summary of the research with the main findings has also been presented. Research contributions from this work have been listed and limitations of the study have also been pointed out. Recommendations based on the study have also been included along with future work directions.

6.1 SUMMARY OF THE RESULTS

The literature review as well as the study has yielded understanding about a number of important issues regarding designing of KM framework for enhancing Research, Curriculum Development and Alumni Contributions in IHTE. ICT is one of the major contributors in reinforcing Knowledge Society. Information and Communication Technologies have a valuable potential to help meet KM goals in India largely untapped till to date. When ICT are properly aligned with KM goals, they can help to create gains in terms of efficiency and effectiveness.

The present study was undertaken in the IHTE for exploring the aspects for Knowledge Management in Research, Curriculum Development and Alumni Contributions and determining the ICT level and KM technologies used. The study assumes importance in the light of the fact that no such study has earlier been conducted in context of the development of KM framework for improving Research, Curriculum Development and Alumni Contributions in IHTE in India. Before conducting the study, extensive review of literature was undertaken for finding out the major issues related to KM in IHTE. The study used a participative stakeholder analysis where respondents were categorized into two groups viz. group A (management and senior academia) and group B (junior academia and research scholars).

The results of participative stakeholder analysis highlight that:

- The academia strongly supported the use of ICT in education and believed that it will enhance knowledge sharing. Respondents of all the 30 institutions covered in

the survey believed that ICT plays an important role for the success of Knowledge Management.

- Regarding the KM policies, strategies and rewards for sharing knowledge, management and academia of IHTE accepted that they are inclined towards KM policies and strategic alliances to promote knowledge sharing culture. Our study indicates that in IHTE the rewards for the sharing knowledge for the employees are still low in practice.
- Concerning knowledge acquisition the results highlight that IHTE capture and use knowledge obtained from other research institutions including universities and government laboratories and also through subscription to external databases and journals.
- Knowledge storage in IHTE is carried out by 'department wise databases' and low priority has been given to 'maintaining best practices and lessons learned database'.
- For dissemination of knowledge, IHTE favored internal lectures, knowledge sharing seminars, followed by preparing written documentation such as lessons learned, training manuals, good work practices, articles for publication etc.
- Knowledge sharing committees were not popular in IHTE for dissemination of knowledge.
- According to the present survey, the portal is recommended to disseminate and access knowledge since 'preferred technology' covering Internet, Intranet & Extranet has emerged as most popular among academia in IHTE. Internets, Intranet Extranet there have been favored to 'other technologies' viz, data warehousing, document management, blog, decision support systems, artificial intelligence and groupware.
- Regarding linkage between Research and Curriculum Development, out of the 141 respondents, 76% opined that Research and Curriculum Development have a strong positive feedback influence.
- Regarding linkage between Research and Alumni Contributions 69% of the respondents expressed a strong mutual positive feedback loop between Alumni Contributions received and Research carried out by an institution.

- 65% respondents opined that there is a strong positive feedback influence between Curriculum Development and Alumni Contributions. Thus, a strong interdependence is believed between them.
- The results of z-test reflect that the importance of the features for Knowledge Management for research perceived by the “thinkers” are commonly shared and agreed by the “doers”.
- Factor analysis of these nine features accepted by both groups helped to categorize them in three factors, viz. Research initiation (R_1); Research Facilitation (R_2) and Research Commercialization (R_3).
- Regression analysis further highlighted the importance of these factors for research perceived benefits in Indian IHTe. Research Facilitation and Research Commercialization emerged as important predictors for the model.
- Similar exercise on Curriculum Development also highlighted the acceptance of all features for the inclusion in KM by the “thought leaders” and “doers”.
- Factor analysis of Curriculum Development features helped in reducing these into three factors namely; Curriculum Design and Improvisation (C_1); Faculty Development and Knowledge Bank(C_2);and Corporate Feedback, Assessment Techniques (tech.) and Lessons Learned(C_3).
- Again step-wise regression was performed to find the important predictors for Curriculum Development perceived benefits. Two important predictors of Curriculum Development benefits are: Curriculum Design and Improvisation (C_1) and Faculty Development and Knowledge bank (C_2).
- Regarding Alumni contribution features, there is no significant difference in the rating given to these for the inclusion in the KM framework by group A (management and senior academia) and group B (junior academia and research scholars).
- Results of factor analysis reduced four features of Alumni Contributions into two factors viz. Research and Curriculum Enhancement(A_1) and Career and Placement Guidance(A_2).
- For finding relationship between Alumni Contributions factors viz. ‘Research and Curriculum Enhancement’ and ‘Career and Placement Guidance’ and perceived benefits, regression analysis has been used. The results highlight that both factors

are positively related with benefits of Alumni contributions, but ‘Research and Curriculum Enhancement’ is more important predictor of the model.

These inputs helped in development of KM framework for enhancing Research, Curriculum Development and Alumni Contributions. The Knowledge Management framework has the following constituents:

- i) Knowledge Management Enablers: Leadership, Structure, Role and Responsibilities and Information and Communications Technologies.
- ii) Knowledge Management Processes: Acquisition, Storage, Dissemination and Utilization.
- iii) Knowledge Management Aspects in the Institutions of Higher Technical Education: Research, Curriculum Development and Alumni Contribution.
- iv) Perceived Benefits

Knowledge Management Enablers: Out of the KM enablers from Leadership; Structure, roles and responsibilities; and ICT. ICT got the highest rating, followed by leadership. Earlier researchers have also identified information technology infrastructure as an element crucial to the linkage of information and knowledge integration in organizations (Argyris and Schon, 1978; Duncan, 1972; Teece, 1998). Many researchers (Chong, 2006; Liebowitz, 1999; Civi, 2000; Davenport and Prusak, 1998; Dutta, 1997; Greengard, 1998; Guns & Valikangas, 1998; Moffett et al, 2003; Pemberton et al, 2002; Ryan & Prybutok, 2001; Salleh & Goh, 2002) have insisted that top-management leadership and commitment are the most critical factors for a successful knowledge management project, particularly in knowledge-creating and culture-sharing activities. The results also highlight them as important enablers as leadership got higher priority after Information technology infrastructure. Structure, roles and responsibilities though important has been rated lower on priority by academia of IHTE.

Knowledge Management Processes: An effort has been made to suggest the steps required for knowledge acquisition, knowledge storage and knowledge dissemination to enhance Research, Curriculum Development and Alumni Contribution in IHTE. Regarding status of KM in IHTE as depicted by results, most institutions are only at initial implementation stage. Thus the suggested

framework will help them to focus on the ways to acquire, store and disseminate knowledge in planned ways and thus help in improving the overall performance.

Knowledge Management Aspects in the Institutions of Higher Technical Education: The three aspects of IHTE-Research, Curriculum Development and Alumni Contributions have been studied in detail. Features to be included in KM framework for Research, Curriculum Development and Alumni Contributions were identified through literature survey. These features were tested through z-test for their inclusion in KM framework. These features were finally shaped into Research, Curriculum Development and Alumni Contributions factors using factor analysis. Further, regression analysis was used to find the relationships and important predictors of perceived benefits.

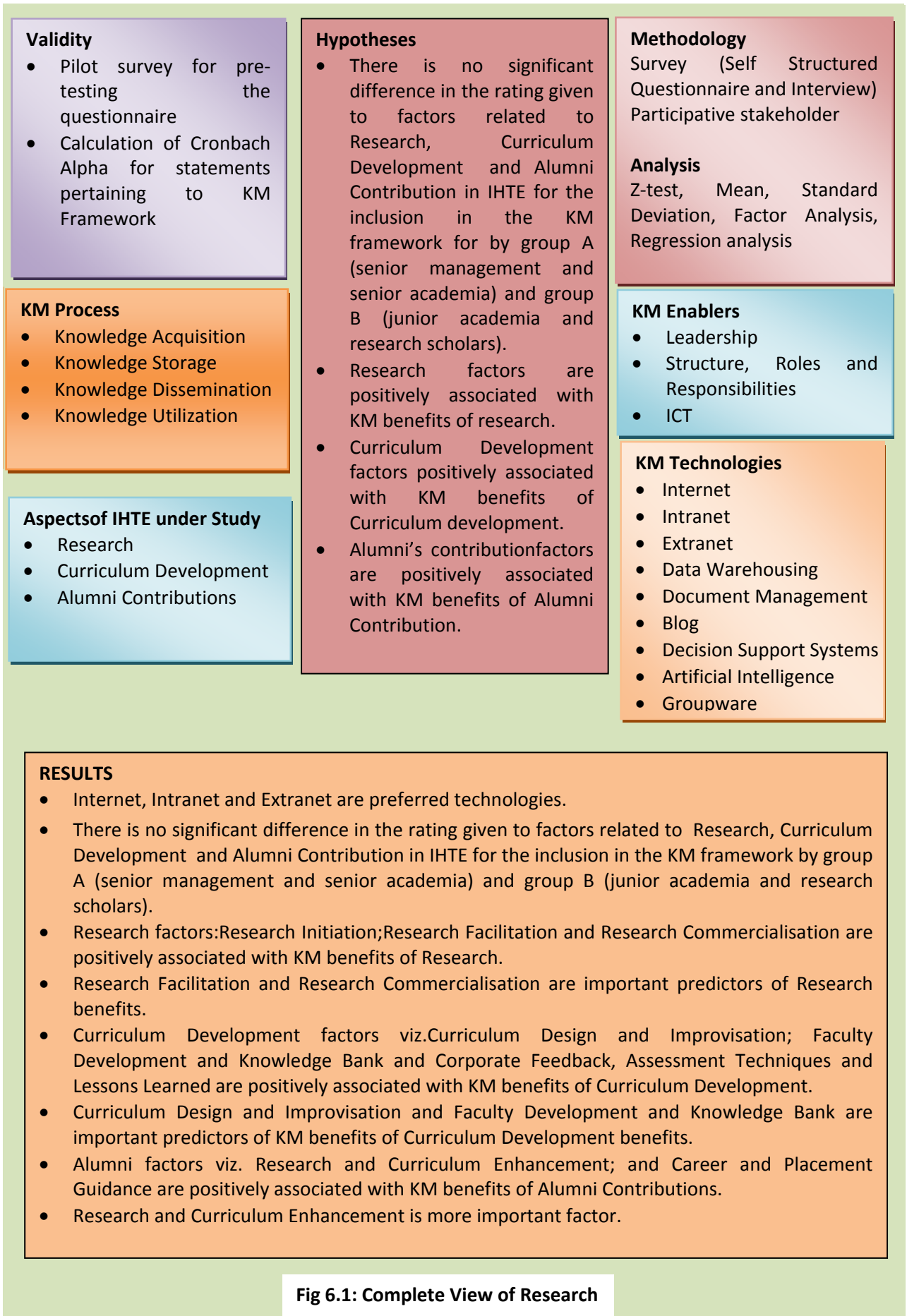
Perceived Benefits: By incorporating the factors for Research, Curriculum Development and Alumni Contributions in KM using four processes viz. acquisition, storage, dissemination and utilization, KM benefits can be attained. As suggested by academia the following perceived benefits of Research, Curriculum Development and Alumni Contributions had higher ratings:

- i. Reduced turnaround time for research.
- ii. Minimized devotion of research resources to administrative tasks.
- iii. Facilitation of interdisciplinary research.
- iv. Good curriculum will enhance the research.
- v. An industry oriented and latest curriculum will produce competent professionals.
- vi. Enhanced quality of curriculum and programs by identifying and leveraging best practices and monitoring outcomes.
- vii. Alumni can contribute to research e.g. grants, industry oriented research.
- viii. With alumni feedback, competent and industry oriented curriculum can be developed.

Thus, the present research is comprehensive as it covers all aspects of Knowledge Management to enhance Research, Curriculum Development and Alumni contributions.

Today, the world economy is experiencing an unprecedented change. New developments in science and technology, media revolution and globalization and the ever-expanding competitive environment are revolutionizing the education scene. A paradigm shift has been noticed in education from 'national education to 'global education', from 'one time education for a few' to 'life-long education for all', from 'teacher-centric education' to 'learner centric education'. These changes make new demands and pose fresh threats to the existing established education practices in the country. (Agarwal et al., 2012) Because of interdependence of world economy in recent years, the Indian higher education system has a new role to play and face the challenges to provide to the nation, skilled human power at all levels, having requisite knowledge and confidence to effectively confront the social and economic realities. People like Hansen, Nohria, and Tierney (1999) advocate IT to connect people with reusable codified knowledge. Others think that technology has little to do with KM. Success of KM is related to appropriate culture rather than technology (Dixon, 2000; Stankosky, 2005). However, it is human nature to create and use tools. Thus, it is not wise to deny or ignore technology which shows an aspect of human complexity (Snowden, 2003). As Knowledge Management method is becoming a perfect education development tool for all academic levels (Thitithananon & Klaewthanong, 2007), Institutions of Higher Technical Education can enhance their competitiveness and face the challenges through the suggested KM framework.

The complete view of research is depicted in fig. 6.1, including methodology, validity, enablers of KM, KM processes, KM technologies, aspects of IHTE under consideration, hypotheses and results.



6.2 CONTRIBUTIONS OF THE STUDY

The contributions of this thesis are listed below:

- Research, Curriculum Development and Alumni Contributions are the pillars of any educational institution. This study is only one of its kinds as it suggests the framework for enhancing Research, Curriculum Development and Alumni Contributions in IHTE in India. Thus, the proposed KM framework will help strengthen the relationship amongst these three, to have sound foundation.
- The study throws light on KM enablers which can provide an environment for successful KM implementation.
- The study helps in analyzing the important KM technologies used for KM by existing IHTE.
- Dimensions used for knowledge acquisition, knowledge storage and knowledge dissemination have been identified by the study.
- The study provides a valuable insight, regarding important features and factors of Research, Curriculum Development and Alumni Contributions.
- The study is a successful attempt in revealing the factors of Research, Curriculum development and Alumni Contributions that require more attention for KM.
- The study also throws light on perceived benefits of KM for Research, Curriculum Development and Alumni Contributions.

6.3 RECOMMENDATIONS OF THE STUDY

Keeping in view the results obtained from this study and the observations during the interviews with thought leaders, a few suggestions are being made.

Firstly, there is a need to have a KM team with a good visionary leader. They should have clear objectives and strategies to achieve the same and should be able to motivate the stakeholders to contribute to KM.

Academia should be made aware that the whole aim of the KM initiative is to enhance their productivity by making their job easier and not burdening them with additional tasks. This can be done by projecting the perceived benefits of KM. Since the whole KM venture can be successful only if acquired knowledge is

disseminated properly and utilized efficiently. KM should be implemented in the technology accepted/ preferred by the academia.

A proper need analysis for KM should be performed. The features of the concerned aspects of IHTE should be identified with the feedback from stakeholders. Before finalizing the features for the inclusion in KM, their perceived benefits should be identified by one to one mapping.

Collaboration tools, such as discussion forums and chats etc. are strongly recommended for the inclusion in KM Framework for the free flow of thoughts and knowledge sharing in IHTE.

6.4 LIMITATIONS AND FOCUS FOR FURTHER STUDY

A limitation of the study is that the sample size is relatively small. To account for the sample size limitation of the study, further studies can consider respondents from more IHTE, to ensure more generality of the findings. The researchers have developed a KM framework for enhancing Research, Curriculum Development and Alumni contribution. Future research could focus on validating this framework in IHTE where KM is being implemented. Thus, this research has laid the foundation for inclusion of factors for improving the Research, Curriculum Development and Alumni Contributions and to attain the perceived benefits.

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APPENDIX-I

Questionnaire

PhD Questionnaire for Management, Academia and Research Scholar in the Institution of Higher Technical Education

Thank you for agreeing to participate in this study of Knowledge Management (KM) practices in Higher Technical Education in India. The aim of the study is to obtain the opinion of academia about KM, who has a fair amount of experience in Higher Educational technical system.

A: Respondent and Organizational Profile

- 1) Your Name : _____
- 2) Institution Name : _____
- 3) Place : _____
- 4) Job Title : _____
- 5) Higher Education Institute Type : _____

☐ University
 ☐ Deemed University
 ☐ Affiliated Institute

- 6) What is the highest level of course your institution offers(if any other, pls specify):

☐ Doctorate
 ☐ Master
 ☐ Bachelor

- 7) Is Knowledge Management System implemented in your institute?

☐ Yes
 ☐ In process
 ☐ No

Please rank on the scale of 1 to 5 by ticking (✓) one of the boxes of each mode. (1 being least preferred and 5 being most preferred)

B:	Information and Communication Technology(ICT)					
	"Information and communications technologies (ICT) are the computing and communications facilities and features that variously support teaching, learning and a range of activities in education."					
1)	ICT skills and applications are needed to keep the pace with world in the knowledge age?	1	2	3	4	5
2)	Educators can use the new technology to improve their teaching, give it more variety e.g. power point shows, web discussions, URL collections, websites ?	1	2	3	4	5
		1	2	3	4	5
3)	The usage of ICT will improve knowledge sharing among educator and students.					
C:	Knowledge Management System in your Institution of Higher Technical Education					
I.	Policies and Strategies					
	To what extent your institution					
1)	is inclined towards having/have written KM policy or strategy?	1	2	3	4	5

2)	has a values system or culture intended to promote knowledge sharing?	1	2	3	4	5
3)	uses partnerships or strategic alliances to acquire knowledge?	1	2	3	4	5
4)	rewards the employees monetarily who share the knowledge?	1	2	3	4	5
5)	rewards the employees non monetarily who share the knowledge?	1	2	3	4	5
II.	Knowledge Acquisition (Capturing or Gathering Knowledge)					
	Your institution regularly					
1)	captures and uses knowledge obtained from research institutions including universities and government laboratories?	1	2	3	4	5
2)	dedicates resources to detect and obtain external knowledge and communicate it with in the institution?	1	2	3	4	5
3)	encourages faculty to participate in project teams with external experts?	1	2	3	4	5
4)	documents the procedures e.g. what and why the changes are made in curriculum.	1	2	3	4	5
5)	subscribes to external databases or journals.	1	2	3	4	5
III.	Knowledge Storage					
	To what extent your institution uses the method to store the knowledge:					
1)	by having the department wise database.	1	2	3	4	5
2)	by maintaining “best practices and lessons learned” database.	1	2	3	4	5
IV.	Knowledge Dissemination (To spread or broadcast knowledge)					
	To what extent the following methods are used for knowledge dissemination in your institution by					
1)	preparing written documentation such as lessons learned , training manuals, good work practices, articles for publication etc.	1	2	3	4	5
2)	internal lectures, knowledge sharing seminars.	1	2	3	4	5
3)	sharing via intranet.	1	2	3	4	5
4)	knowledge sharing committees.	1	2	3	4	5
V.	Knowledge Management Technologies					
	To what extent the IHTE uses the following technologies:					
1)	Internet (such as search engines)	1	2	3	4	5
2)	Intranet (such as internal portals)	1	2	3	4	5
3)	Extranet (such as knowledge bases)	1	2	3	4	5
4)	Data Warehousing	1	2	3	4	5
5)	Document Management	1	2	3	4	5
6)	Blog	1	2	3	4	5
7)	Decision Support Systems	1	2	3	4	5
8)	Artificial Intelligence	1	2	3	4	5
9)	Groupware	1	2	3	4	5
D:	Knowledge Management and Research					
a)	KM Research Features					
	In your opinion the KM in Institutions of Higher Technical Educational should have:					
1)	Research interests within an institution or affiliated institutions	1	2	3	4	5

2)	Research results and funding organizations with easy search capabilities.	1	2	3	4	5
		1	2	3	4	5
3)	Commercial opportunities for research results.					
4)	Funding opportunities	1	2	3	4	5
5)	Pre-populated proposals, budgets and protocols	1	2	3	4	5
6)	Proposal routing policies and procedures	1	2	3	4	5
7)	Award notification, account setup, and negotiation policies and procedures	1	2	3	4	5
8)	Contract and grant management policies and procedures.	1	2	3	4	5
9)	Technical and financial report templates and policies and procedures.	1	2	3	4	5
	According to you, what other features should be added to the KM:					
b)	Perceived Benefits					
	The following benefits can be incurred after the implementation of KM:					
1)	Latest research can give good inputs to improve the curriculum development process	1	2	3	4	5
2)	Quality research at the institution level will cultivate future scientists	1	2	3	4	5
3)	Increased competitiveness and responsiveness for research grants, contracts, and commercial opportunities.	1	2	3	4	5
		1	2	3	4	5
4)	Reduced turnaround time for research.					
5)	Minimized devotion of research resources to administrative tasks.	1	2	3	4	5
6)	Facilitation of interdisciplinary research.	1	2	3	4	5
7)	Leveraging of previous research and proposal efforts.	1	2	3	4	5
8)	Improved internal and external services and effectiveness.	1	2	3	4	5
9)	Reduced administrative costs.	1	2	3	4	5
		1	2	3	4	5
E:	Knowledge Management and Curriculum Development (CD)					
a)	KM Curriculum Development Features					
	In your opinion the KM in Institutions of Higher Technical Educational should have:					
1)	Curriculum revision efforts that includes lesson plan, content sequencing, reference of contents and so forth.	1	2	3	4	5
2)	Content modularized and arranged to facilitate interdisciplinary curriculum design and development.	1	2	3	4	5
3)	Assessment techniques, including best practices, outcomes tracking, faculty development opportunities, and research.	1	2	3	4	5
4)	Analyzed student evaluations updated each semester for lessons learned and best practices for all faculty.	1	2	3	4	5
5)	Corporate relationships to identify curriculum design advisory task forces, guest speakers, adjuncts, case study sites, and so forth.	1	2	3	4	5
6)	Information related to teaching and learning with technology, including faculty development opportunities, outcomes tracking, lessons learned, best practices, technology overviews, and so forth.	1	2	3	4	5
7)	Information in each disciplinary area, including updated materials, recent publications, applicable research, and so forth.	1	2	3	4	5

8)	New faculty with guides for developing curriculum, working with senior faculty, establishing effective teaching styles, advising do's and don'ts, supervising PhD students, and so forth.	1	2	3	4	5
	According to you, what other features should be added to the KM:					
c)	Perceived Benefits					
	The following benefits can be incurred after the implementation of KM:					
1)	Good curriculum will enhance the research.	1	2	3	4	5
2)	An industry oriented and latest curriculum will produce competent professionals	1	2	3	4	5
3)	Enhanced quality of curriculum and programs by identifying and leveraging best practices and monitoring outcomes.	1	2	3	4	5
4)	Improved speed of curriculum revision and updating.	1	2	3	4	5
5)	Enhanced faculty development efforts, especially for new faculty.	1	2	3	4	5
6)	Improved administrative services related to teaching and learning with technology.	1	2	3	4	5
7)	Improved responsiveness by monitoring and incorporating lessons learned from the experiences of colleagues, student evaluations, and corporate or other constituent input.	1	2	3	4	5
8)	Interdisciplinary curriculum design and development facilitated by navigating across departmental boundaries.	1	2	3	4	5
F:	Knowledge Management and Alumni Contributions					
a)	KM Alumni Contributions Features					
	In your opinion the KM in Higher Educational Institutes should have:					
1)	Alumni's feedback for competent and industry oriented curriculum.	1	2	3	4	5
2)	Alumni's contribution for research e.g. grants, industry oriented research	1	2	3	4	5
3)	Alumni services to career development efforts.	1	2	3	4	5
4)	Career placement services (potentially all corporate connections of alumina) to provide a one-stop service centre for students and faculty.	1	2	3	4	5
	According to you, what other features should be added to the KM:					
b)	Perceived Benefits					
	The following benefits can be incurred after the implementation of KM:					
1)	Alumni can contribute to research e.g. grants, industry oriented research.	1	2	3	4	5
2)	With alumina feedback, competent and industry oriented curriculum can be developed.	1	2	3	4	5
3)	Improved services for alumni and other external constituents.	1	2	3	4	5
G:	Knowledge Management Enablers					
	According to you, to what extent the following factors will enable KM in the institution:					
1)	Leadership	1	2	3	4	5
2)	Structure, roles and responsibilities	1	2	3	4	5
3)	Information and communication technology	1	2	3	4	5

APPENDIX-II

PAPERS PUBLISHED/ACCEPTED

Papers Published – SCI indexed						
S.No	Author(s)	Year of Publication	Title of Paper	Name of the Journal, Volume/ page numbers	Name of the Publisher	Impact Factor
1	Parul D. Agarwal, Kiran, Ravi & Verma, A. K.	2011	Empowering educators with knowledge management for the development of state-of-art curriculum	African Journal of Business Management	Academic Journals	1.105
2	Parul D. Agarwal, Kiran, Ravi & Verma, A. K.	2011	Knowledge sharing for stimulating learning environment in institutions of higher technical education	African Journal of Business Management	Academic Journals	1.105
Papers Published						
3	Parul D. Agarwal, Kiran, Ravi & Verma, A. K.		Enhancing the learning of students of higher education through innovative communication modes of knowledge: Educator's Support Model	Global Journal of Management and Business Research, Vol. 10, No. 2, pp 164-170.	Global Journal of Management and Business Research	
4	Parul D. Agarwal, Kiran, Ravi & Verma, A. K.		Enhancing curriculum and research in higher education with a strategic use of knowledge Management	Global Journal of Management and Business Research, Vol. 11, No 12, pp 68-83.	Global Journal of Management and Business Research	
Papers in Book Publisher						
S. No	Author(s)	Year of Publication	Title of Paper	Name of the Journal, Volume/ page numbers	Name of the Publisher	Status

5	Parul D. Agarwal, Kiran, Ravi & Verma, A. K.		A Preservation and Dissemination of Knowledge in a Strategic Way in the Institutions of Higher Education: Utilizing Knowledge to its Maximum with Knowledge Management	Information Management in Knowledge Economy, Vol.2	Mc.Millan.	
Papers Published in International / National conference in India						
6	Parul D. Agarwal, Kiran, Ravi & Verma, A. K.	2009	Unleashing the hidden treasure of knowledge in Higher Education Institutes with Knowledge Management	Innovation Management and Entrepreneurship, Thapar University, Patiala.	Thapar University, Patiala.	NC, India
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