KNOWLEDGE MANAGEMENT SYSTEM THROUGH ICT: A STUDY OF INDIAN HIGHER EDUCATIONAL INSTITUTIONS

THESIS

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by

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DECLARATION

I, hereby certify that the thesis titled "**Knowledge Management System through ICT: A Study of Indian Higher Educational Institutions",** submitted in fulfillment of requirement for the Doctor of Philosophy is an authentic record of my research work carried out under the guidance of Dr. Vikas Gupta. Any material borrowed or referred is duly acknowledged.

The material presented in this thesis has not been submitted elsewhere in part or entirely to any other university or institute for the award of any degree.

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CERTIFICATE

This is to certify that the thesis titled "**Knowledge Management System through ICT: A Study of Indian Higher Educational Institutions"**, submitted in fulfillment of the requirements for the award of the degree of Doctor of Philosophy is an original research work carried out by Ms. Namita Jain, under my supervision. The matter presented in this thesis has not been submitted elsewhere in part or fully to any other university or institute for the award of any degree, to the best of my knowledge.

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EXECUTIVE SUMMARY

In the contemporary world, the dynamics of educational landscape are undergoing a rapid and tremendous qualitative change. Today, it is subjected to similar forces as that of the marketplace to stimulate innovations, improve customer services and achieve operational excellence. With the advent of globalization and cross-border movement of students, educational institutions vie to excel in global rankings to increase their visibility and attract international students (Shastry, 2017). They also have to adjust themselves to respond rapidly to the changes in technologies and increasing demands of stakeholders. In such a scenario, many authors and thinkers have expressed their interest in introducing knowledge management (KM) practices into the field of education. According to Kidwell et al. (2001) if done effectively, KM can lead to improved teaching, research, innovation, industry income, internationalization and skill development. Similarly, the emergence of Information and Communication Technologies (ICT) has opened new avenues that could play important role in meeting the prevailing challenges related to sharing, exchanging and disseminating knowledge by reducing spatial and temporal barriers.

As compared to other countries, higher education system in India is facing several problems which is inhibiting its excellence in world university rankings. Despite having a huge demographic dividend, as per THES ranking, no Indian institution could make to the top 200, while according to QS ranking, only three higher educational institutions (HEIs) could make it to the top 200. The most notable reasons may be identified as lack of internationalization, high pupil-teacher ratio, low industry income and lack of quality research among others (Business Standard 2018; THES 2019).

The research is timely and needs attention, as within education there has been less research or debate of KM as a strategy for enhancing the organization's performance

(Fullan, 2001). HEIs are usually agencies of production of new knowledge, but less number of institutions are actually active at this level. It is understood that we all are in a rapidly evolving educational landscape where technological breakthroughs have the potential to disrupt the existing model. Such disruptions can have behavioral, economic and social ramifications. A better understanding of such alterations will help academicians equip themselves for evolving classrooms accordingly and the changing nature of their jobs.

The objective of this study is to find as to what extent KM is practiced in institutes of higher learning and whether KM practices significantly affect the institute's performance. To assess ICT penetration in institutes of higher learning and to find out whether its interventions significantly affects the institute's performance. It also takes into account if KM and ICT interventions vary among the differently rated institutions.

Building up on the extensive review of literature, observations and expert opinion, the research study developed a scale and collected data from students, faculty and administrative staff using structured questionnaires on a 7 point likert scale. Thereafter, Exploratory Factor Analysis was performed in SPSS and four components each of KM and ICT were derived out of the analysis. The impact of KM and ICT components on institutional performance was measured using structural equation modeling (SEM) in AMOS. Empirical evidence supported the view that Knowledge management systems have a direct and significant impact on the performance of HEIs in India as measured by the R^2 value of 62% of the model. The results of T-test and ANOVA also proved that there is significant difference in the performance of institutions based on their rankings.

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LIST OF ABBREVIATIONS

ASV	:	Average Shared Variance
AVE	:	Average Variance Extracted
CFA	:	Confirmatory Factor Analysis
CFI	:	Comparative Fit Index
CR	:	Composite Reliability
HEIs	:	Higher Educational Institutions
ICT	:	Information and Communication Technology
KC	:	Knowledge Creation
KCul	:	Knowledge Culture
KM	:	Knowledge Management
KMS	:	Knowledge Management System
KSR	:	Knowledge Storage and Retrieval
KT	:	Knowledge Transfer
MOOCs	:	Massive Open Online Courses
MSV	:	Maximum Shared Variance
O_COP	:	Online Communities of practice
Perf	:	Institute Performance
SEM	:	Structural Equation Modeling
SPSS	:	Statistical Package for Social Sciences
T_emerg	:	Emerging technologies
T_infra	:	Technology infrastructure
T_int	:	Technology integration

CHAPTER 1

INTRODUCTION

In the contemporary world, the dynamics of educational landscape are undergoing a rapid and tremendous qualitative change. Today, it is subjected to similar forces as that of the marketplace to stimulate innovations, improve customer services and achieve operational excellence. The intense competition has compelled higher education institutions to "think like a business." Universities also have to adapt themselves and develop strategies to respond rapidly to the changes in technologies and the increasing demands of stakeholders such as faculty, students and administrators (Brown and Duguid, 1996). In such a scenario, many authors and thinkers have expressed their interest in introducing knowledge management (KM) practices into the field of education (Rowley, 2006; Jundale and Navale, 2009; Bhusry et al., 2011). According to Kidwell et al. (2001), academic institutions have notable prospects to harness KM tools to strengthen each element of their goal. There is a tremendous value of educational institutions that develop initiatives to share knowledge in order to achieve its objectives. If done efficiently, knowledge management can lead to "sound decision-making capabilities, reduced product development cycle time (for example, curriculum development and research), better academic and administrative services, and decreased costs." The advent of Information and Communication Technologies (ICT) in the last few decades has opened new pathways in KM that could perform significant and multifaceted roles in confronting the everyday challenges related to sharing, exchanging and disseminating

knowledge and technologies in higher education. A large number of stakeholders in education across ages and regions have turned to a new paradigm that merges conventional classrooms with computer and telecommunication technologies to form online education that make quality learning available across the globe (Laal, 2011).

1.1 Background of the Study

The progress of a nation largely depends on its education system, which in turn has the potential to do justice to its clients (students) if it can make available the right knowledge at the right time to enable one to make the right decision. The above statement calls for an appropriate Knowledge Management system (KMS) in education.

With the advent of globalization and cross-border movement of students, institutes want to obtain top ranks in global ranking systems to increase their visibility and attract international students (Shastry, 2017). To attain this objective, there must be a portrayal of excellent graduation outcomes, success in innovation projects, good placements and internships. The students' world over demand greater exposure, rewarding skillsets and learning opportunities. Similarly, industry demands skills that are readily transferable to industry (Murthy, 2010). Given such rising expectations from all potential stakeholders and challenging goals, proper management of the knowledge in the higher education system is imperative to maximize the potential and productivity of available resources, limited in nature. Under such circumstances, Indian universities must apply KM in the right spirit to make an impact on the global platform. If done efficiently, KM can lead to improved teaching, research, innovation, industry income, internationalization and skill development. In this endeavor, ICT provide an impetus for reducing spatial and

temporal barriers and improving access to knowledge. If the latest ICTs are used to their full potential, it can revolutionize the teaching-learning process. Nowadays ICT is used extensively to facilitate KM which is also referred to as KMS (Alavi and Leidner, 2001). According to Rah et al. (2010) KMS refers to "a (generally IT based) system for managing knowledge in organizations, supporting creation, capture, storage and dissemination of information."

1.2 Higher Education System in India

According to All India Survey of Higher Education, MHRD (2019), "Higher Education is defined as the education, which is obtained after completing 12 years of schooling or equivalent". According to World Bank, 2017, "Higher education comprises all post-secondary education, training and research guidance at education institutions such as universities that are authorized as institutions of higher education by state authorities." UNESCO, JICA, UNDP and other international organizations also use the same definition. As per AISHE (2019), India has about 903 universities, of which 343 are under private ownership. The higher education has an enrolment of 36.6 million students. The stated figure comprises 19.2 million boys and 17.4 million girls are there. About 79.2% students are enrolled in Undergraduate program and 161412 students are enrolled in PhD which is even less than 0.5% of the total student enrolment. The total number of teachers are 12,84,755 teachers and 1,83,352 non-teaching A grade staff.

India is a developing nation characterized by low per capita income and a high density of young population. About 50% of its population is under the age of 25 years and this demographic dividend is expected to peak by 2020 as per the economic survey 2017 (Sethi, 2017). As the nation progresses in a knowledge-driven society, Indian students

will become the largest consumer of higher educational services in the world. As per UNESCO report 2016, 2.5 lac Indian students migrate to other countries for higher studies and spend about 3.7 billion dollars on their maintenance (Krishnan, 2017). This situation may be due to the dearth of globally recognized institutes in India and growing competition for limited seats in them. As per Times Higher Education Survey (THES) ranking 2019, no Indian institution could make it to the top 200, while according to Quacquarelli Symonds (QS) ranking 2019, only 3 Higher Educational Institutions (HEIs) could make it to the top 200. The most important reason is the lack of internationalization. Despite the government's ambitious 'Study in India' program, India can attract students from only a few neighboring countries like Nepal, Afghanistan and Bhutan (GK Today, 2018). As per New Economic Policy (NEP, 2019), the foreign student enrolment in higher education is 46144. Majority of the students come from Nepal (25%), Afghanistan (10%), Sudan (5%), Bhutan (4.3%) and Nigeria (4%). The performance in other parameters like pupil-teacher ratio and industry income is no better. The collaboration between academia and industry for research and innovation is low, and thereby industry income is also low. The research publications and citations per faculty also need improvement (Business Standard 2018; THES 2019).

The study by NASSCOM also reveals that only a fourth of Indian graduates are readily employable (Choudhari and Arya, 2011). Several engineering colleges in India are shutting down for failing to produce quality engineers. Due to their disconnection with the industry, their students are either not getting work or are compelled to work at a low salary (ET online, 2018). According to national crime records bureaus, one student commits suicide every hour in India (ET, 2018). The reasons include mental stress, exam anxiety among the rising unemployment rates. The broken higher

education system is said to produce students who lack the vocational skills required for the job. Failure to secure a job even after graduation has resulted in frustration and depression among students (Mukhopadhyay, 2019).

1.3 Research Problem

As compared to other countries, the higher education system in India is facing several problems which are inhibiting its excellence in world university rankings. India's Gross Enrollment Ratio (GER 18-23 years) in higher education is about 25.8% compared to 86.7% in the US, 56.5% in the UK, and 43.39% in China (MHRD 2016; Iyer 2019; GK Today 2018). India produced around 8,900 doctorates, which is still a fraction of the number from the US and China (Cyranoski et al., 2011). Less than 1% of graduates opt for doctoral studies in India. A substantial number of Indian students prefer to go abroad and earn foreign degrees (Planning Commission, 2014; Iyer, 2019). A report by Clarivate Analytics fifth edition reveals that "India accounts for only .25% of the 4000 highly cited scientists across the globe". The figure stands at 47% for Singapore and 43% for China (Business Insider, 2019). A chronic shortage of faculty is another problem. Around 30%-40% of faculty positions are vacant. In central universities alone, about 19% of positions are lying vacant, even when ad-hoc and visiting faculty are added to permanent teachers. The student-teacher ratio is high in India at 25 (Waghmare, 2018), while it is 14 in USA and Russia. This situation occurs due to the lack of infrastructure, inappropriate recruitments and pressures to accommodate more students in a class. The problem is further accentuated due to obsolete pedagogies and assessment focus on rote learning. Students have little opportunity to develop essential skills like critical thinking, logical reasoning,

problem-solving and collaborative working (British Council, 2016). All this has resulted in graduates with low employability. This dismal situation owes to a deficiency in the teaching and learning process in developing countries, which is due to outdated curricula, lack of teacher training, obsolete pedagogy and the absence of engagement with the course content.

There also exists a separation of teaching and research. The number of patent applications filed by Indians was only 0.3% of the world total. It is a very disappointing figure for a country with a 17% share of the world population (Sinha, 2016). There are very few opportunities for interdisciplinary learning too. "More than 94% of the workforce in India has no technical education and merely 8% in rural and 30% in urban areas have general education of higher secondary and above" (Sharma, 2018).

According to NEP, 2019 the lack of knowledge sharing among different disciplines and rigid departmentalization has resulted in silos leaving little room for multidisciplinary teaching and research. Such practices are producing students with identical education having no real individuality. It may also suppress creativity, talent and idea generation. Such single skilling might be a risky proposition in the twenty first century, where structured task are bound to get automated.

The higher education system in India is highly fragmented. Approximately 20 percent colleges have enrolment below 100, while 4 percent colleges have enrolment above 3000. Such disparity has resulted in sub-optimal use of resources in one institution while resource constraints in another. If there would have been a proper knowledge management system of mentoring, sharing best practices, such disparities would not have arisen.

The recent education policy expressed its concern over the lack of research and thereby knowledge creation and innovation at the university level. This is due to segregation between the teaching and research institution. Such absence has resulted in a high opportunity cost for the nation in terms of not being able to match international standards of product and process innovations.

Teachers in colleges have to adhere to a central university syllabus, pedagogy, curriculum and textbook. They are not having the freedom to introduce innovations in teaching and research. Ideally, they must be allowed to customize their offerings in the light of changing circumstances to meet the needs of dynamic and technology rich business environment. This is all the more necessitated as globalization demands continuous learning, updating of knowledge and its rapid translation and application in the relevant fields.

1.4 Need for the Study

Educational institutions are in the knowledge business as they are into knowledge conception, diffusion and maintenance. So the question emerges, are the concepts of KM relevant to colleges and universities? Some would contend that sharing knowledge is their reason for existence. But, if that is the case, then the HEIs would be filled with examples of institutions that employ knowledge to stimulate innovation, improve customer service, or achieve operational excellence. However, though some cases exist, they are the exception rather than the rule. KM is a new subject, and experiments are just beginning in higher education. We believe there is an excellent value to HEIs that share knowledge to achieve their objectives (Kidwell, 2000).

Within education, there has been less research or debate of KM as a strategy for enhancing the organization's performance (Fullan, 2001). HEIs are usually agencies of production of new knowledge, but less number of institutions are actually active at this level, most of them are only repackaging knowledge. Many of them deal only with the knowledge transfer. Only a small number of Universities are dealing with knowledge processing for efficient decision making. There is an urgent need for rethinking management strategies in HEIs due to the overall requirements of the societies, governments, enterprises and stakeholders worldwide in the wake of increased access to knowledge through ICT, technical innovations, globalization, competition and the emergence of net- generation.

This study helps us understand that we are in a rapidly evolving scenario where innovations have the potential to disrupt the existing model. Such disruptions can have behavioral, economic and social ramifications. A better understanding of such alterations will help academicians equip themselves for evolving classrooms and the changing nature of their jobs. As the environment is getting dynamic and technology cycles are getting shorter, the challenge is how to skill student for the jobs that will be required in the next 10 to 15 years (Krishnan, 2017).

The need for the study can be summarized as follows:

- To understand the role and importance of knowledge management in higher education.
- To understand the role and importance of ICT in higher education.
- To enrich current discussions and debates on the latest ICT tools in higher education.

To introduce new arguments on knowledge management in higher education (among them knowledge creation and innovation; Knowledge sharing, networking and collaboration; Knowledge culture and research focus in universities and colleges). The new ICT enabled ecosystem can be harnessed to deliver quality education and achieve effective knowledge management in universities.

1.5 Research Questions

- What is the extent to which KM is practiced in institutes of higher learning?
- Does KM significantly affect the institute's performance?
- What is the penetration of ICT in institutes of higher learning?
- Does ICT interventions significantly affect the performance of an institution?
- Does KM and ICT interventions vary among the differently rated institutions?

1.6 Research Objectives

1. To measure the impact of KM components (Knowledge culture, transfer, creation, storage and retrieval) on Institute performance.

2. To measure the impact of ICT components (Technology infrastructure, integration, online communities of practice, emerging technologies) on Institute Performance

2.1 To explore the factors of Knowledge management system through ICT affecting the performance of an educational institution.

3. To determine the difference in KM and ICT adoption across the institutions differing in performance based on rankings

1.7 Originality of Research

The present research is a pioneering one in studying the impact of KMS on HEI's performance in India. The quantitative and qualitative analysis is conducted to discover linkage between KMS and performance. The research undertaken is not just a synthesis, but also educe new parameters relevant today. A scale is developed henceforth to measure KMS in the institutions. In the research process, the study also explored the factors of KMS empirically. It measured KM prevalence and ICT penetration in institutions. It then validated the effect of KMS through ICT on the performance of educational institutions and derived components that are critical to improving the performance of HEIs. It also contributes to our understanding of how to effectively create and manage knowledge resources in an institution through a detailed discussion. It also recommends productive strategies for utilization of its valuable latent resources.

The study is novel in the sense that, while the impact of KMS on performance is measured conceptually and empirically in corporations, such studies are scanty in academic centers. Moreover, while measuring the performance in HEIs using KMS, the focus on ranking parameters has never been there. Such an orientation is essential due to the emergence of indigenous rankings framework like NAAC (National Assessment and Accreditation Council) and NIRF (National Institutional Ranking Framework), and thier growing popularity. Currently, the Indian HEIs are also trying hard to achieve recognition in global ranking systems as the QS (Quacquarelli Symonds), THE (Times Higher Education), and other world university rankings. In such a scenario, the research provides insights on how HEIs can enhance their performance by harnessing KMS.

1.8 Organization of Thesis

The thesis is arranged in eleven different chapters that match up the stages undertaken in the research.

Chapter one proposes the title and gives a background to the current education system in India. It explains the research problem and the need for the study based on the research questions, research objectives and originality of the study.

Chapter Two presents the Review of Literature. It defines and explains the major concepts, models and theories in this study and also the need and importance of KM and ICT in HEIs. It also identifies and explores classical theories, models and tools that form the basis of knowledge management and ICT. In the thesis ahead, the possible linkages between KM, ICT and institute performance is explored and presented through a conceptual model. The previous studies are tabulated and research gap is identified. The constructs of the study (IDV and DV) are also derived and developed through an extensive literature review.

Chapter three relates to background and construct development. In this chapter the important factors related to KM and ICT are explored which are the independent variables of the study. The dimensions of institute performance, the dependent variable, are also identified.

It also develops the proposed hypotheses of the research and builds the conceptual model by relating the independent variables with the dependent variables.

Chapter four provides the research methodology. It describes the philosophical underpinnings of research, starting with the research design. It indicated the sampling method along with the sample size, sources of primary and secondary data and development of the research instrument. The pilot study so conducted in the preparation of the main study is also its part. The chapter also throws light on data collection procedure and methods of data cleaning. It states the statistical tools to be employed for data analysis and their justification.

Chapter five highlights the procedures and outcomes of quantitative data analysis. It is in this chapter that the properties of the questionnaire are tested. The reliability and validity of the items are also assessed. The chapter exhibits the profile of the respondents along with other important descriptive. Before proceeding to the main data analysis, the assumptions of multivariate data analysis and sample adequacy of data collected is checked. It also the presents the software results of exploratory factor analysis, structural equation modeling, T-test and ANOVA. The chapter also provides the results of regression analysis. The results portray the how the independent variables of the study affects the dependent variable.

The sixth chapter presents discussion and analysis of the results. The hypotheses so tested are interpreted and the significant and non-significant relationships of the regression tests are clarified. The chapter also concludes the research by presenting an outline of the study undertaken and contributions made. The chapter also describes the case study undertaken as a part of the main study. The scope of the case study is limited and its subjects are the students of the University of Delhi.

The seventh chapter presents implication of the study i.e. how the research will translate into real life benefits, and provides recommendation. The implications are discussed in the light of various policy initiatives taken by the ministry and government. In addition, the upcoming technological advances that can impact teaching and learning was also explored. The implications are followed by the recommendations of the study. As none of the research is perfect, the next sub-heading outlines the study's limitations with respect to its scope and methodology adopted. The chapter also advises on future scope of research in the academic field of knowledge management through ICT. At the end the references and the appendices are provided.

CHAPTER 2

REVIEW OF LITERATURE

The chapter Literature review begins with describing the significant terms used in the title of research. In the first section: Knowledge, its types, and importance are highlighted. In the second section, the term knowledge management is defined along with its models, tools, practices, and barriers. In the third section, KM is related to the educational field, elucidating the benefits of KM to education. In the fourth section, the term ICT is defined and how ICT is transforming education, and aiding KM is being explored. The fifth section describes the role and importance of prominent higher educational bodies in India, and the last two sections take a look at the previous studies in the area and identify the research gap.

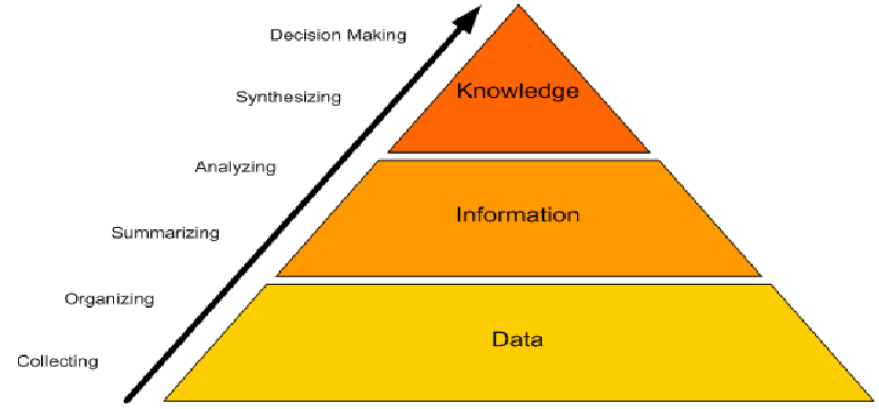
2.1 Knowledge

Knowledge starts as data-raw facts, figures and numbers. Information is data put into context after appropriate processing, and knowledge is information which can be acted upon. It incorporates experience and judgment which enables efficient decision making. In respect of an educational institute, input by teacher is the data for the student, when he comprehends the facts given by data that is information for him, when he analyses the information it becomes knowledge sought by him, and when he applies in the field it becomes his wisdom (Vader, 2009).

The term knowledge is defined by different stalwarts in the field. Nonaka and Takeuchi (1995) defined knowledge as “justified true belief”, whereas Davenport and

Prusak (1998) define knowledge "as a fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information."

Summarily, knowledge is "the insights, understanding and know-how that serves as a basis for intelligent decision making, action and application" (Wiig 1993; Davenport and Prusak 1998; Martensson 2000).



Source: (Finck, 2005)

Figure 1: DIK Model

2.1.1 Types of Knowledge

There are three kinds of knowledge, tacit knowledge, explicit knowledge and implicit knowledge.

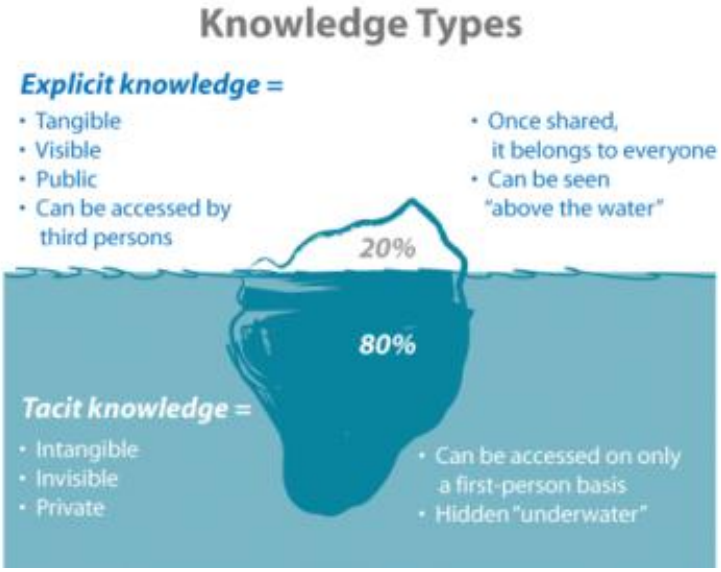
Tacit knowledge is the one that dwells in the minds of people. It is tough to formalize and difficult to codify and usually unexpressed or unsaid openly (Falconer, 2006). Many a time, the person possessing this type of knowledge may himself not be well aware of this fact (Polanyi, 1967). The situation occurs because it is deeply ingrained in the work practices, experiences and routine tasks of an individual. Tacit knowledge

is responsible for building intuits, insights and judgment for decision making (Seidler-de Alwis and Hartmann, 2008). The advantage of tacit knowledge to organizations is that it cannot be imitated easily and serves as a source of competitive advantage for the organizations. The drawback is that it is at a much higher risk of getting lost (Jasimuddin et al., 2005). With the departure of an employee, the tacit knowledge also departs. Realizing its importance, many organizations are trying to capture this knowledge for future benefits. One way to elicit tacit knowledge is group discussions, meeting and interviews. Employee apprenticeship, mentorship and job rotation are other methods. Also referred to as know-how, tacit knowledge helps in developing skills in an individual (Smith, 2001).

Explicit knowledge is the knowledge that is expressed or pronounced. In other words, it is the knowledge that can be codified, documented and recorded (Sanchez, 2005). The forms of explicit knowledge are manuals, reports, best practices, instructions, rule-books and so on. Many organizations document experiences so that it can be made available to the learners and other incoming employees. Explicit knowledge is also said to render clarity and provides an organized or structured form of working. It serves as a ready reference for a routine task and usually referred to as know-what. Nowadays, information technology provides an efficient mechanism to warehouse massive amounts of data, which can be well organized for quick retrieval and query processing in times of need. By maintaining explicit records, institutions remain immune from losing knowledge owing to employee turnover. Though organizations understand the importance of documenting learning, it is not followed as it demands considerable time and effort. The organizations can convert tacit knowledge to explicit by articulating and recording best practices, events, lesson plans, policies,

procedures, organizational stories, and so on (Nickols, 2000). However, caution must be exercised while formalizing it, as it is context-specific and may be particular to a person or situation.

Implicit knowledge lies somewhere between tacit and explicit knowledge and is often confused with tacit knowledge (Frappaolo, 2007). Implicit knowledge is that part of tacit knowledge that is capable of being converted into explicit knowledge. For instance, implicit knowledge gets unconsciously tapped or revealed through the performance of a task or practical application of knowledge (Schacter, 1992). Implicit learning is the one that occurs in an incidental manner without active involvement, for example, merely observing someone performing a task (Reber, 2001).



Source: (UN, 2005)

Figure 2: Types of Knowledge

2.1.2 Reasons for Managing Knowledge

Knowledge is at the hub of modern economy (Kluge et al, 2004). In the primitive periods economies were mainly governed by the physical and material resources like

land, labor and capital, but nowadays, these resources are beginning to lose their dominance (Drucker 1993). Though the importance of knowledge is still underscored (Burton Jones 1999); in future, it seems that economies will be largely governed by knowledge resources, and success will be achieved by an economy's ability to create and utilize knowledge effectively. There had been and will be a change in paradigm from labor-based industries to skill-based industries and further to knowledge based industries (Handy 1984; Hislop et al. 1999).

A comprehensive definition of KM was given by Dalkir (2000), which also explains its benefits to the organizations. It is the "process of applying a systematic approach to capture, structure, management, and dissemination of knowledge throughout an organization in order to work faster, reuse best practices, and reduce costly rework from project to project." (Nonaka and Takeuchi, 1995; Ruggles and Holtshouse, 1999).

Today's era is marked by rapid globalization, innovation and change. There is huge competition and organizations are struggling to keep their cost low and margins high. In an attempt to do so, they go for retrenchment or downsizing. Employees too look for better careers and change jobs. Therefore, in order to keep pace with all these changes, a continual exercise of sharing best practices should be embedded in the culture of the organization.

The reasons for emergence and fruition of KM as given by Serban and Luan (2002) are as follows

1) Information overload

Data is everywhere. With IT systems, it has become all the more convenient to capture data on a mass scale. But it has also created information overload and finding

the right information at the right time has become a challenge. Information may reside in multiple sources, they can be explicit in folders, manuals and database or implicitly understood by the members of the organization. The information systems may not be well organized and may burden the information seeker without giving a succinct solution. Only an efficient query processing system and advanced search option may lend the best result without taking too much time.

2) Decision making and action

The more complex a decision, the more information we need in terms of both quantity and quality. While a well-managed knowledge infrastructure can be a boon, a mis-managed one hinder task completion leading to frustration and useless time consumption. The purpose of KM is to convert heap of unprocessed and unfiltered data into information that can be more readily usable for decision making and action.

3) Multidisciplinary projects

The successful completion of a project may require work of many a specialist and an efficient coordination between them. Such coordination demands free flow of information across different departments and divisions at the right time, which is aided by KM.

4) Workforce mobility and turnover

With liberalization, privatization and globalization, the mobility of the workers is enhanced. When the people retire, resign or shift, they take away the valuable experience and skills which they have gained from their institutions. An efficient method to capture and share these experiences and skills can result in savings, smooth workflow and able coping mechanisms.

5) Competition

Universities and colleges nowadays have become more accountable. They have to design such courses and impart such skills that are going to be relevant in the future. Taking into account speed of changing technology, it has become even far more challenging today. Universities not only face competition from other universities and colleges but also online courses and learning apps. Only the ability to continuously create, innovate and update can help them steer this competition. For growth and enhancement, innovation and proactive response to environmental changes is the key solution which can be brought through effective knowledge management.

6) Dynamic environment

We are living in a dynamic environment where changes in any or all the macro-environmental factors like political, economic, social or technical can disrupt old methods of working. In order to sustain, continuous learning is demanded and updation of skills is necessitated. This will help sense and respond timely to any change.

2.2 Knowledge Management

The concept of Knowledge Management is around for decades, but most organizations accept it only as theory and have not put it into practice in true spirit. Educational institutions do engage in knowledge transfer from teacher to students but only some of them contribute to knowledge creation, knowledge acquisition and knowledge documentation. No attempt is made to capture the tacit knowledge of the teachers who retire or resign and even the students who pass out. Even if it is captured, it may not be well documented, which may lead to knowledge loss. Even many institutes do not have

an open knowledge sharing culture. Knowledge is regarded as the valuable resource of an organization, thus it requires proper management.

According to Quintas et al. (1997), KM is the procedure of persistently managing available knowledge to meet present and future requirements, and making use of knowledge resources to develop new and greater potentials in the times ahead.

In a survey, it was found that the information needed by organizations was already there with them. But it remained a challenge to discover it and making the best use of it (Cranfield University 1998). Organizations can use KM as a strategy to identify what it knows so that it can learn from it and create value for its clientele (Dalkir, 2013).

According to Von Krogh (1998), KM signifies "identifying and leveraging the collective knowledge in an organization to help organizations compete." Serban and Luan (2002) described KM as "using the brain power of an organization in a systematic and organized manner in order to achieve efficiencies, ensure competitive advantage and spur innovation."

"Knowledge management is a discipline that promotes an integrated approach to identifying, capturing, evaluating, retrieving, and sharing all of an enterprise's information assets. These assets may include databases, documents, policies, procedures, and previously un-captured expertise and experience in individual workers. KM means making available right knowledge to the right person at the right time so that he can apply that knowledge for the benefit of the organization." According to Gates (2000), "the knowledge management-is a very clever term to describe a very simple subject. Many of us simply do not think in terms of managing knowledge, but we all do it. Each of us is a personal store of knowledge with training, experiences, and

informal networks of friends and colleagues, whom we seek out when we want to solve a problem or explore an opportunity." According to Dalkir (2013), KM is "the deliberate and systematic coordination of an organization's people, technology, processes, and organizational structure in order to add value through reuse and innovation. This coordination is achieved through creating, sharing, and applying knowledge as well as through feeding the valuable lessons learned and best practices into corporate memory in order to foster continued organizational learning."

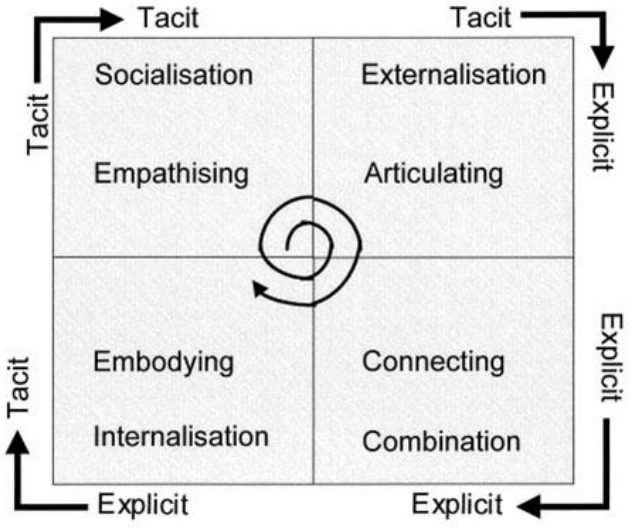
2.2.1 KM Models

A review of literature provides us with models based on knowledge category, knowledge processes and intellectual capital. The examples of knowledge category are SECI model, BA model and Boisot model. The examples of knowledge processes models are Wiig, Meyer & Zack, Bukowitz & Williams, Mc Elroy, Dalkir and Evans & Ali. The examples of intellectual capital model is the Skandia model. Let us now look at these models in detail.

(a) SECI Model

Nonaka et al. (1991) have developed the Socialization, Externalization, Combination and Internalization (SECI) model. The model describes four knowledge conversion methods akin to the four stages mentioned above. The model explains the transformations that take place within and between individuals, groups and organizations, which are all interconnected. Socialization presents knowledge conversion from tacit to tacit like direct interaction and sharing experiences in class and or conferences (Tammets, 2012). In Externalization, tacit knowledge is

transformed into explicit forms. The documentation of knowledge makes it a group asset. For example, it is writing experiences in the way of a case report, teaching manual (Rice and Rice 2005; Bryceson 2007). Then, through combination, knowledge is arranged, edited, sorted, consolidated and re-contextualized; it is shared with other groups and finally becomes a "common property" in the organization (Nonaka, 1994). For example, it is combining knowledge from different books, journals and repositories for a better understanding of a topic. Internalization is the remodeling of knowledge from explicit to tacit, example, deducing a new idea, enacting the lesson plan and simulations. Through practice and performance, the knowledge so created gets embedded in the form of skills and competencies in an individual (Tee and Lee, 2013). In other words, knowledge internalizes to become know-how or shared mental models. This process of conversion from tacit to explicit and vice-versa creates a spiral of learning which leads to the generation of new knowledge.

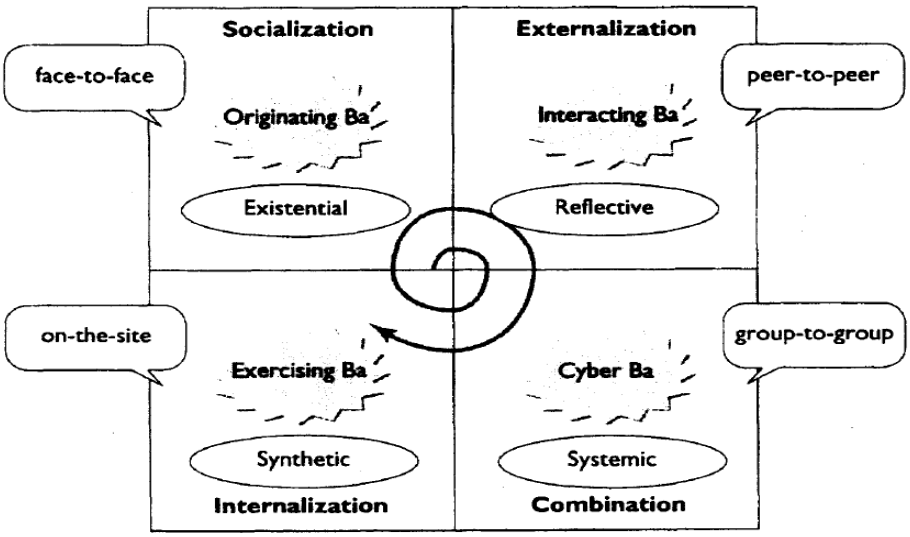


Source: (Nonaka, 2000)

Figure 3: SECI Model

(b) BA model

In Japan, there is a popular concept of BA. The term BA refers to a shared space that serves as a foundation for knowledge creation. The platform that BA provides integrates knowledge from physical, mental and virtual modes. Nonaka and Konno (1998) explained four types of BA, which are relatable to four stages of SECI model.



Source: (Nonaka and Konno 1998)

Figure 4: SECI and BA model

Originating BA is the first phase where tacit knowledge sharing among the members takes place. Being the first quadrant, it is the fertile space for germination of thoughts and initiation of discussions. These activities take place through face to face discussion, experience sharing and story-telling among members. In these interactions, emotions, body language and non-verbal cues also play a significant role. These interfaces enable social learning, which finds its roots in social constructivist theory establishing that "understanding of content is socially construed through conversations about that content and through grounded interactions with others" (Brown and Adler, 2008).

Interacting ba is a mode where tacit knowledge is made explicit through documentation. As people are supposed to type in their thoughts, they try to achieve clarity in their written words, grammar and language. They have become more expressive and articulate. Healthy dialogue and constructive feedback foster reflective learning.

Cyber BA enables the combination and co-creation of knowledge in a virtual space. The ability of online mediums to link, hyperlink, explore and probe has broadened the horizons of members. It is surprising to see how many people are out there thinking and reflecting on a given topic, area of study, or problem. This participative form of learning has strengthened group ties (Brown and Adler, 2008). The example is social networking, groupware and other collaborative technologies like cmoocs. The given mode harnesses social and relational capital and believes that learning resides in connections among people. The networks built by web 2.0 across the globe fostered networked learning also called connectivism (Siemens, 2006).

Exercising BA is a stage where knowledge creation moves from explicit to tacit. All the knowledge gained is to be assimilated, understood and applied to produce the best results. Exercising ba promotes authentic learning or learning by doing. This transformation of 'learning to learned' is highly desirable, and real-life applications or simulations can provide innovative solutions to achieve it.

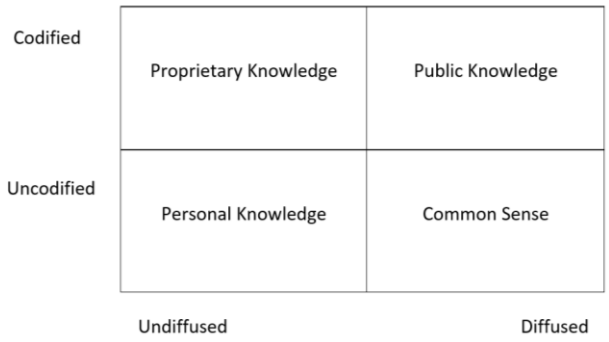
From the above discussion, we identified four modes of knowledge creation from tacit to tacit, tacit to explicit, explicit to explicit and then from explicit to tacit in a spiral. It is established that knowledge moves across the four quadrants in a spiral adding new experiences and learning at every stage. Knowledge becomes obsolete as soon as it is created. The challenge is not to store, transfer and share the knowledge but to create

new knowledge. New knowledge has to be created continuously to survive in this competitive business world (Sinha et al., 2015).

(c) Boisot Knowledge Category Models

The Boisot model bears resemblance to SECI model. As can be seen from the figure, the information can be codified (explicit) or uncodified (tacit), diffused (shared) or undiffused (not readily shared). In the top left quadrant, the information that is codified and undiffused is proprietary which is available to a few selected individuals example confidential reports and internal documents of an organization.

The bottom left quadrant represents personal knowledge which is a combination of uncodified and undiffused knowledge. Personal knowledge can be understood as insights, experiences and views unique to an individual (Banerjee and Dutta, 2016). The upper right column stands at the intersection of codified and diffused and represents public knowledge. This knowledge is the one which is available to the public at large without any restriction. It can be understood as information available on website and annual reports of companies or organization. The fourth and last quadrant stands at the intersection of uncodified and diffused knowledge. It is the common sense which is the understanding of the world built through a process of interaction and internalization.



Source: (Adam and Creedy, 1999)

Figure 5: Boisot model

(d) KM Cycles

A set of KM models represent knowledge processes and are popularly known as KM cycles (Yang et al., 2009). Some of the popular KM cycles are given by Wiig (1993), Meyer & Zack (1999), Bukowitz & Williams (1999), Mc Elroy (2003), Dalkir (2005) and Evans & Ali (2013). As can be seen from the figure below, their stages in KM cycles resemble each other with some variations.

CYCLE	**CROSS-REFERENCE OF LIFECYCLE PHASES**					
KMC Model	**Identify/Create**	**Store**	**Share**	**Use**	**Learn**	**Improve**
Wiig (1993)	Build	Hold	Pool	Apply		-
Meyer & Zack (1999)	Acquisition	Storage/ Retrieval	Distribution	Presentation/ Use	-	Refinement
Bukowitz & Williams (1999)	Get	Build/ Sustain	Contribute		-	Assess & Divest
Mc Elroy (2003)	Claim	-	Integration			-
Dalkir (2005)	Create/ Capture/ Contextualize	Assess	Share/ Disseminate	Apply/ Use	Contextualize	Update
Evans & Ali (2013)	Identify	Organize & Store	Share	Apply	Evaluate & Learn	-

Source: (Evans et. al, 2013)

Figure 6: KM cycles

The major phases in Knowledge Management Cycles are

(i) Knowledge creation/ Knowledge Identification

Knowledge creation is essential to make available new knowledge for innovation and advancement. An organization can capture knowledge from its processes in-house or acquire it from outside through purchase, training and development. Knowledge can

also be sourced from explicit documents, reports and observation. The journals, books, artifacts can also be scanned. Similarly, tacit knowledge can be uncovered through brainstorming, research and development, expert interviews, market surveys and field visits. Nowadays, data analytics is being used to mine data and extract important information for decision making.

(ii) Knowledge Storage

Knowledge storage refers to holding it for future use. It can be tacitly stored in mind and ingrained in one's experiences or explicitly stored in journals, books, reports, case studies and patents. Nowadays, information technology is providing a convenient medium to store information, which can be online repositories, databases, files, folders and archives. Meyer and Zack (1999) discussed refinement of the data as a precursor to storing information. It may be physical that ensures compatibility i.e. smooth migration from one software to the other, logical that include organization of data and it's indexing, cleaning (weeding out irrelevant or duplicate information) and standardization which aims at providing a common base to facilitate comparisons between different groups.

(iii) Knowledge Sharing/ Knowledge Transfer

Knowledge sharing is important to enable mutual learning and growth. The socialization process that takes place in a meeting or conference facilitates healthy discussion and dialogue. Mails, prints and dossiers are the other explicit forms to share information. Nowadays technology related forms such as posts, mails, tweets or web portals are used to share information and discuss viewpoints online. In a physical setting, apprenticeship, storytelling, narratives, anecdotes are beneficial methods.

According to Evans et al (2013) Knowledge sharing can be push-based and pull-based. In a push-based method, all information accumulated is to be distributed while in pull-based method information is distributed on a "need-to-know" basis.

(iv) Use

The use of knowledge refers to its application. Knowledge received must be applied for effective decision making and problem solving. An effective use can result in time and cost savings by eliminating mistakes and re-work. The use of knowledge is necessary so that it gets ingrained in practice and becomes automatically or unconsciously applied in routine tasks (Mohajan, 2016). Also referred to as presentation, this stage in the most important as it renders real benefits in both real and financial terms.

(v) Learn

The learn phase refers to internalizing knowledge. The knowledge accumulated must be absorbed so that it can applied when required. Learning itself is a process of accumulating, integrating, combining and grasping which can foster improved understanding, insights and acumen in human capital.

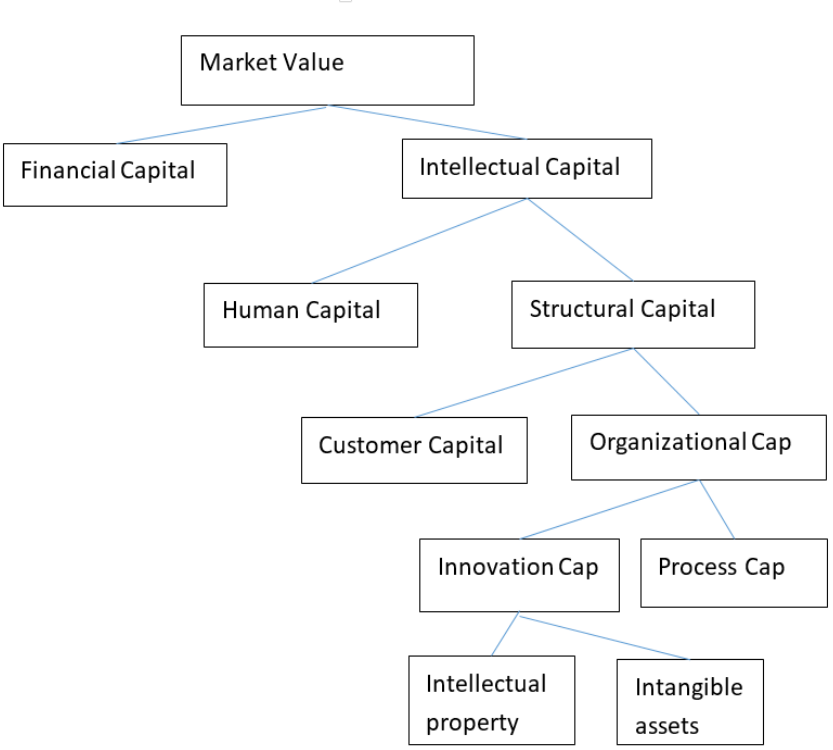
(vi) Improve

The stage 'Improve' furthers to enhance performance on a continual basis. It is necessary to improve on prior performance to seek advancement and growth. In this direction, knowledge must be updated, packaged and put in context to make it fit for use in the future. Some of the tools used by organizations to improve themselves are after-action reviews, benchmarking, reflection and quality control.

(e) Intellectual Capital Model

The Intellectual Capital model views knowledge as an asset of the organization akin to other physical assets like land, building or equipment (Adam and Creedy, 1999). As financial capital and investment in equipment finds its place on the company's balance sheet, similarly an investment in knowledge creation and up gradation should also find a place there (Edvinsson, 1997). This view is relevant especially for today's service organizations that earn mainly through investment in knowledge based applications and a well-skilled human capital. Companies like Microsoft, Uber, Airbnb offer an excellent example in this context. The market value of these companies is much higher than their book value. This occurs due to their possession of valuable intellectual capital.

Skandia was the first company to publish Intellectual capital philosophy in its annual report (Chase, 1997). It defined Intellectual capital as "the possession of knowledge, applied experience, organizational technology, customer relationships and professional skills that provide Skandia AFS with a competitive edge in the market. The value of intellectual assets was determined by the extent to which these intangible assets would be turned into financial returns". Cultivating, capitalizing, encouraging and recycling Intellectual capital is accredited to have steepened the learning curve and reduce the float between idea generation and its application (Edvinsson, 1997). It also benefitted companies through cost savings and continuous value creation.



Source: Edvinsson, 1997

Figure 7: Intellectual Capital Model

2.2.2 KM Tools

The KM tools are aids to managing knowledge. They help the organization capture the explicit and tacit knowledge, and then utilize it to the maximum. The different KM tools employed in an organization are listed below:

(a) Job shadowing

Under the job shadowing program, a less experienced worker observes and learns skills of the trade from a more experienced worker.

(b) Communities of practice

They are small formal or informal groups made by members to discuss and share knowledge, ideas and insights. Members generally discuss topics of common interest and may meet face-to-face or online.

(c) Job aids

They act as a guide to perform work. Job aids can be in the form of checklist or instruction cards describing and reminding people how to handle specific task.

(d) Storyboard

They capture the performance activities in pictorial form and are useful in learning, storing and transferring knowledge.

(e) Storytelling

It is a powerful way through which workers share their experience with each other. Story telling establishes precedence and helps in learning from past mistakes and achievements.

(f) Best practices

Exemplary practices followed in the organization are shared so that they can be replicated or provide motivation for future tasks.

(g) Training

Training is designed to impart relevant knowledge, skills and abilities to employees. Training can be both on-the-job and off-the-job.

(h) Process Documentation/ Flowcharting

It explains how the work is performed in a series of steps in pictorial form. It is very helpful for newcomers.

(i) Critical incident or Questionnaire

As per this tool, the critical or most important and difficult case is documented so that it can be used when such incidence or similar incidence recurs.

(j) Electronic databases

Many organizations document the important policies, procedures and practices. They also answer frequently asked questions and make it available online for the convenience of employees.

(k) Cross training and Job rotation

Under this method, an employee is made to work on different kinds of job in an organization. It improves the understanding of employees about others work besides his own. It is beneficial to the organization as well as the services of trained employee come handy when others leave unexpectedly.

(l) R & D centers

The research and developmental activities boosts knowledge creation and thereby innovation that provides competitive advantage to the firm.

(m) International collaboration

Collaboration builds alliances which permit exchange of ideas and creation of knowledge through brainstorming.

(n) Workshops

Workshops entail a series of tasks, activities and discussion that enhance learning.

(o) Conferences and Seminars

Conferences and seminars facilitate knowledge creation and dissemination through intensive discussion, presentation and QAs. The viewpoints of experts on a particular subject or domain is noted. The proceedings codify the event undertaken with expert views on the subject.

(p) Cross-functional teams

Cross-functional teams are the one that incorporates experts from all the departments to get both a micro and macro view of the organization and the environment in which it is operating. The participation of people from all departments and at all levels helps acquire knowledge useful for decision making and action.

(q) Field visits

Field visits are organized for practical learning. Their main purpose is to augment theoretical learning with real life on-site experience. It helps the visitor understand the operations of a unit by observing the place, equipment, roles and responsibilities of the staff. It is a very useful KM tool as it engages the visitor creating a positive spirit (ISE, 2016). The experience is said to stay with the person for a very long time. Field visits can "deepen and enhance classroom study" (NSTA, 1999).

(r) After-action Review

As the name suggests AAR is conducted after the task or activity has been performed with an intent to review and learn from it. Generally it is undertaken for high-risk and high-cost big tasks. The main purpose is to look back and analyze what has gone right or wrong and detecting reasons for the same. The knowledge accumulated will serve as a ready reference for future tasks.

(s) Retrospect

Retrospect is an inspection of the past project work to bring key knowledge to the forth. It asks questions such as what happened, what you wanted to achieve, what problems came along the way and how your team emerged as success or failure. The aim of the exercise is to transfer the learnings from one project team to another.

(t) Knowledge Retention

Knowledge Retention aims to save the knowledge even when the key knowledge worker is lost. In an organization, a key knowledge worker may be lost due to resignation, retirement, turnover or retrenchment. In this process, they may take away useful knowledge along with them and organization stands helpless and deprived. To avoid this kind of knowledge loss, an organization may undertake a knowledge retention exercise to ensure knowledge becomes a permanent asset. The steps may be to identify crucial knowledge areas and vulnerable knowledge holders. Expert recommend knowledge retention interview as a potential defense mechanism. The interview may ask questions particular to situations where success and failure were achieved, the reasons for it, and key learnings. Such activities safeguard knowledge and serve as valuable insights for future operations.

(u) Peer Assist

While a retrospect and after action review involve examination after the completion of a project or task, the peer assist aims at 'learning before doing'. Here experts of respective areas are called upon to share their expertise, knowledge and learnings before the project begin. In a competitive world where it may be difficult for an individual to make decisions, the peers could provide help in decision making. Activities like peer assist also build trust among members, creates an open culture and help avoid repetition of mistakes.

(v) Business Driven Action Learning

In BDAL, the action of an individual is driven by his organization's vision and mission. It is a result-centric approach that aims to integrate individual's goals with the

organization's goals to achieve the desired results (Boshyk, 2002). BDAL facilitate members and generate knowledge through commitment, support and focused actions.

(w) Knowledge Assets

Knowledge Assets represent the wealth of information accumulated by an organization through all the above methods like business driven action learning, peer assist, retrospect, after-action review and so on. Knowledge assets strive to maintain knowledge in a structured, organized, easy to read format using illustrations, diagrams, pictures and flowcharts. They are more lively and engaging than plain text reports. Knowledge assets cuts across time and space as they are clearly documented and shared via both online and offline modes. Organization can upload them on sharepoint or intranet for members to access and learn. Knowledge assets being explicit documents lends transparency and clarity to the employees in their daily tasks.

(x) Mentoring

Mentoring is a relationship in which an expert or mentor shares his or her knowledge, skills and abilities with his or her mentee. The mentor supervises and guide through a series of practical tasks and assignments. He also provides necessary support at each stage. For a mentoring relationship to succeed, both mentor and mentee must be committed, highly motivated and self-aware (Knoco, 2020).

(y) Storytelling

Story are narratives that not only provide knowledge but help build an emotional connect. They are more interesting and engaging than normal reports. As per its nature, a story may contain a plot, a protagonist, dialogue and climax. Organization may use

stories to shape vision, inculcate values and communicate organization culture. Stories influence people and are viewed as powerful change agent. The person narrating a story is able to reflect on and articulate tacit knowledge. On the other hand, the person listening is able to understand organization's acceptable behavior. Stories can be inspiring and can be used to secure organization commitment (Hajric, 2019). According to Callahan (2018) "a story describes what happened. A good story helps you see what happened. A great story helps you feel what happened."

2.2.3 KM Practices

Besides KM tools, there are specific KM practices which affect the performance of an institute. To realize the maximum benefit from KM conducive KM environment must be present. According to Rasula et al. (2012) organizational culture highly contributes to KM. This is so because "culture determines the basic beliefs, values, and norms regarding the why and how of knowledge generation, sharing, and utilization in an organization." KM success relies heavily on the trust, teamwork, creativity, motivation, and collaboration among employees. Innovation, intrinsic rewards and co-workers support also positively affect knowledge sharing practices. Sharing knowledge generates capabilities that lead to a better firm performance (Wei, 2012; Ipe, 2003; Kogut & Zander, 1996). Wong and Aspinwall (2005) proposed Critical Success Factors, i.e., leadership and support; culture; information technology; organizational infrastructure; strategy; processes and activities; motivational aids; resources; training and education; and human resource management to form the basis for KM adoption in the MSME sector. They emphasized that successful KM require proactive top management support. The leaders can contribute to an environment in

which knowledge creation, cross-boundary learning and knowledge sharing can flourish. Similarly, Lee et al. (2011) found that collaboration, learning culture, top management support, and IT support affect the knowledge process capabilities. However, Mills and Smith (2011) in their study showed that though organizational structure, knowledge acquisition, knowledge application and knowledge protection were significantly related to organizational performance but technology, organizational culture and knowledge conversion did not have a significant impact.

Table 1: KM Practices

Practices	**Brief description**
Culture	"Culture determines the basic beliefs, values, and norms regarding the why and how of knowledge generation, sharing, and utilization in an organization." Culture determines the level of trust, risk-taking behavior, tolerance of mistakes, idea sharing and innovation in the organization
Management leadership and support	Top management determine the objectives of the organization and acts as a role model for others to follow. Their support is essential to staff motivation, behavior and action.
Motivation, rewards, and recognition	Employees can be encouraged to contribute to KM by providing monetary incentives like pay, bonus, commission, or non-monetary incentives like praise or recognition.
Training and education	Training and other educational programs are designed to impart relevant knowledge, skills, and abilities to the employees. Training can be both on-the-job and off-the-job.
Benchmarking, Best practices	Exemplary practices followed within and outside the organization are documented so that they can be replicated or provide motivation for future tasks.
Autonomy and Employee involvement	Autonomy empowers knowledge workers to make decisions and gives them control over the pace of work

Source: (adapted from Sinha et al., 2015)

2.2.4 Barriers to KM

An efficient management of knowledge is indispensable for the functioning of institutions. But there are certain barriers that inhibit the creation, dissemination and storage of knowledge. In this respect, the following points may be noted.

Knowledge is a source of competitive advantage. People feel that knowledge gives them power, and sharing it will dilute their power. Such insecurity also arises due to the lack of trust. The sender doubts the receiver may misuse the information transmitted.

Another barrier to KM is inappropriate knowledge storage. The organization may not have any clear guidelines for documentation and record keeping. It may also not be having an appropriate infrastructure and databases for knowledge storage.

Lack of knowledge culture is another barrier to KM. Absence of motivation, top management support, rewards and recognition may fail to create an environment conducive to knowledge creation and dissemination.

Knowledge creation is another challenge in organizations. Its pre-requisites are research and development, experimentation and investigation. Only the organizations having tolerance for mistakes, willingness to take risk, and persistence for continued trial and error will succeed in creating a distinction for themselves.

Precisely, all KM activities like sourcing, codification, documentation, transfer involve a lot of time and effort. Employees are generally struggling to complete their core tasks and have little time to devote to KM.

2.3 KM and Education- Inter-relations and Benefits

KM initiatives can play a significant part in improving the performance and effectiveness of HEIs in all their work domains ranging from Planning and development, research, placement services, teaching and learning process, performance evaluation, administrative services, student affairs, curriculum development, alumni service and socio-economic development (Bhusry et al., 2011).

Starting from Planning and development, KM makes the right information available at the right time to the right person, which helps in effective decision making. Using KM, organizations can also devise prudent strategies to have a planned response to environmental challenges. The second is research. The information, if processed efficiently, can help in identifying critical research problem that needs immediate attention. In-depth research and analysis assist problem solving, knowledge creation and innovation and sharing research results avoids working the same problem again.

The third domain is placements. With adequate access to market information, educational institutions can build skills that are readily transferable to industry. A well-equipped student is more confident and productive on the job and an asset to society.

The fourth field is the teaching-learning process. The educational institutions provide an atmosphere where the creation and dissemination of knowledge take place and behavior, attitude and cognitive abilities are developed. The teaching-learning process that includes pedagogy, projects, presentations, assessment, discussion and debates stimulate higher-order thinking in students. The fifth domain, Performance evaluation of faculty, consists of their training and development through faculty development programs, seminars, workshops and conferences. These events enrich expertise of the faculty. The knowledge base of the faculty so built determines their promotion, responsibilities and rewards. The sixth is administrative services. The administrative services include the overall management of institutions that incorporates admissions, exams, class schedules, allocations and assignment of duties. Nowadays, databases are serving as an efficient tool for knowledge management. They store data, mine it and give query results just-in-time for better performance.

The seventh is student affairs. Experts believe that in times today, the focus should be on holistic education. According to Pandey (2017), there are four primary aims of education; first is knowledge, which comprises meaningful content, second is a skill, that is how knowledge is applied, and third meta-learning, that is how we reflect and adapt.

The eighth area is curriculum development. It is increasingly being recognized that the universities today cannot run the same old syllabus, examination and evaluation also need an overhaul accordingly. Curriculum must be relevant and be regularly updated to increase students' employability for the world. The ninth domain is alumni services. Active collaboration and knowledge sharing with the alumni reap benefits both for the students and their alma-matter in terms of industry collaborations for curriculum development, innovation projects, and placement.

The tenth area is socio-economic development. An investment in knowledge infrastructure is crucial in building a workforce with the right talent and capabilities to lead a well-dignified life. In a knowledge society, the motto is lifelong learning, competency-based education and skill development. In the global crisis of contemporary civilization, education is the only hope which can lift the masses out of poverty, ignorance and despair (Sampaio, 2016). Academicians must prepare future generations in such a way that they can face complex future problems with conviction and ease.

2.4 ICT in Education

A phenomenon that is driving change worldwide, wherever we look and in a manner never seen before, is the information and communication technologies including the World Wide Web (WWW) or the Internet. Its effects are stunning. And the whole

world is watching. With the inconceivable access to information that was enabled overnight, it has simultaneously empowered ordinary people to access the information they struggled to obtain earlier. It also incited a sense of belongingness as more and more people connect online. It acted as a platform for like-minded coupling in as massive forums of seekers and contributors. Ordinary people have gained confidence because of the awareness that they are not alone, and many are chasing goals of a similar nature. Such is the momentum achievable by ICTs, that practically no sector or country can ignore it. Corporations are harnessing it in novel ways to stay in the competition. Similar is the case with education. It is responding to the same demands that a business grapples with during sustenance and innovation. It has to both maintain operational excellence and improve customer service (Jundale and Navale, 2009). The education system is expected to meet the challenges of education in the 21st century like the increasing competition, demanding jobs and dynamic work profiles. This has led to the creation of certain niche areas in education that need further research.

In such a scenario, the demand for knowledge is real. There is a need for better accessibility to relevant and engaging study material. It is all the more important as students become active agents and take responsibility for personally keeping up with events around the globe. The boundaries represented by the four walls of a classroom have dwindled. Globalization demands teachers are conversant with developments so that they are able to offer quality education.

Hypothetically these demands can be fulfilled by ICTs. Advancement in technology has opened up avenues for innovation and experimentation in education. One such innovation is online learning.

2.4.1 Online Learning

Online learning, e-learning, and distance education, though similar, are defined by different authors in different ways. Online learning is a method of delivering education via the internet (study2u, 2016). E-learning uses technological, web-based tools (Nicholas, 2003). Nowadays, distance education is also increasingly making use of electronic media and the internet, preferring them over correspondence through postal services (Moore, Dickson-Deane, and Galyen, 2011). One of the upcoming online learning mechanism is MOOCs that are Massive Open Online Courses based on the distributed peer learning model (Baturay, 2015). Its key features include short video-based lectures, automatic assessments, and online forums for discussion with teachers, peers and MOOC providers (George Glance, Forsay, and Riley, 2013). In this paper, authors have tried to analyze MOOCs as a catalyst in the future of education.

2.4.2 ICT Tools for KM in Higher Education

KM, which means "making available the right knowledge to the right person at the right time" (Aranganathan and Lakshmi, 2010), is sufficiently supported by ICT. According to Beckinsale and Ram (2006) ICT is "any technology used to support information gathering, processing, distribution and use". ICT tools are used for communication, collaboration and networking functionality. They facilitate knowledge capture, storage, structure, dissemination and creation. Such integration of emerging technologies with teaching methods paves the way for the knowledge society that is characterized by superior academic performance, enhanced learning and innovation. Some of the ICT tools for KM are as follows:

(a) Learning management system

LMS intends to impart learning through training modules and educational e-resources. LMS is a data bank of lessons plans, exercises, best practices and techniques. It is a cloud based repository that serves as a ready reference material to the learners and helps in collaboration and peer-discussion in the anytime-anywhere online format. The faculty can interact with students and track their progress through assignments.

(b) Customer Relationship Management

CRM is a software which tracks the current and prospective customer. Using data intelligence it records the prospects that visit a site, what information they searched, the kind of interaction they had, where they expressed interest and how and when exactly they paid for the item under consideration. Such data can be harnessed to better customize their website design, online searches and academic content for students.

(c) Groupware

Groupware are software that let people collaborate and work together in groups even remotely. These groups are united by a common purpose, task or project in hand. Groupware can be a communication tool for example a google group, web publishing, file sharing etc. it can also be a conferencing tool for example skype, hangout, zoom used for audio and videoconferencing. It can also be a collaborative management tool to manage Information and workflow systems like lotus notes. With their features of communication, conferencing and collaboration the groupware facilitates knowledge sharing, creation and socialization.

(d) Web 2.0

Web 2.0 represents the social networking tools that facilitate two way active communication. Its form can be blogs, social bookmarking, whatsapp groups, chats, RSS feeds, wikis and so on (Bebensee et al. 2010). If this social capital is put to use effectively, it may lead to the development of intellectual capital.

(e) Webinar

Webinar is a seminar conducted online. It allows long distance communication and interactive participation between the host and the attendees. Using video-conferencing tools like skype, meet, webex, zoom and so on, the host can share videos, presentations, documents and audio files. In a webinar, the host can perform multi-level interactions with a number of participants for a long period of time depending on the version installed and services subscribed.

The various other features are polling, chatting, recording, annotation, reporting, archiving and others. Webinar provides flexibility of time and space at the convenience of home. While it may lengthen screen time reducing personal touch and bonding. There may also exist distractions of home environment and an unstable internet connection. Nowadays, corporations are promoting t as they reduce travel time and expenses.

The procedure of webinar is similar to the physical one which involves online registration, intimation to successful participants through mail or message and presentation on the said date through a shared web link. The speaker may stream live or recorded and may use a virtual board to put forth his point.

(f) MOOC

MOOC is Massive Open Online Course that is based on the distributed peer learning model (Baturay, 2015). Its key features include short video-based lectures, automatic assessments, and online forums for discussion with teachers, peers and MOOC providers (George Glance, Forsay, and Riley, 2013). Some of the popular MOOCs are Coursera, Udacity, Udemy and edX.

(g) Open source software

An open source software is the one readily accessible to the public for distribution, use and modification, unlike proprietary software that have certain restrictions. Open source software can be enhanced by programmers or developers to customize it according to the company requirements. A knowledge repository i.e. open and online is capable of being continuously enriched with the queries and suggestions of customers and serve as a self-help data bank.

(h) Web portal

An organization's website is its window to the world and help its viewers understand what the organization stands for. Most web portals contain the home page, about us, vision, mission, staff profile and contact information. It is a one-stop of authentic information regarding the upcoming events, announcements, notification, reports, proceedings and so on. The views of top management and other information in the form of multimedia video, pictures and text gives cue to the culture of the organization. To be effective, a website must have quality navigation, design, content and be updated from time to time. The achievements, best practices and FAQs are also displayed.

(i) Document management system

Document management system capture, organize, store, maintain, archive and update information in explicit documents. For information to be readily accessible, it must be retrievable and fit for use. In this context, an educational institution may develop a content management system like moodle to upload syllabi, course material, lecture notes, assignment, quiz and presentation for the benefit for students and pursuance of the course. An ideal DMS must incorporate all key information, index it, retrievable through search and ensure security. It may have a cloud backup, use passwords and firewall. Multiple platform compatibility, customizable interfaces and file conversions will enable access with ease. A proper use and maintainence of DMS enhance speed, efficiency and safety.

(j) Data warehousing, mining and decision support system

Data warehousing refers to accumulating data from different sources based on organization's information needs. These information needs are based on critical success factors of the organization. The source of data can be both external and external to the organization. Internally, data can be extracted from the operational activities and externally it can be purchased or captured from publically available resources.

After data has been housed, it is mined using various statistical and analytical softwares to discover the hidden patterns. Based on the patterns, the insights can be formed which can be harnessed for decision making in the future. To perform data mining, the researcher should look at the data in an unbiased manner without any pre-conceived notion and try to deduce or decode it for eye-opening knowledge discoveries.

After data mining, data visualization can be performed to represent data in a meaningful and presentable way. For this purpose, tables, charts, 3D models can be made. Such visualizations aid comparisons and quick comprehension.

At the end, Data support system can be employed for decision making by the managers. These are analytical software with intelligent system that allow multi-dimensional view of the data based on different scenarios. A report may be generated for print and presentation. DSS helps in forming decisions and solving problems through data crunching. Such exercise enable managers in taking an informed decision within a given time frame. These information systems process huge data to let managers make sound judgments before reaching any conclusion.

(k) E- Resources

E-resources in an HEI can occur in the form of e-books, e-journals, e-thesis, educational tutorials and channels. Some of the popular e-resources in India are National digital library, Jstor, Shodhganaga, Swayam and Swayamprabha.

The following table presents the important ICT tools as covered by various authors in a chronological order. Their contribution to KM in an educational institute is also listed. Besides the most commonly used tools like power point, wiki, video conferencing, search engine, social networking, and apps; the table also states the latest technology like Internet of things, artificial intelligence, 3D printing and Massive Open Online Courses that are getting popular.

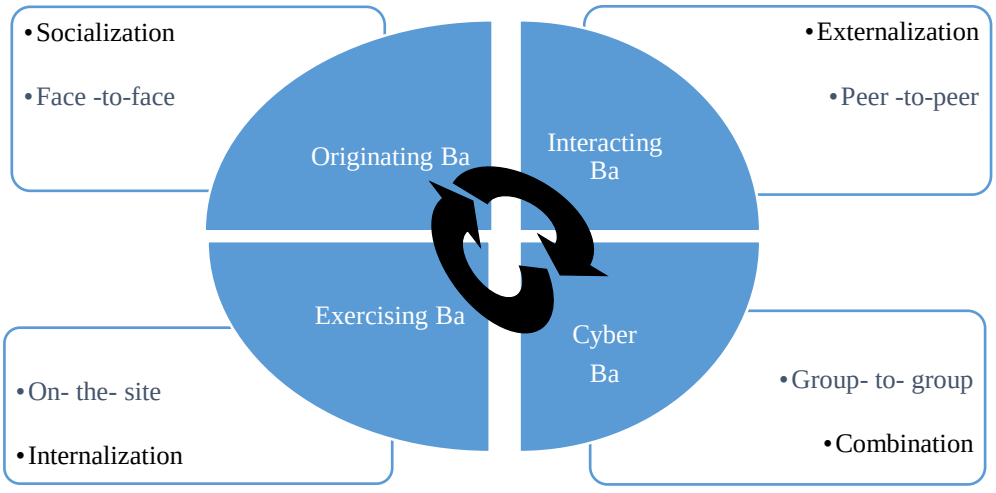
Table 2: Chronological Description of ICT Tools

ICT tools	Application area of KM	Authors and year
JANET network, Infolink	Researchers and academic staff have access to electronic repositories, depositories, video conferencing, email, network resources, training and awareness, digitization, pre-prints and grey literature	Jennifer Rowley (2000, 2006)
Web based Portal, Lotus Notes	Institutional Marketing, building community among student and faculty, gateway for finding information about university resources, curriculum development and its revision, faculty development programs	Kidwell et al. (2001)
National digital repository of IGNOU	Application of KM technologies in different areas like study material development data, student registration data, support services data, study material production and distribution data and evaluation and certification data for distance education courses in IGNOU	Khare, Pankaj, and Misra, R.P. (2003)
Database management system, Data warehouses, data mining	Team collaboration and groupware, quering data for information, online learning	John H. Milam (2004)
Use of Blogs	Blogs for knowledge sharing purpose	Jeremy B Williams, Joanne Jacobs (2004)
Virtual communities, Personal Blogs and mental maps	An Environment for Knowledge Management in Scientific Research and higher education centers	Jonice Oliveira, Jano M. de Souza, Rodrigo Miranda, Sérgio Rodrigues (2005)
Videoconferencing, K Portal, search engine,	Management of knowledge for student courses, to improve internal document management, to increase the level for information and knowledge dissemination	Ruslai Abdullah (2007)
Web 2.0 tools like Dropbox, Google Docs, wikis, GoogleApps, PDA	Web 2.0 applications as a means of collaboration and mutual learning.	Remko Helms and Marco Spruit (2009) Frank Nyame-Asiamah(2009)
Massive Open Online Courses (MOOCs)	Online learning	New York Times (2012), Dasarathy et al. (2014), Baturay (2015)
Virtual classroom, webinar	Blended learning Flipped classroom	Power and Jacques (2014), University of Queensland (2016)
Artificial intelligence, online- simulations, 3D imaging, cloud-based education, gaming, Internet of things	The future of higher education Technology changes in the Past, Present and Future I-Campus, I-lab, x-tutor	Ahmad (2015) The Millenium Project (2006-07) Brandeis University (2015) MIT (2016) Gupta and Jain (2017)

Source: Adapted from Toro and Joshi, 2013; Gupta and Jain, 2017

2.4.3 ICT as a foundation for knowledge creation

The field of education lays the foundation for knowledge creation including knowledge sharing and knowledge representation; it enables development of insight and experience. All these activities were hitherto performed in the classroom with the aid of textbooks and libraries. However now ICT is extensively used for this purpose. An attempt to view the knowledge creation process in education through ICT with the help of Ba model and SECI Model. The Ba and SECI are the most widely used models for the process of knowledge creation. Ba means space, a learning environment, where knowledge is created, shared and practiced. The knowledge cycle in both the models has four modes. Four modes of Ba model i.e. originating ba, interacting ba, cyber ba and exercising ba (Nonaka and Takeuchi, 1995) along with four characteristics of SECI model i.e. socialization, externalization, combination and internalization (Nonaka, 1991) are used to discuss knowledge creation and its management in MOOCs.



Source: Nonaka and Takeuchi, 1995

Figure 8: BA and SECI Models

Socialization i.e. originating ba is the phase where individuals indulge in tacit knowledge sharing and have a face-to-face discussion (Tammets, 2012). They also share their feelings, emotions and other non-verbal cues. Since tacit knowledge is difficult to formalize, and often time and space specific, so it can be acquired only through direct experiences, for instance spending quality time together or living together (Nonaka and Toyama, 2003). Socialization makes use of social and relational capital for effective creation and transfer of knowledge. Classrooms serve as a shared space for emerging relationships where individuals indulge in tacit knowledge sharing. Tacit knowledge is shared, applied and tested leading to create new knowledge. In such a case, physical classrooms are more successful than online ones. But in the future, if face-to-face discussions become possible in MOOCs, this problem could be considerably minimized. The developments in ICTs are paving the way out of such issues. There are attempts to use such paradigms vis-a-vis face-to-face interaction such as videoconferencing, virtual boardrooms, integrated video streams, emoticons for varied emotions and 'Second Life' avatars that represent a person in a networked virtual environment, including its behavior. These interactions enable social learning which finds its roots in social constructivist theory establishing that "understanding of content is socially construed through conversations about that content and through grounded interactions with others" (Brown and Adler, 2008).

In externalization i.e., interacting ba, implicit knowledge is made explicit so that it can be imparted to others and become the source of new knowledge such as ideas, images and written records. Here implicit knowledge gets crystallized (Nonaka and Toyama, 2003). Here the contradiction between the individual's tacit knowledge is synthesized through articulation and interaction. It is combined, edited, processed to

make it more meaningful, and then it is circulated to members of the establishment in a new shape. Externalization or interacting ba is equally successful in both physical and online classrooms. Online courses such as MOOCs provide a platform where students from varied backgrounds can interact and contribute to a creation of a comprehensive knowledge base. ICTs are facilitating this process of knowledge creation where thousands of participants can interact, which was not effectively possible in the physical format.

Also there are other online resources and tools such as Wikipedia, Google scholar, blog posts, chats and networking sites such as Facebook, Twitter, Whatsapp and so forth. Traditionally tacit knowledge used to get lost as there were mostly face-to-face discussions, but today social media not only creates a record of the current chats but also archives them enabling knowledge storage. As people are supposed to type in their thoughts, they try to achieve clarity in their written words, grammar and language. They have become more expressive and articulative. All these activities have promoted reflective learning.

The third quadrant of the model is cyber ba (combination in SECI model) where individuals and groups interact and combine their knowledge base in virtual space. The combination of explicit knowledge is most efficiently supported in a collaborative environment utilizing ICTs (Nonaka and Konno, 1998). In this process, explicit knowledge is converted into more composite forms. Connected learning or CMoocs is the one where learning is viewed as residing in the connections and collaborations that exist between people and digital artifacts within this ubiquitous network (Milligan et al., 2013). Connectivism posits that being a member of an online

network, communicating with others and filtering information and ideas that others provide will lead to knowledge creation and learning advancement (Kop and Fournier, 2010). MOOCs are adding to the relational and social capital, leading to a virtual platform for knowledge creation, having enormous base of participants. The use of such networks and databases has grown rapidly over the years (Nonaka and Konno, 1998). One example of such electronic database is Gateway to Educational Materials (GEM) which provides indexed lesson plans for the benefit of teachers (Fitzgerald et al., 2003). Besides networking tools have given a boost to group communication.

The next quadrant internalization i.e. exercising ba, involves learning by doing or authenticating learning (Lombardi, 2007). All the knowledge gained is to be assimilated, understood and applied to produce the best results. In the case of classrooms, a student can practice the concept learned immediately in a physical space, in the presence of the instructor. They can also get instant help from their instructor in this regard. In virtual space, with the help of technology, simulation is possible. Students can experience an earthquake, visualize outer space and reconstruct architecture through technology. They can bring life to theoretical concepts. Technology is definitely rewiring our brain and reshaping our thinking (Siemens, 2014). In case of MOOCs, students are subjected to self-directed learning (Kop and Fournier, 2010). They must practice on their own and seek help from instructors by posting their queries. MOOCs can be blended with physical classes to achieve this purpose as the proximity and the guidance of the instructor is a very crucial here.

"It is important to note that movement through four modes of knowledge creation and conversion forms a spiral, not a circle. In the spiral, the interaction between the tacit

and explicit knowledge is amplified through four modes of knowledge conversion and new knowledge is created every time" (Nonaka and Toyama, 2003). MOOCs with the help of ICTs will complement and substitute the physical classroom format and create a tremendous pool of knowledge which would never be possible in the brick and mortar model. The amount of knowledge in the world has been doubling in the past ten years according to the American Society of Training and Documentation and learning is becoming a continuous process extending to a lifetime (Siemens, 2014)

2.4.4 Opportunities and Challenges of Online Learning

Online learning is gaining popularity as it has made vast information available at the click of a button. It is available 24X7 anywhere and to anyone. The financial barriers holding students to join premier institutions might no longer be there. Also, a limited number of vacancies and the screening processes to filter applicants would not apply to the online model. There will be no strict rules and regulations arising from the university structure (Dasarathy et al., 2014). Warren Buffet, investment guru and Meredith Vieira, host of Today's show faced rejection from Harvard University and felt shattered at that time. However, in the current context, Harvard has launched its open online course under the name HarvardX. The news is heartening for millions of students across the world who want to study in their dream college but are not able to do so (Shellenbarger, 2016).

MOOCs have provided a variety of options to students. They can join one course at Coursera, another at Udacity or edX. They can quickly compare the content and syllabi to determine the one best for them. They are exposed to various MOOCs and their respective context (Coursera.org and edX.org). These courses are specifically

suited to working professionals who do not have the time or wherewithal needed for a full time regular course. They cannot adhere to strict time regulations associated with the regular physical classroom. Moreover, the student has the freedom to modify course structure. He can study one subject of biology, another of psychology, business or engineering as per his interest, future career prospects, and motivation and even decide the rigor of study, the first time he takes it. It will clarify the boundaries of areas of study, curricula, and give rise to new concepts. One such concept is Meta University, which enables the students to design their own curriculum and share reading material with other universities using a web-based platform (Mishra, 2011).

An online learning mode enables a student to be his own master. The learning is self-paced, so the student can rewind, pause if he is not able to get the concept at one go, or adopt a fast- forward mode if he has prior knowledge of the same topic (MIT Communication Forum, 2013). As opposed to fixed time-tables associated with the physical classroom, the learner enjoys the flexibility to study when he is best motivated. A student can grasp best when his mind is challenged with a problem. At almost any point in time, when he prefers it, online material is immediately accessible, which can be very satisfying for him, enhancing his basic learning.

With the advent of open online courses, knowledge ceases to be the prized possession of a privileged few. These platforms also provide flexibility over fee. Many courses are free, some charge nominal fees, some advanced courses are moderately priced. Certification carries reasonable charges too. Platforms like edX provide education free of cost while charging fees only for course certificates. Udacity targets the training market in the corporate world. iVersity pay-for-certificate programs are targeted at

working professionals. Coursera has fee based courses, specialization, programs and course certificates (Morrison, 2016).

The added advantage of MOOCs is that they offer equal access to all people, irrespective of nationality, caste, creed, religion, color, gender etc. Students with zeal to study are unstoppable. Online education has opened new windows for thoughts, ideas, and innovations. Today even a kid can build a robot and program it by downloading an app (afr.com, 2016). Technology has also bridged the divide between developed and developing nations. The developing nations facing a shortage of qualified faculty and infrastructure especially in remote areas, find a plausible solution in online classes. While a typical physical class can accommodate 50- 60 students, a virtual class can accommodate an infinite number of candidates. One can only imagine the number of brains at work, the number of problems and varied solutions, ideas, insights etc. that come to the fore. Thus, the benefit of scalable learning is derived (UK, 2013).

MOOCs are not only educating students but training the trainers as well. Educators can view online resources, establish online communities for practice with peers for their academic and professional growth (Wilson, 2016 and Friday Institute, 2016).

However, online learning also has its share of problems. Courses such as MOOCs are based on the one-size-fits-all model. They lack customization and the personal touch of traditional classrooms. While physical classrooms are characterized by close supervision from the instructor, online classrooms fail to engage students who frequently get distracted by other things. They feel isolated and miss the charm of working along with others (Stonebraker and Hazeltine, 2004). As most of the online

discussion forums in MOOCs are asynchronous, direct face to face interaction is curbed. Student-to-instructor and student-to-student interactions are vital elements of a course because learners experience a sense of belongingness, interdependence and shared vision (Ni, 2013). The physical classrooms are capable of creating this sense of community, network relations, friendliness, trust among students and instructors. Certain qualities like teamwork, group building, problem solving are vastly easier in physical classrooms. The students entrusted with a particular task assimilate professionalism and develop a sense of responsibility that prepares them for bigger challenges in the future. Employers preferring students who attended regular programs to those with distance online education is common. Most of the online courses do not provide a degree and do not have strict surveillance during examinations. The employers, therefore, question their accreditation and evaluation (Bejerano, 2008). Of late, the new MOOCs (MOOCs 4.0) have tried to address this issue.

Distance online course are not suitable for certain subjects requiring laboratory experiments, equipments, observations and physical presence of the instructor for sudden accident handling. Similar is the case with sporting, behavioral sciences and other field activities (Dasarathy et al., 2014). In these cases, online courses can be made more effective by combining them with physical classrooms. In this blended model, students can get training from renowned professors online, while actual practice happens in native laboratories or sporting grounds, in the presence of a local instructor. Here the instructor can also enroll for the online program to bridge this gap and integrate the different elements of the course seamlessly.

Well-developed ICT infrastructure is a pre-requisite for online learning. Technology and network infrastructure are not well developed in developing countries. Bandwidth is less than in the developed world. Frustration ensues when a student waits a long time for a video download. The developing world should make an effort to increase the bandwidth in the wake of increasing internet traffic and make online learning successful (Tech Times, 2015). Nowadays applications are being developed that have the capacity to transfer data even with low bandwidth.

While online learning is convenient, using laptops and mobile phones for long hours can carry a potential health risk. Constant use of headphones and that too at high volume can damage the ear (Bennett, 2016 and Chakravarthi, 2012). Moreover, online learning discourages physical activity; it may make learning very mundane. On the other hand, classrooms encourage physical activity like skits, role-plays, group discussions etc. which not only enhance learning but also lead to overall personality development of the student. Face to face learning makes students active as opposed to passive learners.

Although online learning offers great comfort to the student, it can be very taxing for the instructor who has to be available 24X7 for feedback when the learner desires. It can often encroach into the personal life of the instructor. The teacher must take additional care that he is not hurting the sentiments of a community, caste or religion. In remote area he might not be aware of the cultural nuances of the community he is dealing with. It becomes particularly significant when the teacher is addressing a highly diverse group of people. Moreover as online learning has high visibility; it puts an extra burden on the teacher to check for any copyright infringement which may land him in legal issues (Toles, LaFayette, and State, 2009).

Attending the traditional class helps in building a relationship which may extend beyond the classroom. School and college associations are a fertile ground for entrepreneurial venture creation and a breeding ground for ideas. Sergey Ben and Larry Page were Ph.D. students at Stanford University when they started Google in 1996 as a part of their research project (Battelle J, 2005). Mark Zuckerberg, Andrew McCollum, Chris Hughes and Dustin Moskovitz were classmates in Harvard when they wrote software for the Facemash (now Facebook) website as a part of their second-year project (Vargas, J.A., 2010). Healthy competition and positive reinforcement that occurs in the physical classroom provide an impetus for learning. Social acceptability and applause inspire the learner. Teachers also take pleasure in teaching a live audience and are stimulated better. The excitement and curiosity of students is a big motivator for teachers. This motivation renders great satisfaction to the teacher and helps in releasing job stress and heal burnout (Bejerano, 2008). Students also find the passion of their teachers contagious. The students achieve greater understanding through both verbal and nonverbal communication of teachers. The lack of such rapport and motivation in online learning can result in high dropout rates among students. The dropout rate is estimated to be around 90% in general (Rivard, 2013). Although many students enroll for the course, only a few are active learners and very few actual give the exam and pass it. This may be due to lack of a clear focus and or non-achievement of learning objectives by the student (Onah et al., 2014).

Last but not the least, the students in an online environment miss the ambience of a school. The schools are not a mere building, they represent temples of learning. This creates an emotional connect. Content delivery is not the primary objective of teaching. A teacher not only explains the concept of a book but also counsels the

students; teaches them values, discipline, inspires them in making life choices apart from assessing performance (Dasarathy et al., 2014).

In the following table, we cover how technology has transformed the way teaching was traditionally conducted.

Table 3: Teaching in Offline and Online mode

Features	Offline Mode	Online Mode
Knowledge acquisition	Textbook, library, encyclopedia	Website, online research tools, search engines, Wikipedia
Content (Text- Based)	Notebooks, bag Packs, ring binders	Interactive pop-up textbooks, 3d printers, e-books, kindle, live binders
Presentation	Blackboard, poster board	Smart Classes, PowerPoint, videos, interactive gaming, Glogster
Discussion	face-to-face	Online forums, posts, blogging, twitter, Facebook, WhatsApp
Communication	Vocal pitch	Video interaction, pre- recorded lectures, voice recognition software, text to speech
Activities and animation	Skits, case study, debates, extempore	Virtual reality, augmented reality
Emotional attachment/ Rapport	High	Low
Student's engagement	Depends on the skills of instructor and motivation of students	Depends on the use of technology by the instructor
Discipline	Direct supervision, rewards, punishment ensure discipline	Self- discipline
Personality development	Overall development of a student	Depends on student's motivation and his choice
Teamwork	Student learn to work in and perform with peers	Virtual teams
Interaction	Face to Face	Video conferencing, satellite communication
Infrastructure	Physical infrastructure like classrooms, land, building, desk	Web- based infrastructure like 3G 4G Wi-Fi, laptops, I-pad
Knowledge sharing	Correspondence through posts, Photostats, folders	E- mails, social networking, smartphones, pen drives
Evaluation	As per date sheet, strict surveillance	Online exams, loss of control

Source: Compiled by author with adaptations from World-wide learn, 2016; McKnight, 2009; Omona et al., 2010

2.4.5 A review of empirical researches in online learning

Various empirical studies have been conducted with online learning as a subject, to ascertain the type of students who enroll in MOOCs and their motivation. Studies have also been conducted to determine the effectiveness of these courses compared with that of physical classrooms. Christensen et al. (2014) surveyed students from the University of Pennysylvania, 32 Coursera offerings. It was found that the MOOC student population was young, male and employed, with a majority from developed countries. In another study, it is suggested that people who enroll in MOOCs are already well educated. (Rohs and Ganz, 2015).

A study was conducted by Coursera to discover the motivation for the competition of MOOCs. The results showed that those who completed the course were more interested in the course content whereas others were interested in MOOCs as a learning experience (Wang and Baker, 2015). Students attend classes in physical format but take help of online resources for reference in on-campus work (MIT Communication Forum, 2013). Now, the concept of the flipped classroom is gaining importance in online learning. Students view lectures online at home and come to the class for exercises, discussion and problem solving in this format. This is in contrast to the traditional model where students attend lectures in college and practice at home (University of Queensland, 2016). This flipping of classrooms allows more time for critical thinking and experiments leading to a deeper understanding and concept clarity. With the help of ICT tools like WhatsApp, teachers can share information and monitor activities of student without being physically present (Dhawan and Dalmia, 2016).

A study was conducted to compare learning effectiveness in six research methods, taught by the same instructor at California State University. It is found that student

performance is independent of the mode of instruction (Ni, 2013). Similarly Mc. Laren (2000) compared the performance of undergraduate students in a business statistics course and found that there is no significant difference in final grades amongst the modes of instruction, while there are significant differences in persistence rates. A study conducted by Fortune 50 companies found that in virtual learning technologies there was a notable degradation of social process but but they were not associated with a degradation of knowledge transfer (Stonebraker and Hazeltine, 2004). Glance et al. (2013) pointed that a MOOC is no less effective than the physical classroom. In fact, it can even enhance learning outcomes in some cases. Completing MOOCs is associated with both tangible and intangible benefits. 72% of the course completers in the study reported tangible benefits like finding a new job, receiving promotion and pay increase while 61% reported intangible benefits like skill enhancement and an increased prospect of getting a job (Zhenghao et al., 2015). Yue & Attaran (2017) observed that MOOC with their features of openness, flexibility and availability are promoting life-long learning. However issues related to pedagogy, assessment and low student teacher interaction are still not fully addressed.

Gamage et al. (2016) revealed that there is an urgent need for quality control in MOOCs as there is high quality variation among the 20 different courses offered in 7 different platforms. The lack of quality can make the courses complex and confusing, and discourage the beginners from completing the course (Yuan and Powell, 2013).

From the above review, we can find that both online and offline modes of teaching and learning have their share of advantages and disadvantages. Singh and Reed (2001) suggest the need to integrate both models to maximize learning objectives.

Evidence suggests that combining the traditional face-to-face format with ICTs can enhance learning outcomes. Ghadiri et al. (2013) implemented a blended model of learning by merging content from an online MOOCs platform with in-class activities to examine their benefits. The study establishes that new delivery models can enhance student engagement, improve student retention and significantly reduce student failure rate. These results are analogous to the research that recommends integrating MOOCs with conventional classrooms (Joseph Israel, 2015). Power and Jacques (2014) and Dziuban et al. (2018) also proposed blended learning design as a solution to widespread online learning challenges in higher education.

2.4.5 New Developments in ICT

It is an exciting time when fundamental restructuring of education is happening worldwide. Education is continuously evolving, and coupling education with ICTs can provide better learning opportunities and experiences to students than before.

1. Bots, 3D printing and wearable technology: With better technology and a greater focus on education, it will not be outlandish to expect robots (bots), 3D printing, wearable technology in every part of the world (classroom-aid, 2012). Today bots are used to reduce the workload of teachers. They are used for answering basic questions, interviewing and for repetitive tasks that need automating. These bots are software applications that use artificial intelligence and are empowered by motion tracking and speech recognition (Singh, 2016). 3D printing can also provide an interesting alternative. Model making will become easy and extremely quick. Engineering students will also experiment freely with it. It will also give a boost to vestibule training. Classrooms will be nothing less than hubs of creativity and innovation. In the

past, application of wearable technology has been limited to monitoring footsteps, but in future, it will monitor and guide not only optimum sleep, but also work and study. It will send reminders and notifications in vibrate mode. In the end, it will produce a summary of our day regarding hours spent on different activities and suggest better time management.

2. Flipped classroom and blended learning: New forms of pedagogy, assessment and learning will be used like the flipped classroom and blended learning. Theoretical learning through video lectures will be enhanced with practical hands-on learning in the class. The traditional mode of rote learning will be abandoned, and technology will be put to use many times over.

3. Tie-ups between corporation and academia: With its limitless expanse, technology will be able to rope in, and spread ideas around the world. This will enable democratization of education. Tie-ups can enhance the learning process. Recently, History Channel and the University of Oklahoma teamed up for programming that complements school curricula. Teachers can videotape the program and align it with appropriate lessons and class activities for making learning exciting and rewarding for students (History Channel and the University of Oklahoma, 2016). In this quest, even tie-ups with amusement and technological parks can make learning enjoyable. Many companies like Google, Facebook, HP, and Microsoft are also taking an interest in education and opening up networks to share knowledge. Some of the notable ones are Google classrooms and Microsoft teams.

4. Big data analytics: Big data analytics has given room for a deeper probe into the study of online behavior of students. Online activity of students leaves a digital trail (Simon, 2016). Such data can be recorded and used to get an idea of their learning

style and also personality type. The assessment score can be used to determine their grasping power. Data mining can be used to build individualized profiles of each student. Profiles can be studied to proactively suggest advanced versions or remedial sessions for fast and slow learners, respectively. These will yield ways to make MOOCs more proactive. Content will be presented in a different way to each student, depending on their profile. Together with big data, biometric tracking of eye movement can be done to get an insight into how people learn and how their brain works. This research will also help in the development of new pedagogy, assessment and course contents. The data profile of a student can also be used to provide career guidance. In fact, each student can be provided summary statistics depicting hours spent by him in online study vis-à-vis his performance in the program. The performance of one student can also be compared with another to bring out differences. Such individualized attention and guidance will be highly beneficial.

5. Small Private Online Courses (SPOCs): SPOCs are customizable version of the standardized MOOCs. SPOCs along with remedial coaching classes can be arranged for students with special needs (UNESCO, 2016).

6. Virtual reality and artificial intelligence: The use of smart classes, animation and surround sound creates an ambience and virtual reality where the students not only see and hear but also feel. Students are now suggesting that classrooms be like a planetarium. They would be surrounded by images and high definition dolby digital sound system (Bamford, 2012). Earlier textbooks were their only window to the world, now technology can take them to the solar system, heritage buildings, and foreign lands. This so because technology can bring life to dull words in text books; it

can awaken interest in moribund lectures of the classroom. Interaction in the real world will become possible with upcoming devices like Google Glass and Oculus Rift. These devices are mounted on the head so that students can explore the world without having to hold on. Such learning will immerse students totally in the subject, and all kinds of distractions will be avoided. Virtual field trips are also possible with artificial intelligence (Poh, 2016). Using virtual reality, it will now be possible to recreate even destroyed archeological sites. This kind of experience-based learning will overcome the habit of cramming.

7. Cloud applications: Cloud storage and the Internet of Things (IoT) will allow for seamless interconnectivity and ready access to all course material at the click of a button. Multi-touch LED screens, flexible displays, foldable keyboards and paper-thin smart phones will make studying less cumbersome and more motile. Nowadays various free educational tools and apps are also available on the Internet which has made research convenient (Cronje, 2013).

8. Gaming: Interesting activities like online gaming, simulations, and augmented reality will make education more exciting and rewarding.

9. Life-long learning: Online courses are not only rewarding for students but teachers as well. Platforms such as MOOCs give support to even faculty and adults in their quest for life-long learning.

10. Sensory equipment and hi-tech search: In the future, it will be possible to create internal motivation inductive to study. Technology will be able to detect the mood of its wearer (Cooper, 2017) and manipulate brain cells to feel energetic, receptive and creative at the same time. Even so, a mood changing headset can be used to perk up

the mind (Corbyn, 2017). Even hi-tech search engines can be built to read the curiosity of the user and give precise search results at lightning speed.

2.5 Prominent educational bodies in higher education in India

As India beckons its position as the third-largest economy, it expects to be driven by the knowledge resources supported by a high-quality education system. Although steps have begun in this direction, stronger attempts are required. While promoting the Digital India campaign to create a digitally empowered society, the appropriate integration of technology into teaching, learning, training, planning and administration is called. In this direction, various schemes have been launched and bodies have been instituted to sensitize the Indian higher education system towards quality education that meets the standards of an international scale (NIRF, 2018).

(a) MHRD

As the name suggests, the Ministry of Human Resource Development (MHRD) concerns itself with the development of human beings as a valuable resource for the country. It recognizes the need for quality education for citizens to lead a dignified life. MHRD was formed on 26th September 1985 with a vision "to realize India's human resource potential to its fullest in the Higher Education sector, with equity and inclusion." The ministry aims to improve the quality of HEIs, especially in areas left behind, to reduce the regional imbalances. The focus is to bring weaker sections like the poor, women and minorities into the mainstream. The ministry has also initiated financial assistance in the form of subsidies and scholarships to meritorious students from the disadvantaged sections. MHRD has also signed a memorandum of

understanding and established collaborations with international organizations like UNESCO and foreign universities and government to increase the educational prospects in the country. The department is also responsible for the overall expansion and improvement of educational infrastructure. It aims to transform national universities to world-class universities. Apart from these, the ministry commits itself to boost research and innovation and expand the frontlines of knowledge. The promotion of Indian languages, vocational education and skill enhancement also come under its ambit. The department also introduces academic reforms on a mass scale to enable improvement and rapid advancement. MHRD is also focusing on technology-enabled learning. ICT is viewed as a powerful mechanism to improve both the quality of education as well as its reach. The participation of renowned faculty can ensure quality in certified programs while networking facilities can be utilized to extend the reach of applications (MHRD, 2019).

To achieve this objective, the participation of dedicated and qualified experts is required. Though efforts have begun in this direction by an institution, they are mostly fragmented. Success is achieved, but it is limited to the top-notch institutions.

Efforts will now have to be made to achieve holistic growth and create synergies resulting in a multiplier effect that can be done through knowledge creation and dissemination, leading to knowledge empowerment.

The development of open-source software, along with the propagation of cloud computing technologies, has opened new parkways in education. For instance, NMEICT i.e. “National Mission on Education through ICT” provides remote access to laboratories as a part of their mission (NMEICT, 2019).

A National Research Foundation will be established to seed, facilitate, fund and incentivize research across all disciplines at the academic institutions. It will also help research reach the common man well in time to improve their quality of life (NRF, 2019).

(b) NAAC

National Assessment and Accreditation Council appraise the higher educational institutions for their compliance to the norms of excellence in the context of their performance in terms of "educational processes and outcomes, curriculum coverage, teaching-learning processes, faculty, research, infrastructure, learning resources, organization, governance, financial well-being and student services. Its vision is to make quality the defining element of higher education in India through a combination of self and external quality evaluation, promotion and sustenance initiatives." NAAC ratings are useful as they make HEIs aware of their own performance and of their peers on parameters such as teaching-learning, research, infrastructure, governance, among others. The rankings also create a sense of responsibility among institutions. They strive for excellence in different fields, contributing to national development. In view of achieving better rankings, they focus on developing competencies in their pursuance for excellence (NAAC, 2019).

(c) NIRF

The National Institute of Ranking Framework was formed under the auspices of MHRD on 29th September 2015. NIRF is a national body that rates HEIs in India (NIRF, 2019). Their rankings parameter includes "Teaching, Learning and Resources," "Research and Professional Practices," "Graduation Outcomes," "Outreach and Inclusivity," and "Perception."

(d) RUSA

RUSA is the Rashtriya Uchchattar Shiksha Abhiyan. It aims "to improve access, equity and quality in higher education through planned development of higher education at the state level. Objectives include creating new academic institutions, expanding and upgrading the existing ones, developing institutions that are self-reliant in terms of quality education, professionally managed, and characterized by a greater inclination towards research and provide students with an education that is relevant to them as well as of the nation as a whole." The objectives of RUSA is

- To encourage institutions to embrace assessment and ranking framework as an assurance of quality. Revamping academics and examination system.
- Assure the availability of expert faculties to stimulate capacity building at all levels.
- Fostering research and innovation.
- Enlarging the institutional base by adding new institutions and creating additional capacity in the existing ones.
- Establishing institutions in deprived regions to check regional imbalances
- Increasing opportunities for the disadvantaged, distressed and backward groups in terms of their caste and creed, gender and health positions.
- Promoting the use of ICT in educational institutions.
- Conduct research and experimentation to innovate and create power for the future (RUSA, 2019).

(e) ARIA

ARIA i.e. "Atal Ranking of Institutions on Innovation Achievements" is another move by MHRD to establish an outlook for invention and entrepreneurship in the nation. The goal is to foster high impact research that can be translated into useful products, services, skills and processes for the advantage of community (ARIA, 2019).

(f) AICTE

AICTE aims to facilitate technical education to promote national development. In this direction, it has also initiated various faculty, student and institution development programs. Among them include skilling the youth for bright careers and training faculty to upgrade their knowledge and skill. AICTE is also running various research and innovation schemes to create an atmosphere of research and innovation in the country.

As India is struggling to achieve its gross enrolment target, ICT can be viewed as an essential tool to augment the current enrolment rate. In this direction, the ministry has introduced a learning gateway called "SAKSHAT: a one-stop education portal" which develops e-content across multiple disciplines. The renowned professors from several IITs and NITs will design the content. To lend two-way interaction amongst students and teachers, the NMEICT "National Mission on Education through Information and Communication Technology" is established. Under its auspices, the virtual labs, online testing mechanisms, virtual conferences, open-source and access tools and talk-to-teacher programs will be established for knowledge sharing and problem-solving in a personalized manner. The ministry also plans to bridge the digital divide by teaching the skills to use digital devices, especially to teachers and learners in the remote areas (AICTE, 2019).

(g) AISHE

All India survey of higher education conducts a survey on the state of higher education in India. It is a government body that collects statistics on the key parameters related to higher education.

The statistics may relate to the number of higher educational institutions in the country, their type, i.e. public, private, deemed and state universities. It also collects data on the number of student enrolments in Higher education. The gender parity is also discussed. Streamwise registrations among Sciences, social sciences, engineering and technology is also stated therein. The report also provides important insights into the enrolments of international students and the internationalization of higher education in India. As higher education includes all post-secondary education, the scope of AISHE includes graduates, post-graduates and Ph.D. level students along with their numbers. The pupil-teacher ratio is another critical area elaborated in the report. The number of faculty deployed in higher education with a bifurcation in terms of males and females is also mentioned. The non-teaching staff employed with their grade levels is also stated. The report also compares and contrasts data of various states in the country.

The report is very beneficial to all the researchers in the field of higher education as it presents important statistics relevant for exploration and analysis and provides key insights to the important statistical figures. Though various other agencies are also collecting data, their scope is not as extensive as that of AISHE. The agency started in 2010-11, is collecting data online, and has gone paperless in collecting data from institutions (AISHE, 2019).

Summarily, the data generated by AISHE is beneficial for the policymakers, planners and analysts and decision-makers in the field of education and overall administration.

(h) UGC

The university grants commission is entrusted with the responsibility of providing grants for education. It not only provides funds but takes reasonable steps for the maintenance of standards in higher education. It advises the government in policymaking and serves as an essential link between Governments and HEIs of the country. It undertakes the steps to maintain and or improve the standards of research, teaching-learning and examinations (UGC, 2019).

(i) UNESCO

UNESCO stands for "United Nations Educational, Scientific and Cultural Organization. It seeks to build peace through international cooperation in Education, the Sciences and Culture and has the mission to build peace, eradicate poverty and drive sustainable development." UNESCO commits to Sustainable Development Goal 4 (SDG 4) of the 2030 Agenda, which aims to "ensure inclusive and equitable quality education and promote lifelong learning opportunities for all by 2030." UNESCO has been entrusted with the task of leading and solidifying the global education system and confront international pressures through wisdom and learning. The agency looks forward to sustainable development and enhancing technical as well as vocational skills.

UNESCO also recognizes the change in educational landscape occurring due to internationalization, student mobility and the internet revolution. With these

changes, the demands from stakeholders are also increasing and now the knowledge, skills and competencies matching world standards are required. The continuous skilling and reskilling of students is becoming crucial and quality assurance and accreditation is becoming essential. The technological revolution has presented new challenges and opportunities. The change has made blended and online learning accessible. The Massive Open Online Courses and Open Educational Resources are harnessed to make education available around the world.

In a developing country like India, where the population is living in deprivation, illiteracy and poverty, education seems to be the savior. It can turn the population into a demographic dividend. In this direction, UNESCO aims to lift people out of poverty, ignorance and deprivation. In the year 2015, India committed itself to the SDG of the United Nations. Also, in the year 2010, India joined hands with one hundred thirty-five countries to make education a fundamental human right, among them being the Right to Education (RTE). It has also launched the Sakshar Bharat Mission to educate the adult and also the Sarva Shiksha Abhiyan and Mid-Day meal programs. The idea is to increase enrolment of all the sections of society, irrespective of their gender, nationality and social and economic background. Besides reaching the masses, the mission also includes quality i.e.; students must be efficient in the 3Rs i.e., reading, writing and arithmetic. Such steps will result in educated youth ready to face the challenge of the labor market (UNESCO, 2019).

(j) World Bank

World Bank (WB) is another international organization that is supporting the cause of education around the world. Since 1963, it has been active in tertiary education or higher education. WB is one of the notable financiers to education and about 20% of its earnings are allocated to it. WB also researches, collects data and publishes valuable reports related to the education system around the globe. These reports are aimed at providing insights to countries about their student admissions, retention, completion, job outcomes and any other relevant area. It also makes countries aware of international best practices. These practices, in turn, can be benchmarked to be followed in other countries for their self-development and growth. EdStats and SABER (System approach for better education results) maintain educational statistics and databases for nations to guide their policy making and action.

Another important issue addressed by WB is the elimination of learning poverty, which is defined as not being able to read and write confidently due to starvation, deprivation and lack of other academic resources. In this direction, WB seeks to meet the needs of all students and teachers who may belong to the conflict-affected, disabled and marginalized sections of the society.

WB also promotes quality improvement, innovation and enrichment. In India, it started with the Technical education quality improvement project (TEQIP) that works to boost the skills of engineering students, making them job-ready for the market. To date, it has aided around 200 engineering higher educational institutions in different parts of the country.

WB is also closely working with other international organizations like UNESCO, OECD, British Council and International Association of Universities (IAU) for efficient co-ordination of efforts. It is also encouraging higher public-private partnerships and alliances so that more colleges and universities can be opened to meet the ever-increasing demands for higher education. This move will be beneficial as students will be able to secure greater choices concerning their institution for higher studies.

WB also seeks to align primary and secondary with tertiary education to maintain consistency in learning. It believes that the focus on tertiary education is vital due to the growing young population, urbanization, and upsurge of the middle class. Moreover, it is proven that an additional year of schooling renders a 9% rise in earnings for an individual. With all these objectives in mind, WB aims to prepare students to become future leaders who have real-life marketable skills and turn out to be an asset to society.

2.6 Previous Studies

Several papers studied the concept of KM in education, but limited studies validated the impact of KM on organizational performance, though they have been undertaken in the corporate world. The table below abstracts the research in not only the education sector but the corporate sector too. This is so because the empirical studies of corporate can be replicated in HEIs with some variations. The table below lists the empirical studies in the order of relevance to the current research.

Table 4: Empirical Studies in KM

Sr. No.	Independent variable	Dependent variable	Sample	Technique	Findings	Author and year
1.	KM process: Knowledge sharing, dissemination, application and creation	Job performance	Lecturers at Jordan University	SEM	KM processes positively affect KM performances which further affect job performance. Though there is limited influence of KM on job performance.	Masa'deh et al., 2017
2.	KM measured through knowledge transfer, acquisition, documentation, creation, and application	Organizational learning	Mixed methodology approach was adopted. Data were collected from 270 respondents of 6 HEIs in Uganda. 13 interviews were conducted.	Correlation, regression and canonical correlation was performed.	There exists interdependent relationship between KM and organizational learning.	Turyasingura, 2011
3.	Organizational culture	KM: Knowledge generation, storage, transfer and application	Teaching staff of two public faculties in Central Europe.	Correlation	There is statistically significant correlation between different types of organizational culture and KM processes.	Omerzel et al, 2011
4.	Entrepreneurship	KM	Employees of Islamic Azad University.	Path analysis using LISREL.	Entrepreneurship has a direct effect on KM.	Nazem, 2015
5.	KM	Academic performance	41 colleges in Iraqi HEIs	Correlation and regression	Iraqi HEIs can benefit from KM processes.	Zwain et al, 2012
6.	KM tools and processes	Quality education	University leaders in Nepal.	Conceptual model	KM tools are useful to quality education.	Adhikari, 2010
7.	Factors related to KM in education have been explored: Knowledge creation, storage, dissemination, organization, capture and application		Public and private HEIs in Malaysia	Factor analysis, T-test	There are significant differences in KM processes with respect to public and private HEIs	Ramachandran et al., 2009
8.	Culture, attitude, motivation, opportunities and nature of knowledge	Knowledge sharing	Teaching staff of public and private HEIs in Malaysia	Cross-sectional survey. ANOVA, regression was applied	Positive relation between the IDV and DV for both public and private HEIs.	Sadiq and Daud, 2009

Sr. No.	Independent variable	Dependent variable	Sample	Technique	Findings	Author and year
9.	KM capability in KM processes	KM effectiveness	Experts in Thailand	Qualitative analysis including Literature Review	Indicators of Knowledge acquisition, creation, storage and application were identified.	Aujirapongpan et al., 2010
10.	KM measured through knowledge acquisition, conversion, use and protection	Business Performance	Web based survey of 241 Brazilian companies	Structural equation modeling (SEM)	KM affects business performance through strategic orientation and innovativeness. This strategic bent enables companies to foresee and counter market changes.	Ferraresi et al., 2012
11.	KM infrastructure and processes	Organisational performance	Egyptian organizations	Correlation, regression in spss	If quality of knowledge is good, management performance improves significantly.	Nasser et al., 2012
12.	KM practices measured through IT, organization and knowledge elements	Organizational performance	Data from 329 companies of Slovenia and Crotia	SEM Lisrel 8.51.	KM heavily relies on technology, but there should be presence of trust and other supportive organization elements.	Rasula et al., 2012
13.	KM practices i.e. Knowledge creation, storage, sharing, implementation and acquisition	Organizational performance measured through productivity, innovation and customer satisfaction.	282 Senior managers in a Small and medium enterprise	SEM Lisrel 8.3	In order to improve company's performance, information should be collected from customers, suppliers and stakeholders. ICT can be employed for organization and dissemination of this vital information.	Gholami et al., 2013
14.	Knowledge resources i.e. Infrastructure and processes	Organizational performance	189 managers working in company	SEM	Organization structure and knowledge application have direct effect on performance, while technology and knowledge conversion do not.	Mills and Smith, 2011
15.	KM enablers and processes: IT, people, structure, culture	Performance measured in terms of learning and efficiency	Data was collected from 58 firms	Factor analysis was performed	There exists positive relationship between IDVs and DVs. Knowledge creation is essential, organization should not undermine ideas.	Lee and Choi, 2003

Sr. No.	Independent variable	Dependent variable	Sample	Technique	Findings	Author and year
16.	Knowledge Circulation Processes (KCP):	Knowledge management performance indicators (KMPI)	Firms listed on KOSDAQ (Korea)	Correlation	When KCP efficiency increases, then KMPI (measured through Price earnings ratio, stock price and R&D expenditure) also increases.	Lee et al., 2005
17.	KM drivers	KM performance	66 Korean companies	PLS	KM performance can be enhanced by KM drivers such as learning orientation, KM system quality, reward, and KM team activity.	Yu S.H. et al., 2007
18.	KM enablers and factors: Leadership, culture, technology, strategy, people	Firm performance	Greek medium and large corporations	SEM	Culture and technology effect KM effectiveness which in turn positively affect firm performance.	Theriou et al., 2011
19.	KM strategy, tools and processes	Performance of the bank	Central Bank of Nigeria	Case study	Performance can be boosted by providing operational workforce with knowledge pertinent to their task. Such knowledge increases their innovation and risk taking capacity.	Oluikpe, 2012
20.	KM processes and IT competency	Firm performance	162 managers of companies were surveyed	SEM	KM processes mediate the relationship between IT competency and firm performance.	Pérez-López and Alegre 2012
21	ICT infrastructure	Educational attainment and productivity	Arab States, Europe, Sub-Saharan Africa	Data Envelopment Analysis (DEA)	ICT infrastructure strongly influence educational performance.	Oyerinde and Bankole 2019
22.	Knowledge Management	Organizational performance	Restaurants in Colombia	Logit regression	Knowledge helps in achieving organizational objectives, keeps abreast in emerging market.	Bernal et al., 2020

Source: (Compiled by the author)

Several papers studied the relationship between KM and organizational performance. Most of the studies established a significant positive relationship between KM and organizational performance. Lee & Choi (2003) in his study on 58 firms, found that KM enablers and processes positively influence the performance of the firm. Another researcher, Wang (2007) conducted a study in 20 training centers in Taiwan in 2007 and found that right KM environment within the organization improves the core competencies of staff which further improves the job performance of employees. Nasser et. al (2011) in his study in Egyptian organizations proved that KM capabilities had a significant positive relationship with organization performance. However, cautioned that KM could improve performance if attention is paid to organization characteristics. Similarly, Donate and Canales (2012) proposed that an integrated knowledge strategy could improve business performance. In the same year, Oluikpe conducted a case study in Central Bank of Nigeria and found that if the staff is provided knowledge relevant to their task, it will enhance the efficiency of business processes and ultimately the firm will benefit. Again, Rasula et al. (2012) in his study on 329 companies concluded that KM practices measured through information technology positively affect organizational performance. Gholami et al. (2013) examined the influence of KM practices on performance of small and medium establishments and found that they share positive relation with organization productivity, innovation, financial performance and staff performance. Thus mechanisms to collect knowledge from customers, suppliers and other stakeholders helped the organization to overcome challenges and improve performance.

Some other studies could not establish a direct relation between KM and organization performance. The most important of the one by Masa'deh et al. (2017) who

researched in Jordan university reporting limited influence of KM on the job performance of staff. The authors reasoned that KM is not well organized at the University of Jordan and no consolidated efforts to facilitate knowledge sharing are made which might have resulted in such a situation. The same author in 2013 also could not find a direct relationship between knowledge sharing capability and firm performance. Similarly, Mills and Smith (2011) reported that "while some knowledge resources, e.g., organizational structure and knowledge application bear a direct relation to organizational performance, others like technology and knowledge conversion do not". Similarly, Ferraresi et al. in his survey of 241 Brazilian companies in 2012 failed to find a direct relation between KM and business performance. He, however, noted KM affects business performance through a strategic orientation that prepares the cope up with market changes. Choi and Lee in 2003 noted organization performance depend highly on KM style. While dynamic style is effective, passive style is not.

From the above analysis, it is proposed that KM can improve business performance only if KM is applied in true spirit taking care of the other important organizational characteristics. Organizations must be prepared to face the challenges in KM implementation otherwise the desired results may not be obtained. Only right KM strategy can provide the right outcome (Ho L.A., 2008).

2.7 Research Gap

As can be seen from table 5, most papers studied the relationship between KMS and corporate performance, but limited research has been carried out in the educational sector whose parameters are different. Even the concept of 'KM in education' is not

well understood. Very few HEIs, especially in developing countries, actively research or produce new knowledge (Bratianu 2011; Gill 2011). Also, seemingly no attempt is made to capture the tacit knowledge (knowledge that resides in mind) of the educators who retire or resign and the students completing their respective courses. Many institutions even lack the culture that promotes knowledge sharing and innovation. Thus, there arises a need to measure KMS in HEIs and its likely influence on performance.

CHAPTER 3

BACKGROUND AND CONSTRUCT DEVELOPMENT

Using the highly cited models and concepts, the study explored the indicators of KMS, which is an independent variable in this study. The indicators of SP, which is a dependent variable, are derived from the national and international ranking framework.

3.1 Independent Variables (IDV)

3.1.1 Knowledge Culture (Kcul)

KCul refers to the norms, values, and shared understanding among people working in an organization (Schein, 2006). It sets the acceptable level of behavior and is shaped by values, beliefs and artifacts. Oliver and Kandadi (2006) have defined knowledge culture as: "A way of organizational life that enables and motivates people to create, share and utilize knowledge for the benefit and enduring success of the organization."

Culture though invisible, is reflected by the practices an organization adopts, aspires and appreciates (Gold et al., 2001). Applying KM practices create successful routines that help organizations remain up to date (Chai and Nakata, 2013). Culture can be instilled through continuous reinforcement, members' involvement, training, recognition and rewards (Bharadwaj et al. 2015; Goh, 2002). To promote knowledge culture, an organization may institute awards for knowledge creation and dissemination. The rewards may be in monetary terms like an increase in pay, promotion, or commission or non-monetary in the form of praise and recognition.

Such practices establish an organization's commitment to knowledge culture and reinforce members to engage in such activities actively. A system of rewards may motivate members to take up challenging work, solve problems, create, and innovate (Chen & Huang, 2009). A learning culture may promote new ways of teaching and learning, innovation and risk-taking (Janz and Prasarnphanich, 2003). Training of members is vital so that they are updated with the changing situations and demands of the job (Donate and Guadamillas, 2011). In fact, lifelong learning is the need of the hour. In such an endeavor, the knowledge and skills of the faculty, students and administrators have to be continuously upgraded to achieve a high level of performance. This cannot be achieved without the support and facilitation by the top management.

A congenial environment of progressive growth requires a clear commitment by the organization not only in words but also in actions and spirit. Training is further needed to grab the opportunities to participate in innovation projects, to publish and to excel in academics. It prepares members of an organization to handle current and upcoming responsibilities with conviction and ease. A positive change in attitude is necessary at every step. This can be achieved by inculcating trust and team spirit among members (Ribiere and Sitar, 2003). For achieving group goals, the participation of all the members is essential and to obtain their commitment, their involvement in decision making is necessary. That will make them identify with their jobs. The suggestions of members are believed to bring out new ideas. To cast a real impact on performance, it is essential to put ideas into action. As without it, no outcomes would be realized. Therefore all good ideas must be implemented.

3.1.2 Knowledge Transfer (KT)

KT refers to the exchange of ideas, facts, experiences and learnings from one person to another within and outside the organization(s) (Bartol & Srivastava, 2002). According to Hsiu-Fen (2006), "knowledge sharing is the act of capturing, organizing, reusing, and transferring experience-based knowledge by making it available to others." KT is more than communication, as it requires not only a medium but also a will to share and an intent to mutually benefit through increased understanding. KT is essential, as unshared knowledge will remain hidden and fail to create surplus value (Jain and Gupta, 2019). KT is recognized as a vital constituent of KMS in a number of studies (refer to table2).

In today's fast-paced and dynamic world, in-depth knowledge of various fields is required for decision making, but everyone cannot be expected to have all the knowledge. In such a scenario, KT can ensure the transfer of knowledge to places where it is demanded (Alavi & Liedner, 2001). For enabling transference from the haves to have-nots, culture plays a vital role (Wang & Noe, 2010). It makes the operating systems robust. For instance, the experience and expertise of retiring employees can be retained and passed on if it were shared continuously as a practice. Similarly, new recruits become productive immediately if they receive orientation and guidance from existing and outgoing employees. The mutual interactions disseminate acceptable behaviors and also acquaint newcomers with the essential know-how, which reduces their anxiety and doubts in unexplored space.

Knowledge sharing must take place at all levels and within all departments, and none of them must exist in silos. Communication and conversation bring forward insights

and experiences which are otherwise tacitly housed in the minds of individuals and also embedded in the routines, roles, relationships, policies, procedures, and methods of working.

People are willing to share information with their peers to help them achieve shared organizational goals (Masa'deh et al., 2017). The willingness to share knowledge is also a matter of personal attitudes and value system of an individual. There may be a tendency to help, build relationships and even expectation of reciprocation when they may need help or information (Chikoore & Ragsdell, 2013). In group activities and team tasks, knowledge sharing among team members becomes indispensable (Lee et al., 2004) as rewards are tied not to an individual performance but group performance.

At times, it is also observed that members do not share knowledge and instead hoard it (Turyasingura, 2011). They believe that knowledge gives them power and sharing it will dilute their power. People don't share knowledge because they don't trust others and think the receiver might misuse it. Another reason could be the lack of knowledge sharing culture. In an individualistic culture, all the members are generally vying for the same rewards or promotions, which are also limited in nature. Sharing their expertise or methodologies would hinder their uniqueness and they will not get any competitive advantage. For a research department, an exchange of academic material might result in plagiarism issues.

To counter these problems, the organizations can work on shaping positive attitude by creating a culture that rewards knowledge sharing. To enable KT, top management support, rewards and recognition system, supportive relationships must be in place. An institution must provide an adequate platform for members to discuss their ideas,

suggestions and concerns freely. One such platform is meetings. Meetings are generally conducted to achieve this objective (Omerzel et al., 2011). In academic institutions, meetings might be held for admission related issues, student attendance, examination, evaluation and scholarship. Faculty might meet to discuss pedagogies, course curriculum and best practices. Meetings are also a useful tool for change management. Top management may use this platform to share their vision and motivate employees for higher professional achievement. The discussion in them also ensures that no essential point is missed and the interest of all is incorporated.

Another important tool of KT in academic institutions is conferences, seminars and workshops (Ramachandran et al., 2009), which can either be organized in-house or at the national or international levels. They become a potpourri of knowledge as people from a diverse group come together to share their views. Such diverse perspectives broaden the mental horizons and help expand the knowledge base.

But many a times, it has been found that the active participation of members in the academic events is missing. For these events to succeed in reality, they must encourage the active involvement of all the participant rather they being passive recipients. For all these efforts to have a long-lasting impact, knowledge-doing gap (Choi et al., 2010) must be reduced to the minimum.

3.1.3 Knowledge Creation (KC)

KC refers to adding or building new components to the existing knowledge domain (Pentland, 1995). Knowledge can result into being as user's process data and information based on their understanding and experiences. The modes of KC are

higher-order thinking, group interaction, research and development and learning by doing. KC is critical to any organizations' success as innovations are rewarding both in monetary and non-monetary terms. Innovative organizations not only earn goodwill by making a positive difference in the lives of people across the globe but also cash in on valuable patents (Jain and Gupta, 2019). In this era of intensive competition, innovation is the only cutting-edge mechanism that promises of turning a stagnant knowledge pool into an ever-growing flow of knowledge (Fan and Lee, 2016). Having a vast potential, KC is accepted as a significant construct of KMS in many studies.

Knowledge creation is also referred to as knowledge capture, acquisition, generation and accumulation (Gold et al., 2001). Knowledge can be captured both from internal and external sources. Internally it can be achieved from manuals and databases and externally it can be obtained or purchased from consultants, experts, alliances and joint ventures (Biloslavo and Trnavčevič, 2007). Nonaka has given the SECI model of knowledge creation, which explains that the Socialization, Externalization, Combination and Internalization process creates knowledge. In the case of Socializing, a dialogue or healthy debate unleashes creativity. Externalization codifies tacit knowledge to explicit by the process of documentation. Recording the insights renders clarity of thought and helps uncover hidden knowledge (Dhamdhere, 2015). Combination gives new meaning to existing explicit knowledge by combining, categorizing, classifying, organizing and synthesizing (Alavi and Leidner,2001; Nonaka, 1994). Benchmarking or best practices can also be a source of valuable information for an organization to follow. The explicit knowledge can later be internalized to become a skill through continuous practice (Garfield, 2018)

Knowledge creation is imperative, which can be achieved through out of the box thinking, research and development and interaction with industry experts. Out of the box thinking means unconventional thinking which breaks away from the old routines. It encourages people to be creative and pay attention to the ideas and insights they have. Culture has a big role to play in this regard. Organizations must not let ideas die and encourage risk-taking and experimentation. People should be able to share their thoughts without fear of ridicule (Ramachandran et al., 2009) and able to implement them with the support of the organization. Employee empowerment, decentralization, open communication, tolerance for mistake are the key enablers in this case.

By creating such an environment, educational institutions have been able to germinate the seeds of innovation and entrepreneurship. School and college associations are a fertile ground for entrepreneurial venture creation and a breeding ground for ideas. Sergey Ben and Larry Page were Ph.D. students at Stanford University when they started Google in 1996 as a part of their research project (Battelle, 2005; Gupta and Jain, 2017). Mark Zuckerberg, Andrew McCollum, Chris Hughes and Dustin Moskovitz were classmates at Harvard when they wrote software for the Facemash (now Facebook) website as a part of their second-year project (Vargas, 2010). The IITs have also birthed innovations aimed at solving the actual pain points of people. From electric cars, autos running on hydrogen to machines for the blind, they strive to make the lives of millions better (Shah, 2018).

Similarly, research and development programs at the university level are vital. Institutions were earlier expected to only prepare students for careers by

disseminating knowledge, but now they are expected to solve the most intricate problems faced by the world at large. They are not only supposed to educate but also research and contribute back to the knowledge pool (Marks, 2014). According to hon'bl Prime Minister Shri Narendra Modi, "Innovation is not a choice but an imperative." Only universities that innovate and research are going to remain competitive and sustain in the long run.

Collaboration between academia and industry is another area worth exploring. The industry can partner with institutions to build curriculum, case studies and research projects. The outcome of this alliance will be graduates who are adequately skilled to be readily transferable to industry. Such tie-up will save time and effort of companies in procuring the right talent. Rather than just recruiting the available talent, the company will get an opportunity to shape the expertise as well, thereby reducing the mismatch between skills and job requirements. These interactions will lend conceptual, analytical, interpersonal and descriptive proficiencies to students, which will help them comprehend the complex business environment and complete their assignments efficiently (Bisaria, 2011).

3.1.4 Knowledge storage and retrieval (KSR)

Knowledge storage is one of the significant knowledge processes in an organization. This is because unless and until the information is saved, it runs a risk of getting lost. In an organization, a lot of data and information is generated over the course of its activities. Though it might appear general and ordinary, it can be valuable for new recruits in the future course. Such knowledge if accumulated and retained, can be a

source of competitive advantage for the firm. Therefore it is essential to store, organize and refine this knowledge as a part of an effective knowledge management system.

"Organizational knowledge storage includes knowledge residing in various component forms, including written documentation, structured information stored in electronic databases, codified human knowledge stored in expert systems, documented organizational procedures and processes and tacit knowledge acquired by individuals and networks of individuals" (Novak, 2017). KS processes include codification and conservation of knowledge for its subsequent access and retrieval. This process is also known as organizational memory (Alsalim and Mohamed, 2013). Walsh and Ungson (1991) define OM as "stored information from an organization's history that can be brought to bear on present decisions. Basic functions of OM are perception, acquisition, abstraction, recording, storage, retrieval, interpretation, and transmission of organizational knowledge" (Stein and Zwass, 1995).

Types of OM that exist are paper documents in the form of manuals, newsletters and handbooks. These are the written documents containing the policies, procedures, practices and activities of the organization. They are also the databases that contain information in a digital format in computer-based system. The databases linked to google forms get auto-populated in an administrator designed setup. Their built-in features i.e. forms, query and reports have made them very popular. Databases increase the shelf life of data as records are saved in a soft format immune primarily to wear and tear. Online storage not only enhances usability as a feature of query processing and search but also helps in organizing and presentation of seemingly

unmanageable data. Stored and captured knowledge is the cornerstone of KMS, as without it all generated information like the valuable knowledge of experts is prone to get lost. The organizations nowadays strive to maintain not only the factual details of employees but also the useful qualitative information like their experience, expertise and achievement. Knowledge of experts is to be recorded so that the knowledge remains even when the expert retires, or the project team dissolves. It is crucial to preserve and retain knowledge that is tacit and vastly not codified.

KSR is said to positively affect the performance of an organization, as the saved documents serve as valuable assets that promote organizational learning (Turyasingura, 2011). The best practices and success stories, if documented, can serve as examples to be followed in the future. It helps the institution make better decisions and avoid repeating lapses over and over again. A well-built repository allows people "to retrieve codified knowledge without having to contact the person who originally developed it" (Caroline et al., 2015). Such impersonalization may lead to transparency and fairness. The ability to seek knowledge without contacting someone in-person saves on time and other organizational resources, and enable improved performance.

3.1.5 ICT infrastructure (ICT_infra)

Any study on technology is incomplete without taking into consideration the availability of a robust and efficient ICT infrastructure. In an organization, it provides the foundation that facilitates the smooth operation of technology-related activities. According to Duncan (1995), IT infrastructure comprises "hardware and operating system, network and telecommunication technologies, data and core software applications." In brief, the hardware, software and networks are the pillars of an ICT

infrastructure. Hardware is a set of equipment which can be seen and touched like CPU, monitor, laptop, printer etc. Nowadays, all established institutions strive to maintain well-equipped research labs that can run latest software. Software is a program that provides necessary instructions for the computer to work. The software can be categorized into various types. They can be free or paid, or free for a limited period and paid after that. They can also be for general use or specific use. Generally, institutions, rather than individuals, buy software that encompasses high subscription fees or premium services. It has been noted that institutions that are able to provide latest and best software to its members get an edge over the others that are not able to do so. The third pillar of ICT infrastructure is network. Network are systems used to connect multiple users. They enable sharing of not only the expensive peripherals but also the premier software, databases and messages as per the requirements of the organization.

To achieve smooth and timely conduct of all these activities, hardware, software and network must be serviced and updated. In an educational institution, there should be the availability of labs and equipment, software, and databases necessary for teaching and research like SPSS, Turnitin, Prowess and Jstor. Similarly, unwavering internet connectivity is vital to ensure a free flow of information. It is the oxygen for all the modern applications that run, update, backup and restore using the network connections.

3.1.6 Technology integration (T_int)

Technology integration is the seamless blending of technological resources like hardware, software and network in the teaching-learning process and management of an institution. Technology infrastructure will be rendered useless unless supplemented

by the skill infrastructure (ECDL, n.d.) and changes in the mindset of people to harness it to its maximum potential. As technology is continuously evolving, it demands continuous learning and adaptability to new software and research tools. It is essential that the faculty first is comfortable and willing to adopt these tools like SPSS, Stata, R, Amos, E-views, Mendeley and others which are said to boost teaching and research endeavors. If integrated successfully, the new software and research tools can improve the quality and amount of publication and can also lead to success in research projects. With their algorithms and advanced features, they can aid data crunching, analysis and reporting that help accomplishes the successful completion of the innovation projects. Technology is said to be fully integrated when it becomes a routine to the members of the organization, and all are actively engaged in its use to achieve their goals and that of the institution. Another aspect of technology integration is engagement. Student engagement has been defined as "investment or commitment, participation, or effortful involvement in learning" (Henrie et al., 2015). O'Brien and Toms (2008) comprehensively explained it as "a quality of user experiences with technology that is characterized by challenge, aesthetic and sensory appeal, feedback, novelty, interactivity, perceived control and time, awareness, motivation, interest, and affect." The faculty has to determine how best people, process and technology can be harnessed to engage learners in a meaningful and productive learning experience. Student engagement can lead to better attendance, participation, task completion and satisfaction. As compared to unengaged students, engaged students produce better academic results, complete the assigned task, collaborate and discuss ideas to solve problems and have a curiosity for learning and

motivation to perform better. Technology should be integrated in such a way that it instills an impression on the minds of students. Dull presentations, cluttered interface fail to capture attention and are quickly dismissed by the students.

On the other hand, engaging systems extend beyond the usability of the application. An engaged student is an active learner who takes active responsibility for his learning and goes beyond limits to explore more and more. If employed wisely, technology can help improve teachers' lesson design with up-to-date material as it can converge knowledge from various sources like books, articles, research papers, newspapers and magazines having text, images, audio, video and other multimedia applications. It is a one-stop-shop of information available at a single click. This process of learning helps students relate established theories to the current scenarios, thus broadening their knowledge paradigm.

3.1.7 Online Communities of Practice (O_COP)

The term communities of practice were initially coined by Lave and Wenger (1991) who described it as "an activity system about which participants share understandings concerning what they are doing and what that means in their lives and for their community". The definition brings out a few important facts. First, COPs encourages knowledge sharing among its group participants (Kimble and Hildreth, 2005; Ardichvili et al., 2006). Second, they are unified by a common goal which is directed towards performance enhancement of members themselves and their community. Third, members discuss what they practice and practice what they discuss (Bates, 2014).

Such communities have now gone online and this is how the new term virtual or online COPs is coined. Some experts defined it as, "Online social networks in which people with common interests, goals, or practices interact to share information and knowledge, and engage in social interactions" (Ardichvili et al., 2003; Chiu, Hsu and Wang, 2006). Online COPs are supported by web 2.0 technologies to a great extent.

The term web 2.0 was officially coined by Tim O'Reilly (2005) for a second-generation world wide web (Safran et al., 2007). McLoughlin and Lee (2007) comprehensively defined Web 2.0 as "a second-generation, or more personalized communicative form of the world wide web that emphasizes active participation, connectivity, collaboration and sharing of knowledge and ideas among users." As opposed to web 1.0 which constituted static read-only websites, web 2.0 is the dynamic "read-write web" (Price, 2006; Richardson, 2006; Thompson, 2007). Web 2.0 allows users to create content, share it, collaborate and conveniently communicate among participants. According to Paroutis and Al Saleh (2009), their key features of knowledge creation, collaboration and dissemination make it an important tool of knowledge management (KM). Their low cost, accessibility and convenience had made them very popular. They also serve as a ready reference due to the features like record keeping, storage and forwarding. With their existence, the process of learning continues even beyond the classroom (Gannon-Leary and Fontainha, 2007). Some of the online COPs are WhatsApp groups, Google groups, Facebook communities, SlideShare, YouTube, Researchgate, LinkedIn and Quora. Recognizing their potential and reach, the companies are promoting academic networking for social outreach. Besides the companies mentioned above, others are also joining the league to cash-in

on the opportunities created by technological disruptions and innovation (McHaney, 2012; Thompson, 2007). A well-planned and well-executed KM function acts as an enabler for the achievement of better performance of the organization.

The features catering to academia have made them more popular among the students' community. The educational institutions are also embracing their use for educational objectives. They are extensively used by faculty, students and administrators for group communication (Hung and Yuen, 2010). As noted by one of the respondents "Just post it in the group and message is communicated to all the members." Nowadays a variety of options are used by the members for networking and knowledge sharing depending on the purpose of communication. Web 2.0 technologies are used both for formal and informal communication in an institution (Gikas and Grant, 2013; Jeon et al., 2011).

3.1.8 Emerging Technologies (T_emerg)

Advancement in technology has opened up avenues for innovation and experimentation in education. One innovation is online learning and massive open online courses (MOOCs). These courses came up in response to the demand for affordable and accessible learning. MOOC is an open access course based on the distributed peer learning model (Baturay, 2015). Its key features include short video-based lectures, automatic assessments and online forums for discussion with teachers, peers and MOOC providers (George Glance et al., 2013).

MOOCs are rolled out by renowned universities and taught by the best faculty in the world. These courses are self-paced and provide great flexibility to a student. He can

study as per his convenience. MOOCs have the capacity to handle the challenges inherent in life-long learning. Working people who wish to upgrade their skills in a particular domain are no longer daunted by their fixed working hours and similar commitments imposed by the employer. They can enhance their competence by enrolling for a MOOC. A MOOC is available 24×7 and the person can learn at his own pace. Sometimes developments in individual domains also create a competency gap and require short courses to fulfill the same. MOOCs provide a creative solution to such problems; as here course is divided into various levels of expertise. Therefore, a student can enroll according to his competence and choice. This saves his time, money and effort as the student enjoys the option of designing his own curriculum. Students can now learn from world class institutions offering MOOCs that have no constraints with regard to the number of people who wish to join. Also, financial implications barring students from joining premier institutions vanish. MOOCs offer a student the virtually unprecedented opportunity of studying a discipline of his own choosing that resonates with his long-held personal interests. MOOCs facilitate upgrading the skill sets of the educators simultaneously, thereby helping improve the overall quality of education in real time.

Besides MOOCs, our lives are intimidated by some other interesting technical inventions and innovations. It is not far that the fictions of yesteryears emerge in our daily lives. Slowly but gradually, we are moving towards Education 4.0, where the barriers between man and machine would blur and the latest technological tools like robots, virtual reality and artificial intelligence would find their way in education (Fisk, 2017). This dynamic environment though thrills but raises concerns at the

same time regarding technological adaptability given limited human capability. The benefits and dangers of technology are still being scanned and explored (Jain and Gupta, 2019). One example is the virtual reality, artificial intelligence and augmented reality though they look similar but have subtle differences.

In the case of virtual reality, the user is transported to a digital world different and disconnected from the real world. The head-mounted displays are used to create an immersive experience that enthralls the human senses. Using VR, the teachers can walk students to the height of mountains, depth of oceans, galaxies, and outer space, which was not possible before. Students are now suggesting that classrooms be like a planetarium. They would be surrounded by images and high definition sound system (Bamford, 2012). Earlier textbooks were their only window to the world; now technology can take them to heritage buildings and foreign lands. The virtual field trips give them an opportunity to learn the traditions, culture and artifacts of different parts of the world. The upcoming devices like Google Glass and Oculus Rift, enable students to explore the world without having to hold on. Such simulations will immerse students totally in the subject, and all kinds of distractions will be avoided. Even destroyed archeological sites can be recreated using virtual reality. This kind of experience-based learning will overcome the habit of cramming (Gupta and Jain, 2017). At Hamilton College and Penn State University, VR is extensively used to teach human anatomy and soft skills respectively.

Artificial intelligence refers to the development of smart machines that mimic human acumen and thinking. AI-enabled devices are capable of reasoning, problem-

solving and self-learning the same way as humans do (ColdFusion 2016; Munfarid 2018). AI derives its intelligence from algorithms that improve performance as it receives more data than non-AI devices. Some of the examples of artificial intelligence are auto-suggestion, pattern recognition, language translation, visual perception and decision making. In the field of education, AI-powered grading software can be used to evaluate a student's assignment. Machine learning as a part of AI, can be used to monitor progress and provide real-time feedback to students. Face recognition software can be used to study the emotional state of students and adjust learning styles accordingly. The same software can also be used to maintain attendance records reducing the workload of teachers and leaving them time for other critical activities. Today services of bots are utilized to reduce the workload of teachers. They are used for answering basic questions, interviewing, and for repetitive tasks that need automating (Singh, 2016).

Augmented reality overlays digital content or objects to the real world view. Augmented reality allows learners to experience learning in a non-threatening game style environment (Hajizada, 2019). In this form of experiential learning, students are no longer spectators to course content but actively operate a machine, perform tasks and learn real-world skills, which was not possible in a conventional classroom (Davies, 2017; Jain 2018). AR has applications in training, gaming and prototype generation. It can be beneficial for engineering students who can inspect 3D objects from all angles, magnify, inspect, add or remove any part for study (Walker, 2018). Model making will also become easy and extremely quick. It will

also give a boost to vestibule training as it is a safe place to fail, learn and succeed. Classrooms will be nothing less than hubs of creativity and innovation.

But these technologies are not without their pitfalls. Over-dependence on technology can be hazardous, as there are many cases of faulty programming or devices getting infected with viruses. In such cases, all the activities of an organization may come to a halt. Also, there can be privacy threats and security issues (Appel, 2018). Having robots or machines do all the work is said to make a person lackadaisical. Experts note that technology has created distances between people and the warmth of deep relationships among them is diminishing. The audio-video content also demands close scrutiny as much depends on the opinions of the developers and programmers. A biased opinion may hurt the sentiments of a particular race or community.

The flipped classroom is a form of pedagogical innovation which inverts the traditional class (Shi-Chun et al., 2014). Students watch video lectures at home which frees time for activities later in class. Flipped class offers a range of benefits to the students and teachers both. For example, students can watch video lectures at their own pace and take down notes by pausing or rewinding and can fast forward if they already know the concept. It gives them the flexibility to learn whenever and wherever they want to.

As students are already familiar with technology, it reduces the anxiety of not being able to follow in class or take down notes (Pastor and Howard, 2018). Similarly, teachers can cover a large portion of the syllabus in this manner. It reduces fatigue as

they don't have to repeat the same material, again and again, over time and for a different set of students (Ramírez et al., 2014). Even the absentees are also able to follow-up. The in-class activities give opportunities for the application of theoretical knowledge to solve real-world problems. The projects in class encourage teamwork, experimentation, collaboration and mutual learning. Students can spend quality time engaging and discussing their ideas with peers and teachers. Teachers can also give one-to-one personal attention to students and students feel confident because they can apply the knowledge they have gained in the presence of faculty. As noted by different authors and experts, there is a flip side to the flipped classroom as well. Watching videos online at home robs students of their hobbies, exercise and leisure time. They can also get distracted by other content online.

Similarly, the workload of teachers also increases as they are supposed to prepare video lessons, presentation and documents for students to study (Taylor, 2015). Teachers have to be extra cautious in preparing the material as it will be watched in their physical presence. The immediate feedback for enhancement and modification of the material will be missed. Several students are dissatisfied, as they feel they have to do all the work themselves (Persky and McLaughlin, 2018). They also miss learning the concept along with their friends and the presence of their teacher and watching content online have given them a sedentary lifestyle wherein they have to sit in front of the computers for long hours. Teachers are apprehensive of its use as they miss the warmth of lecturing and interacting with the students and occupying the focal point of learning (Schmidt and Ralph, 2016).

3.2 Dependent Variable (DV)

Institute Performance (Perf)

The term performance refers to accomplishment, attainment, or achievement. In the case of HEIs, the dependent variable Institute Performance is very relevant and has been picked from national and international ranking framework NAAC, NIRF, THES and QS World University Ranking. Its components are academic results, innovation and social projects, placements, alumni achievement, publication and technological productivity.

The dependent variable of the study 'academic results' is the outcome of the teaching-learning process. Educational institutions provide skills that are measured mainly through academic achievements of students as there is no other such objective measure of measuring teaching or learning in the classroom (QS, 2019). The academic results or marks obtained by students in course subjects as well as other competitive exams can be considered akin to acquired knowledge, skills and abilities of students as the course curriculum is designed to test communication skills, creative thinking, logical reasoning, and data-crunching ability of students.

Apart from exams, there also exist learning by doing via innovation projects. The innovation projects are aimed at technological solutions, community development, environmental sustainability, health and education, which are the pillars of socio-economic development. By translating theory into practice, the projects reinforce learnings in the classroom. Working on the field, students and faculty gain real-life lessons and experiences which make them prudent. Social projects sensitize them for community welfare and imbibe moral values. Through these projects, students not

only earn scholarships but also self-satisfaction and self-esteem as they can bring a difference in the lives of people at the ground level. Success in innovation projects also gives visibility to the institution and builds a positive brand image.

After completion of the course, students usually look for employment. Today, learning and working are no longer separate. Education becomes a currency to get employed or self- employed in earning a living (Iftf.org, 2015). Nowadays, most colleges have placement cells to facilitate employment. A good placement record demonstrates the institute's ability to deliver competent, motivated and disciplined graduates well-prepared for the market (QS, 2019).

An institution is also recognized by its alumni achievement. Several rankings count on the alumni who receive national and international awards for their outstanding contribution to social and economic disciplines. Some graduates become successful entrepreneurs, and others lead the companies as CEO's while others get selected in top institutes of higher learning (CWUR 2019; NIRF 2019). The alumni bring name and fame to their alma-matter and give back in the form of sponsorships, placements and training to the students.

Publication is another parameter measuring the institute's performance. The process of publication involves exploration, reflection and description that augments the quality of teaching, learning and general awareness (NAAC, 2018). The conceptual and empirical results of research bring truth to the table and assist decision making and analysis both at the macro and micro levels. The publications and citation demonstrate "how much each university is contributing to the sum of human

knowledge: they tell us whose research has stood out, has been picked up and built on by other scholars and, most importantly, has been shared around the global scholarly community to expand the boundaries of our understanding, irrespective of discipline" (THES, 2019). The international publications provide global recognition to individuals as well as his institution and testify the university's research acumen.

Last but not the least, a good infrastructure is essential to meet all the above-mentioned demands of a fast-paced, dynamic and tech-savvy world. An adequate availability of software, hardware and networks are vital to scale up the productivity of organization members. It may include uninterrupted wi-fi connections, databases, e-libraries, computer and research labs and software applications (NIRF, 2019). Technological interventions keep even a remote institution connected to researchers and academicians worldwide, while the adoption of the latest and emerging technologies is said to redefine possibilities in the digital age.

The dependent variable Performance is an important construct and is widely recognized in the literature. It is vital to tap the immense energy, potential and skills that lay underneath in faculty and student in an educational institution. If this hidden talent is not developed or utilized, education loses its purpose (Cheng et al., 2001).

The Institute performance parameters are the (dependent variable) derived from NAAC, NIRF, THES and QS report, 2017.

The six parameters used to measure performance are listed below. They are common to various national and international rankings, and are considered key to achieve global excellence.

Table 5: Institute Performance Parameters

KM Performance	**Benchmarks**			
Performance Parameters (PP)	**NIRF**	**NAAC**	**World University Ranking** **(Times Higher Education)**	**QS Ranking Methodology**
PP1: Publications	**Parameter 2** Research and professional Practice	**Criteria 3** Research, Innovations and Extension	**Parameter 3** Citations (research influence)	**Criteria 4** Citations per faculty
PP2: Placement	**Parameter 3** Graduation Outcome	**Criteria 5** Student support and Progression	---	**Criteria 2** Employer Reputation
PP3: Innovation projects	**Parameter 2** Research and professional Practice	**Criteria 3** Research, Innovations and Extension	---	---
PP4: Student performance	**Parameter 3** Graduation Outcome	**Criteria 2** Teaching-Learning and Evaluation	**Parameter 1** Teaching (the learning environment)	**Criteria 1** Academic Reputation
PP5: Alumni	**Parameter 3** Graduation Outcome	**Criteria 5** Student support and Progression	---	---
PP6: Technology productivity	**Parameter 1** Teaching learning and resources	**Criteria 4** Infrastructure and Learning resources	---	---

Source: NAAC, NIRF, Times Higher Education and QS report, 2017

The above table signifies that the above mentioned parameters are considered important in both the indigenous and international rankings framework.

3.3. Proposed Hypotheses and Conceptual Model

The chapter proposes the hypotheses and builds a conceptual model based on the identified IDVs and DVs.

H1 : KMS (Knowledge management system) **significantly affect Perf** (Institute performance) **in HEIs.**

H1.1 : KM significantly affects Perf in HEIs.

H1.1.1 : KCul (Knowledge Culture) significantly affect Perf in HEIs.

H1.1.2 : KT (Knowledge Transfer) significantly affect Perf in HEIs.

H1.1.3 : KC (Knowledge creation) significantly affect Perf in HEIs.

H1.1.4 : KSR (Knowledge Storage and Retrieval) significantly affect Perf in HEIs.

H1.2 : ICT significantly affect Perf in HEIs.

H1.2.1 : T_infra (Technology infrastructure) significantly affect Perf in HEIs.

H1.2.2 : T_int (Technology integration) significantly affect Perf in HEIs.

H1.2.3 : O_COP (Online Communities of practice) significantly affect Perf in HEIs.

H1.2.4 : T_emerg (Emerging technologies) significantly affect Perf in HEIs.

The Conceptual model

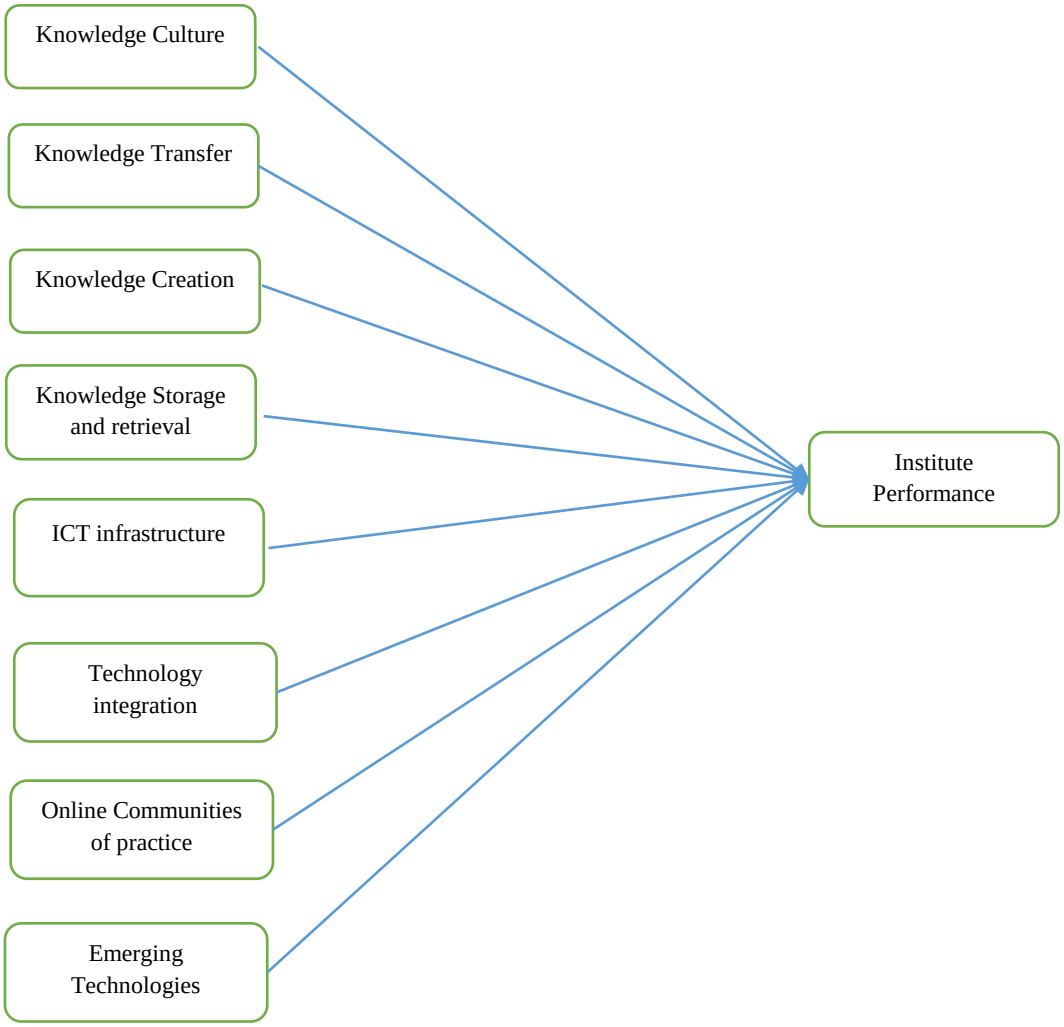


Figure 9: Conceptual Model

CHAPTER 4

RESEARCH METHODOLOGY

After identifying and describing the research problems, it is necessary to outline the steps taken to scientifically and systematically solve them. The process undertaken in order to solve research problem is known as research methodology (Kothari and Garg, 2014). Thus the aim of this chapter is to describe in detail the research methodology adopted.

For the purpose of investigation, the research process is as follows:

1. Problem identification, hypothesis formulation (chapter 1)
2. Conceptual models and theories (chapter 2)
3. Selecting a Research Design

3.1 Sampling design

4. Data sources and data collection

    4.1 Questionnaire formulation

5. Pilot Testing
6. Main Study- Data collection

6.1 Data preparation and cleaning

7. Statistical tools for data analysis: Descriptives, T-test, ANOVA, EFA and CFA

The chapter on research methodology offers a thorough insight of the way a study is conducted. The spirit of a rigorous study lies in the suitable and sound methodology

adopted to achieve the purpose and objective of the study (Malik, 2017). The study revolves around the knowledge management and ICT integration in higher educational institutions. The research study began with the research questions, objectives and hypothesis and the current chapter is dedicated to research design, sampling design, questionnaire development, data collection, data preparation, testing and statistical techniques used for data analysis.

4.1 Research Design

Research Design is "a framework or blueprint that specifies the methods and procedures for collecting and analyzing the needed information" (Zikmund et al, 2013). The research design can be described as the overall scheme which one picks to assimilate the various constituents of the study in an organized and coherent method so as to warrant that the research problem is attended effectively and diligently (Jaideep, 2018). The major types of research design are exploratory and descriptive

Exploratory research is conducted to provide insights into and an understanding of the problem confronting the researcher. Exploratory research is used in cases where "one must identify the problem more precisely, define the relevant courses of action or gain additional insights before an approach could be developed. Exploratory research usually involves secondary data and qualitative research" (Malhotra and Dash, 2012).

Descriptive research is a kind of research whose major objective is the description of something, usually characteristics of a population or a sample. Descriptive research makes use of survey and observation methods.

The research design used in the study is descriptive. Along with descriptive, the study also includes a cross-sectional configuration which entails the gathering of data from any given sample of population elements one time only. (Malhotra and Dash, 2012).

4.2 Sampling

As it is infeasible to study the entire population consisting of faculty, students and administrative staff in HEIs in India, a sample or part is selected from the population for inclusion in the study. In the current research, Taro Yamane method is used for sample size determination.

Taro Yamane method

- $n=N/(1+N(e)^2)$
- $n=38.06 \text{ million}/(1+38.06 \text{ million}(0.05)^2)$
- $n=38068107 /(1+(38068107 *0.0025))$
- $n=400$

(where N represents the Population size, n is the sample size and e is the margin of error)

The current study employs non-probability convenient sampling. Probability sampling is the sampling technique in which all elements have equal chances of getting selected (Malhotra and Dash, 2012), while non-probability sampling is the one that does not use chance, but relies on the judgment of experts (Kothari & Garg, 2014). In the study, the opinion of experts was garnered while deciding the sampling frame. The faculty, students and non-teaching staff of higher educational institutions were selected for conducting the study. Data is collected from the above-mentioned units using a questionnaire. Within the sampling frame, data collection was based on

availability and references. Mails were sent to institutions and their permission was sought for data collection. Many mails were left unanswered, some refused while other agreed to be a part of the study. The members and institutions that replied positively were approached with the questionnaire. In the study, convenience sampling is employed keeping in mind adequate participation from all the groups.

4.3 Sources of Data

Primary data collection was made through structured questionnaires and interviews. Secondary data collection was done through reports of AISHE, UNESCO, UGC, MHRD, Rankings and other relevant databases. The literature was scanned thoroughly for the framing questionnaire.

Questionnaire and discussions

A questionnaire can be defined as a "research tool containing questions and other prompts in sequence for the purpose of collecting information from respondents" (Murthy and Bhojanna, 2008). For achieving the objectives of the study, information so required, was translated into a series of questions for respondents to answer.

For this research, a questionnaire was used because it can help collect data quickly and comprehensively from respondents. It administers and incorporates the opinion of many people in a rather convenient manner. It is inexpensive, and most importantly, respondents can be anonymous (Jaideep, 2018).

The statements of the questionnaire were identified through an extensive review of the literature and were adapted according to the research objectives and the area of study. Experts in this field were approached to check the content validity of the

questionnaire. It was designed on a 7 point Likert scale from 1-strongly disagree to 7-strongly agree.

While framing the questionnaire, attention was paid to the structure, wording, order, form and layout. The wordings of the questions were kept short and simple to encourage greater participation. The respondents reported that they could fill it easily in less time. The instrument started with simple demographics related questions to build comfort and rapport. It begins with a title and a brief introduction to the area of study. The first seven questions were related to demographics, including gender, position, educational qualifications, name of the educational institute, type of institute, department, NAAC grade achieved and age of the respondents. To encourage accuracy in responses, screening questions were kept. Though the study is based on primary data collection, an effort was made to ensure accuracy in responses. For this purpose, screening questions were kept. The length of association of the participant with the institution was asked; second he was questioned regarding the NAAC rating of his institution. It was done to assure that respondents have sufficient knowledge of the institution to which he is associated and about which he is supposed to answer. A substantial data was collected by a personal visit to the colleges and universities and observation of their campuses. An effort was also made to ensure conformity with the documented information available. The secondary data of the selected institution were referred which was available in the form of NIRF scores, NAAC self-study reports and institute website. The outlier and inconsistent cases were removed. Name of the respondents was not asked to ensure anonymity. After demographics, the next section contained questions related to knowledge management in institutions which were succeeded by questions related to ICT efficiency, usage and adoption. In the end, the

e-mail id of the respondent was asked (optional question) in case they need to be contacted later.

Further, face Validity and content validity was checked. Face validity is the professional agreement that a scale reasonably measures what it is intended to measure accurately. Face validity is used to determine if the instrument (here, the questionnaire) is capable of measuring the characteristics or traits of interest in an unambiguous manner (Bolarinwa, 2015). To establish face validity, the feedback was garnered from researchers and colleagues in the related field. The input was taken from nine experts who analyzed the wording of the questionnaire, categories of responses, length of the questionnaire, and screening questions. The experts vet items of the questionnaire and gave useful suggestions which were then incorporated. After discussions, it was decided that the participants of the study (respondents) should be a member of HEI with experience of more than one year as faculty, student, or administrative staff.

Content validity assesses and measures the constructs of interest in the study. It is essential to ensure that the questionnaire is exhaustive and does not miss out on any critical point in the domain. The experts were requested to examine the questionnaire items for readability, clarity and comprehensiveness.

Besides offering the structured questionnaire, discussion and interviews were also carried out to make the study a comprehensive one. Personal visits to the respondents help in getting the questionnaire filled up as well as in establishing a rapport with them offering explanations and clarifications about the questionnaire and its

background. It also instills confidence regarding the confidentiality of the identity of respondents (Dewan, 2017).

As per the nature of the problem, discussions were made with the respondents to know the current practices and future initiatives taken in the area of knowledge management and ICT to improve the quality of learning. At times the respondents themselves enlarged on, clarified, or explained their answers.

4.4 Pilot Study

Pilot studies can be denoted as "feasibility studies which are small scale versions or trial runs done in the preparation of the main study" (Polit et al. 2001). They are used to discover any shortcomings in the data collection instrument (questionnaire) so that the questions are unambiguous, appropriate and acceptable to the participants. The objective of the pilot is also to ascertain and eliminate the problems faced by participants in filling the questionnaire. Pilot tests can signal any possible deficiencies to be corrected for the major study.

In the absence of a pilot, substantial commitments in terms of resources, time, money and effort of the researcher and respondents can go in vain and precise results may not be obtained. Therefore, experts have advocated the use of a pilot to increase the likelihood of success in the main study.

For study, a pilot survey was carried on a sample of 120 subjects selected from Higher Educational Institutions. Data collection for the pilot was held in October 2017, whereas data collection for the final questionnaire was made for a period ranging from May 2018 to November 2018. For the quantitative analysis, data were collected using questionnaires

distributed both through online and offline modes. It was made using google forms and circulated via Whatsapp, mail and personal visit to the campuses.

4.5 Main Study- Data Collection

Primary Data: After pre-testing the questionnaire through a pilot study, it was deemed fit to undertake a full-scale study. Certain modifications were made in the questionnaire; for example, it was determined to make a standard questionnaire for faculty, students and non-teaching staff. Also, the scale was changed from 5 to 7 to allow a greater expression to participants. Some questions were added as it was realized that some key points were missed while the items having low reliability were excluded from being considered any further. One negative worded statement having low reliability was removed from the final questionnaire. After the pilot study, the sampling frame was identified as faculty, students, administrative heads and librarians (among the non-teaching staff). Complicated and confusing questions or those having low reliability were removed and not included in the revised questionnaire, while some were edited according to the suggestions received to improve comprehension.

To collect data, the author visited several higher educational institutions and made observations. For this purpose, the necessary approvals were taken. Though the public institutions freely shared knowledge, allowed entry in the premises, private institutions had some restrictions. First, the libraries were approached as they are the hubs of knowledge. There the librarians and students were contacted to fill the questionnaire. After the library, the staff room of the colleges was visited and interaction was done with the faculty members. Meetings with faculty, non-teaching staff and students were also made in the computer labs and classrooms. The

respondents were also approached in the metro stations and tutorial rooms. In the process of data collection, an effort was made to establish a personal rapport and initiate a discussion with them. In many cases references were sought. The efforts bore fruit and members not only filled the questionnaire but also shared their experiences and reasons for the same most of the time. The non-teaching staff also acquainted the researcher with the college infrastructure. The physical facilities in the computer labs, libraries and classroom were also noted and considered. Though the responses were high, the AO and SO of some administrative office refused to fill the questionnaire, as they could not connect with many questions or had insufficient knowledge to do the same.

An effort was made to cover all types of differently rated institutions i.e., NAAC accredited A and B colleges, on-campus and off-campus, public and private colleges. In addition, people were also approached in conferences, workshops and seminars to seek their opinion on variables mentioned in the questionnaire and related matters therein. To cover a wider area, the online circulation of the questionnaire was also done via google forms. The questionnaire received in hard copy were fed manually, while online were automatically fed into the drive.

All the ethical considerations are kept in mind while collecting the data (Malhotra and Dash, 2012). The consent of the institutions and the members were sought before visiting the campus and it was promised to keep the identity of respondents strictly confidential. All the questions were made short and simple so that respondents could understand them and lucidly express their opinion. The researcher was also open and receptive to new and varied views and carried out the study in an unbiased manner.

Secondary Data: The books, scholarly articles, reports, conference proceedings and online databases in the area of knowledge management, education and technological developments were surveyed. The study describes, summarises, synthesis and appraises these works concerning the research problem being investigated.

An extensive review of literature along with consultations with the academicians and experts of the field were made to propose a conceptual framework. Independent variables i.e., KM processes and ICT tools, have been identified by a systematic review of the literature using a content analysis approach. The dependent variable i.e., Institutional Performance, were selected based on various credible national and international rankings benchmark. Finally, a conceptual model has been proposed to identify these relationships. A prospective set of articles were drawn up from popular databases as ProQuest, Ebsco-Host, Emerald,Web of Science, Elsevier, ScienceDirect, and GoogleScholar and books. The researches undertaken in different countries at different periods were incorporated. Only English literature was referred to. To ensure the quality of research, papers having low academic rigor or having an inadequate discussion about the theme were casted-off from the sample after the first level of screening the abstract, review process and number of citations.

4.6 Data Cleaning

Data cleaning refers to the thorough and extensive test for consistency and the treatment of missing responses. As far as the online mode is concerned, no missing responses were received as the questions were made compulsory with mandatory required fields. However, while making data entry through offline mode, some missing responses were found. Wherever possible, the respondents were approached

to reconsider and answer the missing questions. Where non-responses were high, the questionnaires were excluded from further analysis. Out of 723 questionnaires collected, 110 had missing, unengaged or inconsistent responses. While on observation, it was discovered that approximately 42 had contrasting answers.

After collecting responses, data cleaning was done in the following manner:

1. The questionnaires having missing or contradictory data were discarded: Case by case deletions were made.
2. Unengaged responses were also curtailed from further analysis: the concept of standard deviation was used to find these responses (Gaskin, 2018).
3. Outliers were detected and screened for inconsistencies.
4. Reliability was checked: Reliability can be used to measure the consistency of a questionnaire. In the study, Cronbach alpha was used to check the reliability of statements. Due to low reliability in pre-testing two negative worded questions were removed.
5. The assumptions were checked before applying relevant tests.

Thereafter, coding was done on a scale of 1-7 from 1-Strongly Disagree to 7-Strongly Agree. The descriptive statistics were checked in SPSS and appropriate test like t-test and ANOVA were applied.

4.7 Statistical Tools for Data Analysis

The following are the research tools employed:

1. Descriptives: frequency, mean and standard deviation

2. T-test: T-test is used for hypothesis testing about mean of two samples. It is used when population standard deviation is not known and the sample size is small.

3. ANOVA: Analysis of variance analysis enables us to "test for the significance of the differences among more than two sample means. Using ANOVA it is possible to make inferences whether samples are drawn from population having the same mean." (Levin and Rubin, 2002).

4. Exploratory Factor Analysis: EFA is used to derive key factors from the data collected on a number of variables.

5. Structural Equation Modeling: SEM produces an integrated model depicting the relationships among different variables of the study.

T-test is a hypothesis testing tool used to determine if mean of two groups (which may be sample mean, population mean, two sample means, repeated sample means, paired sample means) differ from each other. T test is used when population mean and variance is unknown and sample size is small ($n<30$) as compared to population size (Chauhan, 2015). In the current study, t test is conducted to find the difference between male and female respondents and public and private institutions.

One way ANOVA is parametric statistical technique used to test the difference of more than two sample means or population mean. Here the variance is unknown and the sample size is small as compared to population size. ANOVA is based on the logic that if the between group variance is significantly greater than the within group variance, than the means of different samples are significantly different. The ANOVA procedure calculates F statistics which compare the systematic variance in the data to the unsystematic variance which is the within group variance (Chauhan, 2015). In

other words F is the ratio of the model to its error. F ratio can be used to test differences among mean and also whether regression model fits the data (Field, 2009). In the current study, F-test was conducted to test the differences in performance of differently graded institutions. How the components of KMS differ across demographics based on educational qualifications (graduates, post-graduates and PhDs) and position (faculty, students and non-teaching staff).

Exploratory Factor Analysis

The questionnaire permits the collection of huge amount of data on various items. But in order to achieve parsimony, it is important to reduce it to a more manageable size and organize information efficiently. One more feature observable in such data collection is high correlation among variables. This may lead to multicollinearity. So it is essential to cluster together similar items and obtain fewer constructs to enable sound analysis. Exploratory factor analysis helps in extracting key constructs from humongous raw data and detect underlying component for meaningful analysis and interpretation (hair et. al 2010, Chauhan 2015, Field 2009)

Zikmund et al. (2013) described factor analysis as "type of analysis used to discern the underlying dimensions or regularity in phenomena. Its general purpose is to summarize the information contained in a large number of variables into a small number of factors".

In the current study, EFA was used as the questionnaire was highly modified to the objectives of the study. Such modifications necessitated the need to explore key constructs and items that converge in them. For the purpose of the study, highly correlated variables were clubbed together to make a factor and achieve

summarization. With the help of the given technique, identification and assignment of items to the factors also became easy.

Structural Equation Modeling

SEM is a multivariate technique which is a combination of confirmatory factor analysis and regression. It is used to ascertain the cause and effect relationship or the dependence relationship between latent constructs and the measured variables. As the variables in the study may be highly correlated, the given technique also shows the interdependence relationship of one latent construct with other latent constructs.

SEM is regarded as a theory testing technique and aid the analysis of theoretical relationship between constructs. The iterations of SEM produces an integrated model with multiple sets of relationship based on the data collected. The ultimate onus lies on the researcher to analyze and explain these relationships based on observation, experience and literature support (Chauhan 2015, Hair et al 2010, Malhotra and Dash, 2012)

SEM is used in situations where at least one (DV or IDV) is on likert scale (Kaushik, 2018). In the current study, the measurement of opinions necessitated a likert scale and therefore SEM is applied. Here a structural relationship is established between Knowledge management, ICT and institute performance. In other words, it shows the extent to which KM and ICT affect performance of a HEI. For the purpose of analysis, version 24 of the SEM AMOS software is used. In the software, observed variables are represented by rectangle and latent variables by oval.

SEM consists of two models viz. the Measurement and the Structural model which are explained below:

Measurement model: It is the first model estimated in SEM. It relates latent variables to its indicators allowing them to correlate. Also used for confirmatory factor analysis, the measurement model helps in determining whether the variables load as predicted. (Hair et al 2010; Malhotra and Dash, 2012). It can also be used to check convergent and discriminant validity.

Structural model: It is the second model used for estimation in SEM and is also known as the causal model. Structural model "represents the theory that specifies how the constructs are related to each other, often with multiple dependence relationships" (Hair et al 2010; Malhotra and Dash, 2012). According to Olio and Ona 2018, SEM is a technique to "estimate the effect and relationship between multiple variables".

CHAPTER 5

DATA ANALYSIS AND RESULTS

In the previous section we found that primary data was collected using a questionnaire. The questionnaire was made on a seven point Likert scale with statements ranging from strongly disagree (1) to strongly agree (7). The statements were identified through an extensive review of the literature and the questions were adapted according to the research objectives and the area of study. Experts in this field were approached to check face and content validity of the questionnaire. First, a pilot study was conducted and reliability was checked on a sample of 120 respondents. As the reliability was above 0.7 for all the constructs, the final data was collected. The responses collected were close to 723 in number, but after cleaning only 613 could be used for final analysis.

After data collection, data analysis is performed to extract material information from raw data. Such material information so derived provides insights for decision making and for accepting or not accepting a given hypothesis. The statistical tools and techniques employed for data analysis are descriptives and sample adequacy test, Exploratory factor analysis, Structural equation modeling, T-test and ANOVA.

5.1 Descriptives

Table 6: NAAC Accreditation

Grades	Frequency	Percent
A++	60	9.79
A+	162	26.43
A	121	19.74
B++	72	11.75
B+	106	17.29
B	51	8.32
N.A.	41	6.69
Total	613	100

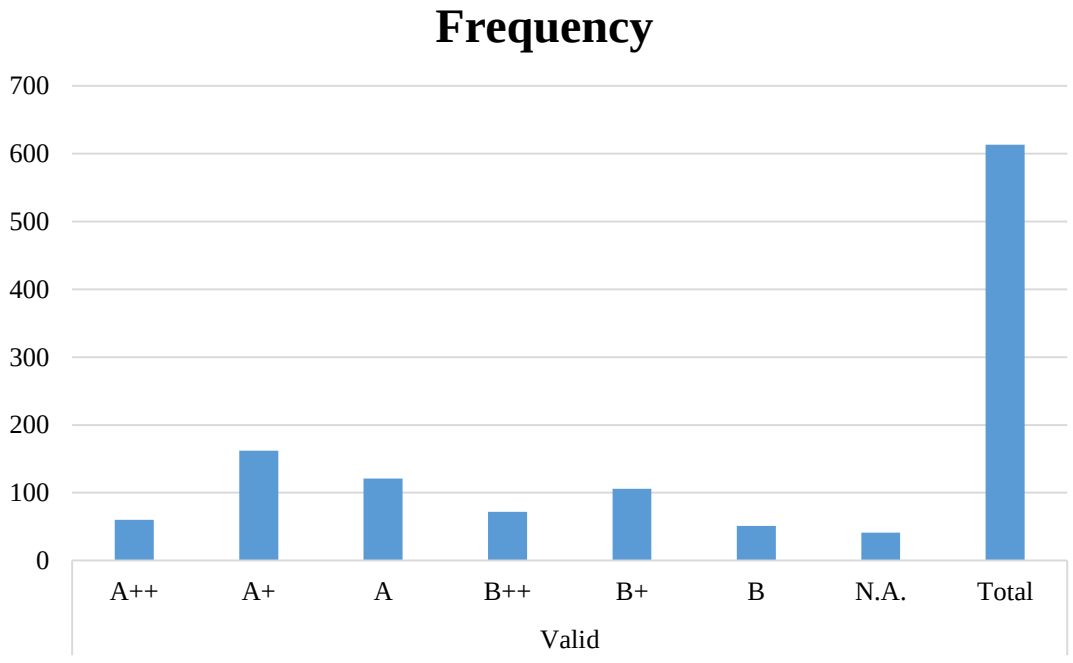


Figure 10: Graphical Description of NAAC Grades

Table 7: Educational Qualifications

Qualifications	Frequency	Percent
Pursuing Graduation	169	27.57
Graduate	61	9.95
Pursuing Post-graduation	98	15.99
Post Graduate	112	18.27
Full time research scholar	95	15.50
PhD	78	12.72
Total	613	100

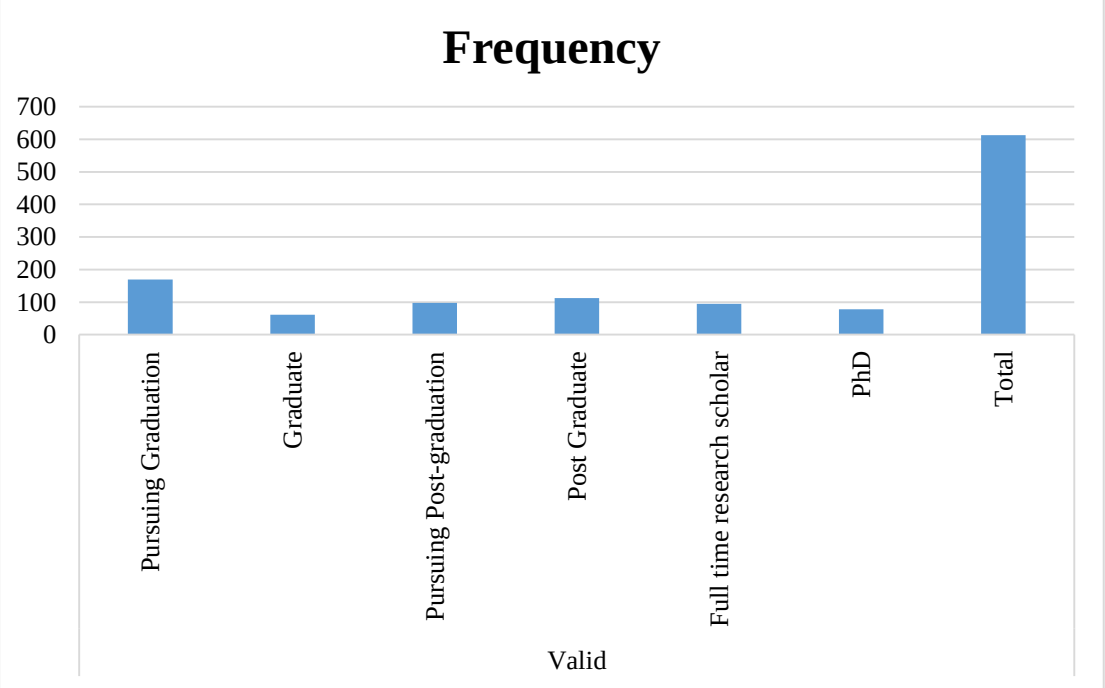


Figure 11: Graphical Description of Educational Qualification

Table 8: Gender

Gender	Frequency	Percent
Male	305	49.8
Female	308	50.2
Total	613	100

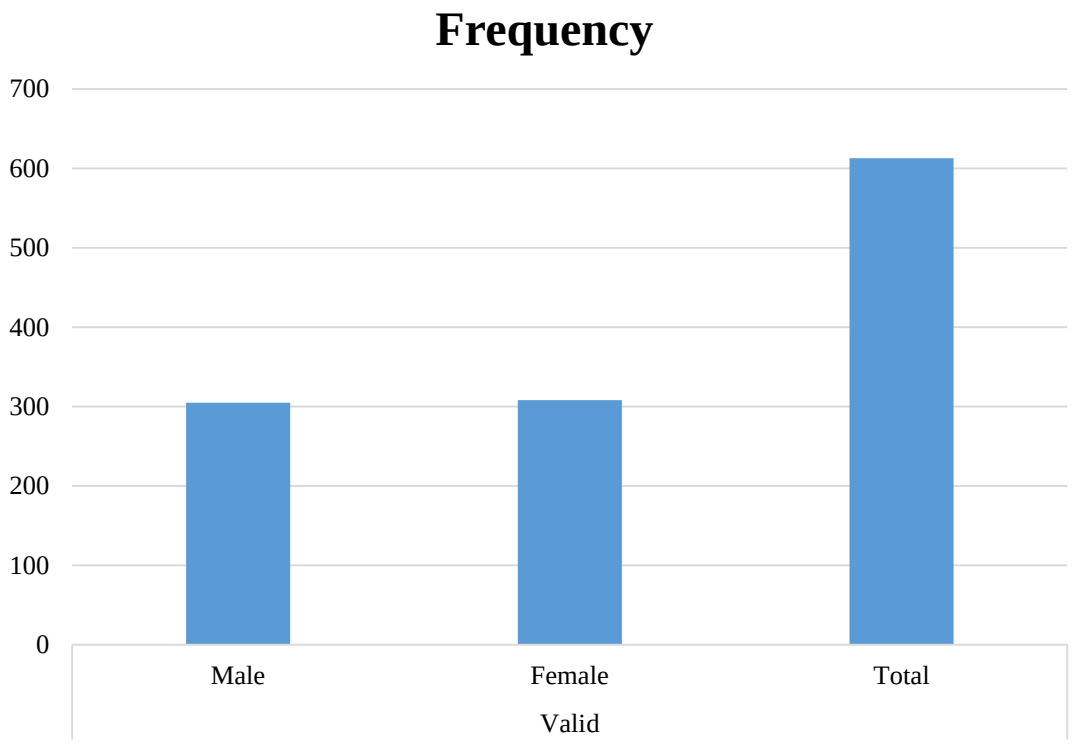


Figure 12: Graphical Description of Gender

Table 9: Position

Position	Frequency	Percent
Faculty	146	23.82
Student	423	69.00
Non- teaching staff	44	7.18
Total	613	100

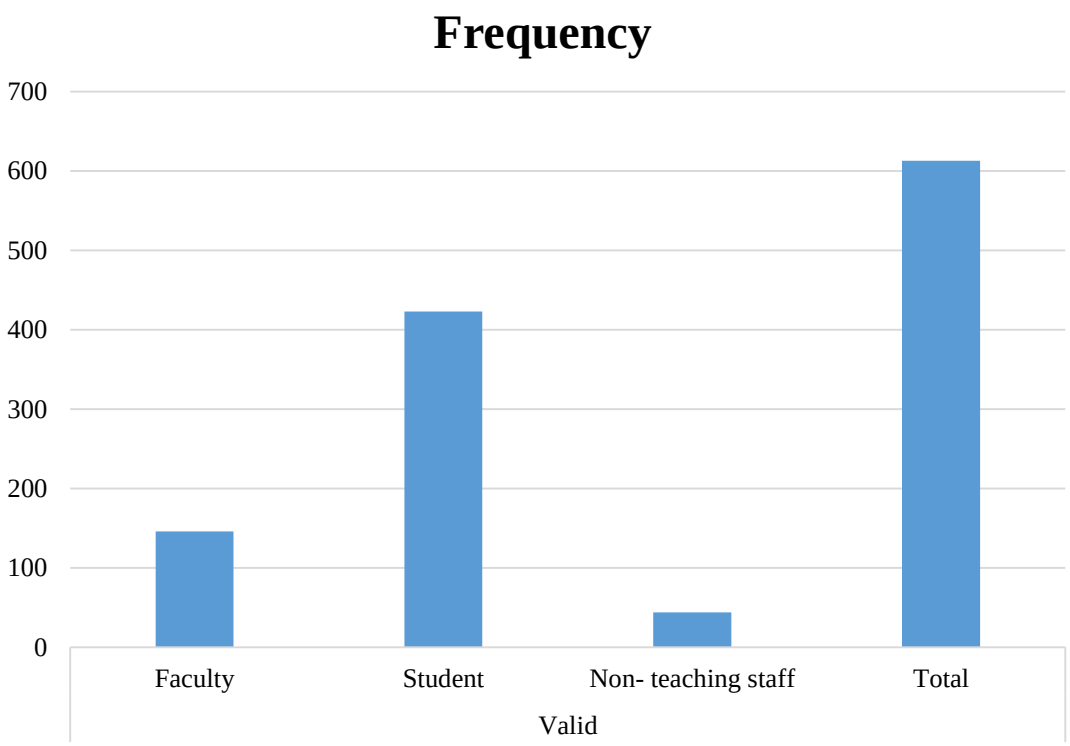


Figure 13: Graphical Description of Position

Table 10: Type of Institute

Institute	Frequency	Percent
Public	392	63.95
Private	221	36.05
Total	613	100

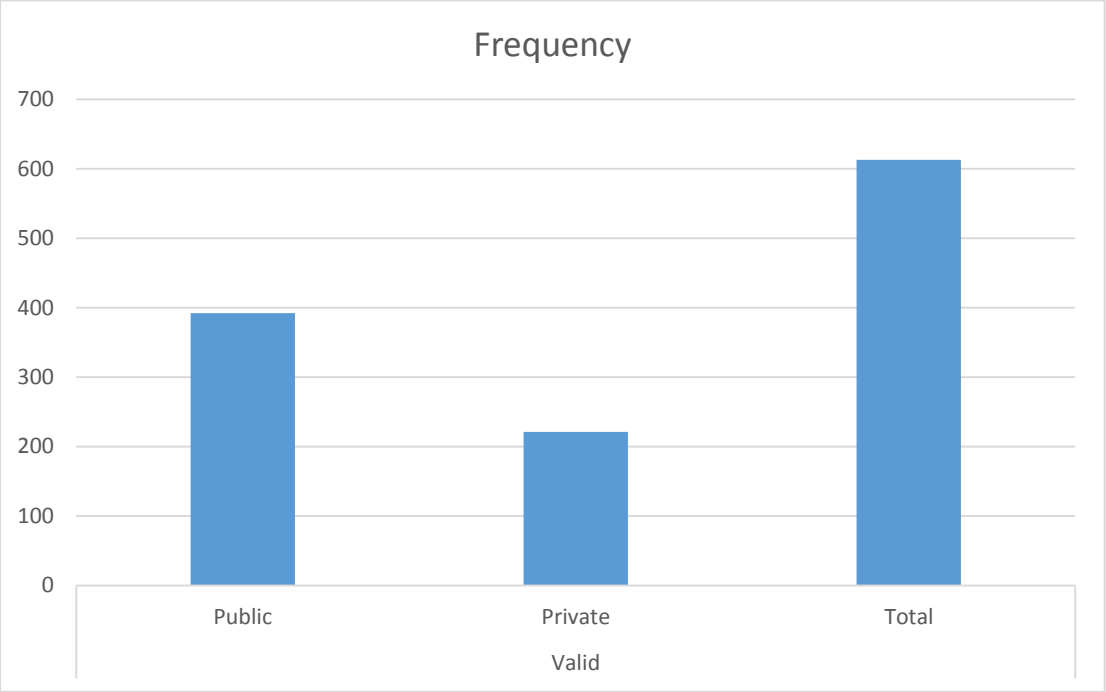


Figure 14: Graphical Description of Type of Institute

Table 11: Factors and their descriptives

Descriptive Statistics				
	N	**Mean**	**Std. Deviation**	**Variance**
Fac_Kcul	613	5.1707	1.21769	1.483
Fac_KT	613	5.8511	0.85747	0.735
Fac_KC	613	5.2823	1.2	1.44
Fac_KSR	613	5.1316	1.0702	1.145
Fac_T_infra	613	3.4965	1.6385	2.685
Fac_Tint	613	5.1713	0.9731	0.947
Fac_O_COP	613	5.6643	1.27192	1.618
Fac_Temerg	613	3.3388	1.49277	2.228
Fac_KP	613	5.1907	1.26219	1.593
Valid N (listwise)	613			

5.2 Sample Adequacy

To determine sample adequacy, KMO and Bartlett test is performed in SPSS. In this case, the KMO value is .923, which depicts great sample adequacy (Hutcheson and Sofroniou, 1999). Bartlett's test is significant which shows that the correlation matrix is significantly different from an identity matrix (Field, 2009).

Table 12: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.923
Bartlett's Test of Sphericity	Approximate Chi-Square	10994.960
	Degrees of freedom	595
	Significance	.000

5.3 Assumptions of Multivariate Analysis

1. Linearity

The explanatory variables should have a linear relationship with the outcome variables to ensure the efficient capture of the trend mathematically (Analytics Vidya, 2016). The linearity will be helpful in achieving an error free, efficient model from the data collected. For the above purpose, linearity assumption was checked in spss. As the p values for all the factors were less than .05 or significant, we can certify linearity in our analysis (Osborne & Waters, 2002).

Table 8: Model Summary and Parameter Estimates

Dependent Variable: Fac_KP									
Equation	**Model Summary**					**Parameter Estimates**			
	R Square	**F**	**df1**	**df2**	**Sig.**	**Constant**	**b1**	**b2**	**b3**
Linear	.343	319.186	1	611	.000	2.061	.607		
Logarithmic	.331	301.995	1	611	.000	1.231	2.471		
Inverse	.263	218.092	1	611	.000	6.710	-7.135		
Quadratic	.343	159.474	2	610	.000	1.874	.694	-.009	
Cubic	.344	106.236	3	609	.000	1.513	.989	-.081	.005
Compound	.324	293.363	1	611	.000	2.397	1.153		
Power	.330	300.629	1	611	.000	1.925	.594		
S	.281	238.445	1	611	.000	1.985	-1.776		
Growth	.324	293.363	1	611	.000	.874	.142		
Exponential	.324	293.363	1	611	.000	2.397	.142		
Logistic	.324	293.363	1	611	.000	.417	.867		
The independent variable is Fac_Kcul.									

2. Multicollinearity

Multicollinearity occurs when the independent variables are highly correlated. This phenomenon can lead to problems where the researcher would not be able to determine which of the explanatory variables is actually affecting the response variable. To determine multicollinearity, VIF values are checked in spss. As all the VIF values are less than 3, we can safely convey the absence of multicollinearity among the independent variables/ factors.

Table 9: Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	.328	.275		1.192	.234		
	Fac_Kcul	.466	.037	.450	12.678	.000	.773	1.293
a. Dependent Variable: Fac_KP								

VIF values are less than 3 (Gaskin et al., 2016)

3. Homoscedasticity

For homoscedasticity, variation in residual (or amount of error in the model) should be similar at all levels of the explanatory variables. In other words, the spread of residual should be fairly constant at each point across the linear model. For this purpose, charting was done. As the scatterplot revealed fair spread, we can confirm the presence of homoscedasticity in the model (Open University, 2019).

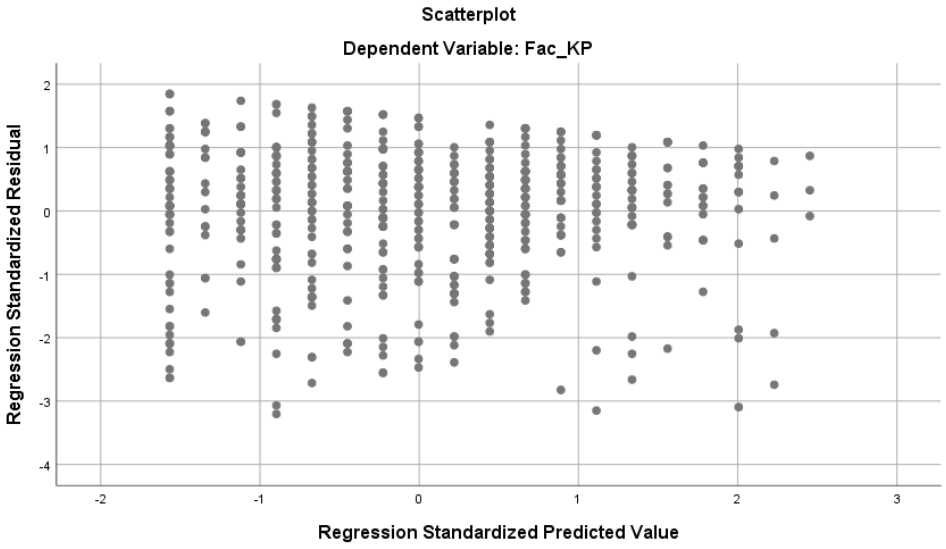


Figure 15: Determining Homoscedasticity

4. Normality

Normality in the data is important, as skewed or kurtotic variables with significant outliers, can cause confidence intervals to become too wide or narrow distorting relationships and significance tests (Analytics Vidya, 2016). Normality would also reduce the probability of type I and type II errors (Osborne & Waters, 2002). To ensure normality, skewness and kurtosis values are checked in spss. As the values of skewness and kurtosis are between -1 to +1, we can confirm the presence of normality.

Table 10: Statistics for Normality

		Fac_kcul	Fac_Tint	Fac_T infra	Fac_O_COP	Fac_T_emerg	Fac_KC	Fac_KSR	Fac_KT	Fac_KP
N	Valid	613	613	613	613	613	613	613	613	613
	Missing	0	0	0	0	0	0	0	0	0
Skewness		-.829	-.896	.169	-.624	.197	.897	-.658	.921	.598
Std. Error of Skewness		.099	.099	.099	.099	.099	.099	.099	.099	.099
Kurtosis		.379	.341	-.927	-.126	-.759	.376	-.254	-.712	-.165
Std. Error of Kurtosis		.197	.197	.197	.197	.197	.197	.197	.197	.197

Values of skewness and kurtosis are between -1 to +1. (Open University, 2019)

5. The values of residuals are independent:

This means that the residuals should be uncorrelated (Strand et al., 2019) . Durbin Watson test was conducted in spss. As the values were between 1 and 3, we can say that the assumption of residuals being independent is met.

Table 11: Model Summary

1	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.586[a]	.343	.342	1.02380	1.710
a. Predictors: (Constant), Fac_Kcul					
b. Dependent Variable: Fac_KP					

Durbin Watson value should lie between 1 to 3. Assumption is met.

6. There are no influential cases biasing the model

Influential cases have the power to bias or inappropriately impact the model. As the cook's distance values are less than 1, we can assure the absence of any significant outliers (Open University UK, 2019).

A look at the spss data file portrays cook's distance values less than 1. No significant outliers are found. The results are not shown for the sake of brevity.

7. Common method bias

To determine Common method bias, the Harman's Single factor method is applied in SPSS using exploratory factor analysis. It is used to check if a single factor dominates the study.

As the total variance explained by a single factor is less than 50%, it indicates the absence of common method bias in the study.

Table 12: Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	10.935	31.242	31.242	10.935	31.242	31.242
2	2.966	8.475	39.716			
3	2.075	5.930	45.646			
4	1.851	5.289	50.935			
5	1.625	4.643	55.577			
6	1.516	4.330	59.908			
7	1.162	3.321	63.228			
8	1.070	3.056	66.285			
9	.934	2.667	68.952			
10	.717	2.049	71.001			
11	.681	1.947	72.948			
12	.641	1.832	74.780			
13	.604	1.725	76.505			
14	.579	1.654	78.159			
15	.563	1.609	79.767			
16	.530	1.515	81.282			
17	.527	1.506	82.789			
18	.463	1.323	84.112			
19	.436	1.245	85.357			
20	.432	1.234	86.591			
21	.398	1.138	87.729			
22	.385	1.101	88.831			
23	.381	1.088	89.919			
24	.370	1.057	90.976			
25	.352	1.007	91.983			
26	.343	.980	92.963			
27	.339	.969	93.932			
28	.313	.893	94.825			
29	.303	.865	95.690			
30	.301	.861	96.551			
31	.279	.797	97.348			
32	.258	.737	98.085			
33	.232	.663	98.748			
34	.227	.648	99.397			
35	.211	.603	100.000			
Extraction Method: Principal Component Analysis.						

5.4 Exploratory Factor Analysis

To derive a small number of common factors from a large number of variables, exploratory factor analysis was performed in spss. This is in line with achieving parsimony in the model (Malhotra and Satyabhushan 2011). Principal factors were extracted using varimax rotation. "By rotating the axis, we present that both clusters of variables are intersected by the factor to which they relate most. So after rotation, the loadings of variables are maximized on one factor and minimized on the remaining factors." (Field, 2009) For rotation, varimax is used as it is considered as a good general approach that loads variables into factors, maximize dispersion of loadings within factors producing interpretable clusters for simplified exploration and analysis (Field, 2009).

As per research practice, statements having cross-loadings or low loadings are dropped. Loadings below .4 (Stevens, 2002) or .5 (Newkirk and Lederer, 2006) are suppressed because this cut-off point is appropriate for interpretative purposes. In this case nine factors were derived which are Kcul, KP, KT, T_int, T_infra, KS, O_COP, T_emerg and KC.

Table 13: Rotated Component Matrix

	Component								
	KCUL	**Perf**	**KT**	**T_int**	**T_infra**	**KS**	**O_COP**	**T_emerg**	**KC**
Cronbach alpha	**.887**	**.901**	**.823**	**.798**	**.809**	**.819**	**.783**	**.750**	**.743**
KT1			.692						
KT2			.793						
KT3			.786						
KT4			.642						
KC1									.719
KC2									.744
KC3									.600
KCUL1	.689								
KCUL2	.642								
KCUL3	.697								
KCUL4	.675								
KCUL5	.792								
KCUL6	.755								
T_int1				.658					
T_int2				.766					
T_int3				.767					
T_int4				.733					
KS1						.788			
KS2						.782			
KS3						.785			
Perf1		.766							
Perf2		.810							
Perf3		.743							
Perf4		.660							
Perf5		.682							
Perf6		.702							
T_infra1					.781				
T_ infra 2					.848				
T_ infra 3					.785				
O_COP1							.843		
O_COP2							.723		
O_COP3							.708		
T_emerg1								.782	
T_emerg2								.803	
T_emerg3								.658	

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

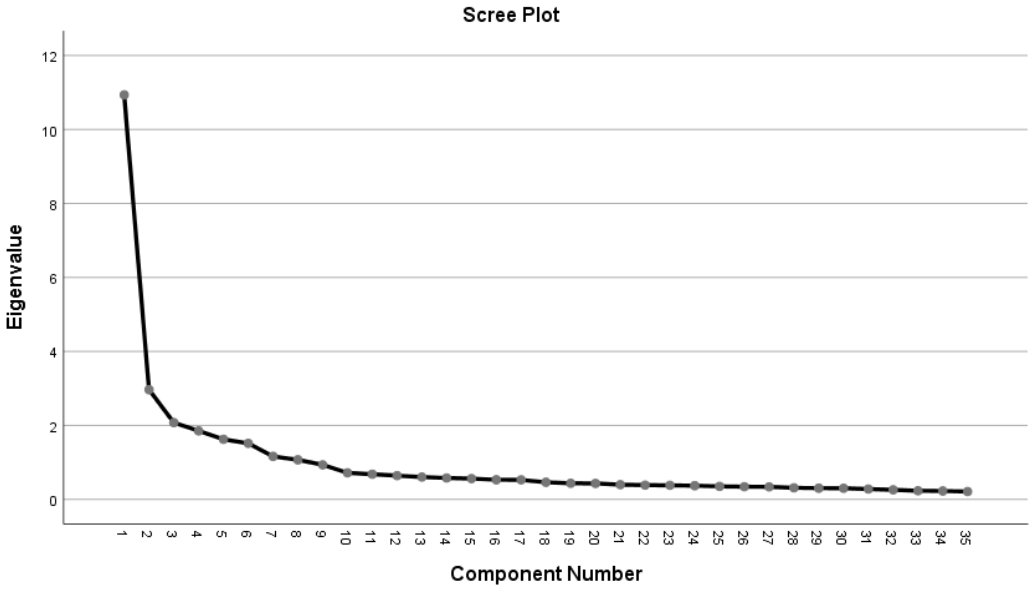


Figure 16: Scree Plot

Table 14: Communalities

	Initial	**Extraction**
KT1	l.000	.667
KT2	l.000	.728
KT3	l.000	.713
KT4	l.000	.572
KC1	I.000	.669
KC2	l.000	.734
KC3	l.000	.602
KCUL1	l.000	.594
KCUL2	l.000	.623
KCUL3	l.000	.605
KCUL4	l.000	.650
KCUL5	l.000	.747
KCUL6	l.000	.702
KSR1	l.000	.599
KSR2	l.000	.680
KSR3	l.000	.714
KSR4	l.000	.639

	Initial	Extraction
T_int1	l.000	.735
T_int2	l.000	.750
T_int3	l.000	.771
Perf_1	l.000	.715
Perf_2	I.000	.733
Perf_3	l.000	.752
Perf_4	l.000	.693
Perf_5	l.000	.682
Perf_6	l.000	.648
T_infra1	l.000	.700
T_infra2	l.000	.779
T_infra3	I.000	.735
O_COP1	I.000	.774
O_COP2	l.000	.711
O_COP3	l.000	.707
T_emerg1	l.000	.699
T_emerg2	l.000	.729
T_emerg3	l.000	.583
Extraction Method: Principal Component Analysis. Rotation converged in 7 iterations		

Table 15: Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	10.935	31.242	31.242	10.935	31.242	31.242	4.232	12.091	12.091
2	2.966	8.475	39.716	2.966	8.475	39.716	3.961	11.316	23.407
3	2.075	5.930	45.646	2.075	5.930	45.646	2.685	7.673	31.079
4	1.851	5.289	50.935	1.851	5.289	50.935	2.611	7.459	38.538
5	1.625	4.643	55.577	1.625	4.643	55.577	2.271	6.489	45.027
6	1.516	4.330	59.908	1.516	4.330	59.908	2.211	6.316	51.343

7	1.162	3.321	63.228	1.162	3.321	63.228	2.134	6.097	57.440
8	1.070	3.056	66.285	1.070	3.056	66.285	2.131	6.088	63.528
9	.934	2.667	68.952	.934	2.667	68.952	1.899	5.424	68.952
10	.717	2.049	71.001						
11	.681	1.947	72.948						
12	.641	1.832	74.780						
13	.604	1.725	76.505						
14	.579	1.654	78.159						
15	.563	1.609	79.767						
16	.530	1.515	81.282						
17	.527	1.506	82.789						
18	.463	1.323	84.112						
19	.436	1.245	85.357						
20	.432	1.234	86.591						
21	.398	1.138	87.729						
22	.385	1.101	88.831						
23	.381	1.088	89.919						
24	.370	1.057	90.976						
25	.352	1.007	91.983						
26	.343	.980	92.963						
27	.339	.969	93.932						
28	.313	.893	94.825						
29	.303	.865	95.690						
30	.301	.861	96.551						
31	.279	.797	97.348						
32	.258	.737	98.085						
33	.232	.663	98.748						
34	.227	.648	99.397						
35	.211	.603	100.000						
Extraction Method: PCA.									

Total variance explained is 68.952

6.5 Reliability of the Instrument

Reliability can be used to measure consistency of a questionnaire. An essential characteristic of reliability is reproducibility or repeatability. A reliable instrument displays similar result over time and across situations (Zikmund, 2003). With a view to determine reliability, Cronbach alpha was calculated. Reliability of all the factors is above 0.7 (Bagozzi and Yi 1988; Kline 1999). The cronbach alpha of Kcul is .887, KT is .823, T_int is .798, T_infra is .809, KSR is .819, O_COP is .783, T_emerg is .750 and KC is .743 (Table 13). 'Cronbach Alpha if item deleted' tells you whether removing an item from a factor will improve its overall reliability. In the current research one negative worded statement was removed after which the overall reliability of the factor improved.

5.5 Confirmatory Factor Analysis

Confirmatory factor analysis is a "technique used to estimate the measurement model. It seeks to confirm if the number of factors are constructs and the loadings of observed indicator (variables) on them confirm to what is expected on the basis of theory (indicator variables are selected on the basis of theory) and CFA is used to confirm if the variables or items load as predicted on the expected number of factors." (Malhotra, 2012)

Measurement model was constructed to check reliability and validity. For this structural equation modeling (SEM) in Amos was performed.

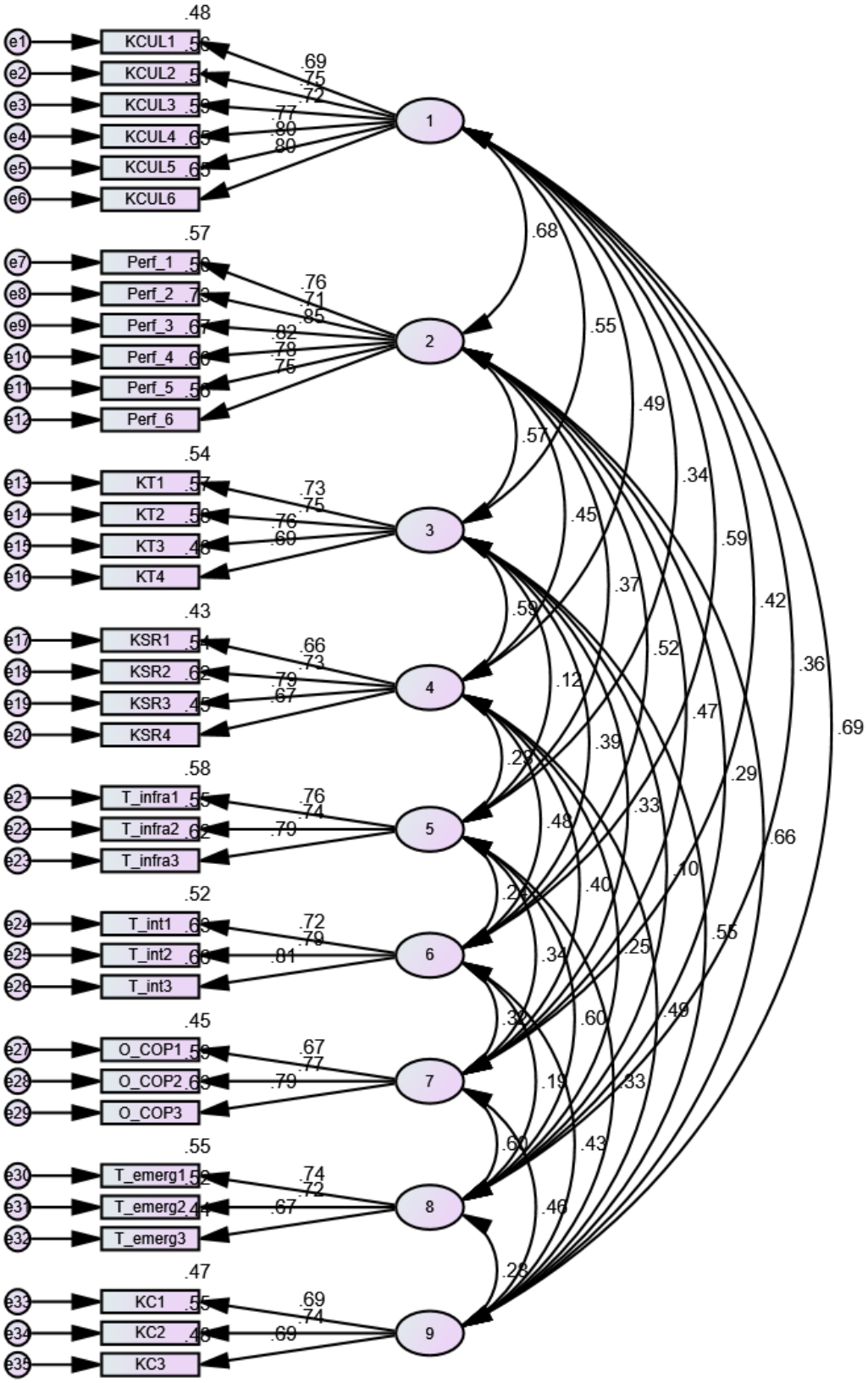


Figure 17: Measurement Model

5.6 Validity

"Validity is the ability of a scale to measure what it intended to measure" (Zikmund, 2003). This means that scores measured are genuine and accurate (Murthy and Bhojanna, 2010), and differences found with measuring instrument reveal true differences (Kothari, 1990).

Face Validity and content validity were checked by experts, while convergent and discriminant validity were checked in amos software.

Convergent Validity

Convergent validity occurs when items of a particular construct converge or correlates positively with other items of the same construct (Malhotra and Dash, 2010). These indicators tend to share a high ratio of variance in common. In factor analysis, such indicators are clubbed together to make a factor.

Several parameters are used to determine convergent validity. For example high loadings on a factor indicate that they converge on a common point i.e. the latent construct. Reliability is also a measure of convergent validity. High construct reliability indicates that internal consistency exists, meaning that the measures all consistently represent the same latent construct. AVE or Average Variance Extracted is calculated as the mean variance extracted for the items loading on a construct and is a summary indicator of convergence. AVE greater than .5 indicates high convergent validity, whereas an AVE less than .5 indicates that on an average more error remains in the item than variance explained by the latent factors (Hair et al, 2010).

Discriminant Validity

Discriminant validity is the degree to which a construct is truly distinct from other constructs and does not correlate with other constructs (Malhotra and Dash, 2010). High discriminant validity verifies that a construct is unique and captures some phenomena which other measures can not. Discriminant validity also mean that individual items should represent only one latent construct and do not cross-load on other constructs (Hair et al, 2010). Discriminant validity is the ability of some measure to have a low correlation with measures of dissimilar concepts.

Thereafter, both AVE (Average Variance Extracted) and CR (Composite Reliability) were calculated to measure convergent validity which shows how well the observed variables in a construct correlate with each other (Hair et al. 2010). In the analysis, all values were acceptable i.e. CR>.7, AVE>.5 and CR>AVE, thus depicting convergent validity. Discriminant validity is used to measure if a construct is distinct from other constructs and makes a unique contribution. The values of MSV (Maximum Shared Variance) is less than AVE in the analysis confirming discriminant validity (Hair et al. 2010)

As can be seen from the table below, all the conditions for convergent and discriminant validity are satisfied.

Table 16: Model Validity Measures

	CR	AVE	MSV	MaxR(H)	1	2	3	4	5	6	7	8	9
1	0.888	0.571	0.474	0.892	**0.756**								
2	0.902	0.605	0.457	0.907	0.676***	**0.778**							
3	0.825	0.541	0.352	0.827	0.549***	0.572***	**0.736**						
4	0.805	0.510	0.352	0.813	0.486***	0.450***	0.593***	**0.714**					
5	0.808	0.584	0.358	0.810	0.341***	0.373***	0.124*	0.228***	**0.764**				
6	0.820	0.603	0.347	0.826	0.589***	0.516***	0.392***	0.477***	0.244***	**0.777**			
7	0.790	0.557	0.365	0.799	0.416***	0.469***	0.329***	0.404***	0.339***	0.322***	**0.746**		
8	0.754	0.506	0.365	0.757	0.361***	0.288***	0.101†	0.251***	0.598***	0.190***	0.604***	**0.711**	
9	0.750	0.500	0.474	0.752	0.689***	0.659***	0.553***	0.492***	0.333***	0.433***	0.457***	0.276***	**0.707**

Validity Concerns

No validity concerns here.

5.7 Structural Model

After testing the measurement model, the structural model was constructed to test the dependence relationship between the constructs (Hair et al. 2006; Anderson and Gerbing, 1988). Research hypotheses were tested by estimating the significance of the path coefficient, which is a standardized regression coefficient (beta). In AMOS, Critical Ratio (CR) for regression weights is used instead of t-value. If CR is >1.96 for a regression weight, that path is significant at .05 level confirming a given hypothesis (Kang et al., 2008; Gao et al., 2008).

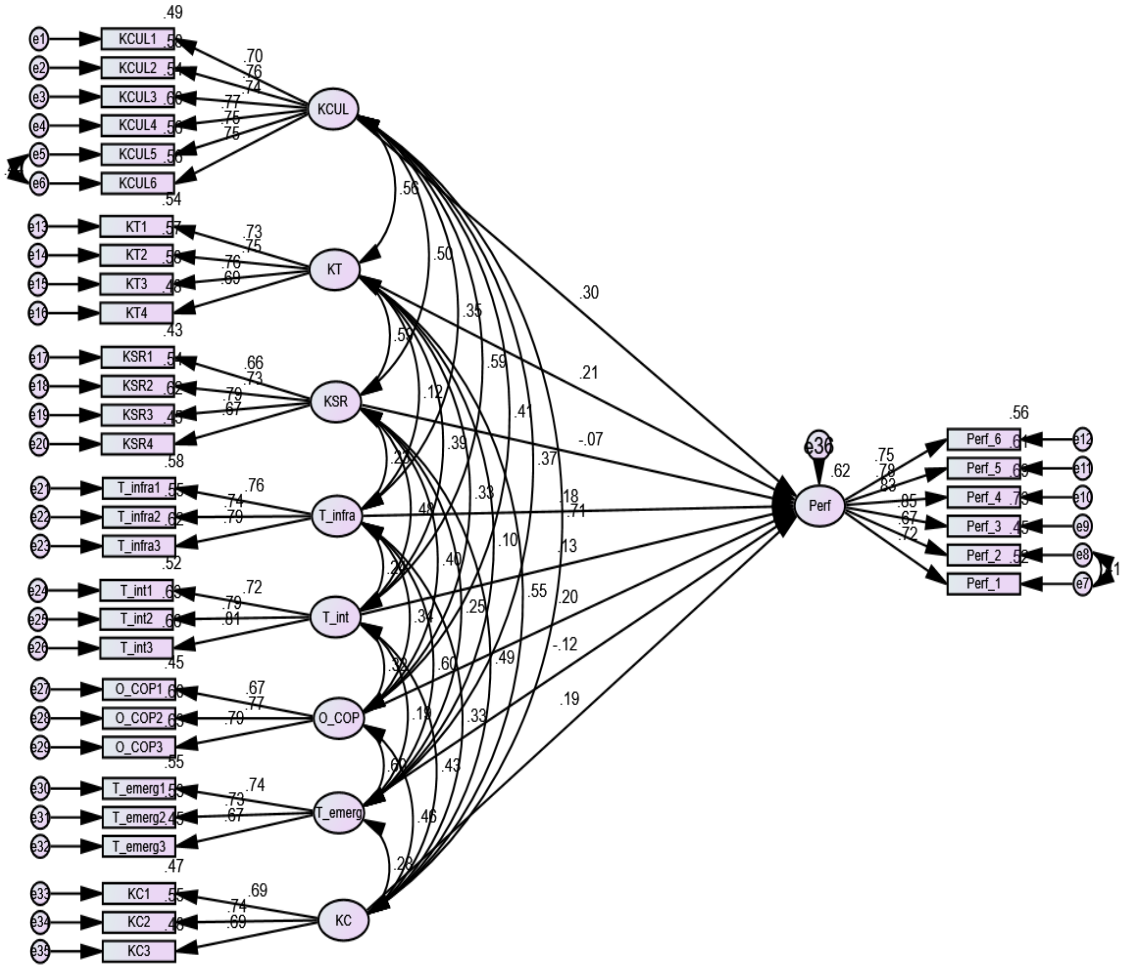


Figure 18: Structural Model

Model fit compares the theory to reality by assessing the similarity of the estimated covariance matrix to the observed covariance matrix. (Hair et al., 2010). The cmin/df value or chi-square is calculated to verify the model fit, that is how the expected values differ from observed values. A smaller difference is considered better. In this case, the cmin/df value is 2.316. The goodness of fit measure CFI is .935 and the badness of fit measure RMSEA is less than .06.

Table 17: Model Fit Measures

CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	108	1208.795	522	.000	2.316

Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.892	.877	.936	.926	.935

RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.046	.043	.050	.960

Measure	**Estimate**	**Threshold**	**Interpretation**
CMIN	1208.795	--	--
DF	522	--	--
CMIN/DF	2.316	Between 1 and 3	Excellent
CFI	0.935	>0.95	Acceptable
SRMR	0.043	<0.08	Excellent
RMSEA	0.046	<0.06	Excellent
PClose	0.960	>0.05	Excellent

The cut-off criteria

Measure	Poor	Acceptable	Excellent
CMIN/DF	>5	>3	>1
CFI	<0.90	<0.95	>0.95
RMSEA	>0.08	>0.06	<0.06
SRMR	>0.10	>0.08	<0.08
PClose	<0.01	<0.05	>0.05

Gaskin, J. & Lim, J. (2016)

5.8 Results of T-test and ANOVA

The results of the t test indicate that there is a statistically significant difference in the mean for knowledge culture between the public (mean=5.23, SD=1.18) and private HEIs (mean= 4.87, SD=1.35), p=.015. The mean values of public HEIs are greater denoting the presence of knowledge culture in these organizations. As opposed to public HEIs, private HEIs observe privacy and confidentiality in their working, and there are restrictions for outsiders to get access to their systems. It was observed that private HEIs are cautious regarding the misuse and misinterpretation of information by outsiders. This is so because most of them are self-sustaining and thus they take additional care in their modus operandi. Collecting data from private HEIs was also challenging and other modes like right to information are not applicable to them.

The results of the t test indicate that there is a statistically significant difference in the mean for knowledge culture between the male (mean=4.99, SD=1.28) and female respondents (mean= 5.34, SD=1.12), p=.000. The mean values for female candidates

are higher suggesting that they are more satisfied with the knowledge culture of the institution than their male counterparts.

A one-way ANOVA was conducted to compare the three groups of faculty, students and non-teaching staff. There was a significant difference in knowledge creation [F (2, 610) =8.066, p = 0.000] between the groups. Post hoc comparisons using the Games-Howell test were carried out. The results revealed a significant difference between faculty (M= 5.80, SD=0.96) and students (M=5.36, SD=1.26) at p = 0.00 in terms of knowledge creation. This may be because the students, especially at the undergraduate level are not as motivated towards research writing and publications as the faculty members. Also very few students get the opportunity to participate in innovation projects due to limited seats and high competition. At this stage, they are more focused on academic results, internships and placements.

A one-way ANOVA was also conducted to compare the respondents according to their educational qualifications i.e. Pursuing-graduation, Graduate, Pursuing post-graduation, Post-graduate, Full time research scholar and PhD. It came to be known that full time research scholars make more use of the emerging technologies than the other groups especially undergraduates. There was a significant difference in usage of emerging technologies [F (5, 605) =6.476, p = 0.000] between the groups. Post hoc comparisons using the Games-Howell test were carried out. The results revealed a significant difference between undergraduates (M= 3.04, SD=1.51) and full-time research scholars (M=4.56, SD=0.99) at p = 0.00 in terms of emerging technologies. This may be because as per their research objectives, scholars are more interested in

exploring new avenues of knowledge employing latest technologies than undergraduates. Similar results are obtained for knowledge creation where [F (5, 605) =4.375, p = 0.001]. To get a clear view, post hoc comparisons using the Games-Howell test were carried out. The results revealed a significant difference between undergraduates (M= 4.98, SD=1.07) and PhD candidates (M=5.90, SD=0.83) at p = 0.001 in terms of knowledge creation.

A one-way ANOVA was conducted to compare the differently graded institutions i.e. A++, A+, A, B++, B+ and B. The A++ and A graded institution fared better than B+ and B grade institution in almost all components of knowledge management and ICT. There was a significant difference especially in terms of availability of technological infrastructure, usage of emerging technologies and knowledge creation. F (6, 606) =5.312, p = 0.000, F (6, 606) =2.628, p = 0.016 and F (6, 606) =2.867, p = 0.009 respectively between A++ and B groups. Post hoc comparisons were carried out. The results revealed a significant difference between A++ (M= 5.50, SD=1.36) and B (M=3.00, SD=.88) at p = 0.00 in terms of technological infrastructure, A++ (M=4.40, SD=0.60) and B (M=1.78, SD=0.19) at p = 0.00 in terms of emerging technologies, A++ (M=5.83, SD=.92) and B (M=5.44, SD=.51) at p=0.022 in terms of knowledge creation. The results revealed that an efficient ICT infrastructure and the usage of current and emerging technologies aid research and development in institutions which has contributed to their better performance and improved rankings. The detailed results of T-test and ANOVA are presented in the appendix.

Table 18: Mean values based on rankings

	N	Kcul Mean	KP mean	KT mean	T_int mean	KS mean	T_infra mean	O_COP mean	T_emerg mean	KC mean
A++	60	5.8500	5.9833	6.3750	6.1000	5.7667	5.5000	5.2333	4.4000	5.8333
A+	162	5.2925	5.5655	5.8925	5.6588	5.1871	3.6562	5.3438	3.4046	5.6182
A	121	4.9383	4.5823	5.8295	5.6705	4.9848	3.2446	5.1126	3.2446	5.2468
B++	72	5.0893	4.8155	5.6429	5.5268	5.1190	2.7262	5.2143	2.6667	5.0952
B+	106	5.3565	5.0231	5.6181	5.8264	5.3704	3.0926	5.5185	3.3519	5.6389
B	51	4.7222	4.4444	5.7500	4.6667	4.5556	3.0000	3.2222	1.7778	5.4444
NA	41	4.6290	4.5161	5.7903	5.7258	4.8172	3.5054	5.0753	3.4624	5.1720
Total	613	5.1707	5.2007	5.8511	5.6713	5.1316	3.4965	5.2643	3.3388	5.4823

5.9 Results of Regression Analysis

In this study, we tried to infer whether the components of KMS i.e. KC, KS, KT, KCul and ICT have a positive and significant effect on performance in HEIs. To determine this, SEM in Amos was performed which gave the following results.

Table 19: Regression Results

			Estimate	S.E.	C.R.	P	Decision
Perf	<---	KCUL	.296	.069	4.311	***	Supported
Perf	<---	KT	.277	.072	3.851	***	Supported
Perf	<---	KC	.191	.066	2.881	.004	Supported
Perf	<---	KSR	-.096	.069	-1.381	.167	Not Supported
Perf	<---	T_infra	.134	.038	3.469	***	Supported
Perf	<---	T_int	.159	.059	2.682	.007	Supported
Perf	<---	O_COP	.180	.054	3.343	***	Supported
Perf	<---	T_emerg	-.097	.057	-1.723	.085	Not Supported

From the estimates, it can be inferred that KMS significantly and positively affects performance in HEIs. The R^2 of the study was 62%. Such positive and significant results between KMS and organizational performance were obtained in some studies (Lee et al. 2005; Rasula et al. 2012; Pérez-López and Alegre 2012; Theriou et al. 2011) while weak influence was found in some other studies (Mills and Smith 2011; Masa'deh et al. 2017).

CHAPTER 6

DISCUSSION AND CONCLUSION

In this section, the hypothesis so tested are interpreted and the significant and non-significant relationships of the regression tests are elucidated in detail. The chapter also concludes the research by presenting an outline of the study undertaken and contributions made.

As hypothesized (H1.1.1) **KCul emerged as the most potent factor influencing performance (p<.001, beta .30).** The results are in line with Lee et al. (2005) and Rasula et al. (2012), who stated that culture is a significant driver of performance. An influential positive culture marked by involvement, continuous learning, application of best practices increases productivity, potential and morale of members (Jain and Gupta, 2019). It helps them achieve higher performance in the form of better academic results, placements, success in innovation projects, higher productivity and better networking.

According to the human relations approach, the work done by a worker is directly proportional to the social norms of the group, which is the reason we find that organizations having inadequate capital or infrastructure are still able to perform better than their resourceful peers, because they have a supportive and ever-encouraging climate. A positive culture builds a positive state of mind where people are happy working, thus productive and lead a more fulfilling life (Robbins and Judge, 1992). Such a positive culture encourages people to co-operate, collaborate, share and co-create knowledge, while a negative atmosphere generates conflict and

leads to dysfunctional behavior like knowledge hoarding (Alavi et al., 2005). The presence of trust, transparency, mutual respect fulfill the social and esteem needs of members. The culture builds a unique identity of an organization that is valuable and at the same time, inimitable (Kayworth and Leidner, 2004). A culture marked by a positive attitude escalates the performance of members, while negative attitudes may de-escalate the same. Culture forms habits and controls their behavior.

A positive culture has helped institutions carve out a niche for themselves. For example, the company like Twitter has created a harmonious environment in which there exists co-operation and team spirit. Members are motivated to achieve organizational goals and don't give up until they complete because they know what they are doing matters (Patel, 2015). Similarly, higher educational institutions like MIT are known to have birthed various discoveries of the twenty-first century and this is achieved by their culture of innovation, experimentation and tolerance for mistakes. Their vision and mission also guide and directs the same. When the organization's show employees that their well-being matters to them, workers strive to give back in the form of contribution towards the organization's goals.

According to Kayworth "the firms which are able to effectively manage knowledge resources can expect to reap benefits such as improved customer service, reduced costs in people and infrastructure, better decision making, innovation, improved corporate agility, rapid development of new product lines, quick and efficient problem resolution, and efficient transfer of best practices."

Companies like Facebook are also reaping advantage by creating an open culture, direct and constructive feedback (Joana, 2019). By expressing their ideas freely,

employees gain confidence while the organization benefits from their valuable suggestions and experiences at the ground level (Pareek, 2002). Educational institutions are also striving to create an environment of research and innovation. For instance, Delhi Technological University has instigated research excellence awards to honor researchers who have published quality work in their domains. This practice motivates and inspires young researchers to excel.

We can sum up by saying that culture provides an enabling environment that increases the potential, productivity and performance of members in various counts. With ever-rising expectations and demands from the job, turbulence at the micro and macro levels, employees seek support and facilities from their organization and that organizations should not let their employees down; otherwise, they may leave it. A positive atmosphere helps in coping with stress and supports them in their progression towards a higher goal. The results are in line with Lee et al. (2005) and Rasula et al. (2012), who stated that culture is a significant driver of performance. However, the results are contrary to Mills and Smith (2011) and Sunalai (2015) who could not find a significant relationship between knowledge culture and performance.

As postulated (H1.1.2**), KT in the study is found to have a significant positive effect on performance (p<.001, beta .21)** as concluded by other studies (Lee et al. 2005; Wang and Wang 2012; Kang et al. 2008). The presence of supportive relationships along with the individual's own positive attitude promotes knowledge sharing (Liu and Cho, 2011). The current study validated that KT broadens the mental horizon of members, which mutually benefits them through improved performance in multifaceted ways (Jain and Gupta, 2019). The willingness to share knowledge

benefits both the recipient and the disseminator. The recipient becomes aware of the developments around and disseminator gains from the views and suggestions of the recipient. Such examination and analysis are crucial to effective decision making.

The transference of know-how, work methodologies and best practices enhances the knowledge base of members (Kang et al., 2008). This improves their productivity and efficiency at work and study (Lee et al., 2004). In an academic institution, students engage in peer-tutoring and share their knowledge with each other (Chikoore & Ragsdell, 2013). It develops social ties and these learning communities motivates and equips students for better performance in examinations. The continuous dialogue with alumni and academia-industry interface help in securing a better transfer to the job, and increase the scope of placements (Dhamdhere, 2015). While working on innovation projects, the students improve their cognitive, communication and perceptual skills. They share their expertise and experience with each other, which would not be possible, had they worked alone. As they deal with failure and success together, it builds group cohesiveness and belongingness, creating an environment congenial for knowledge sharing.

Similarly, the faculty, students and researchers participate in conferences and seminars, make presentations and refine their papers to be acceptable in quality journals. They learn various technical and conceptual skills that help improve the quality of publications. The interactions help bring tacit knowledge to the fore and serve as a fertile ground for idea generation and dissemination. The participants get an opportunity to share their feelings, doubts and problems with the experts and reach a solution. As members can enhance their knowledge pool, it increases their ability to make wise

decisions (Hsiu-Fen, 2006). Their enriched skills make them feel empowered, which boosts their confidence and morale for better performance (Lee, 2018).

Learning in conferences enhances through creative dialogues and discussions that promote collaboration, critical thinking and reflection (Louw & Zuber-Skerritt, 2011). Conferences are credited to improve research and communication skills. The active feedback of session chairs and audiences help refine the participants' products (articles, slides) further. In workshops and training sessions, candidates get hands-on-experiences and receive mentoring and guidance from experts (Downes, 2014).

Various other authors have opined positively about academic events. According to Burkhardt & Schoenfeld (2003), conferences bridge the gap between research and practice. De-Vries and Pieters (2007) noted that participants here meet face-to-face or online to communicate research agenda, findings, share experience, stories, academic materials, and foresights. According to Garfield (1991), "Conferences serve many purposes, both professional and social. They aim to foster efficient information exchange, offer the opportunity to investigate employment possibilities, and provide a chance for old friends to get reacquainted." These interactions and networking open the door to new opportunities (Nassuora & Hasan, 2010).

From the discussion and analysis, it can be concluded that investment in capital resources alone will be rendered ineffective if not supplemented by appropriate knowledge transfer. Babcock (2004) noted that Fortune 500 companies lose $31.5 billion every year for failure to share knowledge. On the other hand, companies that have a robust Knowledge sharing culture learn quickly, co-create and outperform their peers. For example, through the concept of Quality circles and knowledge sharing

among employees, the company Toyota was able to reduce machining defects and tool breakage achieving operational efficiency, higher productivity and lower manufacturing costs. This achievement increased the morale of employees and encouraged them to make such improvements continuously. The results were then shared with other areas in the company to capture the gains completely (Darroch 2003; A3 Thinking 2009).

As hypothesized (H1.1.3**), KC is found to have a significant positive impact on the performance of students (p<.05, beta .19).** The results are similar to the ones as concluded by other researchers (Lee et al. 2005; Mills and Smith 2011; Choi et al. 2010; Pérez-López and Alegre 2012). Research and development, group discussions and interaction with experts unlock the creativity of any person, including students, faculty and administrators in a higher educational institution. Students being young carry fresh perspective and generate new and multiple ways of solving a problem through perseverance, hard work and trial and error (Jain and Gupta, 2019). These traits help them improve their performance in exams and placement interviews. The faculty and administrators owing to their intellect and vast academic and professional experience is able to support institutions achieve their goal. The ability to reason, analyze and critical think helps them research and achieve success in innovation projects. Research is also believed to boost publications. Nowadays, technology has given immense power to even remote institutions to learn, collaborate and co-create with their well-placed peers. Brainstorming and out-of-the-box thinking has resulted in process improvement and enhanced the productivity of members. An interface between industry and universities have resulted in synergies on various counts. . As industry is the end-user in the supply chain of graduates for the labor market, they

look forward to skilled and fully equipped job-ready students (Masrek and Zaincol, 2015). A structured and effective interface can provide a win-win situation for both academicians and corporations. After learning concepts and theories in class, students get an opportunity to use them in solving real challenges faced by the corporate world. Such visible impact has a positive effect on their self-esteem and confidence.

According to Burns et al. (2015), "Collaboration spurs innovation because bringing together groups of people who have different ideas, approaches, experiences and areas of expertise creates a fertile environment for generating new concepts and methods."

Recognizing the importance of such collaboration, the Caltech organized Innovation week inviting alumni entrepreneurs to share their experiences and address their doubts related to startups, commercialization and fundraising with students and faculty (Perkins, 2016). The university organizes executive development programs for professionals, and professionals give back to the university by sharing their corporate experience and insights that help develop relevant research problems for students and faculty.

In fostering collaboration and innovation, the aid of alumni can also be taken. For example, Dickson, an engineer and MIT graduate, returned to the campus to open pathways for student innovators, by connecting them with the industry. He also acquainted them with the company's operational model and sought their ideas and feedback for a better future in this industry. Through lecturing, feedback and discussion, he tried to bridge the gap between technical expertise and its meaningful application in business. Such exercises inspire students and reduce their anxiety of having to work in a real environment in years to come (Murphy, 2018).

California Institute of technology and Boeing have entered into a tech-partnership where students and faculty would provide research assistance to the company. The company, in turn, will provide research dollars and also internship and placement opportunities to deserving candidates. It is said that Caltech faculty played a key role in the certification of Boeing's new Dreamliner aircraft (UI Projects, 2014).

From the above discussion, examples and analysis, we infer that the universities with their renowned faculty and meritorious students are a powerhouse of talent and all their hidden potentials and productive ideas must be tapped and not wasted to build a promising knowledge society. In the current fast-paced, technology-led, globalized world, knowledge creation and innovation are indispensable to sustain and flourish. The more closely aligned universities are to corporations, the more real benefits will accrue to both society and businesses.

As per (H1.1.4) **KSR is the only factor which is not having a significant effect on the Performance (p > 0.05, beta -.07).** Such results portray that the usefulness of KSR is undermined in an organization. Much knowledge exists in tacit form and not documented because of time constraints, lack of interest and motivation to do the same. People feel that knowledge gives them power, and storing it permanently will dilute their power. At the organization's end, efforts are also not made to capture the tacit knowledge of the teachers who retire or resign and even the students who pass out. Even if the information is captured, it may not be well documented, which may lead to knowledge loss. Knowledge storage is in itself a decision an organization has to make. In many organizations, clear policy guidelines regarding it are absent. As in, what information should be documented? How much need to be documented. What

all objectives it should serve? How the information be structured to produce better query results. What authentication steps are required for knowledge protection? Should databases be openly accessible, or they must verify the user each time with a login ID and password. How to enrich the database continuously and encourage stalwarts to document their expertise?

Knowledge properly stored is an only half battle won. All storage mechanisms are rendered ineffective if information is not retrievable for use (Alavi and Leidner, 2001). It has been observed that though the information is accumulated, it is still unavailable and inaccessible to the members of the organization. Quite often, they have to run from pillar to post to obtain it. The data and facts may be dispersed and fragmented among departments and groups. At times, there might be duplication; other there might be missing links. Interoperability issues can also be observed. Some data exist in print, other in digital or tacit form, which makes it difficult for a reader to get a holistic view and identify interconnections. A single central repository or a convenient interface to view and collect information is sometimes missing which makes retrieval difficult.

From the results, it can be observed that blind investment in knowledge may not produce the desired results (Choi et al., 2010). It has to be done with caution. In some cases it was found that though the manuals and databases were available, they were not used because of a lack of awareness and training to use them (Jain and Gupta, 2019). People do not bank on databases and documents as they feel it can get outdated quickly and fail to meet the demands of the current situation (Jennex and Olfman, 2002). They are apprehensive of the context with which knowledge is stored (Zack,

1999). Records can be rendered unreliable, if developer biased towards a particular group develops them. Repositories, being impersonalized also fail to provide real-time feedback to its users.

Moreover, there always exists the fear of corrupting the data in the absence of backups and administrator control. It is noted that users are unable to retrieve needed information as the advanced search and query techniques are neither developed nor used. Much depends on the culture of the organization as well. While interacting with members (students, faculty and non-teaching staff), it was found that there is a continuous transference of tacit knowledge between them, rather than their depending upon or using already stored or documented information (Cheng, 2012). The results are in consonance with Donate and de Pablo (2015), who could not find a direct effect of KS on performance and in contrast with Lee et al. (2005), who found a positive significant impact.

For KSR to be successful, members must recognize its importance as a strategic asset. Not only information be stored appropriately and used productively but also employed to create new knowledge through the techniques of knowledge discovery and data mining (Taraszewski, 2017).

As Zack et al. noted, knowledge storage requires substantial commitments by the top management of an organization, in terms of resources i.e., technical, human and financial. Storing information requires a careful trade-off in terms of what to save and how much to store. Storing everything will result in information overload, while storing less may lead to missing links. Another problem is the capturing of fragmented and dislocated information. All such information from different locations should be

collected and made available on a central server to enable decision making and action. Also, tacit knowledge needs to be captured. Tacit knowledge is hard to obtain or articulate being context-specific, confidential, or culturally and politically sensitive.

A well-designed knowledge repository may improve performance as observed in the case of Technology Research Company (TLR) and Buckman laboratories, while weak or disorganized knowledge storage may have little or no effect on performance.

For example, Buckman laboratories, which is in the chemical business, reaped advantage owing to its knowledge network. Earlier, the business was to mainly sell the products, which was later expanded to pre-sales preparations like advising customers and solving their doubts related to chemical treatment. Such personalized attention drew customers to the company's products and increase their turnover and profitability. The credit for such achievement goes to the knowledge transfer department, which involved all the members of the company right from field assistants to marketing heads. A tech forum was developed wherein members post their problems, make suggestions and help solve each other's queries. Such a platform also brought previously uncaptured tacit knowledge to the fore, leading to strategic advantages for the company. In a similar manner, educational institutions could also develop a platform wherein they can document the best practices for others to learn and apply.

KSR should also be a continuous interactive process to solve problems arising in real-time. But many organizations use the publish method to decrease costs and save time. KS also demands the services of technicians, database experts to ensure their relevance. They must capture, refine, and present information neatly on a continuous basis. The absence of any such activities may bog down the system and make it redundant.

The empirical results (of H1.2.1) **proved that an efficient ICT infrastructure positively and significantly affect performance in HEIs** (p<.001, beta .18)**.** This observation is in line with several studies that demonstrated the benefits of ICT for "improving the quality of education by facilitating access to resources and services as well as remote exchange and collaboration" (Commission of the European Communities 2001). ICT is viewed as a "major tool for building knowledge societies" (UNESCO 2003). Latest equipment, state-of-the-art infrastructure, facilitate staff, renders convenience and reduces their job stress by saving their time and effort. The database and software subscriptions are the e-resources necessary to strengthen teaching, learning and research endeavors. CMIE (Center for Monitoring Indian Economy) prowess database stocks financial data of companies, while Jstor houses scholarly content and research publications. Turnitin deters plagiarism and improves student outcomes by laying the foundation for critical thinking, original writing, and academic integrity practices. SPSS is used for data crunching and statistical analysis. Subscription to all these software and database will give the institution a knowledge edge that will translate into valued research publications, better lecture notes, enhanced student engagement, and thereby better grades or results.

The Internet provides broad-based electronic assets like journals, publications, manuals, books, reports, newspapers, magazines, abstracts and databases of research articles, references such as dictionaries, encyclopedias, volumes, directories and others. In brief, it functions as a window to the universe of knowledge (Walmiki, 2019). Its ubiquitous access, interoperability, resource sharing capabilities have made it an indispensable part of any modern institution. Also, the internet has offered

infinite opportunities to communicate, collaborate and co-create, and without it, online applications would not budge, and the entire system would come to a halt.

The research labs with powerful internet connections are the backbone of all teaching, learning, research, and allied activities. The research labs are seedbeds of breakthrough inventions and innovations. The fully equipped and state-of-the-art labs offer an environment in which hardware, software and experts from different fields can collaborate to produce world-class research outcomes that are significant to society. These labs have a track record of expanding the frontiers of knowledge from the digital to the real-world and providing vision for the future. Some of the examples of lab innovations are e-ink and GPS, LED and Android developed in Massachusetts Institute of Technology, Cardiff and Osaka University, respectively (Writers, 2012). These inventions have received worldwide accolades and patents in their field and contributed to their institutional excellence.

Various studies were conducted measuring the impact of ICT infrastructure on institute performance. In Saudi Arabia, a positive effect of ICT adoption on academic performance was discovered using SEM. ICT is critical to the acquisition of knowledge through search engines and online portals. The paper also recognized the indispensible role of ICT in preparing classroom instructions (Basri et al., 2018). Similarly, Byrd and Turner (2001) revealed a positive relationship between flexible IT infrastructure and competitive advantage. The study acknowledged the importance of infrastructure to achieve the strategic objectives of the organization. Rockart et al., 1996 established that adequate infrastructure is a pre-condition for going global. A study of universities in the western Himalayan region of India suggested that advanced IT infrastructure,

application software, video conferencing and placement/ alumni portal are vital for honing the performance of human resources in universities (Sharma and Singh, 2010). Employing empirical analysis and correlation techniques, an OECD study (2010) indicated that ICT in the classroom improves performance. In Tunisia, however, an adverse effect of ICT on performance was discovered. The authors reasoned that the university is in the early phase of ICT adoption, and so there is a lack of clear policy guidelines, deficiencies in pedagogical tools, and uncoordinated access and use among members (Karamti, 2016). The results are also in consonance with the study conducted in the educational institution of Kenya (Nchunge et al., 2013).

The statistical results proved a positive relationship between technology integration and performance (as per H1.2.2)**.** It was also discovered that the mean scores of technology integration are low. The reason attributed to this result is that ICT integration is a complicated and time-consuming process and that many HEIs, especially in remote areas of India are in their earlier to the middle phase of technology adoption. Faculty and students at the undergraduate level use basic office applications rather than using advanced research tools. Technology is used to access information and it is not yet harnessed to solve unstructured, complicated problems that are meaningful to the community at large. Technology is also not well integrated into the curriculum and pedagogy (Murthy et al., 2017). It may be due to the lack of teacher training in these aspects (Calsoft labs, 2012). Even the lesson plans are designed in such a way, that there is little room for the fruitful application of technology. Teachers are also neither confident nor equipped to use the latest technological tools. There is also a lack of administrative support or motivation (Ghavifekr, 2015). Other issues relate to weak infrastructure wherein there are

frequent power outages and lack of technical assistance for installation and upkeep of ICT (Nyirongo, 2009). Due to the before mentioned reasons and a prominent digital divide, it is not possible to safely bank upon the technological integrations.

The results also reveal a positive relationship between ICT integration and performance ($p<.05$, beta .13). It is so because computers help in automating routine tasks, thus saving time. Also, the accuracy achieved by technology is hard to attain by a normal human being. Their versatility is unmatched and can be used for a variety of applications. They are powerhouses of information and any information, if required, is available on a single click. All these features have enhanced the productivity of institutions.

Educational technologies are also known to have engaged students. Teachers have indicated that ICT at schools improves attention and perception skills (Ghavifekr, 2015). The multimedia applications create an aesthetic and sensory appeal that interests students affecting their cognitive, affective, and psychomotor domains. All this makes the content learning process easier (Forehand, 2005). The tools are interactive and respond according to the users' mood and direction. All these features quickly involve students. The sea of knowledge available through search engines has made people curious learners. It has also given a variety of choices to the learners in the form of text, pictures, audio, video and research papers contributed by different authors and developers around the world.

If the learners (faculty and students) can adapt to new technologies and research tools, it will help them in decision making and carve out an edge for themselves. They will be better able to collect data (google forms), organize (excel), analyze and interpret (spss and e-views) and report (power-point presentations). It will help students make

better assignments and projects, secure better grades and excel in innovation projects. Their strong foundation and knowledge base would help them succeed in their chosen field and bring glory to the institution as well-respected alumni. Similarly, teachers can produce quality publications. The enhanced productivity, efficiency and rewards, in general, will enable an institution achieve excellence and positive climate for continuous improvement and up-gradation.

Several studies established a positive relationship between technology integration and performance. Weathersbee (2008) proved that the integration of technology in the classroom impacted the academic performance of students and re-established the need for integrating technology into education. Similarly, the Association for Educational Communications and Technology (1998) found that ICT literate students master content faster and are better problem-solvers. A study by Chen et al. (2010) suggested a positive relationship between learning technology and student learning outcomes. Similarly, Kim et al. (2013) discovered a strong connection between technological engagement and profitability. Likewise, Motamedi (2012) advocated that educational technologies develop higher-order thinking skills among students and help them attain higher standards. A survey by Ghavifekr (2015) on 101 teachers from Malaysia revealed that ICT integration has high effectiveness for both teachers and students, as students are already familiar with technology and find it interesting. According to Calsoft labs (2012), “the technological tools help create a social, highly collaborative and personalized environment with innovative solutions that will enrich the way students study, communicate and collaborate both on and off-campus”.

On the other hand, some studies could not find a positive relationship between technology integration and performance. Arbaugh (2000) discovered that pedagogical rather than technological factors are more strongly associated with learning. Ludwig (2004) expressed that while multimedia applications can improve the grasp and retention of materials presented in a class, a poorly developed use of multimedia can do more harm than good. Similarly, Simuth and Schuller (2012) suggested that a non-interactive course solely based on the study of the text material or video published on a website has zero educational value, and can reduce the overall outcome of education. Likewise, Sadik (2008) maintained that technological interventions can be useful if teachers themselves possess the capability to use technology in a momentous way in the classroom and that the simple adoption of a novel technology alone does not produce a greater sense of community learning (Morris and Parker, 2014).

The above discussion points to the fact that technology should be used with caution, considering its effect on learning. It demands the teacher's skill and judgment as to how best to integrate and harness it. More significant planning and preparation by the teacher may be required at each step of the learning process. And that learning cannot be left to the use of technology alone. Teacher-interaction, group-discussion, feedback and class activities are significant to stimulate greater understanding and higher-order thinking and problem solving among the members of an educational institution.

The results of the study reveal that the online communities of practice have a high mean value denoting that the social networking tools are extensively used by faculty, students and administrators for group communication. With their acceptability, accessibility, convenience and low cost, they have become routine to

the digital natives (Prensky, 2001; Kirschner and Karpinski, 2010, Amin et al., 2018). The online communities of practice have given freedom to members to share, create and post information as per their will, their own convenient time and place (Brady et al., 2010). The convenience help them reduce job and academic stress.

It is also found that the online communities of practice have a positive effect on the performance of its members ($p<.001$, beta .20 as per H1.2.3). Using web 2.0 tools, members of a group can now better collaborate and work together on projects (Tiruwa et al., 2018) as they can divide the work and know the progress. Through the online mediums, it is now possible to provide real-time aid when the members are applying theory to practice. The research scholars could also peer edit documents with their mentors and collaborate with their co-author online. They also make use of research gate to clear research-related doubts. The members feel that the social platforms has given them a voice. They can share their thoughts, ideas 24*7 with anybody anywhere, not only in their institution but across the world. They can even connect with alumni and get their views and learn from their experiences. The teachers feel that they can keep students involved even in vacations. One of them stated "I want my students to utilize their time fruitfully. I sometimes post quizzes, puzzles related to the subject. I remind them to complete their holiday homework and monitor their progress." The continuous involvement with the academic community through these channels generates interest among the students and faculty both and encourages them to explore and learn more — all such activities impact performance of members positively.

In the era of technology, the availability of information has become convenient. By making members informed, online communities of practice have made them vigilant

of what is going around them. People know important deadlines, competitions, internship and placement opportunities. The members often use Facebook to advertise events, competitions, seminars, conferences. Getting like, comment or share to a post encourages the organizers.

Online communities of practice are also accredited to have united people in a group. Each member is willing to hear and solve the problems of others. Members have gratitude for each other and stand by them in trying times (De Vries et al., 2000; Wenger, 2011; Forkosh-Baruch and Hershkovitz, 2012). The sense of community helps improve organization performance as all the members work towards a common goal and in tandem with each other.

The other important feature of online COP is mutual learning (Jain and Gupta, 2019). In an online group, a person learns from the knowledge and experience of another. Learning can take place between and among all groups, i.e., students, faculty and administrators (Rambe, 2012; Ardichvili, 2008). During exam time, students can post their queries to the teacher and other fellow students. The ensuing discussion, doubts and answers of members help them prepare better. There is an opportunity to learn from alumni working and studying abroad too. Teachers also make use of these communities to share academic resources like lecture notes, research papers, question banks for students to read and answer. Noting the student's interest in gaming, they also send them quizzes and puzzles to solve. Besides students, teachers themselves are immensely benefitting from COPs. One example is the online subject groups that teachers have. All the teachers teaching the same subject are added in a subject group where they can share their doubts, experiences, suggestions and teaching pedagogy. It is a boon for the first-time teachers.

The study brings out the fact that online COPs positively affect the performance of its members in an educational institution as they encourage collaboration, involvement, awareness, sense of community, convenience, mutual learning and knowledge storage. If used in the right manner with the positive spirit, they can overcome the negative factors like irresponsible posting and lack of personalization. With the advancement in technology, the technical glitches could be contained and are not of major concern. The research results are consistent with the established theories and previous researches (Caruso 2018; Al-ghamdi, H. A. K. and Al-ghamdi, A. A. K. 2015). With the help of these low-cost technologies, HEIs with scarce resources can afford to manage knowledge and use it for their advantage. The online COPs will provide a level-playing field to the institutions and students where the access to knowledge would not be limited to privileged few. This will pave a way for capable, hard-working, knowledgeable and passionate knowledge workers to make their mark and achieve to their true potential. Thus, we can say that these innovations have given immense power to the common man to co-create content, share and apply it (Sultan 2013). Google groups are used for formal communication while Facebook and WhatsApp are used for informal or semi-formal communication. For academic and research-based activities, Researchgate and SlideShare enjoy greater patronage. "If we have a doubt while working on a research paper, I post my query on Researchgate. The platform helps me connect with the experts around the globe and solve my problems". The members of an educational institution have established different types of groups. For example, the class group, tutorial group and information group. These groups help improve their academic performance results. Society groups work together on innovation projects. The alumni links are used by students for advice

related to the selection in institutes of higher learning. Besides, there are placement, internships and competitive examination preparation groups (Patelkhana, 2018).

In the current study it has been found that emerging technologies have a low mean value depicting that their usage is low. The students in regular course do not enroll for MOOCs as they have to follow a fixed time-table regime and are already busy in morning to evening classes. The futuristic technologies like artificial intelligence, virtual reality and augmented reality, though used in some of the advanced universities but are still embryonic in developing countries. The concept of flipped classroom is new and people have not still heard about them.

As hypothesized (in H1.2.4), it has also been discovered that emerging technologies do not have a significant effect on performance ($p>.05$, beta -0.12). It is because neither the resources, nor the knowledge or skills are available to use them. So they are not having significant effect on the current performance, but as these technologies gain popularity over time, they might have a significant effect on the future performance. For the success of these technologies, it is also very important that quality content is made by developers, otherwise their adoption will continue to be low (Gamage et al., 2016). Also there is inertia to adoption of new technologies. People have fear that innovations have the potential to disrupt the existing educational landscape and academicians have to redesign pedagogies for evolving classrooms and adapt to the changing nature of their jobs (Gupta and Jain, 2017).

Though various institutions are rolling out online course, but these are still characterized by high dropout rates. Students do not complete the course because they feel isolated and miss the closeness and camaraderie of working together, in proximity

with others sharing the same goal. Competition is wholesome. The usual causalities with MOOCs include the lack of face-to-face interaction, lower levels of discipline, fluctuating connectivity and limited bandwidth in some parts of the world. Another factor is the mechanical tone that MOOCs often display. We found that students can make well use of the online resources only if they are motivated and take responsibility of their learning (Kop and Fournier, 2010). That is why the usage of MOOCs is found to be higher amongst research scholars than undergraduates as it demands certain level of maturity and self-directed learning. From the results it can be inferred that it will take time for people to get used to new technologies and pedogogies, understanding how to apply them to derive maximum advantage for themselves.

Various studies were conducted to measure the impact of online courses on academic performance. In China the students were interviewed to assess their inclination toward a MOOC. The students reported that there is a mismatch between the online and traditional courses in terms of content, assessment and implementation. This made MOOC unpopular among students and their online absenteeism is high (Wang et al., 2019). MOOC retention was surveyed on 379 participants at a university in Cairo. It was found that completion rates were low (Hona & Said, 2016). The reasons attributable to lower completion rates are lack of motivation, interest and absence of disciplinary guidelines as in a traditional university format (Sujatha and Kavitha, 2018). The students had to be self-motivated and engage in self-directed learning to complete the course successfully. Hew and Cheung (2014) expressed concern over quality. He found both content and delivery to less effective in MOOCs. García-Peñalvo et al. (2017) observed that teaching through an online course does not result in any marked improvement over the traditional course format. Moreover, it robs

teachers of their valuable time in development and design of these courses. Also these courses have to be developed with greater care to ensure relevance to varied learners equally on a mass scale, which is again difficult to achieve. In Malaysia, the instructors were interviewed for their perception towards MOOC design. The instructors expressed various challenges in terms of lack of infrastructural support, poor knowledge in MOOC design and absence of relevant training (Kumar and Samarraie, 2018). Goh et al. (2018) studied the effectiveness of MOOCs in Taylor University and found that its content serve as a useful reference material for students. It help build understanding that can be applied to solve real-world problems. The MOOC program was thus successful here. A study by Sablina et al. (2018) in Russia revealed that MOOC offered tangible and intangible benefits to learners and built-on the working knowledge of professionals. Similar results were obtained in data science Imperial College (Altarkistani et al., 2018). Yue & Attaran (2017) observed that MOOC with their features of openness, flexibility and availability are promoting life-long learning. However issues related to pedagogy, assessment and low student teacher interaction are still not fully addressed.

Studies were also conducted to analyze the impact of emerging technologies like flipped classrooms (FC) on performance. A survey by Cabi (2018) revealed that there were no significant differences between the scores of students in a FC group and conventional classroom control group. A study by Jensen et al. (2015) found that flipped classroom may not result in higher learning achievements and the same is dependent on an active-learning style of instruction rather than the order in which the instructor participated in the learning process. The results of the t-test in a Midwestern University explained that students in the flipped class had lower course satisfaction as

they found the adjustment to new pedagogical style intricate (Persky and McLaughlin, 2018). Students feel they have to do all the work themselves (Dusenbury and Olson, 2019). Schmidt and Ralph (2016) found that teachers are apprehensive of the use of FC as the concept is new. They don't want to miss the warmth of lecturing and interacting with students and occupying the focal point of learning. They doubt whether the students have gone through and understood the content or not. The authors reported that 95% teachers don't use flipped classroom and most of them have not even heard about it. However, Gopalan (2018) found that the performance in a flipped class could improve as it allows students to come prepared with content. Cheng et al. (2016) stated this model allowed teachers to have more class time for leading discussions and quizzes rather than retelling rote didactics.

6.1 Case Study

A case study was undertaken as a part of main study. The case study empirically tested the role of Knowledge Management System (KMS) on the performance of students in Higher Educational Institutions (HEIs). For the quantitative analysis, data were collected from undergraduate students using questionnaires distributed both through online and offline modes. The data is limited to 311 undergraduate students from the University of Delhi, India. Building on the extensive review of literature the authors explored the factors of KMS. The independent variable derived are Knowledge Culture (KCUL), Information and communication technology (ICT), Knowledge transfer (KT), Knowledge creation (KC) and Knowledge storage (KS). The dependent variable of the study- Student Performance (SP) is the outcome of the teaching-learning process. In this study, SP is measured by academic results, success

in innovation projects, placements and selection in top institutes for higher studies. These factors measure the outcomes of KMS and are derived from the various national and international rankings. The study linked the identified IDV to the DV to arrive at the conceptual model, which was then validated using structural equation modeling (SEM).

Empirical evidence supports the view that the components of KMS have a direct and significant impact on the student performance (SP) in HEIs, as reflected by the R^2 value of .67. It should be noted that knowledge empowers and therefore its proper management is an utmost priority, more so in this information age. KMS will immensely benefit both the students and their institutions. It becomes vital to build and also tap the immense energy, potential and skills that lay underneath in a student. Students should be given an opportunity to apply their knowledge to solve problems, improve performance and bring a difference in the lives of people on the ground level.

Table 20: Regression Results of Case Study

			Estimate	**S.E.**	**C.R.**	**P**	**Decision**
SP	<---	KCUL	.332	.088	3.756	***	Supported
SP	<---	ICT	.242	.077	3.161	.002	Supported
SP	<---	KT	.157	.073	2.137	.033	Supported
SP	<---	KC	.182	.069	2.655	.008	Supported
SP	<---	KS	-.036	.042	-.865	.387	Not Supported

The results presented that knowledge culture, Information and communication technology, Knowledge creation and knowledge transfer have a significant effect on performance, but knowledge storage does not. The results are similar to the one concluded in the present study.

CHAPTER 7

IMPLICATIONS FOR PRACTICE

The present research is a pioneering one in studying the impact of KMS on HEI's performance in India. The quantitative and qualitative analysis has been able to bring out a strong linkage between KMS and performance. The study establishes that to achieve excellent performance, the culture that promotes knowledge creation and sharing must be imbibed. Similarly, employment of technology can improve the quality of education through improved access to knowledge, collaboration, research and engagement. This proves that HEIs cannot ignore the role played by KM and ICT in their development. The research undertaken is not just a synthesis but also validates new parameters relevant today. The scale so developed can be used to measure the existence and usage of the knowledge management system in the institutions. The study also contributed to our understanding of how to effectively create and manage knowledge resources in an institution and frame productive strategies for its utilization.

In the context of developing countries like India, where material resources are not fully developed, knowledge resources and information systems can be garnered to provide a competitive edge. Though KM initiatives have begun in India at the policy level, they need to be applied honestly, used effectively and extended further to percolate the entire educational ecosystem. Some of these initiatives are the formulation of indigenous benchmarking mechanisms such as NAAC and NIRF.

Other efforts are creating Institutes of Eminence, GIAN (Global Initiative of Academic Networks) and IMPRINT to impact research, innovation and technology. Besides this, SWAYAM - an Indian massive open online course and National Digital Library- has been established. Also, the development of the model curriculum is in the pipeline (and near completion at the time of submission of the thesis), which will keep pace with the changing requirements worldwide and provide quality learning to the students (Devi, 2017). In this endeavor, India can refer its Asian counterparts who made to the list of top 30 universities through active research, benchmarking and best practices (OECD 2011; Lane 2017; THES 2018). Moreover, lessons could be learnt from first world countries like American and British Universities which have harnessed technology, teaching-learning and research capabilities to make an impressive foothold (MIT 2018; Oxford 2018).

This study helps us understand that research, innovation and harnessing young minds to solve challenges faced by society could make institutions global leaders. We should not forget that we are in a rapidly evolving scenario where innovations have the potential to disrupt the existing model. Such disruptions can have behavioral, economic and social ramifications. A continuous upkeep with such alterations will help academicians equip themselves for evolving classrooms and the changing nature of their jobs. If employed effectively, the new ICT enabled ecosystem will try to overcome issues related to the reach of education and accessibility of knowledge empowering common citizens.

7.1 Recommendations of the study

The study presents an empirical proof that KMS significantly affects performance; therefore, HEIs must transform themselves as knowledge hubs that can create, process and disseminate information for effective use faster.

(a) To achieve the goal of KC, the institutions must have research and development cells and innovation centers. For the generation and cross-fertilization of ideas, brainstorming, out-of-the-box thinking and experimentation be encouraged. Experts from the industry can also be called to share their viewpoints. An efficient mechanism should exist not only to generate but also to preserve and implement valuable ideas.

(b) To promote KT, academic events such as conferences, workshops and seminars be organized and meetings be scheduled frequently. They will serve as a platform for collecting and disseminating useful knowledge. Through continuous discussion and dialogue, the barriers to KT be identified and removed. Efforts must be made to create an amicable atmosphere where members can share their knowledge willingly with each other.

(c) By the research entourage, it is proposed that Kcul be present in the institution as an enabler. A strong positive culture marked by trust, involvement, continuous learning and best practices be created. Rewards should be instituted for knowledge creation and dissemination. Organizational members must be motivated to learn and their further education facilitated. Last but not least, feedback collected must be taken into account. Valuable knowledge accumulated must be applied for decision making and solving upcoming challenges proactively.

(d) KSR, though a vital aspect of KMS, could not come up as a significant factor. The finding suggests that having documents, databases and repositories is not enough; they should be appropriately organized and updated regularly. Organizational members must also be trained to retrieve the stored knowledge in times of need.

In KMS, the role of ICT cannot be ignored. The institutions must make available key academic and collaborative technologies to facilitate the further enhancement of knowledge.

(e) The mean value of T_infra is low and the standard deviation is high. The results of the t-test discovered the disparity in the availability of technological resources in the differently graded institutions. As infrastructure is found to significantly and positively affect performance, an investment in these resources can help HEI achieve better performance and higher ranking.

(f) As T_int significantly and positively affects performance, training should be imparted to faculty and students so that they can adapt to the latest software and technological tools. Technology can also be harnessed to engage learners in an enthralling and productive learning experience.

(g) The online COPs being low cost, convenient and popular technologies can be harnessed by HEIs to maximize the gains of mutual learning, collaboration, involvement, awareness and sense of community.

(h) As both the online and offline modes of teaching and learning have their share of advantages and disadvantages, they can be blended wisely to augment learning and productivity in HEIs.

7.2 Scope and Limitations

- The study is limited in scope and covered only the higher educational institutions in India.
- Only the components of KM and ICT were studied, while there may be other factors that affect the performance of educational institutions.
- The research is limited to a given period up to 2019. As the educational ecosystem is evolving very fast, research and analysis on a continuous basis is necessitated.
- In order to collect data, convenience sampling was used, as all the institutions were not equally accessible.
- The sampling is subject to geographical constraints.
- The scale for measuring performance of institutions needs further validation outside the country.

7.3 Future Scope

The current study is limited in scope and studied the effect of KM and ICT on the performance of educational institutions. However, in future, the impact of other factors like politico-legal and socio-economic environment, competition, internationalization, funding, fairness and equity on the performance of educational institutions could also be explored. In the future researches, the scope of this study may also be broadened by doing a comparative analysis between different countries to understand the similarities and dissimilarities in their KM practices and learn from realized outcomes. As the educational ecosystem is continuously evolving, the effect of disruptive and low-cost technological innovations on the educational ecosystem

could be further analyzed. Their applications, scope, opportunities and limitations, along with new educational policies of the government will open up a new arenas for research and investigation. As Microsoft's Satya Nadella (2020) remarked that due to coronavirus, "two years of digital transformation has happened in two months", it will also be relevant to study the long run and short run effect of pandemic on the educational ecosystem.

Addendum

At the time of submitting this thesis, a severe and deplorable outbreak emerged globally in the form of a pandemic called coronavirus or COVID-19, which has forced people to stay at home and maintain social distancing. Under such circumstances, the whole world is compelled to use online tools to avoid physical presence in offices, workplaces, schools, colleges and universities. Though an unfortunate event, it has established the indispensable utility of online or distance learning.

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APPENDICES

Appendix A: Descriptives with Detailed results of T-test and ANOVA

Descriptive Statistics of factors based on gender

"1" for male and "2" for female

Gender		N	Mean	Std. Deviation	Std. Error Mean
Fac_Kcul	1	305	4.9951	1.28414	0.07353
	2	308	5.3447	1.12339	0.06401
Fac_KP	1	305	5.0186	1.33512	0.07645
	2	308	5.3810	1.15982	0.06609
Fac_KT	1	305	5.7221	0.95566	0.05472
	2	308	5.9789	0.72695	0.04142
Fac_T_int	1	305	5.6041	1.08026	0.06186
	2	308	5.7378	0.85040	0.04846
Fac_KSR	1	305	4.9803	1.07961	0.06182
	2	308	5.2814	1.04105	0.05932
Fac_T_infra	1	305	3.5268	1.62540	0.09307
	2	308	3.4665	1.65346	0.09421
Fac_O_COP	1	305	5.1672	1.32457	0.07584
	2	308	5.3604	1.21204	0.06906
Fac_T_emerg	1	305	3.4142	1.42272	0.08146
	2	308	3.2641	1.55776	0.08876
Fac_KC	1	305	5.3257	1.28259	0.07344
	2	308	5.6374	1.09231	0.06224

		Levene's Test for Equality of Variances								
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Fac_Kcul	Equal variances assumed	6.193	0.013	-3.589	611	0.000	-0.34962	0.09742	-0.54094	-0.15829
	Equal variances not assumed			-3.586	598.812	0.000	-0.34962	0.09749	-0.54108	-0.15815

Descriptive Statistics of factors based on 'Type of institute'

"1" for public and "2" for private

Type of institute		N	Mean	Std. Deviation	Std. Error Mean
Fac_Kcul	1	392	5.2290	1.18380	0.05227
	2	221	4.8717	1.34566	0.13457
Fac_KP	1	392	5.3340	1.20275	0.05310
	2	221	4.5167	1.34246	0.13425
Fac_KT	1	392	5.8904	0.85527	0.03776
	2	221	5.6500	0.84462	0.08446
Fac_T_int	1	392	5.6725	0.97062	0.04285
	2	221	5.6650	0.99063	0.09906
Fac_KSR	1	392	5.1345	1.05917	0.04676
	2	221	5.1167	1.13051	0.11305
Fac_T_infra	1	392	3.5296	1.66499	0.07351
	2	221	3.3267	1.49145	0.14914
Fac_O_COP	1	392	5.2930	1.25783	0.05553
	2	221	5.1167	1.33869	0.13387
Fac_T_emerg	1	392	3.3574	1.50089	0.06627
	2	221	3.2433	1.45401	0.14540
Fac_KC	1	392	5.5016	1.20223	0.05308
	2	221	5.3833	1.18953	0.11895

		Levene's Test for Equality of Variances								
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Fac_Kcul	Equal variances assumed	6.171	0.013	2.699	611	0.007	0.35738	0.13243	0.09730	0.61745
	Equal variances not assumed			2.476	130.548	0.015	0.35738	0.14436	0.07179	0.64297

Descriptive Statistics of factors based on Position

"1" for Faculty, "2" for Students and "3" for Non-teaching or administrative staff

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Fac_Kcul	1	146	5.1175	1.27158	0.09869	4.9226	5.3123	1.50	7.00
	2	423	5.1801	1.21490	0.05907	5.0640	5.2962	1.00	7.00
	3	44	5.3750	0.84163	0.17180	5.0196	5.7304	4.00	6.83
	Total	613	5.1707	1.21769	0.04918	5.0742	5.2673	1.00	7.00
Fac_KP	1	146	5.3916	0.98727	0.07663	5.2403	5.5429	1.50	7.00
	2	423	5.1017	1.36733	0.06648	4.9710	5.2323	1.00	7.00
	3	44	5.6250	0.68145	0.13910	5.3372	5.9128	4.33	6.67
	Total	613	5.2007	1.26219	0.05098	5.1005	5.3008	1.00	7.00
Fac_KT	1	146	6.0602	0.69368	0.05384	5.9539	6.1665	3.75	7.00
	2	423	5.7754	0.89501	0.04352	5.6899	5.8610	1.25	7.00
	3	44	5.7396	0.99039	0.20216	5.3214	6.1578	3.75	7.00
	Total	613	5.8511	0.85747	0.03463	5.7831	5.9192	1.25	7.00
Fac_Tint	1	146	5.7259	0.94116	0.07305	5.5817	5.8701	2.25	7.00
	2	423	5.6223	0.99180	0.04822	5.5276	5.7171	2.00	7.00
	3	44	6.1563	0.69475	0.14182	5.8629	6.4496	3.75	7.00
	Total	613	5.6713	0.97310	0.03930	5.5941	5.7485	2.00	7.00
Fac_KSR	1	146	5.0643	1.09293	0.08483	4.8968	5.2317	2.00	7.00
	2	423	5.1781	1.06987	0.05202	5.0758	5.2803	1.00	7.00
	3	44	4.7778	0.83791	0.17104	4.4240	5.1316	2.33	6.00
	Total	613	5.1316	1.07020	0.04322	5.0467	5.2165	1.00	7.00
Fac_Tinfra	1	146	3.4357	1.57534	0.12227	3.1943	3.6772	1.00	7.00
	2	423	3.5169	1.67900	0.08164	3.3565	3.6774	1.00	7.00
	3	44	3.5556	1.36791	0.27922	2.9779	4.1332	1.33	6.33
	Total	613	3.4965	1.63850	0.06618	3.3665	3.6264	1.00	7.00
Fac_O_COP	1	146	5.0783	1.28232	0.09953	4.8818	5.2748	1.67	7.00
	2	423	5.3255	1.25980	0.06125	5.2051	5.4459	1.00	7.00
	3	44	5.4722	1.32940	0.27136	4.9109	6.0336	2.00	7.00
	Total	613	5.2643	1.27192	0.05137	5.1634	5.3652	1.00	7.00
Fac_Temerg	1	146	3.5060	1.46415	0.11364	3.2816	3.7304	1.00	7.00
	2	423	3.2845	1.50275	0.07307	3.1409	3.4281	1.00	7.00
	3	44	3.1389	1.47742	0.30158	2.5150	3.7627	1.00	6.00
	Total	613	3.3388	1.49277	0.06029	3.2204	3.4572	1.00	7.00
Fac_KC	1	146	5.7972	0.95542	0.07415	5.6508	5.9436	1.67	7.00
	2	423	5.3696	1.26076	0.06130	5.2491	5.4901	1.00	7.00
	3	44	5.2917	1.27143	0.25953	4.7548	5.8285	2.67	7.00
	Total	613	5.4823	1.20000	0.04847	5.3871	5.5775	1.00	7.00

Test of homogeneity of variances

		Levene Statistic	df1	df2	Sig.
Fac_kcul	Based on Mean	2.929	2	610	0.054
Fac_KP	Based on Mean	16.730	2	610	0.000
Fac_KT	Based on Mean	3.445	2	610	0.033
Fac_Tint	Based on Mean	2.064	2	610	0.128
Fac_KSR	Based on Mean	0.860	2	610	0.424
Fac_Tinfra	Based on Mean	0.953	2	610	0.386
Fac_O_COP	Based on Mean	0.170	2	610	0.843
Fac_Temerg	Based on Mean	0.516	2	610	0.597
Fac_KC	Based on Mean	7.285	2	610	0.001

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Fac_kcul	Between Groups	1.509	2	0.755	0.508	0.602
	Within Groups	905.953	610	1.485		
	Total	907.462	612			
Fac_KP	Between Groups	14.518	2	7.259	4.610	0.010
	Within Groups	960.469	610	1.575		
	Total	974.986	612			
Fac_KT	Between Groups	9.982	2	4.991	6.920	0.001
	Within Groups	439.997	610	0.721		
	Total	449.979	612			
Fac_Tint	Between Groups	7.153	2	3.577	3.812	0.023
	Within Groups	572.362	610	0.938		
	Total	579.515	612			
Fac_KSR	Between Groups	4.672	2	2.336	2.046	0.130
	Within Groups	696.269	610	1.141		
	Total	700.940	612			
Fac_Tinfra	Between Groups	0.873	2	0.437	0.162	0.850
	Within Groups	1642.147	610	2.692		
	Total	1643.020	612			
Fac_O_COP	Between Groups	8.362	2	4.181	2.598	0.075
	Within Groups	981.715	610	1.609		
	Total	990.076	612			
Fac_Temerg	Between Groups	6.849	2	3.425	1.540	0.215
	Within Groups	1356.910	610	2.224		
	Total	1363.760	612			
Fac_KC	Between Groups	22.706	2	11.353	8.066	0.000
	Within Groups	858.575	610	1.407		
	Total	881.281	612			

Robust tests of equality of means

		Statistic[a]	df1	df2	Sig.
Fac_Kcul	Welch	0.836	2	65.816	0.438
Fac_KP	Welch	7.649	2	72.186	0.001
Fac_KT	Welch	8.631	2	60.829	0.001
Fac_Tint	Welch	6.444	2	65.565	0.003
Fac_KSR	Welch	2.808	2	63.843	0.068
Fac_Tinfra	Welch	0.175	2	63.356	0.840
Fac_O_COP	Welch	2.510	2	60.712	0.090
Fac_Temerg	Welch	1.561	2	61.361	0.218
Fac_KC	Welch	10.220	2	61.451	0.000

Multiple Comparisons

Dependent Variable				Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
							Lower Bound	Upper Bound
Fac_KC	Tukey HSD	1	2	.42761*	0.10866	0.000	0.1723	0.6829
			3	0.50552	0.25908	0.125	-0.1032	1.1142
		2	1	-.42761*	0.10866	0.000	-0.6829	-0.1723
			3	0.07792	0.24894	0.947	-0.5070	0.6628
		3	1	-0.50552	0.25908	0.125	-1.1142	0.1032
			2	-0.07792	0.24894	0.947	-0.6628	0.5070
	Games-Howell	1	2	.42761*	0.09621	0.000	0.2013	0.6540
			3	0.50552	0.26992	0.166	-0.1639	1.1749
		2	1	-.42761*	0.09621	0.000	-0.6540	-0.2013
			3	0.07792	0.26667	0.954	-0.5853	0.7411
		3	1	-0.50552	0.26992	0.166	-1.1749	0.1639
			2	-0.07792	0.26667	0.954	-0.7411	0.5853

Descriptives - Educational qualifications

"1" for Pursuing graduation, "2" for Graduates, "3" for Pursuing post-graduation, "4" for Post-graduates, "5" for Full-time research scholars and "6" for PhD.

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Fac_Kcul	1	169	5.1714	1.24689	0.07465	5.0245	5.3184	1.00	7.00
	2	61	4.9127	1.02146	0.22290	4.4477	5.3777	2.50	6.83
	3	98	5.1446	1.22302	0.12354	4.8994	5.3898	1.50	7.00
	4	112	5.1871	1.19963	0.11236	4.9645	5.4097	1.50	7.00
	5	95	5.2698	1.29151	0.28183	4.6820	5.8577	2.50	7.00
	6	78	5.2137	1.20182	0.13608	4.9427	5.4846	1.67	7.00
	Total	613	5.1699	1.21952	0.04934	5.0730	5.2668	1.00	7.00
Fac_KP	1	169	5.2634	1.35975	0.08141	5.1032	5.4237	1.00	7.00
	2	61	4.9127	1.07448	0.23447	4.4236	5.4018	2.83	6.33
	3	98	4.4983	1.34584	0.13595	4.2285	4.7681	1.17	7.00
	4	112	5.5658	0.88265	0.08267	5.4020	5.7296	2.33	7.00
	5	95	5.4841	1.02997	0.22476	5.0153	5.9530	2.67	7.00
	6	78	5.3141	1.03544	0.11724	5.0806	5.5476	1.50	7.00
	Total	613	5.1991	1.26339	0.05111	5.0988	5.2995	1.00	7.00
Fac_KT	1	169	5.7554	0.91228	0.05462	5.6479	5.8629	1.25	7.00
	2	61	5.6905	0.77824	0.16983	5.3362	6.0447	3.75	7.00
	3	98	5.7781	0.89880	0.09079	5.5979	5.9583	2.00	7.00
	4	112	5.9693	0.78576	0.07359	5.8235	6.1151	3.50	7.00
	5	95	6.0714	0.67149	0.14653	5.7658	6.3771	4.25	7.00
	6	78	6.0929	0.70608	0.07995	5.9338	6.2521	4.00	7.00
	Total	613	5.8507	0.85872	0.03474	5.7824	5.9189	1.25	7.00
Fac_Tint	1	169	5.5833	0.97979	0.05866	5.4679	5.6988	2.00	7.00
	2	61	5.4881	1.17387	0.25616	4.9538	6.0224	2.50	7.00
	3	98	5.6862	1.00982	0.10201	5.4838	5.8887	2.00	7.00
	4	112	5.8224	0.89103	0.08345	5.6570	5.9877	2.25	7.00
	5	95	5.9762	0.94507	0.20623	5.5460	6.4064	3.00	7.00
	6	78	5.7147	0.96002	0.10870	5.4983	5.9312	2.50	7.00
	Total	613	5.6714	0.97466	0.03943	5.5940	5.7489	2.00	7.00
Fac_KSR	1	169	5.1840	1.06033	0.06348	5.0590	5.3090	1.00	7.00
	2	61	5.0476	0.85170	0.18586	4.6599	5.4353	2.67	6.67

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
	3	98	5.1190	1.14399	0.11556	4.8897	5.3484	1.33	7.00
	4	112	5.1784	1.04959	0.09830	4.9836	5.3731	2.00	7.00
	5	95	5.1429	0.91026	0.19863	4.7285	5.5572	3.67	6.67
	6	78	4.8932	1.11980	0.12679	4.6407	5.1456	2.00	7.00
	Total	613	5.1293	1.06911	0.04325	5.0444	5.2142	1.00	7.00
Fac_Tinfra	1	169	3.3429	1.67095	0.10004	3.1460	3.5398	1.00	7.00
	2	61	3.6825	1.61065	0.35147	2.9494	4.4157	1.00	6.33
	3	98	3.5102	1.58617	0.16023	3.1922	3.8282	1.00	7.00
	4	112	3.7690	1.49409	0.13993	3.4918	4.0462	1.00	7.00
	5	95	4.7619	1.54252	0.33661	4.0598	5.4641	2.00	7.00
	6	78	3.2350	1.67238	0.18936	2.8580	3.6121	1.00	7.00
	Total	613	3.4959	1.64071	0.06638	3.3656	3.6263	1.00	7.00
Fac_O_COP	1	169	5.2951	1.29907	0.07777	5.1420	5.4482	1.00	7.00
	2	61	5.0317	1.37802	0.30071	4.4045	5.6590	2.00	7.00
	3	98	5.3163	1.19312	0.12052	5.0771	5.5555	1.67	7.00
	4	112	5.2193	1.26819	0.11878	4.9840	5.4546	2.33	7.00
	5	95	5.8095	1.14781	0.25047	5.2870	6.3320	2.33	7.00
	6	78	5.0769	1.27686	0.14458	4.7890	5.3648	1.67	7.00
	Total	613	5.2651	1.27377	0.05153	5.1639	5.3663	1.00	7.00
Fac_Temerg	1	169	3.0370	1.51195	0.09052	2.8588	3.2152	1.00	7.00
	2	61	3.5079	1.48181	0.32336	2.8334	4.1824	1.00	6.00
	3	98	3.5986	1.41418	0.14285	3.3151	3.8822	1.00	7.00
	4	112	3.4766	1.53233	0.14352	3.1923	3.7609	1.00	7.00
	5	95	4.5556	0.99629	0.21741	4.1021	5.0091	2.33	6.00
	6	78	3.5385	1.30072	0.14728	3.2452	3.8317	1.00	6.67
	Total	613	3.3415	1.49197	0.06036	3.2230	3.4601	1.00	7.00
Fac_KC	1	169	5.3943	1.28443	0.07690	5.2429	5.5456	1.00	7.00
	2	61	4.9841	1.07743	0.23511	4.4937	5.4746	2.00	6.33
	3	98	5.2483	1.26935	0.12822	4.9938	5.5028	1.00	7.00
	4	112	5.6433	1.11812	0.10472	5.4358	5.8507	1.67	7.00
	5	95	5.7302	0.91055	0.19870	5.3157	6.1446	4.00	7.00
	6	78	5.9017	0.83070	0.09406	5.7144	6.0890	3.00	7.00
	Total	613	5.4795	1.20097	0.04859	5.3841	5.5750	1.00	7.00

Test of Homogeneity of Variances

		Levene Statistic	df1	df2	Sig.
Fac_Kcul	Based on Mean	0.378	5	605	0.864
Fac_KP	Based on Mean	6.802	5	605	0.000
Fac_KT	Based on Mean	0.570	5	605	0.723
Fac_Tint	Based on Mean	0.763	5	605	0.577
Fac_KSR	Based on Mean	0.858	5	605	0.509
Fac_Tinfra	Based on Mean	0.517	5	605	0.764
Fac_O_COP	Based on Mean	0.445	5	605	0.817
Fac_Temerg	Based on Mean	2.288	5	605	0.045
Fac_KC	Based on Mean	4.224	5	605	0.001

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Fac_Kcul	Between Groups	1.846	5	0.369	0.247	0.941
	Within Groups	905.370	605	1.496		
	Total	907.216	610			
Fac_KP	Between Groups	69.074	5	13.815	9.239	0.000
	Within Groups	904.588	605	1.495		
	Total	973.662	610			
Fac_KT	Between Groups	10.795	5	2.159	2.975	0.012
	Within Groups	439.014	605	0.726		
	Total	449.810	610			
Fac_Tint	Between Groups	7.587	5	1.517	1.605	0.157
	Within Groups	571.893	605	0.945		
	Total	579.479	610			
Fac_KSR	Between Groups	5.613	5	1.123	0.982	0.428
	Within Groups	691.618	605	1.143		
	Total	697.230	610			
Fac_Tinfra	Between Groups	54.752	5	10.950	4.174	0.001
	Within Groups	1587.321	605	2.624		
	Total	1642.073	610			
Fac_O_COP	Between Groups	10.877	5	2.175	1.345	0.244
	Within Groups	978.837	605	1.618		
	Total	989.714	610			
Fac_Temerg	Between Groups	68.984	5	13.797	6.476	0.000
	Within Groups	1288.864	605	2.130		
	Total	1357.848	610			
Fac_KC	Between Groups	30.700	5	6.140	4.375	0.001
	Within Groups	849.127	605	1.404		
	Total	879.828	610			

Robust Tests of Equality of Means

		Statistic[a]	df1	df2	Sig.
Fac_Kcul	Welch	0.316	5	100.407	0.902
Fac_KP	Welch	9.431	5	101.478	0.000
Fac_KT	Welch	3.505	5	102.065	0.006
Fac_Tint	Welch	1.627	5	98.866	0.160
Fac_KSR	Welch	0.909	5	101.489	0.479
Fac_Tinfra	Welch	4.362	5	99.900	0.001
Fac_O_COP	Welch	1.458	5	99.835	0.210
Fac_Temerg	Welch	9.267	5	102.501	0.000
Fac_KC	Welch	6.046	5	102.490	0.000
a. Asymptotically F distributed.					

Multiple Comparisons

Fac_Temerg	Tukey HSD	1	2	-0.47090	0.33027	0.711	-1.4151	0.4733
			3	-.56160*	0.17139	0.014	-1.0516	-0.0716
			4	-0.43957	0.16224	0.075	-0.9034	0.0243
			5	-1.51852*	0.33027	0.000	-2.4627	-0.5743
			6	-0.50142	0.18694	0.080	-1.0359	0.0330
		2	1	0.47090	0.33027	0.711	-0.4733	1.4151
			3	-0.09070	0.35098	1.000	-1.0941	0.9127
			4	0.03133	0.34660	1.000	-0.9596	1.0222
			5	-1.04762	0.45043	0.185	-2.3354	0.2401
			6	-0.03053	0.35883	1.000	-1.0564	0.9953
		3	1	.56160*	0.17139	0.014	0.0716	1.0516
			2	0.09070	0.35098	1.000	-0.9127	1.0941
			4	0.12203	0.20106	0.991	-0.4528	0.6968
			5	-0.95692	0.35098	0.072	-1.9603	0.0465
			6	0.06018	0.22147	1.000	-0.5730	0.6933
		4	1	0.43957	0.16224	0.075	-0.0243	0.9034
			2	-0.03133	0.34660	1.000	-1.0222	0.9596
			3	-0.12203	0.20106	0.991	-0.6968	0.4528
			5	-1.07895*	0.34660	0.024	-2.0698	-0.0881
			6	-0.06185	0.21448	1.000	-0.6750	0.5513
		5	1	1.51852*	0.33027	0.000	0.5743	2.4627
			2	1.04762	0.45043	0.185	-0.2401	2.3354
			3	0.95692	0.35098	0.072	-0.0465	1.9603
			4	1.07895*	0.34660	0.024	0.0881	2.0698
			6	1.01709	0.35883	0.053	-0.0088	2.0429
		6	1	0.50142	0.18694	0.080	-0.0330	1.0359
			2	0.03053	0.35883	1.000	-0.9953	1.0564
			3	-0.06018	0.22147	1.000	-0.6933	0.5730
			4	0.06185	0.21448	1.000	-0.5513	0.6750
			5	-1.01709	0.35883	0.053	-2.0429	0.0088
	Games-	1	2	-0.47090	0.33579	0.725	-1.5119	0.5701

	Howell		3	-.56160*	0.16912	0.014	-1.0488	-0.0744
			4	-0.43957	0.16968	0.104	-0.9277	0.0485
			5	-1.51852*	0.23550	0.000	-2.2391	-0.7979
			6	-.50142*	0.17287	0.049	-1.0009	-0.0019
		2	1	0.47090	0.33579	0.725	-0.5701	1.5119
			3	-0.09070	0.35351	1.000	-1.1701	0.9886
			4	0.03133	0.35378	1.000	-1.0485	1.1112
			5	-1.04762	0.38965	0.103	-2.2217	0.1265
			6	-0.03053	0.35532	1.000	-1.1141	1.0531
		3	1	.56160*	0.16912	0.014	0.0744	1.0488
			2	0.09070	0.35351	1.000	-0.9886	1.1701
			4	0.12203	0.20249	0.991	-0.4604	0.7045
			5	-.95692*	0.26014	0.009	-1.7358	-0.1780
			6	0.06018	0.20518	1.000	-0.5312	0.6516
		4	1	0.43957	0.16968	0.104	-0.0485	0.9277
			2	-0.03133	0.35378	1.000	-1.1112	1.0485
			3	-0.12203	0.20249	0.991	-0.7045	0.4604
			5	-1.07895*	0.26051	0.002	-1.8585	-0.2993
			6	-0.06185	0.20564	1.000	-0.6542	0.5305
		5	1	1.51852*	0.23550	0.000	0.7979	2.2391
			2	1.04762	0.38965	0.103	-0.1265	2.2217
			3	.95692*	0.26014	0.009	0.1780	1.7358
			4	1.07895*	0.26051	0.002	0.2993	1.8585
			6	1.01709*	0.26260	0.005	0.2317	1.8025
		6	1	.50142*	0.17287	0.049	0.0019	1.0009
			2	0.03053	0.35532	1.000	-1.0531	1.1141
			3	-0.06018	0.20518	1.000	-0.6516	0.5312
			4	0.06185	0.20564	1.000	-0.5305	0.6542
			5	-1.01709*	0.26260	0.005	-1.8025	-0.2317
Fac_KC	Tukey HSD	1	2	0.41014	0.26808	0.645	-0.3563	1.1765
			3	0.14597	0.13911	0.901	-0.2517	0.5437
			4	-0.24901	0.13169	0.409	-0.6255	0.1275
			5	-0.33589	0.26808	0.810	-1.1023	0.4305
			6	-.50744*	0.15174	0.011	-0.9412	-0.0736
		2	1	-0.41014	0.26808	0.645	-1.1765	0.3563
			3	-0.26417	0.28488	0.939	-1.0786	0.5503
			4	-0.65915	0.28133	0.179	-1.4634	0.1451
			5	-0.74603	0.36561	0.321	-1.7913	0.2992
			6	-.91758*	0.29125	0.021	-1.7502	-0.0849
		3	1	-0.14597	0.13911	0.901	-0.5437	0.2517
			2	0.26417	0.28488	0.939	-0.5503	1.0786
			4	-0.39498	0.16320	0.151	-0.8615	0.0716
			5	-0.48186	0.28488	0.538	-1.2963	0.3326
			6	-.65341*	0.17976	0.004	-1.1673	-0.1395
		4	1	0.24901	0.13169	0.409	-0.1275	0.6255
			2	0.65915	0.28133	0.179	-0.1451	1.4634
			3	0.39498	0.16320	0.151	-0.0716	0.8615

			5	-0.08688	0.28133	1.000	-0.8912	0.7174
			6	-0.25843	0.17408	0.674	-0.7561	0.2393
		5	1	0.33589	0.26808	0.810	-0.4305	1.1023
			2	0.74603	0.36561	0.321	-0.2992	1.7913
			3	0.48186	0.28488	0.538	-0.3326	1.2963
			4	0.08688	0.28133	1.000	-0.7174	0.8912
			6	-0.17155	0.29125	0.992	-1.0042	0.6611
		6	1	.50744*	0.15174	0.011	0.0736	0.9412
			2	.91758*	0.29125	0.021	0.0849	1.7502
			3	.65341*	0.17976	0.004	0.1395	1.1673
			4	0.25843	0.17408	0.674	-0.2393	0.7561
			5	0.17155	0.29125	0.992	-0.6611	1.0042
	Games-Howell	1	2	0.41014	0.24737	0.570	-0.3535	1.1737
			3	0.14597	0.14951	0.925	-0.2850	0.5769
			4	-0.24901	0.12992	0.395	-0.6223	0.1242
			5	-0.33589	0.21306	0.620	-0.9898	0.3180
			6	-.50744*	0.12149	0.001	-0.8572	-0.1577
		2	1	-0.41014	0.24737	0.570	-1.1737	0.3535
			3	-0.26417	0.26781	0.919	-1.0738	0.5455
			4	-0.65915	0.25738	0.140	-1.4447	0.1264
			5	-0.74603	0.30783	0.173	-1.6684	0.1763
			6	-.91758*	0.25323	0.014	-1.6940	-0.1412
		3	1	-0.14597	0.14951	0.925	-0.5769	0.2850
			2	0.26417	0.26781	0.919	-0.5455	1.0738
			4	-0.39498	0.16555	0.166	-0.8715	0.0815
			5	-0.48186	0.23648	0.341	-1.1906	0.2269
			6	-.65341*	0.15902	0.001	-1.1119	-0.1950
		4	1	0.24901	0.12992	0.395	-0.1242	0.6223
			2	0.65915	0.25738	0.140	-0.1264	1.4447
			3	0.39498	0.16555	0.166	-0.0815	0.8715
			5	-0.08688	0.22461	0.999	-0.7670	0.5932
			6	-0.25843	0.14076	0.445	-0.6637	0.1468
		5	1	0.33589	0.21306	0.620	-0.3180	0.9898
			2	0.74603	0.30783	0.173	-0.1763	1.6684
			3	0.48186	0.23648	0.341	-0.2269	1.1906
			4	0.08688	0.22461	0.999	-0.5932	0.7670
			6	-0.17155	0.21984	0.969	-0.8408	0.4977
		6	1	.50744*	0.12149	0.001	0.1577	0.8572
			2	.91758*	0.25323	0.014	0.1412	1.6940
			3	.65341*	0.15902	0.001	0.1950	1.1119
			4	0.25843	0.14076	0.445	-0.1468	0.6637
			5	0.17155	0.21984	0.969	-0.4977	0.8408

*. The mean difference is significant at the 0.05 level.

Descriptives for NAAC grades

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Fac_Kcul	A++	60	5.8500	0.90079	0.28485	5.2056	6.4944	4.17	7.00
	A+	162	5.2925	1.18893	0.06346	5.1677	5.4173	1.00	7.00
	A	121	4.9383	1.28450	0.10351	4.7338	5.1428	1.67	7.00
	B++	72	5.0893	1.21503	0.22962	4.6181	5.5604	1.50	7.00
	B+	106	5.3565	0.97846	0.16308	5.0254	5.6875	2.17	7.00
	B	51	4.7222	0.38490	0.22222	3.7661	5.6784	4.50	5.17
	NA	41	4.6290	1.29150	0.23196	4.1553	5.1028	2.67	7.00
	Total	613	5.1707	1.21769	0.04918	5.0742	5.2673	1.00	7.00
Fac_KP	A++	60	5.9833	1.31808	0.41681	5.0404	6.9262	2.67	7.00
	A+	162	5.5655	1.05061	0.05608	5.4552	5.6758	1.67	7.00
	A	121	4.5823	1.35028	0.10881	4.3673	4.7972	1.00	7.00
	B++	72	4.8155	1.09276	0.20651	4.3917	5.2392	2.17	6.83
	B+	106	5.0231	1.32566	0.22094	4.5746	5.4717	1.50	7.00
	B	51	4.4444	0.58531	0.33793	2.9904	5.8984	3.83	5.00
	NA	41	4.5161	1.48720	0.26711	3.9706	5.0616	1.17	6.67
	Total	613	5.2007	1.26219	0.05098	5.1005	5.3008	1.00	7.00
Fac_KT	A++	60	6.3750	0.83541	0.26418	5.7774	6.9726	4.50	7.00
	A+	162	5.8925	0.90987	0.04857	5.7969	5.9880	1.25	7.00
	A	121	5.8295	0.72463	0.05839	5.7142	5.9449	3.00	7.00
	B++	72	5.6429	0.84555	0.15979	5.3150	5.9707	4.25	7.00
	B+	106	5.6181	0.93060	0.15510	5.3032	5.9329	3.50	7.00
	B	51	5.7500	0.25000	0.14434	5.1290	6.3710	5.50	6.00
	NA	41	5.7903	0.75580	0.13575	5.5131	6.0676	4.00	7.00
	Total	613	5.8511	0.85747	0.03463	5.7831	5.9192	1.25	7.00
Fac_Tint	A++	60	6.1000	0.66875	0.21148	5.6216	6.5784	5.25	7.00
	A+	162	5.6588	0.98319	0.05248	5.5556	5.7620	2.00	7.00
	A	121	5.6705	0.98382	0.07928	5.5138	5.8271	2.25	7.00
	B++	72	5.5268	1.07009	0.20223	5.1118	5.9417	3.75	7.00
	B+	106	5.8264	0.90004	0.15001	5.5219	6.1309	3.00	7.00
	B	51	4.6667	0.57735	0.33333	3.2324	6.1009	4.00	5.00
	NA	41	5.7258	0.86928	0.15613	5.4070	6.0447	3.00	7.00
	Total	613	5.6713	0.97310	0.03930	5.5941	5.7485	2.00	7.00
Fac_KSR	A++	60	5.7667	0.81725	0.25844	5.1820	6.3513	4.00	7.00
	A+	162	5.1871	0.99178	0.05294	5.0830	5.2912	1.33	7.00
	A	121	4.9848	1.17363	0.09457	4.7980	5.1717	1.33	7.00
	B++	72	5.1190	1.31222	0.24799	4.6102	5.6279	2.00	7.00
	B+	106	5.3704	0.80387	0.13398	5.0984	5.6424	3.67	7.00
	B	51	4.5556	2.21944	1.28140	-0.9578	10.0690	2.00	6.00
	NA	41	4.8172	1.24377	0.22339	4.3610	5.2734	1.00	6.33

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
	Total	613	5.1316	1.07020	0.04322	5.0467	5.2165	1.00	7.00
Fac_Tinfra	A++	60	5.5000	1.36309	0.43105	4.5249	6.4751	3.67	7.00
	A+	162	3.6562	1.64255	0.08767	3.4838	3.8287	1.00	7.00
	A	121	3.2446	1.54668	0.12464	2.9984	3.4908	1.00	7.00
	B++	72	2.7262	1.54774	0.29250	2.1260	3.3263	1.00	6.33
	B+	106	3.0926	1.34190	0.22365	2.6386	3.5466	1.00	6.67
	B	51	3.0000	0.88192	0.50918	0.8092	5.1908	2.00	3.67
	NA	41	3.5054	1.86760	0.33543	2.8203	4.1904	1.00	7.00
	Total	613	3.4965	1.63850	0.06618	3.3665	3.6264	1.00	7.00
Fac_O_COP	A++	60	5.2333	1.32451	0.41885	4.2858	6.1808	2.33	7.00
	A+	162	5.3438	1.23374	0.06585	5.2143	5.4733	1.33	7.00
	A	121	5.1126	1.30371	0.10506	4.9050	5.3201	1.00	7.00
	B++	72	5.2143	1.27403	0.24077	4.7203	5.7083	3.00	7.00
	B+	106	5.5185	1.33201	0.22200	5.0678	5.9692	2.00	7.00
	B	51	3.2222	0.69389	0.40062	1.4985	4.9459	2.67	4.00
	NA	41	5.0753	1.32696	0.23833	4.5885	5.5620	1.00	7.00
	Total	613	5.2643	1.27192	0.05137	5.1634	5.3652	1.00	7.00
Fac_Temerg	A++	60	4.4000	0.60451	0.19116	3.9676	4.8324	3.33	5.00
	A+	162	3.4046	1.51322	0.08077	3.2457	3.5634	1.00	7.00
	A	121	3.2446	1.44873	0.11674	3.0140	3.4752	1.00	7.00
	B++	72	2.6667	1.29259	0.24428	2.1655	3.1679	1.00	5.33
	B+	106	3.3519	1.53052	0.25509	2.8340	3.8697	1.00	6.33
	B	51	1.7778	0.19245	0.11111	1.2997	2.2559	1.67	2.00
	NA	41	3.4624	1.59322	0.28615	2.8780	4.0468	1.00	6.67
	Total	613	3.3388	1.49277	0.06029	3.2204	3.4572	1.00	7.00
Fac_KC	A++	60	5.8333	0.91961	0.29081	5.1755	6.4912	4.33	7.00
	A+	162	5.6182	1.13886	0.06079	5.4987	5.7378	1.00	7.00
	A	121	5.2468	1.21406	0.09783	5.0535	5.4400	1.67	7.00
	B++	72	5.0952	1.42828	0.26992	4.5414	5.6491	1.67	7.00
	B+	106	5.6389	1.21466	0.20244	5.2279	6.0499	2.33	7.00
	B	51	5.4444	0.50918	0.29397	4.1796	6.7093	5.00	6.00
	NA	41	5.1720	1.44497	0.25952	4.6420	5.7021	1.00	7.00
	Total	613	5.4823	1.20000	0.04847	5.3871	5.5775	1.00	7.00

Test of Homogeneity of Variances					
		Levene Statistic	df1	df2	Sig.
Fac_Kcul	Based on Mean	1.957	6	606	0.070
Fac_KP	Based on Mean	5.787	6	606	0.000
Fac_KT	Based on Mean	0.926	6	606	0.475
Fac_Tint	Based on Mean	0.795	6	606	0.574
Fac_KSR	Based on Mean	2.862	6	606	0.009
Fac_Tinfra	Based on Mean	1.572	6	606	0.153
Fac_O_COP	Based on Mean	0.421	6	606	0.865
Fac_Temerg	Based on Mean	2.687	6	606	0.014
Fac_KC	Based on Mean	1.187	6	606	0.311

ANOVA

		Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
Fac_Kcul	Between Groups	29.265	6	4.878	3.366	0.003
	Within Groups	878.197	606	1.449		
	Total	907.462	612			
Fac_KP	Between Groups	133.278	6	22.213	15.993	0.000
	Within Groups	841.708	606	1.389		
	Total	974.986	612			
Fac_KT	Between Groups	6.731	6	1.122	1.534	0.165
	Within Groups	443.248	606	0.731		
	Total	449.979	612			
Fac_Tint	Between Groups	6.463	6	1.077	1.139	0.338
	Within Groups	573.052	606	0.946		
	Total	579.515	612			
Fac_KSR	Between Groups	14.547	6	2.424	2.140	0.047
	Within Groups	686.394	606	1.133		
	Total	700.940	612			
Fac_Tinfra	Between Groups	82.097	6	13.683	5.312	0.000
	Within Groups	1560.923	606	2.576		
	Total	1643.020	612			
Fac_O_COP	Between Groups	21.788	6	3.631	2.273	0.035
	Within Groups	968.289	606	1.598		
	Total	990.076	612			
Fac_Temerg	Between Groups	34.585	6	5.764	2.628	0.016
	Within Groups	1329.174	606	2.193		
	Total	1363.760	612			
Fac_KC	Between Groups	24.328	6	4.055	2.867	0.009
	Within Groups	856.953	606	1.414		
	Total	881.281	612			

Robust Tests of Equality of Means

		Statistic[a]	df1	df2	Sig.
Fac_Kcul	Welch	3.716	6	24.453	0.009
Fac_KP	Welch	13.211	6	23.326	0.000
Fac_KT	Welch	1.377	6	24.621	0.263
Fac_Tint	Welch	2.181	6	23.419	0.082
Fac_KSR	Welch	2.074	6	22.911	0.096
Fac_Tinfra	Welch	5.851	6	23.413	0.001
Fac_O_COP	Welch	4.575	6	23.319	0.003
Fac_Temerg	Welch	31.519	6	31.900	0.000
Fac_KC	Welch	2.358	6	23.670	0.063
a. Asymptotically F distributed.					

Multiple Comparisons

(Here 1 stands for NAAC grade A++, 2 for A+, 3 for A, 4 for B++, 5 for B+, 6 for B and 7 for NA)

Dependent Variable				Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
							Lower Bound	Upper Bound
Fac_Tinfra	Tukey HSD	1	2	1.84378*	0.51470	0.007	0.3212	3.3664
			3	2.25541*	0.52374	0.000	0.7060	3.8048
			4	2.77381*	0.59124	0.000	1.0247	4.5229
			5	2.40741*	0.57370	0.001	0.7103	4.1046
			6	2.50000	1.05649	0.215	-0.6254	5.6254
			7	1.99462*	0.58367	0.012	0.2680	3.7213
		2	1	-1.84378*	0.51470	0.007	-3.3664	-0.3212
			3	0.41163	0.15513	0.112	-0.0473	0.8705
			4	0.93003	0.31517	0.051	-0.0023	1.8624
			5	0.56363	0.28087	0.411	-0.2673	1.3945
			6	0.65622	0.93055	0.992	-2.0966	3.4091
			7	0.15084	0.30071	0.999	-0.7387	1.0404
		3	1	-2.25541*	0.52374	0.000	-3.8048	-0.7060
			2	-0.41163	0.15513	0.112	-0.8705	0.0473
			4	0.51840	0.32972	0.700	-0.4570	1.4938
			5	0.15200	0.29711	0.999	-0.7269	1.0309
			6	0.24459	0.93559	1.000	-2.5231	3.0123
			7	-0.26079	0.31594	0.982	-1.1954	0.6738

Dependent Variable				Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
							Lower Bound	Upper Bound
		4	1	-2.77381*	0.59124	0.000	-4.5229	-1.0247
			2	-0.93003	0.31517	0.051	-1.8624	0.0023
			3	-0.51840	0.32972	0.700	-1.4938	0.4570
			5	-0.36640	0.40440	0.972	-1.5627	0.8299
			6	-0.27381	0.97498	1.000	-3.1581	2.6104
			7	-0.77919	0.41843	0.506	-2.0170	0.4586
		5	1	-2.40741*	0.57370	0.001	-4.1046	-0.7103
			2	-0.56363	0.28087	0.411	-1.3945	0.2673
			3	-0.15200	0.29711	0.999	-1.0309	0.7269
			4	0.36640	0.40440	0.972	-0.8299	1.5627
			6	0.09259	0.96444	1.000	-2.7605	2.9457
			7	-0.41278	0.39324	0.942	-1.5761	0.7505
		6	1	-2.50000	1.05649	0.215	-5.6254	0.6254
			2	-0.65622	0.93055	0.992	-3.4091	2.0966
			3	-0.24459	0.93559	1.000	-3.0123	2.5231
			4	0.27381	0.97498	1.000	-2.6104	3.1581
			5	-0.09259	0.96444	1.000	-2.9457	2.7605
			7	-0.50538	0.97040	0.999	-3.3761	2.3653
		7	1	-1.99462*	0.58367	0.012	-3.7213	-0.2680
			2	-0.15084	0.30071	0.999	-1.0404	0.7387
			3	0.26079	0.31594	0.982	-0.6738	1.1954
			4	0.77919	0.41843	0.506	-0.4586	2.0170
			5	0.41278	0.39324	0.942	-0.7505	1.5761
			6	0.50538	0.97040	0.999	-2.3653	3.3761
	Games-Howell	1	2	1.84378*	0.43987	0.022	0.2418	3.4458
			3	2.25541*	0.44871	0.006	0.6476	3.8633
			4	2.77381*	0.52092	0.001	1.0517	4.4959
			5	2.40741*	0.48562	0.003	0.7532	4.0616
			6	2.50000	0.66713	0.090	-0.4167	5.4167
			7	1.99462*	0.54618	0.021	0.2183	3.7710
		2	1	-1.84378*	0.43987	0.022	-3.4458	-0.2418
			3	0.41163	0.15238	0.101	-0.0406	0.8639
			4	0.93003	0.30535	0.062	-0.0297	1.8897
			5	0.56363	0.24022	0.245	-0.1765	1.3038
			6	0.65622	0.51667	0.830	-3.5943	4.9067
			7	0.15084	0.34670	0.999	-0.9344	1.2360
		3	1	-2.25541*	0.44871	0.006	-3.8633	-0.6476
			2	-0.41163	0.15238	0.101	-0.8639	0.0406
			4	0.51840	0.31794	0.664	-0.4716	1.5084
			5	0.15200	0.25603	0.997	-0.6296	0.9336

Dependent Variable				Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
							Lower Bound	Upper Bound
			6	0.24459	0.52421	0.997	-3.8097	4.2989
			7	-0.26079	0.35784	0.990	-1.3731	0.8515
		4	1	-2.77381*	0.52092	0.001	-4.4959	-1.0517
			2	-0.93003	0.30535	0.062	-1.8897	0.0297
			3	-0.51840	0.31794	0.664	-1.5084	0.4716
			5	-0.36640	0.36820	0.953	-1.4942	0.7614
			6	-0.27381	0.58721	0.998	-3.4353	2.8877
			7	-0.77919	0.44505	0.586	-2.1396	0.5812
		5	1	-2.40741*	0.48562	0.003	-4.0616	-0.7532
			2	-0.56363	0.24022	0.245	-1.3038	0.1765
			3	-0.15200	0.25603	0.997	-0.9336	0.6296
			4	0.36640	0.36820	0.953	-0.7614	1.4942
			6	0.09259	0.55613	1.000	-3.3850	3.5701
			7	-0.41278	0.40315	0.946	-1.6477	0.8221
		6	1	-2.50000	0.66713	0.090	-5.4167	0.4167
			2	-0.65622	0.51667	0.830	-4.9067	3.5943
			3	-0.24459	0.52421	0.997	-4.2989	3.8097
			4	0.27381	0.58721	0.998	-2.8877	3.4353
			5	-0.09259	0.55613	1.000	-3.5701	3.3850
			7	-0.50538	0.60973	0.968	-3.5210	2.5103
		7	1	-1.99462*	0.54618	0.021	-3.7710	-0.2183
			2	-0.15084	0.34670	0.999	-1.2360	0.9344
			3	0.26079	0.35784	0.990	-0.8515	1.3731
			4	0.77919	0.44505	0.586	-0.5812	2.1396
			5	0.41278	0.40315	0.946	-0.8221	1.6477
			6	0.50538	0.60973	0.968	-2.5103	3.5210
Fac_Temerg	Tukey HSD	1	2	0.99544	0.47496	0.356	-0.4096	2.4005
			3	1.15541	0.48330	0.204	-0.2743	2.5851
			4	1.73333*	0.54559	0.026	0.1193	3.3473
			5	1.04815	0.52940	0.429	-0.5180	2.6143
			6	2.62222	0.97491	0.103	-0.2618	5.5063
			7	0.93763	0.53860	0.589	-0.6557	2.5310
		2	1	-0.99544	0.47496	0.356	-2.4005	0.4096
			3	0.15997	0.14315	0.923	-0.2635	0.5834
			4	0.73789	0.29083	0.148	-0.1225	1.5983
			5	0.05271	0.25918	1.000	-0.7140	0.8194
			6	1.62678	0.85870	0.485	-0.9135	4.1671
			7	-0.05781	0.27749	1.000	-0.8787	0.7631
		3	1	-1.15541	0.48330	0.204	-2.5851	0.2743
			2	-0.15997	0.14315	0.923	-0.5834	0.2635

Dependent Variable				Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
							Lower Bound	Upper Bound
			4	0.57792	0.30426	0.481	-0.3222	1.4780
			5	-0.10726	0.27417	1.000	-0.9183	0.7038
			6	1.46681	0.86334	0.617	-1.0872	4.0208
			7	-0.21778	0.29154	0.990	-1.0802	0.6447
		4	1	-1.73333*	0.54559	0.026	-3.3473	-0.1193
			2	-0.73789	0.29083	0.148	-1.5983	0.1225
			3	-0.57792	0.30426	0.481	-1.4780	0.3222
			5	-0.68519	0.37318	0.524	-1.7891	0.4188
			6	0.88889	0.89970	0.957	-1.7727	3.5504
			7	-0.79570	0.38612	0.378	-1.9379	0.3465
		5	1	-1.04815	0.52940	0.429	-2.6143	0.5180
			2	-0.05271	0.25918	1.000	-0.8194	0.7140
			3	0.10726	0.27417	1.000	-0.7038	0.9183
			4	0.68519	0.37318	0.524	-0.4188	1.7891
			6	1.57407	0.88997	0.570	-1.0587	4.2068
			7	-0.11051	0.36288	1.000	-1.1840	0.9630
		6	1	-2.62222	0.97491	0.103	-5.5063	0.2618
			2	-1.62678	0.85870	0.485	-4.1671	0.9135
			3	-1.46681	0.86334	0.617	-4.0208	1.0872
			4	-0.88889	0.89970	0.957	-3.5504	1.7727
			5	-1.57407	0.88997	0.570	-4.2068	1.0587
			7	-1.68459	0.89547	0.494	-4.3336	0.9645
		7	1	-0.93763	0.53860	0.589	-2.5310	0.6557
			2	0.05781	0.27749	1.000	-0.7631	0.8787
			3	0.21778	0.29154	0.990	-0.6447	1.0802
			4	0.79570	0.38612	0.378	-0.3465	1.9379
			5	0.11051	0.36288	1.000	-0.9630	1.1840
			6	1.68459	0.89547	0.494	-0.9645	4.3336
	Games-Howell	1	2	.99544*	0.20753	0.005	0.2740	1.7168
			3	1.15541*	0.22399	0.001	0.4093	1.9015
			4	1.73333*	0.31018	0.000	0.7603	2.7063
			5	1.04815*	0.31877	0.032	0.0568	2.0395
			6	2.62222*	0.22111	0.000	1.8311	3.4134
			7	0.93763	0.34413	0.120	-0.1336	2.0088
		2	1	-.99544*	0.20753	0.005	-1.7168	-0.2740
			3	0.15997	0.14196	0.919	-0.2614	0.5813
			4	0.73789	0.25728	0.091	-0.0689	1.5447
			5	0.05271	0.26757	1.000	-0.7753	0.8807
			6	1.62678*	0.13737	0.001	0.9926	2.2609
			7	-0.05781	0.29733	1.000	-0.9873	0.8717

Dependent Variable				Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
							Lower Bound	Upper Bound
		3	1	-1.15541*	0.22399	0.001	-1.9015	-0.4093
			2	-0.15997	0.14196	0.919	-0.5813	0.2614
			4	0.57792	0.27074	0.353	-0.2618	1.4177
			5	-0.10726	0.28053	1.000	-0.9684	0.7539
			6	1.46681*	0.16117	0.000	0.8646	2.0690
			7	-0.21778	0.30905	0.992	-1.1761	0.7405
		4	1	-1.73333*	0.31018	0.000	-2.7063	-0.7603
			2	-0.73789	0.25728	0.091	-1.5447	0.0689
			3	-0.57792	0.27074	0.353	-1.4177	0.2618
			5	-0.68519	0.35319	0.463	-1.7617	0.3913
			6	.88889*	0.26836	0.039	0.0299	1.7479
			7	-0.79570	0.37624	0.358	-1.9459	0.3545
		5	1	-1.04815*	0.31877	0.032	-2.0395	-0.0568
			2	-0.05271	0.26757	1.000	-0.8807	0.7753
			3	0.10726	0.28053	1.000	-0.7539	0.9684
			4	0.68519	0.35319	0.463	-0.3913	1.7617
			6	1.57407*	0.27824	0.000	0.6966	2.4516
			7	-0.11051	0.38334	1.000	-1.2782	1.0572
		6	1	-2.62222*	0.22111	0.000	-3.4134	-1.8311
			2	-1.62678*	0.13737	0.001	-2.2609	-0.9926
			3	-1.46681*	0.16117	0.000	-2.0690	-0.8646
			4	-.88889*	0.26836	0.039	-1.7479	-0.0299
			5	-1.57407*	0.27824	0.000	-2.4516	-0.6966
			7	-1.68459*	0.30697	0.000	-2.6544	-0.7148
		7	1	-0.93763	0.34413	0.120	-2.0088	0.1336
			2	0.05781	0.29733	1.000	-0.8717	0.9873
			3	0.21778	0.30905	0.992	-0.7405	1.1761
			4	0.79570	0.37624	0.358	-0.3545	1.9459
			5	0.11051	0.38334	1.000	-1.0572	1.2782
			6	1.68459*	0.30697	0.000	0.7148	2.6544
Fac_KC	Tukey HSD	1	2	0.21510	0.38137	0.998	-0.9131	1.3433
			3	0.58658	0.38806	0.738	-0.5614	1.7346
			4	0.73810	0.43808	0.627	-0.5579	2.0341
			5	0.19444	0.42508	0.999	-1.0631	1.4519
			6	0.38889	0.78280	0.999	-1.9269	2.7046
			7	0.66129	0.43247	0.727	-0.6181	1.9406
		2	1	-0.21510	0.38137	0.998	-1.3433	0.9131
			3	.37148*	0.11494	0.022	0.0315	0.7115
			4	0.52300	0.23352	0.276	-0.1678	1.2138
			5	-0.02066	0.20811	1.000	-0.6363	0.5950

Dependent Variable				Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
							Lower Bound	Upper Bound
			6	0.17379	0.68949	1.000	-1.8659	2.2135
			7	0.44619	0.22281	0.414	-0.2129	1.1053
		3	1	-0.58658	0.38806	0.738	-1.7346	0.5614
			2	-.37148*	0.11494	0.022	-0.7115	-0.0315
			4	0.15152	0.24431	0.996	-0.5712	0.8742
			5	-0.39214	0.22014	0.561	-1.0434	0.2591
			6	-0.19769	0.69322	1.000	-2.2484	1.8530
			7	0.07471	0.23409	1.000	-0.6178	0.7672
		4	1	-0.73810	0.43808	0.627	-2.0341	0.5579
			2	-0.52300	0.23352	0.276	-1.2138	0.1678
			3	-0.15152	0.24431	0.996	-0.8742	0.5712
			5	-0.54365	0.29964	0.539	-1.4301	0.3428
			6	-0.34921	0.72241	0.999	-2.4863	1.7879
			7	-0.07680	0.31003	1.000	-0.9940	0.8404
		5	1	-0.19444	0.42508	0.999	-1.4519	1.0631
			2	0.02066	0.20811	1.000	-0.5950	0.6363
			3	0.39214	0.22014	0.561	-0.2591	1.0434
			4	0.54365	0.29964	0.539	-0.3428	1.4301
			6	0.19444	0.71460	1.000	-1.9195	2.3084
			7	0.46685	0.29137	0.681	-0.3951	1.3288
		6	1	-0.38889	0.78280	0.999	-2.7046	1.9269
			2	-0.17379	0.68949	1.000	-2.2135	1.8659
			3	0.19769	0.69322	1.000	-1.8530	2.2484
			4	0.34921	0.72241	0.999	-1.7879	2.4863
			5	-0.19444	0.71460	1.000	-2.3084	1.9195
			7	0.27240	0.71902	1.000	-1.8547	2.3995
		7	1	-0.66129	0.43247	0.727	-1.9406	0.6181
			2	-0.44619	0.22281	0.414	-1.1053	0.2129
			3	-0.07471	0.23409	1.000	-0.7672	0.6178
			4	0.07680	0.31003	1.000	-0.8404	0.9940
			5	-0.46685	0.29137	0.681	-1.3288	0.3951
			6	-0.27240	0.71902	1.000	-2.3995	1.8547

*. The mean difference is significant at the 0.05 level.

Appendix B: Questionnaire

Knowledge management system in education

Kindly spare few minutes to fill this questionnaire measuring Knowledge Management initiatives (using information and communication technologies) in your institution/ department. The data provided by you will be kept confidential. The email id for correspondence is: namitajain105@gmail.com.

* Required

1. **Gender** *
   Mark only one oval.
   - ◯ Male
   - ◯ Female

2. **Position** *
   Mark only one oval.
   - ◯ Faculty
   - ◯ Student
   - ◯ Non- teaching staff

3. **Educational Qualifications** *
   Mark only one oval.
   - ◯ Pursuing Graduation
   - ◯ Graduate
   - ◯ Pursuing Post-graduation
   - ◯ Post Graduate
   - ◯ Full time research scholar
   - ◯ PhD

4. **Associated Educational Institution** *

5. **Type of institute** *
   Mark only one oval.
   - ◯ Public
   - ◯ Private

6. **Department** *

7. **Please specify the NAAC rating of your institution.** *
   Mark only one oval per row.

	N.A.	A++	A+	A	B++	B+	B	C
NAAC Grade	◯	◯	◯	◯	◯	◯	◯	◯

8. **Age (in years)** *

9. **Please rate the following statements on a scale of 1-7 with respect to your institute/ department. ***

Mark only one oval per row.

	1- Strongly Disagree	2- Disagree	3-Little Disagree	4- Neutral	5- Little Agree	6- Agree	7- Strongly agree
Peers are willing to share knowledge possessed by them.							
I am willing to share my knowledge with other peers.							
Sharing knowledge broadens my horizon.							
Members don't share knowledge due to competitive spirit.							
Meetings are conducted to provide important information.							
Brainstorming sessions are organised for problem solving.							
Out-of-the-box thinking is encouraged.							
Opportunities for international collaboration are provided.							
Experts are invited for guest lectures.							
Our institute organizes workshops and conferences.							
Corporate-academia interface exists.							
New ways of teaching and learning are promoted.							

	1- Strongly Disagree	2- Disagree	3-Little Disagree	4- Neutral	5- Little Agree	6- Agree	7- Strongly agree
I can share my ideas, doubts without any fear.							
Rewards are instituted for knowledge creation and dissemination							
Research and development is facilitated.							
My institution facilitates our further education.							
Organisation members are motivated to learn.							
Our feedback is considered.							
Good ideas are implemented.							
Our curriculum is regularly updated.							
Educational field trips are organised for practical learning.							
I feel comfortable and easily adapt to new software and research tools.							
Technology with traditional teaching methods has been integrated successfully							
Technology has increased student engagement.							
Knowledge is captured in manuals, newsletters and databases.							

	1- Strongly Disagree	2- Disagree	3-Little Disagree	4- Neutral	5- Little Agree	6- Agree	7- Strongly agree
Experience, know-how of intellectuals is captured.							
I make use of online databases to retrieve information.							
Stored knowledge is made available quickly and accurately when required.							
Our institute benchmark the best institutes.							
Our academic results are better than other comparable colleges in India.							
Average placements are better than other colleges.							
We have made a mark in innovation and collaborative projects.							
We have quality publications.							
Our institute is a leader in technology adoption leading to enhanced productivity							
Our alumni are well recognized							

10. **Your Publications (last 5 years in number)**

11. **Innovation projects completed by you (last 5 years in no.)**

12. **Your participation in academic events/ competitions (last 5 years in no.)**

13. **Please rate the following facilities provided by your institute. ***
Mark only one oval per row.

	1-Not available	2- Available but inefficient	3-Little efficient	4-Fairly efficient	5- Satisfactorily efficient	6- Efficient	7-Very efficient
Internet connectivity							
Subscription to knowledge repositories like prowess, Jstor, emerald, ebsco host and others							
Labs with latest software							

14. **Please specify your usage of the following tools for academic/ administrative purposes ***
Mark only one oval per row.

	Never	Almost never	Rarely	Sometimes	Often	Almost Regularly	Regularly
Academic networks like slideshare and researchgate							
Tools like whatsapp and facebook							
Google groups							
MOOCs (online courses) and/or online training platforms							
E- Journals and e-books							
New technology like virtual reality, artificial intelligence and robotics							
Flipped classrooms (Video lectures are viewed by students at home, while class time is devoted to exercises and discussions)							

15. **E-mail id**

16. **Any other Comments**

Appendix C: List of Publications

S. NO	Title of the paper	Name of the authors	Name of Journal	Year	Vol no., Issue no. Page no. ISSN	Indexing status of Journal with indexing agency
1	Harnessing information and communication technologies for effective knowledge creation: Shaping the future of education	Dr. Vikas Gupta and Namita Jain	Journal of Enterprise Information Management	2017	Vol. 30 Issue no. 5 pp. 831-855 ISSN: 1741-0398	**SSCI: Impact factor 2019: 2.659** Scopus ABDC rank B, ABS, UGC care, Emerald
2	The impact of Knowledge Management System on student performance	Namita Jain and Dr. Vikas Gupta	VINE Journal of Information and Knowledge Management System	2019	Vol. 49 Issue no. 1 pp.115–135 ISSN: 2059-5891	Scopus ABDC rank B UGC care Emerald
3	Communities of Practice for Digital Knowledge Management: A Case Study of Web 2.0 in the University of Delhi	Namita Jain and Dr. Vikas Gupta	International Journal of Public Sector Performance Management	Paper accepted		Scopus Inderscience UGC care

S. NO	Title of the paper	Name of the authors	Name of Conference	Year	Conference organizer
4	Communities of Practice in a Digital Knowledge Economy: A case study of Web 2.0 in Educational Institutions	Namita Jain and Dr. Vikas Gupta	International Conference on Business and Management	2019	Delhi School of Management Delhi Technological University
5	Revolutionizing Indian higher Education through Knowledge Management and information and communication technology	Namita Jain and Dr. Vikas Gupta	Annual Conference of Glogift on Transforming Organizations through Flexible Management	2017	Delhi School of Management Delhi Technological University
6	Transforming Organizations by managing succession through knowledge management	Dr. Vikas Gupta and Namita Jain	Conference on Changing Organizations through Strategic, technological, Structural and Behavioural Interventions	2016	University School of Management Studies Guru Gobind Singh Indraprastha University