Knowledge Management and Education Technology

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Abstract-Knowledge management is the process of transforming information and intellectual assets into enduring values. Knowledge Management comprises a range of strategies and practices used in an organization to identify, create, represent, distribute and enable adoption of insights and experiences. It connects people with the knowledge that they need to take action, when they need it. Education technology is ethical practice of facilitating learning and improving performance by creating, using and managing technological process and resources. The term educational technology is often associated with and encompasses instructional theory and learning theory. Knowledge Management (KM) principles recognize that it is important for organizations to "know what they know." All institutions inherently store, access, and deliver knowledge in some manner and educational institutions are no exception. Knowledge management is a new field, and experiments are just beginning in education. This paper explores how Knowledge Management practices might be useful in a technology education setting. Formerly, the meanings of the knowledge management and the educational technologies are discussed. Then, the paper discusses different frame works of knowledge management proposed by various researchers over the years. Later on, the paper intends to apply the concepts of various models to the educational practices.

Key words: Knowledge management, Education technologies

1. Introduction

Collection of raw facts and numbers is called data. Data put into a context is information. Information is combined with experience and judgement to become knowledge. Educational technology is most simply defined as an array of tools that might prove helpful in advancing learning. Knowledge Management comprises three components.

1. People who create, share and use knowledge as part of their daily work and help shape a knowledge sharing organizational culture

2. Processes that include methods to acquire, create, organize, share and transfer of knowledge to fit different situations.

3. The technology including the mechanisms to store and provide access to data, information, and knowledge that must be integrated with the way people work, and address their real needs. Knowledge Management and Education Technologies can be regarded as the application of Knowledge Management tools in student learning process.

2. Key Tasks Involved In Education for Knowledge Management

a. Micro-Level Management of Tasks
1. Course structuring and study material preparation
2. Distribution and presentation of study materials
3. Communication between educational actors (student-faculty, student-student)
4. Performing instructional assignments, either alone or group-based Performance assessment

B. Macro-Level Management of Tasks

i. Organisation of the whole educational process

ii. Organizing and managing information and knowledge flows within the educational organisation

iii. Keeping track of performance of students, faculty, courses, curriculum, and of the (allocation of) available knowledge resources

iv. Monitoring results in terms of goals and standards

v. Dynamic changing of the educational program as feedback to discrepancies between goals and standards and obtained performance results.

3. Knowledge Management Models and Education Technologies

This paper includes the following Knowledge Management models,

1. Treacy & Wiersema's Model
2. Nonaka & Takeuchi matrix
3. Boisot I-space Model
4. Michael Zack Model
5. Derek Binney Model

3.1. Treacy&Wierseam's Model

One of different approaches of KM is proposed by Treacy & Wiersema's value discipline in the year 1993. The three value disciplines focus on organisation's activities.

i. Customer intimacy
ii. Product leadership
iii. Operational Excellence

Operational Excellence

It includes standardised product lines, reliable machines that can produce zero defect products. Procedures for manufacturing pursue the highest level of efficiency, often using automated systems. Companies that pursue operational excellence provide consumers with products at the lowest total cost.

Consumer intimacy

Firms continually tailor and shape products and services to fit an increasingly fine definition of the customer. They seek a deep understanding of their customer's businesses in order to tailor offerings to meet each customer's specific needs. Customer intimate companies invest in a highly skilled work force

and give them great latitude to solve customer problems in the field. Companies seek to capture more percentage of clients.

Product Leadership

It entails producing an ongoing stream of cutting edge products and services. Companies continue to innovate and stay ahead of their competition. They are risk oriented and future driven. Employees of these firms are expected to think creatively.

3.1.1 Treacy & Wierseam's Model and Educational Technology

Operational Excellence

In the context of education, operational excellence would focus on providing educational course material with maximum convenience and the lowest possible cost. Such educational practice offer standardised instruction that serves a large number of student needs rather tailoring to individual students.

Customer Intimacy

Educational practices that involve tailoring programs or resources that meet specific individual needs regardless of the cost follow the value discipline of customer intimacy.

Product Leadership

Academic practices that pursue the value discipline of product leadership seek to hire and retain faculty who are true innovators and leaders in their fields. They encourage faculty to incorporate cutting edge methodology and results within their teaching.

Treacy and Wiersema asserted that a firm must choose a single value discipline and excel at this discipline while remaining proficiently at the other two. They suggested that choosing a single strategy is key because it will shape every subsequent operational decision.

3.2. Nonaka & Takeuchi Matrix
Explicit and Tacit knowledge Basics

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Early researches suggested that a successful knowledge management effort needs to convert internalized tacit knowledge into explicit knowledge in order to share it, but the same effort must also be done by individuals to internalize and personally codify knowledge.

Subsequent research into knowledge management suggested that a distinction between tacit knowledge and explicit knowledge represented an oversimplification and that the notion of explicit knowledge is self-contradictory.

Fig.1
Tacit and Explicit Knowledge
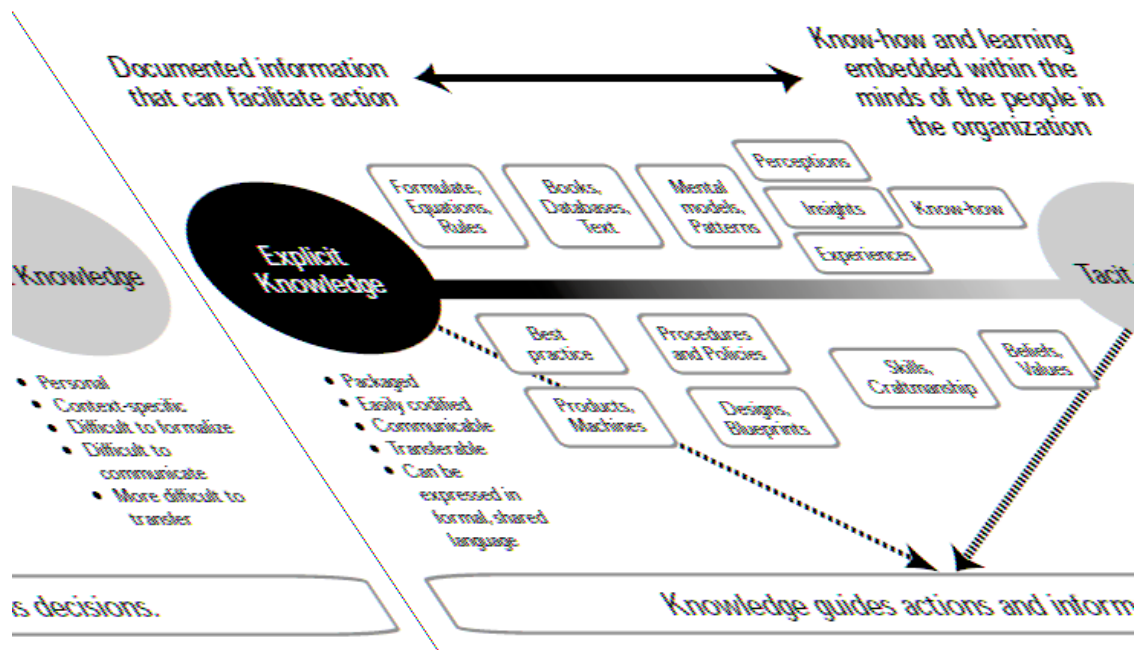
Explicit Knowledge: knowledge in the form of models, theories, methods, techniques documented on media such as paper, audio tapes, video tapes, hard disks, white boards).

Tacit Knowledge: knowledge bounded to an individual's specific experience, personal background, value system, method of learning, and ways of interacting with others.

Explicit knowledge is easier than tacit knowledge to work. The problem with the explicit knowledge is that it will be available to competitors soon. It will not provide a lasting competitive advantage to the base organization. The ability to manage tacit knowledge promises to deliver huge returns for organizations that learn to use it effectively.

Nonaka & Takeuchi Matrix model

For knowledge management practitioners, one of the most influential tool or frame work is SECI (Socialization, Externalization, Combination, Internalization) model proposed by Nonaka & Takeuchi in the year 1995. This matrix classifies knowledge as either explicit or tacit, and either individual or collective. Nonka & Takeuchi also propose corresponding knowledge processes that transform knowledge from one form to another.

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Fig.2. The SECI Matrix
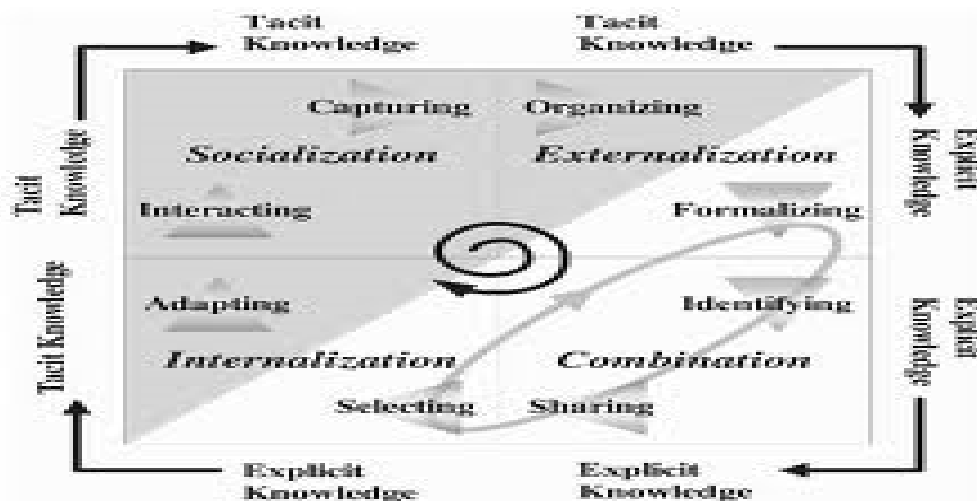
Socialization

This process focuses on *tacit to tacit* knowledge linking. During the socialization mode, tacit knowledge is transferred through interactions between individuals. Individuals may learn and gain a sense of competence by observation, shared experience and imitation behaviour modelled by others.

Externalization

This process focuses on *tacit to explicit* knowledge linking. Individuals may learn and gain a sense of competence by articulation of tacit knowledge to explicit knowledge.

Combination

This process focuses on *explicit to explicit* knowledge linking. Knowledge is maintained through a systematisation of concepts drawing on different bodies of explicit knowledge.

Internalisation

This process focuses on explicit to tacit knowledge linking. In this mode, participant share explicit knowledge that is gradually translated, through interaction and a process of trial and error, into different aspects of tacit knowledge.

3.2.1 Nonaka & Takeuchi matrix and Education Technology

Using Knowledge management techniques in education is as vital as it is in the corporate sector. Consider staff members who possess institutional knowledge with regard to curriculum, research, documentary, solving complex problems. Relying on the institutional knowledge of unique individuals can hamper the flexibility and responsiveness of any organization.   The challenge is to convert the information that currently resides in those individuals and make it widely and easily available to any faculty member, staff person or other constituent. An institution wide approach to knowledge management can lead to exponential improvements in sharing knowledge both explicit and implicit.

Socialization

In institutions knowledge is transferred through interactions among staff. This is achieved with guest lectures and interaction with experts.

Externalization

An expert in a course prepares a curriculum enabling the knowledge management. The institutional approach includes well structured documentation on research process, curriculum development, administrative, strategic and student alumni services.

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Combination

At times, the knowledge can be documented from the other documents.

Internalization

The conversion of explicit to tacit knowledge occurs through a series of iterations in which concepts become concrete and ultimately absorbed as an integral belief or value. This is achieved by a series of training to the staff.

3.3. Boisot's I-Space Model

Boisot proposes a mode of knowledge asset development (in the year 1998) along similar lines to that of Nonaka and Takeuchi. However, Biosot's model introduces a three dimensional space defined by axes from 'uncodified' to 'codified', from 'concrete' to 'abstract' and from 'undiffused' to 'diffused'

Figure 3
Boisot's I-Space Model
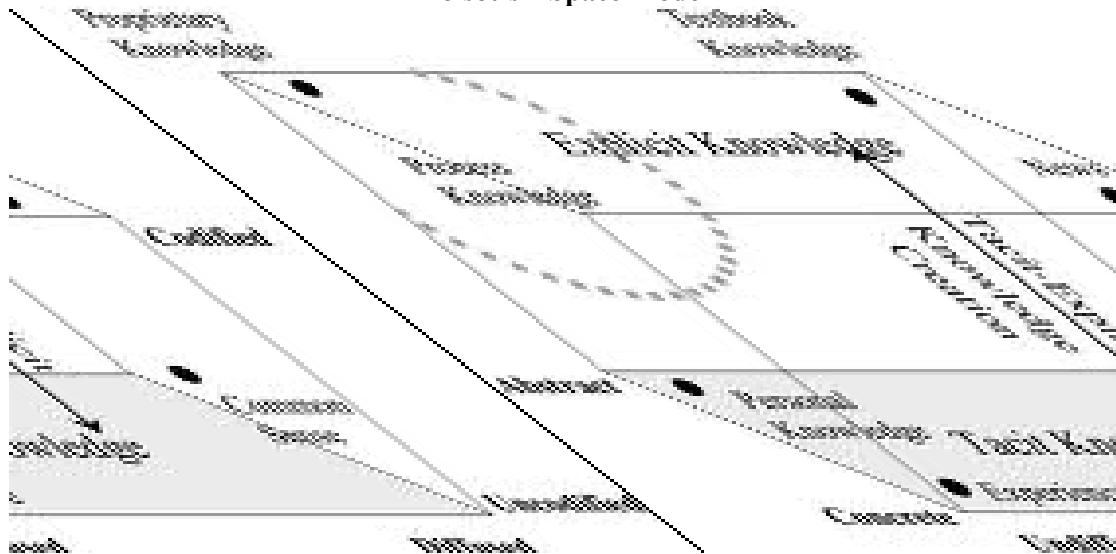
Boisot then proposes a "Social Learning Cycle(SLC)" which uses the I-Space to model the dynamic flow of knowledge through a series of six phases:

  i. Scanning: insights are gained from generally available data
  ii. Problem solving: problems are solved giving structure and coherence to these insights
  iii. Abstraction: the newly codified insights are generalised to a wide range of situations
  iv. Diffusion: the new insights are shared with a target population in a codified and abstract form
  v. Absorption: the newly codified insights are applied to a variety of situations producing new learning experiences
  vi. Impacting: abstract knowledge becomes embedded in concrete in concrete practices in the form of artefacts, rules.

In this model, Boisot develops knowledge assets that are highly abstract, highly codified and undiffused as most ordered and have the lowest rate of uncertainty and therefore the maximum potential for performing value adding work. Knowledge assets at the opposite extreme of the I-Space i.e. least abstract, least codified and most diffused have the highest level of uncertainty and the least potential for performing useful value adding work. An organization pursuing competitive advantage is constantly seeking to move the region of minimum uncertain production and hence maximum value.

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Both Boisot's model and that of Nonaka & Takeuchi is that the process of growing and developing knowledge assets within organizations is always changing. Organizations must constantly adapt to their environment. This means that the knowledge management strategy defined at one moment may not be sufficient in the other. The rate at which this cycle operates will vary from one sector to another.

3.3.1 Boisot's Model and Education Technology

Some of the successful practices in education originated from a severe trouble and thrust to develop. Consider a situation with a requirement to share knowledge among countries. People need to travel all along and share the knowledge and return. This is pretty cumbersome because of expenditure involved, time takes for knowledge sharing and also all risks of transportation. The insights are investigated and resulted in computer based training and web based or online training. The process has been documented and has been used by many institutions and universities. In fact, some of the institutions now a day completely rely on the online training. The same insights are spread to hospitals and social networking on internet in the form of video conference.

3.4. Michael Zack Model

Michael Zack proposed a knowledge strategy in the year 1999. The framework helps an organisation make an explicit connection between its competitive situations and knowledge management strategy to help the organization maintain or re-establish its competitive advantage. Organization will find its own unique link between knowledge and strategy, any such knowledge can be classified on a scale of core, advanced or innovative.

Figure 4
Michael Zack's framework for knowledge management

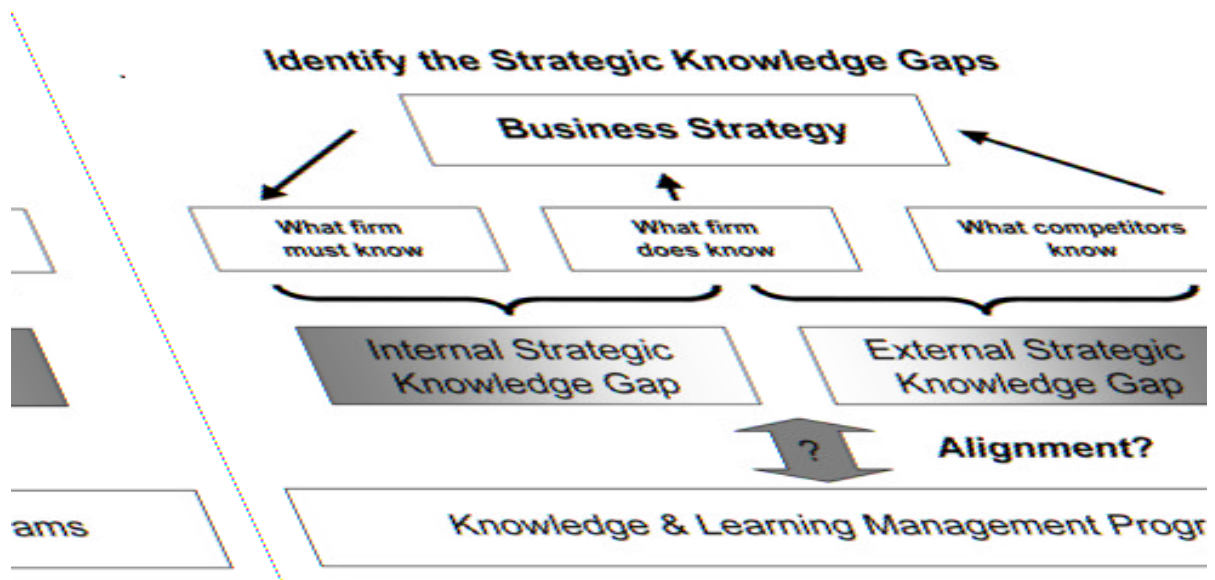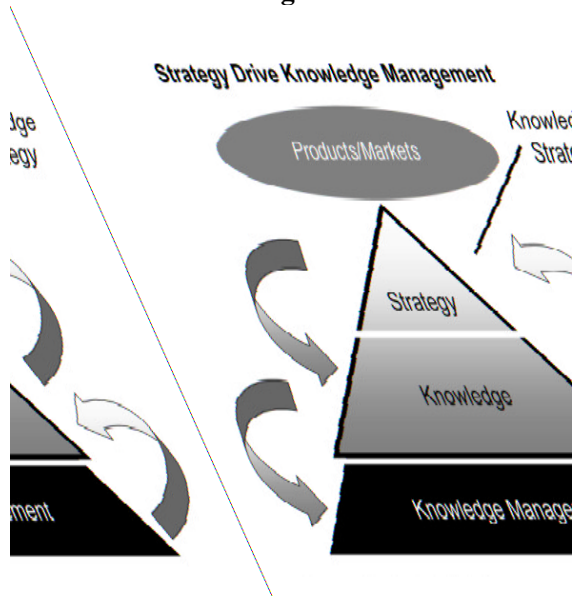**Knowledge Management and Education Technology**

Figure. 5
Michael Zack's framework for knowledge management

Core knowledge is a basic level of knowledge required by all members of a particular industry. It does not represent a competitive advantage, but is simply the knowledge needed to be able to function in that sector at all. Advanced knowledge gives an organization a competitive edge. It is specific knowledge which differentiates an organization from its competitors, either by knowing more than a competitor or by applying knowledge in different ways.

Innovative knowledge is that which enables a company to be a market leader. It allows an organisation to change the way a sector works and represents a significant differentiating factor from other organisations. Having identified the organisation's competitive knowledge position, Zack's approach is to use a SWOT analysis to identify the strategic gaps in an organisation's knowledge. This allows the organisation to identify where it has knowledge which it can exploit and where it needs to develop knowledge to maintain or grow its competitive position. This is achieved by analysing the organisation's knowledge position along two dimensions:

Exploration vs. Exploitation

This is "the degree to which the organisation needs to increase its knowledge in a particular area versus the opportunity it may have to leverage existing but underexploited knowledge resources."

Internal vs. External Knowledge

This refers to whether the knowledge is primarily within the organisation or outside. Some organisations are more externally oriented, drawing on publications, universities, consultants, customers, etc. Others are more internally oriented, building up unique knowledge and experience which is difficult for competitors to imitate. Organisations those are more explorative of internal knowledge as having a "conservative" knowledge management strategy, while those that are exploring external knowledge have a more "aggressive" knowledge management strategy.

3.4.1 Michael Zack Model and Education Technology

Basing on the knowledge levels educational institutions intake students/scholars. The educational institute look for the applicants those suit to the knowledge of the organization. Institutions operate at different levels like core, advanced, innovative. Based on this level institutions work to develop further.

Based on its level of operation the institution explores the environment. Organizational institutions depend on the external knowledge as students come from external environment in most of the cases. The knowledge level and environmental dependency influences the strategy being used in the institution. As an example, for the students from rural background more bookish knowledge been taught as a thrust to make them understand the basics of the pertinent course

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and make them expose to the field. For the students from the urban areas as they are already exposed to the pertinent field the tactics involved in the course are taught.

3.5. Binney's Model

Derek Binney believes that the most real world processes operate on a continuum rather than a step transformation. Perhaps explicit and tacit knowledge should be considered to be at the end of a spectrum of knowledge types rather than being the only two categories on that spectrum. Bineey's analysis (in the year 2001) is interesting because it reflects aspects of both the knowledge centred classification of knowledge management and the business perspectives classification of knowledge management.

   i.   Binney provides a framework to hel organisations make sense of the large diversity of material under knowledge management. His focus on the knowledge management activities that are being carried out, grouped into six categories.
   ii. Transactional knowledge managemer knowledge is embedded in technology.
   iii. Analytical knowledge manageme knowledge is derived from external data sources, typically focusing on customer related information.
   iv. Asset management knowledge management: Explicit management of knowledge assets which can be reused in different ways.
   v.   Process-based knowledge managemen The codification and improvement of business practice sharing of these improved processes within the organization.
   vi. Developmental knowled management: Building up the capabilities of the organization's knowledge workers through training and staff development.
   vii. Innovation/creation knowle management: Fostering an environment which promises the creation of new knowledge, from different disciplines.

For each of these categories of knowledge management, Binney lists several examples of knowledge management systems or approaches that support them. This is shown in table1.

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Table-1
Knowledge Management spectrum and applications

	Transactional	Analytical	Asset Management	Process	Developmental	Innovation and Creation
Knowledge Management Applications	▪ Case-Based Reasoning (CBR) ▪ Help Desk Applications ▪ Customer Service Applications ▪ Order Entry Applications ▪ Service Agent Support Applications	▪ Data Warehousing ▪ Data Mining ▪ Business Intelligence ▪ Management Information Systems ▪ Decision Support Systems ▪ Customer Relationship Management (CRM) ▪ *Competitive Intelligence*	▪ Intellectual Property ▪ Document Management ▪ Knowledge Valuation ▪ Knowledge Repositories ▪ *Content Management*	▪ TQM ▪ Benchmarking ▪ Best practices ▪ Quality Management ▪ Business Process (Re)Engineering ▪ Process Improvement ▪ Process Automation ▪ Lessons Learned ▪ Methodology ▪ *SEI/CMM, ISO9XXX, Six Sigma*	▪ Skills Development ▪ Staff Competencies ▪ Learning ▪ Teaching ▪ Training	▪ Communities ▪ Collaboration ▪ Discussion Forums ▪ Networking ▪ Virtual teams ▪ Research and Development ▪ *Multi-disciplined Teams*
Enabling Technologies	▪ Expert Systems ▪ Cognitive Technologies ▪ Semantic Networks ▪ Rule-based Expert Systems ▪ Probability Networks ▪ Rule Induction, Decision Trees ▪ *Geospatial Information Systems*	▪ Intelligent Agents ▪ Web Crawlers ▪ Relational and Object DBMS ▪ Neural Computing ▪ Push Technologies ▪ Data Analysis and Reporting Tools	▪ Document Management Tools ▪ Search Engines ▪ Knowledge Maps ▪ Library Systems	▪ Workflow Management ▪ Process Modeling Tools	▪ Computer-based Training ▪ Online Training	▪ Groupware ▪ e-Mail ▪ Chat Rooms ▪ Video Conferencing ▪ Search Engines ▪ Voice Mail ▪ Bulletin Boards ▪ Push Technologies ▪ Simulation Technologies
	▪ Portals, Internet, Intranets, Extranets					

Source:

3.5.1 Binney's Model and Education Technology

Universities of these days offer diversified courses to the students. In this regard universities may focus on the different knowledge management activities under on hub. An attempt is made to relate the Binney's model with education technology.

1. Transactional knowledge management: Institutions capable using LCD, computer system will have knowledge within the usage of them.

2. Analytical knowledge management: Colleges derive their examination pattern and syllabus from universities.

3. Asset management knowledge management: Successful methods in the pertinent filed like Mechanical; Automobile will be documented and reused.

4. Process-based knowledge management: Case study method is the best example to process based knowledge in educational institutions.

5. Developmental knowledge management: Guest lectures, seminars,

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and researches to enhance knowledge of both students and staff members.

6. Innovation/creation knowledge management: Feedback from students and brainstorming fosters the creation of knowledge. Fostering an environment which promises the creation of new knowledge, from different disciplines.

4. Conclusion

This paper has presented an analysis of the building blocks required for knowledge strategy. The frameworks of knowledge management and education technologies evolve in parallel through the implementation of tangible knowledge initiatives. The knowledge initiative provides immediate business value, developing a capability that enhances the knowledge environment. Colleges and universities have significant opportunities to apply knowledge management practices to support every part of their mission and develop tools that enhance the learning process (education). It is important to identify needs and expectations of the institution and need of hour for the students and competencies of the staff promptly. Keeping high level of interaction and of good quality among students and teachers is of extreme importance to determine the precise knowledge strategy. Maintaining continuous, fast and efficient information flows is also of special importance for the development of effective tool over the time.

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