CHAPTER 4

EXTRACTION OF IMPLICIT KNOWLEDGE

Implicit knowledge from the sources identified, should be extracted to form a knowledge portal. There are several methods to extract implicit knowledge from different sources. Some of the methods are discussed below:

4.1 FACULTY AND VISITING FACULTY MEMBERS

Faculty members in the universities are the key role players in transferring knowledge from the books to the minds of the students. They transfer the explicit knowledge available in the books in to the minds of the students as implicit knowledge. This is the teaching-learning process. Knowledge transfer occurs in this process. Faculty members differ from each other by their expertise and knowledge in subjects. They also differ in their teaching methodologies.

Some of the faculty members teach in a different way, which will be treasured by the students and those staff members produce good results. But some faculty members may not be able to improve the performance of the students. Once the teaching methodologies of the expert faculty are made explicit, then other faculty members are also able to teach well. Novice professors have much to gain from conversations with and observations of experienced professors, who are willing to share their ideas about teaching. Some novice professors have traits or skills, such as an outgoing personality,
that allow them to strike up relationships with experienced teaching professors (Han Sik Shim and Gene Roth 2009).

There are some methods to extract implicit knowledge from the faculty members. If this knowledge is effectively made explicit and stored in the knowledge portal, then this will help a lot more in designing and implementing knowledge management systems in higher educational institutions. Some of the knowledge extraction methods are:

- Communities of practice
- Email
- Personal information Portals
- Electronic discussion boards

The Knowledge extraction methods from faculty members are shown in Figure 4.1.

![Figure 4.1 Knowledge extraction methods from faculty members](image)

### 4.1.1 Personal Information Portals

A personal information portal is a site on the World Wide Web, which typically provides personalized capabilities to its visitors. It is designed
to use Information, personal folders and updates. Personal information portals can provide links to outside its content, which may help others. Personal information portals are not limited to simply providing links and information or content. By encouraging the faculty members to create the personal information portals, their in-depth knowledge is revealed. They are invited to present their ideas and views in this portal. This helps others to know about their teaching methodologies, and the way they get expertise in subjects. In this way the implicit knowledge from faculty members is made explicit.

4.1.2 E-mail

Electronic mail, commonly called email or e-mail, is a method of exchanging digital messages from an author to one or more recipients. Modern email operates across the Internet or other computer networks. Email is a protocol for receiving, sending, and storing electronic messages, Tzoukermann et al (2001). Emails are freestyle text, not always syntactically well formed, domain independent, of variable length, and on multiple topics. According to Ducheneaut and Bellotti (2002), ‘email users draw on the persistence of the medium to make sense of the objects being talked about, and sometimes even transform the conversation itself into an object of conversation’. Sharman Lichtenstein and Paula (2003), recommend that companies assign email a role in their formal KM strategy, taking into account email’s many advantages for knowledge work. Email is a topmost socialisation tool for extracting and sharing unstructured knowledge.

According to Thomas Jackson et al (2004), Electronic mail (email) is a fast, effective and efficient means of communication. The introduction of email dates back to the late 1971, when a computer engineer named Ray Tomlinson sent the first email message. One of the basic features of electronic messaging in general is that, it aids easy access to the needed information, which empowers employees to make more informed decisions and foster
innovative thinking which is essential to the success of any organisation. Email has gained popularity nowadays with the spread of the Internet. Email has become the preferred method of communication. Dfouni and Croteau (2004) identified email as a topmost socialisation tool for extracting and sharing unstructured knowledge.

Email was highly ranked as an effective and most important method of knowledge transfer from one person to another, Harris (2008). E-mail messaging is a basic but highly efficient way to collaborate. It allows people to make contacts and share views on work, problems and solutions (Uriarte 2008). Faculties in educational organizations can share their views and ideas regarding teaching and other aspects by sending Email to others. These emails can serve as an explicit knowledge source. By means of email, the implicit knowledge is transformed into explicit. Faculties are advised to make use of this email knowledge. Faculties can send their opinions and views directly to the knowledge portal through email.

4.1.3 **Electronic Discussion Boards**

A discussion board is referred to as “reader centered” or focusing upon the user of the information as opposed to the creator of the information (Hauben 1996). The discussion board offers a highly useful context to simulate scenarios or conditions, that may be used to train programmers in the fundamentals of object-oriented design (Rosson and Carroll 1996). The effectiveness of online discussion boards can be improved through technological support for “personalized knowledge representation” and the use of “idea artifacts to facilitate internalization of learners’ collective knowledge into personalized knowledge” (Chen and Hung 2002). Electronic discussion boards are useful KM tools for sharing beliefs and mental models of individuals (Dfouni and Croteau 2004). Electronic Discussion Boards are virtual communication tools which allow individuals in ‘CoP’ to post
questions and comments online and engage others in discussions. These virtual engagement environments are often called message boards, bulletin boards and discussion forums (Frank Nyame-Asiamah 2009).

A discussion board is an asynchronous communication tool that allows a faculty individual to post a comment or question online. Other individuals who are members of the same discussion board may read the comment/question, and respond with their own remarks over time. If one individual posts a question, and three others post answers to that question, these four "posts" comprise what is known as a "thread" of conversation. The phrase, "threaded discussion board" is common, referring to threads of conversation, each focused on a particular topic. Discussion boards, discussion forums, bulletin boards, and message boards typically refer to the same type of system. Discussion boards should not be confused with live chats, however. Live chats provide for synchronous communication (all at the same time), whereas discussion boards provide for asynchronous communication (discussion over time). Faculty members are made to be involved in these discussion boards, so that their implicit knowledge is extracted.

4.1.4 Communities of Practice

Community is defined as a group of people who share the same interest or are inserted in the same context (Koch and Lacher 2000). Communities of practice are groups of people who share a concern or a passion for something they do, and learn how to do it better as they interact regularly. A community can be defined as a group of people that share the same purposes so as to permit and/or contribute to a problem's solution: that is, groups of people and/or professionals with similar interests and/or work. Therefore, the basic elements that form any community are the individuals,
Communities of practice are everywhere, and we are generally involved in a number of them - whether at work, school, home, or in our civic and leisure interests. In some groups we are core members, in others we are more at the margins (Wenger 1998). The term "community of practice" is of relatively recent coinage, even though the phenomenon it refers to is age-old. The concept has turned out to provide a useful perspective on knowing and learning. A growing number of people and organizations in various sectors are now focusing on communities of practice as a key to improving their performance. This brief and general introduction examines what communities of practice are and why researchers and practitioners in so many different contexts find them useful as an approach to knowing and learning.

Vestal (2003) suggests there are four types of communities:

- Innovation communities: to offer new solutions using the existing knowledge;
- Help communities: to solve problems;
- Best Practice communities: searching, validating and disseminating information;
- Knowledge-Stewarding: connecting people, collecting and organizing information and knowledge in organizations.

Each one of these types of communities of practice will demand different efforts, levels of functionality and support.
Another classification is given by Archer (2006) that identifies four classifications for communities of practice:

- **Internal Communities of Practice**: Communities internal to an organization. They add value to the organization in several ways such as: help conduct strategies, start of new business lines, rapid solution of problems, transference of best practices, development of professional abilities and recruiting and retention of company talents.

- **Communities of Practice in Network Organizations**: a network organization is a relation between independent organizations. These networks have grown rapidly in number and extension in the last few years, and most enterprises belong to at least one network. A supply chain, for example, is a network organization. Organization members in a network work in strict and continuous cooperation in projects and build these networks which include rapid market insertion, capacity to concentrate in essential competencies, increase of competency due to the network partners, as well as the need to guarantee the availability of resources and materials.

- **Formal Networks of Practice**: are formal networks that include organizations but are not part of other formal relations. They have a composition that is controlled by taxes and/or acceptance by some central authority that also helps in the organization, facilitating and supporting the members in their communication, events and discussions.

- **Self-Organizing Networks of Practice**: are networks of individuals with ad-hoc relations and without formal ties. It is an informal network, loosely organized, that has no central
administration authority or responsible person, where joining is voluntary and there is almost no explicit compromise. The members may choose to join or leave the community when they want. Most of these networks are virtual, thus the communication strategy is based essentially on knowledge codification.

4.2 FROM ADMINISTRATIVE PERSONNEL

In higher educational institutions, the functioning and administration of the institution is governed by the administrative department. This department is in overall control of the institution. These department personnel will have vast experience in maintaining the learning atmosphere, discipline, faculty management, students’ management, transport management etc. The hierarchy in this department is Chairman/President, Secretary, Directors, Administrative officers, Managers, clerks and other staff. There will be several sorts of administrative problems in the institution. Only the top three or four levels of persons in the hierarchy gets engaged in most of the decision making situations, while the others get engaged in regular activities like maintaining records, income and expenditure, etc. Most of the time it is necessary for the higher authorities to be present in the institution, but it is difficult. In some situations the same decision has to be taken which was taken earlier. This problem can be solved by using the knowledge portal.

Transforming the implicit knowledge from the administrative personnel into explicit and storing it in the knowledge portal, can pave the way to design knowledge management systems which provides solutions. There are several methods to extract the implicit knowledge from the administrative personnel. This extracted knowledge helps new employees to
get trained in their work, and gives them expertise. The extraction methods are given below:

- Learning Laboratory
- Collective cognitive mapping system
- Executive cognitive support
- Knowledge Engineer

The Knowledge extraction methods from the administrative personnel are shown in Figure 4.2.

![Figure 4.2 Knowledge extraction methods from the administrative personnel](image)

**4.2.1 Learning Laboratory**

A Learning Laboratory helps participants to develop a deeper understanding of their beliefs and discover inconsistencies in their mental models and their organisations; such an environment is: “Neutral and non-threatening” (Pourdehnad et al 2002). The Learning Laboratory is a form of a ‘virtual world’ often called a microworld system, where individuals can examine the effects of their own decisions, and share them with the other agents in a collaborated environment (Chen et al 2003).
In a recent success story, United Parcel Service Inc (UPS) used the Integrad Learning Laboratory comprising online learning, three-dimensional models, podcasts, videos, and traditional hands-on and classroom methods for exploiting new drivers and trainees’ skills on the task of carrying a package across a slippery surface without getting hurt. UPS used focus groups involving hundreds of UPS staff, eight professors and 16 students from Virgin Tech to design the Integrad Learning Laboratory; and the company has acknowledged that the safety performance of their drivers since the launch of the technology has exceeded their expectations (Ketter 2008).

4.2.2  Collective Cognitive Mapping System

A collective cognitive mapping system is an archetype system consisting of four key functionalities for exploiting soft knowledge: An episodic memory representing a container of individual cognitive maps; organisational memory representing a reservoir of collective cognitive maps; a local cognitive map generator, which translates individual mental models into graphical representations; and a central collective cognitive map generator, which exploits the cognitive maps of all the members, and uses them for collective problem solving (Frank Nyame-Asiamah 2009). Chen et al (2003) emphasised that collective cognitive mapping systems have capabilities to assist individual members in an organisation to articulate, share and synthesise their visions with their peers. Collective cognitive mapping systems are tools for replicating the mental model discipline of Senge (1990), as it can support people to unearth their internal pictures of realities, bring them to surface and hold them thoroughly to examination. Collective cognitive mapping tools repeal the conventional way of discussing ideas at the highest level, and enact the order of interacting with people at the middle or lower levels for the needed information (Denning 2000).
4.2.3  Executive Cognitive Support

An executive cognitive support system helps higher level learning and knowledge creation, and provides the opportunity for organisational executives to identify tacit knowledge and externalise it into graphical representation (Chen et al 2003). This is often referred to as the Executive Support System (ESS). Information systems at the organisation’s strategic level are designed to address unstructured decision making through advanced graphics and communications. One great advantage of the ESSs is that they are tailored to meet the executive decision style, and executives with minimum computer skills can use the user-friendly tools of the ESS to generate graphic comparisons of data on business processes (Laudon and Laudon 2003). In addition, the ESS provides easy and quick opportunities for managers to identify problems themselves, instead of placing reliance on their subordinates (Leidner and Elam 1995).

4.2.4  Knowledge Engineer

Knowledge engineers work on areas, such as data and information representation, encoding methodologies, data repositories, work flow management, groupware technologies, etc. Knowledge engineers would research the technologies needed to meet the enterprise's knowledge management needs. Knowledge engineers also establish the processes by which knowledge requests are examined, information assembled, and knowledge returned to the requestor.

Knowledge Engineering, an activity in knowledge creation, is the process by which an engineer has to elicit knowledge out of an expert. This knowledge then needs to be modeled, so that it could be represented as a set of rules in a rule-based or expert system. The knowledge engineer elicits,
encodes and continuously refines the knowledgebase until an acceptable performance is achieved (Eric and Charles 2006).

4.3 FROM INDUSTRIAL PERSONS

Higher educational institutions are supposed to have interactions with industries in various sectors like automobiles, communication, software etc. The institutions and industries collaborate for success in their fields. Institutions need to collect information and knowledge from the industries to frame the students for the industrial status. Students are supposed to approach industries for jobs after their studies; hence, they need knowledge about the industries. Persons in higher positions, working in industries, will have vast experience about the functioning of the industry. They will have tremendous knowledge about handling valuable human resources. Once this knowledge is transferred to the students, they will have innumerable opportunities to be self-employed. Also, persons in different positions in different fields of industries will have valuable knowledge in their areas. This knowledge can be gathered from discussions between the institutes and the industries.

Implicit Knowledge extraction from industrial persons is made by the following methods:

- Enterprise Knowledge Portals
- Seminars
- Interaction at their workplace

Industrial knowledge extracted from industrial personnel can be stored in the knowledge portal for the use of students. Inviting the industrial personalities for seminars may help in transforming the knowledge. Industrial knowledge can also be extracted by interacting with industrial people in their
locations. The Knowledge extraction methods from industrial persons are shown in Figure 4.3.

**Figure 4.3 Knowledge extraction methods from Industrial Persons**

### 4.3.1 Enterprise Knowledge Portals

"Enterprise Information Portals are applications that enable companies to unlock internally and externally stored information, and provide users a single gateway to personalized information needed to make informed business decisions. " They are: "... an amalgamation of software applications that consolidate, manage, analyze and distribute information across and outside of an enterprise (including Business Intelligence, Content Management, Data Warehouse and Mart and Data Management applications)" (Shilakes and Tylman 1998). Recently, the term “enterprise knowledge portal” is more widely used instead of “enterprise information portal”. Advanced techniques try to help the user access the right information at the right time. This implies the support of organizational learning and corporate knowledge processes. Therefore, enterprise knowledge portals are the ideal user interface to a knowledge management or organizational memory system (OMS) (Lehner 2000).
EKPs include the internet, intranet and extranet sites of organizations (Dfouni and Croteau 2004). Enterprise portals focus on corporate information and services which should be provided to the employees of an enterprise. The terms enterprise portal and enterprise information portal are used interchangeably. The goal is to provide the user with a consolidated, personalized user interface to all the information he needs for his daily tasks (Torsten Priebe and Günther Pernul 2003). The Internet is defined as: ‘International network of networks that is a collection of hundreds of thousands of private and public networks’. Extranet is a private intranet which allows access to authorised third parties, Laudon and Laudon (2003). The Internet provides tools for inter-group contact with the advantages of creating a secure environment, minimising anxiety, removing geographical barriers, creating equal status and maintaining a friendly atmosphere (Amichai-Hamburger and McKenna 2006).

Intranets provide platforms, especially emails, for shared individual and corporate knowledge, as well as for improving creativity and innovation (Hills 1997). Intranets are corporate communication networks which are normally linked to the Internet technologies, with restricted access to the internal users of organisations (Turban et al 2006). Enterprise Knowledge Portals (EKPs) are information gateways which provide access to internal and external sources of information, including web-browser interfaces, structured and unstructured content management, integrated data and applications, and collaborative work capabilities (Campos 2008). The deployment of the intranet on a firm’s Internet site may lead to unproductive staff hours as some staff may be tempted to stay on the internet, browsing some site for their own interest (Frank Nyame-Asiamah 2009).
4.3.2 **Seminars**

Industrial persons are helpful in sharing their knowledge; this is considered as a rich source of knowledge. Seminars make people come out of their shell and express their ideas and experience. The sharing of knowledge, beyond doubt, highlights the brighter side of the industrial dignitaries’ vast experiences in particular fields, their updated knowledge, their concern for the system and their sense of responsibility. Periodic Seminars and discussions help both in documentation and multiplying the knowledge, thus leading to an effective knowledge transfer. People, who don’t usually meet, share their in-depth knowledge during seminars. In this manner the implicit knowledge from the industrial persons is made explicit.

4.3.3 **Interaction at Workplace**

Making the students and faculty members to visit industries periodically will make the knowledge transfer easier. Industrial visits make the students understand the concepts involved in industries easily. Industrial persons talk openly and freely with the students and faculty, during meetings at their work place. Industrial people also share the information and knowledge about the current trends in production, marketing etc. They will also suggest the areas of importance for training, to the students. The interaction at the workplace will extract more knowledge from the industrial persons.

4.4 **FROM STUDENTS**

Students are brilliant. They may have good knowledge in some subjects. They may be nearly experts in certain areas. A teacher can learn a lot about teaching, by observing the manner in which students listen in the
classes. The knowledge which the students have may not be explicit. This should be extracted and stored in the knowledge portal. This implicit knowledge will help in designing knowledge management systems which will suit the students. Their implicit knowledge can be extracted by several ways. Some of them are as follows:

- Feedback
- Storytelling
- Contextualized Learning
- Brainstorming
- Short Message Service

The Knowledge extraction methods from students are shown in Figure 4.4.

![Figure 4.4 Methods of knowledge extraction from students](image)

4.4.1 Feedback

Feedback is one of the types of knowledge extraction methodologies from the students. Feedback is defined as the return of
information about the result of a process or activity. By making the students to submit feedback reports and suggestions regularly about the faculty member, teaching methodology, institutional atmosphere, knowledge management systems etc, the implicit knowledge from the minds of the students can be extracted. Based on the students’ feedback, the faculty members can change their teaching methodologies, so that students get more concentration and understanding in the subjects, which in-turn, result in an overall improvement in their performance. Feedback can be broadly classified into two types, positive and negative. Positive feedback can be used for identifying the factors which are accepted and encouraged by the students. Negative feedback can reveal the factors, which are not encouraged and accepted by the students. Both the feedback techniques are given equal weightage to extract implicit knowledge from the students. This implicit knowledge extracted can be stored in the knowledge portal. Designing a knowledge management system considering this knowledge will make the system student-friendly.

4.4.2 Storytelling

“The sage of storytelling, says that storytelling is telling a story which is written in a book we have in our own heart. We also have an inner notebook where we note down the story we have listened to, and the notebook will be a storybook we read out to somebody. Thus, a story is not a pragmatic mode that is objective and suitable for explaining logic, but a narrative mode that is subjective and suitable for representing human intention (e.g., what we thought in everyday life). Therefore, we exchange our detailed experiences as tacit knowledge by exchanging these narrative mode messages in daily chat” (Shaw 1993).

Traditionally, the tacit knowledge of individuals was extracted through storytelling techniques, where people sat around fire camps and
swapped stories in village communities. Storytelling unveils unseen implicit knowledge and generates meanings from sentences, which are told messily from narratives to reminiscence. Storytelling therefore, serves to connect knowledge with the emerging context, introduce masterly skills, provide meanings for association and structures, create an environment for dialogue, explain adaptive changes, reveal the creativity of an individual, and reconstruct authenticity (Denning 2000). Storytelling, in knowledge management, is used as a technique to describe complex issues, explain events, understand difficult changes, present other perspectives, make connections and communicate experience. Stories are useful in knowledge management, because people learn things easily from stories enabling the externalization of tacit knowledge (Hildreth and Kimble 2002).

Storytelling allows the exploration of might-have-beens, as well as what happened. This means that a larger range of knowledge can be explored: not just the knowledge that individuals used, but also the knowledge that they might have used (Snowden 2005). Stories provide a bridge between the tacit and the explicit forms of knowledge, as well as conveying the speaker’s moral attitude (Ismail 2006). Interaction between students by the way of storytelling will reveal their implicit knowledge. This knowledge is stored in the knowledge portal.

4.4.3 Contextualized Learning

Contextualized and ubiquitous learning are relatively new research areas that combine the latest developments in ubiquitous and context aware computing, with pedagogical approaches relevant to achieve more situated and context aware learning support. Recent research in human-computer interaction (HCI) describes several trends in designing new interfaces for interacting with information systems. Benford et al (2005), describe four main trends, which include the growing interest and relevance of sensing
technologies, growing diversity in physical interfaces, increasing mobility and physical engagement in HCI, and a shift in the types of applications for which innovative interfaces are designed. These developments also have a major impact on the development of new learning solutions and interfaces for explorative and situated learning support.

Situated learning as introduced by Wenger and Lave (1991), states the importance of knowledge acquisition in a cultural context, and its integration in a community of practice. Learning, in this sense, must not only incorporate a curriculum but also the tasks, learning situations, and interaction with the social environment of the learner. This is often contrasted with classroom-based learning, in which most knowledge is out of context and presented de-contextualized. On the one hand, the process of contextualization and de-contextualization might be important for the abstraction and generalization of knowledge, but on the other hand, in the sense of cognitive apprenticeship, it is reasonable to guide the learner towards appropriate levels and the context of knowledge coming from an authentic learning situation (Collins et al 1989).

From a constructivist point of view, not only is knowledge always contextualized, but also, the construction of knowledge (learning) is always situated within its application and the community of practice (Mandl et al 1995). Stein (1998), defines four central elements of situated learning: the content emphasizes higher order thinking rather than the acquisition of facts; the context for embedding the learning process in the social, psychological and material environment in which the learner is situated; the community of practice that enables reflection and knowledge construction; and the participation in a process of reflecting, interpreting and negotiating meaning. From the perspective of situated learning, several requirements for new learning tools can be stated, such as: use authentic problems, allow multiple
perspectives, enable learning with peers and social interaction within communities, and enable active construction and reflection about knowledge.

Moreover, the idea of situated learning is also closely related to the ideas of "blended learning" and "learning on demand", especially in educational systems for adults and at the workplace (Oppermann and Specht 2006). An important point that is not taken into account by a lot of new approaches for delivering learning on demand, is the aspect that the need (demand) for knowledge and learning arises in a working context with the motivation for solving specific problems or understanding problem situations. This notion of "learning on demand" in the workplace exemplifies the potential of contextualized learning in the workplace. Learners who identify a problem in a certain working situation are highly motivated for learning and acquiring knowledge for problem solving. They have a complex problem situation as a demand, which can be used for delivering learning content adapted to their situation. Furthermore, not only is the delivery of content into a certain context or practice needed, but also interaction facilities that allow an appropriate interaction and cooperation with educational systems must be provided.

The contextualization of learning on demand can not only be seen from the point of view of an actual problem or learning situation, but can also be seen as a longer lasting process of integrated learning activities. Different learning activities are combined in blended learning approaches: The student prepares for a task, updates his/her base knowledge, applies the task in an actual working situation, documents solutions to the problem, and reflects on the activities to evaluate the entire process. The latest research also stresses two other dimensions of embedding learning support into everyday life: first, integration from a lifelong learning perspective and second, integration in a community of practice. The latest research into lifelong learning integrates
informal and formal learning approaches, and supports access to knowledge resources, learning activities, competence development and learning communities from a variety of clients built on service-oriented architectures (Koper and Specht 2006).

Field trips are an ideal example of an established pedagogical method that can be enhanced with computer-based tools for new ways of collaboration and individual active knowledge construction. The learners in the field can collect information, and contextualize it with their own experiences and, at the same time, work on tasks with their peers and detect new perspectives and solutions to the given problems. To foster a variety of perspectives and activities in the field trip process, tools are developed for the focused support of different activities in the field and in the classroom. Small groups of students from the institutions were sent on field trips, while the other students participate interactively from their classrooms via the Internet. The groups going to the field were equipped with data gathering devices (photographic, video, audio, measuring), wireless communication and a video conferencing system for direct interaction between the field and the classroom. The project followed a plan of functional analysis in the field, end user requirements analysis, system and service design, interface design and implementation, and evaluation in the target group.

The different phases and functional requirements for supporting live collaboration and information access during field trips were worked out. Field trips with students were held in different areas in order to identify different activities in the field and in the classroom, and to draw the first evaluations of the critical success factors. Different types of field trips were identified, including individual class field trips within one subject, cross-curricular field trips within the institutions, interconnection of classrooms with different remote experts, comparison field trips synchronously collecting data from different remote classes, longitudinal studies comparing data from
different classes in different years, and others. Through these trials, different phases for preparing the field trip, experiencing the field trip in the classroom and in the field, and the evaluation after the field trip were identified. Therefore, the applications aimed to support the users with different tools, depending on their current phase in the field trip process in general are, preparation, field trip activity, and/or evaluation.

The implementation of different user roles and interfaces was not based on a software solution for the intelligent rendering of interface components, but was developed with specialized applications for the different roles' and role-specific devices for fulfilling the tasks in the field and in the classroom. The applications can be seen as different components in a blended learning process that is, distributed in time, location, social context in the different phases of the field trip. Furthermore, non-functional requirements highlighted the importance of specialized devices for certain tasks to reduce the complexity of handling applications, and also the possibility to split up tasks in learner groups because, in most field trips, the students actually worked in groups. In this way knowledge is captured and stored in the knowledge portal.

4.4.4 Brainstorming

A popular technique for capitalizing on the respective insights and intuitions (tacit knowledge) of a group of individuals is to conduct brainstorming sessions. Brainstorming sessions should occur at crucial stages in the innovation process, as they have been shown to lead to important consequences for the organization as a whole (Sutton and Hargadon 1996). Brainstorming Applications are resourceful tools for sharing, recording, organising and evaluating ideas, and thereby for creating knowledge. These applications support creative thinking and translate tacit understanding into explicit knowledge (Offsey 1997). Tacit knowledge could be converted into
explicit knowledge effectively and efficiently by the sequential use of metaphor, analogy and model. This activity is possible during formal meetings or brainstorming sessions in order to improve the initial ideas generated in the socialization process (Salina Daud et al 2008).

Brainstorming is one of the most common methodologies used to bring out the creativity and innovation from individuals. Different individuals have different levels of knowledge about some things, as well as different ways of looking at the same thing. The process of brainstorming makes possible the sharing of views and ideas and mental models commonly used by individuals. It is also through this process that such ideas, views and mental models can be challenged and defended, and further elaborated or modified. Through brainstorming it becomes possible to bring out the diversity of perspectives and mental sets that exist in the brains of the participants. By properly managing such brainstorming sessions, it is possible to produce a composite perspective on a common problem. This composite perspective could lead to innovation and new knowledge (Uriarte 2008).

Brainstorming is an informal way of generating topics to write about, or points to make about the topic. It can be done at any time during the writing process. One can brainstorm the topics for a whole paper or just a conclusion or an example. There is no pressure on the students to be “brilliant” during the brainstorming sessions. Students can simply open their minds to whatever pops into them. It is a kind of free association. Since the students are free to open their minds, they start sharing more knowledge. Much of what the students will come up with may not be useful, but it is important. Most of the ideas and views from the students get revealed during the brainstorming sessions. Brainstorming will involve a selection process as a part of it. This selection process helps in extracting useful knowledge from the students.
4.4.5 Short Message Service

Today, development in the communication field is enormous. One can easily communicate and share his ideas and views to other persons in any part of the world. This is because of the usage of mobile communication. Most of the students prefer the usage of mobile phones. With a mobile phone one can communicate with others and also share one’s ideas by sending messages. Sending messages through mobile phones is possible by using the short message service. Usually ideas are not generated immediately when a question is asked. It may take some time. Ideas originate in one’s mind, when one is in a relaxed atmosphere. It is not possible to make a hardcopy of an idea, as soon as it dawns. By using the short service message one can send one’s ideas and views whenever they spring into the mind through a mobile phone. Students using mobile phones can share implicit knowledge in this way. The short service messages from the students can be collected and transformed into useful knowledge. This extracted knowledge can be stored in the knowledge portal.

4.5 EMINENT PERSONS FROM SOCIETY

Knowledge comes from experience in certain fields; all of it cannot be learnt from books. There are no prescribed books for the students in universities regarding tradition, culture etc. of the society. Students should be guided through ethical values in order to create a knowledge society. Higher educational institutions and universities need knowledge about the society, culture etc. to teach the students. This knowledge can be gained from the eminent persons in different fields from the society. Persons with experience in different fields can be called to the institutions to share their views in front of the faculty and students, so that students can be motivated through ethical values. Ethical values should to be considered in designing knowledge management systems; hence the knowledge portal should possess this
knowledge. This implicit knowledge can be extracted using the following methods:

- Knowledge management suites
- Facilitation

The Knowledge extraction methods from eminent persons are shown in Figure 4.5.

![Figure 4.5 Knowledge extraction methods from Eminent Persons](image)

4.5.1 Knowledge Management Suites

Knowledge Management suites are complete knowledge management solutions out-of-the-box. They integrate the communications, collaborations, and storage technologies into a single convenient package. A knowledge management suite must still assess internal databases and other external knowledge sources; so, some integration is required to make the software truly functional. Knowledge management suites are powerful approaches to developing a knowledge management system because they offer one user interface, one data repository, and one vendor (Efraim Turban 2005).

At present there are knowledge management suites, such as Open Text’s Livelinks, that combine document management facilities with
functions that help create ‘communities of practice’, whereby people in different departments who are pursuing similar interests can be connected into electronic conversations (Uriarte 2008). By using knowledge management suites, implicit knowledge from the eminent persons can be extracted.

4.5.2 Facilitation

The implicit knowledge from eminent persons in society can be extracted by arranging meetings at regular intervals with the faculty and students in the institutions. By using advanced and latest technologies like air-conditioned halls, cordless mikes, amplifiers, etc. the speakers can be made comfortable enough to share their in-depth knowledge. Facilitation makes sure of the effective transfer of implicit knowledge from the experts drawn from society. Refreshment and facilities provided to the audience may extend the listening hours.