EDUCATION IN COMMUNICATION TECHNOLOGY

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Preface

Education in communication technology is increasingly recognized as vital in today's digital age, where technological advancements have transformed how information is accessed, shared, and communicated. One key aspect of education in communication technology involves equipping students with digital literacy skills, including the ability to navigate online platforms, critically evaluate digital content, and protect their privacy and security in online environments. By incorporating digital literacy into the curriculum, educators can empower students to become responsible digital citizens capable of using technology effectively and ethically.

Moreover, education in communication technology encompasses the integration of digital tools and platforms into teaching and learning practices. This includes the use of multimedia resources, interactive software, and online collaboration tools to enhance engagement, facilitate personalized learning experiences, and promote digital fluency among students. By leveraging communication technologies in education, educators can create dynamic and interactive learning environments that cater to diverse learning styles and foster creativity and innovation.

Furthermore, education in communication technology emphasizes the importance of teaching students essential technical skills such as coding, programming, and digital media production. These skills are increasingly in demand in today's digital economy, where technology plays a central role in various industries and sectors. By providing students with hands-on experience in coding and digital media creation, educators can prepare them for future career opportunities and empower them to pursue pathways in STEM (Science, Technology, Engineering, and Mathematics) fields.

Additionally, education in communication technology addresses the need for digital citizenship education, which involves teaching students about their rights and responsibilities in digital spaces. This includes topics such as online safety, cyberbullying prevention, digital ethics, and responsible use of social media. By promoting digital citizenship education, educators can help students develop the critical thinking skills and ethical awareness needed to navigate the complexities of the digital world and contribute positively to online communities.

Moreover, education in communication technology extends beyond the classroom to encompass professional development opportunities for educators. Teachers need support and training to effectively integrate communication technologies into their teaching practices and stay abreast of emerging trends and innovations in educational technology. Professional development programmes, workshops, and conferences provide educators with opportunities to enhance their digital literacy skills, explore new teaching methodologies, and collaborate with peers to share best practices and resources.

Education in communication technology is essential for preparing students to thrive in a digital society and economy. By equipping students with digital literacy skills, integrating digital tools into teaching and learning practices, teaching technical skills such as coding and digital media production, promoting digital citizenship education, and providing professional development opportunities for educators, schools can ensure that students are well-prepared to succeed in an increasingly interconnected and technology-driven world.

The book on Education in Communication Technology offers a comprehensive exploration of integrating digital tools, fostering digital literacy, and promoting responsible digital citizenship in educational settings.

–Author

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Introduction

PERSPECTIVES AND MEANING OF EDUCATION TECHNOLOGY

Educational technology is most simply and comfortably defined as an array of tools that might prove helpful in advancing student learning. Educational Technology relies on a broad definition of the word "technology". Technology can refer to material objects of use to humanity, such as machines or hardware, but it can also encompass broader themes, including systems, methods of organization, and techniques. Some modern tools include but are not limited to overhead projectors, laptop computers, and calculators. Newer tools such as "smartphones" and games (both online and offline) are beginning to draw serious attention for their learning potential.

Those who employ educational technologies to explore ideas and communicate meaning are learners or teachers. The word technology for the sister fields of Educational and Human Performance Technology means "applied science." In other words, any valid and reliable process or procedure that is derived from basic research using the "scientific method" is considered a "technology."

Educational or Human Performance Technology may be based purely on algorithmic or heuristic processes, but neither necessarily implies physical technology. The word technology, comes from the Greek "Techne" which means craft or art. Another word "technique", with the same origin, also may be used when considering the field Educational technology. So Educational technology may be extended to include the techniques of the educator.

A classic example of an Educational Psychology text is Bloom's 1956 book, *Taxonomy of Educational Objectives*. Bloom's taxonomy is helpful when designing learning activities to keep in mind what is expected of—and what are the learning goals for— learners. However, Bloom's work does not explicitly deal with educational technology *per se* and is more concerned with pedagogical strategies.

According to some, an Educational Technologist is someone who transforms basic educational and psychological research into an evidence-based applied science (or a technology) of learning or instruction. Educational Technologists typically have a graduate degree (Master's, Doctorate, Ph.D., or D.Phil.) in a field related to educational psychology, educational media, experimental psychology, cognitive psychology or, more purely, in the fields of Educational, Instructional or Human Performance Technology or Instructional (Systems) Design. But few of those listed below as theorists would ever use the term "educational technologist" as a term to describe themselves, preferring terms like "educator". The transformation of educational technology from a cottage industry to a profession is discussed by Shurville, Browne, and Whitaker.

HISTORY

For several decades, vendors of equipment such as laptop computers and interactive white boards have been claiming that their technologies would transform classrooms and learning in many positive ways, but there has been little evidence provided to substantiate these claims. To some extent, the history of educational technology has been marked by a succession of innovations that arrive with much fanfare but often fade into the background once fully tested, as Cuban argues in the above title.

THEORIES AND PRACTICES

Three main theoretical schools or philosophical frameworks have been present in the educational technology literature. These are Behaviourism, Cognitivism and Constructivism. Each of these schools of thought are still present in today's literature but have evolved as the Psychology literature has evolved.

BEHAVIOURISM

This theoretical framework was developed in the early 20th century with the animal learning experiments of Ivan Pavlov, Edward Thorndike, Edward C. Tolman, Clark L. Hull, B.F. Skinner and many others. Many psychologists used these theories to describe and experiment with human learning. While still very useful this philosophy of learning has lost favour with many educators.

SKINNER'S CONTRIBUTIONS

B.F. Skinner wrote extensively on improvements of teaching based on his functional analysis of Verbal Behaviour, and wrote "The Technology of Teaching", an attempt to dispel the myths underlying contemporary education,

as well as promote his system he called programmed instruction. Ogden Lindsley also developed the Celeration learning system similarly based on behaviour analysis but quite different from Keller's and Skinner's models.

COGNITIVISM

Cognitive science has changed how educators view learning. Since the very early beginning of the Cognitive Revolution of the 1960s and 1970s, learning theory has undergone a great deal of change. Much of the empirical framework of Behaviourism was retained even though a new paradigm had begun. Cognitive theories look beyond behaviour to explain brain-based learning. Cognitivists consider how human memory works to promote learning.

After memory theories like the Atkinson-Shiffrin memory model and Baddeley's Working memory model were established as a theoretical framework in Cognitive Psychology, new cognitive frameworks of learning began to emerge during the 1970s, 80s, and 90s.

It is important to note that Computer Science and Information Technology have had a major influence on Cognitive Science theory. The Cognitive concepts of working memory (formerly known as short term memory) and long term memory have been facilitated by research and technology from the field of Computer Science.

Another major influence on the field of Cognitive Science is Noam Chomsky. Today researchers are concentrating on topics like Cognitive load and Information Processing Theory.

CONSTRUCTIVISM

Constructivism is a learning theory or educational philosophy that many educators began to consider in the 1990s. One of the primary tenets of this philosophy is that learners construct their own meaning from new information, as they interact with reality or others with different perspectives.

Constructivist learning environments require students to utilize their prior knowledge and experiences to formulate new, related, and/or adaptive concepts in learning. Under this framework the role of the teacher becomes that of a facilitator, providing guidance so that learners can construct their own knowledge. Constructivist educators must make sure that the prior learning experiences are appropriate and related to the concepts being taught. Jonassen (1997) suggests "well-structured" learning environments are useful for novice learners and that "ill-structured" environments are only useful for more advanced learners. Educators utilizing technology when teaching with a constructivist perspective should choose technologies that reinforce prior learning perhaps in a problem-solving environment.

CONNECTIVISM

Connectivism is "a learning theory for the digital age," and has been developed by George Siemens and Stephen Downes based on their analysis of the limitations

of behaviourism, cognitivism and constructivism to explain the effect technology has had on how we live, how we communicate, and how we learn. Donald G. Perrin, Executive Editor of the International Journal of Instructional Technology and Distance Learning says the theory "combines relevant elements of many learning theories, social structures, and technology to create a powerful theoretical construct for learning in the digital age."

TEACHER–STUDENT IN-CLASS COMMUNICATION

Teacher–student in-class communication revolves around the primary communicative roles played by the teacher. Two of these roles are teacher as lecturer and teacher as discussion leader. The lecture enables teachers to communicate large amounts of information organized in a way to appeal to many students at the same time. For the lecture to be effective, it must have the appropriate breadth and depth of content, be organized in a logical pattern, and contain the appropriate amount and type of examples. Teachers must also strive to engage in effective communicative behaviours when lecturing. These communicative behaviours include being clear, making the content relevant, and using humor. When engaged in teaching with clarity, teachers communicate their expectations clearly, stress key points, provide preview and review statements, and describe assignments (Book 1999).

Clear teachers are concerned with not only the clarity of course content, but the clarity of course procedures, course policies, and course expectations. When making content relevant, teachers communicate content relevance through the use of examples, explanations, current events, and experiences. Teachers who are relevant are concerned with making the connection between course material and students' career goals, personal goals, and personal needs. When using humor, teachers communicate through relaying humorous stories, anecdotes, and jokes, and by exaggeration. Humorous teachers make sure their humor is related to the course content and is used to clarify key points made in the lecture. Thus, by incorporating clarity, relevance, and humor in their lectures, teachers are able to enhance student learning. Additionally, when teachers are clear, relevant, and humorous, students report that they liked their teacher, liked the course, and were motivated to study.

When leading discussion, teachers rely on asking questions as their primary communicative tool. By asking questions, teachers can assess whether students are learning, are interested in the course content, or are simply paying attention. Many teachers rely on asking recall and clarification questions to determine whether students are learning or paying attention, but other forms of teacher questions exist. These teacher questions are exploratory, diagnostic, action, cause-and-effect, and summary (Davis 1993). Exploratory questions ask students to probe known facts; diagnostic questions ask students to probe motives or causes; action questions ask students to develop a course of action; cause-and-effect questions ask students to derive a causal explanation; and summary

questions ask students to synthesize content. Whatever the type of questions teachers ask, these questions are designed to challenge and involve students in classroom interaction.

Teacher communication is also central in classroom management. Classroom management refers to the communicative behaviours used by teachers to regulate and control student classroom behaviour. Some of the communicative behaviours used by teachers are messages rooted in teacher power and influence and behavioral alteration techniques. Messages rooted in teacher power and influence enable teachers to persuade students to behave in ways that are appropriate for the classroom. Two of these messages include teacher expert power and teacher referent power. Teacher expert power refers to student recognition of the teacher as a content specialist and teacher referent power refers to student recognition of the teacher as a likeable person. When teachers use expert power and referent power messages, students report that they liked the course, learned something from it, are satisfied with how their teachers communicated in the course, and consider their teachers to be competent and trustworthy. Moreover, students are more likely to behave and respond to their teachers' requests to behave, which emerge in the form of behavioral alteration techniques. Behavioral alteration techniques are 22 strategies used by teachers to gain student compliance using either a positive or a negative tone. When teachers use prosocial techniques, students are more likely to respond positively to teacher influence attempts; when teachers use negative techniques, students are more likely to resist teacher influence attempts.

Conversely, teachers whose student–teacher interaction is governed by the relational perspective communicate with their students as a means of developing a relationship. Communication is mutually created and shared between students and teachers, with an emphasis on the role of shared emotions and feelings used by students and teachers to respond both affectively and effectively to each other. To communicate effectively with their students, teachers use affinity-seeking strategies and immediacy behaviours, are supportive and confirming, and use humor.

Through the relational perspective, student–teacher interaction is viewed as collaborative in that student–teacher interaction is interpersonally driven and relationally oriented. Implicit in this argument is the notion that students and instructors engage in communication in order to develop professional working relationships with each other. The relational perspective can account for student–teacher interaction, which impacts whether and how students are motivated to communicate with their teachers, whether students participate in the classroom, and whether students engage in out-of-class communication with their teachers.

STUDENT COMMUNICATION MOTIVES

Whether student–teacher interaction occurs may be dependent on whether or not students are motivated to communicate with their teachers. Student communication motives refer to the primary reasons for students to communicate

with their teachers. Researchers have identified five communication motives. These motives, or reasons, are relational, functional, participatory, excuse-making, and sycophancy (Martin et al. 1999).

When students communicate with teachers for relational reasons, they are doing so to learn more about the teacher on a personal level. Students may perceive their teachers as having similar interests, sharing the same background, or having the potential to become a potential friend. When students communicate with teachers for functional reasons, they are doing so to acquire needed information about the course. Students may ask questions or use information-seeking strategies to learn about course expectations, to understand the material, or to clarify the requirements for assignments, exams, and projects. When students communicate with teachers for participatory reasons, they are doing so to demonstrate their involvement in the course. Students may answer questions, offer examples, or challenge teachers' comments to demonstrate that they are genuinely interested in participating in class discussion or class activity. When students communicate with teachers for excuse-making, they are doing so to provide a reason as to why their academic performance is suffering. Students may offer excuses for why they are tardy, why they are absent from class, or why their assignments are incomplete or not finished at all. When students communicate with teachers for sycophantic reasons, they are doing so in order to make a favourable impression on teachers. Students may engage in conversation, answer questions, or appear interested in the course content because they want to be viewed positively by their teachers.

When students communicate with their teachers for relational, functional, and participatory reasons, they report that they liked the course, learned something from it, are satisfied with how their teachers communicated in the course, and are motivated to study. Students who communicate with their teachers for relational and functional reasons also report that they liked the teacher. Conversely, students who communicate for excuse-making and sycophancy reasons do not indicate any positive links between their communication with their teachers and their liking, learning, or satisfaction and this motivation. These findings suggest that when students communicate with their teachers for relational, functional, and participatory reasons, their educational experience is affected positively, whereas when they communicate with their teachers for excuse making and sycophantic reasons their educational experience is not affected at all, whether positively or negatively.

At the same time, whether students are motivated to communicate with their teachers is dependent on the interpersonal communication behaviours used by teachers.

Generally, when students are motivated to communicate with their teachers, they perceive their teachers as being approachable, as friendly yet challenging, as responsive yet assertive, and as possessing the communication skills necessary for functional relationships. They are also motivated to communicate when their teachers use verbal and nonverbal immediacy behaviours and use pro-

social classroom management techniques. Moreover, students are motivated to communicate with their teachers when they consider their relationships to be of high quality and unlike the relationships the same teachers have with other students.

MODELS OF THE COMMUNICATION PROCESS

While the field of communication has changed considerably over the last thirty years, the models used in the introductory chapters of communication textbooks are the same models that were used forty years ago. This is, in some sense, a testament to their enduring value. Shannon's model of the communication process provides, in its breakdown of the flow of a message from source to destination, an excellent breakdown of the elements of the communication process that can be very helpful to students who are thinking about how they communicate with others. It remains, however, that these texts generally treat these models as little more than a baseline.

They rapidly segue into other subjects that seem more directly relevant to our everyday experience of communication. In interpersonal communication texts these subjects typically include the social construction of the self, perception of self and other, language, non-verbal communication, listening, conflict management, intercultural communication, relational communication, and various communication contexts, including work and family. In mass communication texts these subjects typically include media literacy, media and culture, new media, media industries, media audiences, advertising, public relations, media effects, regulation, and media ethics.

There was a time when our communication models provided a useful graphical outline of a semesters material. This is no longer the case. This stage presents the classic models that we use in teaching communication, including Shannon's information theory model, a cybernetic model that includes feedback, and the transactive model. Few textbooks cover all of these models together. Mass Communication texts typically segue from Shannon's model to a two-step flow or gatekeeper model.

Interpersonal texts typically present Shannon's model as the "active" model of the communication process and then elaborate it with interactive and transactive models. Here as suggested, argue the value of update these models to better account for the way we teach these diverse subject matters, and present a unifying model of the communication process that will be described as an ecological model of the communication process. This model seeks to better represent the structure and key constituents of the communication process as we teach it today.

SHANNON'S MODEL OF THE COMMUNICATION PROCESS

Shannon's model of the communication process is, in important ways, the beginning of the modern field. It provided, for the first time, a general model of the communication process that could be treated as the common ground of such

diverse disciplines as journalism, rhetoric, linguistics, and speech and hearing sciences. Part of its success is due to its structuralist reduction of communication to a set of basic constituents that not only explain how communication happens, but why communication sometimes fails.

Good timing played a role as well. The world was barely thirty years into the age of mass radio, had arguably fought a world war in its wake, and an even more powerful, television, was about to assert itself. It was time to create the field of communication as a unified discipline, and Shannon's model was as good an excuse as any.

The model's enduring value is readily evident in introductory textbooks. It remains one of the first things most students learn about communication when they take an introductory communication class. Indeed, it is one of only a handful of theoretical statements about the communication process that can be found in introductory textbooks in both mass communication and interpersonal communication.

Shannon's model breaks the process of communication down into eight discrete components:

- *An information source*. Presumably a person who creates a message.
- *The message*, which is both sent by the information source and received by the destination.
- *A transmitter*. For Shannon's immediate purpose a telephone instrument that captures an audio signal, converts it into an electronic signal, and amplifies it for transmission through the telephone network. Transmission is readily generalised within Shannon's information theory to encompass a wide range of transmitters. The simplest transmission system, that associated with face-to-face communication, has at least two layers of transmission. The first, the mouth and body, create and modulate a signal. The second layer, which might also be described as a channel, is built of the air and light that enable the transmission of those signals from one person to another. A television broadcast would obviously include many more layers, with the addition of cameras and microphones, editing and filtering systems, a national signal distribution network and a local radio wave broadcast antenna.
- *The signal*, which flows through a channel. There may be multiple parallel signals, as is the case in face-to-face interaction where sound and gesture involve different signal systems that depend on different channels and modes of transmission. There may be multiple serial signals, with sound and/or gesture turned into electronic signals, radio waves, or words and pictures in a book.
- *A carrier or channel*, which is represented by the small unlabeled box in the middle of the model. The most commonly used channels include air, light, electricity, radio waves, paper, and postal systems. Note that there may be multiple channels associated with the multiple layers of transmission.

- *Noise*, in the form of secondary signals that obscure or confuse the signal carried. Given Shannon's focus on telephone transmission, carriers, and reception, it should not be surprising that noise is restricted to noise that obscures or obliterates some portion of the signal within the channel. This is a fairly restrictive notion of noise, by current standards, and a somewhat misleading one. Today we have at least some media which are so noise free that compressed signals are constructed with an absolutely minimal amount information and little likelihood of signal loss. In the process, Shannon's solution to noise, redundancy, has been largely replaced by a minimally redundant solution: error detection and correction. Today we use noise more as a metaphor for problems associated with effective listening.
- *A receiver*. In Shannon's conception, the receiving telephone instrument. In face to face communication a set of ears and eyes. In television, several layers of receiver, including an antenna and a television set.
- *A destination*. Presumably a person who consumes and processes the message.

Like all models, this is a minimalist abstraction of the reality it attempts to reproduce. The reality of most communication systems is more complex. Most information sources act as both sources and destinations.

Transmitters, receivers, channels, signals, and even messages are often layered both serially and in parallel such that there are multiple signals transmitted and received, even when they are converged into a common signal stream and a common channel. Many other elaborations can be readily described.. It remains, however, that Shannon's model is a useful abstraction that identifies the most important components of communication and their general relationship to one another.

Bell's sketch visibly contains an information source and destination, transmitters and receivers, a channel, a signal, and an implied message. What is new, in Shannon's model is a formal vocabulary that is now generally used in describing such designs, a vocabulary that sets up both Shannon's mathematical theory of information and a large amount of subsequent communi-cation theory.

This correspondence between Bell's sketch and Shannon's model is rarely remarked. Shannon's model isn't really a model of communication, however. It is, instead, a model of the flow of information through a medium, and an incomplete and biased model that is far more applicable to the system it maps, a telephone or telegraph, than it is to most other media. It suggests, for instance, a "push" model in which sources of information can inflict it on destinations.

In the real world of media, destinations are more typically self-selecting "consumers" of information who have the ability to select the messages they are most interested in, turn off messages that don't interest them, focus on one message in preference to other in message rich environments, and can choose to simply not pay attention.

Shannon's model depicts transmission from a transmitter to a receiver as the primary activity of a medium. In the real world of media, messages are frequently

stored for elongated periods of time and/or modified in some way before they are accessed by the "destination". The model suggests that communication within a medium is frequently direct and unidirectional, but in the real world of media, communication is almost never unidirectional and is often indirect.

DERIVATIVE MODELS OF THE COMMUNICATION PROCESS

One of these shortcomings is addressed in Figure's intermediary model of communication. This model, which is frequently depicted in introductory texts in mass communication, focuses on the important role that intermediaries often play in the communication process. Mass communication texts frequently specifically associate editors, who decide what stories will fit in a newspaper or news broadcast, with this intermediary or gatekeeper role.

There are, however, many intermediary roles associated with communication. Many of these intermediaries have the ability to decide what messages others see, the context in which they are seen, and when they see them.

They often have the ability, moreover, to change messages or to prevent them from reaching an audience. In extreme variations we refer to such gatekeepers as censors. Under the more normal conditions of mass media, in which publications choose some content in preference to other potential content based on an editorial policy, we refer to them as editors, moderators, reviewers, or aggregators, among other titles. Delivery workers also act as intermediaries, and have the ability to act as gatekeepers, but are generally restricted from doing so as a matter of ethics and/or law.

The bidirectionality of communication is commonly addressed in interpersonal communication text with two elaborations of Shannon's model: the interactive model and the transactive model. The interactive model, a variant of which is shown in Figure, elaborates Shannon's model with the cybernetic concept of feedback, often without changing any other element of Shannon's model. The key concept associated with this elaboration is that destinations provide feedback on the messages they receive such that the information sources can adapt their messages, in real time. This is an important elaboration, and as generally depicted, a radically oversimplified one.

Feedback is a message. The source of feedback is an information source. The consumer of feedback is a destination. Feedback is transmitted, received, and potentially disruptable via noise sources. None of this is visible in the typical depiction of the interactive model. This doesn't diminish the importance of feedback or the usefulness of elaborating Shannon's model to include it. People really do adapt their messages based on the feedback they receive. It is useful, however, to notice that the interactive model depicts feedback at a much higher level of abstraction than it does messages.

This difference in the level of abstraction is addressed in the transactional model of communication, a variant of which is shown in Figure. This model acknowledges neither creators nor consumers of messages, preferring to label the people associated with the model as communicators who both create and

consume messages. The model presumes additional symmetries as well, with each participant creating messages that are received by the other communicator. This is, in many ways, an excellent model of the face-to-face interactive process which extends readily to any interactive medium that provides users with symmetrical interfaces for creation and consumption of messages, including notes, letters, C.B. Radio, electronic mail, and the radio. It is, however, a distinctly interpersonal model that implies an equality between communicators that often doesn't exist, even in interpersonal contexts. The caller in most telephone conversations has the initial upper hand in setting the direction and tone of a telephone caller than the receiver of the call. In face-to-face head-complement interactions, the boss has considerably more freedom and power to allocate message bandwidth than does the employee. The model certainly does not apply in mass media contexts. The "masspersonal" media of the Internet through this implied symmetry into even greater relief.

Most Internet media grant everyone symmetrical creation and consumption interfaces. Anyone with Internet access can create a web site and participate as an equal partner in e-mail, instant messaging, chat rooms, computer conferences, collaborative composition sites, blogs, interactive games, MUDs, MOOs, and other media. It remains, however, that users have very different preferences in their message consumption and creation. Some people are very comfortable creating messages for others online. Others prefer to "lurk"; to freely browse the messages of others without adding anything of their own. Adding comments to a computer conference is rarely more difficult than sending an e-mail, but most Internet discussion groups have many more lurkers than they have contributors. Oddly, the lurkers sometimes feel more integrated with the community than the contributors do.

A NEW MODEL OF THE COMMUNICATION PROCESS

Existing models of the communication process don't provide a reasonable basis for understanding such effects. Indeed, there are many things that we routinely teach undergraduates in introductory communication courses that are missing from, or outright inconsistent with, these models.

Consider that:

- We now routinely teach students that "receivers" of messages really "consume" messages. People usually have a rich menu of potential messages to choose from and they select the messages they want to hear in much the same way that diners select entrees from a restaurant menu. We teach students that most "noise" is generated within the listener, that we engage messages through "selective attention", that one of the most important things we can do to improve our communication is to learn how to listen, that mass media audiences have choices, and that we need to be "literate" in our media choices, even in our choice of television messages. Yet all of these models suggest an "injection model" in which message reception is automatic.

- We spend a large portion of our introductory courses teaching students about language, including written, verbal, and non-verbal languages, yet language is all but ignored in these models.
- We spend large portions of our introductory courses teaching students about the importance of perception, attribution, and relationships to our interpretation of messages; of the importance of communication to the perceptions that others have of us, the perceptions we have of ourselves, and the creation and maintenence of the relationships we have with others. These models say nothing about the role of perception and relationshp to the way we interpret messages or our willingness to consume messages from different people.
- We spend large portions of our introductory courses teaching students about the socially constructed aspects of languages, messages, and media use. Intercultural communication presumes both social construction and the presumption that people schooled in one set of conventions will almost certainly violate the expectations of people schooled in a different set of expectations. Discussions of the effects of media on culture presume that communication within the same medium may be very different in different cultures, but that the effects of the medium on various cultures will be more uniform. Existing general models provide little in the way of a platform from which these effects can be discussed.
- When we use these models in teaching courses in both interpersonal and mass communication; in teaching students about very different kinds of media. With the exception of the Shannon model, we tend to use these models selectively in describing those media, and without any strong indication of where the medium begins or ends; without any indication of how media interrelate with languages, messages, or the people who create and consume messages. Without addressing the ways in which they are. while these media describe, in a generalised way, media,

The ecological model of communication attempts to provide a platform on which these issues can be explored. It asserts that communication occurs in the intersection of four fundamental constructs: communication between people is mediated by messages which are created using language within media; consumed from media and interpreted using language. This model is, in many ways, a more detailed elaboration of Lasswell's classic outline of the study of communication: "Who... says what... in which channel... to whom... with what effect". In the ecological model, the "who" are the creators of messages, the "says what" are the messages, the "in which channel" is elaborated into languages and media, the "to whom" are the consumers of messages, and the effects are found in various relationships between the primitives, including relationships, perspectives, attributions, interpretations, and the continuing evolution of languages and media.

A number of relationships are described in this model:

- Messages are created and consumed using language
- Language occurs within the context of media
- Messages are constructed and consumed within the context of media
- The roles of consumer and creator are reflexive. People become creators when they reply or supply feedback to other people. Creators become consumers when they make use of feedback to adapt their messages to message consumers. People learn how to create messages through the act of consuming other peoples messages.
- The roles of consumer and creator are introspective. Creators of messages create messages within the context of their perspectives of and relationships with anticipated consumers of messages. Creators optimise their messages to their target audiences. Consumers of messages interpret those messages within the context of their perspectives of, and relationships with, creators of messages. Consumers make attributions of meaning based on their opinion of the message creator. People form these perspectives and relationships as a function of their communication.
- The messages creators of messages construct are necessarily imperfect representations of the meaning they imagine. Messages are created within the expressive limitations of the medium selected and the meaning representation space provided by the language used. The message created is almost always a partial and imperfect representation of what the creator would like to say.
- A consumers interpretation of a messages necessarily attributes meaning imperfectly. Consumers intepret messages within the limits of the languages used and the media those languages are used in. A consumers interpretation of a message may be very different than what the creator of a message imagined.
- People learn language by through the experience of encountering language being used within media. The languages they learn will almost always be the languages when communicating with people who already know and use those languages. That communication always occurs within a medium that enables those languages.
- People learn media by using media. The media they learn will necessarilly be the media used by the people they communicate with.
- People invent and evolve languages. While some behaviour expressions occur naturally and some aspects of language structure may mirror the ways in which the brain structures ideas, language does not occur naturally. People invent new language when there is no language that they can be socialised into. People evolve language when they need to communicate ideas that existing language is not sufficient to.
- People invent and evolve media While some of the modalities and channels associated with communi-cation are naturally occurring, the media we use to communicate are not.

A medium of communication is, in short, the product of a set of complex interactions between its primary consituents: messages, people, languages, and media. Three of these consituents are themselves complex systems and the subject of entire fields of study, including psychology, sociology, anthropology, linguistics, media ecology, and communication. Even messages can be regarded as complex entities, but its complexities can be described entirely within the scope of languages, media, and the people who use them. This ecological model of communication is, in its most fundamental reading, a compact theory of messages and the systems that enable them. Messages are the central feature of the model and the most fundamental product of the interaction of people, language, and media. But there are other products of the model that build up from that base of messages, including observation, learning, interpretation, socialisation, attribution, perspectives, and relationships.

DISCUSSION: POSITIONING THE STUDY OF MEDIA IN THE FIELD OF COMMUNICATION

It is in this layering of interdependent social construction that this model picks up its name. Our communication is not produced within any single system, but in the intersection of several interrelated systems, each of which is self-standing necessarily described by dedicated theories, but each of which is both the product of the others and, in its own limited way, an instance of the other. The medium is, as McLuhan famously observed, a message that is inherent to every message that is created in or consumed from a medium. The medium is, to the extent that we can select among media, also a language such that the message of the medium is not only inherent to a message, but often an element of its composition. In what may be the most extreme view enabled by the processing of messages within media, the medium may also be a person and consumes messages, recreates them, and makes the modified messages available for further consumption. A medium is really none of these things. It is fundamentally a system that enables the construction of messages using a set of languages such that they can be consumed. But a medium is also both all of these things and the product of their interaction. People learn, create, and evolve media as a vehicle for enabling the creation and consumption of messages.

The same might be said of each of the constituents of this model. People can be, and often are, the medium, the language, or the message. Fundamentally a person is none of these things, but they can be used as any of these things and are the product of their experience of all of these things. Our experience of messages, languages, media, and through them, other people, is fundamental in shaping who we become and how we think of ourselves and others. We invent ourselves, and others work diligently to shape that invention, through our consumption of messages, the languages we master, and the media we use.

Language can be, and often are, the message, the medium, the person and even “the language”. Fundamentally a language is none of these things, but it can be used as any of these things and is the product of our use of media to

construct messages. We use language, within media, to construct messages, such as definitions and dictionaries) that construct language. We invent and evolve language as a product of our communication.

As for messages, they reiterate all of these constituents. Every message is a partial and incomplete precis of the language that it is constructed with, the medium it is created in and consumed from, and the person who created it. Every message we consume allows us to learn a little more about the language that we interpret with, the medium we create and consume messages in, and the person who created the message. Every message we create is an opportunity to change and extend the language we use, evolve the media we use, and influence the perspective that consumers of our messages have of us. Yet fundamentally, a message is simply a message, an attempt to communicate something we imagine such that another person can correctly intepret the message and thus imagine the same thing.

This welter of intersecting McLuhanesque/Burkean metaphors and interdependencies provides a second source of the models name. This model seeks, more than anything, to position language and media as the intermediate building blocks on which communication is built. The position of language as a building block of messages and and communication is well understood. Over a century of study in semantics, semiotics, and linguistics have produced systematic theories of message and language production which are well understood and generally accepted. The study of language is routinely incorporated into virtually all programmes in the field of communication, including journalism, rhetoric and speech, film, theater, broadcast media, language arts, speech and hearing sciences telecommunications, and other variants, including departments of "language and social interaction". The positioning of the study of media within the field of communication is considerably more tenuous. Many departments, including most of those named in this paragraph, focus almost entirely on only one or two media, effectively assuming the medium such that the focus of study can be constrained to the art of message production and interpretation, with a heavy focus on the languages of the medium and little real introspection about what it means to use that medium in preference to another or the generalised ways in which all media are invented, learned, evolved, socialised, selected or used meaningfully.

Such is, however, the primary subject matter of the newly emerging discipline of media ecology, and this model can be seen as an attempt to position media ecology relative to language and messages as a building block of our communication. This model was created specifically to support theories of media and position them relative to the process of communication. It is hoped that the reader finds value in that positioning.

CONCLUSION: THEORETICAL AND PEDAGOGICAL VALUE

Models are a fundamental building block of theory. They are also a fundamental tool of instruction. Shannon's information theory model, Weiner's

Cybernetic model, and Katz' two step flow each allowed allowed scholars decompose the process of communication into discrete structural elements. Each provides the basis for considerable bodies of communication theory and research. Each model also provides teachers with a powerful pedagogical tool for teaching students to understand that communication is a complex process in which many things can, and frequently do, go wrong; for teaching students the ways in which they can perfect different skills at different points in the communication process to become more effective communicators. But while Shannon's model has proved effective across the primary divides in the field of communication, the other models Katz' and Weiner's models have not. Indeed, they in many ways exemplify that divide and the differences in what is taught in courses oriented to interpersonal communication and mass communication.

Weiner's cybernetic model accentuates the interactive structure of communication. Katz' model accentuates its production structure. Students of interpersonal communication are taught, through the use of the interactive/ cybernetic and transactive models that attending to the feedback of their audience is an important part of being an effective communicator.

Students of mass communication are taught, through the intermediary/ gatekeeper/two-step flow model, that controlled production processes are an important part of being an effective communicator. The difference is a small one and there is no denying that both attention to feedback and attention to detail are critical skills of effective communicators, but mass media programmes focus heavily on the minutiae of production, interpersonal programmes focus heavily on the munitiae of attention to feedback. Despite the fact that both teach both message production the languages used in message production, and the details of the small range of media that each typically covers, they discuss different media, to some extent different languages, and different approaches to message production. These differences, far more than more obvious differences like audience size or technology, are the divides that seperate the study of interpersonal communication from mass communication.

The ecological model of communication presented here cannot, by itself, remediate such differences, but it does reconsitute and extend these models in ways that make it useful, both pedogogically and theoretically, across the normal disciplinary boundaries of the field of communication. The author has made good use of the model in teaching a variety of courses within several communication disciplines, including on interpersonal communication, mass media criticism, organisational communication, communication ethics, communication in relationships and communities, and new communication technologies.

In introductory Interpersonal Communication classes the model has shown considerable value in outlining and tying together such diverse topics as the social construction of the self, verbal and non-verbal languages, listening, relationship formation and development, miscommunication, perception, attribution, and the ways in which communication changes in different interpersonal media.

In an Organisational Communication class the model has proved value in tying comtemporary Organisational models, including network analysis models, satisficing, and Weick's model to key organisational skills like effective presentation, listening, and matching the medium to the goal and the stakeholder. In a communication ethics class it has proved valuable in elaborating the range of participants in media who have ethical responsibilities and the scope of their responsibilities. In a mass media criticism class it has proved useful in showing how different critical methods relate to the process of communication and to each other. In each course the model has proved valuable, not only in giving students tools with which they can decompose communication, but which they can organise the course materials into a cohesive whole.

While the model was originally composed for pedagogical purposes, the primary value for the author has been theoretical. The field of communication encompasses a wide range of very different and often unintegrated theories and methods. Context-based gaps in the field like the one between mass media and interpersonal communication have been equated to those of "two sovereign nations," with "different purposes, different boundaries", "different methods", and "different theoretical orientations", causing at least some to doubt that the field can ever be united by a common theory of communication. The author repeatedly finds these gaps and boundaries problematic

It may be that complex model of the communication process that bridges the theoretical orientations of interpersonal, organisational, and mass media perspectives can help to bridge this gap and provide something more than the kind of metamodel that Craig calls for. Defining media directly into the process of communication may help to provide the kind of substrate that would satisfy Cappella's suggestion we can "remake the field by altering the organisational format", replacing contexts with processes that operate within the scope of media. This perspective does exactly that. The result does not integrate all of communication theory, but it may provide a useful starting point on which a more integrated communication theory can be built. The construction of such theory is the author's primary objective in forwarding this model for your comment and, hopefully, your response.

EDUCATIONAL TECHNOLOGY AS SYSTEMS APPROACH

Educational Technology as a systems approach: All attempts made to define the concept of educational technology as an area of study involving the application of technologies emerged from the application of theories of learning and development as well as information and communication technologies have not been comprehensive enough without a theoretical grounding in the social context.

The use of these technologies has to be grounded in a theoretical foundation provided by a systems perspective. The field of educational technology shares the same difficulties and struggles involved in defining itself as one comes

across while defining other social sciences and applied social sciences. This section attempts to provide you with adequate theoretical understanding about systems theory in order to have a more comprehensive view of the field of educational technology.

You would have read through the two sections indicated in the article by Luppicini (2005). You would have understood that a comprehensive definition of educational technology goes beyond uses of technology including techniques, theories, and methods from multiple knowledge domains which are standardised and reproducible such as computer science, psychology and communications. The definition would also include the governing principles of systems approach.

'The systems approach to educational technology The systems approach to the design and analysis of teaching/learning situations is the basis of the great majority of modern educational technology-related developments. However, the terms system and systems approach are themselves jargon terms that can have a variety of interpretations. Let us therefore take a look at these terms in order to define the way in which we are to use them.

In general systems theory, a system is any collection of interrelated parts that together constitute a larger whole. These component parts, or elements of the system are intimately linked with one another, either directly or indirectly, and any change in one or more elements may affect the overall performance of the system, either beneficially or adversely.

THE SYSTEMS APPROACH IN TECHNOLOGY EDUCATION

The traditional approach in engineering or technology teaching is bottom-up, *i.e.*, from component to system.

For example, the order of the courses in a typical communications engineering programme is: mathematics (calculus, *etc.*), science (physics, *etc.*), electricity basics, components, linear circuits, modules, basics of transmission and receiving, subsystems, and communications systems. In most traditional curricula, both in high school and undergraduate programmes, the stage of dealing with a complete system is sometimes not fully addressed by the curriculum.

The larger, more complex, more dynamic and more interdisciplinary the specifications for a technological systems get, the harder it is for a lone engineer, as skilled as he or she may be, to design a complete system. Given this, students and their teachers, who are not required to be proficient in engineering, but who should be technologically literate, should not be expected to know so much as trained engineers as they go about manipulating entire technological systems.

Based on the systems thinking approach, what follows is a proposal for a way to teach technology and instill technological literacy without first teaching the details (for instance, electricity basics and linear circuits for electronics, or calculus and dynamics basics for mechanical engineering). The central idea in this premise is that complete systems can be handled, conceptually and

functionally, without needing to know their details. According to this approach, when trying to develop technological literacy in students who are not required to be proficient in engineering, the favoured teaching strategy is top-down. In other words, the focus must be on the characteristics and functionality of whole systems and the interdependences of the subsystems.

SYSTEM APPROACH

This new technology has influenced the educational administration and organisation to a great extent. This is the modern approach.

It acts as a link between hardware and software approach. It is also known as 'Management Technology'. It has brought to educational management a scientific approach for solving educational administrative problems.

It is essentially a new management approach, influencing management decisions in business, industry and education. Education is regard as a system and system approach is a systematic way of designing an effective and economical educational system.

System is defined in the dictionary as "an assemblage of objects united by some form of regular interaction or inter-dependence; as organic or organised whole as the solar system or a new telegraph system". System may be divided into three broad categories.

SYSTEMS APPROACH

System approach is a systematic attempt to coordinate all aspects of a problem towards specific objectives. Webster's dictionary defines a system as "a regularly interacting or independent group of items forming a unified whole." The characteristics of a system of may be explained with the help of an example – various parts of the digestive system may be called as components of digestive system. Every component of the digestive system contributes to as supports in functioning of the digestive system as a whole.

In the context of education, system is a unit as a whole incorporating all its aspects and parts, namely, pupils, teachers, curriculum, content and evaluation of instructional objectives. The teaching-learning process is viewed as communication and control taking place between the components of a system. In this case, the system is composed of a teacher, a student and a programme of instruction, all in a particular pattern of interaction.

The System Approach focuses first upon the learner and then course content, learning experiences and effective media and instructional strategies. Such a system incorporates within itself the capability of providing continuous self-correction and improvement. It is concerned with all elements of instruction including media, including hardware and software. Its purpose is to ensure that the components of the organic whole will be available with the proper characteristics at the proper time to contribute to the total system fulfilling the objectives.

In the systems approach to instruction, the teacher has to plan completely the utilization of selected resource material and the classroom activities. The

teacher should have a good overall view of the subject, know his/her limitations, know all about his/her pupils and the individual differences in their learning capacities and plan accordingly.

The system approach involves continuous evaluation of learning outcomes and utilization of knowledge gained by analysis of results of evaluation to suitably modify the plan of approach to achieve the stated objectives. Major steps in the systems approach in education are: 1. Formulating of specific instructional objectives to be achieved and defining instructional goals, 2. Deciding appropriate media to achieve these goals, 3. Defining learner characteristics and requirements, 4. Selecting appropriate methods suitable for effective learning to take place, 5. Selecting appropriate learning experiences from available alternatives, 6. Selecting appropriate materials and tools required, 7. Assigning appropriate personal roles for teachers, students and supporting staff, 8. Implementing the programme, 9. Evaluating the outcome in terms of original objectives measured in student performance and 10. Revising to improve efficiency of the system to improve students' learning.

ADVANTAGES OF SYSTEMS APPROACH

i. Systems approach helps to identify the suitability of the resource material to achieve the specific goal.
ii. Technological advance could be used to provide integration of machines, media and people for attaining the defined goal.
iii. It helps to assess the resource needs, their sources and facilities in relation to quantities, time and other factors.
iv. It permits an orderly introduction of components demonstrated to be required for systems success in terms of student learning.
v. It avoids rigidity in plan of action as continuous evaluation affords desired beneficial changes to be made.

LIMITATIONS OF SYSTEMS APPROACH

i. Resistance to change. Old ways are difficult to erase. There is always resistance to any new method or approach.
ii. Involves hard work. Systems approach requires hard and continuous work on the part of school personnel. Some are not prepared for the extra load.
iii. Lack of understanding. Teachers and administrators are still not familiar with systems approach. Though it has been successfully implemented industry, it has still to make headway in education.

THE FIELD OF EDUCATIONAL TECHNOLOGY

Educational technology is a term widely used in the field of education. Ely provides the following background information and sources that help in understanding the concept of educational technology:

- *Definition*: Educational technology refers to a particular approach to achieving the ends of education. Instructional technology refers to the use of such technological processes for teaching and learning. The Association for Educational Communications and Technology defines instructional technology as the theory and practice of design, development, utilization, management, and evaluation of processes and resources for learning. In *Educational Technology*:
  - *Educational technology refers to the application of science- based knowledge to educational and instructional planning and to the olution of basic teaching-learning problems. Technology in this sense is applied science. It is concerned with education processes as well as hardware and software systems.*
- *Roots of educational technology*: This field was a 20th century movement with the major developments occurring during and immediately after World War II. What began with an emphasis on audiovisual communications media gradually focused on the systematic development of teaching and learning procedures that were based in behavioural psychology.
- *Educational technologists*: They design instruction, produce instructional materials, and manage instructional computing services or learning resources collections. Many are still employed in schools and universities, but increasing numbers are being employed by training agencies in business, industry, government, the military, and the health professions.
- Educational technology associations include:
  - Association for Learning Technology (ALT)
  - Association for Media and Technology in Education in Canada (AMTEC)
  - American Society for Training and Development (ASTD)
  - AECT
  - Association for the Advancement of Computing in Education (AACE)
  - Consortium of College and University Media Centers (CCUMC)
  - Federal Educational Technology Association (FETA)
  - International Society for Performance Improve-ment (ISPI)
  - ISTE
  - National Association of Media and Technology Centers (NAMTC)
  - National Education Computing Association (NECA)
  - Society for Applied Learning Technology (SALT)

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Scope of Educational Technology

By scope of educational technology we mean the jurisdiction, the limits or the boundaries within which it works. It needs demarcation of the boundaries within which the process of education can go on. Being a fast growing modern discipline it is almost practical all through and is expanding with a tremendous speed, aiming at all- round development in the area of education.

National Policy on Education (1986), recommends that, "Educational Technology will be employed in the spread of useful, information, the training and retraining of teachers, to improve quality, sharpen awareness of art and culture, inculcate abiding values, *etc.*, both in the formal and non-formal sectors. Maximum use will be made of the available infrastructure."

The scope of Educational Technology can be accessed from the following points:

- *Determination of Objectives*: Educational Technology provides different methods and techniques for writing instructional objectives in behavioural terms such as Bloom Taxonomy Magar's Approach and RCEM Approach. The needs and requirements of the people and hence education need be revised from moment to moment. Educational technology helps in fixing-up the right objectives in the light of the changed circumstances and changed environment.
- *Improvement in Teaching Learning Process*: It helps in improving the teaching learning process and makes it more purposive. It tries to discuss the concept of teaching, analysis of teaching process, variables of teaching, phases and levels of teaching, principles of teaching, maxims of teaching and relationship between teaching and learning.

- *Development of Teaching Learning Material*: Teaching learning materials are also as important as anything else in the teaching learning process. In this age of science and technology, the materials of teaching cannot be unscientific. Everything of the society including values of life need be reflected in the materials. Only right type of material will be able to modify the behaviour of the learner suitably making him a fit person for the society.
- *Improvement in Teaching Training*: The change of environment with ne curriculum and new materials need be handled by the teachers. The teachers equipped with old strategies and methodologies of teaching will remain misfits. Right type of training to the teachers is the need of the hour. Educational Technology can render its valuable help in the training of teachers also. The use of video tapes and close circuit T.V. will help the teachers to remodel and reshape their teaching behaviours suitably. It includes micro teaching, simulated teaching, term-teaching, teacher effectiveness, modification of teacher-behaviour, class-room interaction and interaction analysis, *etc.*
- *Development of Teaching Learning Strategies*: A strategy plays an important role in the hands of a teacher in every learning situation. The strategy has to be the right one which should be according to the materials and is able to bring about effective teaching- learning. The different strategies are being evolved by educational technology. The knowledge of those strategies is a must for every teacher. Then only the teacher will be able to do justice to their jobs. It tries to describe the ways and means of discovering selecting and developing suitable strategies and tactics of teaching in terms of optimum learning and available teaching-learning resources; the availability of the different types of teaching methods, devices and models of teaching-their appropriate selection and use for the optimum results.
- *Proper Use of Audio Visual Aids*: Audio Visual aids have always played an important role in the teaching-learning process. They need be used according to the times. The software aids, the hardware aids, the computer and other such appliances, equipment, *etc.*, have to be used in the present type of teaching-learning environment. Computer assisted instructions will help the learner as well as the teacher to achieve the goals of education more conveniently.
- *Utilisation of the Sub-System of Education*: Educational Technology considers education as a system operating in a systematic and scientific way for the achievement of educational objectives. For the coverage of its systematic approach, it tries to include the topics dealing with the theory and principles of a system approach, explaining education as a system, its different sub-systems in terms of input and output. It is helpful in solving scientifically educational administrative problems with the help of system analysis.

- *Development of Curriculum*: Educational Technology is concerned with the designing of a suitable curriculum for the achievement of the desired objectives. It is helpful in describing the ways and means of the selection of suitable learning experiences, organisation of the contents in a suitable framework in order to bring better results. It provides the scientific foundation to education as well as develops theories of teaching and learning.
- *Proper Use of Hardware and Software*: These days' hardware and software are playing an effective role in the attainment of educational objectives. Educational Technology helps in the proper use of these aids. It tries to describe these resources in terms of their specific functions, their solution, proper handling and maintenance.
- *Provides Feedback*: It provides an appropriate feedback to the learners as well as teachers for bringing necessary improvement at the preparatory and implementation stages of their specific acts. For this purpose, educational technology discusses the ways and means of suitable evaluation techniques, their planning, development selection and appropriate use in relation to the objectives of teaching- learning system. In this way Educational Technology is concerned with all those who are connected in any way, directly or indirectly, to the processes and products of education. It teaches the teachers the art of teaching, the learners the science of teach the educational planners the structure of planning and administrators or managers the skill of managing or administering the task of teaching and learning. It works for the individualisation of instructions as well for improving the group dynamics of the class-room.

DIFFERING GLOBAL PERSPECTIVES

Perhaps the most important step in understanding and incorporating global education in classrooms and communities is to understand and relate to the themes of global awareness as presented by experts in the field. Hanvey (1976), one of the first scholarly experts to give a comprehensive definition of the concept "global awareness", proposes five dimensions that prepare students to achieve global awareness. These include perspective consciousness, state-of-the-planet awareness, cross-cultural awareness, knowledge of global dynamics, and awareness of human choices. Haavenson, Savukova, and Mason (1998/99) conducted their research on United States and Russian perspectives on teacher education reform and global education and found that these dimensions form the first level known as attitude formation upon which global education can be implemented.

The second level is the development of cognition skills and the third level is an integrated view of the world. An explanation of Hanvey's five dimensions, paraphrased by Kirkwood (2001) and Haavenson et al. (1998/99) is provided below and an explanation of the other two levels will be identified.

PERSPECTIVE CONSCIOUSNESS

Perspective consciousness refers to an awareness of and appreciation for other images of the world and that a person's worldview is neither universally shared, nor necessarily right, yet may be profoundly different. It is the realization that an individual's worldview is both a matter of conscious opinions and ideas and more importantly to subconscious evaluations, conceptions and unexamined assumptions.

Perspectives are shaped by ethnic, religious, differences in age, sex, and social status, among many other factors. These differences, as stated by Haavenson et al. (1998/99), "have been one of the main causes of conflict and confrontation in the history of mankind" (p.38). The authors go on to say that, "It is important to teach students to look upon a certain phenomenon or event from different perspectives so as to encourage respect and appreciation for beliefs, customs, and values different from their own" (p. 38). It is not only about racial and cultural differences, instead, a pluralistic view needs to be taken when looking at global perspectives.

STATE-OF-THE-PLANET AWARENESS

State-of-the-planet awareness requires comprehension of prevailing world conditions, developments, trends, and problems that are confronting the world community.

It includes an in-depth understanding of global issues such as population growth, migrations, economic disparities, depletion of resources, and international conflicts, that require global learners to be aware of the world around them. Children need to be made aware that what affects the world affects them as well. In elementary school, students can be taught to make decisions about ways to prevent disaster by studying the consequences of environmental illiteracy.

CROSS-CULTURAL AWARENESS

This dimension includes the diversity of ideas and practices in human societies and how these ideas and practices are found in human societies around the world, including concepts of how others might view one's own society as perceived from other vantage points. According to Hanvey (1976), this dimension is the most difficult to attain most likely because it refers to the highest level of global cognition.

The misconception about cross-cultural awareness is that people consider it no more than a set of stereotypes that do more harm than good as superficial knowledge engenders prejudice.

An effective way to promote cross-cultural awareness, as explained by Haavenson et al. (1998/99), is by showing videos and then having discussions with students about these films to help them in separating stereotypical views from those that are more authentic.

KNOWLEDGE OF GLOBAL DYNAMICS

Knowledge of global dynamics refers to an understanding of the world as an interconnected system of complex traits and mechanisms and unanticipated consequences. A high level of sophistication on the part of the student is required because understanding these processes is difficult to achieve due to the unanticipated effects on the human condition. It includes a consciousness of global change and cannot be acquired through mass media. Haavenson et al. (1998/99) explain that "[s]tudents learn to identify subtle cause-effect relationships, anticipate side effects, model processes and make decisions about eliminating or altering undesirable consequences". Students may be asked to create webs of the factors influencing the issue, to suggest feasible solutions, and to foresee possible side effects of such actions.

AWARENESS OF HUMAN CHOICES

Hanvey (1976) challenges global thinkers to realize the problems of choice confronting individuals and nations as consciousness and knowledge of global systems expand. It is related to global dynamics in such a way that it focuses on making choices and develops a sense of responsibility for making decisions made which affect future generations. It also includes an awareness of the interconnectedness of individual, national, and international settings. It fosters a sense of responsible citizenship on the local and global levels. Students may be introduced to alternatives on thought and behaviour by looking at relationships and interactions between man and the world. Students are asked to account for their choices and are taught to be tolerant towards the view of others.

In their study with teachers, Haavenson et al. (1998/99) posits that the second level of global education implementation is cognition focused. This means that life demands both a thorough knowledge of a domain combined with a broad perspective of the world. This is similar to the 'interconnections' theme that Werner & Case (1997) identify and develop which explores both the international and inter-system linkages and conclude that we live in an interconnected world. Therefore students must be encouraged to see the different ways in which one situation is influenced by and influences others.

Further exploration in the topic is explained by Haavenson et al (1998/99) that the brain often searches for common patterns and relationships and seeks to connect new knowledge with prior experiences that result in the fact that cognition operates in all concepts. The traditional approach of filling the minds with facts and information that students are simply asked to memorize and reproduce does nothing to promote global awareness and teachers must keep this in mind when working to plan curriculum. Instead, students need experience in critical thinking, in taking part in cross-cultural experiences, and to make decisions and substantiate them. In the study by Haavenson et al. (1998/99), students are taught to think for themselves and to be able to stand their ground. The authors advise that the atmosphere created by the teacher is very important.

The third level of global education implementation is an integrated view of the world as explained by Haavenson et. al. (1998/99). They state that "the third level aims to create a specific picture of the world where geographical, physical and linguistic features all fit into a complex pattern". This means that all discipline-focused world perspectives need to overlap due to the interdependence of facts, events, and phenomena. For instance, university interdisciplinary courses may be the most effective way to create a cross-disciplinary perspective.

GLOBAL AWARENESS ELEMENTS

Case (1993) identifies five key substantive elements that keep people informed of a range of global topics. The first element describes the universal values and cultural practices, and the second includes global interconnections, which refers to the study of the workings of the four major interactive global systems: economic, political, ecological, and technological.

The third presents worldwide concerns and conditions such as development and peace issues while the fourth forms the origins and past patterns of worldwide affairs such as global history and geography. The last presents alternative future directions in worldwide affairs. In addition to these substantive elements, he proposes perceptual elements that should be addressed which include open mindedness, resistance to stereotyping, anticipation of complexity, empathy, and nonchauvinism.

Kirkwood (2001) analyses Case's elements and explains that the substantive elements listed above "includes the objects of global education that incorporate the contemporary events, conditions and locations in the world that Hanvey (1976) addresses within the state of the planet awareness dimension". The perceptual elements focus on the development of world mindedness and empathy and resistance to prejudicial thinking as well as stereotyping and cross-cultural knowledge. These elements are similar to the Hanvey dimensions of perspective consciousness and cross-cultural awareness.

Case (1993) and Hanvey (1976) provide similar definitions for global awareness even though the terminology they use is different. Merry M. Merryfield, one of the leading scholars in the field of global education, combines the definitions of other scholars and provides us with a current framework in this field today.

Kirkwood (2001) lists Merryfield's eight elements which include: human beliefs and values global systems, global issues and problems, cross-cultural understanding, awareness of human choices, global history, acquisition of indigenous knowledge, and development of analytical, evaluative, and participatory skills.

Kirkwood (2001) concludes that "Merryfield's work contributes significantly in reducing, if not eliminating, the definitional ambiguities that still linger in the field".

NEW UNDERSTANDINGS OF GLOBAL AWARENESS

Kirkwood (2001) presents another dimension to the definition of global education that Lamy (1987) identifies as the acquisition of knowledge transmitted by indigenous people. He concludes that a global education must include knowledge about the contributions of native people who are representing the views of their world. In his words, "The teaching of historical and contemporary events must be balanced by listening to indigenous voices".

To provide further elaboration in regards to listening to Indigenous voices, Battiste and Henderson (2000) think of globalization as a new threatening transformation that is emerging. In the introduction of their book, they state that, "Globalization with its cognitive and linguistic imperialism is the modern force that is taking our heritages, knowledge, and creativity".

For Indigenous people it is not just physical survival that concerns them; it is an issue of "maintaining Indigenous worldviews, languages, and environments". It is ironic that the world looks to Indigenous people for help in order to solve the world's crisis that its worldview has created. Battiste and Henderson (2000) state that "in view of the history of relations between the colonizers and the colonized, this is an extraordinarily bold request."

The work of David Selby and Graham Pike has brought new understandings in regards to ecological awareness or 'state of the planet awareness' as outlined by Hanvey. They have been influential in the global education field in the 1980's and are known nation wide. Influenced mainly by Richardson and Hanvey in the 1970's they have worked mainly with secondary schools. Hicks (2003) in his review of global education discusses the work of Selby & Pike.

He explains that in 1988 they further developed the conceptual map of the field and highlighted what they called 'the four dimensions of globality'. These dimensions make up the core elements of global education. The first is 'issues dimension', which embraces five major problem areas and solutions to them: inequality/equality, injustice/justice, conflict/peace; environmental damage/care; alienation/participation. The second is 'spatial dimension' which emphasizes exploration of the local-global connections that exist in relation to these issues, including the nature of both interdependency and dependency. The third is 'temporal dimension' that emphasizes exploration of the interconnections that exist between past, present, and future in relation to such issues and in particular scenarios of preferred futures. The fourth is the 'process dimension' that emphasizes a participatory and experiential pedagogy which explores differing value perspectives and leads to politically aware local-global citizenship. Selby and Pike then relate this to both individual subjects in the curriculum and whole-school case studies.

Hicks (2003) further explains that each of these four elements needs to be present before one can claim to be involved in global education. Both Selby & Pike have written extensively on the importance of ecological thinking in global education and this is evident within the four-dimensional model that they propose for global education. It needs to be stressed that the environmental health of the

world is just as important as taking care of all humanity and that the two must work together simultaneously. For example when explaining the 'spatial dimension' Selby (1998) writes that "this dimension also concerns the cycles and systems of nature and the relationships between human society and the environment".

Hicks (2003) explains that the 'temporal dimension' is a futures perspective that "looks at how global issues affect and are affected by interrelationships between past, present and future". He goes on to say that "this works to help young people think more critically and creatively about the future, especially in relation to creating more just and sustainable futures".

IMPORTANCE OF TECHNOLOGY

In the past, learning and education simply meant face-to-face lectures, reading books or printed handouts, taking notes and completing assignments generally in the form of answering questions or writing essays. In short; education, learning and teaching were considered impossible without a teacher, books and chalkboards. Today, education and training have taken on a whole new meaning. Computers are an essential part of every classroom and teachers are using DVDs, CD-ROMs and videos to show students how things work and operate. Students can interact with the subject matters through the use of such web based tools and CD-ROMs. Moreover, each student can progress at his/her own pace.

GENERAL TRENDS IN ICT CAPACITY

The capacity for information and communications technology (ICT) has been growing exponentially over the last 10 to 15 years. Computers have become more powerful; satellite, fibre optic and wireless technology has increased transmission capacity; and software developments such as multimedia authoring systems have made it easier to create digital materials such as electronic games, computer simulations and educational materials. The increased capacity and supply has resulted in plunging prices for computer functionality, telephone services and software. Nowhere has the impact been greater than on the telephone industry. Long distance charges in North America and between major developed countries have dropped by 90% in the last 15 years.

Some analysts believe that the Internet will transform the pricing structure for telecommunications from charges by distance and time to a flat charge by capacity. Thus a client will pay according to the size of the "pipe," not by the distance or length of time for which it is used. It should be noted that while the growth of the Internet is one of the major drivers for change, it is only one of several different but converging technologies that are resulting in widespread capacity growth.The rapid growth in satellite and wireless technology, and in particular the growth in mobile phone technology, is resulting in some countries attempting to leap beyond previous or intermediate technologies. For instance, telephone capacity in China had been limited by lack of hard-wired networks.

Mobile phone technology is allowing for a rapid expansion of telephone access in China. It is the last link to the end-user that has previously made hard-wired networks expensive to install on a widespread basis. Wireless technology avoids the need for hard-wired circuits into homes and offices.

However, there are several conditions surrounding this rapid growth in ICT, which can be summarised as follows:

- Despite the recent adjustments to world stock markets, capacity in ICT is forecast to continue to grow rapidly. For instance, while both Cisco and Nortel, the main providers of network hardware for the Internet, have revised downwards their growth forecasts this year, both anticipate continued growth of 15% or more annually for the next five years. This suggests that access, bandwidth and applications will all continue to increase into the foreseeable future.
- The technical capacity has far exceeded the capacity of governments, commercial organisations and educational communities to respond fully to the opportunities and challenges this rapid change has brought.
- ICT growth is not equal between different countries, between different socio-economic groups within countries or within different economic and social sectors of society. This inequality is often referred to as the digital divide: the gap between those with access and with the skills to use ICT appropriately, and those who do not have this capacity.
- Free trade and lower labour costs in developing countries in manufacturing and in resource- based industries such as agriculture and forestry have forced many former industrial nations, as well as some newly emerging "economic tigers" such as Malaysia and India, to move more aggressively into knowledge based businesses heavily dependent on ICT technologies. Thus there has been a rapid growth in e-commerce, software development, hi-tech design (such as micro-processors, digital routers, computers and digital telephone switches), entertainment (video and computer games, film and television) and financial industries in developed countries. Such knowledge-based businesses both exploit the advantage of a highly educated workforce and, at the same time, drive the demand for an even *more* highly educated workforce. Much of this growth has occurred in smaller, more dynamic companies that avoid hierarchical manage-ment structures. The development of alternative organisational and management structures for the new knowledge-based industries is also relevant to virtual education, which is not only dependent on an extensive and reliable ICT infrastructure, but also requires a post-industrial approach to organisation and management.
- Technologies such as wireless and the Internet are disruptive in the sense that they bring about radical change to previously stable sectors. Companies such as Apple, Netscape, and amazon.com have helped revolutionise certain industry sectors, forcing previously dominant

corporations either to radically change their operations or to close down. These same forces have the potential to bring about similar changes in the education sector.

Given the impact of ICT on many businesses and industries, it is not surprising that many commentators have seen education as being potentially revolutionised by it. Hence, there is great interest in virtual education, which is based on the idea of a widespread and significant application of ICT to the core activities of education. However, despite a great deal of hyperbole about the potential of ICT for education, real growth and change has been slow and marginal. This is due not only to lack of vision or commitment by educators and policy-makers; there are significant structural and cultural barriers or restrictions that have slowed the potential for change in education compared with other sectors. These issues are discussed below, first looking at some case studies, then examining what kinds of technology are being used and why. Following that is a brief examination of some key emerging technologies and how they may have an impact on the education sector.

BRIEF CASE STUDIES OF MAJOR ICT APPLICATIONS IN EDUCATION AND TRAINING

As there is a very wide range of different applications of ICT in education, any choice of case studies is somewhat arbitrary. For example, the Open University in the U.K., (UKOU) has been using communications technologies such as broadcast television and radio for educational delivery since the early 1970s, and in recent years it has also moved into online programming. However, print still remains the core delivery medium for the UKOU, even though it has expanded its programming into Europe and other areas of the world.

Similar "dedicated" national open universities, such as Indira Ghandi National Open University in India, the Chinese Central and State Radio and Television Universities, and the Korean National Open University, have operated for many years, primarily on a mix of broadcasting and printed materials. Other dedicated open universities, such as Athabasca University in Canada, have moved more aggressively into Web-based delivery.

At the same time, many institutions that offer both campus-based and distance programmes, such as the University of British Columbia (UBC) in Canada, Charles Sturt University in Australia, and Penn State University in the U.S.A., have begun to move their former print-based distance education courses online. For instance, UBC has over half of its 110 distance courses now online. In Korea and several other countries, campusbased universities are forming consortia for the delivery of online distance learning programmes. However, the most dramatic change in the use of ICT has not been in the traditional distance education market.

The biggest impact has been on campus-based teaching and in the private sector training market. John Chambers, the CEO of Cisco, one of the world's largest ICT companies, has stated that "the next big killer application for the

Internet is going to be education". Merrill Lynch has described e-learning (the combination of the corporate learning and higher education markets) as a U.S., $18 billion market by 2003, compared with $2.3 billion market in 2000.

Here are just a few examples:

- WebCT, a course authoring software platform, has over three million student licences in over 1500 institutions, and it is growing at a rate faster than 500,000 new student licences a year. However, WebCT estimates that over 80% of the use of its software is to support classroom teaching rather than "pure" distance education. Thus we are seeing the emergence of "mixed mode" teaching, combining face-to-face instruction with online learning. One of the best examples of this is the University of Central Florida, which has an extensive programme of Web-based courses available both to on-campus and off-campus students.
- A number of universities have formed consortia and partnerships with the private sector to commercially exploit their e-learning initiatives. Universitas 21 is a network of 17 universities in mainly Commonwealth countries, including Nottingham University, University of Edinburgh, University of Melbourne, Hong Kong University, National University of Singapore and the University of British Columbia. Thomson Publishing and Universitas 21 have announced a partnership to found an "e-university." In 1990 there were 48 million people in higher education by 2025, Thomson Publishing estimates that there will be 160 million.
- UNext, a U.S., company, has established an e-university called Cardean that adapts its teaching material from that of the universities of Columbia, Stanford, Chicago, Carnegie Mellon and the London School of Economics. Degrees are awarded under the Cardean name, endorsed by the state of Illinois.
- The London School of Economics is also more deeply involved in an e-learning venture called Fathom launched last year as a global online library linking institutions such as the New York Public Library, the British Library, the Smithsonian, the Cambridge University Press and the LSE. Fathom's partners participate in the running of the service, and all must approve materials before they are published on the site.
- The U.K., government has established one of the most ambitious joint e-university projects. It has put the Higher Education Funding Council for England (HEFCE) in charge of attempts to create an e-university with a budget of £400 million, half of which will be public sector money. At first this was intended to be an exclusive arrangement, with universities bidding to become members. But now all U.K., universities are allowed to hold shares. The only human contact in the core programme will be with "navigators" — advisers who will help new students to select courses. Only those students who attend summer schools or pay for additional tutorial support will receive face-to-face tuition.

- Oxford University is linking with Stanford, Yale and Princeton to create an online college for alumni. The idea is to provide lifelong learning and support to some of the world's policy-makers and business leaders. Cambridge is exploring virtual learning in its £83 million government-backed link-up with the Massachusetts Institute of Technology (MIT). The project is known as the "bridge of minds" and is principally intended to foster commercial spin-offs from university research. It also has potential to become an euniversity.
- A U.S., company, Hungry Minds has contracted with Michigan State University, New York University, Penn State University, Rochester Institute of Technology, University of California Berkeley Extension and University of California at Los Angeles Extension to provide a range of e-learning services. These vary from providing a common Web portal for their courses, to supporting the development of online certificates by these institutions.
- Since 1996, the University of British Columbia (UBC) has been offering a fully online graduate level programme on technology based distributed learning in partnership with the Monterrey Institute of Technology in Mexico. The core of the programme is on the Web, but UBC also participates by video-conference link from Vancouver to Monterrey in satellite television broadcasts to Monterrey Tech's 29 campuses across Latin America. Monterrey incorporates the five courses in its own master's degree in Educational Technology and has the rights to offer the five courses throughout Latin America. UBC has made the five courses available to both its own mainly campus- based master's students as well as to the rest of the world as a post-graduate certificate programme. To date, it has recruited students from more than 30 different countries. This programme runs on a self-financing basis entirely from student fees. As a result of this experiment, UBC and Monterrey plan to offer a joint master's degree in educational technology in both Spanish and English on a global basis from January 2002.

In the private sector training area, there has been a rapid expansion of "corporate universities," primarily in-house training organisations in the larger multinational companies making use of videoconferencing and the Internet. In parallel, there has been the development of a whole new industry of online training contractors who provide online training services to medium- and smaller-sized companies. Almost two-thirds of Merrill Lynch's estimated $18 billion market is in this private sector training area.

A number of private, for-profit organisations are trying to bridge the gap between centralised distribution (such as foreign Web courses or satellite TV) and local support. For instance, TeltecGlobal is a "business services aggregator" offering corporations and governments "a one-stop, turn-key solution for access to 21st century technology, services and education." The TeltecGlobal Center

of Influence is a "last mile" strategy that provides customers with products and Web-enabled services available through membership in their Community and Business Centers located in developing countries. TeltecGlobal Community Centers work in conjunction with multinational corporate sponsors, designing an offering of products and services "to meet both community needs and corporate objectives."

Business Centers license operations to local entrepreneurs and "global governmentbacked entities" in emerging markets. As with the Community Centers, TeltecGlobal works with the licensees to tailor the products and services to market needs and licensees' goals.

TeletecGlobal is a good example of the increasing synergy between technology, education and business. These developments are not so different from the chaotic, diverse and excessively optimistic developments in the dot.com business sector. Indeed, especially in the U.S.A., e-learning is seen as just another branch of e-business.

However, a more careful analysis of these developments will indicate that there are many barriers and challenges that need to be overcome before such initiatives can operate on a sustainable basis.

OBJECTIVES OF TECHNOLOGY EDUCATION

Technology education allows learners to explore a variety of activities related to many areas of human endeavor. Learners can develop problem solving strategies and work habits that will be useful in almost any career and or occupation. Learners should develop a greater appreciation for the work of craft workers and the skill required of that work. Within the scope of this educational programme is the effort to develop "soft skills" within the learner, as well as an opportunity for the learner to see how systems work together and the chance to put much of the academic class instruction to work in an applied way.

Many of the skills that are to be taught in technology education classes are identified in the 1991 SCANS Secretary's Commission on Achieving Necessary Skills Report. Many of these soft skills may be better developed in a lab, problem solving setting than in a typical academic classroom.

TECHNOLOGY EDUCATION VERSUS TECHNICAL EDUCATION

The goal of technology education is different from technical education. Technical education teaches specific skills directed towards a specific type of work, for example, carpentry, automotive maintenance, welding, or computer network administration, whereas technology education has a more generalized approach.

Technology education is often confused with the term educational technology, which denotes technological devices and methods of delivering or developing educational information.

TECHNOLOGY IN EDUCATION

Many people warn of the possible harmful effects of using technology in the classroom. Will children lose their ability to relate to other human beings? Will they become dependent on technology to learn? Will they find inappropriate materials? The same was probably said with the invention of the printing press, radio, and television.

All of these can be used inappropriately, but all of them have given humanity unbounded access to information which can be turned into knowledge. Appropriately used— interactively and with guidance— they have become tools for the development of higher order thinking skills.

Inappropriately used in the classroom, technology can be used to perpetuate old models of teaching and learning. Students can be "plugged into computers" to do drill and practice that is not so different from workbooks. Teachers can use multimedia technology to give more colourful, stimulating lectures. Both of these have their place, but such use does not begin to tap the power of these new tools. In this area, you will find descriptions of how computers can be used to stimulate and develop writing skills, collaborate with peers in foreign countries, do authentic kinds of research that is valuable to the adult world, and do complex kinds of problem solving that would otherwise be impossible.

NEED FOR EDUCATIONAL TECHNOLOGY IN SCHOOLS—PROCESS OF EDUCATIONAL TECHNOLOGY

Disabilities rights leaders have said that the application of technology will be the equalizer of the 21st century (Flippo, Inge & Barcus 1995). Through the use of assistive technology (AT) devices, many students can decrease their isolation and become an important part of a regular classroom, their least restrictive environment. Assistive technology is a basic tool in the educational process for any individual who may be experiencing a disability. Technology that is used as tool in education is the basic definition of educational technology.

This part will address assistive technology and services, overview the current assistive technology elements of graduate educational technology degrees, and present a model for including assistive technology to better prepare instructional technologists to participate and enhance the performance of students with disabilities.

ASSISTIVE TECHNOLOGY

The Technology-Related Assistance for Individual with Disabilities Act of 1998 (PL 100-407) gave us the first legal definition of assistive technology devices and services. An assistive technology device was defined as: any item, piece of equipment, or product system, whether acquired commercially off the shelf, modified, or customized, that is used to increase, maintain, or improve functional capabilities of individuals with disabilities. An assistive technology service was described as: any service that directly assists an individual with a disability in selection, acquisition or use of an assistive technology service.

LEVELS OF ASSISTIVE TECHNOLOGY USE

In considering assistive technology, you must consider the environment, the individual, and the characteristics and levels of the technology (Gitlow 2000). Assistive technology may be classified as high, middle or low tech. The concept of a high technology device usually includes items that require computers, electronics or microchips to perform some function. Low technology usually does not require an outside power source. An example of high technology is a computer. The application of technology could range from having a computer read a book (high tech) to printing out material in a larger font to a student using a magnifying glass (low tech) to read material.

Along with considering the level of the technology, consider the levels of how the necessary assistive technology item will be applied. The levels in applying the assistive technology solution include whether the item is personally, developmentally, or instructionally necessary (Judd-Wall 1999). The personally necessary level is concerned with assistive technology devices that are used by an individual student, such as a pair of colorblind glasses to enable a learner to more effectively interact with his/her environment.

Developmentally necessary devices may be shared among individuals. These devices help meet an educational need based on a developmental delay, which ideally would be improved, eliminating the need for the item in an individual's future. Lastly, instructionally necessary devices are those that modify the instructional process at a course or grade level, and do not need to be moved with the user as he or she progresses to the next level in education.

WHAT IS EDUCATIONAL TECHNOLOGY?

Educational or instructional technology can be hard to define. At its simplest it can be the application of technology in teaching or education, but many feel that it is much more than that. Perhaps the most encompassing definition is from University of North Carolina Media Services (1997) which states that: "Educational technology is the application of research, learning theory, emergent technologies, and child and adult psychology to solving instructional and performance problems."

The Presidential Commission on Instructional Technology highlighted four areas in which educational technologists perform: 1) design of instruction, 2) production of instructional products and services, 3) management of instruction, and 4) evaluation of instruction.

ASSISTIVE TECHNOLOGY IN THE GRADUATE EDUCATIONAL TECHNOLOGY PROGRAMME

The National Council for Accreditation of Teacher Education (NCATE) accreditation in association with the International Society for Technology in Education (ISTE) requires that assistive technology be addressed within such higher education programmes as educational computing and technology

leadership. The guidelines and standards for those programmes state that a graduate of such a programme should "demonstrate awareness of resources for adaptive assistive devices for students with special needs" and be able to "identify and classify adaptive assistive hardware and software for students and teachers with special needs and locate sources to assist in procurement and implementation" (NCATE 1999).

However, assistive technology is, for the most part, only discussed as a small component of technology integration classes or is thought of as being part of the "special education" section. There exists the need for the addition of a course devoted to the application of assistive technologies, awareness of the possible limitations of users, and universal design in a graduate educational or instructional technology programme.

A review was conducted of instructional and educational technology programmes within the colleges of education across Florida's state university system. According to their published programmes of study, none of the state colleges of education was offering a course specifying assistive technology in its title or available description. A similar limited review was conducted of universities nationwide that offered graduate programmes in educational or instructional technology. From this survey, it was found that less than twenty percent of the colleges that offered an educational technology degree provide courses focusing on assistive technology.

IMPACT ON INSTRUCTIONAL TECHNOLOGISTS

As part of the federal Individuals with Disabilities Act IDEA amendments of 1997 and 1999, statements now require assistive technology devices and services to be considered on an individualized basis and become a part of the individual education plan (IEP) if the child needs them to benefit from his educational programme. The individualized education programme (IEP) is a written statement for a child with a disability that is developed, reviewed, and revised at the child's school.

The IEPs occur each year for every child with a disability and they are developed by members of the IEP team including parents, teachers, special education teachers, administration and others. Section 508 of the Rehabilitation Act Amendments of 1998 is the most extensive new law with wide ranging effects.

This ruling requires that all US federal agencies make their information technology accessible to their employees and customers with disabilities. The law gives federal employees and members of the public the right to sue if the government agency does not provide comparable access to the information and data available to people without disabilities. Section 508 applies to Web sites that are produced for government agencies. All state agencies that receive federal funds under the Assistive Technology Act of 1998 are also required to comply with Section 508 requirements. Schools seeking to comply with legal requirements regarding students with disabilities need faculty with knowledge

of assistive technology applications. Based on NCATE accreditation requirements, it would be reasonable for a school administrator or other official to expect that an educational or instructional technology graduate from an NCATE accredited programme would be able to effectively contribute to a student's IEP team. These expectations would include that such a graduate be able to make effective judgments and recommendations concerning assistive technology and universal access.

ASSISTIVE TECHNOLOGY COURSE DEVELOPMENT

With the rapidly aging population of the United States, there is also a growing need for assistive technology and universal design. To receive federal funding organizations must be IDEA and Section 508 compliant. There exists a need to provide instruction on assistive technologies and methodology to make technology products such as computer programmes and web pages handicapped accessible. Instructional and educational technology specialists require more extensive experience and education concerning assistive technology than they currently receive. Instructional/Educational Technology graduate programmes should devote a course to the presentation of the basic concepts and applications of assistive technology. This course could be offered as a requirement in the current university master's instructional technology programme and as an elective in its master's of education or exceptional education programmes. The NCATE and ISTE standards state that for initial certification, a teacher should "demonstrate awareness of resources for adaptive assistive devices for students with special needs." These standards would be well met by such a course. The technologies and strategies presented in a course concerning the application of assistive technology would also address many of the other NCATE guidelines associated with speciality programmes such as educational computing and technology leadership.

An assistive technology course could be designed as an introductory or survey course in the application of technology as assistive and adaptive devices, software and strategies. This course could present strategies for students who are physically or mentally impaired, and may be in a mainstreamed situation. The purpose of the course material would be to teach about the use of technologies to overcome handicaps and improve functionality. Course topics could include: basics of assistive technology; legal/ethical issues associated with assistive technology; assistive technology and the individual education plan (IEP); levels of assistive technology; technology adaptations; Windows and Macintosh built-in accessibility tools; text-to-speech and speech-to-text; universal design and the internet; English as a second language, and physical and learning disabilities. An additional facet of such a course should also be designing web-based information to be universally accessible, covering such topics as making web pages more accessible and designing multimedia to overcome user handicaps. The assessments and activities of the course should include hands-on experiences with assistive technologies. Activities should be designed to include visitations

to schools or labs to see assistive technology being used, the application and use of text-to-speech and speech-to-text programmes, experiences with adaptive switches and toys, and even experimentation with environmental control hardware and software.

During discussions and interviews with inservice teachers, counsellors, physical therapists, parents, and assistive technology organizations, a need for training and education in the area of assistive technologies was identified. Through continuing discussions, some basic areas of need in assistive technology education were identified. Visitations were conducted at the Assistive Technology Educational Network (ATEN), Florida Diagnostic Learning Resources (FDLRS) and Florida Instructional Materials (FIMSE) labs.

The goal of the visitations was to learn about the state of the art and the programmes being offered, and to understand the components of the AT community. Additional research continued through conducting a literature survey in the field, observing at schools and labs, and studying current Exceptional Student Education (ESE) and Instructional Technology (IT) programmes offered at universities.

In order to begin to fill the need that was perceived, a course outline was developed and components were taught at daylong hands-on workshops designed to introduce instructional technologists and teachers to assistive technology. From these preliminary discussions with professionals in the assistive technology community, it was found that an assistive technology course would be appreciated and that course delivery through distance learning would be preferred. Many of the potential students expressing interest in such a course were unable to travel to a university. As an educational technology programme course, it would have an added benefit as a recertification course for ESE professionals and general education teachers.

After an initial course outline was developed, members of parent support organizations such as the Statewide Advocacy Network on Disabilities (STAND), university professionals in special education, assistive technology state organizations such as Florida Diagnostic and Learning Resources System (FDLRS) and Assistive Technology Education Network (ATEN), future students in exceptional education, and other instructional technology professionals were asked to provide feedback on the course design, goals, topics and assessments. All were extremely pleased with the idea of the material becoming available for instructional technologists, exceptional student education (ESE) and general education educators. In its current form, the AT course "Technologies for Special Populations" is designed as an introductory course in the application of technology as assistive and adaptive devices in education. The course itself should model effective design practices. For example web pages will be designed for universal access and course materials and multimedia will be developed to be handicapped accessible. Because of its online delivery, the course serves as a model of information presented through an assistive medium.

COURSE LEARNING STRATEGIES

The Technologies for Special Populations course stresses hands-on experiences with various assistive technology approaches and devices. One of the main course goals is designing methods for a student to have actual experiences with the technology going beyond readings and looking at images about the technology. Students are expected to purchase, train, and use voice input systems, install and use an environmental control system, purchase and use a voice repeater, and use speaking software and hardware devices. Student interactions with assistive technologies fall into five areas. Students interact in an online forum, they have field experiences, and they complete technology projects, in addition to using standard materials such as tests and papers.

One of the strategies used in the Technologies for Special Populations course is the forum. Students participate for themselves and also analyze what other students have done and provide feedback to their classmates' thoughts. Forum topics include case studies that students use in experimenting with, suggesting and explaining assistive technologies. Further forum topics encourage students to discuss and evaluate the impact that the assistive technologies have on them while they use various devices and programmes such as environmental control, voice input, and text-to-speech.

Students will be required to observe the use of assistive technology as part of their field experiences. Students are asked to observe a student who uses assistive technology devices, or investigate and visit an assistive technology demonstration lab. Using an assistive technology device checklist and observation form, students would observe assistive technologies being used and then contribute in an online exchange concerning their observations. Additional experiences include assistive hearing, assistive audio, voice control, DVD applications, and environmental control. Currently projects are being designed to give students additional experiences with assistive technology in evaluation, adaptation, and creation of assistive technology devices. Students evaluate web sites for universal access, compare various assistive technology software products, compare assistive technology hardware tools, and even complete an evaluation of a student related to the use of a specific assistive technology. Students will use software to create a communication board that augments communication within a specific class or function. Additional support is being sought for the creation of a supplemental travelling assistive technology box. Sent through the standard mail system, this box would provide students access to the more expensive technologies including touch screens, alternative keyboard inputs, talk boxes, close captioning devices, and more.

EDUCATIONAL TECHNOLOGY AND KNOWLEDGE

Educational technology is the study and ethical practice of facilitating learning and improving performance by creating, using and managing appropriate

technological processes and resources." The term educational technology is often associated with, and encompasses, instructional theory and learning theory. While instructional technology is "the theory and practice of design, development, utilization, management, and evaluation of processes and resources for learning," according to the Association for Educational Communications and Technology Definitions and Terminology Committee, educational technology includes other systems used in the process of developing human capability.

Educational technology includes, but is not limited to, software, hardware, as well as Internet applications, such as wiki's and blogs, and activities. But there is still debate on what these terms mean.

Technology of education is most simply and comfortably defined as an array of tools that might prove helpful in advancing student learning and may be measured in how and why individuals behave. Educational Technology relies on a broad definition of the word "technology." Technology can refer to material objects of use to humanity, such as machines or hardware, but it can also encompass broader themes, including systems, methods of organization, and techniques. Some modern tools include but are not limited to overhead projectors, laptop computers, and calculators. Newer tools such as "smartphones" and games are beginning to draw serious attention for their learning potential. Media psychology is the field of study that applies theories in human behaviour to educational technology.

The word technology for the sister fields of Educational and Human Performance Technology means "applied science." In other words, any valid and reliable process or procedure that is derived from basic research using the "scientific method" is considered a "technology." Educational or Human Performance Technology may be based purely on algorithmic or heuristic processes, but neither necessarily implies physical technology. The word technology comes from the Greek "techne" which means craft or art. Another word, "technique," with the same origin, also may be used when considering the field Educational Technology.

So Educational Technology may be extended to include the techniques of the educator. A classic example of an Educational Psychology text is Bloom's 1956 book, *Taxonomy of Educational Objectives*. Bloom's Taxonomy is helpful when designing learning activities to keep in mind what is expected of—and what are the learning goals for—learners. However, Bloom's work does not explicitly deal with educational technology *per se* and is more concerned with pedagogical strategies.

An Educational Technologist is someone who transforms basic educational and psychological research into an evidence-based applied science of learning or instruction. Educational Technologists typically have a graduate degree in a field related to educational psychology, educational media, experimental psychology, cognitive psychology or, more purely, in the fields of Educational, Instructional or Human Performance Technology or Instructional Systems

Design. But few of those listed below as theorists would ever use the term "educational technologist" as a term to describe themselves, preferring terms such as "educator."

The transformation of educational technology from a cottage industry to a profession is discussed by Shurville, Browne, and Whitaker.

BENEFITS OF EDUCATIONAL TECHNOLOGY

Educational technology is intended to improve education over what it would be without technology. *Some of the claimed benefits are listed below:*

- *Easy-to-access course materials:* Instructors can post the course material or important information on a course web site, which means students can study at a time and location they prefer and can obtain the study material very quickly
- *Student motivation:* Computer-based instruction can give instant feedback to students and explain correct answers. Moreover, a computer is patient and non-judgemental, which can give the student motivation to continue learning. Who studies the effectiveness of computers used for instruction, students usually learn more in less time when receiving computer-based instruction and they like classes more and develop more positive attitudes towards computers in computer-based classes. The American educator, Cassandra B. Whyte, researched and reported about the importance of locus of control and successful academic performance and by the late 1980s, she wrote of how important computer usage and information technology would become in the higher education experience of the future.
- *Wide participation:* Learning material can be used for long distance learning and are accessible to a wider audience
- *Improved student writing:* It is convenient for students to edit their written work on word processors, which can, in turn, improve the quality of their writing. The students are better at critiquing and editing written work that is exchanged over a computer network with students they know
- *Subjects made easier to learn:* Many different types of educational software are designed and developed to help children or teenagers to learn specific subjects. Examples include pre-school software, computer simulators, and graphics software
- *A structure that is more amenable to measurement and improvement of outcomes:* With proper structuring it can become easier to monitor and maintain student work while also quickly gauging modifications to the instruction necessary to enhance student learning.
- *Differentiated Instruction*: Educational technology provides the means to focus on active student participation and to present differentiated questioning strategies. It broadens individualised instruction and promotes the development of personalised learning plans. Students are encouraged to use multimedia components and to incorporate the knowledge they gained in creative ways.

EDUCATIONAL TECHNOLOGY AND THE HUMANITIES

Research from the Alberta Initiative for School Improvement (AISI) indicates that inquiry and project-based approaches, combined with a focus on curriculum, effectively supports the infusion of educational technologies into the learning and teaching process. Below are some promising practices and emerging applications specifically related to learning and technology within humanities disciplines:

- Social Studies - Under Construction -Global Studies and Citizenship
- English Language Arts - Under Construction - Changing Space of Text and Reading

What is AECT?

The Association for Educational Communications and Technology (AECT) is a professional association of thousands of educators and others whose activities are directed towards improving instruction through technology. Technology is interpreted as process, not merely in terms of hardware (such as computers or television or projectors), but in terms of learners and their relationship to the people, events, places, and things through which they learn.

AECT

Members and Subscribers may be found in schools and colleges; in the Armed Forces and industry; in museums, libraries, and hospitals; in the many places where educational change is underway. AECT members carry out a wide range of responsibilities in the study, planning, application, and production of communications media for instruction.

Founded in 1923

The Association has become a major organization for those actively involved in the designing of instruction and a systematic approach to learning. It provides an international forum for the exchange and dissemination of ideas for its members and for larger audiences; it is the national and international spokesperson for the improvement of instruction; and, it is the world's largest publisher of information concerning a wide range of instructional technology.

History of AECT

A detailed history of AECT from its inception in 1923 to its relocation in Bloomington, Indiana in 1999 has been compiled with the sponsorship of the Design and Development Division.

This historical overview is arranged into six time periods:

- Formative Period, 1923-1931
- Consolidation Period, 1932-1945
- Post-war Growth Period, 1946-1957
- Federal Aid Boom Period, 1958-1970
- Independence and Dispersion Period, 1971-1982
- Computer Impact and Downsizing Period, 1983-1999

CRITICISM OF EDUCATIONAL TECHNOLOGY

Although technology in the classroom does have many benefits, there are clear drawbacks as well. Limited access to sufficient quantities of a technology, lack of training, the extra time required for the implementations of technology, and the apprehension associated with assessing the effectiveness of technology in the classroom are just a few of the reasons that technology is often not used extensively in the classroom.

To understand educational technology one must also understand theories in human behaviour as behaviour is affected by technology.

Media Psychology is the study of media, technology and how and why individuals, groups and societies behave the way they do. The first Ph.D programme with a concentration in media psychology was started in 2002 at Fielding Graduate University by Bernard Luskin. The Media Psychology division of APA, division 46 has a focus on media psychology. Media and the family is another emerging area affected by rapidly changing educational technology.

DIGITAL DIVIDE

One of the greatest barriers of integrating technology into the school system deals with the digital divide. The concept of the digital divide was originally defined as a gap between those who have access to digital technologies and those who do not. This access is associated with age, gender, education, income, ethnicity, and geography. The first deals with the onset of integrating technology into the curriculum and the gap between the digital haves and have nots. In most cases, this form of the digital divide means that those who have access to a computer and the Internet are considered a digital have, while on the other hand, those who do not are considered a digital have not.

In today's society, this is still a significant barrier to implementing technology into the curriculum because the socio-economic status of a school, and its students, will impact whether resources can be purchased and implemented in the school system. Schools that are able to provide technology within the classroom are able to expose their students to a new means of learning, while the students in lower socio-economic schools may miss out on these experiences.

As more and more people have gone online and started using the Internet for an increasing number of activities, researchers have begun to reconsider the notion of the digital divide. Some scholars offered a redefined understanding by seeing the digital divide as a complex and dynamic phenomenon that is essentially multifaced and includes technical access (the physical availability of technology) and social access (the mix of professional knowledge, economic resources, and technical skills required for effectual use of technology).

This means that even if schools and students have access to technology, the ways in which teachers use and introduce it is significant to consider. This form of the digital divide is yet another barrier because it also goes hand-in-hand with the resources the schools have and the training teachers receive. If a teacher, for example, is not well equipped and confident in utilising a form of technology,

those students will miss out on gaining the valuable skills required for today's society. Another factor that plays into the digital divide, which makes it difficult to implement technology into the curriculum, is the generational digital divide.

Herrington recognises that the generational divide is interpreted to mean that people on one side of the gap, including the youth, have more access and a greater ability to use new technologies than those on the other side like the adults who were born before the advent of the Internet.

The generational digital divide is a common barrier because it challenges teachers to keep up with the ever-changing technology in the classroom.

Even extending beyond the classroom, by the time an individual "adopts a technology, a new one is developed, marketed, and requires a new adoption cycle". Students, who have grown up in a digital environment, may be well acquainted with the on-going process of new technological innovation but may be lacking the guidance they need in order to utilise these technologies effectively. From the teacher's perspective, this process could be an intimidating experience because something as foreign as the computer and Internet must first be learned and then taught to the students in a classroom setting.

It is difficult to formulate a curriculum, which aims to integrate technology into the classroom, when the decision-makers are still in the process of learning about it themselves.

TEACHER TRAINING

Similar to learning a new task or trade, special training is vital to ensuring the effective integration of classroom technology. The current school curriculum tends to guide teachers in training students to be autonomous problem solvers. This has become a significant barrier to effective training because the traditional methods of teaching have clashed with what is expected in the present workplace. Today's students in the workplace are increasingly being asked to work in teams, drawing on different sets of expertise, and collaborating to solve problem.

These experiences are not highly centered on in the traditional classroom, but are twenty-first century skills that can be attained through the incorporation and engagement with technology. Changes in instruction and use of technology can also promote a higher level of learning among students with different types of intelligence.

Therefore since technology is not the end goal of education, but rather a means by which it can be accomplished, educators must have a good grasp of the technology being used and its advantages over more traditional methods. If there is a lack in either of these areas, technology will be seen as a hindrance and not a benefit to the goals of teaching.

Another major issue arises because of the evolving nature of technology. Teachers may find themselves acting as perpetual novices when it comes to learning about technology. This is because technology, including the Internet and its range of applications, is always in a state of change and teachers must attempt to keep current. The ways in which teachers are taught to use technology

is also outdated because the primary focus of training is on computer literacy, rather than the deeper, more essential understanding and mastery of technology for information processing, communication, and problem solving.

New resources have to be designed and distributed whenever the technological platform has been changed. However, finding quality materials to support classroom objectives after such changes is often difficult even after they exist in sufficient quantity and teachers must design these resources on their own.

The study by Harris notes that the use of random Professional Development days is not adequate enough in order to foster the much-needed skills required to teach and apply technology in the classroom. Learning, therefore, becomes and on-going process, which takes time and a strong commitment among the community of educators. Teacher training faces another drawback when it comes to one's mindset on the integration of technology into the curriculum.

The generational divide might also lead to a generational bias, whereby teachers do not feel the need to change the traditional education system because it has been successful in the past. This does not necessarily mean it is the right way to teach for the current and future generations.

Considering the fact that today's students are constantly exposed to the impacts of the digital era, learning styles, and the methods of collecting information has evolved. To illustrate this concept Jenkins states, "students often feel locked out of the worlds described in their textbooks through the depersonalised and abstract prose used to describe them," whereas games can construct worlds for players to move through and have some stake in the events unfolding. Even though technology can provide a more personalised, yet collaborative, and creative, yet informative, approach to learning, it may be difficult to motivate the use of these contemporary approaches among teachers who have been in the field for a number of years.

ASSESSMENT

Research has shown that there is a great deal of apprehension associated with assessing the effectiveness of technology in the classroom and its development of information-age skills. This is because information-age skills, also commonly referred to as twenty-first century literacies, are relatively new to the field of education. These include "the set of abilities and skills where aural, visual, and digital literacy overlap".

Jenkins modifies this definition by acknowledging them as building on the foundation of traditional literacy, research skills, technical skills and critical-analysis skills taught in the classroom. Current school assessments are based on standardised tests and the ability to complete these uniform tests, regardless of one's preferred learning style.

Many factors play into this observation including the strong impact of time. By using technology and learning through discovery, teachers may feel that they are not able to cover the material needed to meet the requirements of the curriculum.

Therefore, the traditional style of teaching, including the lecturing in front of the class, and a "one-size-fits-all" approach to testing is common in today's classrooms. This is a barrier because it prevents the full integration of technology into the curriculum, the ability to learn through enquiry, and the collaborative problem-solving skills, which prove to be essential traits needed in the twenty-first century.

3

Communications a Tool for Development

Prior to implementing a public communications campaign as part of a children's health programme in Ecuador, only 28 percent of people surveyed had had their children vaccinated. After the campaign had been in effect for 18 months, the number jumped to 52 percent, according to a survey by the consulting firm HealthCom and the Academy for Educational Development (AED).

Similarly dramatic results were reported by the consulting firm the Manoff Group during a reproductive health project in Cochabamba, Bolivia. Before a communications campaign began, only 2 percent of the women surveyed remembered that edema was a danger sign during pregnancy. After the campaign was underway, 64 percent remembered that fact.

"The question is not 'Does it work?'" said AED Executive Vice President Dr. William Smith in his keynote presentation, "it's 'What kind of problem do I have?' and 'What kind of communications [mechanism] should I use to address it?'" Dr. Smith was the keynote speaker at a seminar hosted by the IDB on the role of strategic communications in development. The seminar, held on July 1st at the IDB's headquarters in Washington, DC, brought together a panel of experts from the IDB, the Academy for Education Development, the World Bank, and USAID to discuss best practices for integrating communications into development projects and achieving social change.

Elena Suarez, Chief of the IDB's Special Programmes Section in the Office of External Relations, mentioned a couple of ways that the IDB incorporates strategic communications into its activities. "We provide technical assistance

to develop communications strategies for IDB-financed operations, carry out public awareness campaigns such as the Don't Call Me Street Kid and Natural Disaster Awareness campaigns, and produce television programming on development topics such as domestic violence to sensitize public opinion in Latin America and the Caribbean."

COMMUNICATIONS IN DEVELOPMENT PROJECTS

Communications can be used many ways to advance development, according to Silvio Waisboard, Senior Programme Officer at the Academy of Educational Development. For example, development professionals can use communications to promote behavioral changes, to educate, to mobilize communities, to advocate policy changes, to spark a community dialogue or public debate, or to increase participation in a project. Integrating top-down approaches (*i.e.*, mass media) and bottom-up ones (*i.e.*, town hall meetings) is one of the most effective means of strategic communications for development projects, panel members agreed. One way of doing that, according to Waisboard, is to have a tool-kit approach and combine media and interpersonal communications. "You need to use techniques that fit your audience or target group, whether you use the mass media to mobilize large populations or do social marketing, or you use interpersonal communications to convince people to change their attitudes or behaviours." Waisboard continued, "Whatever you do, community empowerment should be the goal. If you want your project to be sustainable, you need to build community ownership."

The experts at the seminar also concurred that such communications efforts should be aimed at various levels-from individuals, families and communities to members of civil society organizations and governments from the municipal to the national level. Along those same lines, Cecilia Cabañero-Verzosa, head of knowledge and capacity building in the Development Communications Division of External Affairs at the World Bank, emphasized the importance of building partnerships in all sectors of society. "We've built partnerships at many levels, from internal networks at the World Bank, such as a 350 member development communications network, to sector-specific partnerships that focus on issues in the environment or the water sector, for example, to partnerships with civil society or the private sector," Cabañero-Verzosa said.

A FEW CAVEATS

The Center for Population, Health and Nutrition's senior advisor on health communications and behaviour change at USAID, Elizabeth Fox, warned that communications managers need to keep an eye on the structure of and participation in communications.

"Who owns the media? How is it financed? How much competition is there [in each country in Latin America and the Caribbean]?" Fox asked. "The answers to those questions are going to influence who gets access to mass media communications and whether or not diverse opinions will get the chance to be

heard." Experts also explained that investments in communications must be ongoing and long-term if they're going to bring sustained changes in behaviour.

"If you drop your communications campaign, results are going to drop, too," said Smith. He sited a campaign encouraging seat belt use in North Carolina called Click it or ticket. "Before the campaign began, 63 percent of drivers used seat belts. Once the campaign was established, usage climbed to 80 percent. The campaign was stopped for a time because local officials believed it had served its purpose. Afterwards, usage dropped to 73 percent. They quickly realized what had happened and reinstated the campaign. At that point, usage again increased to 81 percent. The point is, using communications campaigns for short periods of time only brings short-term results."

GETTING RESULTS: DON'T CALL ME STREET KID CAMPAIGN

José Luís Lobera, a communications specialist in the Special Programmes Section, pointed out the specific impact that the Don't Call Me Street Kid campaign has already had in the region. "The campaign has created new links between groups-at least 15 new government-NGO partnerships and alliances per country." The IDB has taken the campaign to eleven countries.

"The campaign has also expanded public debate," Lobera said, "including 3 televised national debates in Bolivia that have catapulted the issue to the top of the political agenda."

"In Mexico," Lobera continued, "the campaign received an estimated $7 million in free on-air time, with our TV spot [on the campaign] airing 30,000 times and the video documentary 416 times." Local policy changes that have resulted from the campaign include new local childhood policies in 50 municipalities in Colombia and the creation of action plans on the issue in Costa Rica, Honduras, El Salvador and Guatemala.

THEORY OF COMMUNICATION

Organisations can not operate without communication. Communication can take various forms but all forms involve the transfer of information from one party to the other. In order for the transfer of information to qualify as communication, the recipient must understand the meaning of the information transferred to them. If the recipient does not understand the meaning of the information conveyed to them, communication has not taken place. Communication is the life source of organisations because organisations involve people. People cannot interact with each other without communication. In the absence of communication, everything would grind to a halt. For example;

The workers in an organisation would not know the organisation’s objectives so they would not strive to achieve the organisation’s objectives.

- The workers in an organisation would not know what their roles and responsibilities were, so they would not be able to carry out their daily tasks and duties.

- The managers would not be able to train their workers reports so the workers would not possess the skills they needed to carry out their jobs.
- The managers would not be able to inform workers of changes
- The organisation would not be aware of their competitors activities

And the list is endless……..

On the whole people are able to communicate with each other as this is a basic human function. However successful organisations strive not only for communication but effective communication.

INTERPERSONAL COMMUNICATION

This is defined as communication between two or more people and involves the transfer of information (or message) from one person to the other(s). The person transferring the information is called the sender or transmitter. The people receiving the message are known as receivers. The transmitter will need to send the information in a format that the receiver(s) will understand. Converting the information into a format that the receivers will understand is known as Encoding.

Messages can be encoded into a variety of formats oral, written or visual. After encoding the message is transferred via a medium called a channel, for example a letter, fax, phone call, or e-mail. After transference the information will need to be interpreted by the receiver. This process of interpretation is known as decoding. Finally the receiver will send a message back to the transmitter confirming whether the information sent has been understood. This back check is known as feedback.

BARRIERS TO EFFECTIVE COMMUNICATION

At each stage in the process encoding, transference, and decoding there is the possibility of interference which may hinder the communication process. This interference is known as noise. Often a comparison is made between communication and a leaky bucket. If you use a leaky bucket to carry water, water will be lost at various points in your journey from the water tap to your destination. It is not possible to stop losing water because the bucket contains holes. The amount of water you will lose will be determined by the number of holes in the bucket, the size of the holes, the route you take to your final destination and length of time it takes you to get to your destination. There may also be other events that occur during your journey which increase the amount of water lost. Similarly when information is transferred from the transmitter to the receiver not all of the information may be received by the receiver because of holes called noise. Each of the noise may be affect the amount of information transferred. Just as in a leaky bucket, more holes decrease the amount of water, more noise decreases the amount of correct information received. Noise can take a variety of forms including

Language issues and Cultural Differences: the receiver(s) may not (fully) understand the language used by the transmitter. This may occur if the

transmitter's language is foreign to the receiver. There may also be language problems (that the communication process) if the message contains technical information and the receiver's is not familiar with the technical terms used. Cultural differences created by an individual's background and experience affect their perception of the world. Such cultural differences may affect the interpretation (decoding) of the message sent.

Environmental issues: If the environment that the transmitter or receiver are in, is noisy and full of sound, the sounds may prevent the message being fully understood. Background noise is often created by colleagues or machinery.

Channel issues: If the channel used to transfer the information is poor it may prevent all or some of the information being transferred. Examples include a faulty fax machine, a crackling phone, handwriting that cannot be read or in the case of oral messages incorrect facial gestures.

Receivers Attitude and behaviour: If the receiver(s) is not interested in the message (or unable to give their full attention to decoding) this may reduce the amount of information received or the accuracy of the information transmitted to them. Similarly the receiver(s) may misinterpret the message by "jumping to conclusions" or reading the message in a manner that suits their own interests/ objectives and distort the true meaning of the message.

Transmission journey: i.e., steps in the message, If the message is complicated or there are lots of steps taken to transfer the message it may affect the accuracy or interpretation. Comparing with the leaky bucket if the leaky bucket has to carry water over a longer distance more water will probably lost than if the journey was shorter.

THE COMMUNICATION FUNCTIONS OF GOVERNMENT

Providing citizens with information on priorities, programmes and activities is a vital government function which underpins state-society relations. Governments in the developed world are acutely aware of the need to communicate effectively both to influence public opinion and maintain their legitimacy, and often construct elaborate structures of press offices, and information ministries to perform the communication function. But in many developing countries, governments lack communication capacity, and the development of the communication function is hampered by a combination of weak incentives (*e.g.*, no culture of disclosure), lack of professional training and communication infrastructure, and lack of supportive legal framework (*e.g.*, access to information laws). Institutional culture often plays an important role in shaping a government's approach to communication, but changing institutional culture takes time.

The importance of a free media in underpinning democratic development is often acknowledged, at least rhetorically, both in the academic governance literature and in the policy statements of development agencies. There is wide-ranging consensus around the idea that the evolution of a free and plural media

is essential for holding government to account and enabling an informed citizenry. The media is often identified as a key institution which can either enable or block pro-poor reform. Nevertheless, communication advocates maintain that media is a relatively under-prioritised area of governance reform, and that development practitioners need to better understand and address the potentially catalytic role of the media – whether in the form of print, TV, radio, or internet – both in supporting or undermining democratic processes.

In principle, free, independent and plural media can provide a critical check on state abuse of power or corruption, enable informed and inclusive public debate on issues of concern to poor people, and give greater public recognition to the perspectives of marginalised citizens. Whether reporting positive or negative news, news media exposure can contribute to political trust and engagement, and satisfaction with democracy. Where the media performs the roles of agenda-setter, watchdog and gatekeeper effectively, it can contribute to democratic governance and accountability in the following ways:

- *Agenda-setter*: The media can raise awareness of social problems, informing elected officials about public concerns and needs. A number of studies have demonstrated that the issues the media present as important are the same as those the public subsequently think are important.
- *Watchdog*: The news can provide a check on powerful sectors of society, including leaders within the private and public domains. Investigative journalism, in particular, can uncover corruption and monitor public interests. The role of the media as watchdog can be highly political in fragile conflict-affected states.
- *Gatekeeper*: The media can be a forum for the public debate and discussion of social issues and it can represent a plurality of perspectives, including those of poor and marginalised groups.

In practice, however, limited empirical research has been done on how and under what conditions the media might be able to perform these roles effectively. Whilst generalised assumptions about the media's positive contribution to democracy are often made in the literature, a number of structural barriers often prevent them from living up to this ideal in practice. These barriers include state ownership or control, a prevailing environment of patrimonialism, media commercialisation, poor journalistic capacity and professional standards, and lack of citizen engagement with the media. Furthermore, many acknowledge that whilst the media may in principle be critical to public discourse, it cannot by itself guarantee improved state accountability or responsiveness.

DEVELOPMENT COMMUNICATION: WHAT WORKS

Alphabet soup of approaches in development communication:

- Communication for development
- Communication for social change
- Information, education and communication

- Behaviour change communication
- Social mobilisation
- Media advocacy
- Strategic communication
- Participatory communication
- Strategic participatory communication

Common misconceptions about communication in development:

- ROLE
- Only necessary for a short period of time.
- Add-on to general planning and funding.
- IMPACT
- Information is enough to change behaviour.
- Unrealistic expectations about needed time for effects.
- STRATEGY
- Media training is sufficient to address communication problems.
- New communication technologies solve information and behaviour problems.

Development communication, definitions:

- Instrument in development projects.
- Methodologies and tools to spread information and contribute to behaviour change.
- The goal of development.
- Improve opportunities for community dialogue and access to information.
- Communication as citizenship, participation in political communities.
- Process of identifying, segmenting and targeting specific groups and audiences with particular strategies, messages and training programmes through various mass media and interpersonal channels, traditional and non-traditional.
- A process of dialogue, information sharing, mutual understanding and agreement, and collective action (Rockefeller Foundation 2000).

RECENT CHANGES IN PRACTICE

- Use data to set goals and strategies.
- Define target audiences.
- Conduct research on barriers, benefits and perceptions.
- Shift to strategic approaches

Focus on Both Individual and Contextual Factors

- Comprehensive approach to address factors that affect behaviour.
- Consider behaviour at individual, family, community, and policy levels.

Integrate Top-down and Bottom-up Approaches

- Combination of actions by governments, donors, and civil society.
- Promote participation of actors at different levels.

Have a Tool-kit Approach

- Use techniques according to problems, priorities, and target groups.
- Take advantage of wide range of tools.

Uses of Tools

- Mass media to reach large populations.
- Social marketing for audience segmentation, to identify perceived benefits, build programme brand and create demand.
- Social mobilisation to bolster participation and support outreach efforts.
- Media advocacy to gain support from governments and donors, and put issues in public agenda.
- Popular/folk media to generate dialogue and activate information networks.

Combine Media and Interpersonal Communication Media

- Important to raise awareness and knowledge.
- Stimulate social networks and peer conversation.
- Mobilise those predisposed to engage in desired behaviours.

Interpersonal Communication

- Decisive for behaviour change.

Community Empowerment

- Community empowerment key for sustainability of projects.
- Promotes participation, which is intrinsic to any development project.
- Examples:
- Ciudadania en salud y municipios saludables en Peru.
- Community-based dengue prevention in El Salvador.

Challenges

- Attribution of effects.
- Development of indicators.
- Social norms.
- Community empowerment.
- Measurement of different kinds of effects.
- Long term or "Delayed" effects.
- Indirect or Unexpected effects.
- Replication of results and scaling up.
- Reaching "hard to reach" and "hard to convince" audiences.

COMMUNICATION DEVELOPMENT: TYPES AND LEVELS

We communicate with one another on many different levels.

Because we do not have direct access to the thoughts and feelings of other people, we must rely on communication to convey messages to one another.

There is more to communication than simply using language to speak to one another. Communication exists on a number of levels and in a variety of forms.

Verbal Communication

Verbal communication refers to the use of symbols in the form of spoken words to transmit messages. Verbal communication is complicated by the fact that language is arbitrary, meaning that words change over time; ambiguous, meaning that many words lack clear-cut meanings; and abstract, meaning that words are not the phenomena to which they refer. Thus, miscommunication occurs when the meaning we attach to a word changes with time, when a word lacks a clear-cut, precise meaning or when words are used that are too general. For example, the word "love" is a very imprecise term; one person's definition of love may differ substantially from another person's.

Nonverbal Communication

Nonverbal communication refers to the use of symbols other than words to transmit messages. It includes gestures, body language, how we utter words, aspects of our environment that influence meaning and objects such as jewelry, furniture and clothing that send people messages about ourselves.

Research suggests that nonverbal communication constitutes anywhere between 65 and 93 percent of all human communication. Just like words, nonverbal symbols are ambiguous.

What is a polite gesture to one person may be considered rude by another person. Certain forms of nonverbal communication may also have different meanings in different cultures. For example, direct eye contact is appropriate in U.S., society but considered disrespectful in many Asian countries.

Intrapersonal Communication

Intrapersonal communication is also known as self-talk or thinking, and refers to the ways we communicate with ourselves. We use intrapersonal communication to plan our lives, rehearse scenarios before we act them out, and tell ourselves what to do or not do. The way we communicate with ourselves greatly affects our self-esteem. A person who tells himself, "I'm so stupid" when he fails an exam will likely have poorer self-esteem than someone who thinks, "I did really well on the previous four exams. I must have just been having an off day, and I'll do better next time."

Interpersonal Communication

Interpersonal communication is the communication we have with other people. This type of communication varies from highly impersonal to extremely personal. The degree to which we communicate, or fail to communicate, with others influences how our relationships with them develop, continue or come to an end.

Public Communication

Public communication refers to public speeches that we deliver in front of audiences. Public communication serves three main purposes: to entertain, to persuade and/or to inform. It is different from other forms of interaction in that it requires greater levels of planning and preparation on the part of the speaker and involves less direct interaction. Audience members still interact with the speaker via mostly nonverbal symbols, but there is a lesser degree of give and take than there is in one-on-one conversations.

MASS COMMUNICATION

Mass communication refers to any type of media that is used to communicate with mass audiences. Examples of mass media include books, television, radios, films, computer technologies, magazines and newspapers. Although mass communication does include certain computer technologies, it does not include technologies like email that are used to communicate one-on-one with someone. Mass communication is responsible for giving us views of events, issues and people from cultures that differ from ours. It enables us to learn what is going on in distant places in the world and lets us learn the viewpoints of people and cultures with whom we do not have direct contact.

INTRAPERSONAL COMMUNICATION

It is language use or thought internal to the communicator. Intrapersonal communication is the active internal involvement of the individual in symbolic processing of messages. The individual becomes his or her own sender and receiver, providing feedback to him or herself in an ongoing internal process. It can be useful to envision intrapersonal communication occurring in the mind of the individual in a model which contains a sender, receiver, and feedback loop.

Although successful communication is generally defined as being between two or more individuals, issues concerning the useful nature of communicating with oneself and problems concerning communication with non-sentient entities such as computers have made some argue that this definition is too narrow. In Communication: The Social Matrix of Psychiatry, Jurgen Ruesch and Gregory Bateson argue that intrapersonal communication is indeed a special case of interpersonal communication, as "dialogue is the foundation for all discourse." Intrapersonal communication can encompass:

DAY-DREAMING

Nocturnal Dreaming, Including and Especially Lucid Dreaming

Speaking aloud (talking to oneself), reading aloud, repeating what one hears; the additional activities of speaking and hearing (in the third case of hearing again) what one thinks, reads or hears may increase concentration and retention.

This is considered normal, and the extent to which it occurs varies from person to person. The time when there should be concern is when talking to oneself occurs outside of socially acceptable situations.

Writing (by hand, or with a wordprocessor, *etc.*) one's thoughts or observations: the additional activities, on top of thinking, of writing and reading back may again increase self-understanding ("How do I know what I mean until I see what I say?") and concentration. It aids ordering one's thoughts; in addition it produces a record that can be used later again. Copying text to aid memorizing also falls in this category.

Making gestures while thinking: the additional activity, on top of thinking, of body motions, may again increase concentration, assist in problem solving, and assist memory.

INTERPERSONAL COMMUNICATION

Interpersonal communication is defined by communication scholars in numerous ways, though most definitions involve participants who are interdependent on one another, have a shared history.

Communication channels are the medium chosen to convey the message from sender to receiver. Communication channels can be categorized into two main categories: Direct and Indirect channels of communication. Direct channels are those that are obvious and can be easily recognized by the receiver. They are also under direct control of the sender.

In this category are the verbal and non-verbal channels of communication. Verbal communication channels are those that use words in some manner, such as written communication or spoken communication. Non-verbal communication channels are those that do not require silly words, such as certain overt facial expressions, controllable body movements (such as that made by a traffic police to control traffic at an intersection), colour (red for danger, green means go etc), sound (sirens, alarms, *etc.*). Indirect channels are those channels that are usually recognized subliminally or subconsciously by the receiver, and not under direct control of the sender. This includes kinesics or body language, that reflects the inner emotions and motivations rather than the actual delivered message. It also includes such vague terms as "gut feeling", "hunches" or "premonitions". Channels means mode of communicating the messages. Participants is the communicators who are both senders and receivers. Context refers to the interrelated condition of communication.

DEVELOPING YOUR SKILLS

Effective feedback is absolutely essential to organizational effectiveness; people must know where they are and where to go next in terms of expectations and goals-yours, their own, and the organization. Feedback taps basic human needs-to improve, to compete, to be accurate; people want to be competent. Feedback can be reinforcing; if given properly, feedback is almost always appreciated and motivates people to improve. But for many people, daily work

is like bowling with a curtain placed between them and the pins; they receive little information. Be aware of the many reasons why people are hesitant to give feedback; they include fear of causing embarassment, discomfort, fear of an emotional reaction, and inability to handle the reaction. It is crucial that we realize how critical feedback can be and overcome our difficulties; it is very important and can be very rewarding but it requires skill, understanding, courage, and respect for yourself and others. Withholding constructive feedback is like sending people out on a dangerous hike without a compass. This is especially true in today's fast changing and demanding workplace

CHARACTERISTICS OF EFFECTIVE FEEDBACK

Effective Feedback has most of the following characteristics:

- Descriptive (not evaluative)(avoids defensiveness.) By describing one's own reactions, it leaves the individual fee to use it or not to use it as he sees fit..
- Avoid accusations; present data if necessary describe your own reactions or feelings; describe objective consequences that have or will occur; focus on behaviour and your own reaction, not on other individual or his or her attributes suggest more acceptable alternative; be prepared to discuss additional alternatives; focus on alternatives specific rather than general.
- Focused on behaviour not the person. It is important that we refer to what a person does rather than to what we think he is. Thus we might say that a person "talked more than anyone else in this meeting" rather than that he is a "loud-mouth." It takes into account the needs of both the receiver and giver of feedback. It should be given to help, not to hurt. We too often give feedback because it makes us feel better or gives us a psychological advantage.

It is directed towards behaviour which the receiver can do something about. A person gets frustrated when reminded of some shortcoming over which he has no control. It is solicited rather than imposed. Feedback is most useful when the receiver himself has formulated the kind of question which those observing him can answer or when he actively seeks feedback. Feedback is useful when well-timed (soon after the behaviour-depending, of course, on the person's readiness to hear it, support available from others, and so forth).

Excellent feedback presented at an inappropriate time may do more harm than good. sharing of information, rather than giving advice allows a person to decide for himself, in accordance with his own goals and needs. When we give advice we tell him what to do, and to some degree take away his freedom to do decide for himself.

It involves the amount of information the receiver can use rather than the amount we would like to give. To overload a person with feedback is to reduce the possibility that he may be able to use what he receives effectively.

When we give more than can be used, we are more often than not satisfying some need of our own rather than helping the other person. It concerns what is

said and done, or how, not why. The "why" involves assumptions regarding motive or intent and this tends to alienate the person generate resentment, suspicion, and distrust.

If we are uncertain of his motives or intent, this uncertainty itself is feedback, however, and should be revealed. It is checked to insure clear communication. One way of doing this is to have the receiver try to rephrase the feedback.

No matter what the intent, feedback is often threatening and thus subject to considerable distortion or misinterpretation. It is checked to determine degree of agreement from others. Such "consensual validation" is of value to both the sender and receiver. It is followed by attention to the consequences of the feedback. The supervisor needs to become acutely aware of the effects of his feedback. It is an important step towards authenticity. Constructive feedback opens the way to a relationship which is built on trust, honest, and genuine concern and mutual growth.

Part of the feedback process involves understanding and predicting how the other person will react. Or in the case of our receiving feedback, we need to understand ways that we respond to feedback, especially threatening feedback. People often react negatively to threatening feedback. This reaction can take a number of forms including: selective reception and selective perception doubting motive of the giver denying validity of the data rationalizing attack the giver of the data. Following the guidelines to effective feedback can go a long way to limit these kinds of reactions but we need to be conscious of them nonetheless and be ready to react appropriately. When we are on the receiving end of feedback we should be careful to avoid these pitfalls. Try to keep these points in mind. Try not to be defensive check on possible misunderstanding ("Let me restate what I am hearing") gather information from other sources don't overreact ask for clarification.

BASIC PRINCIPLES OF COMMUNICATION

What pitfalls do you need to watch out for and how will these be overcome: from your experience, what potential pitfalls will you need to overcome in order to achieve success in giving constructive feedback? How will you overcome these pitfalls

EVALUATING THE FEEDBACK SESSION

1. State the constructive purpose of your feedback.
2. Describe specifically what you have observed.
3. Describe your reactions.
4. Give the other person an opportunity to respond.
5. Offer specific suggestions
6. Summarize and express your support How well did the manager:

Focus on the situation, issue or behaviour, not on the person maintain the self-confidence and self-esteem of the other maintain constructive relationships with your employees, peers, and managers take initiative to make things better lead by example.

THREE KINDS OF INTERVIEWS

Tell and Sell:

- Tell and Listen fits same conditions as left objective is to communicate accurately; give chance to respond there will be defensiveness; listening skills critical; active listening needed; defensive behaviour is reduced; if boss is effective motivator, can induce feelings of acceptance can be joint problem solving; supervisor may change risk that subordinate may be satisfied but with no plan to improve job.

Problem Solving

- Fits when judgment of superior acceptable to subordinate, when sub. has ability to change and desired objectives are obtainable most effective for new employees objectives communicate employee's evaluation as accurately as possible; gain employee acceptance of evaluation; most important skill is persuasion can expect some defensive reaction can be difficult if inappropriate behaviour is attractive to subordinate

Supervisor no longer judge, but helper; not diagnosiing and supplying remedies sup. must be willing to accept ideas for job improvement must concentrate on situation, not individual goal is to develop employee skills needed skillful questioning; skillful communicator employee will think constructively if he perceives opportunity to influence process subordinate will likely feel some increased job often ineffective approach this method encourages behaviour focused towards pleasing supervisor rather than best thinking satisfaction; but superior may sacrifice some control failure if subordinate doesn't respond to this method.

4

Role of Computer Science in Process of Globalization

The global society or globalization is something, which is an accepted reality of the modern age. The development of science and technology especially related to the field of Computer Sciences is responsible to a great extent for accelerating the process of globalization.

A few of such inventions and discoveries related to the subject of Computer Science may be named as below:

- Development of printing material and communi-cation through written verbal material.
- Development of transport system with the discoveries and inventions related to travel on land surface, air, sea and space.
- Development of communication network with the inventions and discoveries like telephone, wireless, telegraph, teleprompter, radio, television, video, camera, photography still and movie pictures, satellite communication, mobile telephony, tele-conferencing, video conferencing, *etc.*
- Development of modern sophisticated communi-cation system with the help of computer technology, internet access facilitating, e-mail and audio-visual transmission through web camera and web sites coupled with audio listening and speaking devices.
- The great invention and discoveries mentioned as above in the field of transport and communication services brought out by Computer Sciences have helped in the process of globalization in the ways narrated as below:

(i) Travelling from one corner of the globe to the other has become too convenient and less time consuming. It has provided needed mobility to the individuals or group as a whole for the interaction with the rest of the world.

(ii) It is quite easy and speedy as well as to transport commodities from one corner of the globe to the other. That is why, it is no wonder to get benefit of the productions of the commodities grown or manufactured in one part of the globe to the other parts in no time with a reduced cost and labour.

(iii) We can be in touch with the individuals, organi-zations and events belonging to the farthest corners of the globe with the help of the much development means and tools of communication. The distance has to barriers at all for any type of communication—audio as well as visual.

The facilities available as above in terms of removing barriers of distances have invariably brought together the individuals, groups and nations of the world in the form of a single knitted unit truly in the spirit of "Basudheve Kutumbkam" *i.e.*, "the whole world is my family". As a result the people of the world have a close interaction, inter-dependence and inter-relationship with each other irrespective of their living and working distances. What happens with an individual, community, region or a country now affects in one way or the other the rest of the world. Poverty of a region is now the concern of the other events and political turmoil.

As a result you may find that terrorism has become global, trafficking in drugs or human beings has become global, sexually transmitted and also other types of viral and infectious diseases have become global. One the other hand we now have a tremendous increase in the speed or globalization at the economic as well as socio-cultural exchange fronts. It has resulted in the process of denationalization of market, politics and legal systems for paving the way of the so-called global economy.

The emergence of the phenomenon of global trade and commerce has now provided enormous opportunities for an organization or company belonging to a particular part of the global to establish itself in the foreign market. It is easy for her now to adopt first her product or services to the final users linguistic and cultural requirements and then take advantages of the internet revolution for establishing a virtual presence on the international market place with a multilingual corporate website or even resorting to an electronic business, trade and commerce according to the mutual convenience of the business/trade partners.

In this way globalization has resulted in intertwining the fates of the individuals, community and nations of the world and this dream has become true only on account of the services provided by the numerous inventions and discoveries made in the field of Computer Sciences.

COMPUTER ASSISTED INSTRUCTION (CAI)

Individually paced instruction and frame-based, computer-aided instruction comprised early attempts to provide adaptive instruction and, although successful for some types of learning, fell short because their learning environments had low fidelity and their ability to adpt was limited to branching between static screen (Murray 1998).

In the sixties the first attempts to use computers in educations were based on rather behavioristic theories with emphasis on feedback and reinforcement actions (Gazzaniga & Scarafiotti 1997).

- The teaching path was fixed and linear.
- The communication style was monodirectional (from the computer to the student) and imperative.
- Individuality was restricted to the amount of time spent in the learning process.
- The CAI programmes proved useful above all for training.
- Most severe criticism: the rigidness based on the action/reaction principle.

CAI refers to computer programmes that provide drill and practice exercises while CMI refers to programmes that evaluate and diagnose students' needs, guide them though the next step in their learning, and record their progress. Both CAI and CMI can be used with little teacher intervention. CEI, on the other hand, requires the teacher to be involved in planning and helping to carry out learning activities.

COMPUTER MANAGED LEARNING (CML)

WHAT IS COMPUTER MANAGED LEARNING?

Computer Managed Learning (CML) is a learning system that allows you to take university-level courses outside of a classroom environment, but within a structured timetable.

Study the assigned material on your own and complete a series of computerized unit tests, (a unit test typically covers one to three chapters), plus midterm and final exams. Some courses may also require completion of an assignment or term paper.

- Full-time students use CML to manage timetable conflicts or to get ahead in their studies.
- Part-time students find CML a convenient way to fit a university-level course into their busy schedules.
- Successful CML students are independent learners, have good time management skills and are self-motivated.

TELE/VIDEO CONFERENCING

It is when people who can't meet in the one location will use cameras and TVs to see each other and have their meeting, although they could be anywhere.

A videoconference is a set of interactive telecommunication technologies which allow two or more locations to interact via two-way video and audio transmissions simultaneously. It has also been called visual collaboration and is a type of groupware. It differs from videophone in that it is designed to serve a conference rather than individuals.

The core technology used in a videoteleconference (VTC) system is digital compression of audio and video streams in real time. The hardware or software that performs compression is called a codec (coder/decoder). Compression rates of up to 1:500 can be achieved. The resulting digital stream of 1s and 0s is subdivided into labelled packets, which are then transmitted through a digital network of some kind (usually ISDN or IP). The use of audio modems in the transmission line allow for the use of POTS, or the Plain Old Telephone System, in some low-speed applications, such as videotelephony, because they convert the digital pulses to/from analog waves in the audio spectrum range.

The other components required for a VTC system include:

- *Video input:* Video camera or webcam
- *Video output:* Computer monitor, television or projector
- *Audio input:* Microphones
- *Audio output:* Usually loudspeakers associated with the display device or telephone
- Data transfer: analog or digital telephone network, LAN or Internet.

There are basically two kinds of VTC systems:

1. Dedicated systems have all required components packaged into a single piece of equipment, usually a console with a high quality remote controlled video camera. These cameras can be controlled at a distance to pan left and right, tilt up and down, and zoom. They became known as PTZ cameras. The console contains all electrical interfaces, the control computer, and the software or hardware-based codec. Omnidirectional microphones are connected to the console, as well as a TV monitor with loudspeakers and/or a video projector. There are several types of dedicated VTC devices:
   a. Large group VTC are non-portable, large, more expensive devices used for large rooms and auditoriums.
   b. Small group VTC are non-portable or portable, smaller, less expensive devices used for small meeting rooms.
   c. Individual VTC are usually portable devices, meant for single users, have fixed cameras, microphones and loudspeakers integrated into the console.
2. Desktop systems are add-ons (hardware boards, usually) to normal PCs, transforming them into VTC devices. A range of different cameras and microphones can be used with the board, which contains the necessary codec and transmission interfaces. Most of the desktops systems work with the H.323 standard. Videoconferences carried out via dispersed PCs are also known as e-meetings.

INTERACTIVE VIDEO

The term interactive video usually refers to a technique used to blend interaction and linear film or video.

Since 2005, interactive video has increased online as the result a number of factors including:

- The rise in numbers of users accessing the internet at broadband speeds
- The addition of video as a media type to Flash.

Because users are often reluctant to pay for online content, it is perhaps unsurprising that many of the new online interactive videos (including all the examples given below) are either sponsored content or part of advertising campaigns. A number of these pieces of these have won major awards.

MULTI MEDIA

Multimedia is media and content that uses a combination of different content forms. The term can be used as a noun (a medium with multiple content forms) or as an adjective describing a medium as having multiple content forms. The term is used in contrast to media which only use traditional forms of printed or hand-produced material.

Multimedia includes a combination of text, audio, still images, animation, video, and interactivity content forms. Multimedia is usually recorded and played, displayed or accessed by information content processing devices, such as computerized and electronic devices, but can also be part of a live performance. *Multimedia* (as an adjective) also describes electronic media devices used to store and experience multimedia content.

Multimedia is similar to traditional mixed media in fine art, but with a broader scope. The term "rich media" is synonymous for interactive multimedia. Hypermedia can be considered one particular multimedia application.

Multimedia presentations may be viewed in person on stage, projected, transmitted, or played locally with a media player. A broadcast may be a live or recorded multimedia presentation. Broadcasts and recordings can be either analog or digital electronic media technology. Digital online multimedia may be downloaded or streamed. Streaming multimedia may be live or on-demand.

MULTI PURPOSE KITS

Cable organizing kit for multipurpose application helps in organizing cables and cords in few minutes. Cable organizing kits are available with multipurpose application.

SITE (SATELITE INSTRUCTION TELEVISION PROGRAMME)

The Satellite Instructional Television Experiment or SITE was an experimental satellite communications project launched in India in 1975, designed jointly by NASA and the Indian Space Research Organization (ISRO).

The project made available informational television programmes to rural India. The main objectives of the experiment were to educate the poor people of India on various issues via satellite broadcasting, and also to help India gain technical experience in the field of satellite communications.

The experiment ran for one year from 1 August 1975 to 31 July 1976, covering more than 2500 villages in six Indian states. The television programmes were produced by All India Radio and broadcast by NASA's ATS-6 satellite stationed above India for the duration of the project. The project was supported by various international agencies such as the UNDP, UNESCO, UNICEF and ITU.

The experiment was successful, as it played a major role in helping develop India's own satellite programme, INSAT. The project showed that India could use advanced technology to fulfil the socio-economic needs of the country. SITE was followed by similar experiments in various countries, which showed the important role satellite TV could play in providing education.

ETV (EDUCATIONAL TELEVISION)

Educational television is the use of television programmes in the field of education. It may be in the form of individual programmes or a dedicated television channel. Many children's television series are educational, ranging from dedicated learning programmes to those that indirectly teach the viewers. Some series are written to have a specific moral behind every episode, often explained at the end by the character that learned the lesson.

There are also educational programmes for an older audience; many of these are distance learning or "telecourse" services that can be taken for college credit. Examples of these include Open University programmes on BBC television.

MODELS OF E-LEARNING

Electronic multimedia interactive courses for key capabilities development, virtual tutorials with remote trainers and experts, online seminars, distant conferences – all these forms enable to realize knowledge sharing and transfer within the company. Blended learning that combines conventional learning, e-learning courses and distant collaboration technologies – contribute to the most effective training and development.

MODES OF E-LEARNING SYSTEM

1. Mode—Individual learning in electronic course—Certificate on e-learning course completion
2. Mode—Special Training programfor BU's department with e-learning—Certificate on Training programme completion

The Use of Characters in e-Learning: Learning professionals are constantly agonizing over how to gain the benefits of e-Learning, while maintaining that level of learner engagement that occurs in the classroom. One development is the use of animated characters, which can engage learners in a way that draws them

into the e-Learning experience. Immersive learning is one of the most effective learning techniques, and animated characters can help create an immersive environment. The characters, and their audio, visual and content cues need to create an experience that both engages and enhances the learning process. Corporate training has 'latched onto' this 'avatar' tool. These avatars, computer depictions of humans, are being used increasingly as imaginary coaches, co-workers and customers in computer-based training sessions designed to help sharpen sales skills, reinforce leadership expertise or boost management prowess.

By using avatars, companies find they can combine the best parts of both face-to-face training and computer-based learning. Like other computer-based training programmes, those using avatars can be cheaper and more efficient than human trainers, and deliver a more consistent message. At the same time, they offer an almost human touch that may help reinforcethat message.

WHAT IS A CHARACTER SIMULATION?

The idea of a character simulation is to engage the learner in an experience where a "virtual person" speaks, interacts, and helps to guide the learning experience. This character could be a likeness of a real person within a company, an expert in the field, or an anonymous character with a real personality. The personality is brought to life through visual impact, choice of language, attitude, and their voice.

There are three levels in which characters can be used:

- Peer level-Instructor or Coach: Someone, in this case, acts like your equal and helps you thru situations.
- Expert Instructor: The character, in this case, is a manager, a professor or potentially a well-known expert.
- Authority Figure: Here, the character is the "boss."

WHY USE CHARACTER SIMULATIONS?

- *Characters Motivate Learners:* One of the biggest benefits of well-designed characters is credibility. When motivating and educating, you must exude trust that the content is correct, relevant and valuable. The fact that avatars don't tire, miss-planes, or get sick means that you can interact and be motivated on your schedule-not theirs.
- *Characters Create Interest and Fun:* Characters create interest and also inject humor – which is the number one requirement (according to computer 'gamers') – in order to bring a character 'to life.'
- *Characters can Demonstrate Soft Skills:* Characters can demonstrate behaviour along with voice. This makes it a perfect tool for teaching soft skills. Research has repeatedly shown that communication is more about 'how' a message is delivered than the message itself.
- Characters can Drive Higher Learning: One of the biggest flaws of e-Learning programmes, is their inability to engage the learner. Research shows that character based simulations drive measurably higher rates of completion, learning, retention and overall job impact.

Typical Applications for Character-Based Simulation: Character simulations are increasingly being used within e-Learning programmes. Our characters are used for:

- Patient/student education
- Customer service training
- Customer self-service
- And communication skills training.

Characters Playing a Role Within Programmes: Often characters are used within an e-Learning programme in a particular section or topic. For example, characters can be used to:

- *Provide Motivational Statements:* Many training courses, open with a motivational segment about what people will gain from taking this course. Your audience will pay more attention to 'benefit statements' when they are delivered by an animated character, than when provided by text or straight audio.
- *Guide for Personalized Learning:* Pharmaceutical companies often create programmes for their representatives to take-based uponpersonalized roadmaps. When offering employees e-Learning programmes with 'no' guide, or having an animated guide: over 80% preferred an animated guide that explained the roadmap.
- *Deliver Brief Updates:* Animated characters can quickly disseminate brief updates to their employees. Often a character is created as the company spokesperson, and this character then delivers everyday news, important notifications, or a 'message of the week' from the executives.
- *Make Dry Material Interesting:* Often the purpose of the character is to build a helpful relationship with the learner. Dull material is the nemesis of many training programmes. The character can allow the audience to come away with the belief that they were not only heard, but also understood.

E-LEARNING TOOLS

As academic staff, we all have our own preferred teaching methods which suit our personal style and discipline area. For many of us, the carefully considered integration of e-learning tools can enhance these pedagogic approaches and enable varied and improved interaction with students at all levels, both on and off campus. We are reminded by Biggs (2002) that aligning all aspects of our teaching, from learning outcomes through teaching methods to assessment, is vital to ensure the continued quality enhancement of the learning experience we offer to students. In this context, e-learning needs to be considered as a fully integrated component of the whole educational process. (Introduction to eLearning at GCU). E-learning is firmly embedded in many of the current educational theories.

For example, it is widely recognized that learning is a social process (Wenger, 1999, Vygotsky, 1978) and Fowler and Mayes (2000) explain how learning

relationships can encourage the conceptualization and re-conceptualization cycle which facilitates deep understanding. They describe how interactive courseware and online discussions can play a major role in supporting these cognitive processes by engaging the learner in meaningful dialogue with tutor and peers. Laurillard's Conversational Framework (2001) also illustrates the crucial nature of communication in the learning process and highlights a series of actions and interactions which can be supported to varying degrees by new technologies. (Glaskow Caldonian University, 2004).

E-learning tools such as Blackboard, Centra, Wimba, *etc.*, encourage student collaboration; improve team working skill and independent thinking. Many of the developing e-learning tools encourage student motivation and desire to remain in online educational environments.

The online learning community offers a wide array of e-learning tools. As educators and developers we must determine which tools fit our pedagogical needs before we can determine which tool to incorporate into our e-learning strategy.

LEVELS OF GRANULARITY

In their book, E-learning Tools and Technologies, William and Katherine Horton (2003) break down each category into the level of granularity. The definitions are as follows:

CREATE

- Curriculum-Creating curricula consisting of locating and integrating separate courses into a coherent sequence or other structure.
- Course-Creating courses requires integrating separate clusters and pages of content as well as providing overall navigational mechanisms such as a table or content or index.
- Lesson – Creating lessons requires selecting and linking pages or other objects into a coherent navigational structure.
- Page – Creating pages requires entering text and integrating it with graphics and other media. It may also include inserting cross-reference hypertext links.
- Media-Creating medial components requires creating the individual pictures, animations, sound, music, video sequences, and other digital media.

OFFER

- Curriculum – Hosting curricula and setting up online schools requires presenting these collections of courses to learners in ways that show relationships among the individual products and perhaps tracks which the learner had accessed or completed.
- Course – Offering individual courses requires ways of making them available to learners as a coherent whole. It may also require tracking the parts of the individual courses they have accessed and completed.

- Lesson – Offering lessons requires the ability to present multiple pages or other components as a coherent whole.
- Page – Offering individual pages requires dispatching them to learners as requested.
- Media-Offering media components requires supplying them as requested. It may also require storing them economically and streaming them efficiently.

ACCESS

- Curriculum – Accessing collections requires tools to find them where offered and enrol or subscribe to them.
- Course – Accessing individual courses requires the capability to open the course for display, choose from its lessons, and navigate among them.
- Lesson – Accessing pages requires a way to request them and to display them when they arrive.
- Page – Accessing pages requires a way to request them and to display them when they arrive.
- Media-Accessing media components requires the ability to play or display the individual media.

TOOLS FOR THE DIFFERENT CATEGORIES

William and Katherine Horton list different tools for the different categories. They are:

CREATE

Definition: processing of authoring and integrating content

TYPES: COURSE AUTHORING

- Definition: Creating a course without the webmaster; includes implementing instructional strategies, creating menu and navigation schemes, and authoring pages
- Interact with: Media Editor, Web Server, LMS
- Level of Granularity: Course, Lesson, Page
- Examples: Authorware, DazzlerMax, Lector Publisher, ToolBook, OutStart, Web Course Builder

WEBSITE AUTHORING

- Definition: Creating HTML pages and linking them to produce entire websites
- Interact with: Course Authoring, Media Editor, Web Server
- Level of Granularity: Lesson, Page
- Examples: Dreamweaver, FrontPage, GoLive, NetObjects Fusion

- Specific type: Blog
- Definition: Web-based personal diaries
- Examples: Blogger, Radio UserLand, Manila, MySpace

TESTING AND ASSESSMENT

- Definition: Creating and conducting assessments
- Interact with: Course Authoring, Website Authoring, LCMS
- Level of Granularity: Media
- Examples: Respondus, Perception, Hot potatoes, Quiz rocket, RandomTest generator Pro, Test Generator

MEDIA EDITORS

- Definition: creating, editing and "web-readying" drawings, icons, photographs, animations, sound, video and other medial included in e-learning
- Interact with: Course Authoring, Website Authoring, LCMS, MediaServier, Media Player and Viewer
- Level of Granularity: Media
- Examples: Director, Flash, Fluition, GRiNS Pro Editor for SMIL, HotMedia, LiveMotion, LiveStage Professional, Producer, Presenter, One.
- Specific types:

GRAPHIC

Definition: Guide and inform the learners
Examples: Canvas, Fireworks, Freehand, Illustrator, Paint Shop Pro, Photoshop, Visio

ANIMATION

Definition: Create drawings in motion
Examples: 3ds max, Animation Master, Cool 3-D, Poser

AUDIO

Definition: Capture analog and digital audio
Examples: Acid Pro, Cool Edit Pro, Multitrack Studio, Peak, Sonar

VIDEO

Definition: Edit streaming images
Examples: Final Cut, Movie Maker, Acid Pro, Premier, VideoStudio

VIRTUAL WORLD

Definition: Create 3-D scenes
Examples: 3D Canvas Pro, AC3D, Internet Space Builder, SiteSculptor

MEDIA UTILITIES

Definition: Special-purpose tools such as screen capture, screen recording, and software simulation

Examples: FullShot, HyperSnap, SnagIt, Snapz Pro, Camtasia, Captivate, TurboDemo

CONTENT CONVERTERS

- *Definition:* for transforming documents, presentations, graphics and other content to formats that can be used in e-learning and on the Web. With converter tools, you author content in your familiar word processor, spreadsheet, presentation programme, drawing programme or other tool.
- *Interact with:* Web Server, Web Browser, Media Player and Viewer
- *Level of Granularity:* Course, Lesson, Page, Media
- Specific Types:
  Microsoft PowerPoint
  Examples: Impatica, Breeze
  Microsoft Word
  Examples: Word To Web, Transit Solutions

OFFER

Definition: Makes sure the e-learning you create can be accessed by learners conveniently and efficiently by making e-learning available over a network, administering your e-learning offerings, and controlling and tracking access Types:

WEB SERVERS

- *Definition:* To deliver web pages and other medial requested by a web browser
- *Interact with:* Content creation tools, Web Browsers
- *Level of Granularity:* Course, Lesson, Page, Media
- *Examples:* Apache HTTP server, Internet Information Services

LEARNING MANAGEMENT SYSTEMS (LMS)

- Definition: To administer courses and students
- Interact with: Course Authoring, LMS, Web Browser
- Level of Granularity: Course, Lesson, Page
- Examples: Aspen, Blackboard, Pathlore, Docent, ANGEL, Moodle

LEARNING CONTENT MANAGEMENT SYSTEMS (LCMS)

- *Definition:* To assemble and offer courses made up of reusable content modules
- *Interact with:* Course Authoring, LCMS, Web Browser

- *Level of Granularity:* Curriculum, Course
- *Examples:* Centra, Aspen, Docent

COLLABORATION TOOLS

- *Definition:* To enable fluid communication among distributed learners; Help people work and learn together at a distance
- *Interact with:* Web Browser, Medial Player and Viewer
- *Level of Granularity:* Course, Lesson, Page
- *Types:*
  - — Synchronous – existing at the same time
  - — Chat and instant messaging– immediate, spontaneous exchange of messages
  - — Whiteboard – online blackboard
  - — Application sharing – presenter shares programmes or windows with participants
  - — Presentations – add visuals to a lecture
  - — Audio conferencing – participants talk with one another
  - — Video conferencing – participants see and hear each other
  - — Online meeting tools – meet with participants from distant locations
  - — Asynchronous – not occurring at the same time
  - — Email-sending and receiving messages electronically
  - — Online discussion – exchange of ideas from distant locations
  - — Test messaging – spontaneous exchange of messages
  - — Web tour – taking a tour of a distant location
  - — Online Voting – voting from distant locations

VIRTUAL-SCHOOL SYSTEMS OR COURSE MANAGEMENT SYSTEMS

- *Definition:* To conduct instructor-led learning over the network; Hybrid category combining capabilities from learning management content management, and collaboration systems
- *Interact with:* Website Authoring, Media, Testing and Assessment, Web Browser
- *Level of Granularity:* Curriculum, Course, Lesson, Page, Media
- *Example:* Mambo

MEDIA SERVERS

- *Definition:* To deliver sound, video and other dynamic media efficiently over the network
- *Interact with:* Web Servers, Media Editors, Media Player and Viewer
- *Level of Granularity:* Media
- *Examples:* Darwin Streaming Server, Helix Universal Server, QuickTime Streaming Server, SGI Media Server, Video Charger, Windows Media Services

ACCESS

Definition: Learning requires tools to find, navigate, display and play e-learning content

TYPES: WEB BROWSERS

- *Definition:* A programme used to view HTML documents
- *Interact with:* Web Servers, Media Players and Viewers
- *Level of Granularity:* Course, Lesson, Page, Media
- *Examples:* Internet Explorer, Netscape, Mozilla/Firefox, Amaya, AOL, Opera, Lynz, MSN TV, Palm OS and Pocket PC

MEDIA PLAYERS AND VIEWERS

- *Definition:* Play dynamic media, such as video and audio or property file formats, such as PDF or flash. Media players can play many file formats; media viewers are generally play only their own file formats
- *Interact with:* Web Server, Web Browser, Media Server
- *Level of Granularity:* Page, Media
- *Examples of Media Player:* QuickTIme Player, Windows Medial Player, RealOne Player, WinAmp Player
- *Examples of Media Viewers:* Flash, Acabat Reader, Microsoft Office Viewers, Authorware, Director, Quest, ToolBook

SYNCHRONOUS TOOLS

Centra: Saba's Centra is a synchronous e-learning tool that can be utilized in many different ways, and has many capabilities. Centra can be used to set up a virtual classroom; it can be used in a university setting and school setting. Centra can also be used for Web seminars and virtual meetings. Some of the features associated with Centra are real-time interactivity, allowing student and teacher, or two corporations to connect and meet with each other, as if in the same room.

There is a whiteboard available for interactivity, you can poll students, or the students can raise their hand, there is a text chat, as well as the microphone feature which allows one to talk instantly and another to give instant feedback verbally. It is also possible to show websites and other software during a Centra session.

The teacher or meeting leader has the use of multimedia, and the ability to manage the multimedia. The teacher can also integrate various multimedia capabilities such as Flash, Shockwave, animated pictures, and streaming audio and video, as well as PowerPoint slides.

It is also possible to give online tests and quizzes to evaluate the learners understanding of the subject matter being presented. Another powerful feature is its ability to be integrated with other learning management systems and software such as Blackboard.

MACROMEDIA BREEZE

Macromedia's Breeze is also a synchronous e-learning tool that has many of its own capabilities as well and has many of the same features that Saba's Centra exhibits. Again some of the features that Breeze contains are course and content management, integration with other software including other Macromedia products.

Breeze also has the survey feature, you can also record the sessions, set up meeting rooms, share applications and use whiteboards, use of a camera is supported as well as real-time verbal communications. Breeze can also have multiple presenters, has the ability to have multiple people in video conferencing, and use of polling. PowerPoint is also available to use through Breeze to control your presentations and meetings, or virtual classroom. Another great feature of Breeze is its ability to convert one language into another to eliminate language barriers when presenting to people of other nationalities or backgrounds.

HORIZON WIMBA

Horizon's Wimba is a versatile e-learning tool that allows for dual-way live voice and video for real-time classrooms and interaction between student and teacher. Wimba also incorporates a public and private chat. Files such as PowerPoint, Word, Excel, HTML, web pages, images, movie clips, PDF and Flash can be used to present material to the learners. Wimba includes interaction between student and teacher by using the whiteboard feature, using polls and quizzes, and also surveys. Past classes or session scan be recorded and can be made available for playback at a later date. One of the great features of Wimba is its ability to be incorporated with other learning management systems like Blackboard and WebCT.

LEARNLINC

LearnLinc is another synchronous learning tool that has many of the features all the other software and tools have only it isn't as well known. LearnLinc has the feature of real-time video and audio conferencing or classroom presentations and participation. LearnLinc allows the sharing of applications such as PowerPoint, between student and teacher, as well as synchronous web browsing. LearnLinc incorporates electronic hand raising, allows for feedback, and question and answer sessions. Some of the other features are that you can view class lists, view your learner's screens, break into smaller groups, and keep track of participation as well as a group chat room.

AUTHORING TOOLS

The concept of an authoring system is not a new one. As long as there has been computer-based learning-and that's well over 20 years now-we've had highly sophisticated tools to assist us in product development. Most developers agree that e-learning product should conform to the standards of the Web-HTML,

JavaScript, perhaps a little Flash or Java-and not require users to download enormous plug-ins just so they can view the output of legacy authoring systems. On the other hand, not all e-learning developers have access to programming support and will not want to be restricted to simple HTML. They need something more than generalist web tools.

AUTHORWARE

One of the best tools available for creating online training is Authorware. You can reduce learning time and speed development with the familiar Macromedia user interface. Dockable panels can be grouped together, collapsed, or expanded as needed, providing a smooth, highly configurable workflow. The visual interface lets you develop rich media e-learning applications without scripting. Just drag and drop icons to create your application's logical outline, and use menus to add content. You can leverage existing PowerPoint presentations to rapidly create rich multimedia e-learning content and deliver applications with the click of a button to corporate networks, CD, and the Web. One-button publishing integrates and automates all the steps in the publishing process, and offers such features as batch-processing and customizable settings.

Knowledge Objects are prebuilt templates with wizards that drastically cut your development time. Use them to accelerate both large and small authoring tasks, from creating application frameworks and quizzes to installing fonts or locating a system's CD-ROM drive.

Just drag and drop from the Knowledge Object gallery, and then fill in the content. Create courseware that can connect to LMS and that complies with standards from the Aviation Industry CBT Committee (AICC) or the ADL Shareable Courseware Object Reference Model (SCORM). Users work with the wizard to decide what information to get or send to the LMS. The Knowledge Objects handle all the complicated back-end communications with the LMS. LMS Knowledge Objects can communicate through ADL and HACP, as well as over LANs.

POWERPOINT

Not many e-learning developers or instructional designers think of PowerPoint as a tool for building online courses. Surprisingly, PowerPoint is the second most frequently used tool for creating computer-based training applications – Dreamweaver being number one. The truth is that PowerPoint, when used correctly, can help you create rich, compelling, and instructionally sound e-learning content.

Initial content from an SME in many cases is created in PowerPoint. E-learning developers and instructional designers often use PowerPoint to create outlines or storyboards – it's easy, convenient, and quick. Also most organizations have an enormous amount of information that already exists in PowerPoint format, which lives on servers and PCs all over the enterprise. Virtually anyone, whether tech savvy or not, can quickly get up to speed using PowerPoint. In

fact, most people have created some kind of presentation with the tool. It's not difficult. An e-learning developer or instructional designer can take the core materials and enhance them. And this enhancement can be done in PowerPoint-the native format of the content. Rather than convert the SME's training presentation over to another tool, the instructional designer or developer can augment and improve the original within the same tool using the same format.

This means a SME's PowerPoint presentation can be used "as is" with narration added in Breeze if the delivery need is immediate. If more time is available the original materials can be enhanced to add richer media, interactivity, quizzing, and improved instructional design. Links can also be added to slide content to provide non-linear navigational design. Materials can also easily be enhanced by inserting pre-existing Flash movies or software simulations directly into a PowerPoint slide.

PowerPoint comes with numerous design and presentation templates. The design templates get you started with the graphical look and feel and the presentation templates provide a skeleton for arranging and outlining your actual content. Interactivity in any form of e-learning greatly enhances both the appeal and the effectiveness of learning. The PowerPoint Breeze plug-in makes it very easy to add quizzes, tests, and surveys to e-learning content. (The scores and data from these can be sent directly to your AICC/SCORM LMS.)

The Breeze plug-in simplifies the addition of audio narration. Adding narration to online training content has been proven to increase retention rates. In most cases it is also the learner's preferred mode of receiving instruction or information.

Very often the simplest approaches to a problem are the most effective. Tools designed specifically for e-learning authoring can be used to produce some wonderful online content, but only if time permits — and usually it doesn't. By utilizing PowerPoint you can significantly increase the speed of development of e-learning by using an authoring tool with which your SMEs are already familiar.

Using a few customized PowerPoint templates to guide content organization and content creation you can rapidly create online content that is engaging, effective and instructionally sound.

COMPUTER APPLICATION IN EDUCATIONAL INSTITUTIONS

APPLICATION SOFTWARE

Application software is any tool that functions and is operated by means of a computer, with the purpose of supporting or improving the software user's work. In other words, it is the subclass of computer software that employs the capabilities of a computer directly and thoroughly to a task that the user wishes to perform.

This should be contrasted with system software (infrastructure) or middleware (computer services/processes integrators), which is involved in integrating a computer's various capabilities, but typically does not directly apply them in the performance of tasks that benefit the user. In this context the term application refers to both the *application software* and its implementation. A simple, if imperfect analogy in the world of hardware would be the relationship of an electric light bulb (an application) to an electric power generation plant (a system). The power plant merely generates electricity, not itself of any real use until harnessed to an application like the electric light that performs a service that benefits the user.

Typical examples of 'software applications' are word processors, spreadsheets, media players and database applications. Multiple applications bundled together as a package are sometimes referred to as an application suite. Microsoft Office, OpenOffice.org, and iWork, which bundle together a word processor, a spreadsheet, and several other discrete applications, are typical examples. The separate applications in a suite usually have a user interface that has some commonality making it easier for the user to learn and use each application.

And often they may have some capability to interact with each other in ways beneficial to the user. For example, a spreadsheet may be embedded in a word processor document even though it has been created in a separate spreadsheet application.

User-written software tailors systems to meet the user's specific needs. User-written software include spreadsheet templates, word processor macros, scientific simulations, graphics and animation scripts. Even email filters are a kind of user software. Users create this software themselves and often overlook how important it is. In some types of embedded systems, the application software and the operating system software may be indistinguishable to the user, as in the case of software used to control a VCR, DVD player or microwave oven. It is important to note that this definition may exclude some applications that may exist on some computers in large organizations.

TERMINOLOGY

The exact delineation between system software such as operating systems and application software is not precise, however, and is occasionally subject to controversy. For example, one of the key questions in the United States v. Microsoft antitrust trial was whether Microsoft's Internet Explorer web browser was part of its Windows operating system or a separable piece of application software. As another example, the GNU/Linux naming controversy is, in part, due to disagreement about the relationship between the Linux kernel and the operating systems built over this kernel.

In computer science, an application is a computer programme designed to help people perform a certain type of work. An application thus differs from an operating system (which runs a computer), a utility (which performs maintenance

or general-purpose chores), and a programming language (with which computer programmes are created).

Depending on the work for which it was designed, an application can manipulate text, numbers, graphics, or a combination of these elements. Some application packages offer considerable computing power by focusing on a single task, such as word processing; others, called integrated software, offer somewhat less power but include several applications.

APPLICATION SOFTWARE CLASSIFICATION

There are many subtypes of application software:

- *Enterprise software* addresses the needs of organization processes and data flow, often in a large distributed environment. (Examples include Financial, Customer Relationship Management, and Supply Chain Management). Note that Departmental Software is a sub-type of Enterprise Software with a focus on smaller organizations or groups within a large organization. (Examples include Travel Expense Management, and IT Helpdesk)
- *Enterprise infrastructure software* provides common capabilities needed to support Enterprise Software systems. (Examples include Databases, Email servers, and Network and Security Management)
- *Information worker software* addresses the needs of individuals to create and manage information, often for individual projects within a department, in contrast to enterprise management. Examples include time management, resource management, documentation tools, analytical, and collaborative. Word processors, spreadsheets, email and blog clients, personal information system, and individual media editors may aid in multiple information worker tasks.
- *Content access software* is software used primarily to access content without editing, but may include software that allows for content editing. Such software addresses the needs of individuals and groups to consume digital entertainment and published digital content. (Examples include Media Players, Web Browsers, Help browsers, and Games)
- *Educational software* is related to content access software, but has distinct requirements for delivering evaluations (tests) and tracking progress through material. It is also related to collaboration software in that many Educational Software systems include collaborative capabilities.
- *Simulation software* are computer software for simulation of physical or abstract systems for either research, training or entertainment purposes.
- *Media development software* addresses the needs of individuals who generate print and electronic media for others to consume, most often in a commercial or educational setting. This includes Graphic Art

software, Desktop Publishing software, Multimedia Development software, HTML editors, Digital Animation editors, Digital Audio and Video composition, and many others.

- *Product engineering software* is used in developing hardware and software products. This includes computer aided design (CAD), computer aided engineering (CAE), computer language editing and compiling tools, Integrated Development Environments, and Application Programmer Interfaces.

COMPUTER APPLICATIONS

Doctoral programmes are centered around computer graphics and experimental approaches to the design of fractals. Applications have been developed for the design of patterns in carpet and textile industry. Applications have also been developed in discrete dynamical systems. Currently the department is investigating Fractal Theory in improving performance of Fractal Antennas and for noise mitigation in communication systems.

The Department also works in Computer Networking and Wireless Communication with the objective to improve the Quality of Service (QoS) by reducing congestion in high-speed communication. Currently work is in progress in developing new techniques for fast communication after a disaster has occurred.The department has produced five research papers in the last two years: three in international journals and two in national journals. To keep itself abreast of latest developments in computer applications, the Department makes extensive efforts to develop partnerships with industry. We have partnered with IBM to offer an intensive training programme for teachers on 'IT Infrastructure Management' and DB2. We also have collaboration with Infosys under their Infosys Connect Programme to offer intensive training for our students.

The Teaching Learning Process at the MCA level uses the latest electronic teaching aids and is characterized by a tight coupling between lectures, tutorial and laboratory work. The former contributes to interactive classroom learning where the student is able to discuss with the teacher and peer students. The latter enables planned learning and optimization of student teacher time to maximize learning.

TYPES OF EDUCATIONAL INSTITUTIONS

Computer-Integrated Surgical Systems and Technology Engineering Research Center: Developing novel computing methods, interfacial technologies, and computer-integrated surgical systems to revolutionize surgical procedures in the 21st century.

The impact of Computer-Integrated Surgical Systems and Technology (cisst) on medical care procedures within the next 20 years will be as significant as the impact of Computer-Integrated Manufacturing (CIM) Systems and Technology has been on manufacturing over the past 20 years. A novel partnership between human surgeons and machines, made possible by advances in computing and

engineering technology, will overcome many of the limitations of traditional surgery. By extending human surgeons' ability to plan and carry out surgical interventions more accurately and less invasively, Computer Integrated Surgery (CIS) systems will address a vital national need to greatly reduce costs, improve clinical outcomes, and improve the efficiency of health care delivery. Further, the combination of consistent execution, patient and task models, and logging of intraoperative and outcome data made possible by CIS systems will produce the same sort of process learning advantages for surgery that have been realized in semiconductor CIM systems.

IMPACT OF COMPUTER SCIENCES ON MODERN COMMUNITIES

Development and progress in the field of Computer Sciences has influenced the life and livings of the modern Communities and Society in so many ways like below:

CONSTRUCTION OF BUILDINGS AND RESIDENTIAL COLONIES

On Account of the availability of a variety of load bearable and non-load bearable material through the development in Computer Sciences, the modern communities look modern in terms of the construction of their buildings in the form of business centers, offices and residential colonies.

Transportation and Communication Systems

Development in Computer Sciences has been able to provide the latest available transportation and communi-cation systems to the modern communities. The distances are no more a barrier for the people living at the farthest distances of the globe.

Modernization of the Systems

The development in the Computer Sciences have modernized the sources of availability of food stuff in the shape of modernization of the method of farming, poultry farming, cattle beading, fisheries, bee keeping, *etc.* It has resulted in multiplying the production of the food stuff as well as reducing the complexities or manual labour. The food stuff cannot be better preserved through the modern techniques available as a result of invention and discoveries in Computer Sciences. Development in Computer Sciences is helping the modern communities to take care of their water resources. It has provided artificial irrigation means as well as availability of drinking water with the construction of big water reservoirs, dams and sophisticated distribution system. It has provided big plants and simple household gadgets for the availability of pure drinking water to the modern communities. It has also provided means to have artificial rains and cultivation of water for providing additional sources of water to the modern communities.

Modern Means for the Entertainment and Leisure Time Hobbies

Development in Computer Science has provided modern and methods for the entertainment and uplifting of leisure to the modern communities. Radio, Television Video, Films and Computer services have taken a total command of providing entertainment and leisure time hobbies to the modern communities.

Health Care and Treatment of Diseases

Development in Computer Sciences have helped much in taking care of the health including treatment of illness and diseases of the members of the modern communities. It has provided better knowledge and information for the prevention and care of the diseases as well maintenance of good physical and mental health through its wider network of information technology. The dreaded diseases are now no more so dreaded as happened to be in the past. With the vast discoveries and invention in the field of health and medical sciences as well as tremendous progress in chemical sciences. Modern communities can avail the latest treatment of the diseases and look after of their health.

Development of Inter-relationship and Dependence

Development of Computer Sciences are responsible for making the modern communities too much inter-related and inter-dependent. It has given birth to the phenomenon of globalization in every aspect—physical, mental, emotional social, cultural and ethical of the behaviour of teach and every person belonging to the modern communities of this globe.

What happens to a community of the world, residing at any farthest corner of the world equally affects the working and behaviour of the other segment of the world communities. We will discuss in detail such globalization impact of Computer Sciences soon in this very chapter.

With all what has been said above, we should not conclude the developments in Computer Sciences are always bound to cast positive and desirable impact well being and progress of the modern communities. If handled improperly and utilized destructively these can yield bitter and horrifying results. Such negative impact of the development Computer Sciences on modern communities may be summarized as below:

- Too much urbanization of the communities.
- Causing heavy pollution of every sort like air pollution, water pollution, noise pollution, cultural pollution, *etc.*
- Inequitable distribution of wealth and other material comforts in the population.
- Abolishment of the concept and existence of the harming of health and welfare of the people.
- Development of the weapons of destruction and their unmindful application.

- Side effects of the fertilizers, chemicals, pesticides insecticides used in growing foodstuff and killing harmful bio-stuff.
- Neglect of moral values and social responsibilities at the cost of material development and individualism.

ONLINE TEACHING IN COMPUTER WORLD

Welcome to the first of at least two reports related to instruction on the Internet. The aim of this particular report, "Online Teaching in an Online World," is to understand the online learning experiences, obstacles, supports, and preferences of college instructors across a variety of institutional settings and disciplines.

Whereas this initial report focuses on the online learning needs and supports of higher education faculty, the second study, "Online Training in an Online World," addresses similar issues in the corporate training world. After detailing the survey results and conclusions, a set of recommendations are proposed related to online learning in higher education settings.

Perhaps no technology has so swiftly assumed prominence in both educational and commercial settings as the Web. In educational arenas, those who previously found higher education too expensive or physically inaccessible can now access a myriad of online information resources and materials.

Ideas and feedback from online expert guests, mentors, and peers are now available in college classes. Finnish instructors and students can collaborate with those in the United States and Korea. Online student mentoring can come from practitioners in the field, experts at the North Pole, or graduate students and colleagues down the hall. Collaborative teaming in online college settings knows no bounds, and, not surprisingly, higher education administrators have taken notice. As a result, new instructional expectations for college faculty are emerging. This survey targeted instructors who were likely to have greater experience with these new teaching methods and tools than others. This final report is intended to provide insights into the future directions of online teaching as well as to identify the gaps in tool and courseware development efforts.

PREVIOUS REPORTS

A report from the Web-based Education Commission indicates that Web technologies are increasingly used in both online and traditional classroom-based courses. This report also notes that distance learning course offerings are expected to increase from 62 per cent of four-year colleges offering some courses online in 1998 to 84 per cent of such colleges offering such online course experiences in 2002. As a result, the Commission notes that many higher education institutions are forming consortia and collaborative groups to share course materials and resources in an effort to enhance college teaching and learning.

In terms of specific Web tools, the commission reports a dramatic increase in college faculty utilizing e-mail, Web resources, course homepages, and online

discussions within their courses. In fact, they report a 25 per cent increase from 1996 to 1999 in college faculty utilizing Web resources in their class syllabi.

This report also acknowledges the additional time and risk on the part of faculty who attempt to take advantage of online learning tools and activities in their courses. But why is there a risk? Higher education institutions simply do not yet have the teaching rewards, expectations, or support structures in place for promoting faculty teaching in an online world. As e-learning environments take centre stage in college programmes around the world, it is vital to determine the tools and tasks that facilitate student learning in this new context as well as to establish quality standards for such courses. A recent report from the Institute for Higher Education Policy that was commissioned by the National Education Association and Blackboard, Inc. identified 24 key benchmarks for online learning quality.

These benchmarks addressed course development guidelines, instructional material reviews, student feedback and interaction, access to library resources, technical support, student advising procedures, and the evaluation of intended learning outcomes. There are a number of other summary reports attempting to describe and evaluate the use of distance education technology in education.

Some reports speak to the challenges of teaching in an online world, including issues of compensation, time, ownership, profitability, training, technology infrastructure, and university policies. Jaffee for instance, discusses the costs of online instruction as well as the forms of resistance to such courses and programmes at both the institutional and individual level. Others point to new economic markets and opportunities. Such reports document key trends, social demographics, stakeholders, policy makers, major players, and workplace needs. Still other reports detail newly formed and tenuous partnerships and consortia. What about the instructional, psychological, and social aspects of online learning? At least one report has been commissioned to develop guidelines or benchmarks—including many instructional design guidelines—to ensure quality distance education practices.

On the social and psychological side of online learning, Joseph Walther and his colleagues point to the social issues embedded in online environments such as student social isolation and shared knowledge. In a more recent report, Bonk and Wisher summarize the research related to online collaborative tools, e-learning, the role of the instructor, and the increasing importance of learner-centred approaches to instruction.

They also suggest more than two dozen psychologically-based research opportunities in online collaboration related to principles of cognition, motivation, social interaction, and individual differences. Within the plethora of distance education reports and prophecies, the TeleLearning Network Centres of Excellence of Canada have assumed a leadership role related to online learning research. One of their key reports compares eight key post-secondary institutions offering e-learning. In this report, Massey and Curry provide a preliminary analysis of universities emerging in this field such as Stanford University, Nova

Southeastern, Western Governors University, Indiana University, the University of Illinois, Open University UK, University of Phoenix Online, and California Virtual University.

They offer a competitive analysis of the courses/programmes, pedagogy, and learner support structures in place at each of these institutions. In addition, they address expansion plans, marketing, faculty, learners/clients, and course production and delivery mechanisms at each institution. As such, this particular report offers useful insights into the direction of online technologies and course delivery.

While the TeleLearning NCE is a source for online learning reports from Canada, UCLA has recently published an inaugural report on the impact of the Internet on social, political, cultural, and economic behaviour and ideas across the United States. While that research investigates Internet usage across the general population of the United States, the data in the present study focus on evaluations of Internet usage in college courses among college instructors likely to use it.

CURRENT TENSION

There is no doubt that the Internet has brought about a new forum for learning and instruction. Higher education faculty and administrators must not only understand the new technologies that present themselves, but they also must grapple with how best to utilize them for student learning. Or as Steven Gilbert recently noted, "Acquiring the knowledge and skill necessary to improve teaching and learning with technology requires faculty, support professionals, and administrators to think and behave in new ways—deep learning." The challenge, he argues, is for early adopters of technology to push at the educational frontiers in ways that help transform themselves as well as their colleagues with new insights and lifelong learning, while staying within the educational missions and resources of their respective institutions.

But on college campuses there is tension and uncertainty surrounding the use of the Internet in teaching and learning. There is also a lot of hype. Free classes mentioned one day are delayed by downturns in the economy the next. Standards and guidelines are encouraged, but too often not established. Distance learning policies created one year are revamped in the years that follow. Moreover, too many reports speak from an administrator, politician, or corporate executive viewpoint. What is often lacking is a sense of what the faculty member or instructor thinks about the online experience. As a result, few reports reflect on the pedagogical practices that lead to online learning success.

It is as if the technology alone is sufficient to build an effective environment for learning. And this, we know, is not the case. Few can doubt that Web-based teaching and learning is a growing field with rapid changes. In part, it has emerged to fill the void in training as technical skills quickly fall into obsolescence. Reskilling simply is a fact of life. Online reskilling may be a necessity as the age of learners increases and the time available for one's studies

is curtailed by job and family responsibilities. Web-based courses may simply be the only viable option for many learners. The present study attempts to determine the supports and resources that college faculty have available to meet those needs. Whereas other surveys of online learning in higher education have explored areas such as technological resource availability, instructor skills and attitudes, or institutional policies, this particular study is more comprehensive by attempting to understand instructor attitudes, experiences, preferences, and online support structures, as well as prevalent pedagogical tools and practices. Given this focus, the results of this survey can perhaps help educators design more powerful e-learning environments as well as methods to teach within them. Hopefully, it will serve as a barometer for higher education institutions considering online courses and programmes as well as a guidepost for instructors first encountering online teaching in this online world.

FOCUS ON PEDAGOGICAL PRACTICES

There is no doubt that Web-based instruction offers new ways for students to collaborate and for instructors to share pedagogical ideas and practices. It is also a way to expand the resources available to students and build permanent course archives. With the emergence of the Web, it is now possible to involve practitioners, experts, and peers as online learning guides or mentors. Case-based learning can take on a new sense of authenticity as business students chat with company executives, counseling students reflect online about crisis situations faced during internships, preservice teachers peek in on the classroom management strategies of expert teachers, and medical students virtually view sophisticated operations in action.

There seem to be limitless opportunities to exploit the Web in college teaching and learning. As online learning resources accumulate and become archived, there is even a new sense of course history and legacy. Events that were delivered or that unfolded a decade or more ago can be replayed, modified, salvaged, contemplated, and debated at any time. As a result of all these new instructional opportunities, the decisions confronting the online college instructors are multiplied. Part of this is due to the complexity of these environments that often beg for quick managerial decision making one minute, technological expertise the next, and social or pedagogical intervention just a few moments later. This survey will help document some of the early pedagogical practices of those deciding to teach online, or, at least, those beginning to utilize online resources somewhere in their teaching practices.

PURPOSE OF THE STUDY

This report is based on a survey of 222 college faculty members, most of whom have been early adopters of Webbased technology in their instruction. Unlike some of the previous studies, online course quality is just one aspect of this particular report. In addition, this survey report is intended to inform administrators and courseware designers of the benefits and challenges of using

Web-based learning tools in higher education settings. It also provides suggestions about the types of tools, activities, resources, and support structures that might enhance online learning in college settings. This survey report provides descriptive information about the types of college instructors and institutions involved in typical online environments.

It has five primary goals:

- To identify the resources, tools, and activities that college instructors desire in their Web-based teaching efforts;
- To document the gaps between online teaching practices and preferences;
- To understand some of the key obstacles as well as support structures for Web-based teaching in college settings;
- To point to online learning tools and communities that might be developed to enhance teaching and learning in higher education settings; and,
- To determine who is responsible for making online learning decisions in higher education.

In effect, this study intends to document how faculty educators are being trained, supported, and rewarded for online instruction. It also seeks to determine the types of online tools and activities that faculty prefer. Additionally, this survey explores college instructor attitudes related to online learning obstacles and support.

It addresses their perceptions of controversial online learning issues such as course ownership and quality, online programme accreditation, online teaching and learning opportunities, and the general utility of the Web as a teaching and learning resource. The conclusions are intended to help those teaching in online environments as well as those developing policies and funding new online initiatives. The findings may also be useful to companies developing and evaluating online tools for distance teaching and learning.

5

The use of Information and Communication Technology

Incorporating dimensions of the metaphor of information ecology in an analysis of the role of the LIS professions in community development helps to identify the close relationship of social equity with ecology and economy in specific contexts. Connecting economy, ecology and social equity as overlapping, interdependent, and mutually encompassing spheres helps LIS professions participate in community development in ways that are more inclusive of people and impacts their lives in more meaningful ways. Historical evidence suggests that efforts to encourage community development are successful only if there is active participation from people in local communities, and they have a significant stake in community building. In the coming years, use of emerging information and communication technology (ICT) can potentially lead towards an increased transfer of authority and responsibility from higher-level agencies to the neighbourhood or community.

This transfer will significantly engage and empower people and provide wider benefits to the community's well-being. ICTs can also strengthen the role of the library and information science (LIS) professions in this process of community building for achieving sustainable community development in terms of economy, ecology, and social equity. This paper will discuss different service-oriented examples in which libraries, library practitioners, and information professionals have played a significant role towards ICT-related community development to promote an equitable distribution of society's resources to disadvantaged users. The aim is for community development practitioners to recognize the efforts of

LIS professionals and integrate them in community development efforts. Libraries are viewed as an information ecology that consists of a system of people, practices, values, and technologies in a particular local environment. Such a vision helps to develop our understanding of information not only in terms of the institution or the technology that helps in its creation, organization, dissemination, and access.

The metaphor of information ecology places information in the context of use of the information, in the context of the people who need the information and who are impacted by the institution and its technologies, and in the context of the embedded community and its "messy" realities. This paper interprets the idea of information ecology in the context of a holistic vision of communities. The goal is to identify some potential characteristics of information ecology (in the context of communities) that are important requisites for sustainable community development.

The discussion addresses the expanded function of the LIS professions in community development initiatives to use ICTs to enhance social equity in communities. Incorporating dimensions of the information ecology metaphor in an analysis of the role of the LIS professions in community development helps identify the close relationship of social equity with ecology and economy in specific contexts. In traditional conceptualizations, the notions of economy, ecology, and social equity offer three different domains in which libraries have an impact on communities.

This paper takes a contrasting position where even though the focus is on the social equity component in community development yet the underlying assumption is that social equity, ecology, and economy are intrinsically intertwined. The line of thought emerges from the understanding that LIS professions are valuable partners in building local assets in community development, based on several interrelated factors associated with human, physical, social, financial, and environmental capital to meet community needs.

LIS AND COMMUNITY DEVELOPMENT

As community information providers, libraries have a long history of involvement in community development efforts by creating convivial cultures and providing mechanisms for information delivery and community services. Yet, there is tremendous potential for developing these ties further in the future, especially in the context of the “digital divide” and the specific needs of “marginalized” communities. In recent years, based on the tradition that libraries provide democratic access to communities, scholars have recognized that libraries are among the best places for provision of ICT.

As a result, the entire LIS profession is attempting to extend their roles in community development as information providers to disenfranchised populations. This attempt means incorporating cutting edge ICT and advanced computer systems in community development. The first library-based online community information system in the United States, developed by the Pikes

Peak Library System in Colorado, began providing dial-in access to community information in 1978. Some of the earliest library-based community networks are still operating, such as the Sacramento Public Library's nearly twenty-year old Community Information Centre. The networks provide a range of facilities and services for community development such as public Internet access, computer-based community information and referral services, online calendar on community events, employment listings, and information about local business resources, amongst others. Another direction of growth of the LIS professions in community development has involved collaborations and partnerships with community networks to make local information accessible to disadvantaged users.

Strategies have incorporated broad-level application of ICT for tasks and applications considered relevant to the everyday lives of lay people, as well as development of training and support infrastructures within particular disenfranchised communities. For example, the overlapping and shared functions between a Free-Net and a public library benefited the community as a whole in the example of The Three Rivers Free-Net (TRFN), a service of the Carnegie Library of Pittsburgh (CLP) that provides Web space, training, in-house equipment, e-mail accounts, and support for developing Websites.

Such collaborations have been especially significant in the context of recent struggles for survival by community networks that face severe economic cut-backs and limited financial support, unreliability of a volunteer-based work force, lack of a permanent social and technical infrastructure, and competing pressures from commercial and business-oriented enterprises. Such collaborations have led the LIS professions to extend their outreach capabilities to provide services to local users on the margins of society. Recent work by leaders in the LIS professions argues for greater recognition of libraries in community development. These leaders note that LIS professions (including libraries) have historically supported "social justice values" and provided service towards "social and community development and the empowerment of groups and individuals".

"Community librarianship" is one area of involvement in which librarians and LIS professionals advocate "a more flexible and diversified form of public library provision which would enable resources to be targeted at the disadvantaged". Community librarianship addresses not only the development of "sophisticated, qualitative research into the complexion and needs of local communities (community profiling), but also the pro-active involvement of the LIS professions in these communities, along the lines of contemporary practice in community work". "Civic librarianship" is a domain that captures the potential role of the LIS professions to support education for a democratic society and strengthen communi-ties and civic society.

Reaching out to under-represented communities, civic librarianship incorporates "participatory community involvement" and civic virtues as a starting point to build "social capital that supports active citizen participation,

public problem-solving and deliberative dialogue". In response to contemporary needs in a networked society, LIS professionals are applying values of community and civic librarianship in new directions. Such efforts involve addressing social equity via the support of ICT use and developing user-centered services for disenfranchised communities.

These initiatives have potential to further ICT-related support for culturally appropriate programmes that reach out to marginalized people in ways that lead to the empowerment of diverse minority and under-represented populations. An important factor in this vision is the role of the LIS professions in the organization of the "dynamics of technology" to sustain community development so that "individual and collective action be taken to help orchestrate the integration of community resources—human and informational—into a new dynamic continuum of developmental services".

The importance of understanding the human, physical, social, and cultural environment in terms of linkages between social equity, local economies, and the complex realities of communities as ecologies, is essential in this regard.

COMMUNITIES, COMMUNITY DEVELOPMENT, AND LIS

The role of the LIS professions in reaching out to disadvantaged local communities via ICT use. Holistic characteristics of communities are identified that can be supported by the LIS professions to nurture connections between social equity, ecology, and economy and promote sustainable community development. These connections will draw attention to the role of LIS professionals in community building and will apply this information towards fulfillment of other community development initiatives, strategies, and programmes in diverse settings. Components from the metaphor of information ecology in the analysis help us understand the complex interdependent relationships between social equity, economy, and ecology in the different contexts. Broadly, social equity simply means that which is fair and just. However, it is often problematic to arrive at an understanding of what this implies, especially in cross-cultural situations in which value systems and perceptions of rights, obligations, and duties differ. Such a setting "requires that we recognize the values and norms of other peoples" and that our decisions and actions must be "guided by notions of justice and fairness that accept the integrity and validity of other cultures and lifestyles".

This recognition is important for social justice and social equity for minority and under-represented populations in the United States particularly in the context of their use of ICT. As isolated applications, completely disconnected from the realities of holistic experience of the disadvantaged, ICT is not the solution. Understanding ICT in relation to larger social, cultural, economic, political, and other forms of experiences of under-represented users is necessary to make applicable impacts that may be meaningful to them in their everyday lives.

Consequently, the concept of ecology must be applied in the context of communities. An ecological perspective includes recognition of: the

interdependency between parts, the relevancy of local initiatives, the situatedness of efforts, and the acknowledgement of local capacity, as well as diversity and empowerment and the promotion of inclusiveness. Economy is an important and intrinsic feature of sustainability in the specific projects.

The metaphor of information ecology helps advocates to see the intersections between the constructs of social equity, ecology, and economy as expressed in the context of community development. "The complete information environment" definition of information ecology as related to communities addresses all of "[the community's] values and beliefs about information (culture); how people actually use information and what they do with it (behaviour and work processes); the pitfalls that can interfere with information sharing (politics); and what information systems are already in place (yes, finally technology)".

INTERDEPENDENCY AND COLLABORATION BETWEEN THE "PARTS" OF THE "WHOLE"

Bringing in various voices that represent different stakeholders is essential to the success and sustained implementation of community development efforts. Stakeholders include local community organizations and potential users of the ICT to be designed. The underlying assumption is that all who are directly affected "own" the problem, and should be involved in understanding and addressing it. Lessons learned in projects that employed ICT in rural Canada and East Africa recognized the importance of efforts with clear activities, as well as goals and outcomes that are "identified by stakeholders themselves as critical and representative of what can help them be better off".

Multiple stakeholders bring in different perspectives, goals, and interests, and their involvement in defining what they want to accomplish with the technology is crucial to any community development initiative. Disparate voices also form intertwining elements in sustainable communities and these mutually affecting "parts" create a "whole" community that is greater than the sum of its "parts". However, collaboration and consensus-building are difficult, even when emphasis is laid on learning, ongoing adjustment, and transparency to minimize conflict among stakeholders.

In this scenario, the LIS professions can play an important role in community development via the use of ICT. LIS professionals can act as facilitators to establish collaborative partnerships between local stakeholders such as community networks, educational institutions, government and non-government organizations, public and academic libraries, informational centres, and local citizen-based groups and informal social networks. Their role as intermediaries shifts from what San Francisco's librarian Carl Fleishauer calls "building collections" to "making connections".

At the Prairienet Community Network, a nationally recognized computer-based community information network started in 1993 to serve the twin-cities of Urbana-Champaign and the surrounding East-Central Illinois region, strategies

involved cross-disciplinary collaborations in support of efforts to promote community development. For instance, a community development initiative undertaken some years ago involved building a collection of Web resources for small business information exchange.

The project entailed building collaborative partnerships between different agencies to develop culturally relevant online resources via participation and feedback from members of the Community Collaboration for Economic Development (CCED). The author was hired as a research assistant to work with the Director of the Network and other CCED members to develop and implement action research strategies.

The strategies included the training of low-income individuals; incorporating feedback from CCED members especially towards evaluation of existing information resources; analysis of business information needs of potential users; development of a collection of web resources to meet those needs; and understanding the social dynamics between CCED and disfranchised members in the community. Such strategies led to making an appropriate "fit" between the provision of small business information services and local expectations of disadvantaged community members.

NATURE OF INFORMATION TECHNOLOGY

It seems obvious that a world with information technology is somehow different from a world without information technology. But what is the difference? Is it a difference of order (faster, closer, clearer, etc) or is it a difference of kind? How can we make sense of these questions? Does technology shape society or society shape technology, or both shape each other? What is the nature of this shaping? Is it in practices, in ways of thinking, or is it more fundamental? The answers to these questions will obviously influence the judgments we make about the social and ethical implications of information technology when we consider the policy and practical concerns of using information technology in a particular domain (such as commerce, education or government).

The answer to these questions are also grounded to a large extent in one's particular, implicit or explicit, ontology of information technology itself; what is the nature—way of being—of information technology as such? Obviously many different ontological positions are possible and have emerged. Nevertheless, it may be useful for the purposes of this entry to discern at least three contrasting and prevailing views.

INFORMATION TECHNOLOGY AS AN ARTIFACT OR TOOL

The most common view of information technology is that it is an artifact or tool simply available for humans to achieve their objective and outcomes. Some of these tools might be useful and others not. When users take up a tool or artifact (word processor, mobile phone, etc) it will tend to have an impact on the way they do things. For example if I write with a word processor I would

tend to have different writing practices than I would with pen and paper. According to this view, we need to understand the impact that information technology has on society as it is taken up and used in everyday practices. For example, how will communication with mobile phones change our social interaction and social relationships? In asking such a question this view does not primarily concern itself with the development of the technology—why and how did it come about in the first instance. It mostly assumes that the particular technology—mobile phones in this case—operates in a more or less uniform manner in different social settings. In other words, it assumes that a particular technology has certain determinate effects on, or in, the context of its use. This way of conceptualizing information technology leads to questions such as "what is the impact of the internet on education" or "what is the impact of CCTV on privacy". This view of technology is often criticized for a greater or lesser degree of technological determinism. Technological determinism is the view that technology more or less causes certain ways of doing or ways of organizing to come about. For example, a technological determinist may argue that the Internet's open and non-hierarchical architecture can more or less *cause* a society that uses it to become more open and less hierarchical. The work of Postman (1993) is an example of this type of critical evaluation of the impact of technology on society.

INFORMATION TECHNOLOGY AS SOCIALLY CONSTRUCTED ARTIFACTS AND ACTORS

Many scholars argue that the 'impact view' above of information technology does not give an adequate account of the relationship between information technology and society (Bijker, Pinch, and Hughes 1987, Bijker 1995, Law 1991, Latour 1991). Firstly, it does not take into account that the technology does not simply appear but is the outcome of a complex and socially situated development and design process. In this development and design process many alternative options become excluded in favour of the technology that is now available—obviously with important implications.

In other words there are many cultural, political and economic forces that shape the particular options suggested as well as the way the selected options become designed and implemented (Bijker, Pinch, and Hughes 1987). It is not only technology that 'impacts' on society; technology itself is already the outcome of complex and subtle social processes—in other words it is socially constructed. Moreover, they argue that when we look at the actual uses of particular technologies we discover that users use them in many diverse and often unexpected ways—leading to many and diverse unintended consequences. Both in its design and in its actual use there is an ongoing reciprocal relationship in which society and technology co-construct each other; they act through and upon each other. It is therefore very difficult to make general statements about the 'impact' of a technology. One can, at most, speak of some general trends for which many exceptions will invariably exist. For the proponents of the this

constructivist view it is important to understand, through detailed descriptive accounts, the particular ways in which technologies emerge and become embedded in particular social practices. Examples of such studies can be found in the work of Bijker (1995), Law (1991) and Latour (1991).

INFORMATION TECHNOLOGY AS AN ONGOING HORIZON OF MEANING AND ACTION

For the phenomenologist the 'impact view' of technology as well as the constructivist view of the technology/society relationships is valid but not adequate (Heidegger 1977, Borgmann 1985, Winograd and Flores 1987, Ihde 1990, Dreyfus 1992, 2001). They argue that these accounts of technology, and the technology/society relationship, posit technology and society as if speaking about the one does not immediately and already draw upon the other for its ongoing sense or meaning. For the phenomenologist society and technology co-constitute each other; they are each other's ongoing condition or possibility for being what they are.

For them technology is not just the artifact. Rather, the artifact already emerges from a prior 'technological' attitude towards the world (Heidegger 1977). For example, as the already technologically oriented human beings that we are, we will tend to conceive communication as a problem requiring a technological solution. Thus, technology is already the outcome of a technological way of looking and relating ourselves to the world. Once in place technology allows the world to 'show up' in particular ways (Introna and Ilharco 2003).

For example you are a different person to me with a mobile phone than without one. With a mobile phone you become disclosed, or show up, as 'contactable', 'within reach' as it were. It is this way of thinking about information technology, as a horizon of meaning and action that we want to elaborate further before considering how these various ways of conceptualizing technology shape our views on the social and ethical implications of information technology.

INFORMATION AND COMMUNICATION TECHNOLOGIES

Information and communication technologies, or ICT, allows users to participate in a rapidly changing world in which work and other activities are increasingly transformed by access to varied and developing technologies.

By this definition, you could almost say ICT is technology's version of economic growth, to satisfy the needs and wants of the community over time. ICT is also a very age friendly mechagnmisom ICT tools can be used to find, explore, analyse, exchange and present information responsibly and without discrimination. ICT can be employed to give users quick access to ideas and experiences from a wide range of people, communities and cultures.

ECONOMIC IMPACTS

In recent decades widespread incorporation of ICTs into many tiers of business, political processes and eructuring of the global economy.

ICTs have increased international interconnectedness and sped up the process of globalization. They have been instrumental in the information revolution, facilitating the transition from industrial economies, driven by the manufacturing sector, to knowledge economies. ICTs, in conjunction with globalization and the information revolution, have reshaped the workforce. By increasing the speed of international communication ICTs have enabled corporations to outsource jobs, both in the manufacturing as well as white collar sectors. While this lowers production costs and as a result the cost of goods, it has also had fundamental and often detrimental impacts on labour conditions. Outsourcing causes geographic fragmentation of commodity chains, in which production of goods occurs in specialized plants in different locations, often traversing international boundaries.

Locations with no or minimal restrictions on wages, compensation and entitlements for workers therefor become economically attractive as sites of production. This can lead to the exploitation of workers in developing countries and undermine the bargaining power of organized labour in developed countries outsourcing causes geographic fragmentation of in which production of goods ocure in speciallixes pants in different occasion often traversoi international boundaries despite the international spread of ict the economic impacts have been gerographically uneven.

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Despite the international spread of ICTs the economic impacts have been geographically uneven. They have exacerbated pre-existing disparities between developed countries, which can afford to produce and consume the latest technologies and developing countries, which cannot. This gap is known as the digital divide.

SOCIAL IMPACTS

ICTs have impacted societies on many levels. They have extended the reach of public administration, leading to a centralization of regional management into urban centres. They have led to new forms of employment in innovation and production of ICTs and a demand for highly skilled specialists. However ICTs have also enabled professionals in certain industries to be replaced by unskilled workers, or even made entirely redundant. Proponents of ICTs portray this as a ‘re-skilling’ of the workforce, while to detractors it is a ‘de-skilling’ process.

The diffusion of ICTs within societies is varied, with some institutions and sections of society having greater access to ICTs then others. These divisions are reflected in the content of ICTs. For example the English language, which is understood by only 10% of the worlds population accounts for approximately 80% of internet content.

Despite these imbalance in power relations, many social justice movements believe ICTs can be used to promote equality and empower marginalized groups. These groups advocate ICTs as a means of providing accessible and affordable information and as a platform for voices that might otherwise go unheard.

ECONOMIC DEVELOPMENT

ICTs have been identified by many international development institutions as a crucial element in developing the worlds poorest countries, by integrating them into the global economy and by making global markets more accessible. The World Bank has collaborated with the International Finance Corporation to promote access to ICTs, an initiative which it describes as one of its most successful information and communication is most important to each and every organation with out IC can not growth org. In 2006 the United Nations launched an initiative called the Global Alliance for Information and Communication Technologies and Development.

UNDERSTANDING THE LOCAL: SITUATED-NESS OF EFFORTS

In order to bring positive change via ICT use in community development, efforts need to be "grounded in local settings," a principle central to an information ecology that helps identify what information or a certain technology "means to the people who use it". Local relevance is related to the importance of context in understanding the nature of information and its meanings that are "unique to each case," and embedded in the set of relationships surrounding information exchange.

Adoption and implementation of technology are significantly related to its appropriation in varied settings that are determined by the extent of local control and adaptation that take place. Based on the past experience of community-based technology initiatives, local involvement and steering of policies to the needs of community users are important steps in the process to address broader issues of integration, identity, and power; they also prevent deepening of social exclusion of disadvantaged populations.

The Community Networking Initiative (CNI), a collabora-tion between the Graduate School of Information Science (GSLIS) at the University of Illinois at Urbana-Champaign (UIUC), Prairienet Community Network, and the Urban League, has the following goals:

- Analyzing local information needs and practices;
- Training and delivering computers to teens and adults;
- Providing technical assistance to community-based organizations;
- Enhancing Prairienet Community Network's information content and retrieval capabilities for low-income, African-American neighbourhoods.

An important strategy for community development in the CNI project involves

the participation of people from within the local disadvantaged communities. This participation has been significant through the acknowledged recognition of local capacity and resources; the contextualized provision of information services to local expectations; and the enhanced contributions of local community members from minority and marginalized groups.

Various challenges were encountered with CNI. For example, while training different groups in the community, a major problem was "how to handle users of different skill levels". It was not possible to develop a "cookie-cut" solution to serve different needs of various participating groups, members of which included advanced adults, novice adults, advanced teens, novice teens, and others. In response to different contextual parameters (shaped by both social and technological factors) such as skill level, comfort with use of technology, social dynamics in each group, and delivery rate of information, a range of strategies were adopted. Strategies varied in terms of the duration of time, learning goals, training mechanisms, phase development trajectories, and broad and specific outcomes.

From these efforts in the application of training procedures and strategies to local populations, an important lesson was learned: the need for flexibility in process development and implementation. A situated understanding of technology recognizes multiple contexts of technology use in different settings. It helped develop a focus on the local context, on people's practices and applications, and on the systems of relations surrounding ICT use.

UNDERSTANDING THE LOCAL

Working with the community and letting its members decide what directions to choose are central for building capacity and engagement in participative democracy for making positive changes for a better quality of life. Empowerment endeavors can systematically support people, organizations, and communities achieve mastery over their own affairs.

These endeavors contribute to creating knowledge and developing culturally appropriate information resources that meet needs of actual users, for such resources are built by members of the community themselves. LIS faculty and students at UIUC are engaged in ongoing collective inquiry into the everyday lives of the community at the Puerto Rican Community Centre (PRCC) located in Chicago's Paseo Boricua neighbourhood. The goal is to incorporate localized knowledge and local narratives of community experiences in the online component of the Paseo Boricua Community Library (PBCL). Collaborative practices and equitable interactions with PRCC members are resulting in the development of Community Inquiry Labs (CIL) that include ICT use to "support community learning and action that addresses critical local problems in a democratic manner". CILs include online curriculum units, developed to address intersection of race, class, and technology-related issues that are incorporated into computer training classes for high school students at the Pedro Albizu Campos High School in Paseo Boricua. Training classes engage Latino youth

to identify relevant concerns in the community, build culturally relevant community resources, and elicit their feedback about an online community information system that will form a part of the Paseo Boricua online community library.

MEASURING LOCAL CAPACITY: NEIGHBOURHOOD ASSET MAPPING

Understanding the extent and boundaries of an information ecology in the context of the community calls attention to the measurement of its existing skills and potentials. Community development efforts support community in ways that "assemble its assets and capacities into new combinations, new structures of opportunity, new sources of income and control, and new possibilities of production".

Community capacity is defined as the community's ability to identify, enhance, and mobilize its human promise, economic opportunities, social relationships, and ecological capital for the purpose of improved community stability. It provides a practical way to reach out to "marginalized" populations and target local neighbourhoods in order to enhance resident participation and build on existing ICT-related neighbourhood assets. LIS leadership in community development can be potent to help develop asset mapping as a community capacity measuring tool, as well as link service initiatives to the local community asset base.

Asset mapping is a "visual path displaying capacities and assets" in which" community members identify what is an asset and how it can benefit their community". It recognizes that all kinds of communities, including poor and disadvan-taged user groups, have assets that can be acknowledged within planning efforts.

Grounding strategies to existent geographic areas accommodates an integrative and comprehensive vision of community building. Several campus units at UIUC, such as the Department of Urban and Regional Planning, the Department of Landscape Architecture, the Department of Architecture, and GSLIS, are involved in service-learning activities in East St. Louis where faculty and students work with neighbourhood organizations to map community resources and "address the immediate and long-term needs of some of the city's most distressed communities".

Activities involved documentation and mapping of local community assets in order to build geographic information system (GIS) based databases for the visualization of community components and their relationships; to develop urban systems models to analyse census-based economic and environmental variables that impact community develop-ment; and to identify positive and negative factors that impact development of community technology centres across the city.

DIVERSITY AND EMPOWERMENT

Diversity is an important element of natural information ecology and an

inherent feature in contemporary local on-site and online communities. As a Nations Bank official concluded at the end of the conference titled, Blueprint 2000: Accepting and working successfully within an increasingly diverse America is the nation's single largest challenge affecting community building.

If we are afraid of each other, full of hate for each other, or discriminate against one another, how can we expect to build communities that are livable? Within our increased diversity, we must work together to build a civil society. In order to promote such a civil society, it is important for there to be recognition and acceptance of a moral, social, legal, and intellectual equality in "our inherent differences". The participatory action research (PAR) framework gives an opportunity to actualize and operationalize the notion of equality in our practical work and personal lives by empowering all people who interact within settings that adopt the underlying PAR philosophy. PAR has been practiced under different names--action research, collaborative research, community-based research, amongst others.

There are common threads underlying PAR manifestations: a) democratization of the knowledge process in which the people who are usually considered "research subjects" become part of the research process as researchers analyzing their own experiences; and b) emphasis on social justice and social equity via action to change imbalances in distribution of resources, information, and power. Using PAR, participants draw intersections between social equity, economy, and ecology in ways that lead to empowerment of those traditionally "left out" in the process of resource-sharing and decision-making.

Empowerment in PAR comes from letting people on the margins themselves determine what meaningful intersections are and how they should address them in ways to improve their conditions. PAR is significant for community development in the use of ICT since it can be applied towards the process of knowledge creation, as well as in the context of taking action that brings about changes at different personal, social, political, economic, and cultural levels. Such initiatives will lead directly towards the empowerment of participants by helping them recognize their own worth as well as leading to their social recognition as creators of knowledge.

Additionally, PAR will provide an avenue for participants to take action that leads to an improvement in their own experienced situations. The LIS professions can play an important role in PAR processes by helping community development practitioners to reconfigure embedded relationships, practices, and values of people belonging to various segments in the community. One direct outcome of adopting a PAR approach by LIS professionals is the transference of power to make decisions during various stages of project implementation from external sources to the hands of the "insiders" in local communities. The Afya (Swahili for "health") project is an example in which the LIS faculty and students at UIUC are working with community activists to develop participative and democratic practices to bridge the social, economic, and political divides by targeting barriers that prevent access to health information and services

experienced by African American women in the community.

Afya involved establishing partnerships with SisterNet, a local network of African American women committed to address their physical, emotional, intellectual, and spiritual health needs. LIS professionals worked towards building collaborations between local SisterNet women and community health care and information providers. Faculty and students at GSLIS helped to facilitate such collaborations, to advance participative techniques, and to develop online and offline resources that supported the work of community groups. SisterNet women shared their realities and experiences, played activist and leadership roles, and took action to bring changes in the community for improving their health-related situations.

Prairienet Community Network was an important partner in the Afya project and provided computer technology, training, and Web development services. Parkland College, the local community college, was a supporter of SisterNet through its Department of Adult and Continuing Education and provided access to computer hardware, software, and other resources. One major challenge in building community connections was the lack of a common vocabulary for communication between traditionally defined technological "experts" and disenfranchised users. Issues were greater than those related to language; barriers were more associated with established mindsets, existing institutional bureaucratic procedures and policies, and individual personality traits.

In such divergently disjoint situations, LIS professionals played significant roles to build bridges across social and technological gaps. Promoting Inclusiveness: Outreach in Planning and Policy Implementation Sustainable information ecology requires inclusiveness in the processes associated with its development, a fact that is also true for ICT use in community development projects. LIS professions can play active roles to promote outreach to local residents from minority and under-represented populations.

The goal is to develop successful user-centreed information services that are effective at the grassroots levels. Towards this vision, greater support in favour of disenfranchised groups is needed from civic and business associations, non-profit and voluntary organizations, public and private schools, community colleges and universities, health centres, and other local institutions. The underlying idea is to work “with” people rather than simply “for” them by integrating scientific knowledge, disciplined effort, and learned skills into a more contextualized interactive practice.

Zimmerman, et al. highlight the examination of grassroots community organizations for promoting empowerment of “marginalized” populations. Participation of local disenfranchised people in voluntary community organizations, for example, is empowering for “marginalized” individuals for it leads to higher competencies, confidence, sense of duty, and lower feelings of helplessness. In the Afya project, participation of SisterNet women insured that efforts were rooted in existing social institutions and activities of community African American women.

Locating computer-training labs in the local Urban League, Workforce Prep

Centre, and within Prairienet Community Network's premises was significant in trying to integrate information access strategies within the daily social life of community members. Similarly, strategies such as developing SisterNet Resource Centres for making health-information resources available at local public spaces such as health salons, churches, libraries, and family centres are instrumental in this regard.

In order to incorporate libraries within the daily social experiences of African American women, the Afya project tried to develop public libraries as an important place for promoting collaborations between SisterNet women, health care and information providers, researchers, local organizations, and civic institutions, as well as other community stakeholders. Presenting participative strategies in public libraries, for promoting access to networked digital information for local Black women, was one such initiative. Similarly, the organization of the SisterNet Health Fair in a public library was another initiative that contributed in trust-building and knowledge exchange of relevant health-related social practices and availability of appropriate resources.

Future Directions of Growth

"The modern public library in large measure represents the need of democracy for an enlightened electorate, and its history records its adaptation to changing social requirements". There is tremendous potential for future growth of the LIS professions as gateways of provision and access to the Information Age for all members in the community. In 1990, the American Library Association adopted the policy, "Library Services for the Poor," stating that libraries and LIS professionals should recognize their role "in enabling poor people to participate fully in a democratic society, by utilizing a wide variety of available resources and strategies".

There are strong critics of the LIS professions to achieve the goal of social equity for under-represented populations. Research by scholars like Chatman, Dervin, Bishop et al., and others has shown that libraries are the last places where minority and marginalized individuals seek information. In this context, community development practitioners need to realise the capabilities and capacities as well as some of the following challenges that the LIS professions face in community development efforts: a need for creativity and openness in outreach to disadvantaged community members; progressive strategies to develop increased involvement in local community initiatives; and greater flexibility and simplicity in policies and procedures. To strengthen their role in community development for social equity, LIS professions will have to loosen bureaucratic procedures, reconsider national and local limiting institutional practices, discard rigid administrative frameworks, and redefine policies of libraries and information systems based on incorporating representative community voices in planning and implement-ation deliberations.

Provision of greater proactive service to disenfranchised communities in different geographic areas to promote activities such as community development

planning, assertive community asset mapping, and environmental scanning procedures are first steps in that direction. Other steps towards social equity are for LIS professionals to work together with community development practitioners and others and to bring change in broader policy issues via political action and legislation.

"Working our collaborative and citizen-based efforts into the formal, local political structure will not only create policy that reflects the values of citizens but will also hasten reform of local government from that of a purely representative form to a highly participatory and dynamic decision-making structure". The goal is to insure social equity for disadvantaged users by initiating whatever it may take, including political, cultural, and/or economic reforms. In order for community development initiatives to be more meaningful to under-represented populations, it is important to recognize the intertwined relationships that occur in real-life situations between social equity, economy, and ecology.

These factors emerge in settings as individual temperaments and personalities respond to social and cultural expectations and real-forces of politics, power, and economics come into play.

Only when the complexities and the "messiness" of everyday life of the "marginalized" are acknowledged can there be actual changes in everyday operations and functioning for lay people.

For only then will community development reflect and represent reality in a more accurate manner; experiences that recognize the constant and multiple intersections between the information needs, daily practices, class and financial realities, and issues of social inequalities in the everyday lives of the disenfranchised.

The metaphor of information ecology as applied in the context of community provides a good mechanism for LIS professionals, community development practitioners, and others to draw connections between social equity, economy, and ecology, as well as to make ICT development and implementation more meaningful in the everyday lives of disadvantaged populations.

Future community development initiatives in LIS require creating constant awareness that even though tools may be technology-driven, the vision is yet to lean towards strengthening community in terms of "the common life of beings who are guided essentially from within, actively, spontaneously, and freely relating themselves to one another, weaving for themselves the complex web of social unity".

As information providers, LIS professionals can play an important role in this regard, not by finding piece-meal and isolated solutions to ICT use for social equity, but instead, by taking a holistic view that recognizes multiple perceptions and brings various elements of communities to work together for its sustainable development. Some helpful steps include recognition of the capacity and strengths of local "marginalized" communities, implementation and use of ICT in relation to larger socioeconomic and sociopolitical experiences of under-represented populations, and provision of ICT functionalities that directly situate themselves in the context of everyday lives of disadvantaged

users in terms of what is meaningful to them.

Stronger ties between LIS professionals and community development practitioners can do wonders towards reaching this goal because both emerge from rich service-oriented traditions.

The contemporary realities of ICT inequities and deepening divides in our communities demand greater efforts in collaboration between LIS professionals, community development practitioners, and others for building bridges to support social justice and promote sustainable community-wide development for all segments in society.

Outdoor challenge education has become increasingly popular as a method of developing team cohesion.

Also referred to as adventure learning, experiential learning, and challenge programmes, such outdoor education involves having a group navigate a course of mental and physical challenge activities to improve its team relationships, group dynamics, cooperation, and communication. Such training typically provides a framework for group problem-solving exercises by requiring groups to develop a plan that enables all members to complete the exercise.

The physical elements of the course encourage participants to find strength from within and embrace the support they receive from their fellow team members. While educators often find outdoor activities impossible or impractical to implement, elements of the methods can be adapted for business communication courses and other disciplines in which team building and communication are emphasized. This chapter examines briefly the evolution, purpose, and components of outdoor challenge programmes and describes three indoor activities that incorporate some of the benefits found in such programmes.

Kurt Hahn is generally credited as the first person to use challenging outdoor experience as a medium for the development of the self and of groups. Hahn was approached in 1941 by Lawrence Holt, the head of a large merchant shipping line, to address the problem of the poor survival rate of young sailors which Holt attributed to an inability to rely on their "inner resources."

Hahn developed a programme of physical experiences which were a medium for the sailors to mature and realise their full potential. While Hahn recognized its value, he never advocated adventure as an end in itself, but rather as a training vehicle through which youth would mature.

The key tenets of Hahn's concept may be summarized as an experience which:

- Takes place in the outdoors.
- Is structured to assist individuals to discover and realise their inner resources.
- Is designed to reflect the environment in which the participant is expected to operate.
- Is based on adventure activities which are inherently dangerous and deemed appropriate for meeting the first three objectives.

The establishment of the Outward Bound movement by Hahn popularized the challenge experience to a broad array of participants all over the world.

Outward Bound is intended to be catalytic, to encourage change and to help each participant more fully achieve self-knowledge and understanding of others. An Outward Bound trip, however, usually consists of a five-day wilderness challenge experience, so companies are turning to challenge courses, which are more convenient and shorter. Since the late 1970s, outdoor-based experiential training programmes have become increasingly popular; and surveys indicate that the trend continues.

Present-Day Outdoor Challenge Education

Entwined in the experiential learning process is a creative problem-solving process. The word "creative" differentiates the particular type of problem solving from an analytical or technical problem-solving process, in which equations or formulae may be used to reach a singular, "correct" solution. In creative problem-solving, a number of different solutions may be possible, but the solution sought is one that best fits the complex context of the problem. The "accuracy" or "correctness" of the solution is not the issue. Rather the issue is, "What can we do which will give us a very good chance of solving the problem?"

Challenge activities involve mental and physical challenges requiring strong individual and team skills. A facilitator may lead the group through the activities, stopping between them to discuss how the group worked together. During the debriefing, the group discusses how they decided to solve the problem, who took the lead, who held back, and how they can do better in the future. Even the most powerful training experience fades if it is not linked to the reality of the workplace.

For this reason, most reputable outdoor-training companies integrate the outdoor activities with classroom discussions, needs assessments, and extensive preparation and follow-up.

Outdoor training courses typically consist of "low elements" and "high elements." Low element activities rarely take place above eye level. Equipment can include props Or permanently installed "low ropes" courses. Some popular low element activities are summarized as follows:

- *The Web*: A group faces a spider web of rope strung between two trees. The challenge is to get the entire group through the web - without touching it and using each gap in the web only once. People have to let go and allow themselves to be hoisted into the air and put through the web.
- *The Beam*: Each group member must get over a six-foot-high beam between two trees without aids (other than help from the team). Once a participant is over the beam, he or she cannot help those who are not, except by "spotting" or watching them in case they lose their balance.
- *The Islands*: A shipwrecked group must travel from a large "island," which is sinking, to two successively smaller ones using only the ship's plank (a board). The plank, however, is not quite long enough to serve as a complete bridge between the islands. If participants touch the

(pretend) shark-infested waters around the islands, they must start over.

- *Electric Fence*: Each member of the group must move from one side of the "electric" fence to the other, without touching the fence.
- *Tube Pass*: A bicycle inner tube must be passed around a circle of people who are holding hands, without either breaking the circle or letting the tube touch the ground.

High element activities often focus on a series of rope-based activities placed 4 to 40 feet above the ground, rock climbing, or rappelling.

Course participants are held secure with harnesses and a system of ropes and pulleys. A climbing tower or wall may also be used. The goals may be to challenge a person to tackle his or her fears, learn to make decisions, and learn to lead a group. The purpose of the high element activities is to push people out of their comfort zones.

The advantages and disadvantages of outdoor experiential learning vary based on the type of programme selected. Some distinct benefits are associated with simply being outdoors and engaging in physical activity. One benefit is that physical risk forces participants to engage actively in the training. A person walking across a cable or falling from a table into the arms of teammates is likely to pay close attention to the experience. In typical indoor programmes, people are less likely to be forced to engage actively and participate because they tend to remain within their comfort zones. Another benefit to outdoor programmes is that participants often experience real feelings and emotions. They are not role-playing, and there is no place to hide from feeling the experience.

Many of the characteristics of outdoor training that contribute to the learning environment (especially in high-impact programmes) may also be those that create danger, emotional distress, and legal liability. In addition, the Americans with Disabilities Act (ADA) raises questions about equal access and fair treatment of employees based on abilities that are not relevant to their jobs. Outdoor activities that require people to touch each other also raise concerns.

For instance, the Spider Web exercise requires a team to lift its members one at a time and pass them through a "hole" in the "web." Some people absolutely love this activity, but others refuse to participate because of the amount of touching it requires. Some see this touching as an invasion of their privacy; the issue can be especially critical when programmes involve multicultural groups. A third concern with outdoor programmes is the outdoor setting itself. Rain, snow, and extremely hot and cold temperatures may not be conducive to the learning experience.

6

Challenges in Integrating ICTs in Education

Although valuable lessons may be learned from best practices around the world, there is no one formula for determining the optimal level of ICT integration in the educational system.

Significant challenges that policymakers and planners, educators, education administrators, and other stakeholders need to consider include educational policy and planning, infrastructure, language and content, capacity building, and financing. What are the implications of ICT-enhanced education for educational policy and planning? Attempts to enhance and reform education through ICTs require clear and specific objectives, guidelines and time-bound targets, the mobilization of required resources, and the political commitment at all levels to see the initiative through. Some essential elements of planning for ICT are listed below.

- A rigorous analysis of the present state of the educational system. ICT-based interventions must take into account current institutional practices and arrangements. Specifically, drivers and barriers to ICT use need to be identified, including those related to curriculum and pedagogy, infrastructure, capacity-building, language and content, and financing.
- The specification of educational goals at different education and training levels as well as the different modalities of use of ICTs that can best be employed in pursuit of these goals. This requires of the policymaker an understanding of the potentials of different ICTs when applied in different contexts for different purposes, and an awareness of priority

education needs and financial and human resource capacity and constraints within the country or locality, as well as best practices around the world and how these practices can be adapted for specific country requirements.

- The identification of stakeholders and the harmonizing of efforts across different interest groups.
- The piloting of the chosen ICT-based model. Even the best designed models or those that have already been proven to work in other contexts need to be tested on a small scale. Such pilots are essential to identify, and correct, potential glitches in instructional design, implementability, effectiveness, and the like.
- The specification of existing sources of financing and the development of strategies for generating financial resources to support ICT use over the long term.

INFRASTRUCTURE-RELATED CHALLENGES IN ICT-ENHANCED EDUCATION

A country's educational technology infrastructure sits on top of the national telecommunications and information infrastructure. Before any ICT-based programme is launched, policymakers and planners must carefully consider the following:

- In the first place, are appropriate rooms or buildings available to house the technology? In countries where there are many old school buildings, extensive retrofitting to ensure proper electrical wiring, heating/cooling and ventilation, and safety and security would be needed.
- Another basic requirement is the availability of electricity and telephony. In developing countries large areas are still without a reliable supply of electricity and the nearest telephones are miles away. Experience in some countries in Africa point to wireless technologies (such as VSAT or Very Small Aperture Terminal) as possible levers for leapfrogging.. Although this is currently an extremely costly approach, other developing countries with very poor telecommunications infrastructure should study this option.
- Policymakers should also look at the ubiquity of different types of ICT in the country in general, and in the educational system (at all levels) in particular. For instance, a basic requirement for computer-based or online learning is access to computers in schools, communities, and households, as well as affordable Internet service.

In general, ICT use in education should follow use in society, not lead it. Education programmes that use cutting-edge technologies rarely achieve long term success:

It is cheaper, and easier, to introduce a form of technology into education, and keep it working, where education is riding on the back of large-scale developments by governments or the private sector. Television works for

education when it follows rather than precedes television for entertainment; computers in schools can be maintained once commercial and private use has expanded to the point where there is an established service industry.

CHALLENGES WITH RESPECT TO CAPACITY-BUILDING

Various competencies must be developed throughout the educational system for ICT integration to be successful.

Teachers: Teacher professional development should have five foci: 1) skills with particular applications; 2) integration into existing curricula; 3) curricular changes related to the use of IT (including changes in instructional design); 4) changes in teacher role (5) underpinning educational theories. Ideally, these should be addressed in pre-service teacher training and built on and enhanced in-service. In some countries, like Singapore, Malaysia, and the United Kingdom, teaching accreditation requirements include training in ICT use. ICTs are swiftly evolving technologies, however, and so even the most ICT fluent teachers need to continuously upgrade their skills and keep abreast of the latest developments and best practices.

While the first focus—skills with particular applications—is self-evident, the four other foci are of equal, if not ultimately greater, importance. Research on the use of ICTs in different educational settings over the years invariably identify as a barrier to success the inability of teachers to understand why they should use ICTs and how exactly they can use ICTs to help them teach better. Unfortunately, most teacher professional development in ICTs are heavy on "teaching the tools" and light on "using the tools to teach."

Teacher anxiety over being replaced by technology or losing their authority in the classroom as the learning process becomes more learner-centred—an acknowledged barrier to ICT adoption—can be alleviated only if teachers have a keen understanding and appreciation of their changing role.

***Education Administrators*:** Leadership plays a key role in ICT integration in education. Many teacher-or student-initiated ICT projects have been undermined by lack of support from above. For ICT integration programmes to be effective and sustainable, administrators themselves must be competent in the use of the technology, and they must have a broad understanding of the technical, curricular, administrative, financial, and social dimensions of ICT use in education.

Technical Support Specialists: Whether provided by in-school staff or external service providers, or both, technical support specialists are essential to the continued viability of ICT use in a given school. While the technical support requirements of an institution depend ultimately on what and how technology is deployed and used, general competencies that are required would be in the installation, operation, and maintenance of technical equipment (including software), network administration, and network security. Without on-site technical support, much time and money may be lost due to technical breakdowns. In the Philippines, for example, one of the major obstacles to

optimizing computer use in high schools has been the lack of timely technical support. In some extreme cases involving schools in remote areas, disabled computers take months to be repaired since no technician is available in the immediate vicinity and so the computers have to be sent to the nearest city hundreds of kilometers away.

***Content Developers*:** Content development is a critical area that is too often overlooked. The bulk of existing ICT-based educational material is likely to be in English or of little relevance to education in developing countries (especially at the primary and secondary levels). There is a need to develop original educational content (*e.g.*, radio programmes, interactive multimedia learning materials on CD-ROM or DVD, Web-based courses, *etc.*), adapt existing content, and convert print-based content to digital media. These are tasks for which content development specialists such as instructional designers, scriptwriters, audio and video production specialists, programmers, multimedia course authors, and web-developers are needed. Like technical support specialists, content developers are highly skilled professionals and are not, with the exception of instructional designers, historically employed by primary and secondary schools. Many universities with distance education programmes, and those who otherwise make use of ICTs, have dedicated technical support and content development units.

What challenges need to be addressed in the areas of language and content?

English is the dominant language of the Internet. An estimated 80% of online content is in English. A large proportion of the educational software produced in the world market is in English. For developing countries in the Asia-Pacific where English language proficiency is not high, especially outside metropolitan areas, this represents a serious barrier to maximizing the educational benefits of the World Wide Web.

Even in countries where English is a second language (such as Singapore, Malaysia, the Philippines, and India) it is imperative that teaching and learning materials that match national curriculum requirements and have locally meaningful content, preferably in the local languages, be developed. This would ensure that the Web is a genuinely multicultural space and that peoples of different cultures have an equal stake and voice in the global communities of learning and practice online. Particularly vulnerable to exclusion of this sort are isolated, rural populations, cultural minorities, and women in general. Thus attention must be paid to their special needs. One encouraging trend has been the emergence of national and regional school networks, or SchoolNets, that facilitate the sharing of content and information—curriculum guides, teaching and learning resources, telecollaborative project registries, school and teacher directories, training curricula and materials, research and policy papers, technology management guides, and start-up toolkits, among others. Countries like Australia, France, Finland, Japan, Canada, Thailand, Ghana, South Africa, and Zimbabwe, to name a few, all have national SchoolNets. The Enlaces programme in Latin America has linked schools from Spanish-speaking countries

like Chile, Paraguay, Costa Rica, Colombia, and Peru. In Southeast Asia, efforts are currently underway to pilot SchoolNets in the Philippines, Indonesia, Cambodia, Laos, Myanmar and Vietnam, and to link these to existing national SchoolNets to create a region-wide ASEAN SchoolNet.

In Web-based learning, technical standardization of content has also become a pressing issue. Standardization allows different applications to share content and learning systems. Specifications in content, structure, and test formats are proposed so that interoperability may exist between different management systems, resulting in some cost-efficiencies. Standards must be general enough to support all kinds of learning systems and content. Worth mentioning are initiatives conducted by the Instructional Management System (IMS), the Advanced Distributed Learning/Shareable Courseware Object Reference Model (ADL/SCORM) initiative, the Aviation Industry Computer Based Training Committee (AICC), and the European ARIADNE project, since some of the standards they have proposed are already being widely applied.

The ease by which Web-based educational content can be stored, transmitted, duplicated, and modified has also raised concerns about the protection of intellectual property rights. For instance, are intellectual, property rights violated when lectures broadcast over the television or on the Web incorporate pre-existing materials, or when students record educational broadcast on tape for later viewing? While schools and universities may already have agreements that expressly authorize the use of certain materials for classroom purposes, these agreements may not be broad enough to accommodate telecommunications transmission, videotape recording, or the distribution of course-related materials beyond the classroom setting.

The United Nations International World Intellectual Property Organization is leading international efforts in setting global standards for the protection of intellectual property rights that would not at the same time unduly curtail the accessing and sharing of information.

For teachers and students, each of whom are potential publishers of multimedia materials that incorporate the works of others, information and training about the ethical use of intellectual property should be an important component of ICT-based programmes.

What are the challenges related to financing the cost of ICT use? One of the greatest challenges in ICT use in education is balancing educational goals with economic realities. ICTs in education programmes require large capital investments and developing countries need to be prudent in making decisions about what models of ICT use will be introduced and to be conscious of maintaining economies of scale.

Ultimately it is an issue of whether the value added of ICT use offsets the cost, relative to the cost of alternatives. Put another way, is ICT-based learning the most effective strategy for achieving the desired educational goals, and if so what is the modality and scale of implementation that can be supported given existing financial, human and other resources?

COMMUNICATION TECHNOLOGY IN SCHOOL EDUCATION

Technology is rapidly changing in all spheres of life, so in education. It has become very necessary to know how we learn, how we express ourselves, and how we perceive and interact with our world. As a means of responding to the change and surviving in an increasingly competitive educational environment, management institutes must develop a strategic plan for enhancing management education and value adding to the existing system of education. As a means of achieving the aforesaid goal the use of computers and other technology in support of student learning, accommodating the full range of learning styles and special needs, and fully integrating technology into the curriculum has become extremely needful in this hour.

A lot of related issues are also involved in such a process as this includes administrative, planning and budgeting; professional development for teachers and administrators; and, very importantly, ensuring equity of access and use. The current emphasis is ensuring that technology is used effectively to create new opportunities for learning and to promote student achievement.

In almost all management institutes the main focus is laid on the employers need who prefer: This has been derived somehow from the student's psyche as success for them is a respectable degree, good education, good job and higher salary, to meet such a demand each management institute should plan strategies to enhance the learning experience of the students so that they get better value of management education and have a better prospect in job market.

Some basic principals of good teaching are never going to change even teaching involves the use of ICT, as this has been found my many researchers that it remains a matter of concern for teachers who are not able to shift from traditional class rooms to a modern technology driven classroom. It is central to the role of a teacher to help pupils learn.

As the nature of what is to be learnt changes, so does the role of the teacher in that process. The teacher was once the sole source of information and was expected to know all the relevant knowledge and to transmit it effectively to the pupils. But now with the advent of various technologies, when we sometimes find that some students do have access to more information than any teacher can ever know, thus it has become very necessary for a teacher to change the role of being an instructor who was considered as a source of all knowledge to a facilitator who by the experiences, knowledge and skills help students, learn, understand, evaluate and communicate knowledge.

The role of the teacher is not being diminished but changed. What is necessary above all is that teachers develop the confidence that they are important to their pupils, not because they happen to know some facts that pupils do not know, but that they have a vision of what they want pupils to be educated in as well as the requisite knowledge, skills and understanding to facilitate and monitor pupils' progress. The fact that pupils may know more about the operation of a piece of software than the teacher can be of benefit to both.

When computers were first brought in as an educational tool, many articles, press releases gave a very fearful idea to the teachers about "teacher less classrooms". But truth is technologies do not do the way it was depicted. There is no simple way to implement new procedures. But if the process is thought through and well handled, the dividends can be huge. As business schools experience increased competitive pressures, information technology is one area that schools might use to differentiate or compete with or, more importantly, to use as a catalyst for transforming educational processes. ICT has definitely proved out to be an efficacious means of enabling intentional changes in teaching and learning processes.

Before discussing the technologies available for it, becomes very important to discuss the learning models and Role of ICT.

OBJECTIVIST MODEL (YARUSSO 1992)

This model assumes that the goal of teaching is to efficiently transmit knowledge from the expert to the learner. The lecture method of teaching embeds the pedagogical assumptions of this model. The transfer of knowledge can be by the means of electronic presentation.

The softwares which are easily available, like power point etc can be used. If the faculty wants to make the presentation more interesting other softwares like macromedia director (for giving interactive effect) media player (to display some clips related to the topic), *etc.*, can be used.

CONSTRUCTIVIST MODEL (O'LOUGHLIN 1992)

It calls for learner-centred instruction: individuals are assumed to learn better when they are forced to discover things themselves rather than when they are told, or instructed. It is found that the learner develops the skill hypothesizing, predicting, posing questions, researching answers, imagining, investigating, and inventing.

Following this model ICT's role in imparting knowledge is by providing a particular problem area by the faculty. Rest finding the answer by the students can be by the use of online databases, internet search engines or CD-ROMs or electronic library.

COOPERATIVE MODEL OF LEARNING (SLAVIN, 1990)

The major goal of cooperative learning is the construction of shared understanding through interaction with other individuals, an implicit goal is improving communication and listening skills and eliciting participation. One implication of the cooperative model for instructional methods is that the instructor's role is to facilitate maximal information and knowledge sharing among learners rather than controlling the content and delivery of learning. This can be brought about by networked computers where each and every individual learner and instructor is able to view the work of everybody in the classroom.

Higher education is beginning to change in response to providing educational opportunities to an increasing diverse population of students. A new type of university emerged in the last 25 years which John Daniel (1996) thinks will hold lessons for the renewal of all universities. Called "mega-universities".

Prominent Business gurus have given traditional universities just 30 more years before dying off (Cunningham et al., 2002). As radical as their predictions may be, it does require colleges and universities to take seriously the changes and challenges that technology will bring to them in the 21st Century.

The utilization of educational technology up to this point has given rise to the opportunity and potential of restructuring the educational system to extend the learning environment beyond the four walls of the classroom. In order to integrate technology and education we must first develop our view of the revolution that technology is creating in education, and appropriately incorporate it into the system (Chen et al., 2006). This in turn will influence cultural changes in the education system, and technology is also often assumed to be the catalyst of new pedagogical change towards e-learning.

Distance educators have had to redefine their communication skills. They have found that two-way interaction is a critical feature of the educational process. Educators must communicate progress to learners as well as engaging the learners into the e-learning environment.

For Distance Education to be successful, high levels of interaction typically need to be present for learners to have a positive attitudes and greater satisfaction. Two-way interactive technologies (*e.g.*, video, audio, audio graphics, and computer conferencing), while capable of providing two-way interactivity, still depend on user skill to successfully bring about interaction in an instructional context.

The current distance education literature addresses distance interaction from the learner's perspective. Shea, Motiwalla, and Lewis (2001) conducted a study to investigate the status of distance education (DE) at 68 higher education institutions.

The number of DE students continues to grow. This tremendous growth can be attributed, in part, to shrinking budgets and lower local student enrollments at universities. DE via the Internet provides them with a low-cost, flexible option to expand into global markets (Casey, 1998). Distance education can provide a strong interaction between the learner, learner/instructor, and the content as well as other learners. There needs to be a distinct interaction with learners and high technology devices. Hence, the four typical types of interaction for distance learners are: (a) learner-content, (b) learner-instructor, (c) learner-learner, and (d) learner-technology. However, distance instructors develop similar, although relatively different, instructional interactions: (a) instructor-learner, (b) instructor-content, and (c) instructor-technology.

These instructional interactions are complex processes; the literature recommends that instructional designers keep them in mind to produce effective, efficient, and quality distance education courses. Transactional distance included

the distance that exists in every educational relationship. There has to be a certain amount of structure in distance education that fosters a certain amount of dialogue between the learner and instructor.

On the other hand, Social Presence is a strong communication component that reduces isolation between the distant learner and other learners and instructor. Lack of social presence might affect learner's performance and outcomes during the instructional transaction. Social presence is the degree to which a person is perceived as a real person in a mediated situation (Short, 1976). The notion is that social presence can be transferred both by the medium itself and by the people using the medium for interaction. Transactional distance and social presence are strongly interrelated and together influence the learner's control of the learning process.

INFORMATION SYSTEM RESOURCES

PEOPLE RESOURCES

People are required for the operation of all information systems. These people resources include end users and IS specialists.

- End users (also called users or clients) are people who use an information system or the information it produces. They can be accountants, salespersons, engineers, clerks, customers, or managers. Most of us are information system end users.
- IS Specialists are people who develop and operate information systems. They include systems analysts, programmers, computer operators, and other managerial technical, and clerical IS personnel. Briefly, systems analysts design information systems based on the information requirements of end uses, programmers prepare computer programmes based on the specifications of systems analysts, and computer operators operate large computer systems.

HARDWARE RESOURCES

The concept of Hardware resources includes all physical devices and materials used in information processing. Specially, it includes not only machines, such as computers and other equipment, but also all data media, that is, all tangible objects on which data is recorded, from sheets of paper to magnetic disks. Example of hardware in computer-based information systems are:

- Computer systems, which consist of central processing units containing microprocessors, and variety of interconnected peripheral devices. Examples are microcomputer systems, midrange computer systems, and large mainframe computer systems.
- Computer peripherals, which are devices such as a keyboard or electronic mouse for input of data and commands, a video screen or printer for output of information, and magnetic or optical disks for storage of data resources.

SOFTWARE RESOURCES

The concept of Software Resources includes all sets of information processing instructions. This generic concept of software includes not only the sets of operating instructions called programmes, which direct and control computer hardware, but also the sets of information processing instructions needed by people, called procedures.

It is important to understand that even information systems that don't use computers have a software resource component. This is true even for the information systems of ancient times, or the manual and machine-supported information systems still used in the world today. They all require software resources in the form of information processing instructions and procedures in order to properly capture, process, and disseminate information to their users. The following are the examples of software resources:

- System Software, such as an operating system programme, which con controls and supports the operations of a computer system.
- Application Software, which are programmes that direct processing for a particular use of computers by end users. Examples are a sales analysis programme, a payroll programme, and a work processing programme.
- Procedures, which are operating instructions for the people who will use an information system. Examples are instructions for filling out a paper form or using a software package.

DATA RESOURCES

Data is more than the raw material of information systems. The concept of data resources has been broadened by managers and information systems professionals.

They realize that data constitutes a valuable organization resource. Thus, you should view data as data resources that must be managed effectively to benefit all end users in an organization.

Data can take many forms, including traditional alphanumeric data, composed of numbers and alphabetical and other characters that describe business transactions and other events and entities.

Text data, consisting of sentences and paragraphs used in written communications; image data, such as graphic shapes and figures; and audio data, the human voice and other sounds, are also important forms of data. The data resources of information systems are typically organized into:

- Database that hold processed and organized data.
- Knowledge bases that hold knowledge in variety of forms such as facts, rules, and case examples about successful business practices.

For example, data about sales transactions may be accumulated and stored in a sales database for subsequent processing that yields daily, weekly, and

monthly sales analysis reports for management.

CLASSIFICATIONS OF INFORMATION SYSTEMS

EXPERT SYSTEMS

An expert system is a knowledge-based information systems; that is, it uses its knowledge about a specific area to act as an expert consultant to users. The components of an expert system are a knowledge base and software modules that perform inferences on the knowledge and offer answers to a user's questions.

Expert systems are being used in many different fields, including medicine, engineering, the physical sciences, and business. For example, expert systems now help diagnose illnesses, search for minerals, analyze compounds, recommend repairs, and do financial planning. Expert systems can support either operations or management activities.

KNOWLEDGE MANAGEMENT SYSTEMS

Knowledge Management systems (KMS), Workers create, organize, and share important business knowledge wherever and whenever it is needed. For example, many knowledge management systems rely on Internet and intranet Web sites, knowledge bases, and discussion forums as key technologies for gathering, storing, and disseminating business knowledge. In this way, knowledge management systems facilitate organization learning and knowledge creation and dissemination within the business enterprise.

STRATEGIC INFORMATION SYSTEMS

The strategic role of information systems involves using information technology to develop products, services, and capabilities that give a company strategic advantages over the competitive forces it faces in the global marketplace.

This creates strategic information system, information systems that support or shape the competitive position and strategies of an enterprise. So a strategic information system can be any kind of information systems (TPS, MIS, DSS, *etc.*) that helps an organization gain a competitive advantage, reduce a competitive disadvantage, or meet other strategic enterprise objectives.

BUSINESS INFORMATION SYSTEMS

As a future managerial end user, it is important for you to realize that information systems directly support both operations and management activities in the business functions of accounting, finance, human resource management, marketing, and operations management. Such business information systems are needed by all business functions.

For example, marketing managers need information about sales performance

and trends provided by marketing information systems. Financial managers need information concerning financing costs and investment returns provided by financial information systems.

INTEGRATED INFORMATION SYSTEM

It is also important to realize that information systems in the real world are typically integrated combinations of several types of information systems we have just mentioned. That's because conceptual classification of information systems are designed to emphasize the many different roles of information systems. In practice, these roles are integrated into composite or cross-functional information systems that provide a variety of functions.

Thus, most information systems are designed to produce information and support decision making for various levels of management and business functions, as well as do record keeping and transaction processing systems.

THE SYSTEMS APPROACH

The systems approach to problem solving used a systems orientation to define problems and opportunities and develop solutions. Studying a problem and formulating a solution involve the following interrelated activities:

1. Recognize and define a problem or opportunity using systems thinking.
2. Develop and evaluate alternative system solutions.
3. Select the system solution that best meets your requirements.
4. Design the selected system solution.
5. Implement and evaluate the success of the designed system.

OPERATIONS SUPPORT SYSTEMS

Information systems have always been needed to process data generated by, and used in, business operations. Such operations support systems produce a variety of information products for internal and external use. However, they do not emphasize producing the specific information products that can best be sued by managers. Further processing by management information systems is usually required. The role of a business firm's operations support systems is to efficiently process business transactions, control industrial processes, support enterprise communications and collaboration, and update corporate databases.

TRANSACTION PROCESSING SYSTEMS

Operations support systems include the major category of transaction processing systems (TPS). Transaction processing systems record and process data resulting fro business transactions. Typically examples are information systems that process sales, purchases, and inventory changes. The results of such processing are sued to update customer, inventory, and other organizational databases. These databases then provide the data resources that can be processed and used by management information systems, decision support systems, and

executive information systems.

Transaction processing systems process transactions in two basic ways. In batch processing, transactions data is accumulated over a period of time and processed periodically. In real-time (or online) processing, data is processed immediately after a transaction occurs. For example, point of sale (POS) systems at retail stores may use electronic cash register terminals to capture and transmit sales data over telecommunication links to regional computer centers for immediate (real-time) or nightly (batch) processing.

PROCESS CONTROL SYSTEMS

Operation support systems also make routine decisions that control operational processes. Examples are automatic inventory reorder decisions and production control decisions. This includes a category of information systems called process control systems, in which decisions adjusting a physical production process are automatically made by computers. For example, a petroleum refiner uses electronic sensors linked to computers to continually monitor chemical processes. The computers monitor a chemical process, capture and process data detected by sensors, and make instant (real-time) adjustments to appropriate refinery processes.

ENTERPRISE COLLABORATION SYSTEMS

Enterprise collaboration systems are information systems that use a variety of information technologies to help people work together. Enterprise collaboration systems help us collaborate to communicate ides, share resources, and coordinate our cooperative work efforts as members of the many formal and informal process and project teams and other workgroups that are a vital part of today's organizations. Thus, the goal of enterprise collaboration systems is to use information technology to enhance the productivity and creativity of teams and workgroups in the modern business enterprise.

MANAGEMENT SUPPORT SYSTEMS

When information systems focus on providing information and support for effective decision making by managers, they are called management support systems.

COMPONENTS OF AN INFORMATION SYSTEM

An information system is a system that accepts data resources as input and processes them into information products as output. An information system depends on the resources of people (end users and IS specialists), hardware (machines and media), software (programmes and procedures), data (data and knowledge basis), and networks (communications media and network support) to perform input, processing, output, storage, and control activities that convert data resources into information products.

This information system model highlights the relationships among the components and activities of information systems. It provides a framework that emphasizes four major concepts that can be applied to all types of information systems:

- People, hardware, software, data, and networks are the five basic resources of information systems.
- People resources include end users and IS specialists, hardware resources consist of machines and media, software resources include both programmes and procedures, data resources can include data and knowledge bases, and network resources include communications media and networks.
- Data resources are transformed by information processing activities into a variety of information products for end users.
- Information processing consists of input, processing, output, storage, and control activities.

DEVELOPMENT OF THE INFORMATION SOCIETY MODEL

One of the first people to develop the concept of the information society was the economist Fritz Machlup. In 1933 Machlup began studying the effect of patents on research. His work culminated in the breakthrough study "The production and distribution of knowledge in the United States" in 1962. This book was widely regarded and was eventually translated into Russian and Japanese. The Japanese have also studied the information society (or johoka shakai,).

The issue of technologies and their role in contemporary society have been discussed in the scientific literature using a range of labels and concepts. Ideas of a knowledge or information economy, post-industrial society, postmodern society, network society, the information revolution, informational capitalism, network capitalism, and the like, have been debated over the last several decades.

Fritz Machlup (1962) introduced the concept of the knowledge industry. He distinguished five sectors of the knowledge sector: education, research and development, mass media, information technologies, information services. Based on this categorization he calculated that in 1959 29% per cent of the GNP in the USA had been produced in knowledge industries.

Peter Drucker has argued that there is a transition from an economy based on material goods to one based on knowledge. Marc Porat distinguishes a primary (information goods and services that are directly used in the production, distribution or processing of information) and a secondary sector (information services produced for internal consumption by government and non-information firms) of the information economy. Porat uses the total value added by the primary and secondary information sector to the GNP as an indicator for the information economy. The OECD has employed Porat's definition for calculating

the share of the information economy in the total economy (*e.g.*, OECD 1981, 1986). Based on such indicators the information society has been defined as a society where more than half of the GNP is produced and more than half of the employees are active in the information economy.

For Daniel Bell the number of employees producing services and information is an indicator for the informational character of a society. "A post-industrial society is based on services. (…) What counts is not raw muscle power, or energy, but information. (…) A post industrial society is one in which the majority of those employed are not involved in the production of tangible goods".

Alain Touraine already spoke in 1971 of the post-industrial society. "The passage to postindustrial society takes place when investment results in the production of symbolic goods that modify values, needs, representations, far more than in the production of material goods or even of 'services'. Industrial society had transformed the means of production: post-industrial society changes the ends of production, that is, culture. (…) The decisive point here is that in postindustrial society all of the economic system is the object of intervention of society upon itself. That is why we can call it the programmed society, because this phrase captures its capacity to create models of management, production, organization, distribution, and consumption, so that such a society appears, at all its functional levels, as the product of an action exercised by the society itself, and not as the outcome of natural laws or cultural specificities" (Touraine 1988: 104). In the programmed society also the area of cultural reproduction including aspects such as information, consumption, health, research, education would be industrialized. That modern society is increasing its capacity to act upon itself means for Touraine that society is reinvesting ever larger parts of production and so produces and transforms itself. This makes Touraine's concept substantially different from that of Daniel Bell who focused on the capacity to process and generate information for efficient society functioning.

Jean-François Lyotard has argued that "knowledge has become the principle force of production over the last few decades". Knowledge would be transformed into a commodity. Lyotard says that postindustrial society makes knowledge accessible to the layman because knowledge and information technologies would diffuse into society and break up Grand Narratives of centralized structures and groups. Lyotard denotes these changing circumstances as postmodern condition or postmodern society.

Similarly to Bell Peter Otto and Philipp Sonntag (1985) say that an information society is a society where the majority of employees work in information jobs, *i.e.*, they have to deal more with information, signals, symbols, and images than with energy and matter. Radovan Richta (1977) argues that society has been transformed into a scientific civilization based on services, education, and creative activities. This transformation would be the result of a scientific-technological transformation based on technological progress and the increasing importance of computer technology. Science and technology would become immediate forces of production.

Nico Stehr (1994, 2002a, b) says that in the knowledge society a majority of jobs involves working with knowledge. "Contemporary society may be described as a knowledge society based on the extensive penetration of all its spheres of life and institutions by scientific and technological knowledge" (Stehr 2002b: 18). For Stehr, knowledge is a capacity for social action. Science would become an immediate productive force, knowledge would no longer be primarily embodied in machines, but already appropriated nature that represents knowledge would be rearranged according to certain designs and programmes (Ibid.: 41-46). For Stehr the economy of a knowledge society is largely driven not by material inputs, but by symbolic or knowledge-based inputs (Ibid.: 67), there would be a large number of professions that involve working with knowledge, and a declining number of jobs that demand low cognitive skills as well as in manufacturing (Stehr 2002a).

Also Alvin Toffler argues that knowledge is the central resource in the economy of the information society: "In a Third Wave economy, the central resource – a single word broadly encompassing data, information, images, symbols, culture, ideology, and values – is actionable knowledge" (Dyson/ Gilder/Keyworth/Toffler 1994).

In recent years the concept of the network society has gained importance in information society theory. For Manuel Castells network logic is besides information, pervasiveness, flexibility, and convergence a central feature of the information technology paradigm (2000a: 69ff). "One of the key features of informational society is the networking logic of its basic structure, which explains the use of the concept of 'network society'" (Castells 2000: 21). "As an historical trend, dominant functions and processes in the Information Age are increasingly organized around networks. Networks constitute the new social morphology of our societies, and the diffusion of networking logic substantially modifies the operation and outcomes in processes of production, experience, power, and culture" (Castells 2000: 500). For Castells the network society is the result of informationalism, a new technological paradigm. Jan Van Dijk (2006) defines the network society as a "social formation with an infrastructure of social and media networks enabling its prime mode of organization at all levels (individual, group/organizational and societal). Increasingly, these networks link all units or parts of this formation (individuals, groups and organizations)" (Van Dijk 2006: 20).

For Van Dijk networks have become the nervous system of society, whereas Castells links the concept of the network society to capitalist transformation, Van Dijk sees it as the logical result of the increasing widening and thickening of networks in nature and society. Darin Barney uses the term for characterizing societies that exhibit two fundamental characteristics: "The first is the presence in those societies of sophisticated – almost exclusively digital – technologies of networked communication and information management/distribution, technologies which form the basic infrastructure mediating an increasing array of social, political and economic practices. (…) The second, arguably more

intriguing, characteristic of network societies is the reproduction and institutionalization throughout (and between) those societies of networks as the basic form of human organization and relationship across a wide range of social, political and economic configurations and associations".

The major critique of concepts such as information society, knowledge society, network society, postmodern society, postindustrial society, *etc.*, that has mainly been voiced by critical scholars is that they create the impression that we have entered a completely new type of society. "If there is just more information then it is hard to understand why anyone should suggest that we have before us something radically new" (Webster 2002a: 259). Critics such as Frank Webster argue that these approaches stress discontinuity, as if contemporary society had nothing in common with society as it was 100 or 150 years ago. Such assumptions would have ideological character because they would fit with the view that we can do nothing about change and have to adopt to existing political realities (Webster 2002b: 267). These critics argue that contemporary society first of all is still a capitalist society oriented towards accumulating economic, political, and cultural capital. They acknowledge that information society theories stress some important new qualities of society (notably globalization and informatization), but charge that they fail to show that these are attributes of overall capitalist structures. Critics such as Webster insist on the continuities that characterise change. In this way Webster distinguishes between different epochs of capitalism: laissez-faire capitalism of the 19th century, corporate capitalism in the 20th century, and informational capitalism for the 21st century (Webster 2006).

For describing contemporary society based on a dialectic of the old and the new, continuity and discontinuity, other critical scholars have suggested several terms like:

- *Transnational network capitalism, transnational informational capitalism (Christian Fuchs 2008, 2007):* "Computer networks are the technological foundation that has allowed the emergence of global network capitalism, that is, regimes of accumulation, regulation, and discipline that are helping to increasingly base the accumulation of economic, political, and cultural capital on transnational network organizations that make use of cyberspace and other new technologies for global coordination and communication. [...] The need to find new strategies for executing corporate and political domination has resulted in a restructuration of capitalism that is characterized by the emergence of transnational, networked spaces in the economic, political, and cultural system and has been mediated by cyberspace as a tool of global coordination and communication. Economic, political, and cultural space have been restructured; they have become more fluid and dynamic, have enlarged their borders to a transnational scale, and handle the inclusion and exclusion of nodes in flexible ways. These networks are complex due to the high number of nodes (individuals,

enterprises, teams, political actors, *etc.*) that can be involved and the high speed at which a high number of resources is produced and transported within them. But global network capitalism is based on structural inequalities; it is made up of segmented spaces in which central hubs (transnational corporations, certain political actors, regions, countries, Western lifestyles, and worldviews) centralize the production, control, and flows of economic, political, and cultural capital (property, power, definition capacities). This segmentation is an expression of the overall competitive character of contemporary society." (Fuchs 2008: 110+119).

- *Digital capitalism (Schiller 2000, cf. also Peter Glotz):* "Networks are directly generalizing the social and cultural range of the capitalist economy as never before" (Schiller 2000: xiv)
- *Virtual capitalism:* The "combination of marketing and the new information technology will enable certain firms to obtain higher profit margins and larger market shares, and will thereby promote greater concentration and centralization of capital" (Dawson/John Bellamy Foster 1998: 63sq),
- High-tech capitalism or informatic capitalism (Fitzpatrick 2002) – to focus on the computer as a guiding technology that has transformed the productive forces of capitalism and has enabled a globalized economy.
- Other scholars prefer to speak of information capitalism (Morris-Suzuki 1997) or informational capitalism (Manuel Castells 2000, Christian Fuchs 2005, Schmiede 2006a, b). Manuel Castells sees informationalism as a new technological paradigm (he speaks of a mode of development) characterized by "information generation, processing, and transmission" that have become "the fundamental sources of productivity and power" (Castells 2000: 21). The "most decisive historical factor accelerating, channelling and shaping the information technology paradigm, and inducing its associated social forms, was/is the process of capitalist restructuring undertaken since the 1980s, so that the new techno-economic system can be adequately characterized as informational capitalism" (Castells 2000: 18). Castells has added to theories of the information society the idea that in contemporary society dominant functions and processes are increasingly organized around networks that constitute the new social morphology of society (Castells 2000: 500). Nicholas Garnham is critical of Castells and argues that the latter's account is technologically determinist because Castells points out that his approach is based on a dialectic of technology and society in which technology embodies society and society uses technology (Castells 2000: 5sqq). But Castells also makes clear that the rise of a new "mode of development" is shaped by capitalist production, *i.e.*, by society, which implies that technology isn't the only driving force of society.

- Antonio Negri and Michael Hardt argue that contemporary society is an Empire that is characterized by a singular global logic of capitalist domination that is based on immaterial labour. With the concept of immaterial labour Negri and Hardt introduce ideas of information society discourse into their Marxist account of contemporary capitalism. Immaterial labour would be labour "that creates immaterial products, such as knowledge, information, communication, a relationship, or an emotional response", or services, cultural products, knowledge. There would be two forms: intellectual labour that produces ideas, symbols, codes, texts, linguistic figures, images, *etc.*; and affective labour that produces and manipulates affects such as a feeling of ease, well-being, satisfaction, excitement, passion, joy, sadness, *etc.* (Ibid.).

Overall, neo-Marxist accounts of the information society have in common that they stress that knowledge, information technologies, and computer networks have played a role in the restructuration and globalization of capitalism and the emergence of a flexible regime of accumulation (David Harvey 1989). They warn that new technologies are embedded into societal antagonisms that cause structural unemployment, rising poverty, social exclusion, the deregulation of the welfare state and of labour rights, the lowering of wages, warfare, *etc.* Concepts such as knowledge society, information society, network society, informational capitalism, postindustrial society, transnational network capitalism, postmodern society, *etc.*, show that there is a vivid discussion in contemporary sociology on the character of contemporary society and the role that technologies, information, communication, and co-operation play in it. Information society theory discusses the role of information and information technology in society, the question which key concepts shall be used for characterizing contemporary society, and how to define such concepts. It has become a specific branch of contemporary sociology.

There is currently no universally accepted concept of what exactly can be termed information society and what shall rather not so be termed. Most theoreticians agree that a transformation can be seen that started somewhere between the 1970s and today and is changing the way societies work fundamentally. Information technology is not only internet, and there are discussions about how big the influence of specific media or specific modes of production really is.

Some people, such as Antonio Negri and Newt Gingrich, characterize the information society as one in which people do immaterial labour. By this, they appear to refer to the production of knowledge or cultural artifacts. One problem with this model is that it ignores the material and essentially industrial basis of the society. However it does point to a problem for workers, namely how many creative people does this society need to function? For example, it may be that you only need a few star performers, rather than a plethora of non-celebrities, as the work of those performers can be easily distributed, forcing all secondary players to the bottom of the market. It is now common for publishers to promote

only their best selling authors and to try to avoid the rest—even if they still sell steadily. Films are becoming more and more judged, in terms of distribution, by their first weekend's performance, in many cases cutting out opportunity for word-of-mouth development.

Considering that metaphors and technologies of information move forward in a reciprocal relationship, we can describe some societies (especially the Japanese society) as an information society because we think of it as such.

LEARNING ON AND OVER THE INTERNET

We live in a continuously shifting state of realities in which the only predictable constant is the inevitability of more change. This is the basic element of our Information Technology Era, which commenced with the development of the microprocessor (1973) and proceeds into the foreseeable future. The most recent impetus to microprocessor development, the convergence of technologies, is represented in embryonic form by the Internet, particularly the World Wide Web.

This chapter reports on the findings of an online investigation intended to explore the educational function of the Internet by analysing the ways learning opportunities are presented and utilised on and over it, in an attempt to understand the trends of changes in learning technology and how these changes affect adult learners.

Points of Departure: I based the planing of this investigation on reflecting on the observations made by Kirkup and Jones (1996) on open learning and distance education related to the concept and reality of a learning society.

In particular, the issues raised in their chapter of whether new ICTs may "overcome the previous weakness of ODL without undermining its strengths", and that, in a learning society, learning opportunities should be open to "all classes of society, especially those people who have had less formal education than the majority, and what usually follows from (this) lower income", have been used as a measurement throughout the investigation.

Technological Determinism and the Network of Learning Society: The Internet is an evolving, growing entity aligned to continuous technological change. This constant change is instrumental in paradigm shifts in the development of learning technology. To some learners (and educators alike) it appears to have become too complex, too technical, and many make an assumption of technological determinism. There is no need to assume technological determinism, we can ensure that the development of technology will not be detrimental to learning and education.

Barry Jones (1990) uses the example of Los Angeles and the way the car and tyre industry was allowed to replace the public transport system with cars and freeways, as a warning that we should not accept the consequences of technological determinism, but that we have a choice in the way technology is used and developed. The development of the car was an uncontrolled, chaotic phenomenon with wide reaching "side-effects", such as road deaths, urban sprawl

and environmental pollution. This did not necessarily need to be the case, but was accepted as part of the development of technology.

The Alternative Network: In the educational field, as in the commercial, innovations may develop spontaneously. Some may be planned, such as in the commercial arena when a new calorie-controlled, portion-controlled, fixed weight chicken product is developed for sale to consumers at retail level because they are now cholesterol conscious and then diffuses to restaurants who in turn have expressed a need for such a product.

Many developments have however occurred spontaneously from research with a different purpose, such as the many offshoots of the NASA space programmes and the Internet from its 1967 beginnings as ARPANET, initially commissioned by the US DoD and the Pentagon, for military purposes.

What is the Internet?: At a technological level, the Internet is millions of computers (no one is quite sure how many,) interconnected through the worldwide telecommunications systems. All these computers are able to share information with each other because they use common communications protocols.

At the human level, the Internet is the people who use those computers and the information they share. The people come from all walks of life, acting both as private individuals and representatives of organisations. Everyone on the Internet can publish information on any subject they wish, and almost everything published is available to everyone else. As a result, the content is staggeringly extensive and varied. Finally, the Internet is a technological, social and cultural phenomenon, unlike anything the world has seen before. It has emerged as such not because of some ideology or social manifesto, but simply because of its anarchic technological structure. It might be seen as historical irony the reason that this network was initially built during the period of the cold war, which was to ensure that there would always be some means of communication in case the USA was hit by enemy nuclear missiles. Unlike other human-conceived networks which exist since the beginning of humanity (*e.g.*, power and energy networks), the Internet is not owned by anyone. No one owns the Internet. It is shared, by the consensus of its users. It does not come from a place, or even a country. It recognises no political boundaries. It was not invented. It evolved, over three decades, from the desire of people worldwide to share knowledge and to communicate.

> *"Why do people want to be "on the Internet?" One of the main reasons is simple freedom. The Internet is a rare example of a true, modern, functional anarchy. There is no "Internet Inc." There are no official censors, no bosses, no board of directors, no stockholders. In principle, any node can speak as a peer to any other node, as long as it obeys the rules of the TCP/IP protocols, which are strictly technical, not social or political. (There has been some struggle over commercial use of the Internet, but that situation is changing as businesses supply their own links)."*

Trends in Technological Change: Different technologies and methods for educational delivery. People retain about 20 per cent of what they see, 30 per cent of what they hear, 50 per cent of what they see and hear, and up to 80 per cent of what they see, hear, and do simultaneously; to the extent that computer-based learning systems integrate these techniques, they can be very effective.

Technological change, occurring at a faster rate now than ever before, is having incremental effects upon communication and social interaction. Increasing sophistication in the technologies of communication and computerisation are decreasing the cost and increasing the availability of instantaneous communication across the world. Electronic Mail, video-conferencing and multimedia applications are just a few examples of innovative technology now being used in education.

The use of the Internet is growing exponentially, although it is not possible to measure accurately that growth rate. These figures are collated by one of the largest Internet hosts in the USA, using world wide surveys. They show that minimal figures of Internet hosts had reached approximately 13 million by mid 1996 and exceeded the 20 million mark by August 1997, of which approximately 5 million were European hosts representing a quarterly increase of nearly 15 per cent.. Of these, educational institutions as hosts (edu domains) had reached more than 2 million by June 1996 and neared 3 million in August 1997.

One of the implications of this is that our learning institutions and practices will change.

Moore (1995), refers to models explaining how educators will respond to new technologies:

- The minimal change model-in which instructors make no fundamental changes but merely use technology as an instructional aid;
- The marginal change model-in which the pedagogy and organisation of education remain unchanged and students are added on to conventionally taught classes (the most common application of distance education in North America);
- Systemic change in which institutions change the fundamental organisation of teaching by reorganising it into a system driven by technology; and a virtual system in which universities and schools are "place-free, with little or no formal organisation"

Only the last model acknowledges the existence of a paradigm shift. It differs significantly from Scott's notions of the British perspective (Scott, 1993), as it attempts to do away with the established institutional culture. This model should flow on to changes in the text-paper based emphasis on knowledge and content, and to the training of teachers, and perhaps a redefining of the position of teacher from "teacher as knowledge source" to "teacher as facilitator of the learning process" (D. Spender, 1995, pp114ff).

Other implications of this are that there will be fewer on-campus students, more education over the Internet, more universities online, and "virtual degrees" through virtual universities. The methodology of education will change,

becoming more varied and flexible. Isolated and other marginalised students will benefit-assuming they have the technology of access. An example of this trend is Ken Eustace of Charles Sturt University, Australia, who has received accreditation for an MA from Paideia University. Eustace is the first Australian academic to be awarded an online degree from a "Virtual University".

"The electronic transfer of a global Master's degree over the Internet from Paideia University in Amsterdam to Perth in Australia six weeks ago signified the start of profound changes-and dilemmas-to the university system", The 'Australian' reported on 6th September 1995. There is a wide spectrum of learning opportunities on and over the Internet, especially on the World Wide Web.

The existence of Virtual Universities and Classrooms on the Net paves the way for wider access and participation for adult learners as it changes the philosophy and practice of ODL. Hypertext, the nonlinear medium, a term coined by computer utopian Theodor Nelson in his 1974 'Computer Lib/Dream Machines' to describe electronic texts embedded with links to other texts is yet another tech-tool which enhances learning, breaks down the traditional linear narrative of the written word by encouraging readers/users/surfers to find their own paths though large amounts of information. His idea came to fruition with the advent of the World Wide Web, where "hypermedia" also includes sounds, pictures, and moving images. Hypertext was the first tool to enhance interactivity on the Net.

The capacity for learners to add to the dialogue through an interactive medium provides opportunity for development, application and linkage of new knowledge to the adults own learning context. The Internet recreates the 'agora' or meeting place in which knowledge is not only shared but created and recreated.

Learners engage in active learning within conferenced environments where they take responsibility for their own learning processes. Learners "are required to examine thinking and learning processes; collect, record, and analyse data; formulate and test hypothesis; reflect on previous understandings; and construct their own meaning" (Crotty 1994, as quoted in Jonassen et al., 1995, p. 11) within an environment that gives the opportunity for students to interact together to build a community of learners.

Computer conferencing (CC), now common on the Internet, is a technology that facilitates interaction between learner and instructor and among learners and, potentially, opens the door to active learning. It creates opportunities for students to engage in the kind of active learning activities that Meyers and Jones (1993) and others identify. For example, CC allows the formation of small groups, creates opportunities for collaborative learning, discussion using case studies, role playing, simulations, online journaling, and provides opportunities to discuss and make connections between content and their own lived experiences.

One such example could be the online experience I have had in attending one of the newly established OU courses which are delivered over the Internet.

A Case Study within the Project: Because of its asynchronous nature, CC-based group discussion allows for more thoughtful, well-constructed responses than one might find in a face-to-face classroom. Also, within the group context, students have opportunity to interpret and transform content (*i.e.*, make content their own); they can integrate new material with what they already know about the subject. Both large and small group discussion facilitates the active exchange of ideas and opinions related to specific content. MZX205 is a computing OU course. It is delivered in the usual OU manner, plus the fact that OU offers learners access to its WWW and e-mail conferencing facilities over the Internet. Since the beginning of the term, I have accumulated 362 conferencing messages from the 21 fellow learners on the course. We have been discussing our common concerns on the course, facilitating each other and commenting on our work, flaming about and complaining, socialising in virtual reality, using our first names and showing intimacy rarely found in everyday acquaintance under similar circumstances.

CC mediated case studies and collaborative activities gave us opportunity to apply and test theory and knowledge to a "real-life" context. Specifically, collaborative activities encouraged mutual decision-making, and shared analysis amongst group members (skills that are valuable in the work world!). Generally, we were required to produce some product as evidence of our collaborative efforts, such as a final report or posting which was presented online for comments from other students and the instructor. Online journaling allows learners to reflect on content in a personal context, and to analyse and evaluate content in light of their experience. This reflection facilitates a personal level of integration and interpretation of content. Although an individual activity, journaling is, nonetheless, "active," because it provides the opportunity for reflection on and "meaning-making" with regard to course content.

TOOLS OF INFORMATION TECHNOLOGY

SYSTEM IMPLEMENTATION STRUCTURE

To implement the WBE we propose the system implementation structure. The school classrooms, office and training centers are connected through Intranet. This Intranet is connected to the Internet by using network operating system. Firewall is introduced between Intranets and Internet in order to provide security.

SYSTEM DESCRIPTION

In initial stage of school education the students are not expert in reading and writing. Subject understanding increases if they learn the things through visualization. With the help of multimedia or Rich Media, which includes, Audio, video, graphics and Java Applets have made WBE very effective.

In the primary stage students don't have good knowledge of English. Therefore the presentation should be available in their mother tongue for the better understanding, which is also helpful in improving their pronunciation.

This is possible by developing Natural Language Interface to database. One important device called, as "Tech Commander" is also useful for teachers to identify students potential by viewing any students computer display on his own monitor. If he finds something that everyone should see he could set everyone's monitor to display it.

Web Based Education: Considerations and Approaches

- *Conversion of Existing Material*: In order to shift from traditional education to WBE we have to convert the existing school educational material to the Web. The important points to consider are bandwidth, design, usability, and the necessity of high quality media elements and consistency of material across the mediums.
- *Authoring for Multiple Delivery Environments*: We have to provide consistency of interface and ease of authoring and design of an effective multi platform course.
- *Using the Web for student/Teacher Interaction*: Web site can be used for posting of assignments, student work and marks, along with the ability to submit work on-line through the site, also JavaScript and JAVA applets to demonstrate course concepts interactively. This means that course delivery on the Web must be dynamic and truly interactive between the instructor and the students.
- *Faculty Support and Training:* We have to provide centralized support and training resources for training the teachers initially.

Problems to be faced while implementing WBE in school education in Indian context: Looking at how to use Information Technology in school education, its different tools, the system structure as defined and described it is obvious that we will face some problems while implementing WBE in school education in India.

The major problems we will be facing are:

- Intensive Training to Schoolteachers: Schoolteachers are not introduced to the web based education. Therefore training should be given in order to create a learning environment that will itself train and spur students on the one hand to turn the learning experience into useful, practical and personal knowledge.
- WBL awareness and Workshops: In rural area parents are not much knowing about WBL. So the demonstration, seminars and workshops needs be conducted for society in order to understand the importance of it.
- *Bandwidth Limitations*: Limited bandwidth of Internet connection gives slower performance for sound, video and intensive graphics, causing long waits for downloads that can affect the ease of the learning process. Improved bandwidth will help the teacher to solve his problem.
- *Effect on Teachers*: WBL will lead to reduction in manpower as per as teachers are concerned. This will lead to agitations by teacher's organization.

- *Effect on Students*: Although the students will be benefited by WBL there will some part of students opposing this introduction of technology in education.
- Infrastructure: WBE will primarily require free access to Web to all the learners and hence government of India will have to setup nation wide Fibre Optic Cable network.
- *Access*: Every school will not have equal opportunity to information because of access issues. The schools with fewer budgets will always face this problem. This is the major problem as per as India is concerned, as there is big gap between poor and rich communities in India.
- *Download*: The learning material that appears on web needs to be downloaded will require more time. The speed depends on the transmission methods and bandwidth, which is problem as per as India is concerned.

Important Features of Web-Based Learning Environment

While designing Web-Based Learning sites the following important features should be kept in mind:

- *The Online Syllabus*: An online syllabus provides the instructor with a way to change course material easily and as per the requirements in industry, and the student will have a complete and up-to-date picture of the course requirements. Hypertext links to sample relevant disciplinary web sites may be helpful in giving students (and also prospective students) a sense of the disciplinary context for the course.
- *Personal Home Pages*: Personal home pages can be used to foster the sense that the class is not just a collection of isolated individuals but a community of learners who can profit from interacting with one another. Home pages encourage students to learn about each other so as to encourage contact and mutual interests. This helps the learners to create a group with common interest.
- *Interactivity*: Adding discussion forums and chat sessions to your online course is a common way to add an interactive component to a web-based course. There are many implementations of bulletin board and chat session software to choose from. A second method of interactivity is, of course, e-mail. It's a good practice to have an online list of the e-mail addresses of all registered students, the professor, and teaching assistants. This is possible with an e-mail subscription mechanism included in your Online Syllabus.
- *Assignments*: The web page listings of homework assignments, upcoming events and exams can be more interactive than the familiar print counterparts. If some homework assignments, for example, are based on online materials, they can be directly linked to the class schedule. This helps the students to plan the preparations for the examination in systematic way.

- *Announcements*: To be effective, announcements need to be read; for that to happen, students need to know when a new announcement has been posted. Alert sounds or perhaps a blinking link added to a page can let students know of new announcements, or perhaps, even a mass e-mail to all students in the course. For a home page, or a long life syllabus, various software tools can be used for the subscribers announcement about page changes. All these techniques will attract the learner's attention towards announcements.
- *Testing*: Online drill or practice testing can be used to reinforce material, even if the results are not used as part of a grade. Reading comprehension questions, for example, in short answer or multiple choice formats can provide students with an assessment of their level of understanding of text. This facilitates the students to measure his level of understanding and through continuous assessment he can try to improve his performance.
- *Course Management*: Software should be available to add or delete students from the course, assign user Ids and passwords, create or edit home pages, and manage any open discussion groups. This helps to keep up to date records of students admitted for various courses.
- *Content*: Perhaps the most difficult part of developing a web-based course is creating the online contents. You can begin by transferring your basic lecture materials to the web and integrating media such as sound, images, and video. Remember, to experiment with incorporating some of the new web-based learning paradigms. And finally, come back and rebuild the lecture building its graph structure and using more html facilities.

Other Features of a Web-Based Learning Environment

- Managing cognitive load — the amount of information people can process — is essential to effective teaching or training. Bombarding learners with too much information at once, called cognitive overload, is one of the chief obstacles to learning. This indicates that we should provide only required information in order to avoid cognitive overload.
- Dividing each tutorial lesson into segments (Classroom, Quiz, Lab, *etc.*) and then further subdividing these segments into a manageable number of chunks allows users to digest new concepts and skills in a manner that prevents overload.
- *Web-based tutorial*: Users will also enjoy a great deal of flexibility in managing their cognitive load, selecting instructional tasks from a menu of lessons, depending upon the amount and kinds of skills they bring with them, and once engaged in a lesson, selecting which portions of that particular lesson they wish to complete. This allows the students to learn the topics in proper sequence and according to his ability of understanding.

- Because the limited capacity of working memory is rapidly overwhelmed by large amounts of new information, frequent opportunities to practice are important. Rehearsal encodes or moves information into long-term memory. The practice assignments can be presented with practice opportunities throughout the classroom portion of the lesson and is also encouraged to complete the practice portion of each lesson. This allows the student to find out how much he has understood at the end of learning a particular module.
- Finally, online testing is used to reinforce material. Elaborative rehearsal involves presenting questions, which allow the user to apply knowledge in an appropriate context, thus encoding it into permanent memory.
- Quiz questions are designed to provide an authentic assessment of user skill levels by calling on the user to apply the appropriate techniques and practices from the lesson.

INFORMATION AND COMMUNICATION TECHNOLOGIES FOR DEVELOPMENT

Information and Communication Technologies for Development (ICT4D) is a general term referring to the application of Information and Communication Technologies (ICTs) within the field of socioeconomic development or international development.

ICT4D concerns itself with directly applying information technology approaches to poverty reduction.

ICTs can be applied either in the direct sense, wherein their use directly benefits the disadvantaged population, or in an indirect sense, wherein the ICTs assist aid organisations or non-governmental organizations or governments or businesses in order to improve general socioeconomic conditions. In many impoverished regions of the world, legislative and political measures are required to facilitate or enable application of ICTs, especially with respect to monopolistic communications structures and censorship laws.

The concept of ICT4D can be interpreted as dealing with disadvantaged populations anywhere in the world, but is more typically associated with applications in developing countries. The field is becoming recognized as an interdisciplinary research area as can be noted by the growing number of conferences, workshops and publications. Such research have been spurred on in part by the need for scientifically validated benchmarks and results, which can be used to measure the efficacy of current projects. Many international development agencies recognize the importance of ICT4D. For example the World Bank's GICT section has a dedicated team of some 200 staff working on these issues.

A good example of the impact of ICTs on development are African farmers getting better market price information and thus not being impoverished by

unfair corps buy-out people. Another example includes mobile telecommunications and radio broadcasting fighting political corruption in Burundi. The dominant terminology used in this field is "ICT4D". Alternatives include ICTD and development informatics.

HISTORY

The history of ICT4D can, roughly, be divided into three periods:

- *ICT4D 0.0:* mid-1950s to late-1990s. During this period (before the creation of the term "ICT4D"), the focus was on computing/data processing for back office applications in large government and private sector organisations in developing countries.
- *ICT4D 1.0:* late-1990s to late-2000s. The combined advent of the Millennium Development Goals and mainstream usage of the Internet in industrialised countries led to a rapid rise in investment in ICT infrastructure and ICT programmes/projects in developing countries. The most typical application was the telecentre, used to bring information on development issues such as health, education, and agricultural extension into poor communities. More latterly, telecentres might also deliver online or partly-online government services.
- *ICT4D 2.0:* late-2000s onwards. There is no clear boundary between phase 1.0 and 2.0 but suggestions of moving to a new phase include the change from the telecentre to the mobile phone as the archetypal application; less concern with e-readiness and more interest in the impact of ICTs on development; and more focus on the poor as producers and innovators with ICTs (as opposed to just consumers of ICT-based information).

PROJECTS

Anatomy

ICT4D initiatives and projects may be designed and implemented by international institutions, private companies (*e.g.*, Intel's Classmate), governments (*e.g.*, e-Mexico initiative), non-governmental organizations (*e.g.*, International Institute for Communication and Development), or virtual organizations (*e.g.*, One Laptop per Child).

ICT4D projects address one or more of the following issues:

- Access and *Infrastructure*: providing suitable computer hardware, operating systems, software, and connectivity to the internet. These would include the affordability of software and hardware, the ability to share software (as echoed in the Free Software movement), and the ability to sustainably connect to the internet.
- *Capacity building and training in ICT:* installing, maintaining, and developing hardware and software, digital literacy (technological literacy and informational literacy) and e-Awareness.

- *Digital content and services:* e-services (e-learning, e-health, e-business/ e-commerce, e-Governance/e-Government), including concerns related to local-language solutions in computing, and the Open Access agenda.
- *Regulation of the ICT Sector and digital rights:* Universal Access vs. monopolistic structures, Intellectual Property Rights, privacy, security, and digital identity.
- *Ethics and Social Contexts*
- Environment and Agriculture
- Free and Open Source Software
- Gender and ICT
- Health and Medicine
- Policy and Social Analyses
- Technical Innovation for Development.

PROBLEMS

Projects which deploy technologies in underdeveloped areas face well-known problems concerning crime, problems of adjustment to the social context, and also possibly infrastructural problems. Literacy issue is one of the factor why projects fail in rural areas, proper education and training to make the user at least understand how to manipulate the application to get the proper information they needed. Constant follow up with the community to monitor if the project is being used or implemented.

Projects in marginalised rural areas face the most significant hurdles. Since people in marginalised rural areas are at the very bottom of the pyramid, development efforts should make the most difference in this sector. ICTs have the potential to multiply development effects and are thus also meaningful in the rural arena. However introducing ICTs in these areas is also most costly, as the following barriers exist:

- Lack of Infrastructure: no power, no running water, bad roads
- Lack of Health Services: diseases like HIV, TB, malaria are more common.
- Lack of Employment: there are practically no jobs in marginalised rural areas.
- Hunger: hungry users have problems concentrating.
- Illiteracy: Text user interfaces do not work very well, innovative Human Computer Interfaces are required.
- Lack of means to maintain the project: some projects may be left to deteriorate in time because if a component gets broken they are costly to repair and maintain.
- Lack of support from the local government
- Social Contexts: the potential users living in rural marginalised areas often cannot easily see the point of ICTs, because of social context and also because of the impediments of hunger, disease and illiteracy.
- Corruption is one of the factors why it hampers the implementation of the ICT project in rural areas.

- Trainings and seminars must be conducted according the suitable time of the farmers, to make sure that their daily routine for livelihood must be done first.
- Proper applications are not user friendly.

The World Bank runs Information for Development Programme (infoDev), whose Rural ICT Toolkit analyses the costs and possible profits involved in such a venture and shows that there is more potential in developing areas than many might assume. The potential for profit arsises from two sources-resource sharing across large numbers of users (specifically, the publication talks about line sharing, but the principle is the same for, *e.g.*, telecentres at which computing/Internet are shared) and remittances (specifically the publication talks about carriers making money from incoming calls, *i.e.*, from urban to rural areas). Remittances are estimated to have a volume of upward of 250 billion USD and websites have been established to take advantage of this fact (*e.g.*, Aryty, Philippines; Mukuru.com, Zimbabwe.

LESSONS LEARNED

What's crucial in making any ICT4D effort successful is effective partnership between four key stakeholders:

- Public sector (governments-from developed nations, developing nations, international bodies, and local governments)
- Private sector (companies belonging to members of the target audience, multi-national organizations wishing to expand their markets to the 4 billion people under US$2/day, pro-poor or social companies)
- Informal sector (NGOs, advocacy groups, think tanks)
- Representation from the target audience

InfoDev have published 6 lessons from an analysis of 17 their pilot programmes. These lessons are backed by a variety of examples as well as a list of recommendations, which should be read by everyone starting an ICT4D project.

- *Lesson 1:* Involve target groups in project design and monitoring.
- *Lesson 2:* When choosing the technology for a poverty intervention project, pay particular attention to infrastructure requirements, local availability, training requirements, and technical challenges. Simpler technology often produces better results.
- *Lesson 3:* Existing technologies—particularly the telephone, radio, and television—can often convey information less expensively, in local languages, and to larger numbers of people than can newer technologies. In some cases, the former can enhance the capacity of the latter.
- *Lesson 4:* ICT projects that reach out to rural areas might contribute more to the MDGs than projects based in urban areas.
- *Lesson 5:* Financial sustainability is a challenge for ICT-for-development initiatives.
- *Lesson 6:* Projects that focus on ICT training should include a job placement component.

SUSTAINABILITY AND SCALABILITY

A growing perspective in the field is also the need to build projects that are sustainable and scalable, rather than focusing on those which must be propped up by huge amounts of external funding and cannot survive for long without it. Sustaining the project's scalability is a huge challenge of ICT for development on how the target user will continue using the platform. Development on ICT is not one shot implementation but rather it is a complex process to undertake continuously and the progress of each project evolves around the pervasive education for adaptability of the technology

Also, many so-called "developing" countries, such as India (or other South Asian countries like Sri Lanka, Pakistan, and Bangladesh, as also nations like Malaysia, China, Indonesia, Brazil, South Africa and many others) have proved their skills in IT (information technology). In this context, unless these skills are tapped adequately to build on ICT4D projects, not only will a lot of potential be wasted, but a key indigenous partner in the growth of this sector would be lost. Also there would be unnecessary negative impact on the balance of payments due to imports in both hardware and software. Currently, the main two perspectives coming out of this sector either emphasize the need for external aid to build infrastructure before projects can touch viability, or the need to develop and build on local talent. Both approaches are, of course, not mutually exclusive.

CRITICS

As it has grown in popularity, especially in the international development sector, ICT4D has also increasingly come under criticism. For instance, questions have been raised about whether projects that have been implemented at enormous cost are actually designed to be scalable, or whether these projects make enough of an impact to produce noticeable change. In Sri Lankan journalist Nalaka Gunawardene argues that thousands of pilot projects have been seeded without regard to generalisability, scalability, and sustainability, implying that these projects will always require external funding to continue running and that their impact is limited. This sentiment echoes a 2003 report by the World Bank.

Further criticism on ICT4D concerns the impact of ICTs on traditional cultures and the so-called cultural imperialism which may be spread with ICTs. For example, young males are tempted to spend their recreational time playing violent computer games. It is emphasised that local language content and software seem to be good ways to help soften the impact of ICTs in developing areas. Anriette Esterhuysen, an advocate for ICT4D and human rights in South Africa, pointed out that some ICT4D projects often gives more impetus to how ICT can help its beneficiaries economically rather than helping them gain a society where social justice and equal rights prevails. She Believes that sustainable development can only be achieved if there is human rights and people can speak freely.

Another point of criticism against ICT4D is that its projects are seldom environmentally friendly. Beneficiary communities are often given the responsibility to dispose of the toxic electronic scrap when an equipment breaks

down beyond repair. Since transporting the equipment to a recycling facility is costly; the equipment is often disposed of improperly, thus contributing to the pollution of the environment.

TECHNOLOGY

ICT4D projects typically try to employ low-cost, low-powered technology that can be sustainable in developing environment. Desktop virtualization and multiseat configurations are probably the most simple and common way to affordable computing as of 2009.

ICT4D projects needs to be properly monitored and implemented; the system's design and user interface should be suitable to the target users. ICT4D projects installed without proper coordination with its beneficiary community has a tendency to fall short of its main objectives. For example, the usage of ICT4D projects in farming sector in third world countries, where a majority of the population are considered to be technologically illiterate, projects lay idle and sometimes get damaged or become obsolete.

Furthermore, there should be a line of communication between the project coordinator and the user for immediate response to the query or the difficulty encountered by the user. Addressing properly to the problem will help encourage the user for the interactivity and participation.

ORGANIZATIONS

- APC Association for Progressive Communications
- Computer Aid International Computer Aid International
- Dialog Telekom Dialog Telekom PLC Sri Lanka
- LinkNet Zambia LinkNet Zambia
- PhilRice Philippine Rice Research Institute.

NOTABLE EVENTS

World Summit on the Information Society (WSIS)

A major event for ICT4D was the twin WSIS (WSIS)-lead organisation was the International Telecommunications Union (ITU). The first part of WSIS took place in Geneva, Switzerland in December 2003 (with a large ICT4D exhibition and an ICT4D symposium co-ordinated by infoDev). The second part of WSIS took place in Tunis, Tunisia, in November 2005. One of its chief aims of the WSIS process was to seek solutions to help bridge the so-called "digital divide" separating rich countries from poor countries by spreading access to the Internet in the developing world.

Perspectives on the WSIS are available elsewhere on Wikipedia, and this covers links to civil society, Tunis 2005, US priorities at WSIS, media responses,

Tunis conference developments, roles for business and government, digital divide issues, the digital divide and the digital dilemma, common ground, a civil society study on WSIS, and external links.

INFORMATION AND COMMUNICATION TECHNOLOGIES FOR ENVIRONMENTAL SUSTAINABILITY

Information and Communication Technologies for Environmental Sustainability (ICT Ensure) is a general term referring to the application of Information and Communication Technologies (ICTs) within the field of environmental sustainability. With the usage of new technologies the global community, can be supported in their collaboration to preserve the environment in the long term. New technologies provide utilities for Knowledge acquisition and awareness, early evaluation of new knowledge, reaching agreements and communication of progress in the interest of the human welfare. This includes ethical aspects of protecting human life as well as aspects of consumer safety and the preservation of our natural environment.

APPLICATION AREAS

More and more application areas are becoming relevant to sustainable development in industry, health care, agriculture and the information society. And they have an impact on the perspectives of ICT, the environment, policy and science. More and more interest has been emerged as well to risk and disaster management, adaptation to climate change and resource use.

- ICT for Energy Consumption/Efficiency
- ICT in Climate Change
- ICT in Natural Resource Management
- Eco-industrial Applications and ICT for Industrial Ecology
- ICT in Agriculture
- ICT for Biodiversity
- ICT for Landscape Ecology
- Personalized Information Systems and ICT for Quality of Life
- ICT for Sustainable Urban Development
- ICT in Health Care
- ICT for Environmental Risk Management.

BASED OR TRADITIONAL EMPLOYEE TRAINING

It is important to know when to use traditional training and when competency-based training is an appropriate choice. Use traditional training based on the ISD model in the following situations:

- The organization's resources are insufficient for researching and validating a competency model.

- The shelf life of the training is limited or its objectives are short term.
- The targeted training population is small.
- The work does not have a strategic impact on organizational success. Use competency-based training in the following situations:
- The organization has the resources available to research and validate a quality competency model.
- The work and related training content have a significantly high strategic impact on organizational success.
- Time is available to devote to competency identification, validation, and modeling.
- The training content shelf life is of sufficient length to justify the expense of researching and validating the competency model.
- The training population is large enough to warrant resource expenditure.
- Decision makers consider it appropriate to focus on achieving exemplary rather than fully successful performance when the training is complete.

MODELS FOR COMPETENCY-BASED TRAINING

There are three models for reinventing training around a competency foundation.

The models correspond to the approaches to competency-based training we described in the previous sections of this chapter.

1. Reinventing the ISD model
2. Training to build individual competence relative to a competency model of exemplary performance
3. Building individual competence in a work team context

A MODEL FOR COMPETENCY-BASED ISD

The competency-based ISD model reinvents each step of the traditional ISD model around a competency foundation.

The first step in applying the competency-based ISD model is called performance analysis, in which trainers analyse the performance problem. Traditional performance analysis is designed to separate problems that can be solved by training from problems that require management action, but performance analysis in the competency-based ISD model is different. The goal of the competency-based process is to determine whether the problem is caused by a lack of individual competence or by a lack of organizational competence.

Individual competence is related to the characteristics needed for an individual to meet or exceed organizational or customer-performance requirements. Organizational competence, in contrast, refers to the organization's core competencies.

In the competency-based ISD model, it is important to align individual performance with organizational or, more important, customer expectations.

Some customer needs are predictable, such as for products or services, but there are additional, value-added elements that make some organizations preferable in a customer's eyes. Those elements are tied to the organization's core competence, which amounts to its strategic strengths.

By focusing attention on both individual and organizational competence, trainers move beyond a simple focus on an individual's knowledge, skill, and attitude and begin to consider organizational factors that may create barriers to individual-or exemplary-performance. As in the traditional ISD model, the competency-based model requires trainers to examine organizational, individual, and work requirements. Instead of focusing on the minimum performance requirements, however, trainers who use the competency-based ISD model must specify the conditions essential for exemplary performance. Key questions to consider in this step may include the following:

- What working conditions are essential for exemplary performance?
- What competencies enable individuals to match the outputs of exemplary performers?
- Who is targeted for training, and how closely do those individuals approach the characteristics of exemplary performers?

The answers to these and related questions clarify the optimal context in which learning will subsequently be applied. The focus is on what it takes to create exemplary, not minimal, results.

In the third step in the model, the training needs assessment, the competency-based model expands the traditional focus of the ISD model to address all the variables that support exemplary performance.

The fourth step in applying the competency-based ISD model is to write instructional objectives, specifying the behavioural indicators tied to exemplary work performance that must be demonstrated upon completion of training. Those indicators must be observable and measurable.

In the fifth step trainers must decide whether to prepare or purchase training content to achieve the instructional objectives identified in the previous step.

The sixth step in applying the competency-based ISD model is to select a method of delivering the training. Trainers must consider not only traditional issues such as the relative costs and benefits of different delivery methods but also whether the method is appropriate for the competency and perhaps even how to blend methods to achieve the best results. For instance, if the objective is to build writing skills, audiotape-based instructional delivery may not be the most effective approach. The seventh step in applying the competency-based ISD model is to conduct a formative evaluation. In competency-based training, the formative evaluation is focused on how well the training builds competence.

It is therefore particularly effective when exemplary performers or other work experts participate in reviewing the training and contribute their insights and know-how on achieving enhanced outputs or results. The eighth step of the model is the implementation phase, when trainers actually offer the training to targeted participants.

A summative evaluation is the ninth step of the competency-based ISD model. Evaluation has long been an important topic in the training field.

Increasingly, decision makers want to know what returns they have received on their expensive training investments. If training is competency based, the answer should be apparent, because every step of the process is linked to the results of fully successful or exemplary performance and the competencies required to achieve them.

HR practitioners should consider three key questions in evaluating competency-based training:

1. How well did the training succeed in building the competencies associated with essential results for the work to be performed?
2. How well does the learner's performance compare to the outputs of the organization's exemplary performers?
3. How well does the learner's performance match the organizational and customer requirements essential to maintaining a competitive advantage and optimal customer service?

These questions may be answered by asking learners to produce work products or simulate service delivery and then measuring the results against the objectives established before training was delivered. Another method is to note key discrepancies between a 360-degree competency assessment conducted before and after training for each learner. The goal of any 360-degree assessment should always be to determine how well the learner demonstrates the competencies required for essential work outputs or results on the job.

DIRECTED TRAINING AND DEVELOPMENT

A competency-based model for self-directed training and development emphasizes the individual's increased responsibility for his or her own learning.

In the first step of the model, individuals decide to take more responsibility for their own learning and competency development. In the second and third steps, they access existing competency models and compare themselves to those models with input from organizational superiors or work experts.

In the fourth step, they create individual development plans (IDPs) to close the gap between their perceived competencies and the competencies required for work success or exemplary performance. The fifth step is to implement the plan by participating in training and other developmental experiences designed to build the competencies specified in the IDPs. In the sixth step, they periodically compare their competency development to the models and consult knowledgeable performers and mentors. In the seventh step, they modify their IDPs as necessary in order to ensure that they are building competence and possibly to do further planning. The individual learner evaluates the results of this approach in cooperation with mentors, peers, immediate organizational superiors, coworkers, and particularly with exemplary performers. A key concern throughout the process is to determine whether the individual produces at or near the level of an exemplary performer when the objectives of the IDP have been met.

BASED WORK TEAM DEVELOPMENT

This model emphasizes both the group's ability to carry out its collective work and each individual's competence within the team context. In the first step of the model, team performance is examined against the performance of exemplary teams. Second, HR or other practitioners develop a team competency model that includes specific competencies and behavioural indicators associated with exemplary team performance. In the third step, individual members are assessed against the team competency model using a 360-degree competency assessment or other method such as a performance test. Fourth, trainers compile the ratings of the entire team and use them to guide the training plans for team members.

This may also result in a work team development plan for bringing the team's current performance closer to the level of an exemplary team. In the fifth step, team members undergo training and thus implement the plan to build the identified competencies. Sixth, team members periodically compare their team's competency development to the model. Seventh and finally, they modify the development plan to ensure that they are building competence.

HR practitioners evaluate the outcomes from the work team development plan. Did the team achieve performance that rivals exemplary teams? If it did, then the plan has been successful in guiding team development. If not, additional team development may be necessary.

EDUCATION IN COMMUNICATION TECHNOLOGY

Education in communication technology encompasses the integration of digital tools and platforms into teaching and learning practices, fostering digital literacy, critical thinking, and technical skills among students. It involves equipping students with essential digital literacy skills, including the ability to navigate online platforms, critically evaluate digital content, and protect their privacy and security in online environments. Moreover, education in communication technology emphasizes the importance of integrating digital tools such as multimedia resources, interactive software, and online collaboration platforms into the curriculum to enhance engagement, facilitate personalized learning experiences, and promote digital fluency among students. By leveraging communication technologies in education, educators can create dynamic and interactive learning environments that cater to diverse learning styles and foster creativity and innovation. Additionally, education in communication technology addresses the need for digital citizenship education, teaching students about their rights and responsibilities in digital spaces, including topics such as online safety, cyberbullying prevention, digital ethics, and responsible use of social media. Through education in communication technology, students are prepared to thrive in a digital society and economy, equipped with the skills and knowledge needed to navigate the complexities of the digital world and contribute positively to online communities. The book on Education in Communication Technology offers a comprehensive exploration of integrating digital tools, fostering digital literacy, and promoting responsible digital citizenship in educational settings.

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