
UNIT 4 MANAGING TECHNOLOGICAL CHANGE

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4.0 INTRODUCTION

One of the biggest problems of technology use in education is its adaptation and integration in the institutional culture and practices. Every time a new technology is introduced, there is some sort of resistance to change due to various reasons. Many do not want to try a new technology, as they are comfortable with the existing practices, and do not see any value addition. Others think technology as intimidating, and have techno-phobia. However, in distance teaching institutions, use of technology is common and widely prevalent. It is important to manage technology in institutions to effectively deploy appropriate technology for educational activities. In this unit, we will discuss issues related to management of change, innovation and technology costs to help you decide use of appropriate technology for teaching and learning. We will also discuss management of intellectual property in distance learning institutions, including the trend towards use of Open Educational Resources (OER) and Open Source Software (OSS) in education.

4.1 LEARNING OUTCOMES

After working through this unit, you are expected to be able to:

- *Discuss* the process of ‘change’ and the concept of ‘diffusion of innovation’;
- *Analyze* the factors affecting management of technological change;
- *Critically examine* cost and technology issues; and
- *Discuss* management of intellectual property and copyrights within a technology-enabled learning environment.

4.2 MANAGEMENT OF TECHNOLOGY

The word 'technology' comes from two Greek words: *techne* (meaning the skill and craft needed to make something) and *logos* (meaning discussion or knowledge of something). Thus technology means knowledge of how something is made. This is purely the point of view from the production or economics. For technology is both production, and a facilitation too that enables us in educational transactions – in all activities of teaching and learning. Generally, technology is a combination of hardware and software – the hardware being the tangible physical object, and software being the logical process and thinking on which it runs. The adoption and use of technology is an indicator of development of a nation. The developed nations have sophisticated technological power in all spheres of human activity, including education. The ability of the human resources to make use of the technologies, develop and improve these, make the developed nations economically productive and leaders. In this context, the management of technology becomes highly important. Access to technology and its proper deployment to get the most out of it is a human activity. It requires a systematic approach to use technology, and in our context, we are interested in how best educational technologies can be utilized for teaching and learning in institutions. Management of technology is also an issue related to innovation and change. We will discuss about these in this unit. But, let's first discuss about issues related to deciding which technology to use and cost analysis of technology in education.

4.2.1 Decision Making for Use of Technology

Much about use of educational technology in institutions are related to decision-making at the top management level. It is not always a "technical-rational activity", but one which is ruled by prejudice and ignorance. In developing countries, top management's decision on use of a particular technology for teaching and learning may be arbitrary and ad hoc, as technology availability could be due to a government grant or the technology is coming from a donor agency, and the receiving institution can't say no. When institutions do not pay for the use of the technology, it is taken for granted, and never questioned critically about its usefulness in a specific context. For example, the use of satellite time for interactive teleconferencing at IGNOU is free of cost to the University, though there is a cost involved. Thus, there is hardly any serious thinking about its use; and it has been observed that not many students attend these sessions either. Similarly, in 1993/94, the Commonwealth of Learning (COL) provided an audio-conference system to IGNOU that worked with a telephone bridge and could connect to 16 centres simultaneously. After an initial euphoria about its usage for administrative meetings, it has never been put to use in the University. It is therefore, important to critically analyse the usefulness of a technology before it is put to use or purchased. A. W. Bates proposed a framework for deciding the use of technology in open learning. Bates suggests that every institution should take decision on the basis of answers to questions regarding ACTIONS:

- *Access*: How accessible is a particular technology for learners? How flexible is it for a particular target group?
- *Cost*: What is the cost structure of each technology? What is the unit cost per learner?
- *Teaching and learning*: What kinds of learning are needed? What instructional approaches will best meet these needs? What is the best technology for supporting this teaching and learning?

- *Interactivity and user-friendliness:* What kind of interaction does this technology enable? How easy is it to use?
- *Organisational issues:* What are the organisational requirements, and the barriers to be removed, before this technology can be used successfully? What changes in organisation need to be made?
- *Novelty:* How new is this technology?
- *Speed:* How quickly can courses be mounted with this technology? How quickly can materials be changed?

Access: A distance learner may learn at home or at work place or at a local centre. How much technology is available to a learner will depend where he/she is placed at the study time. Open access, home based learning will be limited in many countries to relatively few technologies. For example, the poorest countries may be in a position to use only print and radio, while slightly wealthier countries may use print, radio, audio cassettes and possibly television. The developed countries will use all these and the telephone, the computer and so on.

Availability is only the tip of the iceberg though. Even in the wealthiest countries, there is always a section of people who do not own a television or even access to a telephone. Is the use of a technology to be denied to those who have access to it, so as not to discriminate against those who do not?

Cost: A number of general points can be made about the balance of costs for different technologies. The cost of putting equipment into local centres can far exceed capital costs $\frac{3}{4}$ for example, for organizations with multiple study centres. The major cost of using technologies for teaching is in production rather than capital and hence it is recurrent for instance, the yearly recurrent cost often exceeds the total start-capital cost: in general, the recurrent costs of producing good quality technology-based materials tend to be underestimated.

Technologies vary considerably in their fixed and variable costs:

- Audio cassettes and radio have low fixed and low variable costs;
- Face-to-face teaching, computer-mediated communication and tutor-mediate tele-courses have low fixed costs but high variable costs;
- Pre-programmed computer-based learning (CBL) and video discs have both high fixed and high variable costs, if work-stations are to be provided;
- Since production is the main cost, and hence fixed for any course, for most technologies currently used in national distance teaching and open learning institutions fixed costs usually far exceed variable costs; this means that the economies of scale apply to 'traditional' distance education courses : the more students, the more cost effective technologies become;
- Some of the newer interactive technologies, such as computer conferencing and audio-graphics, reduce fixed costs, but have high variable costs; thus, while suitable for sources with relatively low student numbers they will be very expensive for courses with large student numbers;
- Broadcast distribution is likely to be uneconomical for national distribution with less than 500 students per course for television, or less than 1,000 students per course for radio; satellite distribution may be economically viable on a regional or sub-continental basis, if the production costs can be justified in terms of the likely target audience;

- Audio cassettes are a particularly economical medium; audio cassettes plus, for example audio vision is usually a cheaper combination than the cheapest form of video or computer-based learning.

It can be seen that the likely size of a course, in terms of student numbers, is crucial in influencing the choice of technology.

Teaching functions: You might feel that teaching functions should be the first criterion to be considered. After all if the technology is not effective, as a teaching tool there may not be much point in using it. However, it is much easier to discriminate between media on the basis of access or cost than on that of teaching effectiveness. The bases of media are flexible. Each medium can be used in a wide variety of ways. Consequently, difference within a medium (for example, a televised lecture and a documentary) may be greater than between media (for example, a face-to-face lecture and a lecture on a radio programme).

The choice of media depends on their presentational qualities and ability to develop skills. The presentational qualities of each medium can be exploited by the course designer in relation to the course objectives and what kinds of learning (comprehension analysis, application, problem-solving, inter-personal, mechanical skills, attitude change, etc.) are required.

Interactivity and user-friendliness: The extent to which a particular medium encourages interaction and active learning, and its user-friendliness is of utmost importance. Some technologies provide 'real-time' interactivity, whereas others are only asynchronous. Some are one-way interactive media, while others are two-way interactive. Since, the learner in distance education is at a distance from the teacher, the interactivity of the medium is of paramount importance. As far as the question of user-friendliness is concerned, it is the quality of the medium to provide control to the learner. For example, in a TV broadcast, the message just passes away and you can't go back to a specific frame. But in a video tape, you can just fast forward and rewind to understand a specific concept as many times as you want.

Organisational issues: The issues related to organisation deal with how to exploit the potential of each medium. The organisation must be ready to change and/or adopt new technologies relevant to its operation. Since technologies require additional cost, the organisation would like to effectively deploy both manpower and technologies to adopt changes. At the time of taking a decision regarding technology, issues like how much training the staff would require to handle it need to be assessed. May be depending on the requirement, the overall organisational structure, job roles, etc. may need re-engineering.

Novelty: Bates recommends that novelty should be the least important of all the criteria. However, at times the novelty of the medium attracts funding from different agencies. But, you must be sure about the pedagogic utility of the medium before being fascinated by its novelty. And if the medium is not cost-effective, it will ultimately be a burden on the institution.

Speed: It relates to how quickly the medium allows the institution to make the shift to the new medium. Some technologies take more time for development. For example multi-media learning packages take more time. Even video tape takes lot of time to produce their audiotape. Also you must consider the speed at which the materials can be updated and revised.

Table 4.1 presents the comparative strengths of different media and technology analysed by Bates (1995). However, it may also be noted here that such categorization is only indicative, and if you are asked to decide on a technology in your institution, it is better to critically analyse the points covered under ACTIONS.

Table 4.1: Strengths and Weaknesses of Various Technologies

Media	Access	Costs/Students Nos.		Teaching		Interactivity		Organi- sation	Speed
		Large	Small	Presen- tation	Skills	Learning	Social		
One-way Media									
Print	Good	Good	Average	Average	Average	Average	Poor	Poor	Poor
Radio	Good	Good	Poor	Poor	Poor	Poor	Poor	Average	Good
Audio Cassette	Good	Good	Average	Average	Good	Good	Poor	Good	Average
Educational Broadcast TV	Average	Poor	Poor	Good	Average	Poor	Poor	Poor	Poor
Pre-recorded TV	Poor	Good	Poor	Average	Average	Average	Average	Average	Poor
Video cassettes	Good	Average	Poor	Good	Good	Good	Poor	Average	Poor
Computer based learning	Average	Poor	Poor	Average	Average	Good	Poor	Poor	Poor
Multimedia	Poor	Poor	Poor	Good	Good	Good	Poor	Poor	Poor
Two-way Media									
Audio Conferencing	Good	Poor	Good	Poor	Average	Poor	Good	Good	Good
Live Interactive TV	Poor	Poor	Poor	Poor	Poor	Poor	Average	Average	Good
Video Conferencing	Poor	Poor	Average	Poor	Average	Average	Average	Average	Good
CMC	Average	Average	Good	Poor	Good	Average	Good	Good	Good

(Source: Bates, 1995)

4.2.2 Calculating the Costs of Technology

One of the major issues related to deciding the use of technology for teaching and learning pertains to the costs of technology – costs to the institution and costs to the learners. Technology costs lots of money for the institutions, and it has a variety of associated costs. It is important to analyze these to understand the cost structure of using a particular technology. While my objective here is not to have a full discussion on cost and economics of technology, I would like you to understand the categories of costs associated with analyzing technology costs in teaching and learning contexts. We take for granted the availability of electricity and other infrastructure in office, and therefore tend not to consider these as costs involved. Some also believe that costing educational activity is not possible, especially cost-benefit

analysis. While benefits are not always tangible and visible, cost analysis is done with certain assumptions that are open to challenge. For example, your institution may decide that 'overhead charges' would not be included in cost analysis of new technology. This would have significant influence in the total cost calculations. So, the assumptions are context-driven.

In order to calculate the cost of technology application in education, you must differentiate between *fixed* and *variable* costs. Fixed costs do not change with increase or decrease in number of learners, while variable costs do. For example, the development costs of a video programme or Multimedia CD is fixed, while its distribution cost to the learners would increase with the increase in the number of learners. Research shows that cost increases with the increase in number of learners in classroom teaching. In comparison, the use of printed learning materials or multimedia materials significantly reduces the total costs. The use of computer mediated communications (CMC) such as discussion groups and virtual conferences increases the total costs and are usually higher than only use of multimedia materials, and less than classroom teaching. But, if you want to use both CMC and multimedia materials/ Web-based materials, it may not be cost-effective for smaller number of learners. This is so because, use of CMC require teacher interventions (though not at the same level of classroom teaching), and the initial costs of development of multimedia materials are higher.

To calculate the costs, it is important to record every detail of the expenditure accurately and faithfully. Bates (2000) says "costing is like playing golf. If you cheat, it is between you and God – no one else is likely to know!" Many a times, the overhead costs (capital costs and operating costs) are difficult to ascertain, and especially amortization of the capital costs is only a guesstimate/assumption. In Table 4.2 we present the cost heads of a web-based course that uses multimedia-web based materials, readings from journal articles (require copyrights payments), etc. In order to estimate the cost per learners, it is also important to analyze the costs over the *life of the course* (which may be 3-5 years).

From Table 4.2, you may note that the costs of a programme/course would depend on the core instructional design and teaching and learning model it follows. While development of multimedia materials would add to high cost, by using set books as an alternate model you can pass on the cost to the learner. For tutoring, the number of tutors would depend on the number of learners. A tutor may moderate a group of 15-20 learners in a course, and thus, a course having 100 learners would require at least 5 tutors, and thus the cost would be more. You can also design courses that may not have more interaction at the learner-learner or learner-tutor level, and the online content can take care of the interactivity component. In such a situation the variable cost can be reduced. Cost of technology-based courses depends on how technology has been planned to be used. It may also be noted that in online courses, the learners spend extra money in addition to the tuition fees. These costs for learners are in purchase of computer/laptop and relevant software, and the Internet access time.

Table 4.2: Item-wise Cost Headings

Items (All items to be covered)	Costs in Rupees/Dollars					
	Year 1	Year 2	Year 3	Year 4	Year 5	Total Costs
Fixed Costs (Capital)						
- Subject Experts						
- Web Developers						
- Multimedia Developers						
- Instructional Designers						
- Copyright						
Sub-Total						
Fixed Costs (Operating)						
- Institutional Overheads						
- Departmental Overheads						
- Server charges (LMS hosting, web space, bandwidth)						
- Quality Assurance Approval						
Total Fixed Costs						
Variable Costs						
- Tutoring						
- Delivery Costs (Registration, ID Cards, etc.)						
Total Variable Costs						
Total Costs						

Check Your Progress 4.1

Notes: a) Write your answers in the space given below.

b) Compare your answers with those given at the end of this unit.

1) Expand and explain the acronym ACTIONS.

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2) List the item-wise cost headings for an online programme.

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4.3 UNDERSTANDING MANAGEMENT OF CHANGE

Change is something that is inevitable. It happens all the time. But, it is perhaps one of the most difficult issues to handle in organizations. Understanding change and taking appropriate action differentiate between successful and unsuccessful organizations. Organizations that can predict and manage change effectively survive in difficult times. Change in organizations happen due to many reasons: change in purpose, organizational structure, technology, people, etc. Changes may also be external to the organization such as changes in the lifestyle of the clients. For example access to mobile phone amongst learners is a significant change that educational institutions may take note for their future planning activities. Some changes may be planned, while others may be sudden and unplanned. It is therefore important to manage the change process systematically, especially when the change is due to induction of a new technology. The purpose of change management is to facilitate organization's integration into and adaptation to the new changed environment. Shoham and Perry (2009) present five models of change management:

- **Dynamic Stability Model:** The model strives to move the organization from a state of instability to a state of stability by unfreezing, changing, and refreezing. Change In this model is a transient stage.
- **Problem Solving Model:** In this model change happens due to a problem, and organization's desire to overcome the same.
- **Strategic Planning Model:** This model has three stages: dissatisfaction, vision and step towards change. It is a systematic approach that the top management takes into consideration when they are dissatisfied with the existing situation.
- **Eight Stage Model:** It was proposed by Kotter (1998) that includes a sense of urgency, creating a guiding coalition, developing a vision and strategy, clarifying the change and vision, empowering broad-based action, generating short-term success, evaluating change and anchoring new approaches in the organizations culture.
- **Dynamic Systems Model:** This model believes in transformative systems, where people and processes interact to being transformation through discussion and dialogue. It is based on systems theory, and therefore, the components are interdependent, inter-related and function in a synergetic manner to provide feedback in the change process.

While these models are drawn from the corporate world, educational institutions are different in their objectives, functions and organization. Being mostly not-for-profit and following a 'collegial decision-making' model, they are difficult to change, especially when it comes to pedagogical practices. However, Scott (2003) lists the following four forces of change faced by higher education intuitions:

- Increase competition of educational providers from within and outside the country;
- Decrease in governmental funding in education;
- Mounting trend towards consumer rights as education is considered as a service leading to students not hesitating to take educational institutions to court for poor service; and
- Influence of information and communication technology in all walks of life, and availability of information on the Internet.

4.3.1 Need for Change

Is there a need for change in your institution? I am sure your answer would be a big 'yes'. We are not always happy with what is happening around us. But, if you are asked to change, we may not be too enthusiastic, as change is something that we all are afraid of. We do not want to come out of our comfort zone, and do not want to tread the path of unknown. But, as part of distance education institution, it is no more possible to continue with the age old practices. The support from the government for all types of educational institutions is decreasing, and distance education is no exception. Moreover, there is a perception that distance education institutions can sustain themselves. Thus, there is a need to do 'more with less', and every dollar spent has to be justified by reaching more learners with quality education. It is no more possible to run universities with traditional graduate programmes alone. The skills and knowledge needed by the employers in the 21st Century are different, and therefore educational provisions in distance education institutions must cater to societal needs by modifying/ revising courses and programmes and innovating new ones that meet the needs of the workforce.

4.3.2 Nature of Organizations

Distance education institutions are primarily 'Fordist' in their nature. That they believe in industrialization of the education as pronounced by Otto Peters. The features of industrialization that are found in distance education are:

- Production of uniform products as self-learning materials
- Economies of scale due to large number of enrollment for courses
- Division of labour in production of learning materials, and also in delivery of teaching and learning, as teaching is done through self-learning materials and tutoring
- Hierarchical management due to departmentalization of activities
- Standard, bureaucratic policies and procedures for operation of different activities
- Automation of processes and activities

In contrast, the face-to-face teaching follows an agrarian organizational model, where the teacher prepares the curriculum, identifies the resources, teaches in the classroom, does the student evaluation, etc. as a farmer does all activities in agrarian society. So, distance education institutes are different, and operate in the Fordist model. But with the advent of information technology, there is a new model that is emerging, which is called as the post-Fordist or post-industrial universities. Such universities depend heavily on information technology; are networked; operate through different locations; employees also operate in a decentralized manner; are characterized by strong visionary leadership ready to take on new opportunities and challenges. These institutions operate globally and develop their *brand image*. Examples include University of Phoenix, Western Governors' University, Jones International University, etc. Following this model, open universities and distance education institutions are also changing to adopt the practices of post-Fordist institutions and creating online learning centres and virtual learning centres.

4.3.3 Importance of Leadership

To see the change institutionalize, it is important to have a strong leadership. Usually the Vice Chancellor/President is the main force behind change in many universities. However, we also know that this does not happen just be one person. There is always need for other people in the senior management who shares the vision and thinking of the leader to make change happen. So, in this context, a good leader is one who can find competent people within the institution who buy-in his vision, and propagate the same in all ranks. In this sense, leadership is not something to be only found in the Vice Chancellor, but leadership as a quality is required amongst all workers who are be part of the change process. A team based leadership works very well in post-Fordist organizations, and the leadership should focus on the following:

- Define a vision of teaching and learning through technology
- Identify new target groups that can be reached through technology
- Define priority areas and target groups for appropriate programmes
- Identify areas and strategies to populate information technology related activities within the institution
- Identify the needs for capacity building (including human resources) for application of information technology
- Promote and reward innovation and appropriate use of technology
- Develop strategy for key technology procurement and implementation

For all these to happen, the role of leadership is to recruit competent people. In this context Bates (2000) says leadership is more about *quality* than *strategy*. He says “It is really the responsibility of the board of governors and the president, or deans, through their appointment process, to ensure that senior managers or heads of department have leadership quality and an understanding of the strategic importance of applying new technologies to teaching and learning.” Understanding of new technology applications in distance education by leaders would go a long way in the change management process.

4.3.4 Vision and Strategic Planning

Vision is the art of seeing the invisible.

– Jonathan Swift

It is the role of the leadership to develop a vision and strategic plan for use of technology in teaching and learning in the institution. Developing an institutional vision is a complex process; though you may have a personal vision for technology use. Vision is not same as that of mission. While mission defines the fundamental purpose of the organization, vision is the intended future state of the organization. The vision statement outlines what the organization would like to be in a future date. In the context of technology, it is a document that clearly shows the path of adopting technology in teaching and learning. Fritz (1989) defines vision as a set of concrete scenarios that reflect exactly what we would like to be doing in the future. While the vision statement can be just a sentence or a paragraph, the vision document will also include the strategy to achieve the vision.

Strategic planning, therefore, considers:

- What do we do?
- For whom do we do it?
- How do we excel?

The strategic plan for use of technology in teaching and learning should cover a long term view and include situation analysis, goals, and specific action that can be implemented. Though strategic planning is an institution wide activity, it is important to have departmental strategic plans which are consolidated to prepare the institutional plan. The strategic plan helps us to do monitoring of our progress, and we know when the vision is realized leading to institutionalization of change. When strategic plans are discussed in the institutions, everyone knows the expected outcomes and work towards that. But, if the plans are not shared or changed without consultation, the result may not be as expected. Some also believe that strategic planning is a long term activity, and it is not possible to apply the same in organizations that depend more on information and communication technology that moves very fast. In spite of such criticism, in order to implement change we need to have a roadmap, and strategic planning is a process to develop that roadmap.

4.3.5 Why Use Technology?

In the change management process, technology is vital. When it comes to distance education institutions, technology is central to many of its operations. When technology changes, it is natural that existing practices would change. Therefore, it is not necessary here to convince you of the reasons of using technology for change. However, let's state the reasons for use of technology for emphasizing the need for technology for management of change process.

Reasons for using technology in distance education institutions are:

- To improve the quality of teaching and learning by adding suitable technology that increases the amount of interaction between student and a teacher and student and student
- To provide learners with suitable technology literacy for work and life
- To improve access to quality education and training using online and mobile learning platforms
- To reduce the cost of education (this is a debatable statement)
- To improve the cost-effectiveness of education
- To meet the technological imperative

Use of technology for teaching and learning in distance teaching institution is common. But, it requires constant vigilant to remain up-to-date to be a leader. Technological imperative demands that when a suitable technology is there, and it is not used by an institution, others look it as sign of backwardness. While this interpretation may be too extreme, and we do not promote mindless use of technology, it is useful to be evaluative in deciding the use of technology for change.

4.3.6 Factors Affecting Management of Technological Change

Having discussed some of the issues in change management in the preceding sub-sections, now let's turn to discuss factors affecting management of technological change. It has been discussed so far that leadership is an important factor, and having a clear vision and strategic planning for implementation of the technology makes the change process hurdle free leading to a stable organization. In the context of distance education institutions, we also know that application of technology in teaching and learning moves the Fordist organization to a post-Fordist

model that has characteristics of both agrarian and Fordist model. In such a scenario, let's identify some other factors that we must take care of during implementation of change. These are:

- Role of change agent: Having champions of change or change agents in the organization who play the role of catalysis in the process is very important. Such people can be trainers and staff developers, who provide the necessary training to adapt change.
- Finance: Appropriate funding of the technology implementation is a must to see the change. Without sufficient budgetary provisions technological change may be incomplete as technology needs heavy investments initially.
- Opposition to change: Addressing opposition to change through improved communication helps in effective change management. Most opposition to technology is due to negative perceptions about it. Regular training programmes, newsletters, etc. about the use and effectiveness of the technology adds to removing fear amongst the stakeholders.
- Eliciting cooperation: Change is a slow process in academic institutions, and therefore it is important to elicit cooperation from all stakeholders. It is also necessary that everyone is sympathetic towards the change and remain patient when the newly created system does not work as expected. Providing feedback to improve the system is part of the change process and to stabilize the change, we must elicit feedback and cooperation.

Check Your Progress 4.2

Notes: a) Write your answers in the space given below.

b) Compare your answers with those given at the end of this unit.

1) Identify the major factors affecting management of technological change in an organization.

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2) Explain the meaning of strategic planning in the context of technology in education in about 100 words.

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Now let's see change as innovation or innovation as change!

4.4 INNOVATION AS CHANGE

Innovation has become a buzz word in all walks of life, and Distance Education is not far from it. The Asian Association Open Universities (AAOU) Conference in Teheran in 1995 was first such occasion to devote full fledged discussion on innovations in distance learning. But, if we closely look at the deliberations there and elsewhere in distance education literature about what is innovation, it would be much clear that there is much to be desired. While some would consider the use of an existing technology in a new context as innovation, others would consider a new teaching learning programme an innovation. Broadly, innovation is the act of starting something new. It could be a new *idea*, a new *product* or a new *process*. Two important concepts are related to innovations – creativity and change. Innovation is a creative process, and it advocates change in the current practice. The change could be radical or incremental. However, it is different from invention. Innovation is idea applied in practice. As such, distance education itself is an innovation in the field of education!

We can all be creative and innovative, but contrary to popular belief innovations are not always appreciated. Remember, Alexander Graham Bell, who invented telephone was turned down by Western Union telling it as a “useless toy”. Scott Berkun, author of the *Myths of Innovation*, states “Every great idea in history has the fat red stamp of rejection on its face”. Does that mean, we should stop thinking and innovating? No. The real innovators sustain and persist. There may be rejection due to ego, pride, politics, priority, fear, greed, etc, but innovators survive due to their convictions and belief in what they have strived to create. Fortunately, history shows that when institutions do not recognize innovations, it results in entrepreneurship. But, this is also a sign of institutional failure to accept innovations internally, experiment and institutionalize ideas, because it may come from a person in low hierarchy. Fortunately for distance education in India, and for the Indira Gandhi National Open University, we have the National Centre or Innovations in Distance Education (NICDE), which has various schemes for recognizing innovations within the institution and the system in the country.

For distance education innovations is an imperative. It is not something that we may do, but it is something that we must do. For example, cost-effectiveness is one of the strong pillars of distance education. If we do not constantly think and innovate how can we maintain cost-effectiveness? One programme may not be cost-effective, but the system as a whole should be cost effective to justify its existence as an alternative mode to provide quality educational access to large number of people. So, we need to innovate new programmes that cater to the needs of the market. We need to use new instructional and learning design principles to develop programmes that are suitable to the needs of the learners. We need to use appropriate technology to make the programme more interactive and useful to the learners. In all the activities, we need to think about the philosophy of open learning and innovate appropriate distance education programmes that provide access to more people at less cost. Innovations in distance education therefore should follow a system-wide perspective, and it is the responsibility of teachers and administrators to think about the system as a whole. Innovations are required in the areas of curriculum design, instructional design, learning material preparation, ICT enabled programme delivery, new programmes, and new technologies in education.

4.4.1 Diffusion of Innovation

Diffusion research comes from many disciplines, but emphasize on one thing: the speed of spread of the innovation within an organization or society. There is a set pattern in the process of diffusion that has been observed. An innovation to get diffused in an organization or society follows a five stage process: Knowledge or awareness about the innovation, a stage of persuasion and explaining the advantages, decision by the stakeholders (acceptance/rejection), implementation (if accepted), and confirmation or continuance with the innovation. The speed of adoption of a technology in the society differs greatly, and to reach a critical mass of adoption it take time. Table 4.3 shows some technologies and the speed of change acceptance in the society.

Table 4.3: Speed of Introducing Technological Development into Social Use

Specific Technology	Invention	Innovation	Speed of Change
Aspirin	1853	1899	46
Incandescent Lamp	1854	1880	26
Telephone	1860	1887	27
Photography	1871	1888	17
Synthetic Rubber	1882	1932	50
Ballpoint Pen	1888	1938	50
Fluorescent Lamp	1896	1938	42
AM Radio	1900	1920	20
FM Radio	1902	1936	34
Aeroplane	1903	1920	17
Vacuum Tube	1904	1915	11
Helicopter	1907	1938	31
Black & White Television	1907	1936	29
Colour Photography	1912	1935	23
Colour Television	1925	1953	28
Nylon	1927	1938	11
Penicillin	1929	1942	13
Jet Aircraft	1930	1942	12
Polaroid Photo	1937	1948	11
Xerography	1937	1950	13
Electronic Computer	1945	1951	6
Transistor	1947	1951	4

Source: Sharif (1983).

Everett Rogers (1962) in his book *Diffusion of Innovations* categorized individuals as adopters of innovation at different level within an organization or society. According to him there are five types of adopters: innovators, early adopters, early majority, late majority, and laggards. The number of people in each category if plotted in a graph follows the S-curve or bell curve pattern (see Fig. 4.1). The innovators (2.5%) are those who actually start the innovation or first adopt it. They are risk takers, and greatest contact to scientific sources and interactions with other innovators. The early adopters (13.5%) are opinion leaders and adapt to an innovation in second fastest way. They are typically younger people in an organization with advanced education and are forward looking. The early majority (34%)

take significantly more time to accept an innovation than innovators and early adopters. They are influenced by the early adopters, while the later majority (34%) is those who approach an innovation with lots of skepticism and adopt to change after a long checking and verification process. The laggards (16%) are those who are the most difficult to handle in the change process. They believe in tradition, and are mostly unwilling to change. It is this group that may also create possible hurdle in implementation of an innovation to change existing practices. They do adopt to change the last in an organization. So, while implementing change in an organization, it is important to pay attention to the different types of adopters, identify them and address their concerns accordingly.

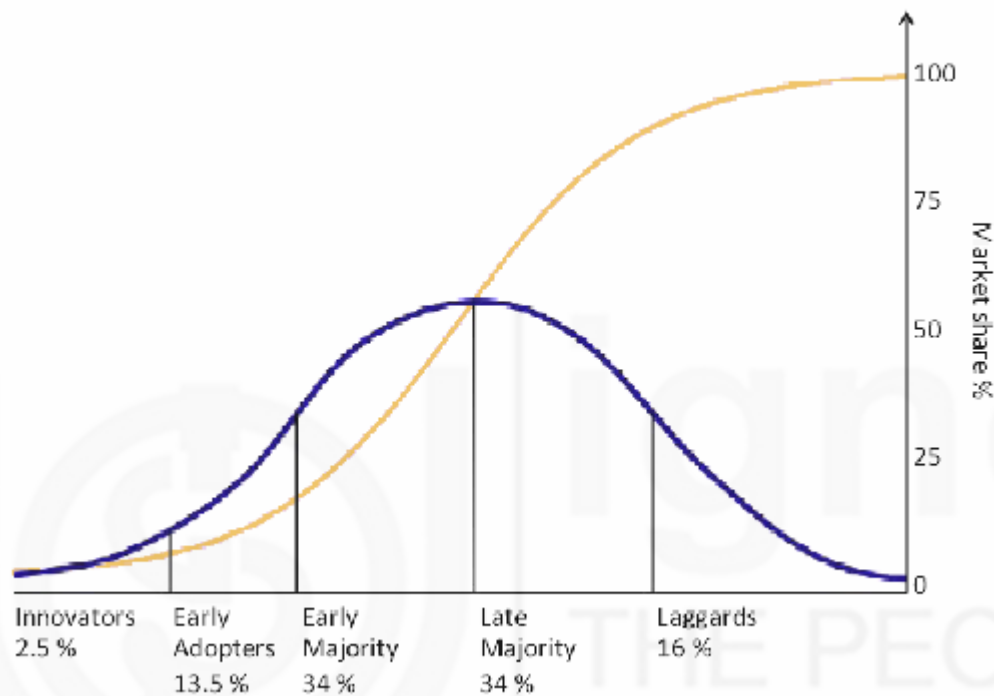


Fig. 4.1: Bell curve for adopters of innovation (Source: Wikipedia)

4.5 MANAGING INTELLECTUAL PROPERTY

Intellectual property has emerged as a major issue in distance education, especially due to the use of digital media and resources in the delivery of education. While intellectual property covers a broad range of concepts such as patents, copyrights, trademarks and designs, in this section we will focus only on copyrights. The copyright laws differ from country to country, though there is a general convention on it to which most countries are signatory. Thus, we will make general statements on copyrights related issues, and would suggest you to consult your legal advisor, when in doubt. There are certain aspects of the copyrights law that are subject to interpretations and sufficient cases are not available to make generalizations. Many a time copyright violations are not even reported as the compensations may not justify the litigation costs and it also takes time to get judicial verdict as legal case can go from lower courts to upper courts till the supreme court of a country, and thus wasting time and resources. For educational institutions that create contents, this is a problem as they need to protect the intellectual property created by their faculty, and provide appropriate rewards to the creators. While we are not going to take discuss how to safe guard intellectual property, we are more interested in how not to violate the laws and avoid legal battles. Distance education intuitions

develop huge amount of contents like major publishers using large number of authors, and therefore, it is important that copyright policies are in place to safeguard institutional interests.

Copyright is the exclusive rights given to the creator of the original work to reproduce, translate, adapt, copy, perform, authorize, receive royalty and engage in any other economic benefits arising out of the work. The Copyright Act, 1957 (in India) protects the creator of the original work by making it illegal for others to use the original material without the creator's or owner's consent. Many distance teaching institutions appoint Copyright Officer to handle issues related to copyright, asking for permissions, payments to copyright holders and keeping records of copyright permissions granted by the institution. Some other institutions advise the authors to get the copyright permission if third party materials are used beyond "fair use" or "fair dealing" clause. The fair use clause in copyright laws allows for a small proportion of work to be used without the need to seek permission from the copyright holder. However, the amount of "small" is open to interpretation. Moreover, it is also possible to use some works (one time only) in the classroom contexts, and that would not be violation of copyrights. But, in distance education contexts the issue of fair use become complex. As the materials are printed, and many institutions do earn profits out of the works!

4.5.1 Copyright in the Digital World

The issue of copyright become more complex in the digital world. Many believe that the mere access to a website without password protection is free availability of the same to be used by anyone in their work. In fact, a website is like a book. So, the copyright laws are also applicable to the websites, and unless and otherwise the author/creator of the website give open permission to use the content, we can't make use of the same in our work. However, fair use for the purpose of research and criticism are always permitted. Some also think that the websites are in public domain! In fact, it is not. The phrase 'Public domain' connotes that any material that are not covered by copyright laws or the intellectual property rights have expired. For example the copyright expiration in many countries ranges from 50-70 years after the death of the creator. In United States the Government works are not covered under copyright and are available in public domain.

Who owns online courses and digital materials? This is a question often asked by many, especially in the context of online learning. The materials created under hire (job) are normally owned by the employer. So, the learning materials created by a teacher under employment are the copyright of the employer. However, this is governed by the contract of the teacher in many universities. Some universities allow the teachers to use the materials in their own works. Some even permit the teachers to take the course with them when they leave the university. So, institutions must have clarity on copyrights of the work created by them, especially those created by the staff and those created by outside consultants. Whatever may be the situation, while creating copyrighted work, it is important that use of works of others as per accepted conventions, and permissions are taken from the copyright holder for tables, graphics and when a significant portion of text is used.

Bates (2000) provides the following advice on copyright for creators of digital materials:

- Use the same rules of print publication to digital materials, wherever possible.

- When in doubt, ask for permission. Usually permission is granted by the creator for non-for-profit use.
- Always password protect your course sites, and also inform the users that the materials in the site are for their personal use, and not for sharing with others.
- Provide links to other sites, rather than copy materials and host in your server.
- While using links to other sites, check the copyright provisions in the site. If advised, inform the webmasters. Sometimes due to heavy traffic on a site it may crash (if appropriate bandwidth is not available), and thus it is morally your responsibility to inform the sites, if you are directing large number of users to them.
- Clearly give copyright statement in your sites and multimedia materials.
- Always acknowledge the use of other materials, especially indicate the permission taken.
- Do not give permission to use third party materials in your site. Refer the requesting person to the appropriate copyright holder.
- Educate all stakeholders about copyright and its implications.
- Develop appropriate legal instruments, contracts, agreements following the copyright laws.

4.5.2 Open Source, Open Content

In response to the complexities of the copyright regime, the open source movement has emerged in 1985 with the establishment of the Free Software Foundation (FSF) (<http://www.gnu.org/>) by Richard M. Stallman. The FSF has developed the General Public License (GPL) that is often called “copyleft” to allow programmers to release the software with its source code. In the year 1991, Linus Torvalds, a student at Helsinki University started a project that would spread to become the “poster child of open source” (Hart, 2003). With the release of version 0.1 of the Linux kernel as an operating system, open source as an alternative approach to software development became popular. In the mid-1990s, Netscape decided to publicize the source code of its browser, which led to the emergence of the Open Source Initiative (OSI) (<http://www.opensource.org/>) as an alternate institution to FSF. The OSI maintains that for any software to satisfy as open source,

- the source code must be distributed with the software or otherwise made available for no more than the cost of distribution;
- the software be allowed for re-distribution without any royalty payment to the creator; and
- the user can modify the source code and then distribute the modified software under the same terms.

Sometimes, the software released under open source is also called “Free and Open Source Software” (FOSS). To a certain degree, open source software is free of charge to the extent that they do not charge licensing fee for usage. However, it should not be confused as “freeware” that are made available free of cost in their executable form without the source code. In the case of open source, the *free* is as in *freedom*, and can be seen as:

- freedom to access the source code;
- freedom to use the software without paying any license fee;
- freedom to re-distribute; and
- freedom to modify the software and distribute.

Open source software is becoming popular in education due to the cost advantage. The software is free, and thus no payments are to be made. However, some service providers may take training and maintenance charges. Today, almost all proprietary software has an open source alternative that you can find on the net. Following the open source movement, in 2002 with the initiative of the UNESCO, the open content movement started which is now popularly known as Open Educational Resources (OER).

OER has been defined as “the provision of educational resources, enabled by information and communication technologies, for consultation, use and adaptation by a community of users for non-commercial purposes” (UNESCO, 2002). So, open content materials follow an open licence policy thereby permitting other users to use the work without permission. The emergence of Creative Commons licenses for OER has made it easier for creators of original work to specify the terms and conditions of use. Using OER materials, institutions can save money and avoid duplication of work. The UNESCO has developed a website for the promotion of OER (see <http://oerwiki.iiep-unesco.org/>). There are many other such provisions with huge contents suitable for learners from kindergarten to lifelong learning available. Some of these are:

- WikiEducator (www.wikieducator.org)
- Connections (www.cnx.org)
- Curriki (www.curriki.org)
- OER Commons (www.oercommons.org)

You can search for more such sites on the web.

Check Your Progress 4.3

Notes: a) Write your answers in the space given below.

b) Compare your answers with those given at the end of this unit.

1) What is innovation? Explain in about 150 words.

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2) Explain the five types of technology adopters in any organization.

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- 3) Choose the right answer.
- i) Copyright of a work available online:
 - a) Does not exist because the Internet is part of public domain.
 - b) Is same as the copyright of the work, if published in print.
 - c) Depends on whether a copyright notice is available or not.
 - d) Last for the life of the author plus 14 years.
 - ii) If a work is in the public domain, it means:
 - a) The work is available online.
 - b) The work is available in a public library.
 - c) The work can be copied without permission.
 - d) The work is copyrighted by the society.
 - iii) Fair use/dealing means:
 - a) The right to copy entire work without taking permission.
 - b) The right of teachers and students to use copyrighted work without permission.
 - c) The right to use material available on the Internet
 - d) The right to use reason portion of a work for research, review and criticism.

4.6 LET US SUM UP

Management is systematic activity. Without scientific management, it is not possible for organizations to be managed to achieve their goals. So, institutions do have structures, policies and procedures to work and achieve the organizational goals and excellence. Educational institutions, especially distance teaching institutions, are established to provide education and training to people, and provide wider access to education. Use of technology in education has become common, and in distance education inevitable, as it is primarily a technology-mediated system of education. Appropriate use of technology within the institution is significant in the process. In this unit, we highlighted the significance of management of technology with special reference to choice of appropriate technology and calculation of cost of technology. We discussed the ACTIONS framework of Bates in this connection that emphasize the need to understand students' access to technology, cost of the technology, teaching functions performed by the technology, interactivity offered by the technology, organizational issues associated with the technology, novelty value and speed of the technology for change.

We also discussed the factors affecting management of change, and emphasized the role of nature of organization, leadership, strategic planning, and need of change and rationale for appropriate technology. We discussed about innovation as change, and how innovations diffuse within organization. We identified five types of adopters to change, and discussed how to motivate these individuals to accept change. In this unit we also discussed about intellectual property rights related issues such as how to follow the laws related to copyrights. We discussed about the emerging trends in open educational resources and open license arrangements about content utilization in the digital world.

4.7 KEYWORDS

Change Management: is the process of structuring and controlling the change in an organization.

Copyright: is the exclusive rights given to the creator or author of an original work to copy, distribute and adapt the work. It can be assigned to another person who is not the author, and the copyright holder can license the work for payment.

Innovation: is a change in the thought process of doing something. Innovation can be a new idea, a new product or a new process. But, it is not necessarily a new invention. It could be a new application of an already invented item.

Open Source: relates to availability of the source code of a software program, and its related freedom to distribute the work and its derivative freely to others.

Strategic Planning: is the process of preparing strategic plan in an organization. This will include situation analysis, identification of strengths and weaknesses, development of a roadmap, clarifying the objectives, and deliverables with timeline to monitor progress and evaluate the implementation of the strategic plan. The end product of strategic planning is a plan document.

4.8 REFERENCES AND FURTHER READINGS

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4.9 FEEDBACK TO CHECK YOUR PROGRESS QUESTIONS

Check Your Progress 4.1

- 1) ACTIONS stands for Access, Cost, Teaching function, Interactivity, Organizational issues, Novelty and Speed. A. W Bates has developed ACTIONS as a framework to choose appropriate technology for teaching and learning in an institution. It provides a rational basis for educators to think about access of a technology to the students; its cost to institution and students; teaching functions it can deliver; nature and levels of interactivity; newness of the technology to motivate the user; and speed of change of technology so as not to affect the cost structures drastically.
- 2) Costing of online programmes requires us to identify the items under fixed and variable costs. The fixed costs (also called capital cost) of a programme includes the programme development cost such as the payments made to the subject matter experts, web and multimedia developers, instructional designers, and

copyright costs of media elements. There are another category of fixed costs (that can be attributed as operating costs): such as the institutional overheads, departmental overheads, server charges, and quality assurance approval related payments. Besides these, the variable costs include cost of tutoring, delivery cost of CDs, Identity Cards, etc. to the students. To calculate the cost of the online programmes, it is important to calculate the cost of each and every item carefully.

Check Your Progress 4.2

- 1) Factors affecting management of technology includes, but not limited to the following:
 - A clear understanding for need to change
 - Understanding of why to use a particular technology
 - Knowledge of the nature of the organization (Fordist, post Fordist)
 - How the leadership is disposed to technology, and how it promotes the same in the institution
 - Whether the institution has a strategic plan for implementation of technological change
 - Availability of champions of technology to take the role of change agents
 - Capacity building activities to train the staff to use technology
 - Availability of adequate fund to implement the change
 - Cooperation of all the stakeholders
- 2) Strategic planning in the context of educational technology in an institution is the blueprint to use technology for teaching and learning. The strategic plan should consist of what to do, how to do and for whom to do. It should include a situational analysis, strengths and weaknesses of the institution; provide specific goals to be achieved after implementation of the strategic plan; and the achievable targets and milestones. The plan is used for monitoring the progress of implementation, and also for evaluation of the implementation in the light of the strategic objectives and their achievements.

Check Your Progress 4.3

- 1) Innovation is the act of starting something new. It may be an idea, a product, or a new process. Innovation is a creative process and it expects change in the organization. In the context of distance education, constant innovation is important to maintain cost-effectiveness of the system as a whole. Innovation is not invention, and therefore, a new use of an already existing technology can also be considered innovation. For example, using email to provide training can be considered innovative use in specific contexts, as email is primarily meant for communication of message and not for education and training. In distance education, we can innovate in the areas of curriculum design, course development, delivery, and use of new technologies for teaching and learning.
- 2) Innovations take time to get adopted at different levels in the institutions. Everett Rogers, identified five types of individuals in organizations based on how they react/adopt technology/innovation. These are: innovators, early adopters, early majority, late majority, and laggards. Percentage-wise, 68% fall under early majority and late majority, which form the major group in any organization to make any innovation successful. So, strategies may be developed to get these people adopt innovation through training, and other processes of briefing and involvement.
- 3) i) The correct answer is (b), as copyright laws do not distinguish between works published online or in print. Internet, though available to all, is not a 'public domain'. Whether or not a copyright notice is given on a work, it is copyrighted, if otherwise expressed as available on creative commons or other open licenses. The year of copyright varies from country to country. But, it is normally 50 plus year after the death of the author.

- ii) The right answer is (c). A work in public domain may not be available online. And, webpages being available to anyone is not in public domain! Public libraries may have the work available in public domain, but it is also not necessarily so. And the use of public does not connote copyright is held by the society. As such copyrights are granted to individuals and group, and not to the whole society.
- iii) The correct answer is (d). Fair use/dealing clause in copyright laws allow us to use some portion of a copyrighted work for teaching, research, review and criticism purpose without taking permission of the copyright holder. Copying entire work without permission is violation of copyright. Normally teachers and students are allowed to use copyrighted works for under fair use clause as in (d), and also for one time use. But, this is not blanket permission. Materials available on the Internet should also be checked for their copyrights before use.

