DIPLOMA IN EDUCATION LEADERSHIP AND MANAGEMENT
MODULE 7:LEADERSHIP IN SCIENCE, TECHOLOGY AND INNOVATION

UNIT 5:
INNOVATION DEVELOPMENT, TRANSFER AND DIFFUSION

Introduction

- Leaders in institutions of learning have the responsibility of creating a climate of creativity and innovation in their contexts.
- In Kenya, the curriculum driving teaching and learning is competence-based and it embraces science technology and innovation. Competency-Based Curriculum (CBC) deliberately embraces problem-solving, digital literacy, creative thinking and innovation as key competencies to be developed throughout the learning cycle among others.
- Learning environments that embrace these competencies are transformative. This transformation does not come to institutions of learning by accident or coincidence.
- They must be planned. Institutions must develop their capacity to innovate. In this unit, we will explore what innovations are, the characteristics of innovations, and how they are developed, transferred and implemented.
- We will also learn about practices that promote creativity and innovation and examine innovative initiatives that can be emulated.





Upon completion of this unit, you will be able to:

a) Demonstrate understanding of how innovations are developed, transferred, and diffused;

b) Promote practices that enhance creativity and innovation through educational leadership;

c) Identify innovation initiatives in educational environments

The Concept of Innovation

- Innovation is an idea, behaviour, or object that is perceived as new by its audience.
- It is also referred to as a new approach that brings an improved result.
- It is described as a new process, product, service, design, form of organization, or function of production that may lead to increased productivity and widespread market adoption and expansion.
- Innovations can be material or non-material.

According to the ST&I Act (2013) innovation includes;

a) A technovation model, utility model, or industrial design within the meaning of the industrial property act, 2001;

b) A product, process, service, or idea which is novel;

c) Improved use of a new product, service, or method in the industry, business, or society;

d) Indigenous or traditional knowledge by a community of beneficial properties of land, natural resources, including plant and animal resources and the environment, or;

e) Any other non-patentable creations or improvements which may be deemed as deserving promotion and protection or sui generis intellectual property rights and "innovator" shall be construed accordingly

Characteristics of Innovations

- As an education manager, you will be called upon to be innovative and mentor innovation in your institution. The innovation you develop will have a variety of characteristics. You need, therefore, to be in a position to identify innovative ideas when they emerge.

A. **Relative advantage**:

This **r**efers to the degree to which the innovation is perceived as better than the idea it supersedes. Relative advantage may also refer to the extent to which the innovation is more productive, efficient, cost-effective, or improves in some other manner, upon existing practices. It might seem like relative advantage alone should be enough to persuade persons to adopt an innovation. Certainly, a relative advantage is a key indicator of adoption. But sometimes relative advantage is a matter of debate

B. Compatibility:

- The degree to which the innovation is perceived as being consistent with existing values, past experiences, and needs of potential adopters.
- Compatibility is the trump card for all innovations, even those with high relative advantage. Innovation must be considered socially acceptable to be implemented.
- Some innovations require much time and discussion before they become socially acceptable. This may be due to:
  - If the idea seems ethically irreconcilable with existing norms, then the innovation may face difficulties to be adopted (e.g., euthanasia for the terminally ill is having a hard time catching on with the public; human cloning might never be accepted; the use of self-driven vehicles).
  - If the innovation is very or even a little bit different from the current practices, then adoption may be difficult (eg. The use of digital currency has taken lengthy discussions even in developed countries)

C. **Complexity:**

- It is the degree to which the innovation is perceived as difficult to understand and use. Innovation need not be particularly complex from the viewpoint of its users. It is the perception of the end user that means
- the most for achieving public adoption of new technology.

D. **Trialability (Piloting)**:

- It is the degree to which the innovation may be experimented with on a limited basis. Innovations are easier to adopt if they can be tried out in part, temporarily, or easily dispensed with after
- trial. For example, the famous mobile money transfer in Kenya had this capacity at the initial stages and even upgrades are usually piloted before full-scale implementation.

E. **Observability:**

- It is the degree to which the results of the innovation are visible to others hence the chances of adoption are greater if people can easily observe the relative advantages of the new technology.

The stages of an Innovation

Stage 1: Idea generation and mobilization	The generation stage is the starting line for new ideas. Successful idea generation needs to be fueled by both the pressure to compete and the freedom to explore. Once a new idea is generated, it passes on to the mobilization stage, wherein it travels to a different physical or logical location. Since most inventors are not also marketers, a new idea often needs someone other than its originator to move it along. This stage is vitally important to the progression of a new idea, and skipping it can delay or even sabotage the innovation process.
Stage 2: Advocacy and screening	This stage involves weighing an idea's pros and cons. Advocacy and screening have to take place at the same time to weed out ideas that lack potential without allowing stakeholders to reject ideas impulsively solely on the basis of their novelty. Most companies achieve more success when the evaluation process is transparent and standardized because employees feel more comfortable contributing when they could anticipate how their ideas would be judged.
Stage 3: Experimentation	The experimentation stage tests the sustainability of ideas for a particular organization at a particular time and in a particular environment. At this stage, it is important to determine who the users will be and what they will use the innovation for. With that in mind, the company might discover that although someone has a great idea, it is ahead of its time or just not right for a particular market. However, it is also important not to interpret these kinds of discoveries as failures. They could actually be the catalysts of new and better ideas if refined.

Stage 4: Commercialization	In the commercialization stage, the organization should look to its customers to verify that the innovation actually solves their problems and then should analyze the costs and benefits of rolling out the innovation. An invention is only considered an innovation once it has been commercialized. Therefore, the commercialization stage is an important one, similar to advocacy in that it takes the right people to progress the idea to the next developmental stage.
Stage 5: Diffusion and implementation	The diffusion and implementation stages are two sides of the same coin. Diffusion is the process of gaining final, company-wide acceptance of an innovation, and implementation is the process of setting up the structures, maintenance and resources needed to produce it. A good example of a successful approach to diffusion comes from International Business Machines Corporation, which involves its employees early in the idea-generation stage and conducts so-called innovation jams, to which they invite not only employees but also clients, business partners and even employees' families. IBM aids later diffusion by giving everyone a stake in the idea from the beginning

Innovation adoption

- Innovation adoption entails the uptake of innovation for utilization. Individuals' uptake of innovation takes different trajectories. Thus, innovation adopters come in five categories;

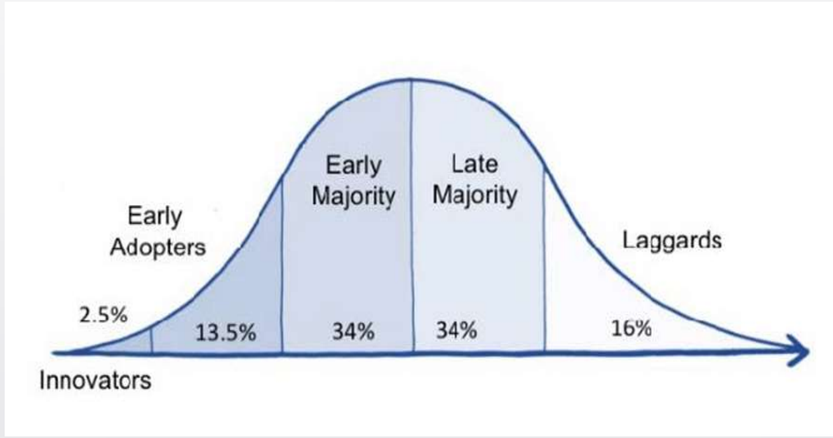
i. **Innovators (risk takers)** – are the first individuals to adopt an innovation. They are willing to take risks,

ii. **Early adopters (hedgers)** – are the second fastest category to adopt an innovation,

iii. **An early majority (waiters)** – the third group, tends to take more time to consider adopting new innovations and is inclined to draw from feedback from early adopters before taking the risk of purchasing new products/systems.

iv. **A late majority (sceptics)** – adopts the innovation after it has been established in the marketplace and is seldom willing to take risks with new innovation, and;

v. **Laggards (slow pokes)** – are the last to adopt an innovation. They tend to prefer traditions and are unwilling to take risks



- To promote innovation uptake and hasten the process, promoters of innovation adoption need to be aware of the following steps that are key to decision-making units which could be individual users or organizations;

Knowledge	The decision-making unit is made aware of the innovation. The innovation could be new hardware, software, methodology, or tools. The innovation can be communicated via various methods such as advertising, word of mouth, formal education, or training among others
Persuasion	The decision-making unit forms an opinion toward the innovation. This opinion could be favourable or unfavourable.
Decision	The decision-making unit decides either to drop (reject) or accept (adopt) the innovation. Usually, the decision to adopt or reject would be made based on a trial period. The result would determine whether to adopt or reject the innovation. External parties might be involved by providing an opportunity to demonstrate the innovation.
Implementation	The decision-making unit uses innovation. The implementation stage would end when innovation becomes an integrated part of the adopter ‘s life or the innovation is perceived as useless.
Confirmation.	The decision-making unit confirms or reverses the decision to reject or adopt the innovation made in the previous stage. The reason for this change is that information (feedback) received about innovation may have conflicted with the previous beliefs.

Technology Transfer

- Technology Transfer is a process through which technical information and products developed by the innovator are provided to potential users in a manner that encourages and accelerates their evaluation and/or use.
- More than merely disseminating information, technology transfer techniques feature marketing of ST&I products as well as demonstrating the use of these new technologies when necessary.
- Technology transfer activities include the proactive identification of innovations with a high potential for commercialization; the identification of market segments and user groups; ways to advertise and highlight these products; and assistance in commercializing innovations

Specific benefits of technology transfer include:

i. It encourages the use of technology developed using taxpayer money to benefit society.
ii. It demonstrates research program relevancy and value.
iii. It permits innovators or researchers to partner with the private sector, leverage resources, and share ideas in a protected environment.
iv. It gives increased visibility to researchers/innovators and enables them to generate and earn royalty income.

Inventions and Patents

- The rights to intellectual property can be bought and sold, leased or rented, or otherwise transferred between parties in much the same way that real property or other personal property can be transferred.
- Intellectual property is often a substantial component of the technology transfer process. It must be protected in the transfer of technology to ensure the commercial viability of the technology.
- Intellectual property is most often transferred through contracts or licenses. Some of the ways of protecting innovations include patents, copyrights, trade secrets, trademarks and trade names.
- Intellectual Property (IP) is intangible property arising from human intellect that can only be protected upon expression. Like tangible property, it can be owned, administered by states, sold (assigned), leased (licensed), developed (exploited) and is usually enforceable by the law.

Patenting Intellectual Property

- It is important to identify and protect innovative ideas generated in an institution through its individuals. A school environment that promotes research is likely to generate viable ideas for commercialization. It is of essence to protect such ideas which constitute Intellectual Property.
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- Intellectual Property is protected in Law by use of: Patents, Copyrights, Trademarks, Industrial designs, Geographical Indications and Traditional Knowledge. Under Article 11 (2) (c)of the Constitution of Kenya; the State shall promote the intellectual property rights of the people of Kenya.
- Kenya is one of the members of the African Regional Industrial Property Organization (ARIPO). ARIPO is based in Harare, Zimbabwe. Kenya is also empowered by the Harare protocol on patents and industrial designs to grant patents and register industrial designs on behalf of states also signatory to this protocol. The country is a signatory to a number of key international IP (Intellectual Property) agreements, one of such being the Trade-Related Aspects of Intellectual Property Rights (TRIPS) agreement of the World Trade Organization (WTO).
- The United Nations global World Intellectual Property Organization (WIPO), is an international organization designed to promote the worldwide protection of both industrial property (inventions, trademarks, and designs) and copyrighted materials (literary, musical, photographic, and other artistic works).

- IP protection agencies in Kenya are the Kenya Copyright Board (KECOBO), Kenya Intellectual Property Institute (KIPI) and the Anti-Counterfeiting Agency (ACA).

Types of IPR

Patent

- A patent is a government-granted monopoly to build, sell, and use your invention while preventing others from doing so.
- If you are issued a patent, it's usually good for a specified period. After the allocated time is over, your patent expires and anyone can copy, build, and sell your invention. In exchange for the monopoly, one must disclose the details of the invention to the public so that someone practiced in the arts could recreate it.
- Kenya Industrial Property Institute (KIPI) is responsible for examining and granting patents in Kenya. KIPI operates under the Industrial Property Act 2001.
- An application for the grant and registration of a Kenyan patent may be filed by the inventor or any other person to whom he/she has transferred the right. It is presumed that a legal entity does not have the ability to invent or create but rather it is the *natural persons* working for that legal entity (eg. A school).
- It is on this basis that it is necessary when a legal entity is filing the application, the application be accompanied by a statement justifying the applicants right to a patent.

Copyrights

- Copyrights protect original works of authorship, such as paintings, photographs, musical compositions, sound recordings, computer programs, books, blog posts, movies, architectural works, and plays. Copyrights protect expression of new ideas, procedures, methods, systems, processes, concepts, principles, or discoveries.
- Copyright law provides copyright owners with the following exclusive rights (among others):
  - Reproduce the work
  - Prepare derivative works
  - Distribute copies by sale, transfer of ownership, or license
  - Perform or display the work publicly
- Kenya's 2021 Copyright Amendment Act was signed into law on 4 April 2022. It introduces a new royalty sharing formula which entitles musicians and performing artists to receive a guaranteed 52% of revenues generated from the licensed use of music for ring-back tones used by telecommunications companies. What does this mean to the education sector? What about the music and films produced during the Kenya Music Festival?

Trademarks

- A trademark can be any word, phrase, symbol, design, or combination of these things that identifies your goods or services — it's how customers recognize your company in the marketplace.
- We tend to use the term "trademark" generically as referring to both trademarks and service marks.
- A trademark is used for goods; a "service mark" is used for services.
- Kenya Industrial Property Institute (KIPI) a parastatal under the Ministry of Industrialization, Trade and Enterprise Development is responsible for Trademark registration in Kenya.
- Trademarks in Kenya are categorized in accordance with the International Classification of Goods and Services as provided for under the NICE protocol.

Industrial designs

- Industrial design simply refers to the outward appearance of a product.
- The special designs of some products may give them an edge in the market based on visual appeal.
- This form of IP protection seeks to protect the unique design patterns of some products.

Geographical Indication

- A geographical indication (GI) is a sign used on products that have a specific geographical origin and possess qualities or a reputation that are due to that origin.
- In order to function as a GI, a sign must identify a product as originating in a given place.
- Lessos are known to form part of women dressing and originates from the coastal region of Kenya.

Indigenous Knowledge

- Traditional knowledge refers to: knowledge or practices passed down from generation to generation that form part of the traditions or heritage of Indigenous communities, knowledge or practice for which Indigenous communities act as the guardians or custodians.
- For instance, knowledge on a particular herbal remedy.

Practices that enhance creativity and innovation

- Creativity is a crucial component of our capacity to innovate.
- Innovation is critical in developing a competitive edge in performance and also to improve the quality of life and development.
- Education and training are core tools for helping people develop talent and creativity.
- This underpins the inclusion of innovation and creativity as key competencies being developed through Competency Based Curriculum (CBC) and Competency-Based Education and Training (CBET).
- Creativity and innovation in learners could be nurtured by teachers adopting teaching-learning approaches that enable learners to develop critical thinking capabilities and engaging practical work and research during learning processes.

In order to enhance creativity in education processes, the following is recommended:

a) **Integration:** Inventive creativity is made an explicit goal of education at all levels for solving societal problems.

b) **Higher education:** Higher education institutions should offer a wide variety of courses on invention and the inventive process, including hands-on activities, visual thinking experiences, and —how things work exercises for all students.

c) **Infuse design-oriented activities:** Infuse design-oriented and realistic, open-ended applications into all courses-where the primary aim is to teach the important principles of a field in ways that will promote creativity in the application of these principles. If students experience design-oriented activities in all disciplines, they will be more likely to develop a deeper understanding of the creative process itself, independent of any discipline.

d) **Exchange mechanisms:** Develop exchange mechanisms for the sharing of materials, ideas and approaches for effective teaching of inventive creativity. This includes sharing within and between educational institutions like primary, and secondary schools and other higher institutions of learning.

e) **Technical training institutions:** Technical training institutions in particular and other institutions, in general, should implement and promote criteria that give importance to invention and teaching of inventiveness.

f) **Learning materials:** Similarly, technical institutions should encourage the development of a new set of learning materials that unites the teaching of principles and the fostering of the invention. This can be achieved, in part, through the inclusion of new sets of open-ended problems through which the principles are learned.

g) **Research:** There is a need for a substantial increase in research on the process of invention and teaching of inventiveness. This should include research aimed at a deeper understanding of the creative mind and creative environment, as well as research on the measurement of inventiveness, diffusion of the teaching of inventive creativity, and the study of rapid learning as part of the boundary transgression that is at the heart of inventions ‘practised, learned and celebrated.

h) **Courses:** There should be a robust combination of courses throughout the curriculum specifically on design, visual thinking and invention. Problem solving, invention and design are a key organizing framework for courses teaching fundamental principles in technology, and in other domains, including the sciences, the social sciences and the humanities.

Innovation initiatives

I. Technology/Science parks:

- A technology or science park is an area managed in a manner designed to promote innovation. It is managed by specialized professionals, whose main aim is to increase the wealth of its community by promoting the culture of innovation and the competitiveness of its associated businesses and knowledge-based institutions. To enable these goals to be met, a technology or science park stimulates and manages the flow of knowledge and technology among education institutions, R&D institutions, companies, and markets.
- The objectives of technology or science parks are to;
  a) Foster the technologies of the future;
  b) Stimulate science-based technological innovation;
  c) Encourage spin-off firms started by academics.
  d) Encourage and facilitate links between higher education institutions (HEI) and industry;
  e) Facilitate technology transfer from academic institutions to park firms;
  f) Commercialize academic research;
  g) Engender an entrepreneurial culture;
  h) Generate income for the academic institutions;
  i) Create convenient environments for high-tech firms to conduct their R&D studies.

Planning for a science technology park involves the following

- Bringing together the right mix of partners;
- Undertaking a feasibility study and developing a master plan;
- Preparing a business plan and marketing study;
- Identifying a project champion to manage the creation of the Park;
- Creating the appropriate vehicle to run the project;
- Creating the developing team;
- Implementing development;
- Site promotion/marketing;
- Developing a package of business support services;
- Building a management system, and;
- Bench-marking performance.

II. Technology Incubation centres

- Incubators nurture young firms, helping them to survive in their early stage. Incubators provide infrastructural support i.e. office space, meeting room, platform to do networking, management assistance and other support services, specific to incubators.
- A technology-incubating program is an innovative system designed to assist entrepreneurs in the development of new technology-based firms, both start-ups and fledglings. It seeks to effectively link talent, technology, capital and know-how to leverage entrepreneurial talent in order to accelerate the development of new companies, and thus speed the commercialization of technology.

Starting a technology incubation centre

- To successfully start an incubation center, the steps to be followed are:

Step 1. The feasibility study: Conduct a feasibility study for a proposed incubator to achieve several important objectives and, if this is properly done, can provide a solid basis for judging the economic and political viability of the proposed project.

The reasons for conducting a feasibility study are;

To help forge a consensus among key organizations and civic leaders;

- To catalyze the involvement of organizations that can provide the incubator with a range of resources including facilities, funding, equipment, and human resources;
- Allows for the completion of plans for both the facilities and the services to be provided;
- Helps secure funding from government sources at all levels;
- Educates public and private sector constituencies about business incubation to avoid confusion and unwarranted expectations;
- Provides an occasion to contact successful incubator programs in similar communities to learn their best practice lessons.

- **Step 2. Building support:** A core group committed to starting a business incubator must recognize that its efforts cannot be pursued in a vacuum. The dream of a few must become the dream of many. An incubator represents an important community investment, both practically and symbolically, and requires broad-based community support to be feasible.
- The importance of building support is due to the following reasons:
  a) Provides information on the business incubation industry;
  b) Invites reaction to the prospects for a local business incubator
  c) Solicits referrals to people, companies, organizations, and facilities that can assist the process of feasibility and/or development;
  d) Offers opportunity of direct participation, to seek specific leads to entrepreneur prospects and/or
  e) Gather information that had been overlooked

Step 3. Identifying and securing stakeholders:

- A stakeholder is any group or individual who can affect or is affected by the achievement of an organization‘s objectives. While each incubator's circumstances are unique, anticipated stakeholders would likely include local and state governments and a variety of public and private sector organizations interested in fostering new-business development in the region.
- Stakeholders need to be identified and then cultivated.
- The first step is to secure a commitment from potential stakeholders who have the strongest interest and who are most likely to provide financial support for the endeavour.
- Once stakeholders have committed to support the project, the organizational structure needs to be formalized.
- A governing body, typically a board of directors, provides the organizational vehicle for maintaining, building, and strengthening commitment to the incubator program.

Step 4. Identifying a market niche: A business incubator will operate in a particular locale with its rich history.

- The entrepreneur must target the regional economy and existing institutions. To become an accepted part of this complex social fabric, an incubator must establish its distinctiveness and unique purpose.
- From a business perspective, the incubator needs to identify its market niche (a competitive edge).
- Successful businesses carefully define their market position, products and services in relation to their competitors.
- They also have to be sensitive and responsive to the ever-changing customer preferences.

Key success factors in managing incubation centres

Successful management of the incubation centres requires a provision of transformative leadership. The salient activities for success at each level include:

i. **Preparatory Process that entails:** Identification surveys to selected locations; involvement of local consultants who are familiar with local conditions; identification of a strong sponsor; resolution of issues concerning feasibility and commitment by governmental agencies.

ii. **The Implementation Process involves** A strong management board with advisory groups; appropriate legal status for the incubator; careful selection; training at home and abroad; proper remuneration of managers; screening of the technical business and market potential of tenants; wise capital expenditure on building renovation and furnishing; a promotional campaign to mobilize community support and sound national/international technical assistance to supplement local skills.

iii. **The Sustainability of Incubator Operations needs** Imaginative ways of raising income; an objective evaluation of the incubator experience; political stability; macro-economic policy structure and a regulatory framework that encourage entrepreneurship.

Conclusion

- We have come to the end this unit where we looked at the concepts of innovation development, transfer and dissemination.
- We have examined the characteristics of innovations and various ways of encouraging innovations in our schools.
- We have also looked at the importance of patenting as a way of protecting intellectual properties rights.
- We have ended the unit by looking at various ways of encouraging innovations.
- We hope ypu can now be able to identifying innovative ideasfrom learners and help them to nurture those ideas.