Lecture 3: Technology Life Cycle (TLC) & Technology Forecasting

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MANAGEMENT OF TECHNOLOGY AND INNOVATION (MTI)

Mr. Robert Mtowe – 0766838451

Mbeya University of Science and Technology - MUST

TOPICS:

- What is strategic planning
- What is TLC and its importance
- Stages of TLC
- Factors influencing TLC
- What is technology forecasting and its importance
- Methods of technology forecasting
- Challenges and limitations of technology forecasting
- Applications of Technology forecasting

Strategic Planning:

- A systematic process of defining goals and direction of an organization and allocating resources to attain the objectives is a **strategic planning**.
- It used to foresee challenges that may occur also helps an organization to develop new flexible invention that will adopt temporary changes of TLC hence solve the **uncertainty** challenge of MTI.
- Example, Mobile phone company may use strategic planning to plan the new features, target audience and market for new phone before release.

Technology Life Cycle (TLC):

- **TLC** refers to the process or stages whereby technology being developed, introduced, adopted and diffused.
- It starts from the creation of technology up to when it become outdated by new technology replace it.
- It is important to every innovator to know the process of TLC as:-
  - Help to **decide when to invest or phase out new technology**. Example, A company can focus on innovation during the introduction of technology.

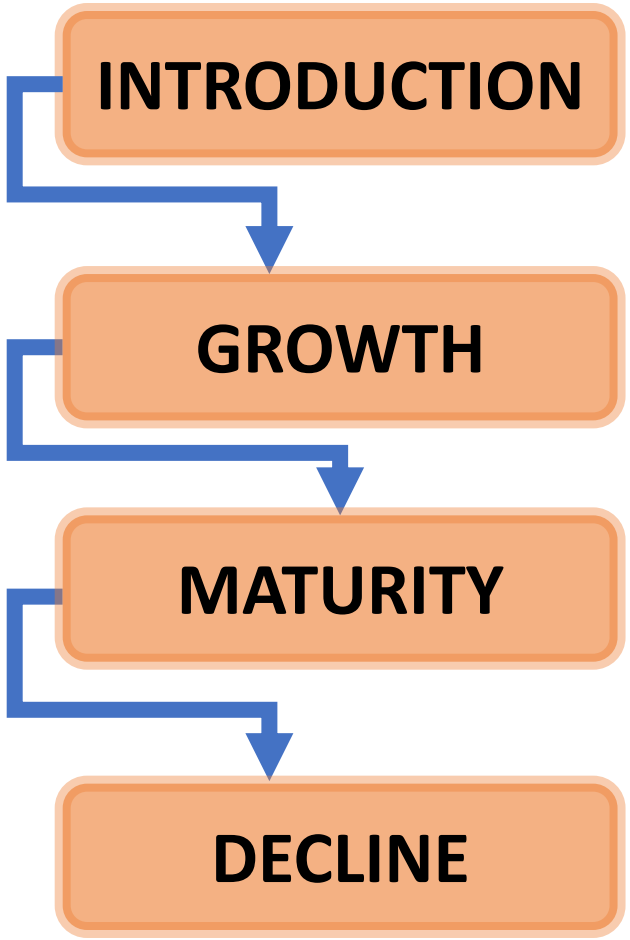
Technology Life Cycle, (Cont..)

- Helps in **proper resource allocation** (money, people and time) for example, higher R&D is needed in introduction stage hence more resources.
- Scanning the TLC for a technology can ensure to **gain a competitive advantage** by innovating technologies at a right time, Example Apple company stay competitive by identifying when to enhance their products.

Stages of Technology Life Cycle (TLC).

- Stages of TLC are the phases in which a technology goes through from creation up to be outdated.

- There are four stages of TLC:
  - Introduction
  - Growth
  - Maturity and
  - Decline.



Stages of TLC, Cont..

a. Introduction,

- It involves the development and introduction of new technologies.
- R&D is highly invested for customers and market research.
- As a technology is still new, it is less adopted and unfamiliar to the society hence few number of people emerge to use it.
- High risk of failure.
- Example, Tesla's electric vehicles are on introduction stage of TLC, it is less adopted and still unfamiliar to the society.

Stages of TLC, Cont..

b. Growth ,

- Technology has more adopted and already familiar to most of people.
- It’s market acceptance increases and become popular.
- Increased profitability hence the competition from others start to emerge as it has already proves it’s benefits.
- Example, Artificial Intelligence (AI) technology, seems to be on the stage of growth, It has adopted on over the world and most of company try impose it to increase efficiency and productivity .

Stages of TLC, Cont..

c. Maturity ,

- In this stage, technology become widely used and the growth slows.
- Technology become standardized and improvements are made to it.
- Increased competition and the cost goes down.
- Minor features to the technology will determine the strong competitor e.g. camera quality ,battery life, software enhancements.
- Example, Smartphones are in maturity stage and iPhone smartphones seems to lead competition due to the minor features added to it.

Stages of TLC, Cont..

d. Decline stage ,

- Technology seems to be normal thing, the demand declined and loosing market share.
- Newer innovations rise and replace the former technology.
- A company discontinue produce the technology or transition to alternative technologies.
- Example, Smartphones with 2G, 3G become declined as the 4G and 5G smartphones are popular.

Factors influencing TLC:

- **Market demand**, technologies with higher demand tend to grow faster. Example, (Artificial Intelligence) AI is growing faster as in now days it is mostly demanded and usable in many areas.
- **Competition**, Rival technologies can shorten a lifecycle of a certain technology itself or other. Example DVDs (Digital Versatile Disk) replaced VHS tapes quickly due to more competition on it.

- **Regulations**, also the presence of regulation such as government policies can facilitate the TLC stages, for example Renewable energy comes to grow faster as the policy tend to minimize the use of traditional sources of energy like charcoal.

Technology Forecasting:

- **Technology forecasting** involves predicting of future trends and developments in technology so as to ensure strategic decisions.
- Now world Most competitors use technology forecasting so as to be the first to utilize the future trend hence competitive advantage.
- Identifying emerging trends helps in effective resource allocation.
- It enables businesses to stay ahead of market changes and drive competition, as it is familiar to the future technological trends.
- Also high R&D investments can be easily guided toward that trends.

Methods of Technology Forecasting:

- There are two main methods of technology forecasting;
  - Qualitative method
  - Quantitative method.
- **Qualitative method**,
  - Rely on expert judgement, opinions and non-numerical data.
  - Use emerging technology to predict due to scarce historical data.
  - Qualitative method includes methods like **Delphi method**, **scenario planning.**

Qualitative method Cont..

a) Delphi method,
   - A structured and iterative process that gathers input from a panel of experts, through the series of questionnaires.
   - More rounds are involved and expert's opinions are given in each one.
   - Example, Delphi method may be used to ask AI researchers about future AI capabilities.

b) Scenario planning,
   - Involves creating different probable future scenarios based on various expectations about technological developments.
   - Example, Predicting future Electric vehicles adoption will vary based on government policy, battery tech and charging infrastructure.

Quantitative method

- **Quantitative method,**
  - This relies on numerical data, statistical models and mathematical techniques to predict future technology trends.
  - The presence of historical technological data hence it is data-driven.
  - methods like **Trend analysis**, **time series analysis** and **simulation method** are quantitative methods.

a) Trend analysis,

- Examining past and current trends to predict future technology trends or advancements. Example, analyzing the growth of smartphones, company can plan for product launches as smartphone still on trend and grow.

Quantitative method Cont..

b) Time series analysis,
   - Time-ordered data points are recorded overtime.
   - Examining those data points enable predictions about future technology trends.
   - Example, Basing on past release cycles of processors, then the next generation of processors may be predicted.

c) Simulation methods,
   - Computer-based models used to imitate real-world processes and predicting the future technology trends based on known variables.
   - Example, simulation on the renewable energy adoption on the power grid using variable like energy demand and weather patterns.

Challenges and limitations of forecasting:

- **Uncertainty**, technology it self is unpredictable may be due to rapid changes, so even predicting future trends also become difficult, Example, Predicting the 4G technology, unexpectedly 5G emerge faster hence disrupt investments.
- **Human bias,** Expert opinions may be influenced by personal biases result to inaccurate predictions, Example, Fail of Microsoft's Zune over iPod's because of focusing replicating iPod's features without understanding consumer demand.
- **Resource limitations,** High-quality data may be scarce and expensive to collect for emerging technology, Example, Predictions on internet was data-limited hence its growth and impact was underestimated

Challenges and limitations, Cont..

- **Global variations,** Difference in regulations, economies, and cultural acceptance across regions complicate forecasting. Example, Predicting wide spread of renewable energy, but overlooking the slower progress in developing countries due to financial and infrastructural challenges.
- **Inflexibility,** Forecasts may not well adopt the sudden changes like economic crisis, market changes and so on, for example, Blockbuster's failure to adopt to online streaming services while predicted to be a leader in movie rentals sticking to its physical DVD's and CD rental model.

Applications of technology forecasting:

- **Product development,** Company like Apple and Samsung forecast the future consumer needs so as emerge it in their products.
- **Policy formulation**, Government use technology forecasting to develop policies related to emerging technologies such as renewable energy.
- **Education and training**, Learning institution like universities use technology forecasting to design curricula that prepare students for emerging technologies like blockchain and data science.
- **Investment decisions**, Investors forecast the emerging successful technology and identify investment opportunities.
- **Risk management**, Example, Energy companies predict shift to solar energy as future trend so as to prepare for market disruptions.

UNTIL NEXT LECTURE