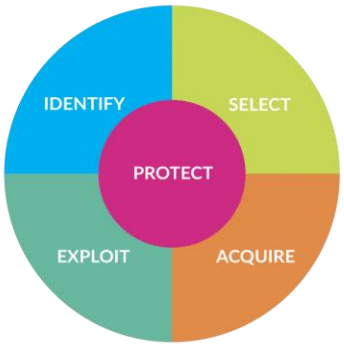
Technology Management: Management of innovation and changes, Technology life cycle, case study.

Technology Management: Technology management can also be defined as the integrated planning, design, optimization, operation and control of technological products, processes and services, a better definition would be the management of the use of technology for human advantage.

Technology management framework

This also means that in order to maintain its competitive edge, a company needs to consider a technology management and strategy that is perfectly aligned with its broader business strategy**.** This technology management 'roadmap' consists of five phases:



- **Identify** relevant technological evolutions (monitoring, concept generation).
- **Select** technologies that fit your business strategy.
- **Acquire** the selected technologies (internal or external).
- **Exploit** the technologies and integrate them within the company's next-generation products, processes and services in line with market and business drivers.
- **Protect** the technology and expertise through copyrights, trademarks, patents, etc. to ensure that only the firm benefits.

Innovation

Innovation can be new ideas, new devices or new processes. It can be defined as something original and new being introduced to the world.
Innovation often refers to something new, such as an invention, or the practice of developing and introducing new things. In the tech world, an innovation is usually a new product, but it can also be a new way of doing something or even a new way of thinking.

Innovation management

Innovation management involves the process of managing an organization's innovation procedure, starting at the initial stage of ideation, to its final stage of successful implementation. It encompasses the decisions, activities and practices of devising and implementing an innovation strategy.

Innovation management methods

Broadly speaking, innovation can be incremental, breakthrough or disruptive.

- **Incremental**: In an era where businesses are required to constantly reinvent themselves, incremental innovation helps them thrive by constantly improving current products, services, processes or methods.
- **Breakthrough**: A breakthrough innovation refers to technological advancements that can boost the level of a product or service, within an existing category, ahead of its competitors.
- **Disruptive**: Disruptive innovations are ideas that are capable of radically changing the market behavior after being implemented.

Change

Change can be defined as the "difference in a state of affairs related to different points of time". Time dictates change, so the change needs to be conceptualized at different stages of a certain factor. It may be organizational or personal. The change could be an act of making (intentional) or becoming (natural). Change always would have two stages. One is the previous or old stage, and the other is the new stage (after the change). Knowledge of both stages is a prerequisite to confirm a change has taken place. It's a comparison of different stages and evaluation of the differences between such stages. The change could have been positive or negative. iPhone 5 has been replaced with iPhone 6 which is a good example of change.

Change management

Change management is a systematic approach to dealing with the transition or transformation of an organization's goals, processes or technologies. The purpose of change management is to implement strategies for effecting change, controlling change and helping people to adapt to change.

Principles of change management

The 5 key Change Management Principles that you need to focus on are:

- Identify the ROI or Change Benefit.
- Build a Coalition for Change.
- Assess organisations' readiness.
- Personalize the change, making it relevant to everyone affected.
- Measure to sustain performance of change

Management of innovation and changes: Innovation management is a combination of the management of innovation processes, and change management, It refers both to product, business process, and organizational innovation. Innovation processes can either be pushed or pulled through development.

Six Effective Ways to Foster Innovation

1. Maintain an open dialogue between employees and upper management

Dialogue will effectively motivate and engage employees. Always allow employees to present their ideas before important decisions are made. Provide feedback to employees, even when their ideas are not used, so that they know that they are not being dismissed. Encourage communication between departments: Collaboration between members of different departments often results in creative solutions for problems. Interdepartmental communication facilitates trust and prevents conflict. Departments that do not communicate are more likely to blame each other when problems arise.

2. Organize brainstorming sessions

IBM has found the innovation jam to be quite successful. Since 2001, jams have allowed hundreds of thousands of IBM employees around the world to connect and come up with innovative solutions for company problems. You do not need to run a global enterprise to benefit from companywide collaboration. Give your employees regular opportunities to bounce ideas off each other.

3. Engage employees by encouraging them to share creative ideas

Do not limit creativity to special occasions. Employees should be encouraged to continually share their ideas with supervisors and each other. Find the most effective method of communication for your organization. You may want to create a type of suggestion box or schedule time at the end of meetings for people to share their ideas.

4. Do not force people to be innovative

Creativity can be encouraged but not compelled. Forcing people to present creative ideas at certain times will not bring true innovation. Rather, create a number of different incentives to draw out creativity. Innovative ideas could be rewarded financially, with opportunities for advancement or any other incentive you have found effective for your employee base.

5. Remain flexible and forgiving

Inflexible environments discourage innovation. Innovation often involves taking risks. Encourage employees to think outside the box and implement ideas without interference. Additionally, do not punish employees if ideas are unsuccessful. Employees who are punished for taking risks serve as a warning to others against being creative or innovative.

6. Keep track of company innovations

Many leaders in upper management lose interest in supporting creativity and innovation because they do not bother to keep track of past innovations. Knowing how many employee innovations have been implemented and how successful they are, presents a clear picture of the financial benefits of employee creativity. Keeping track of innovations will also indicate whether any alterations need to be made to recently implemented programs or the company culture.

Difference between Innovation and Change

	Innovation	Change
Definition	Innovation is something original and new, being introduced to the world. It can be new ideas, new devices or new processes.	The difference in a state of affairs related to different points of time.
Knowledge	Previous knowledge is not necessary for innovation to happen	Previous knowledge and resources are required for a change to happen.
Comparability	Innovation is not easily comparable as it does not have near factors to be compared with as it's unrelated in	Change is comparable with a previous situation or product and is relative in nature.
Need	Innovation will be the answer to satisfy an unsatisfied need which did not have a solution earlier.	Change will only improve on the ability to satisfy a need which already has a solution. Change will not assist in answering an unsatisfied
Continuity	Innovation is discontinuous in nature and usually originates from perceptional change.	Change is a continuous and natural process of adoption and efficiency improvement.

Why Innovation is important?

Studies have confirmed that all businesses want to be more innovative. One survey identified that almost 90 per cent of businesses believe that innovation is a priority for them. The conclusion is that the importance of innovation is increasing, and increasing significantly. In the current day economic scenario, innovativeness has become a major factor in influencing strategic planning. It has been acknowledged that innovation leads to wealth creation. Even though efficiency is essential for business success, in the long run, it cannot sustain business growth.

Most often planned and measured a combination of ideas, objects, and people leads to innovation resulting in new business ideas and technological revolutions. In order to be termed valuable innovations, new products and services need to be strong enough to progress through rigorous commercialization processes and into the marketplace. Management expert Peter Drucker said that if an established organization, which in this age necessitating innovation, is not able to innovate, it faces decline and extinction. Many organizations are adopting measures to strengthen their ability to innovate. Such companies are creating a dependable operating system for innovation, an important indicator of corporate sustainability.

Research has indicated that competition combined with strong demand is a major driver of innovation. The intensity of competition is the determinant of innovation and productivity. Innovation, besides products and services, also includes new processes, new business systems and new methods of management, which have a significant impact on productivity and growth.

Today, we need innovators more than any time before. Every organization and business are feeling the impact of globalization, migration, technological and knowledge revolutions, and climate change issues. Innovation will bring added value and widen the employment base. Innovation is imperative if the quality of life in these trying circumstances is to improve. Innovation will make the world a better place for the younger generation.

8 reasons why innovation is important to businesses today

1. The word is full of problems that are hard to solve and aren't going away

Albert Einstein famously said that **"we cannot solve the problem with the same thinking we used when we created them".** So simple conventional linear planning and problem solving processes using the same thinking that created some of these undesirable problems in the first place aren't not going to result in the visionary, creative ideas and innovative solutions required to solve them. The first thing about understanding innovation is that it is, in essence about seeing, perceiving and solving problems in creative ways! It requires a sense of urgent passionate purpose and visionary dreaming and thinking to play with solving wicked problems so as to improve the quality of people lives and the way we live.

2. Adapting to Black Swan Events

Black Swans are random and unpredictable events that cannot be anticipated and require us to find new ways of responding and adapting to them, and their impact, when they happen. So be-ing innovative involves be-ing willing and competent in adapting and in knowing how to think differently. Knowing both how to think analytically and laterally as well as knowing how to think at the critical, creative and associative levels. To see and solve problems and to respond to Black Swan Events and external crises in different ways to transform them into creative ideas and innovative solutions that people value and cherish.

3. Taking advantage of the global entrepreneurship movement

Entrepreneurship is becoming a global movement and entrepreneurship is growing especially in emerging markets, where China and India are leading the pack and Africa is predicted to be the next hot spot. There are three particularly "Hot" sectors that include people who really want to 'both' take self responsibility for their futures, by contributing towards making the world a better and more sustainable place 'and' make a difference via the social, women and youth sectors. This movement is being powered by governments realizing that entrepreneurship is a vehicle of economic success and prosperity, by organizations realizing that they can harness the collective genius of their people through building an entrepreneurship capability and finally by the rise of new impact investors. Innovation is an enabler of entrepreneurship as well as a way of empowering and enabling people to take control of their lives and manifest their own destiny and economic prosperity.

4. Competing via blue ocean possibilities with lean & agile start-up methodologies

In their book Blue Ocean Strategy research proves that there are no permanently excellent companies, and that organizations, like people, all do smart and less smart things. They suggest that what matters is making smart strategic moves and that the strategic move that matters centrally is to create 'blue oceans' of disruptive, new and uncontested markets. The emerging business paradigm is shifting towards discovering blue oceans that incorporate lean and agile start-up methodologies as a way of innovating businesses to create increased value for customers that they value and cherish**.**

5. Flowing with advances in technology

The advance of digitization enabled largely by the internet of things has created the connection and sharing of data between digital devices, ranging from household devices and heating systems to automobiles, and even jet engines. This connectivity and the resulting aggregation of data is creating entirely new business models and revenue streams, both for startups and established companies that leverage existing assets in exciting, profitable new ways. It also is changing the basis of competition as companies can now compete as part of ecosystems. The increasing availability and accessibility to free and low cost online education is encouraging and enabling almost anybody with a desire for learning and a hunger for knowledge to become subject matter experts in their fields. Innovative entrepreneurs and lean start-ups are proliferating by via the internet of things, always connected mobile devices, cloud computing and via the social media. Especially by the development of software applications aimed at improving the quality of people's minds and lives everywhere.

6. Adapting to changing workplace dynamics and trends

As more baby boomers retire and conventional succession planning processes become obsolete, the ageing demographic globally is the new tidal wave incurring financial demands on already exhausted financial systems. Millennial are also swapping jobs at increasing rates as they seek more meaningful work, autonomy and equality. Hiring processes are shifting as more recruiters rely on internet based social processes where 'reputation' is fast becoming more important to professionals and companies alike. Freelancing and contracting are becoming a way of life, meaning that more people are working from home, taking responsibility for generating their own income and wealth. They are also operating more from co-working and collaborative work environments. This means they are networking and teaming to share and gain knowledge, skills and experience. These factors are forcing organizations to explore innovative strategies for enhancing staff engagement, empowerment and enablement as well as with the acquisition and retention of the best talent.

7. Responding to increasing customer expectations and choices

There are significant changes required as to how we perceive and sense customer's needs, wants and expectations as they too, adapt to, are empowered by the increasing speed and proliferation of choices available in our increasingly connected and digitized world. Their focus is on receiving value that demonstrates that companies understand and empathize with them and support their lifestyle choices. Noting that customers have never had more control over who they are, what they do, and importantly, what, how and where they buy! Increasing consumer expectations and choices are impacting organizations to become increasingly customer centric through innovative change. By using human centered design to improve the users (our) experience provides increased value and new ways to create and invent products and services as well as to execute plans in ways that people value and cherish.

8. Maximizing globalization connectivity

The current wave of globalization has been driven by policies that have opened economies domestically and internationally as a result of many governments adopting free-market economic systems, vastly increasing their own productive potential and creating new opportunities for international trade and investment. Whilst reducing barriers to global trade and negotiating new international agreements to promote trade, in goods and services as well as in investments. This trend allows true connectivity and collaboration to occur. It encourages anyone, anyplace at any time to develop an internet based business that leverages and builds scale via the application of lean methodologies. Coupled with the speed and pace of technological change, increasing availability of private funding and easing of government infrastructures and compliance factors make it easier for people to initiate low cost, internet based global businesses.

TECHNOLOGY LIFE CYCLE

The technology life cycle shows the journey your technology takes. From it's exciting birth and growth; to its inevitable decline and eventual death – it's a foregone conclusion your technology won't last forever!

Either a new product enters the fray and forces you to adapt, or the demands on the current model increase and pushes you to introduce incremental updates of the current offering. In any case, understanding the technology life cycle helps you predict when you'll be able to recover the investment you put into it development, and when to plan for new projects.

Types of Technology

- The evolution of technology in education
- The technology of teaching
- Instructional technology
- Assistive technology
- Medical technology
- Technology productivity tools
- Information technology

THE EVOLUTION OF TECHNOLOGY IN EDUCATION

To many of us, the term technology conjures up visions of things such as computers, cell phones, spaceships, digital video players, computer games, advanced military equipment, and other highly sophisticated machines. Such perceptions have been acquired and reinforced through exposure to televised reports of fascinating devices and news articles about them, science fiction books and movies, and our use of equipment such as automobiles, telephones, computers, and automatic teller machines.

TECHNOLOGY OF TEACHING

The technology of teaching refers to instructional approaches that are very systematically designed and applied in very precise ways. Such approaches typically include the use of well-defined objectives, precise instructional procedures based upon the tasks that students are required to learn, small units of instruction that are carefully sequenced, a high degree of teacher activity, high levels of student involvement, liberal use of reinforcement, and careful monitoring of student performance.

INSTRUCTIONAL TECHNOLOGY

Instructional technology is a systematic way of designing, carrying out, and evaluating the total process of learning and teaching in terms of specific objectives, based on research in human learning and communication, and employing a combination of human and nonhuman resources to bring about more effective instruction.

ASSISTIVE TECHNOLOGY

Assistive technology employs the use of various types of services and devices designed to help people with disabilities function within the environment. Assistive technologies include mechanical, electronic, and microprocessor-based equipment, non-mechanical and non-electronic aids, specialized instructional materials, services, and strategies that people with disabilities can use either to (a) assist them in learning, (b) make the environment more accessible, (c) enable them to compete in the workplace, (d) enhance their independence, or (e) otherwise improve their quality of life.

MEDICAL TECHNOLOGY

The field of medicine continues to amaze us with the advances constantly being made in medical technology. In addition to seemingly miraculous surgical procedures that are technology-based, many individuals are dependent upon medical technology to stay alive or otherwise enable people to function outside of hospitals and other medical settings. It is not uncommon to see people in their home and community settings who use medical technology.

TECHNOLOGY PRODUCTIVITY TOOLS

As the name implies, technology productivity tools are computer software, hardware, and related systems that enable us to work more effectively and efficiently. For example, computer software such as database programs can be used to store and rapidly retrieve information; word processing programs can be used to easily edit text material; FAX machines can facilitate the transmission of written documents over long distances; expert system computer programs can aid in decision making, such as weather forecasting; and video conferencing facilities can reduce the need for travel.

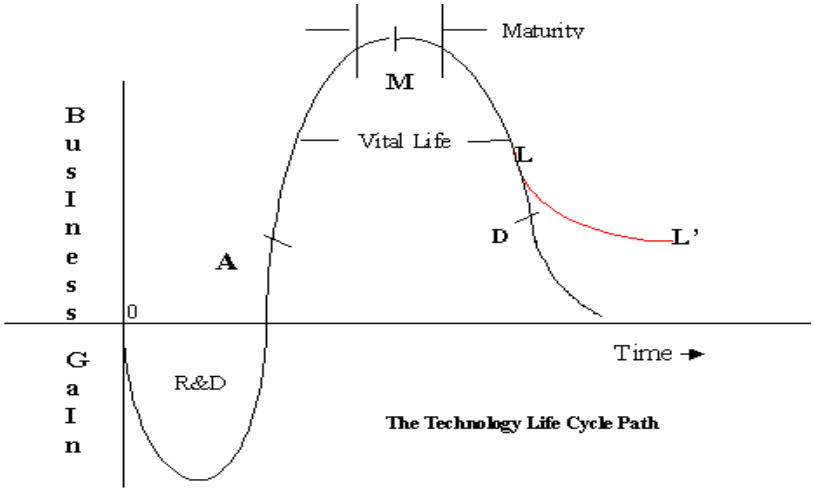
INFORMATION TECHNOLOGY

Information technologies provide access to knowledge and resources on a wide range of topics. The Internet, and its World Wide Web component, is the most prominent example of information technology. The Educational Resources Information Center (ERIC) is another example. The ERIC system enables people to search and locate much of the world's educational literature on a given topic. More information about the ERIC System is available elsewhere on this Web site.

Technology Life Cycle

The Technology Life Cycle can be defined as how the technology and its processes affect the Business processes and impact the entire life cycle of the product offerings of the company. The stages that get impacted are the research and development phase, growth, maturity, and decline.

The 4 phases of the Technology Life Cycle:



The Technology Life Cycle Path

1) Research and Development Phase

The research and development are also called as the bleeding edge as the income from the inputs being put in making the technology are negative in nature and the chances of failure of technology are quite high in nature. As the revenues are quite, the money for developing the technology is poured from your own pocket. At this stage, it is very important to take the feedback on the technology developed from the industry experts and tweak it to match as per the industry standards and to give it an edge of innovation and novelty.

2) Ascent Phase

The ascent phase of the Technology Life Cycle is also called as the leading edge as the company starts to recover the costs and expenses that have been incurred and plus the technology developed begins to gather strength and goes beyond the initial point of development to get accepted in the market. The company creates all the hype and promotion of the innovation and newness of the technology grabbing the attention from all the quarters.

3) Maturity Phase

The maturity stage arrives when the gains from the technology are high and stable but there is also a point of saturation. The technology developed is well accepted by the public but as the competitors are well aware and have caught with the realms of the technology developed, the market has reached the point of saturation. The revenues start to get slow down as the technology developed starts to become yet another commodity in the market. In order to stay relevant in the market, it is very important to make the incremental and innovative changes in the technology considering the changing dynamics of the markets and the evolving tastes of the customers. Keeping an eye on the competition is also very important at this stage.

4) Decline Phase

The decline phase is inevitable in nature most of the times and here is when the companies witness the decrease in sales of its products and there is a need or an emergence of the new and replacement of the technology. Many a time, the companies reach the point where there are no returns at all and further developments are not profitable at all. The best possible step that the company can initiate is to move out of the current technology and plant its resources on the new project that is sure to yield more profits.

The 4 stages of Technology Life Cycle:

1) Innovation Stage

The first and foremost stage of the Technology Life Cycle represents the innovation or the birth of the new product, software, material or the processes that are a result of the thorough research and development activities. In the R & D department of the company, various new ideas are planned, developed, tested, designed, and executed depending on the company resources and the current needs and demands of the market. This stage is quite time to consume in nature as the ideas need to be tested and verified considering the various internal and external forces affecting the operations of the business.

2) Syndication Stage

The syndication stage of the Technology Life Cycle focuses on the commercialization and demonstration of the new technology developed. The products, processes or material with the optimal potential for success are utilized on the immediate basis. In the research and development departments, many innovations are put on hold and only a percentage of the same are utilized for the commercial purposes. The outcome of the same largely depends on the economic factors along with the technical and non-technical factors.

3) Diffusion Stage

This stage focuses on the penetration of the new technology developed in the market and the technology is widely accepted by its potential users owing to its innovation and novel ideation. All this results in the higher profits, enhanced brand value, and elevated revenue generation for the company making it a market leader. But it is important to take note that the demand and supply side of factors jointly influence the rate of diffusion of the technology.

4) Substitution Stage

The substitution is the last and final stage of the Technology Life Cycle and represents the decline in the use of the technology due to its replacement with another technology that is far better, novel, and innovative in nature catering to the current needs and demands of the target market. The time frame of the substitution stage depends on the dynamics of the market and the various technical and non-technical factors influence the rate of the substitution of the technology.

THE FOUR STAGES OF THE TECHNOLOGY LIFE CYCLE

1. THE INTRO STAGE: You're still building it, and a Beta version is ready to be tested by early adopters. This is also known as the "bleeding edge", it's when revenues are low and you're pouring money into its development – most likely out of your own pocket**.**

2. THE GROWTH STAGE: This is where you've moved from beta to launching the product. And where you're initial has been recovered. Here you'll want to take advantage of the newness of the technology and start creating some hype. Ideally you want to get covered by all the major blogs to grow your user base and expand your distribution to more people.

3. THE MATURITY STAGE: Good news! This is a stage your technology is being accepted by the public. The bad news? The market has reached a saturation point where competitors have caught up. And revenue slows down as your technology becomes a commodity.

4. THE INEVITABLE DECLINE STAGE: This is what everybody dreads. The inevitable decline or more appropriately the death stage. This is a stage where you'll see a decrease in sales or the emergence of a replacement technology. Here you'll reach a point of no return, where further development is not profitable. For example Nokia's mobile operating system Symbian was the cream of the crop for many years, that is until Google and Apple entered the market with Android and iOS respectively.