आईएफटीएम विश्वविद्यालय, मुरादाबाद, उत्तर प्रदेश

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E-Content

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UNIT III

Q1:- What do you understand by Organizational infrastructure and Technological infrastructure?

Answer:-

Organizational infrastructure The organizational infrastructure refers to choices pertaining to the particular configurations and internal arrangements intended to support the organization's chosen position in the market.
Organizational infrastructure is defined by Henderson and Venkatraman in terms of three dimensions.
The first one, organizational design, includes choices about organizational structure, roles, responsibilities, and reporting relationships. The second dimension refers to the processes, which articulate the workflow and associated information flows for carrying out key organizational activities. The last one, called skills, indicates the choices about the capabilities of organizational members needed to accomplish the key tasks that support a business strategy. Organizational infrastructure also delineates choices in the decisionmaking processes and accountabilities appropriate to the strategic orientation of the firm.
Organizational infrastructure also refers to the internal configurations and arrangements involving organizational structure, business processes, work design, training and education that intend to support the firm's business strategy.
Technological infrastructure Technological infrastructure provides the shared foundation of the technological capabilities for building business applications, and comprises two layers. The first layer concerns the technological components, such as computer and communications technologies, commodities that are readily available in the marketplace. The second layer refers to a set of shared services such as management of data processing, provision of electronic exchange capability, or management of databases.
The technological infrastructure, when viewed in analogy to the organizational infrastructure, can also be defined in terms of three dimensions.
The first one is the architecture, consisting of applications, data, and technology, "articulated in terms of the configurations of hardware, software, and communications.
The second dimension refers to the work processes, central to the operations of the technological infrastructure such as systems development and maintenance, and monitoring and control systems. The last dimension relates to the skills, which involve knowledge and capabilities required to effectively manage the technological infrastructure. Information technology infrastructure embodies the configuration of technologies, IT work processes, and shared services that build and sustain present and future business applications.

Q2:- Explain in detail FMS also define its types.

Answer:-

Flexible Manufacturing Management System

"Flexible manufacturing is a theory which permits production systems to perform under high modified production needs. The problems such as minimum inventories and market-response time to bump into customer needs, response to adjust as per the deviations in the market. In order to sweep market by reducing the cost of products and services will be mandatory to various companies to shift over to flexible manufacturing systems. FMSs as a possible way to overcome the said issues while making reliable and good quality and cost effective yields. Flexible manufacturing system has advanced as a tool to bridge the gap between high mechanized line and CNC Machines with efficient midvolume production of a various part mix with low setup time, low workin-process, low inventory, short manufacturing lead time, high machine utilization and high quality.

"Flexible manufacturing system incorporates the following concepts and skills in an automated production system

1. Flexible automation
2. Group technology
3. Computer numerical control machine tools
4. Automated material handling between machines

TYPES OF FMS "Flexible manufacturing systems can be separated into various types subject to their natures:"
DEPENDING UPON KINDS OF OPERATION "Flexible manufacturing system can be illustrious subject to the kinds of operation performed:" a. "Processing operation. It performs some activities on a given job. Such activities convert the job from one shape to another continuous up to the final product. It enhances significance by altering the geometry, features or appearance of the initial materials." b. **"Assembly operation**. It comprises an assembly of two or more parts to make a new component which is called an assembly/subassembly. The subassemblies which are joined permanently use processes like welding, brazing, soldering , adhesive bonding, rivets, press fitting."
2. **BASED ON NUMBER OF MACHINES** "There are typical varieties of FMS based on the number of machines in the system:"

a. "Single machine cell (SMC). It consists of completely automated machines which are capable of performing unattended operations within a time period lengthier than one complete machine cycle. It is skilful of dispensing various part mix, reacting to fluctuations in manufacture plan, and inviting introduction of a part as a new entry. It is a sequence dependent production system."

b. "Flexible manufacturing cell (FMC). It entails two or three dispensing workstations and a material handling system. The material handling system is linked to a load/unload station. It is a simultaneous production system."

c. An Flexible Manufacturing System (FMS). "It has four or more processing work stations (typically CNC machining centers or turning centers) connected mechanically by a common part handling system and automatically by a distributed computer system. It also includes non-processing work stations that support production but do not directly participate in it e.g., part / pallet washing stations, co-ordinate measuring machines. These features significantly differentiate it from Flexible manufacturing cell (FMC)."

3. BASED ON LEVEL OF FLEXIBILITY "FMS is further classified based on the level of flexibility related to the manufacturing system. Two categories are depicted here:"

a. Dedicated FMS. "It is made to produce a certain variety of part styles. The product design is considered fixed. So, the system can be designed with a certain amount of process specialization to make the operation more efficient.

b. Random order FMS. "It is able to handle the substantial variations in part configurations. To accommodate these variations, a random order FMS must be more flexible than the dedicated FMS. A random order FMS is capable of processing parts that have a higher degree of complexity. Thus, to deal with these kinds of complexity, sophisticated computer control system is used for this FMS type.

Q3:- What do you understand by innovation? Also explain typology of innovation.

Answer:-

Definition of innovation: Innovation generally refers to changing processes or creating more effective processes, products and ideas. For **businesses**, this could mean implementing new ideas, creating dynamic products or improving your existing services. ... **Innovation** can increase the likelihood of your **business** succeeding.

invention can be defined as the creation of a product or introduction of a process for the first time. **Innovation**, on the other hand, occurs if someone improves on or makes a significant contribution to an existing product, process or service.

Innovation can be defined simply as a "new idea, device or method". However, innovation is often also viewed as the application of better solutions that meet new requirements, unarticulated needs, or existing market needs.

Economics of innovation: In business and in economics, innovation can become a catalyst for growth. With rapid advancements in transportation and communications over the past few decades, the old-world concepts of factor endowments and comparative advantage which focused on an area's unique inputs are outmoded for today's global economy. Economist Joseph Schumpeter(1883-1950), who contributed greatly to the study of innovation economics, argued that industries must incessantly revolutionize the economic structure from within, that is innovate with better or more effective processes and products, as well as market distribution, such as the connection from the craft shop to factory. He famously asserted that "creative destruction is the essential fact about capitalism". Entrepreneurs continuously look for better ways to satisfy their consumer base with improved quality, durability, service, and price which come to fruition in innovation with advanced technologies and organizational strategies.

A prime example of innovation involved the explosive boom of Silicon Valley startups out of the Stanford Industrial Park. In 1957, dissatisfied employees of Shockley Semiconductor, the company of Nobel laureate and co-inventor of the transistor William Shockley, left to form an independent firm, Fairchild Semiconductor. After several years, Fairchild developed into a formidable presence in the sector. Eventually, these founders left to start their own companies based on their own, unique, latest ideas, and then leading employees started their own firms. Over the next 20 years, this snowball process launched the momentous startup-company explosion of information-technology firms. Essentially, Silicon Valley began as 65 new enterprises born out of Shockley's eight former employees. Since then, hubs of innovation have sprung up globally with similar metonyms, including Silicon Alleyen compassing New York City.

The concept of innovation: The ability to innovate was always one factor that contributed to the success of an organization. Organizations that dispose of the necessary resources, of a powerful motivation to innovate and of an organizational climate that would allow and encourage innovative ideas, are exactly those which will innovate quickly and successfully. The capacity to innovate represents therefore the ability of continuously making knowledge and ideas innovation process is very complex and multidimensional since many factors interact to make possible the emergence of this process. Generally, organizations which dispose of the necessary resources, a strong motivation to innovate and an organizational climate that allows and encourages the emergence of innovative ideas, are exactly those which will innovate quickly and successfully. The ability to innovate is represented by the ability to continuously transform knowledge and ideas into new products, processes and systems, to the benefit of both the organization and the shareholders.

Characteristics of innovation : Some features of innovation vary according to the organization considered, as some organizational characteristics vary depending on the type of innovation considered.

Compatibility is a great example because the same innovation may vary significantly in terms of suitability for different organizations. Complexity, the relative advantage or the costs are a few characteristics that can vary

significantly from one organization to another. Primary characteristics of innovation are those that do not change from one organization to another and are closely related to the industrial context in which innovation occurs.

Innovation typology : As regards the typology of innovations, Damanpour (1991) shows three pairs of types of innovation:

administrative innovation - technical innovation,
process innovation - product innovation
radical innovation - incremental innovation.

The technical innovations refer to products, services and technologies in the production process. They relate to basic activities of an organization and focus on product or process. This type of innovation is facilitated by a high level of professionalism, low formalization and low centralization.

The administrative innovations involve organizational structure and administrative processes. These innovations are indirectly related to basic activities of the organization and more directly to the management of those activities. Administrative innovations are facilitated by low levels of professionalism, high formalization and high centralization.

Product innovations are represented by the new products or services introduced to meet the needs of the market. Such innovations are reflected in new products or services on the market to the benefit of customers.

Process innovations are new elements introduced in the various processes carried out at the level of the organization. The adoption of product innovations and the process are different in various stages of the organization development .

Radical innovations are represented by the fundamental re-conceptualizing of a business . This type of innovation can be approached on three levels: product (new ideas or technology), process (new methods of product and services delivery to consumers) and the combination of the two levels mentioned above .

The incremental innovation refers to improving products, services and the existing processes The architectural innovation is the kind of innovation that changes only the architecture of a product without influencing its components. The distinction between the product as a system and the product as a set of components challenges the idea that successful development of a product requires the use of two types of knowledge: about the components of a product and the product architecture, i.e. how those components are integrated and linked to form a coherent whole. The essence of the architectural innovation is the reconfiguration of the existing system by integrating existing components in a new way so that to form a coherent whole.

Another classification of innovation is given by Thompson (2004):creative innovation – adoptive innovation.

Creative innovation refers to the ability of the organization to implement and carry out technological innovation through its own system, usually materializing in new products or services.

Adoptive innovation, on the other hand, refers to the ability to use new ideas from outside the organization, adapting those ideas to implement change in the management system of the organization or in the relationship between the system's components. An adoptive approach to innovation is addressed mainly to areas such as strategy or management by processes leading to new strategies, to a new company image or to new organizational structures.

UNIT- IV

Q1. What do you understand by technology transfer? Explain in detail.

Answer:-

Technology transfer, also called **transfer of technology** (**TOT**), is the process of transferring (disseminating) technology from the places and in-groups of its origination to wider distribution among more people and places. It occurs along various axes: among universities, from universities to businesses, from large businesses to smaller ones, from governments to businesses, across borders, both formally and informally, and both openly and surreptitiously. Often it occurs by concerted effort to share skills, knowledge, technologies, methods of manufacturing, samples of manufacturing, and facilities among governments or universities and other institutions to ensure that scientific and technological developments are accessible to a wider range of users who can then further develop and exploit the technology into new products, processes, applications, materials, or services. It is closely related to (and may arguably be considered a subset of) knowledge transfer. Horizontal transfer is the movement of technologies from one area to another. At present transfer of technology (TOT) is primarily horizontal. Vertical transfer occurs when technologies are moved from applied research centers to research and development departments.

Technology transfer is promoted at conferences organized by such groups as the Ewing Marion Kauffman Foundation and the Association of University Technology Managers, and at "challenge" competitions by organizations such as the Center for Advancing Innovation in Maryland. Local venture capital organizations such as the Mid-Atlantic Venture Association (MAVA) also sponsor conferences at which investors assess the potential for commercialization of technology.

Technology brokers are people who discovered how to bridge the emergent worlds and apply scientific concepts or processes to new situations or circumstances. A related term, used almost synonymously, is "technology valorization". While conceptually the practice has been utilized for many years (in ancient times, Archimedes was notable for applying science to practical problems), the present-day volume of research, combined with high-profile failures at Xerox PARC and elsewhere, has led to a focus on the process itself.

Whereas technology transfer can involve the dissemination of highly complex technology from capital-intensive origins to low-capital recipients (and can involve aspects of dependency and fragility of systems), it also can involve appropriate technology, not necessarily high-tech or expensive, that is better disseminated, yielding robustness and independence of systems.

Transfer process

Many companies, universities and governmental organizations now have an Office of Technology Transfer (TTO, also known as "Tech Transfer" or "TechXfer") dedicated to identifying research which has potential commercial interest and strategies for how to exploit it. For instance, a research result may be of scientific and commercial interest, but patents are normally only issued for practical processes, and so someone—not necessarily the researchers—must come up with a specific practical process. Another consideration is commercial value; for example, while there are many ways to accomplish nuclear fusion, the ones of commercial value are those that generate more energy than they require to operate.

The process to commercially exploit research varies widely. It can involve licensing agreements or setting up joint ventures and partnerships to share both the risks and rewards of bringing new technologies to market. Other corporate vehicles, e.g. spin-outs, are used where the host organization does not have the necessary will, resources or skills to develop a new technology. Often these approaches are associated with raising of venture capital (VC) as a means of funding the development process, a practice more common in the United States than in the European Union, which has a more conservative approach to VC funding. Research spin-off companies are a popular vehicle of commercialization in Canada, where the rate of licensing of Canadian university research remains far below that of the US.

Technology transfer offices may work on behalf of research institutions, governments and even large multinationals. Where start-ups and spin-outs are the clients, commercial fees are sometimes waived in lieu of an equity stake in the business. As a result of the potential complexity of the technology transfer process, technology transfer organizations are often multidisciplinary, including economists, engineers, lawyers, marketers and scientists. The dynamics of the technology transfer process has attracted attention in its own right, and there are several dedicated societies and journals.

There has been a marked increase in technology transfer intermediaries specialized in their field since 1980, stimulated in large part by the Bayh-Dole Act and equivalent legislation in other countries, which provided additional incentives for research exploitation.

Q2. Explain in detail technology assessment.

Answer:-

Technological Assessment: TA is the study and evaluation of new technologies. It is based on the conviction that new developments within, and discoveries by, the scientific community are relevant for the world at large rather than just for the scientific experts themselves, and that technological progress can never be free of ethical implications. Also, technology assessment recognizes the fact that scientists normally are not trained ethicists themselves and accordingly

ought to be very careful when passing ethical judgement on their own, or their colleagues, new findings, projects, or work in progress.

Technology assessment assumes a global perspective and is future-oriented, not anti-technological. TA considers its task as an interdisciplinary approach to solving already existing problems and preventing potential damage caused by the uncritical application and the commercialization of new technologies.

Therefore, any results of technology assessment studies must be published, and particular consideration must be given to communication with political decision-makers.

An important problem concerning technology assessment is the so-called Collin ridge dilemma: on the one hand, impacts of new technologies cannot be easily predicted until the technology is extensively developed and widely used; on the other hand, control or change of a technology is difficult as soon as it is widely used.

Technology assessments, which are a form of cost–benefit analysis, are difficult if not impossible to carry out in an objective manner since subjective decisions and value judgments have to be made regarding a number of complex issues such as (a) the boundaries of the analysis (i.e., what costs are internalized and externalized), (b) the selection of appropriate indicators of potential positive and negative consequences of the new technology, (c) the monetization of non-market values, and (d) a wide range of ethical perspectives. Consequently, most technology assessments are neither objective nor value-neutral exercises but instead are greatly influenced and biased by the values of the most powerful stakeholders, which are in many cases the developers and proponents (i.e., corporations and governments) of new technologies under consideration. In the most extreme view, as expressed by Ian Barbour in ''Technology, Environment, and Human Values'', technology assessment is "a one-sided apology for contemporary technology by people with a stake in its continuation."

Some of the major fields of TA are: information technology, hydrogen technologies, nuclear technology, molecular nanotechnology, pharmacology, organ transplants, gene technology, artificial intelligence, the Internet and many more. Health technology assessment is related, but profoundly different, despite the similarity in the name.

Forms and concepts of technology assessment

The following types of concepts of TA are those that are most visible and practiced. There are, however, a number of further TA forms that are only proposed as concepts in the literature or are the label used by a particular TA institution.

Parliamentary TA (PTA): TA activities of various kinds whose addressee is a parliament. PTA may be performed directly by members of those parliaments (e.g. in France and Finland) or on their behalf of related TA institutions (such as in the UK, in Germany and Denmark) or by organizations not directly linked to a Parliament (such as in the Netherlands and Switzerland).

Expert TA (often also referred to as the **classical TA** or **traditional TA** concept): TA activities carried out by (a team of) TA and technical experts. Input from stakeholders and other actors is included only via written statements, documents and interviews, but not as in participatory TA.

Participatory TA (pTA): TA activities which actively, systematically and methodologically involve various kinds of social actors as assessors and discussants, such as different kinds of civil society organisations, representatives of the state systems, but characteristically also individual stakeholders and citizens (lay persons), technical scientists and technical experts. Standard pTA methods include consensus conferences, focus groups, scenario workshops etc. Sometimes pTA is further divided into **expert-stakeholder pTA** and **public pTA** (including lay persons).

Constructive TA (CTA): This concept of TA, developed in the Netherlands, but also applied and discussed elsewhere attempts to broaden the design of new technology through feedback of TA activities into the actual construction of technology. Contrary to other forms of TA, CTA is not directed toward influencing regulatory practices by assessing the impacts of technology. Instead, CTA wants to address social issues around technology by influencing design practices.

Discursive TA or **Argumentative TA**: This type of TA wants to deepen the political and normative debate about science, technology and society. It is inspired by ethics, policy discourse analysis and the sociology of expectations in science and technology. This mode of TA aims to clarify and bring under public and political scrutiny the normative assumptions and visions that drive the actors who are socially shaping science and technology. Accordingly, argumentative TA not only addresses the side effects of technological change, but deals with both broader impacts of science and technology and the fundamental normative question of why developing a certain technology is legitimate and desirable.

Health TA (HTA): A specialized type of expert TA informing policy makers about efficacy, safety and cost effectiveness issues of pharmaceuticals and medical treatments, see health technology assessment.

Q3. What do you understand by technology change?

Answer:-

TECHNOLOGICAL CHANGE

THE HUMAN ASPECTS OF TECHNOLOGY CHANGE

importance of strategic organizational change and provide tips to help ensure successful implementation of new tools and technology in terms of the human aspects. Engaging in the following will help facilitate successful organizational change and alignment:

- Implement change management from the get-go

- Expect and formally manage resistance to change
- Identify and inspire stakeholders

CHANGE MANAGEMENT

Having a well thought out change management strategy from the get-go will go a long way in mitigating resistance to change and other unforeseen roadblocks. One way to think about change management strategies is grouping them into *Pre-Launch, Launch, and Post-Launch* phases.

- In the **Pre-Launch Phase**, consider the message you want to relay, the best way to communicate it, who should communicate it, and how different groups are likely to react (can you think of any reasons a particular group might be skeptical or resistant?). To craft a message that resonates with the workforce, consider the necessity, potential alternatives, feasibility of implementation, and perceived value of the initiative (Armenakis & Harris, 2002). Put yourself in the shoes of different parts of the workforce and think about how they've responded to change initiatives in the past. Identify potential pockets of resistance and talk to them to understand their perspectives and convey how the outcomes of the project connect to and can help with their concerns. In other words, don't try to avoid resistance, and don't try to stifle it. Turn your would-be resistors into change advocates!
- In the **Launch Phase,** you'll communicate the message(s) to inform the workforce in a thoughtful way (thanks to your prep-work during pre-launch!), which will help garner buy-in. In this phase it's important to introduce initial activities to engage and excite employees about the change initiative. Tailoring each communication and message to speak to the benefits for each group and level in the organization will go a long way.
- In the **Post-Launch Phase**, it's important to have a multi-faceted communication approach; more involvement and exposure leads to more buy-in. After the launch, steps will need to be taken to sustain the change. Dealing with the unanticipated consequences of change initiatives requires understanding that not all roadblocks can be foreseen and

being prepared to take swift action when they occur. Taking initiative and being flexible will help maintain the momentum of the implementation and keep employees engaged and excited about the change!

Q4. What is resistance to change?

Answer:-

RESISTANCE TO CHANGE

We talked about identifying and working *with* potential resistors, but what do we mean by "resistors"? To help answer this, think about a time when you wanted to organize a get-together at a new hot spot in town with a group of friends or family and you know from experience that not everyone will want to stray from their local hangout. These are your resistors! So, you must find a way to appeal to each of their personalities and mindsets. The same goes for organizational change initiatives! Individuals will react to and resist change differently, and you need to address this for change initiatives to be successful. There are several reasons why employees will resist change initiatives including being invested in the current way of doing work (especially if they played a role in creating it), fear of not being able to adapt to the new way of work, expecting more work as a result of the change, and having been rewarded for their role. There are several types of resistance and ways to mitigate their effects.

- **Blind Resistance** indicates that employees will not accept any kind of change, regardless of what it is and the potential value of the change. Organizations with people displaying blind resistance will want it to be open and communicative with them and provide as much reassurance as possible. As time goes on the resistance may diminish as the employees adjust and accept the change.
- **Political Resistance** occurs when people think they'll lose something due to the change initiative. To mitigate this resistance, organizations will want to assure employees that they will still have something of value after the change occurs.
- **Ideological Resistance** refers to the type of reaction by people who don't think the change initiative is going to work well based on their opinions and beliefs. In order to encourage these individuals to accept change, organizations can use data to demonstrate the value of the initiative to garner their support.

Do you see any of your friends' and family members' reactions within these types resistance to change? Someone with political resistance to going to the new hot spot may respond well to being told that the new place is on the metro and has a killer happy hour, while someone displaying ideological resistance may respond well to the rave reviews the new place has and the innovative cocktail menu that is posted online. While the exact same appeals may not work for

tools and technology change initiatives (though cocktails will likely help), the same thought processes and strategies can be used! With new tools and technology, you need to understand how work is currently performed and how that will change after the implementation, and work to address whatever gaps exist. Encouraging the learning of new skills, competencies, and ways of operating in the newly changed organizational system will help employees accept the new tool/technology being introduced and feel supported by the organization!

STAKEHOLDERS

To ensure a successful change initiative, it's important to have the right people supporting the effort, relaying the message, and effectively mitigating resistance (Hussain et al., 2018). When implementing new tools/technology, think about the unique impacts of the change on different groups: Who has influence or might be influenced by the project and its outcomes? Will anyone experience short-term costs? Additional workload? Who stands to benefit from the success (or failure) of the project? Lastly, **what information is valuable to each of these groups?**

Remember, no one likes to be caught off-guard. Taking the opportunity to explain the duration of the impact and what the long-term outcomes are will help avoid immediate resentment and skepticism. To gain buy-in and willingness to work through the transition, emphasize the end-goal and benefits in a way that'll resonate with different groups based on what they value. Yes, we mentioned this before, but it's important! Here are some examples:

- Senior leaders pay attention to new insights and decision-making capabilities based on data and dashboarding functions enabled by new tools/technology.
- Employees care about how new tools/technology will impact how they work, learning and development opportunities, and potential career paths both within and outside the organization.
- Managers and supervisors typically have some combination of both senior leader and employee concerns (i.e., paying attention to strategic decision-making and looking out for their employees). Managers can be the biggest conduits of information and champions of acceptance.

CONCLUSION

Technology change is an unavoidable reality these days. To keep up with the pace of change, the most successful organizations foster an *adopt-and-adapt* culture. This type of cultural change takes time to develop and starts with strategic change management, which leads to repeated "success stories" of new technology implementation. The tips described in this blog are key to creating these success stories that foster a culture of receptiveness and excitement around change, especially pertaining to tools and technology. Taking the extra time to thoughtfully and intentionally pay attention to *the human aspect of technology change* will result in compounding benefits in the long run!

MBA IT 03
UNIT-1

Q1. What is technology? Explain evolution of technology in detail also write down the effects of new technology.

Answer:-

Technology:- Is all made by humans.

Technology is the collection of techniques, skills, methods, and processes used in the production of goods or services or in the accomplishment of objectives, such as scientific investigation. Technology can be the knowledge of techniques, processes, and the like, or it can be embedded in machines to allow for operation without detailed knowledge of their workings.

The American sociologist Read Bain wrote that "technology includes all tools, machines, utensils, weapons, instruments, housing, clothing, communicating and transporting devices and the skills by which we produce and use them.

Technology can be most broadly defined as the entities, both material and immaterial, created by the application of mental and physical effort in order to achieve some value. In this usage, technology refers to tools and machines that may be used to solve real-world problems. It is a far-reaching term that may include simple tools, such as a crowbar or wooden spoon, or more complex machines, such as a space station or particle accelerator. Tools and machines need not be material; virtual technology, such as computer software and business methods, fall under this definition of technology.

History :- The technology appear with the creation of the fire by the humans.

Examples :-Computers, cellphones, houses, notebooks, energy, and others.

Uses :- Is used in all the moments of our days.

Evolution of Technology:-

Evolution :- In the beginning the technology only appears in the fire.

After it appear with the houses and tools. But it was a took a lot of time. After that time, the mineral ingots are in with the humans. Those ingots helped for the development of the technology. After this amazing period, the machines appear to make better things. In this time, the industrial revolution was born, it was the period in that the humans do a lot of machines and factories. After those thing, the technology revolution was started and growing a lot. In this time the human go to the moon and also we study all the universe.

Subsequent to the first commercialization of a product, industries are seen to go through a progression that has substantial regularities in the time trends of key variables, such as number of firms, sales, price, and innovation patterns. Although life cycle models apply to a broad range of

settings, our focus in this chapter is on the relationship between technological and industry evolution, two processes that we posit are inextricably linked. We begin by developing stylized observations about technology and industry development – that is, a generic industry life cycle model, building on empirical work from three areas of the literature: technology management, evolutionary economics, and organizational ecology.

Stages of evolution:-

we distinguish three stages of evolution – emergence/ growth, shakeout, and maturity. In the initial stage, high levels of uncertainty permeate every aspect of an industry. Firms experiment with a variety of technologies, since the performance trajectory of different technologies is unclear. Customers have undeveloped preferences and explore a range of product uses. The market is small and production processes are not specialized, so manufacturing is inefficient. Some industries never progress beyond emergence, but those that do generally experience

1. Emergence/growth stage

Inception of industry due to initial commercialization of an invention. Other words used to describe this stage, such as fragmentation, fluid phase, variation, era of ferment, and entrepreneurial regime reflect that this stage is characterized by

◆ very few firms initially, followed by rapid entry by firms, both entrepreneurial and diversifying entrants with pre-entry capabi- lities;

◆ high technology and demand uncertainty;

◆ experimentation with different approaches and product design;

◆ emphasis on both product and process innovation, with the relative ratio of product to process innovation decreasing over the stage;

◆ very low levels of initial sales, and sustained growth in output over the entire period;

◆ decrease in price, particularly when adjusted for quality;

◆ gradual development of complementary assets (e.g., distribution channels, supply chain relationships, related infrastructure).

There is wide variation across industries in the number of years that is characterized as the emergence/growth stage, with some products never progressing beyond the emergence stage

2. Shakeout stage

Transition occurs due to establishment of efficiencies in production, dominant design, and ensuing competitive pressures. Other words used to describe this stage include selection and transitional phase. This stage is characterized by

◆ rapid decline in the number of firms from the peak, as inefficient firms exit due to increased competitive pressures;

◆ establishment of a dominant design;

◆ increasing emphasis on process relative to product innovation;

◆ innovation conducted by large, established firms, which focus on economies of scale;

◆ decrease in the growth rate of sales;

◆ continuing decline in prices, particularly when adjusted for quality.

There is wide variation in industries in the number of years and severity of shakeout in the number of firms.

3. Mature stage

Transition occurs when an 'equilibrium' number of firms has been reached. Other words used to describe this stage include retention, specific phase, era of incremental change, and routinized regime. This stage is characterized by

◆ stable number of firms, with low levels of both entry and exit rates relative to the other stages of the life cycle;

◆ reduction in overall innovation rates relative to the earlier stages, with most innovations being incremental in nature;

◆ innovation conducted by large, established firms, which focus on economies of scale;

◆ leveling off in the growth rate of sales, as industry reaches high penetration rates;

◆ stable price levels;

◆ well-established complementary assets.

There is wide variation in industries in the number of years and the 'equilibrium' number of firms that exist in the mature stage. Transition to a decline or a cycle back to the Emergence Stage may occur due to new (radical) innovations being introduced

Effects of New Technology :-

The positive and negative effects of technology

Positive:

Enhances Learning

Over the past few years, technology has become integrated into the classroom to enhance the learning experience for children. Technologies such as Smartboards, document cameras, Apple TVs, and even 3D printers are now incorporated into educational lessons to boost collaboration and engage students in the learning process. With increased collaboration in the classroom, teachers and students have increased creativity and project-based learning opportunities that make academic instruction more meaningful.

In addition, at-home educational technologies have assisted toddler-aged children in learning numbers, letters, colors, and other foundational skills before they enter formal schooling. Mobile device apps like Avokiddo ABC Ride, Moose Math, and Metamorphabet have been recommended by parents to introduce math, the alphabet, and even the arts before kids enter school!

Fosters Problem-Solving Skills

Have you ever heard of the term "survival mode?" It's a gameplay function in many kids' video games where the player is tasked with staying alive as long as possible to outlast opponents. For example, in the popular video game Minecraft, players are dropped into new and different environments and must immediately build shelter and collect items like food, in order to survive and outlive their opponents. Not to mention, an entire day in Minecraft lasts just 10 minutes, so players must make good decisions quickly.

With these types of technologies, kids must work independently to achieve a specific goal. In the process, they're posed with different types of roadblocks and challenges, which they must learn to navigate and overcome. In turn, they'll be encouraged to come up with their own problem-solving solutions when facing real-life issues such as homework trouble, disagreements with friends, or personal hardship, as well as technology-based obstacles.

Develops Future Technological Leaders

It's common knowledge that our future lies in many of today's emerging technologies. In the years to come, technical skills will be more important in the workplace, as well as the growing impact it'll have on day-to-day life. One of the greatest benefits of exposing kids to technology is the fact that they'll be well-prepared to jump into a pool of available, high-paying tech jobs.

With large tech companies like Amazon consistently adding hundreds of new jobs around the country, introducing technology skills to children at an early age can prepare them for a career with a positive outlook. Tech jobs are here today. Tech jobs will be here tomorrow. Some of today's tech will be tomorrow's tech, and some of tomorrow's tech will be completely brand

new and something our world has never seen before. Who's going to be best equipped to fill those positions? The ones who start learning now.

Negative:

Diminishes Relationships and Social Skills

As children use mobile devices more and more, they're more apt to be virtually connected with family and friends, rather than spending time together physically; they're more likely to text, chat on social media, or connect through online gaming than actually meeting them in person.

As Lisa Rai Mabry-Price, the associate director of school services from the American Speech-Language-Hearing Association (ASHA), told The Philadelphia Inquirer, "Social communication skills are also in jeopardy due to tech overuse. These skills are developed and honed through daily interaction and include knowing how to take turns during a conversation, using facial expressions, changing the way you speak based on the listener—such as how you talk to a baby versus an adult—and making appropriate eye contact. Such personal interactions are limited as children passively view a screen."

Stimulates Health Issues

The overuse of mobile devices can be harmful to children's health, as the more they use mobile devices, the less physical activities they do. In addition, when children choose to play on their devices over physical activity, they often couple their activity with mindless snacking and other unhealthy habits.

As children spend more time in front of those screens—most of the time on the couch—the less time they spend outside playing, running, and burning off calories. Over time, those habits can lead to significant weight gain and other associated health problems.

Reduces Sleep Quality

A study from JAMA Pediatrics found that children and adolescents who use media before bed were two times more likely to not get enough sleep at night. Even further, having access to a media device in their sleeping environment, even if the device was not being actively used near bedtime, was also associated with an inadequate amount of sleep.

Children under the age of 13 typically require 11-14 hours of sleep, depending on their age. Sleep is immensely important for children, as it promotes growth, helps heart health, affects weight, increases attention span, and even boosts learning. However, when children don't get the proper amount of sleep each night, these ever-important qualities can suffer.

Like many of the things children love, like pizza or candy, technology can be great—but only in moderation. The problems associated with technology come with misuse and lack of attention

around how much technology is “too much.” Be sure to regulate and limit your children's technology use, and they’ll be able to reap its positive effects!

Q2. Explain Technology Innovation (Invention- Innovation- Diffusion) in detail.

Answer:-

What Is Innovation?

The process and outcome of creating something new, which is also of value.

Drivers for Innovation

Financial Pressures Increased Competition Demographic, Social & Market Changes Customer Expectations Changing Economy

Whenever we hear of the latest technology recently put on the market, or invented by brilliant scientists and techies, we immediately think of innovation. Even departments in companies or organizations usually pair the nomination innovation and technology, linking the two in an almost indissoluble concept. In our very digital society, any new technological advancement is considered as innovation, as a way forward, as the proof that we are doing something right to progress.

So is technology really the same as innovation?

To better answer this question, let’s look at what encompasses innovation:

Divergence, Curiosity, Multidisciplinary Teamwork, Resilience

Among the various features of innovation I described, none requires technology. Innovation is a human-centered perspective and *process*. This process requires experimentation and iteration, a diverse team, and a desire to learn while failing. Innovative solutions might result in new technology, but innovation doesn’t equal technology. Innovation can be intangible, as opposed to technology, which is tangible. You can even apply the innovation process to your everyday life. Technology can be used to implement innovation, but the technology itself doesn’t produce innovation. It can indeed be a helpful and powerful medium to allow us to test and iterate at a faster and more efficient rate, but it’s not the end result of innovation. Depending on the problem, innovation doesn’t necessarily have to be complicated or require super-advanced technology that perhaps cannot even be used by our audience. It might just lead to simple solutions that just weren’t thought of before, and can be easily applied for the benefit of our intended users.

“Technological innovation

Technology as a source of innovation can be identified as a critical success factor for increased market competitiveness.

Technological innovation involves new or improved technology, such as new type of machinery or alteration of some form of technology into a product, processes or service delivery methods.

When talking about incorporating technology into a **production process**, for example, it enables automation which results in higher production rates, lower cost per unit of output, and enables more efficient use of materials – reducing variability and resulting in more consistent product quality.
We're using a number of **technological product innovations** daily all the way from our smartphones and health devices to wireless home sound systems. SONOS, for example, has created advanced technology to provide a wireless multi-room music experience. They initially meant to choose Linux as the technology platform, but no audio drivers existed at the time, so they had to build it themselves.
When it comes to **technological service innovation**, McDonald's has taken a holistic approach to the digital to create engaging customer experiences. Their main strategic objective has been to use technology to improve the in-restaurant experience and to create the next generation of drive-throughs and delivery.
They've already said goodbye to cashiers and replaced them with self-ordering kiosks. They also provide you with an application you can use to order and pay for your meal before picking it up to avoid the line.
"

Invention- Innovation- Diffusion

Invention is the discovery or development of a product or process by applying previous knowledge in new ways. Inventions often begin as **prototypes**, in which the essential features are developed to see if they are workable. These prototypes, or **basic working models**, are then improved by adding, subtracting, or modifying the characteristics of the prototype until no other improvements can be made based on the prototype.

To motivate people to invent, governments grant **patents**, which gives the patent holder exclusive rights to sell the patented product or method for a specific duration, which, in the United States, is usually 20 years after the patent filing date.

Innovation is applying basic discoveries or inventions to produce a useful product or process for a specific application. **Product innovation** is the development of new and improved products or services; **process innovation** refers to new or improved methods of production or distribution. Innovations cannot be patented, even though the distinction between inventions and innovations is often indistinct. Innovations can, however, be protected by **trade secrets**, where, before any employees can learn of the innovation, they must sign a contract to not disclose the trade secret to anyone.

Discoveries and inventions are rarely profitable in themselves. Innovation is necessary to bring the product to market economically. For instance, the development of integrated circuits has been one the most important in history, enabling modern-day computers, tablets, and phones. In

fact, integrated circuits are necessary for almost all electronic devices. However, there are 2 steps in developing new integrated circuits. The first step is that they must be designed so that they work in a specific way, channeling the flow of electricity so that the device can carry out its purpose. Once the integrated circuit chip is designed, then the company must also develop an economic way of manufacturing the chips, for without a low-cost method of manufacturing the chips, their prevalence, and therefore their influence, would be limited. Hence, their decreasing cost over time is almost as important as their actual design.

The word “innovation” is derived from the Latin verb innovare, which means to renew. In essence, the word has retained its meaning up until today. Innovation means to improve or to replace something, for example, a process, a product, or a service. In the context of companies, however, the term needs a definition. In the complex context of business, a definition is needed.

Innovation requires more creativity and more willingness to take risks than the implementation of typical projects. To successfully realize innovation projects, a different mindset is needed. We have created four cartoons, which you are welcome to include in presentations or on your website with reference (backlink) to this page.

Diffusion is the spread of innovation to other firms so that they can remain competitive. This diffusion occurs by either emulating or copying others' products or processes, which is achieved in several ways. First, a company can look at any patents, which are available for inspection by anyone, to see the essential design, and develop new ways of working around that, developing ideas or methods to achieve the same functionality but without infringing the patent. Since patents are narrow in scope, a patent may reveal ways around it, enabling a competitor to develop a process or product functionally equivalent to the patented product or process. In other cases, competing firms can reverse engineer the product to see how it works and to see how it could be improved.

Website development is a good example of diffusion. For instance, Groupon developed a new way for firms to market their products and services by selling what is known as a group coupon over the Internet, which gives the consumers a steep discount if enough of them subscribe to the product or service. Now, many other companies have also started offering major deals, many of them offering variations of the group coupon.

Q3. Differentiate different types of innovation.

Answer:-

Revolutionary and Evolutionary Innovation:-

Revolutionary Innovation/Breakthrough

While evolutionary innovation might be the backbone of most companies, revolutionary innovation is the backbone of most innovation. Without these unexpected inventions, there would be nothing to create incremental innovation off. Revolutionary innovation, while unexpected, does not have a tangible effect on already existing markets, neither does it create new ones.

Nevertheless, revolutionary innovation is incredibly important, as it feeds both evolutionary and disruptive innovation. Evolutionary innovation uses the products and processes created by revolutionary innovation to make incremental innovation. Similarly, many examples of disruptive innovation have been based on revolutionary innovation.

- Revolutionary innovation focuses on orientation OF tomorrow's customers

"Revolutionary ideas rely on evolution to survive", says Rieva Lesonsky in a great post on that issue

Example of revolutionary innovation

An example of revolutionary innovation is the first cars in the late 19th century. These cars where possible because of the evolutionary innovation that was fuel injections. Due to their high cost, making them unavailable to the everyday man, they are not considered an example of disruptive innovation. What is considered disruptive is the Ford Model T, which was based on the first cars, but affordable enough to replace horse-drawn carriages.

Organic/Evolutionary Innovation

Evolutionary innovation tends to be slow and focused on adaption rather than disruption. When innovating in an evolutionary manner, the focus is on incremental and linear improvements, not on creating new markets. Evolutionary innovation is the backbone of most businesses, and what makes products valuable for consumers.

- Evolutionary innovation focuses on orientation TOWARDS today's customers

Evolutionary innovators ask questions based on the limitations of existing solutions; revolutionary innovators ask questions no one else has thought of.

Example of evolutionary innovation

Toyota is a great example of evolutionary innovation in practice. At the focus on Toyota's brand and development is the Japanese word kaizen. Kaizen translates as continuous improvement, which is an evolutionary innovation by another name. This focus is expressed by Toyota's focus on long-term solutions that customers of today are interested in. They are not attempting to reinvent the car or create a product that will disrupt the entire car market. Instead, Toyota focuses on building better cars for already existing markets.

Another example of evolutionary innovation is both the iPhone, iPod, and iPad. These three products were not the first in their respective markets. Instead, Apple took already existing products and enhanced them to markets that already existed.

Product innovation

Product innovation is probably the most common form of innovation and it refers to improvements in performance characteristics and attributes of the product. It can also use components that differ from previously manufactured products.

Product innovations are always tangible, can involve radically new technologies or can be built based on combining existing technologies in a new way, although they don't necessarily have to involve any technology at all.

A product innovation can be a completely new product that has never been seen before, such as the fidget spinner, or it can be an improved version of an existing product, such as wireless headphones or the 2nd generation Amazon Echo. It can also be a new feature to an existing product, such as a dynamic turn indicator in a car or foot massaging shoe insoles that leverage magnetic technology.

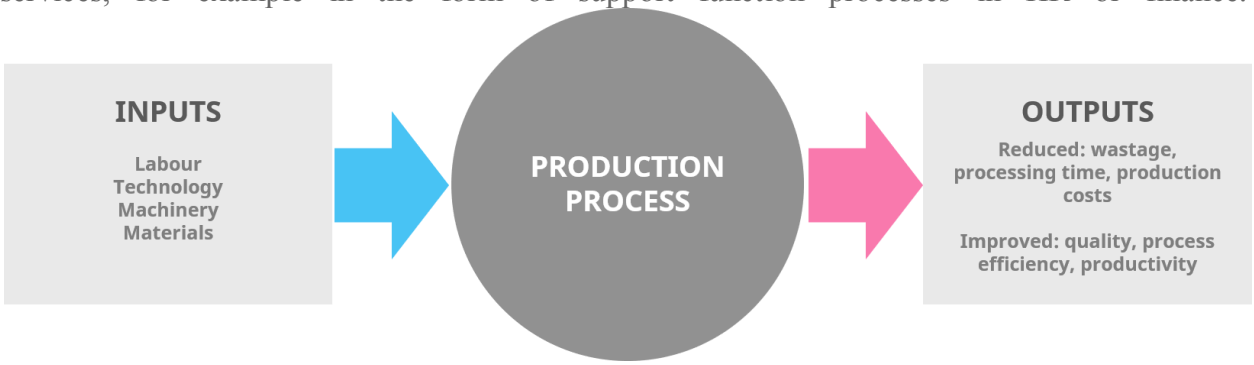
There are some evident drivers of product innovation, such as changes in customer requirements, need to increase the life cycle of the product, urge to tap new markets or segments, or simply to enhance the look-and-feel and the convenience of using the product.

Product innovation is a great way to improve quality and product reliability to either gain competitive edge or sustain your position in the market. In addition, it can help reduce processing and manufacturing costs.

Process innovation

A process combines the skills, technologies and structures that are used to produce products or provide services.

Process innovation generally refers to the **implementation of a new or significantly improved production or delivery method**. It may also be indirectly related to the company's products and services, for example in the form of support function processes in HR or finance.



Process innovation can be done by applying new technology or improved method to a process and is often done to save time, money, or to serve customers better. It often involves new techniques, equipment, or software, and can often require a cultural or structural change as well.

In process innovation, the final product is usually not changed, but the method of bringing out the product is improved.

An example of a process innovation is automated replenishment ordering for retail stores. Previously, an employee had to manually go through all the products one by one to see how much should be ordered. This is not only extremely time consuming but easily leads to over- or under-stocking, depending on whether the estimate is conservative or not.

A more modern way is to use statistical models to calculate a significantly more accurate forecast. If automated orders are created by a system, you can simply let staff double check the pre-calculated order proposals, for example in case the order happens to exceed a certain threshold value. This can not only save you a lot of time and money but having better stock levels also improves your ability to serve customers.

Organizational and Individual innovations

The notion „organizational innovation" denotes, in general, a mechanism applied by the organizations to adapt to changing conditions of competition, technological advancement and market expansion by producing newer products, techniques and systems In its simplest term, organizational innovation is"the tendency of the organization to develop new or improved products/services and its success in bringing those products/services to the market"(Gumusluoglu and Ilsev, 2009: 467). It is also defined as the organizational capability to renovate ideas and knowledge into new products, services or processes continuously for the benefit its stakeholders. To define the concept more clearly, a distinction between creativity and organizational innovation is very useful. Accordingly Amabile (1998) defined creativity as the production of creative and constructive ideas, and innovation as the successful realization of innovative ideas within an organization.

Individual innovations

Individual innovation can be operationalized in various ways. Generally, the construct has been thought of in terms of personality characteristics, outputs and behaviors. For instance, Hurt, Joseph and Cook (1977) regarded individual innovation to be personality-based, defining it as a generalized willingness to change. individual innovation in two respects. First, we add to the measurement of individual innovation by developing and empirically validating a multi-dimensional measure of innovative work behavior. Second and most important, we aim to improve our understanding of the antecedents of individual innovation by investigating which leader behaviors correlate with innovative work behavior.

Q4. Explain Models of Innovations.

Answer:-

Models of Innovations

1. First Generation Model – Technology Push

The first generation model was developed by NASA in 1960 as a management tool. NASA referred to the process as the Phase-review-processes or the technology push. The process was broken down to help in systematizing the work and for controlling contractors and suppliers who were working on space projects.

Since progress to the next stage relied on completion of the previous stage, the management held a meeting when a stage was completed. Their role was to determine whether the set objectives for the stage had been met. They also met to decide on the progress of the project. The processes were linear in nature and relied on engineering.

Basically, the model assumes that technological advances from scientific discovery and research and development come before 'pushed' technological innovation through engineering, marketing, applied research, and manufacturing towards successful inventions or products as outputs.

Advantages of the model

- First, all the tasks were completed as one process had to be completed before moving on to the next one.

- Secondly, the model reduced technical uncertainties.
  Disadvantages of the model

- The fact that all activities within a given phase had to be completed before progressing created delays. This is because all other activities were put on hold until the management review for the particular stage was completed.

- Another disadvantage is that the marketing phase was left out; the model mainly dealt with the development stage of an idea.
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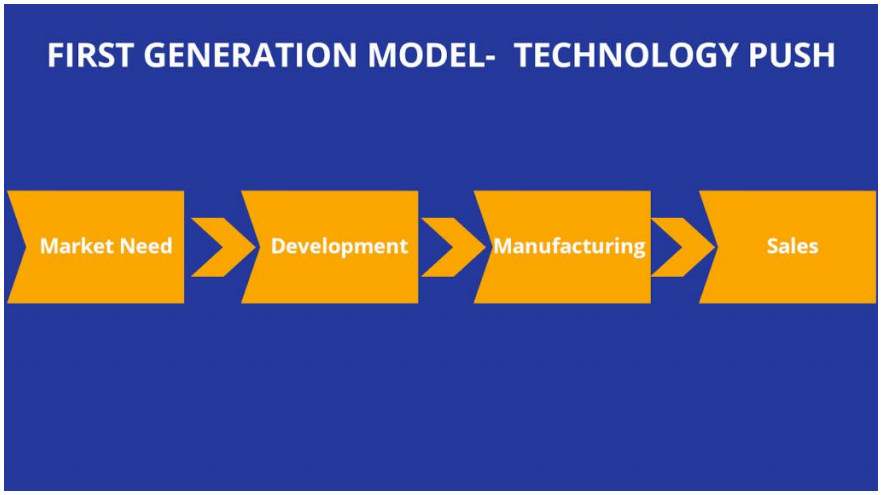


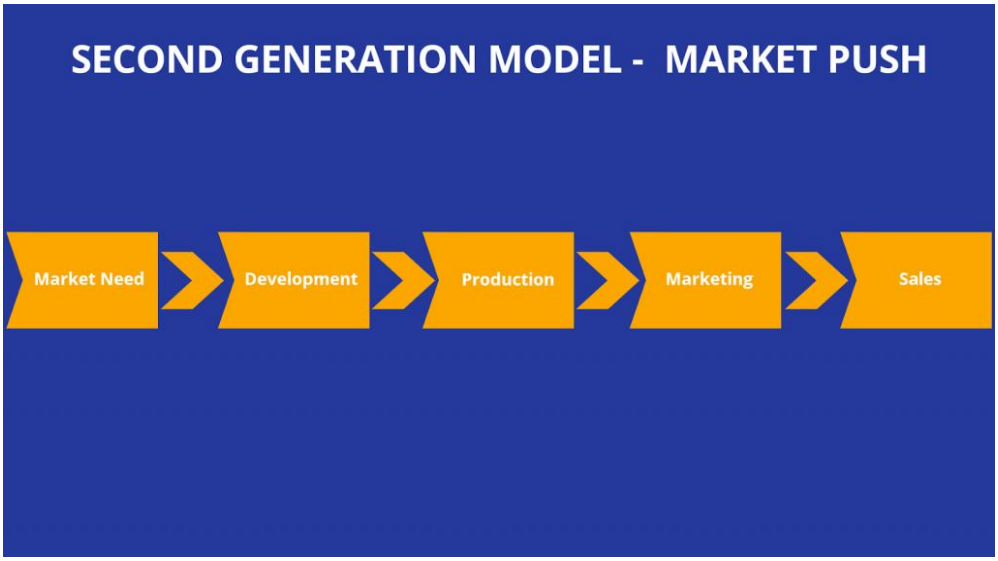
2. Second generation model – market pull

In the 1960s mid, the approach shifted from Technological push to Market pull. The focus began on responding to market needs. Factors ignored during the first generation are considered now in the second generation.

It includes- the cost-benefit analysis of each project & systematic allocation of resources.

The process is similar or sequentially linear but emphasized on market needs. Thus reducing the research time.

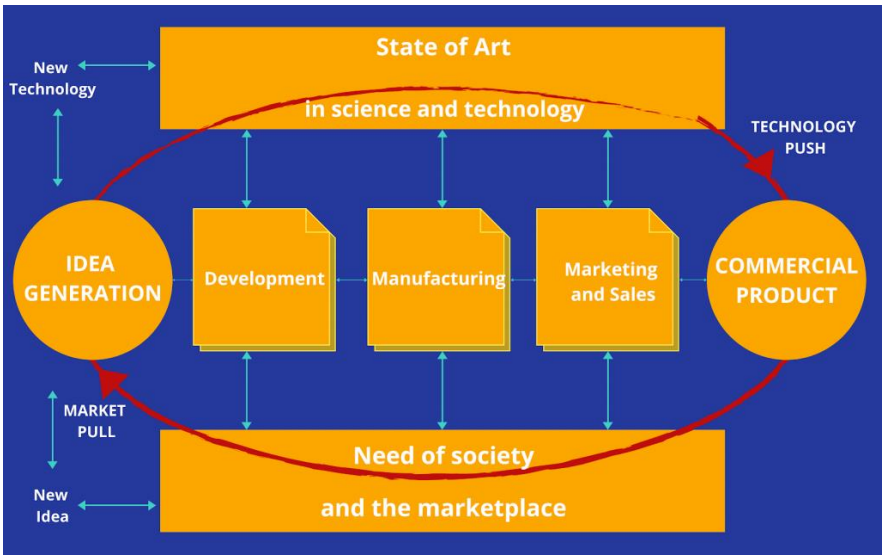
As the market needs are dynamic, the projects would last for a shortfor short period. Hence, resulting in numerous small projects.



3. Third-Generation Innovation Model (3G) – Coupling Method:-

The third-generation model overcomes the limitations of the previous two linear models. It gained prominent acceptance during the inflation and stagflation phase of the economy. It tightly combined R&D and Marketing. The innovators coupled technological innovation with market needs. The model was based on the balanced coupling of Technology Pull and Market Push.

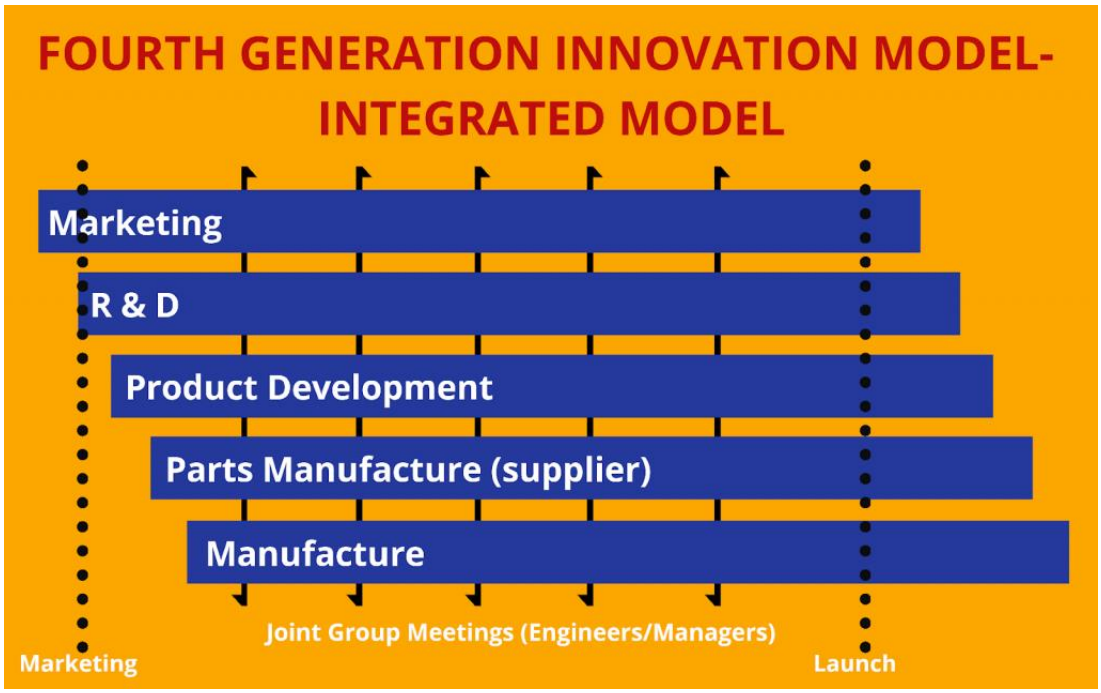
The core driving factor was reducing the operational costs during the contraction stage of the economy. So, the process formed a non-linear feedback loop. But the stages in the process made the model sequential.



Fourth-Generation Innovation Model (4G) – Integrated Model

The fourth-generation model follows an integrated model for the business process. It moved away from the sequential process to follow the parallel process.

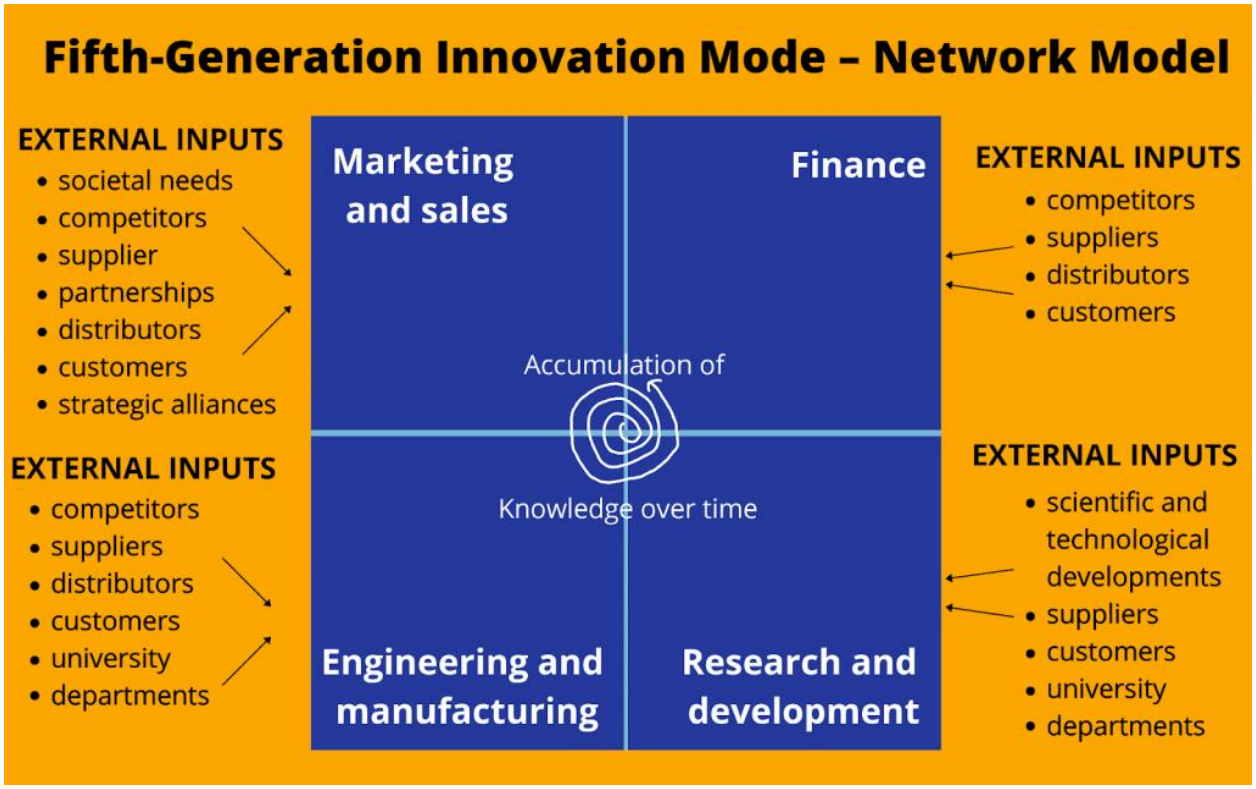
A parallel approach is followed in development, internal company communication, key suppliers at upwards, and customers at downwards.



Fifth-Generation Innovation Model(5G) – Network Model

The network model focused on the effective distribution of network processes. It emphasized on gaining flexibility and increasing the development speed.

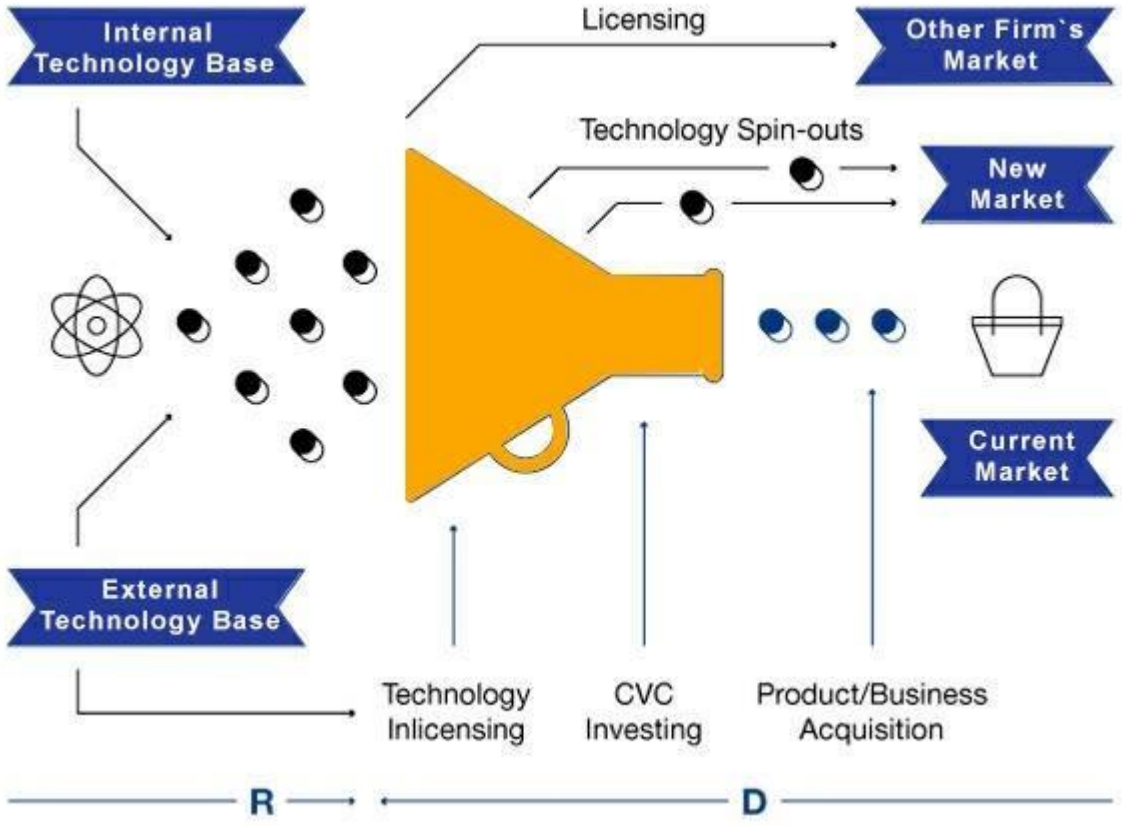
The 5G model has integrated network systems to consolidate external and internal factors. Therefore, the model considers the external inputs of suppliers, customers, competitors, government, etc.



Thus gaining market competitiveness in time of rapid technological changes and shorter product cycles.

The Integrated and network model intensifies the fact that technological innovation is cross-functional & multi-factor but not sequential.

Sixth-Generation Innovation Model (6G) – Open Innovation Model



As Chesbrough defines, “Open innovation is the use of purposeful inflows and outflows of knowledge to accelerate innovation internally while also expanding the markets for the external use of innovation.”

It looks out for technological advancements by combining internal and external ideas. The funnel representation shows- Initiating with a large pool of ideas to narrow down later at the best choice of the idea.

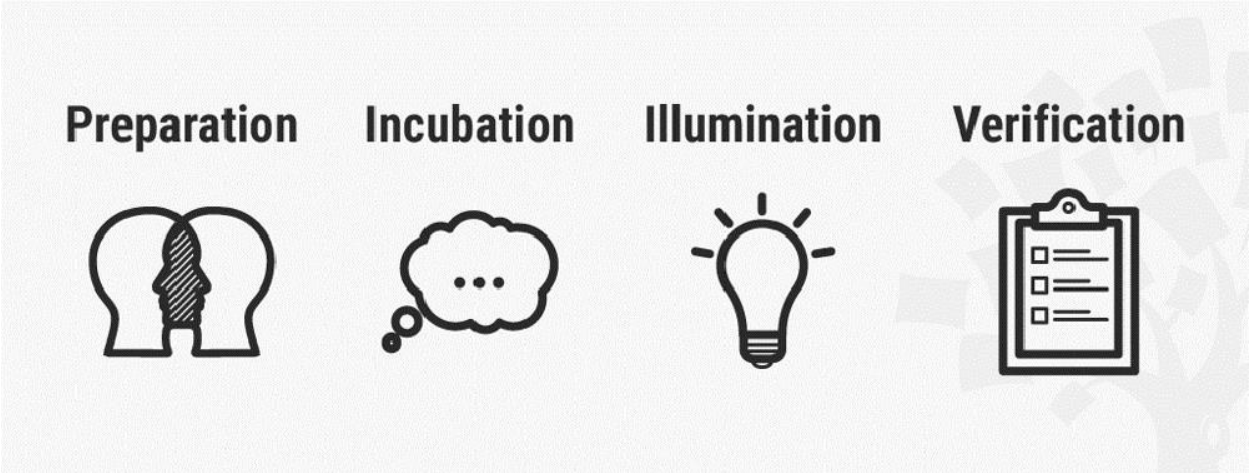
Q5. Explain Creativity Process and its stages in detail.

Answer:-

A real cognitive process is involved in producing new ideas and transforming old ideas into something new. It’s called the creative process and it’s something you can apply to any part of your life, regardless if it’s creative or not. We all have creative potential inside of us. Somehow, in some way, we make decisions and act on them by using creativity. A lot of our daily problems need a creative solution.

Stages of Creativity Process:-

Graham Wallas proposed one of the first complete models of the creative process. Wallas described how it consists of the four-stage process of preparation (or saturation), incubation, illumination and verification (or implementation).



1. **Preparation:** This first stage is all about gathering information. This is the stage where you do user research and empathize with the users in order to define the problem and your users' needs. Some people think that creative ideas just pop up from a vacuum, but creative ideas are always solutions to a problem or a need. At this stage, you also use various ideation methods to help you understand, attack and build your design problem and creative idea from various angles. You provoke your habitual thinking in order to better understand your design problem, your idea and your design space.

   The first stage is the idea of **PREPARATION**, the idea that you are immersing yourself in the domain. If you area musician you are absorbing a lot of the music that is inspiring you to create this new piece. If you're a writer you are reading other writers in this area. If you are an artist you are looking at other artist's work in the area that you are looking at creating something in. If you are a scientist you are looking at all the background research. And if you are an entrepreneur or marketer you are looking at all the previous market research and what other companies have done before.

   So this stage is normally best carried out in a quiet environment. It's really this stage that you are trying to absorb as much information as possible because this information will go into your sub-consciousness where it is very important for the second stage, or second level.

2. **Incubation:** At this stage, you take a step back from the problem and allow your mind to wander to let it contemplate and work the problem through. You nurture the unconscious thought process, for example, by staying open to the ideas that come to you while you do the dishes or go for a walk. You open your mind to all ideas—even the crazy ones.
   The second stage is what we call the **INCUBATION** stage. In incubation this is when all the information that you have gathered in the PREPARATION stage really goes back. It

starts to churn in the back of your mind, in the sub-consciousness. This is an extremely important stage because sometimes it can takes days, or weeks, or months or sometimes even years. That idea that you'll think about writing about a book or piece of music, and you're writing about it and you just leave it to the side for a while and then you come back to it. Now the interesting thing about the incubation stages it that to a certain extent it is not really under your control how long that stage will take. It is something you cannot really rush because what it leads to is the third stage.

3. **Illumination:** This is the third stage. This stage essentially describes the classic "eureka!" or "aha" moment of insight. However, the fact that illumination has an entire stage devoted to it shows that it's essentially not just a quick moment of insight and helps us understand that it's something we can—and should—work towards achieving. The third stage is what most people think is a classic characteristic of a creative person, but creativity is a process which even the most seemingly unimaginative people can learn to manage and nurture.

   The third stage is what most of the public think is a classic signal or sign of a creative person, what is called the **INSIGHT** stage or the insight step. With insight it is really the idea of the 'Aha' moment, the 'Eureka' moment. Although it is probably the smallest part of the five steps, it is possible one of the most important parts. On one of my subsequent videos I'll take you more into how to increase your chances of having those 'Aha' moments, those insights. A quick thing I would say here is that they most often happen when you are doing some kind of low-level physical activity; going for a shower, driving a car, having a walk. This is because your subconsciousness in the previous stages is bubbling away and this insight stage really allows the mind to work on something else. And then bring these ideas to the forefront of your mind. So that's the third stage, the insight's stage. And now we go on to the fourth stage.

4. **Verification/implementation:** At this fourth stage, you build on the "aha" solution. You evaluate, analyze and build on your idea. You then polish it to make sure that it's both useful and novel. At this stage, you would also often choose to prototype and test your idea in order to find out if it meets the users' needs which you defined at the preparation stage—and, if so, polish it as needed.

   The fourth stage is this idea of **EVALUATION**. This is something I have a problem with. I think it is an area that a lot of creative people struggle with because often you have so many ideas and you have a limited amount of time. So the evaluation stage is important because this is where it requires self-criticism and reflection. It is asking yourself questions like:

   "Is this a novel or new idea or is it one that is just re-hashed and has been done before?"

   It's the idea of going out to a small group of trusted friends and saying:

   "I've had this idea, what do you think about this?"

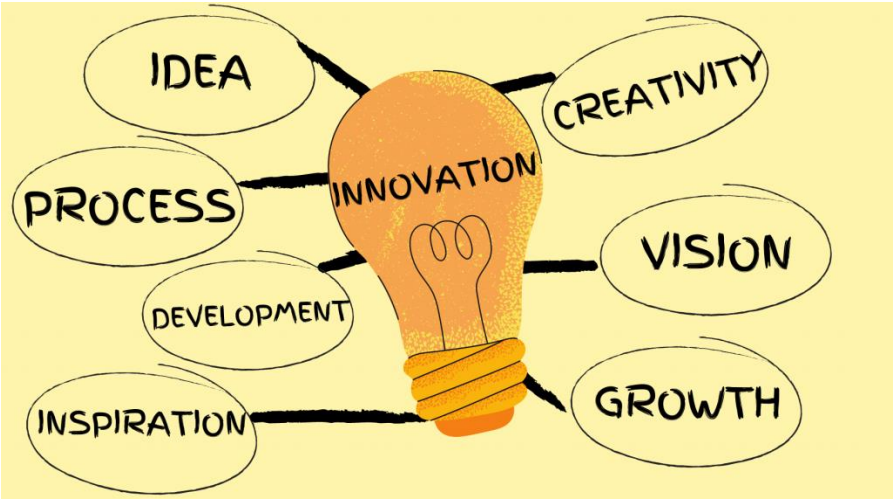
It is very important part because we only have a limited amount of time to do certain things. Often you find that people who are called the most 'creative people' are often very good at this stage, the evaluation stage. They have all these ideas but they can use self-criticism and reflection to say "these are the ones that have the most merit and that I'm going to work on".

Innovation Process:

Innovation refers to the introduction of a new quality of a good or a new good, market, method of production, source of supply, and organization in an industry. The most promising thing about innovation process is being able to actualize an idea into a successful concept.

"Innovation takes birth in sync with the evolution of customer's expectations and demands or vice versa. Either way, organizations around the world have to continually innovate themselves and keep up with the people's wants. The failure to do so or being indifferent to your customer's needs will make your competitors win. And then, customers become indifferent to you with a high-risk gamble to play at."

Steps of Innovation Process –



Step 1: Idea Generation And Mobilization –

New ideas are created during idea generation. Successful idea generation should involve the pressure to compete and the freedom to explore.

Mobilization occurs when the idea is moved to a different logical or physical location.

For instance, how Apple waited three years after MP3 players were introduced to create the iPod, which was attractive, intuitive, and offered capacity for up to 1,000 songs.

Step 2: Advocacy And Screening –

Advocacy and screening help to evaluate the feasibility of a business idea with its potential problems and benefits.

Hence, a decision can be made about an idea's future. Companies looking to develop a culture can establish a few best practices.
For instance, Employees should have plenty of avenues to receive advocacy and feedback. Also, organizations must understand the difficulties involved in evaluating truly innovative ideas. Also, organizations need to build transparent evaluation and screening protocols.

Step 3: Experimentation –
The experimentation stage tests the sustainability of ideas for an organization at a specific time. Experimentation generates new ideas with the information that is gathered on the results and feasibility of the original idea.
For instance, when Amazon tested its grocery delivery service in certain Seattle suburbs. After this, Amazon Fresh expanded to Los Angeles, San Diego, and New York City.

Step 4: Commercialization –
Commercialization develops market value for an idea by focusing on its impact. An important part is establishing the specifications of any given idea.
Commercialization is the stage that involves the change of focus developments to persuasion. After the idea is clarified and a business plan is developed, it will be ready for diffusion and implementation.

Step 5: Diffusion And Implementation –
Diffusion is the company-wide acceptance of an innovative idea, and implementation sets up everything needed to develop the innovation.
Diffusion and implementation allow the organization to determine the next set of needs for customers. Receiving feedback, indicators for success metrics and other benchmarks enable the organization to stimulate the innovation process.

Q6. What do you understand by strategic implications?

Answer:-

STRATEGIC IMPLICATIONS
The strategic implications are the major consequences arising from not understanding and tackling the multitudinous impact of forces and dynamics of change that can often impact a business from various angles: political, regulatory and legal

- economic and monetary
- social-cultural
- technological
- ecological and environmental

Strategic planning impacts the management's performance because it directly influences the ability of the resulting strategic plan in getting the commitment and support of the

human resources of the organization in order to maximize the output or consequences of implementation of the plan.

Technology Implications:

A corporation's strategy has technological implications. For example, a company may shift from advertising in newspapers to advertising in online blogs or newsletters. A company may have an expansion goal but realize that opening new offices would be too expensive. Instead it opts to build out its information technology infrastructure servers, hardware, and software and tech support to support employees working from home.

Strategy Alliance:-

Strategy alliances happen when two or more businesses work together to create a win-win situation. For example, Company A and Company B may decide to combine their distribution facilities so they can share mutual resources and cut the costs associated with shipping.

You can form a strategic alliance with any company and for any reason. Often, businesses seek out strategic alliances in the areas of design, product development, manufacturing, distribution or the sale of goods and services, but you can enter into an alliance to further any business objective.

Some Strategic Alliance Examples

To give you an idea of the scope and breadth of strategic alliances, here are some examples:

An adhesives manufacturer forms a strategic alliance with a research laboratory to develop a next-generation adhesive that runs clean on production lines.

A commercial design company forms a strategic alliance with a digital marketing agency to improve its marketing efforts.

A clothing retailer forms a strategic alliance with a single manufacturer to ensure consistent sizing and quality.

A commercial maintenance company partners with a commercial real estate agent to write a regular column in the real estate agent's newsletter, adding value to readership and expanding the maintenance company's marketing reach.

A coffee shop partners with a bookstore so people can browse the latest bestsellers and take a coffee break all in one go, thus expanding the customer base for both partners. This alliance actually happened between Starbucks and Barnes & Noble, and has stood the test of time.

Types of Strategic Alliance

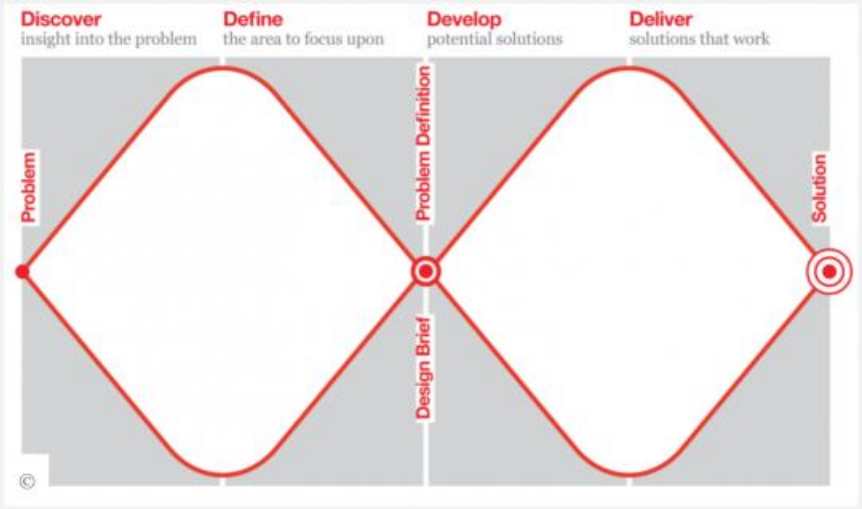
Joint ventures (JV) are often called strategic alliances — and they are, although we are more likely to call them by their proper name. A JV is established when two companies,

Company A and Company B, establish a subsidiary or child company, Company C, to perform the alliance's business goals. If Company A and Company B each own 50 percent of Company C, then it is a 50-50 joint venture. But, they can allocate the ownership in whatever percentages they wish.

A similar structure is the so-called "equity alliance," where Company A buys an equity percentage in Company B (or vice versa). If Company A bought 45 percent of Company B's shares, for example, an equity strategic alliance would be formed.

Most times though, when businesses talk about strategic alliances, they are referring to a much looser structure. A contractual strategic alliance is created when two or more companies sign a contract to pool their resources and seek mutual benefits together. This arrangement is less involved and less binding than equity purchases and JVs. Instead, the two companies remain autonomous, while exploring new opportunities together.

Design Thinking: Divergence and Convergence Cycles



In design thinking the number of possible ideas are created (‘divergent thinking’) before refining and narrowing down to the best idea (‘convergent thinking’), and this can be represented by a diamond shape — the Double Diamond is a simple visual map of the design process.

But the Double Diamond indicates that this happens twice — once to confirm the problem definition and once to create the solution. The creative process is iterative.

Divided into four distinct phases –

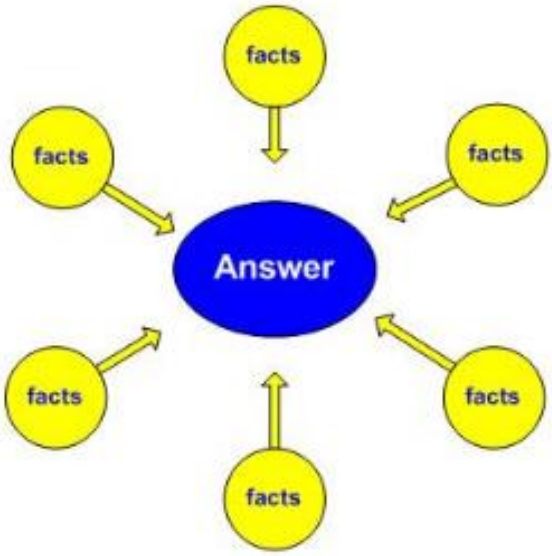
Discover — look in a fresh way, notice new things and gather insights.

Define –make sense of all the possibilities. Which matters most? Which should we act on first? What is feasible? The goal here is to develop a clear creative brief that frames the fundamental design challenge.

Develop –solutions or concepts are created, prototyped, tested and iterated. This process of trial and error helps designers to improve and refine their ideas.
Delivery — resulting project a is finalised, produced and launched.

Convergent Thinking

Convergent stems from the word "converge" which means "come together." Convergent thinking involves putting a number of different pieces of a topic together to find a single answer. The deductive reasoning Sherlock Holmes used in solving mysteries is a good example of convergent thinking. By gathering various bits of information, he was able to put the pieces of a puzzle together and come up with a logical answer to the question of "Who done it?"



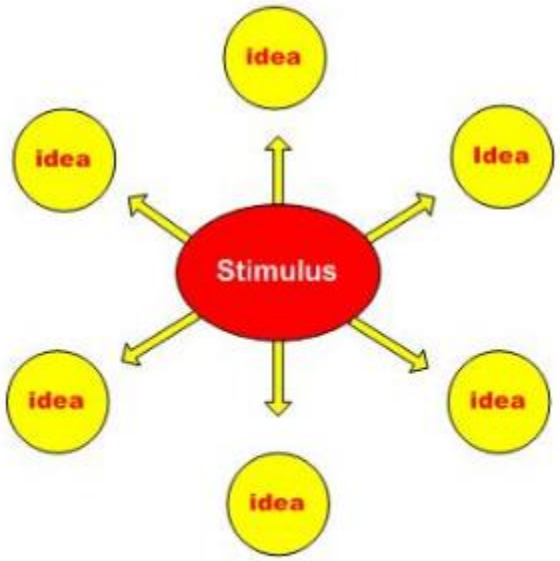
Convergent thinking is what you engage in when you answer a multiple choice or fill-in-the-blank question. This type of thinking assumes there is one correct way to do things. Therefore, in convergent thinking, you begin by focusing on a limited number of choices as possible solutions. You then choose the one correct answer. Because you are finding a single answer, this type of thinking helps you make a decision and bring closure to a problem.

Convergent Thinking Example:

You want to travel to Boston from New York. You are looking for the fastest way to get there. You may consider several options such a plane, bus, car, or train, but ultimately decide on the one fastest way.

Divergent Thinking

Divergent thinking is a creative process that helps you generate multiple possibilities. It generally resists the accepted ways of doing things and seeks alternatives. Therefore, the possibilities you generate are often original and unique ideas.



Divergent stems from the word "diverge" which means "go in different directions." Divergent thinking is thinking outwards instead of inward. It starts from a common point and moves outward in diverging directions to involve a variety of aspects or perspectives. It opens your mind to various possibilities in all directions. It has you looking for options as opposed to choosing from a set of predetermined ones. However, with divergent thinking, you then need to assess and evaluate those possibilities before you make a conclusion and bring closure to the problem.

Divergent Thinking Example:

You want to travel to Boston from New York. You are looking for options of how you can get there. You may generate ideas such a plane, train, boat, bus, car, scooter, motorcycle, bicycle, taxi, walking, or hitchhiking.

Unit-2

Q1: Explain Technology Assessment, Technology leadership and Technology followership in detail.

Answer:-

Technology Assessment:-

Technology is generally defined as "science or knowledge applied to a definite purpose." Technology assessment has been defined as a form of policy research that examines short- and long-term consequences (for example, societal, economic, ethical, legal) of the application of technology.

Technology leadership:

Industry leaders are those companies which maintain their competitive positions through early development and application of new technologies. However technology leadership imposes costs and risks to the organisations which aspire for maintaining technological superiority or leadership.

Technology followership:

Not all firms are equally prepared to be technology leaders, nor would leadership benefit each firm equally. Whether a firm chooses to be a technology leader or a follower depends on how the firm positions itself to compete, the benefits gained through the use of a technology and the characteristics of the firm.

Q2. What do you understand by Technological forecasting?

Answer:-

Technological forecasting:- Technological Forecasting (TF) is concerned with the investigation of new trends, radically new technologies, and new forces which could arise from the interplay of factors such as new public concerns, national policies and scientific discoveries.

Technology Foresight is a combination of creative thinking, expert views and alternative scenarios to make a contribution to strategic planning.

The future is almost by definition unknown, but in both forecasting and foresight activities the judgments or opinions of experts are used. Experts can be used singly, or in numbers. Different techniques can be applied to provide either a consensus view, a range of opinions, or maverick views. The kinds of exercises that can be carried out vary enormously in their complexity and structure and in the ease with which they can be managed.

The simple expedient of subscribing to a technical journal, or belonging to a network or collaborative R&D project, or finding out what research is being done by a relevant research organisation, can all be the first stage towards setting up a more structured approach.

Planning the exercise and getting started

When planning to start either forecasting or fore sighting it is useful to consider:

- The reasons for doing it.
- What resources will be needed and what resources can be made available.
- How long will it take?.
- How to learn the techniques and improve the overall process?

Establish the need

In order to assess if a more systematic approach will be useful the following factors can be considered:

- The criticality of technologies used by the company.
- The maturity and rate of change of critical technologies.
- The nature of the R&D strategy, (eg whether offensive or defensive).
- The complexity and flexibility of markets and the overall business environment.
    - **Co-ordinating resources**

    - Decisions must be made about who should manage the forecasting process. It is not a task for a junior member of staff. It may need a multidisciplinary team or a single individual with adequate authority to co-ordinate across several departments. In all cases the exercise should first seek to use the knowledge and expertise of individuals within the

company. Their specific knowledge of company activities and processes will be useful; much additional information can also be gleaned from their contacts and networks and from their appreciation of the general business environment.

- **Establish and improve the process: forecasting**

- The process has two primary activities: information gathering and analysis. The value of the overall process to each company depends on how the two main activities are carried out, how the techniques are customised, and the extent to which the process is followed through to recommendations and actions. They are often applied in iterative or parallel processes. It is not necessary to complete the whole process to appreciate the potential benefits so the process reinforces itself and encourages further iterations.

Activity 1: collection of relevant information

The major issues to be addressed are:

◦ What information and what kind of data are relevant?

◦ What sources of information are to be used?

◦ How accurate is it?

◦ What systems need to be set up to provide information and data on technological developments and trends?

Practical decisions arising from consideration of these issues include:

◦ Which journals to monitor, and how.

◦ Which conferences and trade fairs to attend.

◦ How to share information.

◦ Who should participate in which networks.

◦ How can an individual’s relevant expertise best be used?

- What internal data to collect and external data to acquire.
- How to track performance parameters of competitors' products?

Activity 2: analysis of the data by individuals and by various methods and techniques

The major issues to be addressed are:

- Whose expertise should be used?.
- Which methodologies or techniques are appropriate?.
- Against what criteria or objectives are the analyses to be judged?.
- What data should be used or is relevant?.
- Who are the relevant people to apply the techniques to the data?.

Decisions following from considerations of these issues could result in a greater understanding of the potential contribution and judgement of different experts, within and without the company; more tightly formulated objectives; and a greater understanding of the value of forecasting in general.

Establish and improve the process: foresight

Foresight activity seeks the subjective or intuitive opinions of a number of people with varying degrees of expertise. Opinions need to be collected without bias or misinterpretation. Using different techniques, some more structured than others, experts are asked to project their present knowledge towards how events and trends might develop in the future. They also need to consider what alternatives might be possible within the projected time frame. When setting up a foresight programme it is important to consider:

- What kind of expertise is relevant and how can it be obtained.
- What boundaries to the creativity of the process have to be imposed.
- How can the exercise be aligned to the needs of the organisation that is commissioning the study.

Q3. Explain techniques of forecasting.

Answer:-

Forecasting techniques

Specific techniques for forecasting fall into two main categories, exploratory and normative.

- **Exploratory** techniques are primarily concerned with the analysis of historical data. Selected attributes such as functional performance, technical parameters, economic performance etc. are plotted against time. Since it is usually assumed that progress is evolutionary and that technological progress is not random, it is possible to generate characteristic curves or patterns from the data and from these patterns forecasts can be made with varying degrees of certainty. However, changes do occur and the influence and impact of new or surprise factors must not be disregarded. Examples of relevant exploratory techniques are:

  - S-curves
  - cycles
  - trend extrapolation
  - technology substitution

— all of which rely on a large amount of statistical data, which may or may not be available freely.

- **Normative** techniques start by proposing a desired or possible state, such as the satisfaction of a market need or the achievement of a technological development, and work backwards from this to determine the steps necessary to reach the required outcome. The number of foreseeable paths of development from the present position to the objective could range from ‘none’, implying a completely new technology, to ‘several’. Each feasible path to the objective is analysed for its relevance and difficulty. Examples of relevant normative techniques are:

- relevance trees
- morphological analysis
- technology watch and technology monitoring
- Delphi analysis
- trend impact analysis
- technology substitution.

Information needed for these techniques is likely to be more firm-specific than that needed for exploratory techniques. Technology-watch in particular needs a proactive role to help the organisation identify and establish links with the most useful sources of information and opinion; typically these will be at the forefront of innovative activity.

Relevance tree

Once an objective has been defined, a *relevance tree* technique can be used to investigate the relevance and feasibility of different ways of achieving it. It provides a means of exploring all the contributing technologies and approaches in a systematic way and highlights the alternative routes and choices that are available, and their consequences. If there is a critical gap which cannot be bridged with existing technology, it could signal an opportunity for a major technological innovation. Each route can then be assessed on criteria such as development cost, probability of success and lead time, and a decision taken relevant to company policy at that time. Expert opinion has to be employed to quantify the consequences and relevance of many of the steps, and there is no ‘best’ approach, because criteria will be company specific. A methodology using ‘relevance numbers’, which assigns to each path a proportional relevance with respect to other alternatives at the same level, is a useful tool for reaching a consensus, and for quantitatively comparing relative importance.

Delphi exercises

The *Delphi* technique is used where a consensus of expert opinion is required on the timing, probability and identification of future technological goals or consumer needs and the factors likely to affect their achievement. It is best used in making long-term forecasts and revealing how new technologies and other factors could trigger discontinuities in technological trajectories. The choice of experts and the identification of their level and area of expertise are important; the structuring of the questions is even more important. Experts in non-technological fields can be included to ensure that trends in economic, social and environmental fields are not overlooked.

Growth Curve:- Growth curve analysis (GCA) is a multilevel regression technique designed for analysis of time course or longitudinal data. A major advantage of this approach is that it can be used to simultaneously analyze both group-level effects (e.g., experimental manipulations) and individual-level effects (i.e., individual differences). We have been using this method for several years, particularly in the context of visual world paradigm (VWP) eye tracking data and learning curves, though it can be applied to any time course data.

Q4. Explain in detail Relevance Trees & Morphological Analysis.

Answer:-

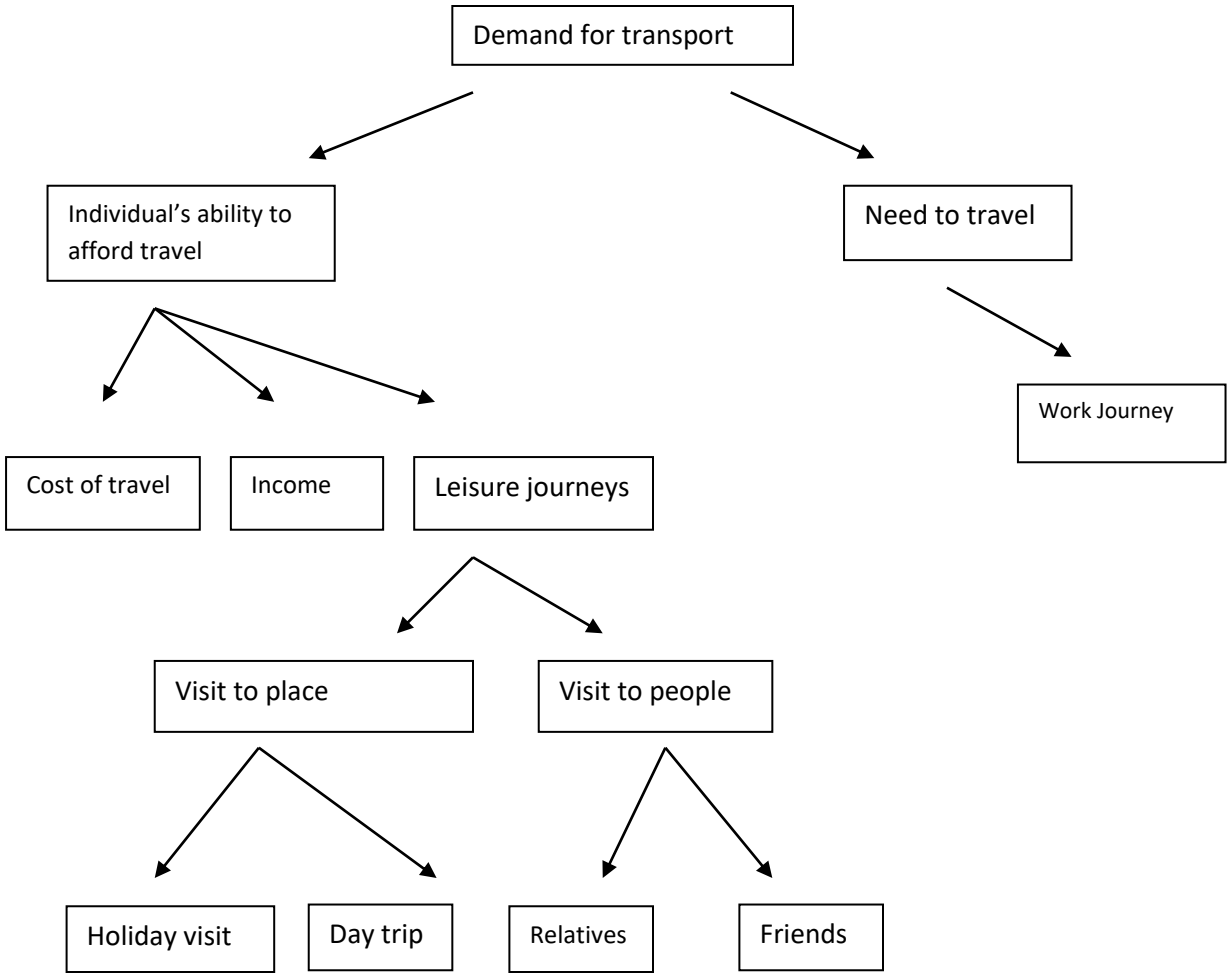
Relevance Trees & Morphological Analysis are normative forecasting methods which start with future needs or objectives, and then seek to identify the circumstances, actions, technologies, etc. required to meet them.

A relevance tree is an analytic technique that subdivides a broad topic into increasingly smaller subtopics thereby showing 'all' possible paths to the objective, and provides a forecast of associated costs, durations and probabilities for each element.

Similarly, morphological analysis involves mapping options to obtain an overall perspective of possible

RELEVANCE TREE :- A relevance tree allows you to map out your initial ideas on a topic, in this case ‘demand for transport’, and think through various sub-topics in order to help you identify a specific area to research. Here, TWO key factors are suggested as affecting ‘demand for transport’: ‘the individual’s ability to pay’ and the ‘need to travel’. Although a number of

ideas are considered in response to the overall topic of ‘demand for transport’, the sub-topic of ‘work journeys’ as a branch from ‘need to travel’ appears to offer the best focus for a research project (this is placed in a circle). Thinking through a relevance tree, and perhaps adding notes regarding possible sources of information for each topic, can help you see whether your topic is too broad or too narrow to work as a dissertation project.



Morphological analysis or **general morphological analysis** is a method developed by Fritz Zwicky (1967, 1969) for exploring all the possible solutions to a multi-dimensional, non-quantified complex problem.

MA was designed for multi-dimensional, non-quantifiable problems where causal modeling and simulation do not function well, or at all.

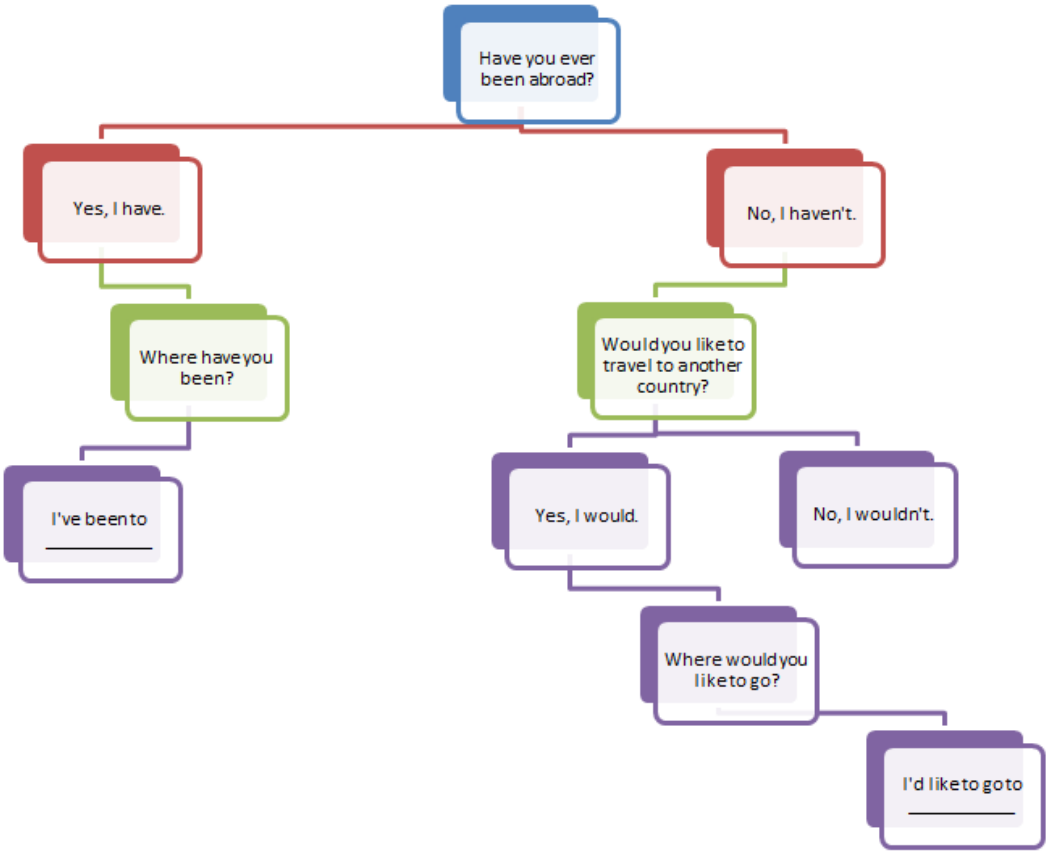
Morphological analysis of real-world problems

Consider a complex, real-world problem, like those of marketing or making policies for a nation, where there are many governing factors, and most of them cannot be expressed as numerical time series data, as one would like to have for building mathematical models.

The conventional approach here would be to break the system down into parts, isolate the vital parts (dropping the 'trivial' components) for their contributions to the output and solve the simplified system for creating desired models or scenarios. The disadvantage of this method is that real-world scenarios do not behave rationally: more often than not, a simplified model will break down when the contribution of the 'trivial' components becomes significant. Also, importantly, the behaviour of many components will be governed by the states of, and their relations with, other components – ones that may be seen to be minor before the analysis.

Morphological analysis, on the other hand, does not drop any of the components from the system itself, but works backwards from the output towards the system internals. Again, the interactions and relations get to play their parts in MA and their effects are accounted for in the analysis.

Mission flow diagram:-



Benefits

-Technology cannot be considered in isolation from environmental, social, economic and political factors and all these factors can affect a company's performance and outlook. The quality of decision-making in strategic planning can be improved by information on these factors and by the knowledge and experience learned from obtaining such information.

-Forecasting and foresight extend and expand the benefits of near-term market intelligence and simultaneously stimulate learning and improvement practices.

-Forecasting and foresight studies try to shed light upon the nature, magnitude, probability and timing of relevant scientific and technological developments. These can be opportunities or threats and might have a potential impact either on a single enterprise or on several or many

enterprises collectively. They might have an impact on supply-chains, industry sectors or consumer markets.

-It is sometimes important that national governments and international organisations, such as health and environmental agencies, should set up forecasting and foresight activities. These activities can complement the formal or informal planning, marketing or forecasting and foresight activities set up by business associations and/or individual companies. A co-incidental benefit of national or international studies that are conducted in a participative way is that they can facilitate networking between companies.

-Much of the value of engaging in foresight activities at a company level lies in working through the processes themselves rather than just reading the results and formal reports arising from the exercise.

-Foresight information can give greater legitimacy to vision statements. A common reason for a company to change its Chief Executive Officer is to inject a new vision into the organisation. Foresighting exercises can provide an alternative way to inject new vision; they are less dependent on the talent or inspiration of a few key individuals. A wide representation of employees can be involved in foresighting, or can learn about its impact and results; this has direct benefits since the vision is already communicated and better understood across the organisation. There are also indirect benefits in terms of empowerment, motivation and learning.